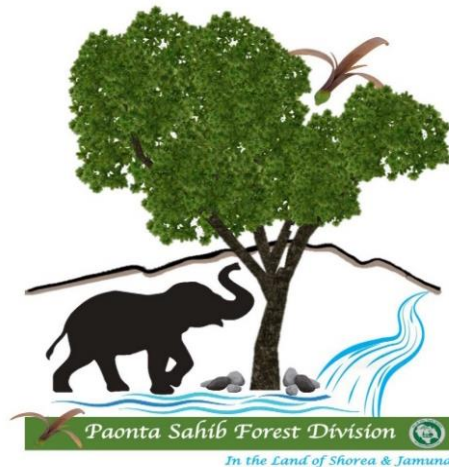




# **DRAFT WORKING PLAN FOR THE FORESTS OF PAONTA SAHIB FOREST DIVISION**

**FOR THE PERIOD 2023-24 TO 2032-33**



**AISHWARYA RAJ  
WFO-CUM-DFO , PAONTA SAHIB**



## Preface

Working Plans are the *liber primus* of the Forest Department and hold an almost sanctimonious importance. They are also the *vade mecum* or the guiding document that detail the scientific management of forests and the prescriptions given therein are the backbone on which sustainable management of our forests rests.

Considering its immense importance, authoring a Working Plan is an opportunity of great privilege for a forester. In the days of yore, when forests were worked for timber needs, writing a working plan called for an expertise in the scientific discipline of forestry to prescribe sustained yields in what are essentially very long-term operations. However, in the current paradigm of mega global challenges of climate change, unprecedented biodiversity loss and a consequent call to action therein, scripting a working plan requires an even wider set of qualities comprising not only the rigours of science but also the sensitivities of art to understand and prescribe for the deep “web-of-life” that a forest is!

Paonta Sahib Forest Division for which the current working plan has been written is a crucial forest division of the state abounding in Sal Forests. It formed one of the three areas where experimental Silvicultural Felling has been carried out under the direct monitoring of the Hon’ble Supreme Court of India in the very recent past. The prescriptions detailed in the Working Plan chart the road-ahead for carrying out the scientific management of these forests that is premised on the core issues of improved regeneration, biodiversity conservation and increased carbon sequestration, apart from realizing their ecotourism potential and above all deepening the connect of forests and the people.

It gives me pleasure to approve this Working Plan of the Paonta Sahib Forest Division, execution of which shall enhance the ecosystem services provided by these forests. I congratulate the team of foresters for this commendable effort executed amidst various challenging constraints but nonetheless completed within the prescribed time.

It is my hope that the tradition of writing such Working Plans that are alive and responsive to the dynamics of the ever-changing, complex needs of the anthropocosm gets reinvigorated. After all, our aspirations of realizing a more sustainable future depend on this. This present Working Plan is one such important step in that direction.

Rajiv Kumar, IFS  
PCCF(HoFF), H.P.



## Message

Paonta Sahib Forest Division is one among the three forest divisions in Himachal Pradesh where experimental silvicultural felling has been carried out under the monitoring of the Hon'ble Supreme Court of India in the recent past. The results of the same on the regeneration of Sal have been very encouraging.

It is in this context that this Working plan acquires greater salience and the prescriptions given here provide the way forward regarding the scientific working of Sal forests in this important division. Alongside the silvicultural prescriptions, the Working Plan also caters to the changing paradigm of forestry as regards provisioning of ecosystem services, realizing ecotourism potential of the division, and deepening the communities-forests connect.

I heartily congratulate the team of foresters of Paonta Sahib Forest Division for their laudable and timely execution of this Working Plan and I hope the dedication and professionalism shown by this team inspires other divisions where the Working Plans are due for revision.

Pradeep Thakur, IFS

Member Secretary,

Standing Consultative Committee-cum-

APPCF (WP&S) HP at Mandi



## Message

It is a matter of great joy to see the revised Working Plan of Paonta Sahib Forest Division, one that had been due for revision for more than two decades. For this, I heartily congratulate the team of dedicated foresters at Paonta Sahib Forest Division who have worked despite various constraints to nonetheless complete the Working Plan within the stipulated time.

Paonta Sahib Forest Division under Nahan Circle is indeed unique for being the home of rich Sal forests – the only division to have them in Himachal Pradesh. This is also one of the areas where experimental silvicultural program has been carried out, monitored directly by the Hon'ble Supreme Court. The results of experimental felling have been very encouraging and proves the merit of silviculture to improve regeneration of natural forests. In this context, this Working Plan provides the way forward for scientific management of Sal forests.

It is also pertinent to note that scientific management in today's context has expanded from sustainable harvesting of timber to a holistic provisioning of ecosystem services. It gives me delight to state that the prescriptions given herein stand true to these changing needs.

This Working Plan for Paonta Sahib Forest Division is thus a welcome addition to the long tradition of the management of Sal forests in the state and paves the way for the sustainable future that we all are aspiring for.

Vasanth Kiran Babu, IFS

CF Nahan



## **ACKNOWLEDGEMENTS**

I would like to acknowledge the following persons who have been instrumental in the making of this draft working plan. Firstly, I would like to thank Sh. Rajiv Kumar, IFS, PCCF (HoFF) for giving us this valuable opportunity to write the Draft Working Plan and his insightful and sharp guidance in writing of the Plan. Sh. GS Goraya, IFS, PCCF (HoFF) (Retd.) for kindly revisiting and revising the flora list of the Division for this plan. Smt. Sarita IFS, then CCF Nahan and Sh. Vasantha Kiran Babu, CF Nahan for their valuable guidance and insights in writing of the plan. Sh. H.V. Kathuria, IFS (then APCCF Working Plan) and Sh. Abhilash Damodaran IFS (CF, Chamba) for guiding us regarding the sampling techniques. I would also like to convey gratitude to Sh. Pradeep Thakur IFS (APCCF Working Plan & Settlement) and IFS, Smt. Parul Sood HPFS for their guidance in the drafting of the Plan as well as members of the State Consultative Committee for their inputs.

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The team at Paonta Sahib Forest Division has been the backbone of making this plan in such a short span of time by putting days and nights together that too with a significant change as per New Working Plan Code 2014. Sh. Suprabhat Thakur, HPFS, ACF, for his constant support, keen interest, initiative and inputs in the writing of this plan. Sh. Suresh Pal Thakur, Supdt. Gr. II, for his immaculate compilation in record-keeping and his dedication all through, managing the delegation of work.

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Aishwarya Raj  
DFO-cum-WPO  
Paonta Sahib

## Abbreviations

| Sr. No | Abbreviations | Full forms                                                        |
|--------|---------------|-------------------------------------------------------------------|
| 1      | ACF           | Assistant Conservator of Forest                                   |
| 2      | ANR           | Assisted Natural Regeneration                                     |
| 3      | BO            | Block Officer                                                     |
| 4      | BEF           | Biomass Expansion Factor                                          |
| 5      | CAMPA         | Compensatory Afforestation Fund Management and Planning Authority |
| 6      | CEC           | Central Empowered Committee                                       |
| 7      | CH            | Compartment History                                               |
| 8      | DFO           | Divisional Forest Officer                                         |
| 9      | Dia.          | Diameter                                                          |
| 10     | DMFT          | District Mineral Foundation Trust                                 |
| 11     | FCA           | Forest Conservation Act                                           |
| 12     | FDA           | Forest Development Agencies                                       |
| 13     | FRA           | Forest Rights Act                                                 |
| 14     | GIS           | Group Insurance Scheme                                            |
| 15     | HPSFDC        | Himachal Pradesh State Forest Development Corporation             |
| 16     | JFM           | Joint Forest Management                                           |
| 17     | MCR           | Master Control Rooms                                              |
| 18     | NCAP          | National Clean Air Programme                                      |
| 19     | NPV           | Net Present Value                                                 |
| 22     | NTFP          | Non-Timber Forest Produce                                         |
| 23     | RF            | Reserve Forest                                                    |
| 24     | RO            | Range Officer                                                     |
| 25     | Spp.          | Species                                                           |
| 26     | WC            | Working Circle                                                    |

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# **I. EXECUTIVE SUMMARY**

## **INTRODUCTION**

The working plan for Paonta Sahib Forest Division, Himachal Pradesh, for the period 2023-24 to 2032-2033 has been prepared as per National Working Plan Code-2014. The previous Working Plan was written by Sh. Vineet Kumar (1998-99 to 2012-13 and extended up to 2017-18). The plan was for a period of 15 years beginning from 1998-99 to 2012-13 which was extended up to 2017-18 and approved by MoEF&CC. It is also noteworthy that the current Working Plan is the 1<sup>st</sup> being written exclusively for Paonta Sahib Forest Division, since previously it was combined with Nahan Division, having being carved out only in 1984.

The current initiative is undertaken to efficiently plan and sustainably manage, improve, conserve and utilize the state forests & the biodiversity. This technical document being prepared for 10 years contains details of information about forest type, flora, fauna, soil and water resources, management practices to be adopted, growth & yield statistics of different forest, interference and interdependence of biotic and abiotic factors etc. Further, the working plan aims to steer processes to guide the increase in the percentage of forest area both in qualitative and quantitative terms. The key driver is also to link the village level development issues (local livelihoods) with the improvement and protection of ecosystem services of the forest. This needs to be done by integrating environmental, social and economic issues into a holistic framework based on the livelihoods of the natural resource dependent community. The data of forest attributes in new working plan code will help foresters in delineation of drivers of degradation and to implement correct prescriptions in future for improvement and management of ecosystem services of Paonta Sahib Forest Division.

The Working Plan has been prepared for sustainable management of Paonta Sahib Forest Division keeping in mind the availability of resources and the issues therein along with measures to control the pressure on the forest reserves and increase the green cover of the division. The reserved forests covered by this Working Plan lie within the geographical limits. The area is situated between 30° 22' 37" and 30° 41' 36" North latitude and 77° 7' 19" and 77° 49' 48" East Latitude.

Measures to control pressures on forest reserves and enhance the green cover and forest productivity of the division have been emphasized in the working plan.

The total forest area covered by the present plan is 28791.69 ha. The Division comprises of 4 ranges namely Majra, Girinagar, Paonta Sahib and Bhagani Ranges. The area is bounded by Nahan and Renukaji Forest Divisions in North, Dehradun district of Uttarakhand in the East, separated by Tons and Yamuna rivers and Yamunanagar district of Haryana in the South. The Divisional Head Quarter of Paonta Sahib Forest Division is located at Paonta Sahib falling in Doon Valley, on the banks of Yamuna river, at an elevation of about 389 mts.

The forests of Paonta Sahib Forest Division have long attracted the keen-eyes of foresters through planned management of the rich Sal forests. Forestry, however has traversed many cross-roads in the last few decades here, ranging from complete ban on green felling in Himachal Pradesh since 1980s to its part uplifting under experimental felling program in Paonta Sahib Range of the Division in 2018-2020. Today, the Division finds itself in a critical phase. The forests' health, due to the ban on felling and in a way ban on scientific management of forests through silviculture have been affected with over-aged stock, higher diameter classes of trees and impacted regeneration. A whole range of biological resources, utilized in many different ways, are also under immense pressure with increasing biotic pressures, encroachments and fragmentation. The issue therefore is to find out a comprehensive 'Sustainable forest /eco-system Management' practice for revitalizing the forests of Paonta Sahib in terms of silviculture inputs and implementation, as well as to produce enough goods & services to fulfill the ever-increasing demand of all the stakeholders as well as garner their support in protecting the forests, biodiversity within and mitigation of human-wildlife conflicts.

#### **A) VISION STATEMENT**

Revival of scientific forest management in the forests of Paonta Sahib Forest Division based on 'Ecosystem Approach to Forest Management', eco-restoration of degraded forest areas and to ensure participation of local communities along with Forest department in controlling and prevention of any degradation of the forests

#### **B) GOALS AND OBJECTIVES OF MANAGEMENT:**

The objectives of the Working Plan are based on Ecosystem Approach to Forest Management (EAFM) principles: -

- I. To restore scientific management of the forests and revive forest health
- II. To identify the right silvicultural systems for various working circles with the goal to move towards normality of forests and sustainable yield regulation



- III. To enhance the forest/tree cover through various forestry interventions and to assist in derivation of all kinds of *provisioning, regulatory and supporting* Ecosystem Services (ES).
- IV. To restore the ecological balance and to address the demand of the local community without destroying the natural ecosystem
- V. To develop forests as carbon sink for absorption of toxic carbon contents of industry and other polluting agents to enhance the role of *regulatory* Ecosystem Services.
- VI. To protect and conserve the large and compact areas of forests to ensure environmental services such as perennial supply of water, wildlife migration
- VII. To ensure sufficient carbon sink storage through eco-restoration and plantation meeting India's Sustainable Development Goals
- VIII. To replace the exotic species planted in the Paonta Sahib Forest Division with native/indigenous species.
- IX. To minimize the damage to ecology and environment through the various threats that forests face through proper landscape and ecosystem management
- X. To facilitate a Revival Action Plan for water resource management practices in the Division
- XI. To mitigate human-animal conflicts and to increase community participation in conservation of biodiversity and mitigation of conflict
- XII. To tap on the success models in the Division pertaining to water security and enhancement of forest cover including eco-restoration by looking at scalability and replicability.

### C) SWOT ANALYSIS OF THE DIVISION

|                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>STRENGTHS</b> <ul style="list-style-type: none"> <li>• The largest Sal working circle of Himachal Pradesh</li> <li>• Rich biodiversity – floral and faunal</li> <li>• Altitude and accessibility: Complete forests checking and 100% enumeration possible</li> <li>• Proper forest management and monitoring feasibility</li> <li>• Successful people-led forestry activities – Amboya, Chandpur etc.</li> </ul> | <b>WEAKNESSES</b> <ul style="list-style-type: none"> <li>• Multiple exit points for illegal activities</li> <li>• Increased anthropogenic interferences</li> <li>• Fragmentation and encroachments</li> <li>• River bank erosion and susceptibility</li> <li>• Inadequate training and lack of firearms with field-staff</li> <li>• Lack of patrolling vehicles and resources for sensitive areas</li> </ul> |
| <b>OPPORTUNITIES</b> <ul style="list-style-type: none"> <li>• Success of experimental felling for Sal – scope for revival of forest</li> </ul>                                                                                                                                                                                                                                                                      | <b>THREATS</b> <ul style="list-style-type: none"> <li>• Continued ban on scientific management of forests</li> </ul>                                                                                                                                                                                                                                                                                         |

|                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>health, revenue generation and employment creation in the state</p> <ul style="list-style-type: none"> <li>• Scope for creation and management of wildlife corridors for safe passage and enrichment</li> <li>• Ecotourism circuit development with riverfront, diverse forests, National Park and wetland in the vicinity</li> <li>• Untapped spring sheds and water-conservation potential</li> </ul> | <ul style="list-style-type: none"> <li>• Bordering areas with three states - high threat of illegal transit of forest produce</li> <li>• Illicit mining prone with Yamuna, Giri and Bata river systems</li> <li>• Human-elephant conflict scenarios on the rise in recent years</li> <li>• Grazing and biotic pressures</li> <li>• Calamities: Forest fires and landslides</li> </ul> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### **D) EXPECTED OUTCOMES**

The expected outcomes of the current Working Plan include: –

1. Improvement of quality of existing forests and movement towards normality and better regeneration
2. Increase in forest cover through various forestry interventions and improved carbon sink in the Division to add to India's commitments under Sustainable Development Goals
3. Promotion of people-led participation and SHGs strengthening viz forest protection and conservation through increased livelihood opportunities, ecotourism, and plantations.
4. Improved hydrological regime in the Division basis planned interventions of revival of water resources and equitable, regulated flow of water in streams and tapping of spring-sheds
5. Mitigation of human-wildlife conflicts through informed practices and cooperation of communities as well as through technical interventions

#### **BRIEF ON THE WORKING PLAN & FORMAT**

The focus of forest management has shifted from forest product harvesting to environmental stability, biodiversity monitoring and management, restoration of ecological balance of the disturbed areas, protective function of the forest resources and Joint Forest Management of village communities. Considering all these aspects of forest management, New Working Plan Code-2014 (NWPC) has been developed by MOEF & CC with the main focus on sustainable forest management, biodiversity conservation, JFM and to initiate action to mitigate climate change.

The New Working Plan Code-2014 has been divided into two parts; PART-I and PART-II. There are 12 chapters in PART-1 of the Working Plan. As per NWPC 2014, the following seven thematic elements of Sustainable Forest Management (Global Forest Resources Assessment, 2005) have been incorporated in the Working Plan of Paonta Sahib Forest Division. These have been

acknowledged by FAO member countries and the UNFF (chapter numbers in brackets are from the NWPC 2014, followed in this Working Plan):

1. Extent of Forest Resources (Chapter 1 & 2)
2. Biological Diversity (Chapter 3)
3. Forest Health and Vitality (Chapter 4)
4. Productive Functions of Forest Resources (Chapter 5 & 6)
5. Protective Functions of Forest Resources (Chapter 7)
6. Socio-Economic Functions (Chapter 8)
7. Legal, Policy and Institutional Framework (Chapter 9)

The forests are providing ecosystem services to mankind. NWPC 2014 focuses on sustainable management of ecosystem services. The ecosystem services that humans derived from the forests are provisioning, regulating, cultural and supporting services. The provisioning services are water for drinking and irrigation, food, fuel, timber, fodder and NTFPs of economic importance. The regulatory services are control of diseases and pests, control of soil erosion, control of natural disasters, supply of perennial water, climate regulation, pollination and air quality regulation. The supporting services include soil formation, primary production, nutrient cycling, water cycling, photosynthesis and provision of habitat. The cultural services include cultural habitat, ecotourism, spiritual tourism and social relations in context of nature-dependence.

The present Working Plan of Paonta Sahib is therefore prepared on the basis of sustainable management of ecosystem services as accordance with NWPC 2014. The preparation of NWPC 2014 Working Plan is done with collection of field data from more than 600 grid points based on Grid Map of Paonta Sahib Forest Division provided by GIS Cell. The field inventory data were collected in forms (Form 1: Plot Approach Form; Form 2: Plot Description Form; Form 3: Plot Enumeration Form etc.) in line with the NWPC 2014. Forest Inventory data have been collected by the field staff of Paonta Sahib Forest Division for all ranges in the form of Sample Point Data.

The following Chapters are prepared for Paonta Sahib Forest Division working plan according to NWPC. The elements of the working plan are summarized in the following chapters:

## **PART-I CHAPTERS OF CURRENT WORKING PLAN:**

**Chapters 1 and 2:** The extent of forest area, forest cover, forest types, land use patterns, supply of water sources, types of soils, rocks, topography, altitudinal variation and climate and threats to the forests. The numbers of forest ranges in Paonta Sahib Forest Division are 4. The field data were collected from the compartments of the forest ranges.

**Chapter 3:** The assessment and conservation efforts of biological diversity of Paonta Sahib Division. In this chapter importance value index of flora and diversity indexes of different forest ranges are assessed. The IVI revealed the importance of particular species in the compartments and diversity indices revealed the diversity of species in the Division.

**Chapter 4:** Methods and techniques of protection of forest health from natural hazards (flood, soil erosion, drought etc.) and biotic pressure (grazing, lopping, forest fires, illicit felling, encroachment, invasive species and insects –pests).

**Chapter 5:** Soil and water conservation of the division. The areas treated under soil and water conservation in different ranges have shown in the chapter. The chapter highlighted the importance of water tables and water harvesting in Paonta Sahib Forest division.

**Chapter 6:** The wealth of the forest is assessed through growing stock. The management of growing stock has given rise to the concept of sustained yield which envisages that during a period the cut from a forest should not exceed its growth. The growing stock of forests of Paonta Sahib Forest Division is assessed in this chapter. Carbon stock of Paonta Sahib is estimated as per IPCC guideline and formula to mitigate climate change.

**Chapter 7:** Utilization of forest resources of Paonta Sahib Division by the people living in close proximity to forests based on rights. Both timber and non-timber products from the forests have real value for these communities. They have market values and also socio-cultural values. Extraction in context of FRA/FCA and salvage removals has also been discussed.

**Chapter 8:** Participation of local communities in protection and conservation of forests under JFM. Utilization of forest resources for livelihood opportunities has been briefed.

**Chapter 9:** Forest policies, acts, rules and guidelines implemented by the State Forest departments help in making various decisions of forest protection and management. The implementation of policies, acts and rules for management of Paonta Sahib Forests are highlighted in the chapter. The acts and rules of Central as well HPFD level are addressed in the chapter.

**Chapter 10:** History of India's Five-year plans concomitant with Paonta Sahib's Forest working plans has been traced in the chapter.

**Chapter 11:** The chapter revealed the past system of management and their implication on the forests of Paonta Sahib Forest Division. This chapter also guides the improvement of works and constitution of working circles for PART-II of the working plan.

**Chapter 12:** The chapter highlighted the growth and yield of forest products and important commercial tree species of Paonta Sahib Forest Division.

Besides these, GIS maps of different layers of the resources of Paonta Sahib Forest Division are prepared and presented in the working plan. The new approach of sustainable management of ecosystem services approach has been incorporated in this Working Plan to manage forests based on the application of appropriate modern scientific methodologies of Remote Sensing, GIS and using other tools focused on equitable sharing of resources and sustainable forest management of the Division.

#### **PART-II CHAPTERS OF CURRENT WORKING PLAN:**

Part-II of NWPC reflects the proposals of working circles for the management of forests of Paonta Sahib Forest Division. It contained the following elements:

**(i) Object of Management:** For achievement goal of working plan, the following have also been considered:

A. Interventions to manage, monitor, protect, and enhance the natural habitats and resources through scientific management of forests of the Paonta Sahib Forest Division, and

B. Provide an administrative framework to facilitate community participation and enhancement of natural resources.

**(ii) Management Strategy:** The main objective of the management is to maintain and restore ecosystem integrity. Sustainability and ecosystem restoration (or eco-restoration) remains the goal of the management where ecosystem functions have been hampered, forest stocking and biodiversity have been reduced, soil nutrients have depleted due to erosion or forest fires or heavy removal of wood and non-wood forest products. The treatment methods are based on principles of restoration ecology. It would, however, be not possible to restore the degraded ecosystems to their pristine structure and composition, which may not necessarily a goal. But it is possible to undertake treatment to bring them close to nature which could be done mimicking the nature and

learning from similar least disturbed areas of similar forest types elsewhere either in a protected area or outside it.

**(iii) Constitution of Working Circles:** The management is a continuum as are ecosystems. Applying adaptive management principles, the working circles of the previous working plan (by Sh. Vineet Kumar) are readjusted and new working circles are also included in view of new facts and new evolving management approaches. The following Working Circles were proposed:

| Sr. No. | Name of Working Circles                                                      |
|---------|------------------------------------------------------------------------------|
| 1.      | Sal Working Circle                                                           |
| 2.      | Coppice Working Circle                                                       |
| 3.      | Chil Working Circle                                                          |
| 4.      | Protection cum- Rehabilitation Working Circle                                |
| 5.      | Eucalyptus Plantation, Restoration & Rehabilitation Management Plan          |
| 6.      | Khair (Overlapping) Working Circle                                           |
| 7.      | Water Resource Management & Soil Conservation (Overlapping) Working Circle   |
| 8.      | Forest Protection (Overlapping) Working Circle                               |
| 9.      | Wildlife Management & Biodiversity Conservation (Overlapping) Working Circle |
| 10.     | Joint Forest Management (Overlapping) Working Circle                         |
| 11.     | Ecotourism (Overlapping) Working Circle                                      |

**Additionally,** Chapter 17 under ‘Weed Management’ discusses the common weeds of Paonta Sahib Forest Area and Chapter 18 discusses the background of ‘Climate Change’ and its visible impacts in mountainous ecosystems and Paonta Sahib Division area.

## **II-A Glossary of Technical Terms**

| <b>Term</b>                           | <b>Explanation</b>                                                                                                                                                                                                                                                                                                                                                                                               |
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| <b>Above-ground biomass</b>           | The AGB carbon pool consists of all living vegetation above the soil, inclusive of stems, stumps, branches, bark, seeds and foliage.                                                                                                                                                                                                                                                                             |
| <b>Afforestation</b>                  | Artificial establishment of forest on lands which previously did not carry forest within living memory                                                                                                                                                                                                                                                                                                           |
| <b>ANR</b>                            | Assisted Natural Regeneration                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Aquifer</b>                        | An aquifer is an underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials (gravel, silt and sand). Groundwater can be extracted using a water well.                                                                                                                                                                                                                         |
| <b>Bank Erosion</b>                   | Bank erosion is the wearing away of the banks of a stream or river. This is distinguished from erosion of the bed of the watercourse, which is referred to as scour. The roots of trees growing by a stream are undercut by such erosion.                                                                                                                                                                        |
| <b>Below-ground Biomass</b>           | The BGB carbon pool consists of the biomass contained within live roots                                                                                                                                                                                                                                                                                                                                          |
| <b>Biomass Expansion Factor (BEF)</b> | The ratio of aboveground biomass and bole biomass (defined by a merchantable measure or a minimum DBH). It is used to quantify carbon stock in forests.                                                                                                                                                                                                                                                          |
| <b>Biotic Factor</b>                  | Any influence of living organisms. Usually restricted to the influence of animals including man.                                                                                                                                                                                                                                                                                                                 |
| <b>Block Plantation</b>               | Tree plantations in compact blocks of more than 0.1 ha on lands outside recorded forest areas.                                                                                                                                                                                                                                                                                                                   |
| <b>Borers</b>                         | Any of various insects, insect larvae make holes in tree trunks, barks etc.                                                                                                                                                                                                                                                                                                                                      |
| <b>CAMPA</b>                          | CAMPA Act or Compensatory Afforestation Fund Act is an Indian legislation that seeks to provide an appropriate institutional mechanism, both at the Centre and in each State and Union Territory, to ensure expeditious utilization in efficient and transparent manner of amounts released in lieu of forest land diverted for non-forest purpose which would mitigate impact of diversion of such forest land. |
| <b>Canopy</b>                         | The cover of branches and foliage formed by the crowns of trees in a wood.                                                                                                                                                                                                                                                                                                                                       |
| <b>Canopy Density</b>                 | The relative completeness of canopy usually expressed as a decimal coefficient, taking closed canopy as unity. The following classification of canopy density is in vogue: Closed when the density is 1.0; dense when the density is between 0.75 and 1.0.; thin when the density is between 0.5 and 0.7; and open when the density is under 0.5                                                                 |

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| <b>Capacity Building</b>      | It is the process by which individuals and organizations obtain, improve, and retain the skills, knowledge, tools, equipment, and other resources needed to do their jobs competently. It improves individual or organization capacity to do works in efficient way.           |
| <b>Carbon Sequestration</b>   | The uptake and storage of carbon. Trees and plants, for example, absorb carbon dioxide, release the oxygen and store the carbon.                                                                                                                                               |
| <b>CEC</b>                    | Central Empowered Committee                                                                                                                                                                                                                                                    |
| <b>Check Dam</b>              | A small low dam constructed in a gully or other water-course to decrease the velocity of stream flow and thereby to minimize channel scour and promote deposition of eroded material.                                                                                          |
| <b>Clay Loam</b>              | A heavy soil intermediate in texture between clay and loam.                                                                                                                                                                                                                    |
| <b>Clear Felling</b>          | Strictly the felling of the whole standing crop in one operation.                                                                                                                                                                                                              |
| <b>Climax Forest</b>          | The final stage of successional development on a forest site under specific climatic and other environmental conditions, leading to a more or less stable equilibrium underlying only minor changes in species composition.                                                    |
| <b>Compartment</b>            | A territorial unit of a forest permanently defined for the purposes of administration, description and record. (Preferably designated by Arabic numerals, 1, 2, 3, etc.).                                                                                                      |
| <b>Compartment History</b>    | A record of all events effecting the forestry of an individual compartment.                                                                                                                                                                                                    |
| <b>Controlled Burning</b>     | Any deliberate use of fire whereby burning is restricted to a predetermined area and intensity.                                                                                                                                                                                |
| <b>Controlled Grazing</b>     | Conservative grazing through controlling the period and incidence by the movement of livestock in different parts of the area in prescribed sequence.                                                                                                                          |
| <b>Coppice with Standards</b> | Silviculture system where forest or stand consists of coppice among which a number of trees (standards), that are generally of seedling origin, are retained for a longer rotation to provide large material and seeds to regenerate the forests.                              |
| <b>Coppice Shoot</b>          | A shoot arising from an adventitious bud at the base of a woody plant that has been cut near the ground or burnt back. Sometimes (incorrectly) used to include root suckers.                                                                                                   |
| <b>Coupe</b>                  | Defined felling area in forest compartment                                                                                                                                                                                                                                     |
| <b>Defoliators</b>            | An adult or larval insect which strips all the leaves from a tree or shrub.                                                                                                                                                                                                    |
| <b>Deforestation</b>          | Change of land cover with depletion of tree crown cover to less than 10 percent. Changes within the forest class (e.g. from closed to open forest) which negatively affect the stand or site and, in particular, lower the production capacity, are termed forest degradation. |



|                           |                                                                                                                                                                                                                                                                                                           |
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| <b>Dense Forest</b>       | All lands with a forest cover having a canopy density of 40 percent and above.                                                                                                                                                                                                                            |
| <b>Diameter Class</b>     | One of the intervals into which the range of stem diameters, e.g., of trees or logs, is divided for classification and use; also, the trees, logs, etc., falling into such an interval.                                                                                                                   |
| <b>DMFT</b>               | District Mineral Foundation Trust                                                                                                                                                                                                                                                                         |
| <b>Dominant species</b>   | The species that predominates in an ecological community, particularly when they are most numerous or form the bulk of the biomass.                                                                                                                                                                       |
| <b>Ecosystem</b>          | The sum of plants, animals, environmental influences, and their interactions within a particular habitat                                                                                                                                                                                                  |
| <b>Ecosystem Services</b> | Ecosystem services, outputs, conditions, or processes of natural systems that directly or indirectly benefit humans or enhance social welfare. ... For example, the pollination of crops provided by bees and other organisms contributes to food production and is thus considered an ecosystem service. |
| <b>Ecotourism</b>         | It is tourism with an ecological conscience. It involves visiting fragile, pristine, and relatively untouched natural areas, with the intention to support conservation efforts.                                                                                                                          |
| <b>Emissions factor</b>   | Emissions factor gives gains and losses in carbon stock as a standard rate of emissions per unit activity. It is used to scale emissions to activity data.                                                                                                                                                |
| <b>Enumeration</b>        | The counting, singly or together, of individuals of one or more species in a forest crop and their classification by species, size, condition, etc. Enumeration may be complete (total) or partial (sample); a partial enumeration may be carried out on separate sample plots or in strips or lines.     |
| <b>Evenness</b>           | A value for evenness approaching zero reflects large differences in abundance of species, whereas an evenness of one means all species are equally abundant                                                                                                                                               |
| <b>FDA</b>                | Forest Development Agencies are to be registered as Federation of all Joint Forest Management Committees (JFMCs) within a territorial/ wildlife forest division under the Societies' Registration Act                                                                                                     |
| <b>Felling Cycle</b>      | Felling cycle is defined as the time that elapses between successive – fellings                                                                                                                                                                                                                           |
| <b>Felling Series</b>     | Annual felling of trees in Forest Compartment                                                                                                                                                                                                                                                             |
| <b>Fire Lines</b>         | Containment lines or fire breaks in Forest Compartments to check forest fires. Width of Fire lines are kept as 10-15 m.                                                                                                                                                                                   |
| <b>Fire Protection</b>    | All activities concerned with protection of a forest area from damage by fire; comprises prevention, detection, pre-suppression and suppression.                                                                                                                                                          |

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| <b>Flagship species</b>       | A flagship species is a species selected to act as an ambassador, icon or symbol for a defined habitat, issue, campaign or environmental cause.                                                                                                                                          |
| <b>Flood Plains</b>           | A flood plain is an area of flat land alongside a river. This area gets covered in water when the river floods. Flood plains are naturally very fertile due to the river sediment which is deposited there.                                                                              |
| <b>Forest</b>                 | a) An area set aside for the production of timber and other forest produce, or maintained under woody vegetation for certain indirect benefits which it provides, e.g., climatic or protective.                                                                                          |
|                               | (b) A plant community predominantly of trees and other woody vegetation, usually with a closed canopy.                                                                                                                                                                                   |
|                               | (c) An area of land proclaimed to be a forest under a forest law.                                                                                                                                                                                                                        |
| <b>Forest Area</b>            | The area recorded as a forest in the Government records. It is also referred to as “Recorded Forest Area”.                                                                                                                                                                               |
| <b>Forest Cover</b>           | All trees and other plants occupying the ground in a forest.                                                                                                                                                                                                                             |
| <b>Forest Crop</b>            | The entire collection of trees (including bamboos) growing on a given area. Forest crops may be classified in terms of their stages of development as seedling crops, thickets or sapling crops, pole crops and tree crops.                                                              |
| <b>Forest Diversion</b>       | Forest land is usually recommended for diversion by state governments for the development of various infrastructure projects or mining, and then given a final approval by the Union Ministry of Environment, Forest and Climate Change (MoEF &CC)                                       |
| <b>Forest Division</b>        | A forest division is a term used to signify an area containing one or more (usually) demarcated and (usually) protected or resource-managed forests, for administrative purposes.                                                                                                        |
| <b>Forest Fire Mitigation</b> | Fire mitigation is a series of steps that you can take to reduce the risk of a wildfire consuming your property. It includes assessing the risks around your property, recognizing the wildfire dangers and your responsibility in mitigating them, thereby creating a defensible space. |
| <b>Forest Fringe Villages</b> | The villages located in the proximity of forest areas.                                                                                                                                                                                                                                   |
| <b>Forest inventory</b>       | A survey of a forest area to collect information on timber and a variety of other resource values.                                                                                                                                                                                       |
| <b>Forest management plan</b> | A general plan for the management of a forest area, usually for a full rotation cycle, including the objectives, prescribed management activities and standards to be employed to achieve specified goals. Commonly supported with more detailed development plans.                      |
| <b>Forest Policy</b>          | The general principles determined according to social and economic objects adopted or the creation and/or maintenance of forests and their use.                                                                                                                                          |

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| <b>Forest Produce</b>                      | All material yielded by a forest estate. Generally defined in forest acts, regulations, etc., and may include earth, stone, gravel and minerals. Classified as<br>(a) Major Forest Produce – timber, smallwood and fire wood and<br>(b) Minor Forest Produce – all forest produce, other than major forest produce, including grass, fruit, leaves, animal products, soil and minerals.                  |
| <b>Forest Range</b>                        | An executive territorial unit, usually the charge of a forest ranger.                                                                                                                                                                                                                                                                                                                                    |
| <b>Forest Regulation</b>                   | (a) A branch of forestry concerned with the technical aspects of organizing and maintaining a forest for sustained yield.<br>(b) A legal ordinance affecting forests.                                                                                                                                                                                                                                    |
| <b>Forest Right</b>                        | A legally recognized claim, possessed by a person, community or property, to share in the enjoyment of some or all of the benefits of the forest property of another.                                                                                                                                                                                                                                    |
| <b>Forest Type</b>                         | A category of forest defined generally with reference to its geographical location, climatic and edaphic features, composition and condition                                                                                                                                                                                                                                                             |
| <b>Forest Utilization</b>                  | The branch of forestry concerned with the harvesting, conversion, disposal and use of forest produce.                                                                                                                                                                                                                                                                                                    |
| <b>General Volume Table</b>                | Volume table designed to cover the whole natural range and dimensions of a species                                                                                                                                                                                                                                                                                                                       |
| <b>Geographic information system (GIS)</b> | A computer-based mapping system which combines different types of resource information. Often used to make forest management decisions.                                                                                                                                                                                                                                                                  |
| <b>Girth Class</b>                         | One of the intervals into which the range of girth of trees or logs is divided for classification or use; also, the trees or logs falling into such an interval.                                                                                                                                                                                                                                         |
| <b>Grassland</b>                           | A community in which grasses predominate; trees are either altogether absent or present in relatively small number.                                                                                                                                                                                                                                                                                      |
| <b>Grazing Incidence</b>                   | The amount of grazing in an area expressed as number of animals or equivalent cow units per acre.                                                                                                                                                                                                                                                                                                        |
| <b>Ground Water</b>                        | The body of water in the ground, accumulated above impermeable layers that completely fills the pore space to a level whose depth below the surface varies from place to place and, generally from time to time.                                                                                                                                                                                         |
| <b>Growing Stock</b>                       | The sum (by number or volume) of all the trees growing in the forest or a specified part of it.                                                                                                                                                                                                                                                                                                          |
| <b>Habitat</b>                             | The place where an organism lives and/or the conditions of that environment including the soil, vegetation, water, and food.                                                                                                                                                                                                                                                                             |
| <b>Hardwood</b>                            | A conventional term, used irrespective of physical hardness or softness, for broadleaved trees and their timber, as distinguished from conifers and their timber which are known as softwoods. In countries where conifers are of little commercial importance, however, the terms are commonly used in their literal sense. In India the lighter hardwoods are often called 'light' or 'soft' hardwoods |
| <b>Harvesting</b>                          | The cutting and removal of trees from a forested area.                                                                                                                                                                                                                                                                                                                                                   |

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| <b>Hazard</b>                                          | A hazard is any source of potential damage, harm or adverse health effects on something or someone.                                                                                                                                                                                                                                                                               |
| <b>Heart Rot</b>                                       | In trees, heart rot is a fungal disease that causes the decay of wood at the center of the trunk and branches.                                                                                                                                                                                                                                                                    |
| <b>Hillocks</b>                                        | Narrow hills separated from larger hills                                                                                                                                                                                                                                                                                                                                          |
| <b>Humus</b>                                           | The organic component of soil, formed by the decomposition of leaves and other plant material by soil microorganisms.                                                                                                                                                                                                                                                             |
| <b>Infiltration</b>                                    | It is the process by which water on the ground surface enters the <u>soil</u>                                                                                                                                                                                                                                                                                                     |
| <b>Irregular Shelterwood System</b>                    | Silviculture system in which the advance growth (saplings and poles) are retained for compensating deficiency of natural regeneration, resulting in irregular crop                                                                                                                                                                                                                |
| <b>Invasive Species</b>                                | The species not native to a specific location (an introduced species) and tends to spread to a degree believed to cause damage to the environment, human economy or human health.                                                                                                                                                                                                 |
| <b>JFM</b>                                             | Joint Forest Management                                                                                                                                                                                                                                                                                                                                                           |
| <b>Land Use, Land-Use Change and Forestry (LULUCF)</b> | It is a category within UNFCCC accounting framework for greenhouse gas (GHG) emissions. LULUCF includes carbon pools of living biomass (above and below ground), dead organic matter (dead wood and litter) and organic soil carbon.                                                                                                                                              |
| <b>Landslide</b>                                       | The sudden sliding of masses of rock soil or other superficial deposits on steep slopes.                                                                                                                                                                                                                                                                                          |
| <b>Livelihood</b>                                      | A means of supporting one's existence, especially financially or vocationally.                                                                                                                                                                                                                                                                                                    |
| <b>Loamy</b>                                           | Includes all sandy loams, clay loams, loam, silt and silt-loam textures. Sometimes subdivided into moderately, coarse-textured, medium-textured, and moderately fine-textured groups                                                                                                                                                                                              |
| <b>Location Map</b>                                    | Location map means a map depicting the location of the resource referenced in the application delineated in relation to the resource in its entirety and enough surrounding area to locate the resource on other map sources.                                                                                                                                                     |
| <b>Log</b>                                             | The stem of a tree or a length of stem or branch after felling and trimming.                                                                                                                                                                                                                                                                                                      |
| <b>Logging (Synonym: Harvesting)</b>                   | A method by which the growing stock (or part of it) of a stand is removed. Includes the procedure from felling to long-distance transport.                                                                                                                                                                                                                                        |
| <b>MAI (mean annual increment)</b>                     | The average annual increase in volume of individual trees or stands up to the specified point in time. The MAI changes with different growth phases in a tree's life, being highest in the middle years and then slowly decreasing with age. The point at which the MAI peaks is commonly used to identify the biological maturity of the stand and its readiness for harvesting. |

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| <b>Management Information System</b>      | A management information system (MIS) is a computer system consisting of hardware and software that serves as the backbone of an organization's operations.                                                                                                                                                                                                                                                                             |
| <b>MCR</b>                                | Master Control Rooms; established in forest division to release information bulletin on Forest Fire Danger Rating to all beats.                                                                                                                                                                                                                                                                                                         |
| <b>Micro-plans</b>                        | Micro-plans are prepared for execution of various developmental activities of villages under JFM.                                                                                                                                                                                                                                                                                                                                       |
| <b>Mixed Forest</b>                       | A forest composed of trees of two or more species intermingled in the same canopy; in practice and by convention, at least 20 per cent of the canopy must consist of species other than principal one.                                                                                                                                                                                                                                  |
| <b>Moderately Dense Forest</b>            | All lands with forest cover having a canopy density between 40 to 70 percent.                                                                                                                                                                                                                                                                                                                                                           |
| <b>NAP</b>                                | National Afforestation Plan of Govt of India to decentralised powers to JFMCs and FDA for protection of forests, plantation activities and capacity building.                                                                                                                                                                                                                                                                           |
| <b>NCAP</b>                               | National Clean Air Programme, launched in 2019, and India's flagship program for better air quality in 122 cities.                                                                                                                                                                                                                                                                                                                      |
| <b>Native species</b>                     | A "native" plant is one that is living, growing, and reproducing naturally in a particular region.                                                                                                                                                                                                                                                                                                                                      |
| <b>Natural Regeneration</b>               | The renewal of a forest crop by self-sown seed, or by coppice or root suckers; also, the crop so obtained.                                                                                                                                                                                                                                                                                                                              |
| <b>Net present value (NPV)</b>            | A stand's present worth before harvesting once costs associated with its establishment and tending have been subtracted.                                                                                                                                                                                                                                                                                                                |
| <b>Non-forest land</b>                    | Land not primarily intended for growing or supporting a forest.                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Non-Timber Forest Products (NTFPs)</b> | It is defined as product or service other than timber that is produced in forests. NTFPs are useful materials or commodities obtained from forests without harvesting (logging) of trees.                                                                                                                                                                                                                                               |
| <b>Normal Forest</b>                      | A forest which for a given site and given objects of management, is ideally constituted as regards growing stock, age class distribution and increment, and from which the annual or periodic removal of produce equal to the increment can be continued indefinitely without endangering future yields. A forest which by reason of its normalcy in these respects serves as a standard of comparison, for sustained yield management. |
| <b>Open Forest</b>                        | Lands with forest cover having a canopy density between 10 to 40 percent.                                                                                                                                                                                                                                                                                                                                                               |
| <b>Overlapping Working Circle</b>         | Overlap across more than one Working Circle of a Forest Division                                                                                                                                                                                                                                                                                                                                                                        |

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| <b>Panchayat Forest</b>                                             | Any forest whose management is vested in a village panchayat, i.e., a body of men elected by the villagers from among themselves for specific administrative or other purposes pertaining to the village.                                            |
| <b>Panwis</b>                                                       | The forests other than RF, DPFS and UF having no tree growth and which contain grasses only                                                                                                                                                          |
| <b>Perennial rivers</b>                                             | The rivers flow in all seasons.                                                                                                                                                                                                                      |
| <b>Permanent pastures</b>                                           | Land used to grow grasses or other herbaceous forage naturally (self-seeded) or through cultivation (sown) and that is not included in the crop rotation of the holding for five years or longer                                                     |
| <b>Physiographic Zone</b>                                           | A physiographic zone constitutes geographical areas that exhibit broad similarities in factors responsible for the growth of tree vegetation. Physiographic zones have been used as strata for assessing tree cover in the country.                  |
| <b>Pole crop</b>                                                    | 5 to 9.9 cm DBH trees                                                                                                                                                                                                                                |
| <b>Pollution</b>                                                    | A change in the physical, chemical, or biological characteristics of the air, water, or soil that can affect the health, survival, or activities of humans in an unwanted way. Some expand the term to include harmful effects on all forms of life. |
| <b>Preservation Plot</b>                                            | A sample area of natural forest or plantation set apart for preservation in perpetuity mainly for purposes of ecological observations and growth studies covering the full life of the trees and crops.                                              |
| <b>Reducing Emissions from Deforestation and Forest Degradation</b> | A framework to reduce emissions from deforestation and degradation, conservation of existing carbon stocks and enhancement of carbon stocks.                                                                                                         |
| <b>Reforestation</b>                                                | Artificial (planting, seeding) or natural re-establishment of forest after harvesting/cutting on previously forest or other wooded land.                                                                                                             |
| <b>Regeneration</b>                                                 | The renewal of a tree crop, either by natural or artificial means                                                                                                                                                                                    |
| <b>Regeneration Survey</b>                                          | A survey for the assessment of established and unestablished regeneration generally by sample enumeration.                                                                                                                                           |
| <b>Remote sensing</b>                                               | Remote sensing is the acquisition of data, such as total forest area, forest type, canopy cover and height, from sensors on board aircraft or space-based platforms.                                                                                 |
| <b>Reserved Forest</b>                                              | An area so constituted under the forest act or other law.                                                                                                                                                                                            |
| <b>Root Rot</b>                                                     | Any of various plant diseases characterized by decay of the roots and caused especially by fungi.                                                                                                                                                    |
| <b>Root stock</b>                                                   | Rootstock varieties may come from naturally growing trees, unique naturally occurring plant mutations, or be genetically bred for the purpose of being rootstock.                                                                                    |

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| <b>Rotation</b>                  | The planned number of years between the formation or regeneration of a crop and its final felling. In the case of a selection forest, the average age at which a tree is considered mature for felling.                                                                                                             |
| <b>Sample Plot</b>               | A plot chosen as representative of a larger area. In forestry, sample plots are used mainly in enumeration surveys and for studies of growth.                                                                                                                                                                       |
| <b>Sampling</b>                  | The selection of sample units from a population and the measurement and/or recording of information on these units to obtain estimates of population characteristics.                                                                                                                                               |
| <b>Sapling</b>                   | A young tree from the time when it reaches 3 feet in height till the lower branches begin to fall. A sapling is characterized by the absence of dead bark and its vigorous height growth.                                                                                                                           |
| <b>Scrub</b>                     | Inferior growth consisting chiefly of small or stunted trees and shrubs                                                                                                                                                                                                                                             |
| <b>Seasonal rivers</b>           | Seasonal rivers are the rivers which flow only in rainy seasons and remain dry mostly.                                                                                                                                                                                                                              |
| <b>Seedlings</b>                 | A young plant, especially one raised from seed and not from a cutting usually less than 1 m of height                                                                                                                                                                                                               |
| <b>Selection System</b>          | The system in which regeneration and felling carried out in whole compartment but not in specific areas as in other systems. Dead, decaying, diseased and mature trees are selected for felling.                                                                                                                    |
| <b>Shannon-Weiner Index</b>      | A measure of species richness and abundance. It is used for comparing diversity of species between various habitats.                                                                                                                                                                                                |
| <b>Shelterwood System</b>        | Shelterwood systems are those high forests system in which the young crop is established under the shelter (overhead or lateral) of the old one, the latter at the same time affords protection to the soil. It includes the various systems of successive regeneration felling together with the selection system. |
| <b>Silvicultural System</b>      | A method of silvicultural procedure worked out in accordance with accepted sets of silvicultural principles, by which crops constituting forests are tended, harvested and replaced by new crops of distinctive forms.                                                                                              |
| <b>Silviculture</b>              | The art and science of cultivating forest crops.                                                                                                                                                                                                                                                                    |
| <b>Soil Organic Matter (SOM)</b> | It is the organic component of soil containing small plants residues, small living soil organism and decomposed organic matter.                                                                                                                                                                                     |
| <b>Species richness</b>          | Species richness is the number of different species represented in an ecological community, landscape or region                                                                                                                                                                                                     |
| <b>Stand density</b>             | A relative measure of the amount of stocking on a forest area. Often described in terms of stems per hectare.                                                                                                                                                                                                       |

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| <b>Standard Volume Table</b>      | A volume table in which the contents are given as volume measured down to the limits for standard timber, and, if necessary, smallwood, with stump included. Mainly of use as a basis for reference and for deriving, by the application of suitable conversion factors, subordinate volume tables in units and modes of measurement for specific local purposes                                                                                                                                   |
| <b>Stratification</b>             | Stratification is the division of the area into more homogenous units of carbon density. The purpose of stratification is to increase the accuracy and precision of accounting by reducing field data variability.                                                                                                                                                                                                                                                                                 |
| <b>Succession</b>                 | The gradual replacement of one community by another in the development of vegetation towards a climax; succession is primary on sites which have previously not borne vegetation and secondary after destruction of whole or part of original vegetation.                                                                                                                                                                                                                                          |
| <b>Sustainable Development</b>    | Preservation and protection of diverse ecosystems—the soil, plants, animals, insects and fungi while maintaining the forest's productivity                                                                                                                                                                                                                                                                                                                                                         |
| <b>Sustainable Use of Forests</b> | <p>Sustainable management is the prerequisite for the sustainable use of forests.</p> <p>Sustainable management means the stewardship and use of forests and forest lands in such a way and at such a rate that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions at local, national, and global levels and that does not cause damage to other ecosystems.</p> |
| <b>Thinning</b>                   | A felling made in an immature stand for the purpose of improving the growth and form of the trees that remain, without permanently breaking the canopy.                                                                                                                                                                                                                                                                                                                                            |
| <b>Timber</b>                     | Categories of wood other than fire wood.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Trenching</b>                  | Trenching is a construction method that involves digging a narrow trench/ nali in the ground for protection of forest resources or water harvesting for plants.                                                                                                                                                                                                                                                                                                                                    |
| <b>Un-classed Forests</b>         | An area recorded as forest but not included in reserved or protected forest                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Undergrowth</b>                | The lowest stratum of woody and other vegetation above the ground cover                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Understorey</b>                | The lower storey of a forest crop, e.g., a young crop under seedbearers, coppice under standards, or the lower storeys in a multi-storeyed high forest.                                                                                                                                                                                                                                                                                                                                            |
| <b>Very Dense Forest</b>          | Lands with forest cover having a canopy density of 70 per cent and above.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Vitality</b>                   | Making forest resources strong                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Volume Table</b>               | A table showing for a given species the average contents of trees, logs or sawn timber for one or more given dimensions. The given dimensions may be (a) d.b.h. alone, (b) d.b.h. and height or (c) d.b.h. height and some                                                                                                                                                                                                                                                                         |



|                             |                                                                                                                                                                                                                                                         |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             | measure of form or taper. Volume tables may be (a) general, (b) regional or (c) local, depending on the scope of their applicability.                                                                                                                   |
| <b>Water logging</b>        | A condition in which the soil pores get filled with water to the exclusion of air. A consequence of inadequate soil drainage.                                                                                                                           |
| <b>Watershed</b>            | Strictly a water parting, the dividing line between catchment areas. The use of this term as a synonym for catchment or drainage area is deprecated.                                                                                                    |
| <b>Watershed Management</b> | The administration and regulation of the aggregate resources of a drainage basin for the conservation of water and the control of erosion, streamflow and floods.                                                                                       |
| <b>Yield</b>                | The volume or number of stems that can be removed annually or periodically or the area over which fellings may pass annually or periodically, consistent with the attainment of the objects of management.                                              |
| <b>Yield Table</b>          | A tabular statement which summarizes on an acre or other unit area basis all the essential data relating to the development of a fully-stocked and regularly thinned even-aged crop at periodic intervals covering the greater part of its useful life. |

## **II-B GLOSSARY OF LOCAL TERMS**

|    | <b>TERM</b>                 | <b>EXPLANTATION</b>                                                                |
|----|-----------------------------|------------------------------------------------------------------------------------|
| 1  | <i>Bajri</i>                | Gravel                                                                             |
| 2  | <i>Balli</i>                | A round pole having a diameter of 10-30 cm at butt end                             |
| 3  | <i>Bhediwala</i>            | A profession grazier of sheep and goats                                            |
| 4  | <i>Bigha</i>                | A measure of area of land. Equals 5/24 of an acre; 1008.3 square yards; 0.208 acre |
| 5  | <i>Chak</i>                 | Demarcated private land in the reserve, Protected, Unclassed or Mushterqa forest   |
| 6  | <i>Chhapar</i>              | A thatched roof or hut                                                             |
| 7  | <i>Charand</i>              | Grazing land                                                                       |
| 8  | <i>Chatti</i>               | A fuelwood land                                                                    |
| 9  | <i>Chauki</i>               | An out post generally the residence of forest guards                               |
| 10 | <i>Chowkidar</i>            | Watchman                                                                           |
| 11 | <i>Coolie</i>               | Labourer                                                                           |
| 12 | <i>Daat</i>                 | Log                                                                                |
| 13 | <i>Darbar</i>               | Court of the Ruler                                                                 |
| 14 | <i>Dastur-UI-Amal rates</i> | Rates of the sale of various forest produce                                        |
| 15 | <i>Dat</i>                  | Darat                                                                              |
| 16 | <i>Devi</i>                 | Hindu goddess                                                                      |

|    |                          |                                                                                          |
|----|--------------------------|------------------------------------------------------------------------------------------|
| 17 | <i>Dhar</i>              | Ridge or spur                                                                            |
| 18 | <i>Devta</i>             | Local deity                                                                              |
| 19 | <i>Dochi</i>             | Temporary field residence                                                                |
| 20 | <i>Faisala-e-janglat</i> | Forest Settlement report                                                                 |
| 21 | <i>Gaddies</i>           | Professional sheep and goat graziers.                                                    |
| 22 | <i>Ghair Mumkin</i>      | Land under building, roads, paths, streams etc.                                          |
| 23 | <i>Gharat</i>            | Water mill                                                                               |
| 24 | <i>Ghasnies</i>          | Grass land                                                                               |
| 25 | <i>Ghat</i>              | Ford along a river                                                                       |
| 26 | <i>Gujjar</i>            | A professional, nomadic buffalo grazier                                                  |
| 27 | <i>Hadbast number</i>    | Serial number allotted to a village at the time of revenue settlement.                   |
| 28 | <i>Harkries</i>          | Pieces of unfashioned split wood                                                         |
| 29 | <i>Hectare</i>           | Measure of area. Equals 10,000 square meter; 2.471 acre                                  |
| 30 | <i>Jagir</i>             | An estate/grant                                                                          |
| 31 | <i>Jama-bandi</i>        | Record of land, maintained by the revenue Department.                                    |
| 32 | <i>Karam</i>             | A linear unit of land measurement equal to 1.4518 m; 57.157 inches                       |
| 33 | <i>Katha</i>             | Extract from khair heartwood                                                             |
| 34 | <i>Kokath</i>            | General terms for miscellaneous broad-leaved species of comparatively low value          |
| 35 | <i>Korwa</i>             | Pole used in the frame work of Chapter                                                   |
| 36 | <i>Mahkma-janglat</i>    | Forest Department                                                                        |
| 37 | <i>Makbooja</i>          | Possession                                                                               |
| 38 | <i>Mali</i>              | Gardener                                                                                 |
| 39 | <i>Manu</i>              | Current year's shoot of bamboo.                                                          |
| 40 | <i>Missal haquiyat</i>   | Revenue document containing information regarding customs rights and concessions.        |
| 41 | <i>Mauza</i>             | Unit of revenue village                                                                  |
| 42 | <i>Nadi</i>              | River/stream                                                                             |
| 43 | <i>Nautor</i>            | Government waste land granted to an individual for purpose of cultivation or habitation. |
| 44 | <i>Naquabil</i>          | Land not fit for cultivation                                                             |
| 45 | <i>Nullah/Khalla</i>     | Water course                                                                             |
| 46 | <i>Ogal</i>              | Hole or pit dug in the bed of a Nalla to obtain water for below the surface.             |
| 47 | <i>Panchyat</i>          | A body of panches forming a village management committee.                                |
| 48 | <i>Parao</i>             | Gujjar grazing/halting                                                                   |
| 49 | <i>Patti</i>             | A section of a village                                                                   |
| 50 | <i>Rewana</i>            | A license to fell trees                                                                  |
| 51 | <i>Sehada</i>            | Trijunction pillar or three mauzas                                                       |

|    |                              |                                                                                                                                                               |
|----|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 52 | <i>Shamlat</i>               | Village common land                                                                                                                                           |
| 53 | <i>Shamlat<br/>Deh/Taraf</i> | Areas which are not owned individually but owned collectively by the entire village community or by sub-Division of the village concerned as Pattie or Taraf. |
| 54 | <i>Sokhta</i>                | Dry fuel                                                                                                                                                      |
| 55 | <i>Takhta</i>                | Plank                                                                                                                                                         |
| 56 | <i>Tappar</i>                | An open grassy area in the midst of a forest                                                                                                                  |
| 57 | <i>Taraf</i>                 | A sub-Division of village                                                                                                                                     |
| 58 | <i>Tehsil</i>                | Sub-Division of district                                                                                                                                      |
| 59 | <i>Thach</i>                 | A grassy blank                                                                                                                                                |
| 60 | <i>Tibba</i>                 | Hillock                                                                                                                                                       |
| 61 | <i>Tora</i>                  | Raised edge of a cultivated field                                                                                                                             |
| 62 | <i>Wajab-ul-Araj</i>         | Revenue settlement record dealing with social customs, rights concession obligation etc                                                                       |
| 63 | <i>Zamindar</i>              | A landlord or a cultivating land owner                                                                                                                        |

### III - LIST OF FLORA

#### A-TREES

| Sr. No. | BOTANICAL NAME                                                            | HINDI/ VERNACULAR/ ENGLISH NAMES          |
|---------|---------------------------------------------------------------------------|-------------------------------------------|
| 1.      | <i>Acacia nilotica</i> (= <i>Vachellia nilotica</i> )                     | Kikkar, Babul, Indian Gum Arabic Tree     |
| 2.      | <i>Acacia catechu</i> (= <i>Senegalia catechu</i> )                       | Khair, Khadira, Cutch Tree                |
| 3.      | <i>Acacia modesta</i> (= <i>Senegalia modesta</i> )                       | Phulahi                                   |
| 4.      | <i>Acer oblongum</i>                                                      | Parag, Moli, Putli                        |
| 5.      | <i>Adina cordifolia</i> (= <i>Haldenia cordifolia</i> )                   | Haldu                                     |
| 6.      | <i>Aegle marmelos</i>                                                     | Bel, Bilva, Indian Quince, Stone Apple    |
| 7.      | <i>Albizia lebbek</i>                                                     | Siris, Shirish, Woman's Tongue Tree       |
| 8.      | <i>Anogeissus latifolia</i> (= <i>Terminalia anogeissiana</i> )           | Chhal                                     |
| 9.      | <i>Artocarpus lacucha</i> (= <i>A. lakoocha</i> )                         | Dheu                                      |
| 10.     | <i>Azadirachta indica</i>                                                 | Neem, Margosa Tree                        |
| 11.     | <i>Bauhinia racemosa</i>                                                  | Jhinjhora, Gurial, Sveta Kanchan, Kanchan |
| 12.     | <i>Bauhinia semla</i> (= <i>Phanera roxburghiana</i> ; <i>B. retusa</i> ) | Chakera, Semla, Kandla                    |
| 13.     | <i>Bauhinia variegata</i>                                                 | Kachnar                                   |
| 14.     | <i>Boehmeria rugulosa</i>                                                 | Shingeer, Tushiari                        |
| 15.     | <i>Bombax ceiba</i>                                                       | Semal, Salmali, Silk Cotton Tree          |
| 16.     | <i>Boswellia serrata</i>                                                  | Sala, Salai                               |
| 17.     | <i>Bridelia retusa</i>                                                    | Gaaj                                      |
| 18.     | <i>Buchanania lanzan</i>                                                  | Matindu, Mehru                            |
| 19.     | <i>Butea monosperma</i> (= <i>Butea frondosa</i> )                        | Dhak, Palash, Flame-of-the Forest         |
| 20.     | <i>Careya arborea</i>                                                     | Kumbhi                                    |
| 21.     | <i>Cassia fistula</i>                                                     | Amaltas, Indian Laburnum, Purging Fistula |
| 22.     | <i>Casearia tomentosa</i>                                                 | Chila                                     |
| 23.     | <i>Celtis tetrandra</i>                                                   | Kharak                                    |
| 24.     | <i>Citrus sp</i>                                                          | Kimbu                                     |
| 25.     | <i>Cordia dichotoma</i> (= <i>C. obliqua</i> )                            | Lassora                                   |
| 26.     | <i>Cordia vestita</i>                                                     | Bareula, Kum                              |
| 27.     | <i>Dalbergia lanceolaria</i>                                              | Anjan, Takoli                             |
| 28.     | <i>Dalbergia sissoo</i>                                                   | Shisham, Tali, Sissoo, Shinsa             |
| 29.     | <i>Diospyros cordifolia</i>                                               | Bis Tendu                                 |
| 30.     | <i>Diospyros tomentosa</i>                                                | Tendu                                     |

|     |                                                                |                                               |
|-----|----------------------------------------------------------------|-----------------------------------------------|
| 31. | <i>Ehretia laevis</i>                                          | Chamror                                       |
| 32. | <i>Elaeodendron glaucum</i> (= <i>Cassine glauca</i> )         | Janga, Jamrasi                                |
| 33. | <i>Erythrina suberosa</i>                                      | Dhaul-Dhak, Mandara, Pangra, Corky Coral Tree |
| 34. | <i>Falconeria insignis</i> (= <i>Sapium insigne</i> )          | Chhiran                                       |
| 35. | <i>Ficus bengalensis</i>                                       | Bargad, Bohar, Vat,                           |
| 36. | <i>Ficus hispida</i>                                           | Girmal                                        |
| 37. | <i>Ficus neriifolia</i> (= <i>F. nemoralis</i> )               | Dudhla                                        |
| 38. | <i>Ficus palmata</i>                                           | Khemri                                        |
| 39. | <i>Ficus racemosa</i> (= <i>F. glomerata</i> )                 | Gular, Udumbara                               |
| 40. | <i>Ficus religiosa</i>                                         | Pipal, Aswattha, Bodhi Tree                   |
| 41. | <i>Ficus semicordata</i> (= <i>F. cunia</i> )                  | Khano                                         |
| 42. | <i>Flacourtia indica</i>                                       | Kangoo                                        |
| 43. | <i>Garuga pinnata</i>                                          | Kharpat                                       |
| 44. | <i>Gmelina arborea</i>                                         | Gambhar, Kumbhar                              |
| 45. | <i>Grewia tiliifolia</i>                                       | Dhaman                                        |
| 46. | <i>Grewia optiva</i> (= <i>G. oppositifolia</i> )              | Behul, Biul                                   |
| 47. | <i>Grewia serrulata</i>                                        | Beuli                                         |
| 48. | <i>Holoptelea integrifolia</i>                                 | Papri, Chilbil                                |
| 49. | <i>Lagerstroemia parviflora</i>                                | Dhauri, Sidha                                 |
| 50. | <i>Lannea coromandelica</i> (= <i>L. grandis</i> )             | Jhingan, Kembal                               |
| 51. | <i>Litsea glutinosa</i> (= <i>Litsea chinensis</i> )           | Chandna, Maida-Lakri                          |
| 52. | <i>Litsea monopetala</i> (= <i>Litsea polyantha</i> )          | Karka, Markua                                 |
| 53. | <i>Mallotus philippensis</i>                                   | Rohini                                        |
| 54. | <i>Mangifera indica</i>                                        | Aam, Amra, Rasala, Mango                      |
| 55. | <i>Mitragyna parvifolia</i> (= <i>Stephegyne parvifolia</i> )  | Kaem, Phaldu                                  |
| 56. | <i>Miliusa velutina</i>                                        | Dom-Sal                                       |
| 57. | <i>Moringa oleifera</i> (= <i>M. pterygosperma</i> )           | Sanjna, Sohanjna, Sigru, Drumstick Tree       |
| 58. | <i>Morus alba</i>                                              | Tut, Shahtoot, White Mulbery                  |
| 59. | <i>Myrica esculenta</i>                                        | Kaphal                                        |
| 60. | <i>Naringi crenulata</i> (= <i>Limonium acidissima</i> )       | Beli                                          |
| 61. | <i>Oroxylum indicum</i>                                        | Tarlu, Tat-Patanga                            |
| 62. | <i>Ougeinia oojeinensis</i> (= <i>Ougeinia dalbergioides</i> ) | Sandan, Tinsia, Sejandana, Rot                |
| 63. | <i>Phoebe lanceolata</i>                                       | Tumri, Bhadrol                                |

|                                     |                                                                           |                                           |
|-------------------------------------|---------------------------------------------------------------------------|-------------------------------------------|
| 64.                                 | <i>Phoenix humilis</i>                                                    | Khajur                                    |
| 65.                                 | <i>Phyllanthus emblica</i> (= <i>Embllica officinalis</i> )               | Aamla, Amalak, Dhatri, Indian Goose Berry |
| 66.                                 | <i>Pinus roxburghii</i> (= <i>Pinus longifolia</i> )                      | Chir, Chil                                |
| 67.                                 | <i>Pistacia integerrima</i>                                               | Kakkar Singi, Pistachio Wood              |
| 68.                                 | <i>Premna latifolia</i>                                                   | Bakar                                     |
| 69.                                 | <i>Punica granatum</i>                                                    | Anar                                      |
| 70.                                 | <i>Pyrus pashia</i>                                                       | Kainth                                    |
| 71.                                 | <i>Quercus leucotrichophora</i> (= <i>Q. incana</i> )                     | Ban                                       |
| 72.                                 | <i>Rhododendron arboreum</i>                                              | Bras                                      |
| 73.                                 | <i>Sapindus mukorossi</i>                                                 | Ritha, Soap Nut Tree of North India       |
| 74.                                 | <i>Schleichera oleosa</i> (= <i>S. trijuga</i> )                          | Kusum, Lac Tree, Macassar Oil Tree        |
| 75.                                 | <i>Semecarpus anacardium</i>                                              | Bhilawa, Marking Nut Tree                 |
| 76.                                 | <i>Shorea robusta</i>                                                     | Sal, Sala, Shal                           |
| 77.                                 | <i>Spondias pinnata</i>                                                   | Amara, Hog-Plum                           |
| 78.                                 | <i>Sterculia villosa</i>                                                  | Gudgudala, Udal                           |
| 79.                                 | <i>Stereospermum suaveolens</i>                                           | Padal                                     |
| 80.                                 | <i>Syzygium nervosum</i> (= <i>S. operculatum</i> )                       | Thuthi                                    |
| 81.                                 | <i>Syzygium cumini</i> (= <i>Eugenia jambolana</i> )                      | Jamoa, Jaamun, Jamun                      |
| 82.                                 | <i>Tamarix dioica</i>                                                     | Jhau                                      |
| 83.                                 | <i>Toona ciliata</i> (= <i>Cedrela toona</i> )                            | Tun, Red Cedar, Moulmein Cedar            |
| 84.                                 | <i>Terminalia arjuna</i>                                                  | Arjun                                     |
| 85.                                 | <i>Terminalia bellirica</i>                                               | Bahera, Vibhitika, Bahira                 |
| 86.                                 | <i>Terminalia chebula</i>                                                 | Harar, Haritika                           |
| 87.                                 | <i>Terminalia elliptica</i> (= <i>T. alata</i> /<br><i>T. tomentosa</i> ) | Sain, Saj, Saja                           |
| 88.                                 | <i>Trevis nudiflora</i> (= <i>Mallotus nudiflorus</i> )                   | Gutel, Tumr                               |
| 89.                                 | <i>Wendlandia exserta</i>                                                 | Chili                                     |
| 90.                                 | <i>Wrightia arborea</i> ( <i>W. tomentosa</i> )                           | Dudhi                                     |
| 91.                                 | <i>Xylosma longifolia</i>                                                 | Barach, Silau, Chirindu                   |
| 92.                                 | <i>Ziziphus mauritiana</i>                                                | Ber, Badari, Dadara, Jujube               |
| 93.                                 | <i>Ziziphus jujuba</i>                                                    | Madhuraphala                              |
| 94.                                 | <i>Ziziphus xylopyrus</i> ( <i>Z. glaberrima</i> )                        | Kathber, Mandher                          |
| <b>Introduced/ Cultivated Trees</b> |                                                                           |                                           |
| 95.                                 | <i>Artocarpus heterophyllum</i>                                           | Kathal                                    |

|      |                                                      |                                              |
|------|------------------------------------------------------|----------------------------------------------|
| 96.  | <i>Callistemon viminalis</i> (=Melaleuca viminalis)  | Bottlebrush                                  |
| 97.  | <i>Delonix regia</i>                                 | Gulmohar, Fire Tree                          |
| 98.  | <i>Erythrina variegata</i> (=E. indica)              | Mandara, Pangra, Indian Coral Tree           |
| 99.  | <i>Eucalyptus tereticornis</i>                       | Eucalyptus, Safeda                           |
| 100. | <i>Grevillea robusta</i>                             | Silver Oak                                   |
| 101. | <i>Jacaranda mimosifolia</i>                         | Jacaranda                                    |
| 102. | <i>Leucaena leucocephala</i>                         | Leucaena, Ku Babul                           |
| 103. | <i>Magnolia champaca</i> (=Michelia champaca)        | Champa                                       |
| 104. | <i>Melia azedarach</i>                               | Bakain, Drek, Persian Lilac                  |
| 105. | <i>Neolamarckia cadamba</i> (=Anthocephalus cadamba) | Kadam                                        |
| 106. | <i>Populus spp.</i>                                  | Poplar                                       |
| 107. | <i>Prosopis juliflora</i>                            | Prosopis Juliflora, Vilayati Babul, Mesquite |
| 108. | <i>Psidium guyava</i>                                | Amrood                                       |
| 109. | <i>Pterospermum acerifolium</i>                      | Kanak Champa                                 |
| 110. | <i>Robinia pseudo-acacia</i>                         | Robinia, Black Locust                        |
| 111. | <i>Salix spp.</i>                                    | Willow                                       |
| 112. | <i>Saraca asoca</i> (=Saraca indica)                 | Ashok                                        |
| 113. | <i>Tecoma stans</i>                                  | Tecoma                                       |
| 114. | <i>Tectona grandis</i>                               | Teak                                         |

## B- SHRUBS

| Sr. No. | Scientific Name                                       | Common Name                    |
|---------|-------------------------------------------------------|--------------------------------|
| 1       | <i>Antidesma acidum</i> ( <i>Antidesma diandrum</i> ) | Khatla                         |
| 2       | <i>Ardisia solanacea</i>                              | Gur-bheli                      |
| 3       | <i>Asparagus adscendens</i>                           | Satamuli, Sataron              |
| 4       | <i>Berberis asiatica</i>                              | Chatraon                       |
| 5       | <i>Berberis lycium</i>                                | Kasmal                         |
| 6       | <i>Calotropis procera</i>                             | Aak                            |
| 7       | <i>Cannabis sativa</i>                                | Bhanga                         |
| 8       | <i>Carissa opaca</i>                                  | Kandlai, Katrarh               |
| 9       | <i>Capparis sepiaria</i>                              | Hedge Caper                    |
| 10      | <i>Capparis zeylanica</i>                             | Indian Caper                   |
| 11      | <i>Cestrum nocturnum</i>                              | Rat ki Rani, Lady of the Night |
| 12      | <i>Catunaregam spinosa</i> (=Randia dumetorum)        | Maniphal, Rada                 |

|    |                                                                    |                                          |
|----|--------------------------------------------------------------------|------------------------------------------|
| 13 | <i>Clerodendron viscosum</i>                                       | Karu                                     |
| 14 | <i>Colebrookea oppositifolia</i>                                   | Binda, Binta-lakari                      |
| 15 | <i>Cotinus coggygria</i> (= <i>Rhus cotinus</i> )                  | Tung                                     |
| 16 | <i>Debregeasia senec (D. hypoleuca)</i>                            | Singar, Siaru                            |
| 17 | <i>Dodonaea viscosa</i>                                            | Mehandru                                 |
| 18 | <i>Euphorbia royleana</i>                                          | Thor                                     |
| 19 | <i>Flemingia chappar</i>                                           | Chhanchra                                |
| 20 | <i>Justicia adhatoda</i> (= <i>Adhatoda vasica</i> )               | Basooti, Bansa                           |
| 21 | <i>Helicteres isora</i>                                            | Marorphali                               |
| 22 | <i>Holarrhena pubescens</i> ( <i>H. antidysenterica</i> )          | Kura, Kora                               |
| 23 | <i>Indigofera pulchella</i>                                        | Kathi                                    |
| 24 | <i>Lantana camara</i>                                              | Varzhita, Phuljari                       |
| 25 | <i>Maesa indica</i>                                                | Dumani                                   |
| 26 | <i>Murraya koenigii</i>                                            | Gandhela, Mirchu                         |
| 27 | <i>Murraya paniculata</i>                                          | Ban mirchi                               |
| 28 | <i>Nyctanthes arbor-tristis</i>                                    | Harsingar, Kuri, Parijata, Night Jasmine |
| 29 | <i>Opuntia dillenii</i>                                            | Nagphon                                  |
| 30 | <i>Orthanthera viminea</i>                                         | Sharar                                   |
| 31 | <i>Osyris wightiana</i>                                            | Lal-lakri                                |
| 32 | <i>Prinsepia utilis</i>                                            | Bhekhra                                  |
| 33 | <i>Rauwolfia serpentina</i>                                        | Sarphgandha                              |
| 34 | <i>Rhus parviflora</i> (= <i>Searsia parviflora</i> )              | Ban tung                                 |
| 35 | <i>Rosa brunonii</i> (= <i>R. moschata</i> )                       | Jangli-gulab                             |
| 36 | <i>Rubus niveus</i>                                                | Bhera                                    |
| 37 | <i>Rumex hastatus</i>                                              | Chulmora, Khatibuti                      |
| 38 | <i>Solanum verbascifolium</i>                                      | Ban Tamaku                               |
| 39 | <i>Strobilanthes tomentosa</i> (= <i>Aechmantherea gossypina</i> ) | Bharara                                  |
| 40 | <i>Vitex negundo</i>                                               | Shimalu, Bahna                           |
| 41 | <i>Woodfordia fruticosa</i> (= <i>W. floribunda</i> )              | Bhaura, Dhawi, Dhai                      |
| 42 | <i>Ziziphus nummularia</i>                                         | Jhar ber                                 |



### C- CLIMBERS

| Sr. no. | Scientific Name                                                                   | Common Name                        |
|---------|-----------------------------------------------------------------------------------|------------------------------------|
| 1       | <i>Abrus precatorius</i>                                                          | Ratti or Gunchi                    |
| 2       | <i>Acacia pennata</i> (= <i>Senegalia pinnata</i> )                               | Agla                               |
| 3       | <i>Atylosia mollis</i>                                                            | Ban Sem                            |
| 4       | <i>Bauhinia vahlii</i> (= <i>Phanera vahlii</i> )                                 | Maljhan                            |
| 5       | <i>Caesalpinia decapetala</i> ( <i>C. sepiaria</i> / <i>Biancaea decapetala</i> ) | Heens, Alai                        |
| 6       | <i>Calamus tenuis</i>                                                             | Baint                              |
| 7       | <i>Celastrus paniculata</i>                                                       | Malkangi                           |
| 8       | <i>Chonemorpha macrophylla</i>                                                    | Dudhi                              |
| 9       | <i>Cissampelos pareira</i>                                                        | Patha                              |
| 10      | <i>Clematis grata</i>                                                             | -                                  |
| 11      | <i>Cryptolepis buchananii</i>                                                     | Dali Dudhi, Bakar Bel, Medha Singi |
| 12      | <i>Combretum decandrum</i>                                                        | Roel bel, Patindu, Harjori,        |
| 13      | <i>Dioscorea bulbifera</i>                                                        | Githa                              |
| 14      | <i>Ficus hederacea</i> (= <i>F. scandens</i> )                                    | Makhota                            |
| 15      | <i>Ichnocarpus frutescens</i> (= <i>Quirivelia frutescens</i> )                   | Pili dudhi                         |
| 16      | <i>Millettia extensa</i> (= <i>M. auriculata</i> )                                | Gaj                                |
| 17      | <i>Mimosa himalayana</i>                                                          | Alay                               |
| 18      | <i>Mucuna pruriens</i> ( <i>Mucuna prurita</i> )                                  | Kaunch                             |
| 19      | <i>Pergularia daema</i>                                                           | Gadaria ki bel                     |
| 20      | <i>Porana paniculata</i>                                                          | Safed Bel                          |
| 21      | <i>Pueraria tuberosa</i>                                                          | Sarali                             |
| 22      | <i>Rubia cordifolia</i>                                                           | Manjit                             |
| 23      | <i>Smilax aspera</i>                                                              | Ramdataun                          |
| 24      | <i>Tinospora cordifolia</i>                                                       | Giloe, Gulje                       |
| 25      | <i>Tinospora sinensis</i>                                                         | Giloe, Gulje                       |
| 26      | <i>Vallaris solanacea</i>                                                         | Dudhi bel, Safed bel               |
| 27      | <i>Vitis latifolia</i> (= <i>Ampelocissus latifolia</i> )                         | Panibel                            |
| 28      | <i>Vitis trifolia</i> (= <i>Cayretia trifolia</i> , <i>Causonis trifolia</i> )    | Amal bel                           |
| 29      | <i>Zizyphus oenoplia</i>                                                          | Makoh                              |

## D GRASSES & BAMBOO

| Sr. no. | Scientific Name                 | Common Name                |
|---------|---------------------------------|----------------------------|
| 1       | <i>Arundo donax</i>             | Nal or Nara                |
| 2       | <i>Chrysopogon montanus</i>     | Dhailu                     |
| 3       | <i>Cymbopogon martini</i>       | Mirchangandh or makora     |
| 4       | <i>Cynodon dactylon</i>         | Dub, Durva grass, Haritali |
| 5       | <i>Dendrocalamus strictus</i>   | Bans                       |
| 6       | <i>Dendrocalamus hamiltonii</i> | Bans                       |
| 7       | <i>Eulailopsis binata</i>       | Bhabbar                    |
| 8       | <i>Heteropogon contortus</i>    | Kumeria or Sarala          |
| 9       | <i>Imperata cylindrical</i>     | Dab                        |
| 10      | <i>Saccharum munja</i>          | Munj                       |
| 11      | <i>Sinarundinaria falcata</i>   | Nigal or Nirgal            |
| 12      | <i>Sorghum halepense</i>        | Banchari                   |
| 13      | <i>Thysanoloena maxima</i>      | Prilu or Aunsh             |

## IV - LIST OF FAUNA

### I) MAMMALS OF PAONTA SAHIB

| Sr. No | Local Name   | English Name               | Scientific Name             |
|--------|--------------|----------------------------|-----------------------------|
| 1      | Bhaloo       | Himalayan Black Bear       | <i>Ursus thibetanus</i>     |
| 2      | Tendua       | Leopard                    | <i>Panthera pardus</i>      |
| 3      | En Koryal    | Flying Squirrel            | <i>Belomys pearsoni</i>     |
| 4      | Ghoral       | Himalayan Goat             | <i>Naemoredus goral</i>     |
| 5      | Jungli Suar  | Wild Boar                  | <i>Sus scrofa</i>           |
| 6      | Kakar        | Barking deer               | <i>Muntiacus muntjak</i>    |
| 7      | Khargosh     | Common Hare                | <i>Lepus nigricollis</i>    |
| 8      | Lomri        | Red Fox                    | <i>Vulpes bengalensis</i>   |
| 9      | Sambar       | Sambar                     | <i>Cervus unicolor</i>      |
| 10     | Shail        | Porcupine                  | <i>Hystrix indica</i>       |
| 11     | Bandar       | Monkey (Rhesus Macaque)    | <i>Macaca mulatta</i>       |
| 12     | Gidar        | Jackal                     | <i>Canis aureus</i>         |
| 13     | Gilhari      | Five striped Palm squirrel | <i>Funambulus pennantii</i> |
| 14     | Jungli Billi | Wild Cat                   | <i>Felis chans</i>          |
| 15     | Langoor      | Common Langoor             | <i>Presbytis entellus</i>   |
| 16     | Newla        | Mongoose                   | <i>Urva edwardsii</i>       |
| 17     | Bagh         | Royal Bengal Tiger         | <i>Panthera tigris</i>      |
| 18     | Hathi        | Asiatic Elephant           | <i>Elephas maximus</i>      |

## II) BIRDS OF PAONTA SAHIB

| Sr. No. | LOCAL NAME   | ENGLISH NAME               | SCIENTIFIC NAME                          |
|---------|--------------|----------------------------|------------------------------------------|
| 1       | Bater        | Common or Grey Quail       | <i>Coturnix coturnix</i>                 |
| 2       | Ghugi        | Spotted Dove               | <i>Streptopelia chinensis</i>            |
| 3       | Harial       | Yellow-footed green Pigeon | <i>Treron phoenicoptera</i>              |
| 4       | Jangli Murga | Red Jungle Fowl            | <i>Gallus gallus</i>                     |
| 5       | Kabutar      | Blue Rock Pigeon           | <i>Columba livia</i>                     |
| 6       | Kaleej       | Kalij pheasant             | <i>Lophura leucomelanos</i>              |
| 7       | Lowwa        | Jungle Bush Quail          | <i>Perdica asiatica</i>                  |
| 8       | Peora        | Hill Partridge             | <i>Arborophila torqueola</i>             |
| 9       | Kala Teetar  | Black Francolin            | <i>Francolinus francolinus</i>           |
| 10      | Bulbul       | Crested bulbul             | <i>Pycnonotus jocosus</i>                |
| 11      | Cuckoo       | Large hawk-Cuckoo          | <i>Hierococcyx sparveroides</i>          |
| 12      | Gidh         | Himalayan Griffin          | <i>Gyps himalayensis</i>                 |
| 13      | Kaua         | Crow                       | <i>Corvus splendens &amp; culminatus</i> |
| 14      | Kath phora   | Woodpecker                 | <i>Dendrocopos himalayensis</i>          |
| 15      | Goraiya      | House sparrow              | <i>Passer domesticus (indicus)</i>       |
| 16      | Tota         | Rose-ringed Parakeet       | <i>Psittacula krameri</i>                |

Other important birds have been pictorially depicted ahead.

# COMMON BIRDS OF PAONTA SAHIB

## WETLAND BIRDS



## GROUND FEEDING BIRDS



## AERIAL FEEDING BIRDS



## ARBOREAL BIRDS



## BIRDS OF PREY



## WINTER VISITOR



## SUMMER VISITOR



MALE



FEMALE

# PAONTA SAHIB FOREST DIVISION

### III) REPTILES OF PAONTA SAHIB

| Sr. No. | LOCAL NAME         | ENGLISH NAME        | SCIENTIFIC NAME                 |
|---------|--------------------|---------------------|---------------------------------|
| 1       | Biskhopra          | Monitor lizard      | <i>Varanus griseus (daudin)</i> |
| 2       | Gobilda            | Chameleon           | <i>Chameleon calcaratus</i>     |
| 3       | Kharpa             | Indian Cobra        | <i>Naja naja</i>                |
| 4       | Krait              | Common Indian Krait | <i>Bungarus caeruleus</i>       |
| 5       | Daboiya            | Russell Viper       | <i>Vipera russelli</i>          |
| 6       | Kukri Snake        | Common Kukri        | <i>Oligodon arnensis</i>        |
| 7       | Russel Kukri       | Russel's Kukri      | <i>Oligodon taeniolatus</i>     |
| 8       | Common wolf        | Common Wolf         | <i>Lycodon capucinus</i>        |
| 9       | Teliya/Andha snake | Brahminy Worm       | <i>Indotyphlops braminus</i>    |
| 10      | Retila snake       | Common Sand Boa     | <i>Eryx conicus</i>             |
| 11      | Dhodiya            | Checkered Keelback  | <i>Xenochrophis piscator</i>    |
| 12      | Hurhur Snake       | Striped Keelback    | <i>Xenochrophis vittatus</i>    |
| 13      | Common Trinket     | Common Trinket      | <i>Coelognathus helena</i>      |
| 14      | Bronzeback         | Bronzeback          | <i>Dendrelaphis tristis</i>     |
| 15      | Dhamman            | Indian Rat          | <i>Ptyas mucosa</i>             |
| 16      | Ajgar              | Indian Rock Python  | <i>Python molurus</i>           |
| 17      | Domuha             | Red Sand Boa        | <i>Eryx johnii</i>              |
| 18      | Harantal           | Common Vine         | <i>Ahaetulla nasuta</i>         |
| 19      | Cat snake          | Common Cat Snake    | <i>Boiga trigonata</i>          |
| 20      | King Cobra         | King Cobra          | <i>Ophiophagus hannah</i>       |



# पांवटा साहिब में पाए जाने वाली सर्प प्रजातियां



**Common Krait Snake (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Striped Keelback (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Common Vine Snake (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Russett's Krait Snake (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Common Trinket (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Common Cat Snake (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Common Wolf Snake (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Bronzeback Snake (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Spectacled Cobra (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Russett's Worm Snake (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Indian Rat Snake (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Common Krait (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Common Sand Boa (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Indian Rock Python (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Russett's Viper (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Checkered Keelback (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Red Sand Boa (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।



**Ring Cobra (विषहीन सर्प)**  
एक छोटी सा सर्प जो अक्सर घास-पौधों में पाया जाता है। इसका रंग अक्सर काला और सफेद होता है। यह सर्प अत्यंत विषहीन है।

विषहीन

कम विषधारी

विषाक्त

विभिन्न तरह की कियदतियों के कारण सांघों को लेकर जन-मानस में भय व्याप्त रहता है। भारत में पाई जाने वाली सर्पों की लगभग 270 प्रजातियों में से केवल 50 प्रजातियां ही गहरीली होती हैं। सांघ चूहों आदि को खाकर अपनाजीवी पैदावार नष्ट होने से रोकते हैं। सांघ अधिकांशतः घनुष्यों से बचते हुए रहते हैं व केवल हिस्टर्ब किए जाने पर या गलती से पैर चढ़ जाने पर ही काटते हैं। इन्हें मारने की बजाए इन्हें भगाने का प्रयास करें।



वन मंडल पांवटा साहिब





#### IV) BUTTERFLIES OF PAONTA SAHIB





## V) BUTTERFLIES OF PAONTA SAHIB

| Sr. No. | LOCAL NAME                     | SCIENTIFIC NAME              |
|---------|--------------------------------|------------------------------|
| 1       | Common Palmfly                 | <i>Elymnias hypermnestra</i> |
| 2       | Club Beak                      | <i>Libythea myrrha</i>       |
| 3       | Indian jezebel                 | <i>Delias eucharis</i>       |
| 4       | Baronet                        | <i>Symphhaedra nais</i>      |
| 5       | Common Castor                  | <i>Ariadne merione</i>       |
| 6       | Psyche                         | <i>Leptosia nina</i>         |
| 7       | Orange Oakleaf                 | <i>Kallima inachus</i>       |
| 8       | Plain Tiger                    | <i>Danaus chrysippus</i>     |
| 9       | Glassy Tiger                   | <i>Parantica aglea</i>       |
| 10      | Himalayan Five-Ring            | <i>Ypthima sakra</i>         |
| 11      | Zebra Blue                     | <i>Leptotes plinius</i>      |
| 12      | Lemon Emigrant                 | <i>Catopsilia pomona</i>     |
| 13      | Indian Tortoiseshell           | <i>Aglaia caschmirensis</i>  |
| 14      | Glassy Bluebottle              | <i>Graphium cloanthus</i>    |
| 15      | Red Pierrot                    | <i>Talica niseus</i>         |
| 16      | Grizzled Skipper               | <i>Spialia galba</i>         |
| 17      | Blue Tiger                     | <i>Tirumala limniace</i>     |
| 18      | Common Woodbrown               | <i>Lethe sidonis</i>         |
| 19      | Common Jester                  | <i>Symbrenthia lila</i>      |
| 20      | Common Leopard/ Spotted rustic | <i>Phalanta phalantha</i>    |
| 21      | Common Baron                   | <i>Euthalia aconthea</i>     |
| 22      | Common Peacock                 | <i>Papilio bianor</i>        |
| 23      | Lime Swallowtail               | <i>Papilio demoleus</i>      |
| 24      | Chocolate Pansy                | <i>Junonia iphita</i>        |
| 25      | Yellow Pansy                   | <i>Junonia hierta</i>        |
| 26      | Painted Lady                   | <i>Vanessa cardui</i>        |
| 27      | Sorrel Sapphire                | <i>Heliophorus sena</i>      |
| 28      | Grass Demon                    | <i>Udaspes folus</i>         |
| 29      | Cheshtnut Angle                | <i>Odontoptilum angulata</i> |
| 30      | Common Gull                    | <i>Cepora nerissa</i>        |

## VI - FISHES

| Sr. No. | LOCAL NAME | SCIENTIFIC NAME          |
|---------|------------|--------------------------|
| 1       | Goonch     | <i>Bagarius yarrelli</i> |
| 2       | Lachi      | <i>Wallago attu</i>      |
| 3       | Mahseer    | <i>Tor putitora</i>      |
| 4       | Rohu       | <i>Labeo rohita</i>      |

# CHAPTER-1

## THE TRACT DEALT WITH

### 1.1 NAME AND SITUATION:

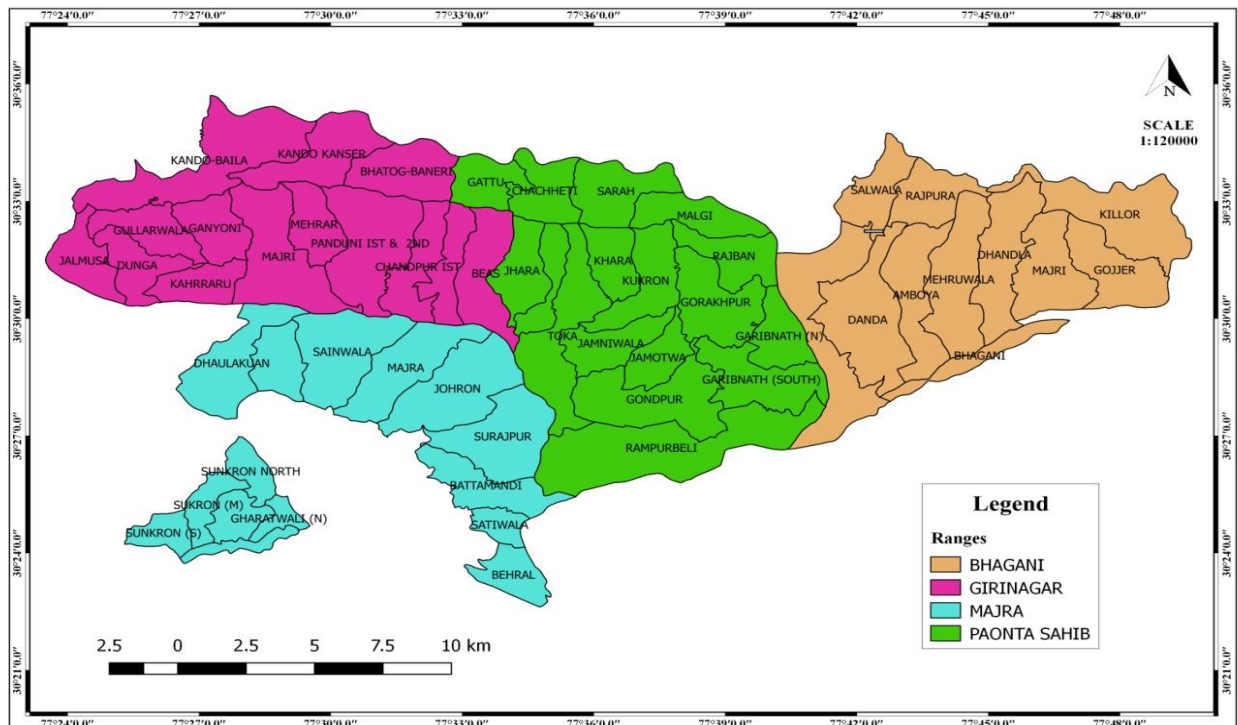
The tract falls in Paonta Sahib Tehsil of Sirmour District. The Paonta Sahib Forest Division (Territorial) was created on 1<sup>st</sup> April 1984. There are 4 Ranges namely Paonta Sahib Bhagani, Majra, and Girinagar ranges.

The total forest area covered by the present plan is 28791.69 ha. The area is bounded by Nahan and Renuka Forest Division in North, Dehradun district of Uttarakhand in the East, separated by Tons and Yamuna rivers and Yamuna Nagar district of Haryana in the South.

The Divisional Head Quarter of Paonta Sahib Forest Division is located at Paonta Sahib falling in Doon Valley, on the bank of Yamuna River, at an elevation of about 389 mts. It is at a distance of 45km from Nahan Circle headquarters. The Division area is situated between 30°- 22'- 37" N and 30°- 41'-36" N and 77°- 7'- 19" E and 77°- 49'- 48" E.

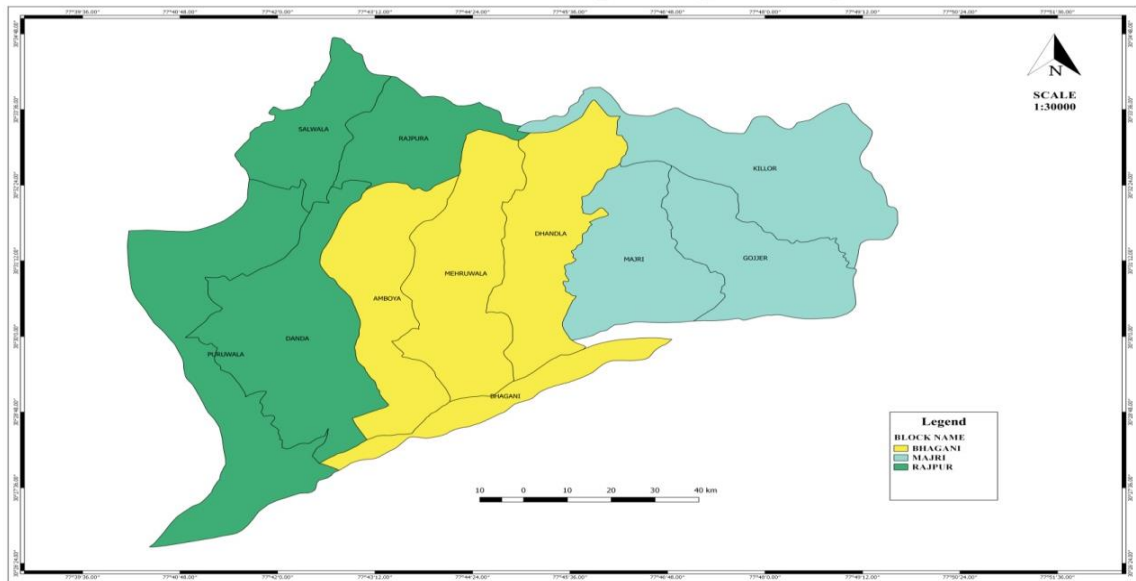
### Map No. – 1.1

Administrative map - Paonta Sahib division



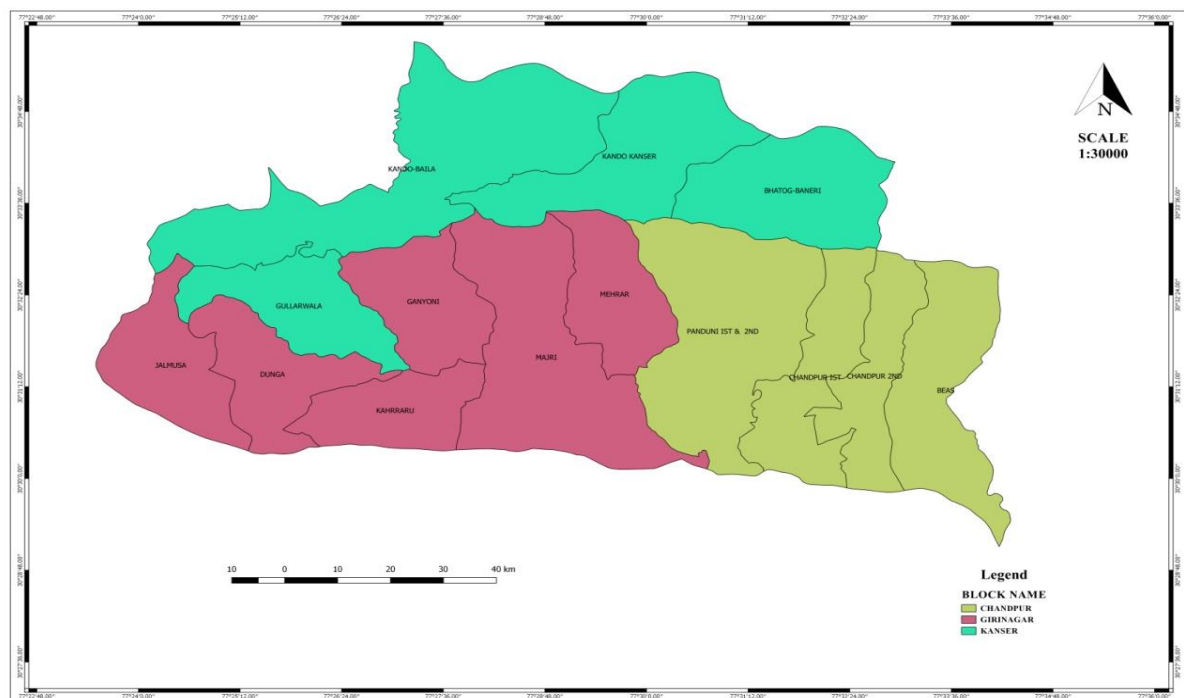
**Map No. – 1.1 (a)**

**Administrative map- Bhagani Range**



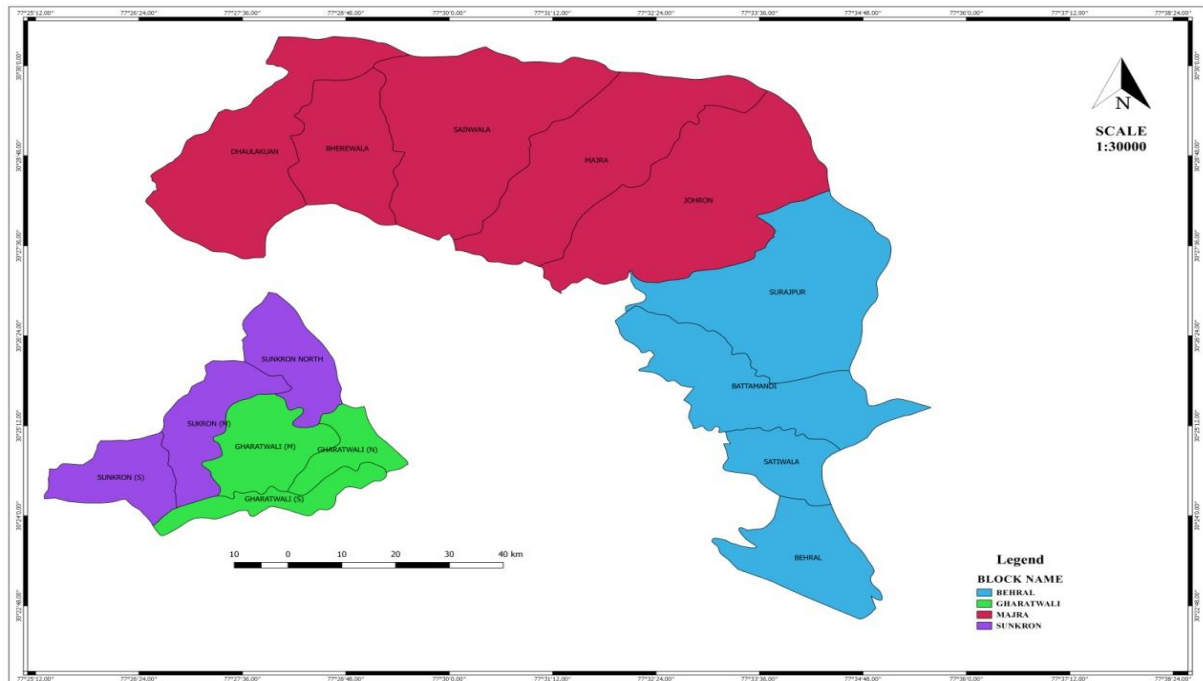
**Map No. – 1.1 (b)**

**Administrative Map: Girinagar Range**



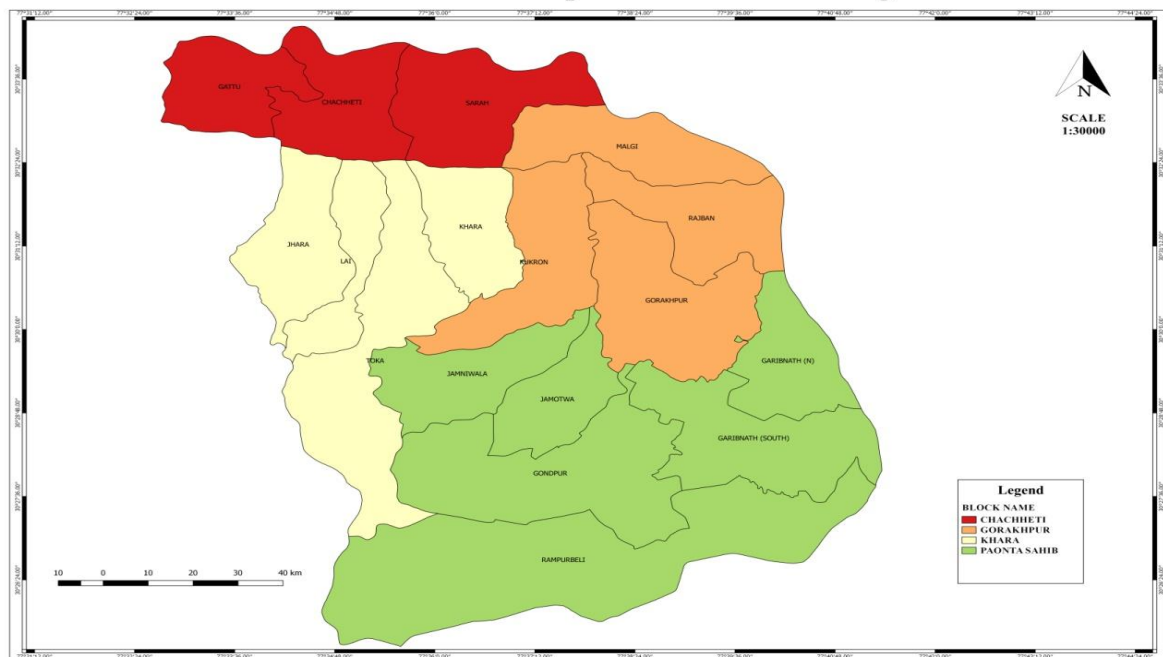
**Map No. – 1.1 (c)**

### Administrative Map: Majra Range



**Map No. – 1.1 (d)**

### Administrative map- Paonta Sahib Range



## **1.2 CONFIGURATION OF THE GROUND:**

The tract covered by this working plan is generally plain covering Doon Valley to partly hilly tracts. The three well defined ranges running almost parallel, form the most striking geographical feature of the area, they are the '*Shiwalik Hills*', '*Kamrau Bharli Dhar*' and '*Dharti Dhar*'. Between the Shiwalik and Dharti Dhar falls a fertile valley known as '*Kiarda*', where one of the best Sal Forests is found in the region.

**1.2.1 THE SHIWALIK HILLS:** The Shiwalik hills cover almost half of the forests of the area covering Majra Range and consist of numerous hillocks and spurs running in all directions and draining into various '*khols*'. The Southern and Western slopes of these hillocks are quite steep and unstable. The Northern slopes fall out into the "Doon". Most of the area is severely eroded and supports scrub vegetation and grasses. Bhabar grass is commonly found here. There are several streams in the tract called '*khols*', which generally remain dry throughout the year except in rainy season.

**1.2.1.1 THE DOON:** This is a level narrow fertile valley also known as '*Kiarda*'. It falls between main Shiwalik ridge and Dharti Dhar. This valley is about 30km long. It is about 20km wide near Yamuna River and narrows to about 600mt. in width near Paonta Sahib-Nahan border at Kolar area. This valley bears good deep soil and boulders underneath. The entire area drains into Bata, Giri and Yamuna rivers. The Doon valley supported the best Sal forests at one time, large areas of which were clear felled about 130-150 years back to make available cultivable land for the immigrants and the local Jagirdars.

**1.2.1.1.1** In the Doon Valley, there is a detached spindle shaped hillock known as Garibnath. It is situated to the North-East of Paonta Sahib and bears extensive Sal forests.

**1.2.2 KAMRAOO-BHARLI DHAR:** It forms an outer Himalyan Range and is situated in the North and North West of Doon valley. Kamroo-Bharli Dhar rises near Killaur village on the bank of Tons river and runs west wards through Danda, Nagheta, Bharli etc. The altitude varies from about 550m. to 2102m. The slopes are steep with poor soil. This area is covered by poor quality Sal forest in the lower portions and Ban Oak, Chil and Scrub forest as we move up towards the main Dhar.

**1.2.3** The other prominent hill range in the tract is known as Dharti Dhar, which starts from Rajgarh Forest Division near Sarahan and runs westwards via Kansar, Parduni, Chandpur forests of Girinagar range and ends near Rajban in Paonta Sahib Range.

## **1.3 GEOLOGY, ROCK AND SOIL:**

The geological formation of the area can be categorized broadly into two distinct formations;

- (i) Sub Himalayan and

(ii) Himalayan

**1.3.1 SUB HIMALAYAN FORMATION:** Major portion of the area discussed in this plan falls under this classification. This consists of Shiwalik Hills, Doon and the Dharti-Dhar.

**1.3.1.1 SHIWALIK HILLS:**

The Shiwalik hills are formed of alternating beds of hard clay, sand stone, conglomerates and sand. These alternating tilted bands can be seen at many places in vertical sections of the hills formed by denudation and sliding land masses. Due to very loose formation, with sparse vegetational cover which is indiscriminately grazed, browsed and lopped, the Shiwaliks are easily eroded and as a consequence, bowl-shaped Nalas, locally called 'Khalas' have been formed. Soil is poor in humus, shallow and interbedded with boulders. Naked, vertical edged hillocks are a common sight in these areas.

Sal and Sain of inferior quality are found singly or in groups in shelters and suitable places. Outer Southern slopes bear the scrub forest and 'Bhabar' grass. Khair, Shisham are found on Nala banks and riverine tracts. Good quality Sal is found from Katasan to Behral on the Northern aspect towards Doon, wood and animal fossils are found in areas near Simbalwara.

**1.3.1.2 The Doon:** This is a flat to gently undulating valley having deep alluvial soil varying in texture from sandy loam to clayey loam. From adjoining hills, the "Khalas" bring down the debris and boulders and at places boulders are exposed. Doon valley bears the best quality of Sal of the tract. Major portion of valley is under cultivation.

**1.3.1.3 Dharti Dhar:** This is a mixture of Shiwalik and the Sub Himalayan formation. Greenish grey sandstone is met with as large rocks or small bounders with reddish sandstone at places. Shales, phyllitic shales and slate also occur inter mixed with sandstone. Iron pyrite is found in pockets e.g. Kansar and Kando in Giri Nagar Range. Lime stone occurs from Sarah to Kando at places coming to the surface e.g. near Kansar. This Dhar starts from Rajgarh Forest Division near Sarahan and enters Nahan Forest Division from there. It runs eastwards via Banethi, Kansar, Malgi and ends near Rajban in Paonta Sahib Range.

The Northern slopes upto Dhaun bear Chil and area from Dhaun to Sirmouri-Tal bears Chil and Sal associations. This aspect is well covered with forest vegetation. Fertile lands coming under this classification having deep soil, are under cultivation.

**1.3.2. THE HIMALAYAN FORMATION:** The small portion of Bhagani Range of Paonta Sahib Forest Division from Kandela to Killaur situated in Kamraoo-Bharali Dhar forms the outer Himalayas. Lime stone is found in varying depth. The lime stone has come up to the surface at Kandela and Raipur.

The precipitous slopes in this tract have hardly any soil. Rock is exposed on steeper slopes. The soil is shallow and poor, and supports gentle slopes. Level areas with deep clay loam to loamy soil bears pure Sal forests.

#### 1.4 CLIMATIC PARAMETERS

**ALTITUDE:** The altitude ranges from 389 m to 2102 mt. (highest on Kamraoo Bharli Dhar).

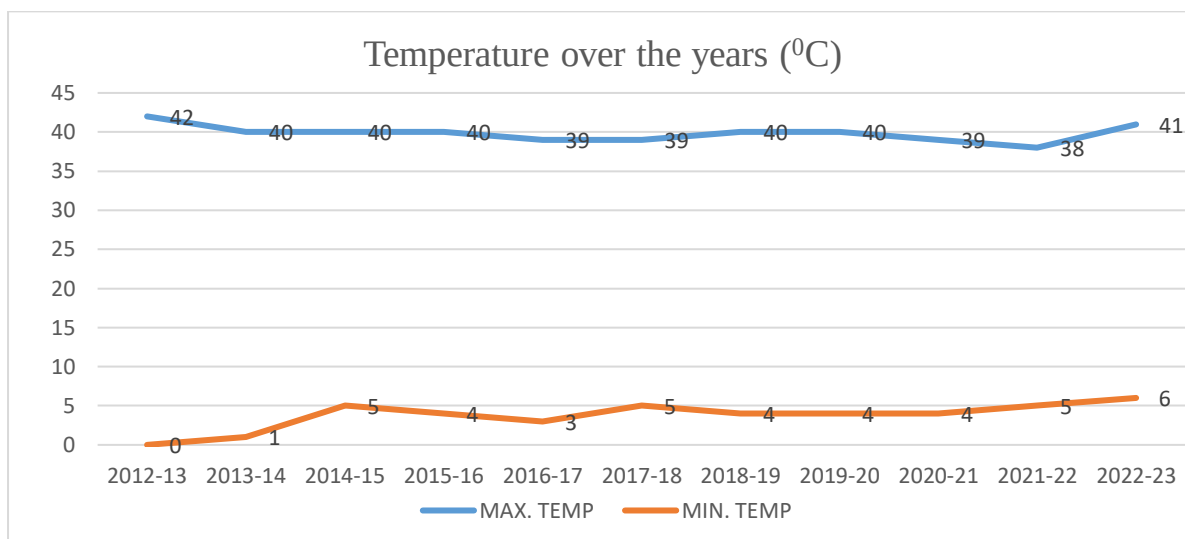
**CLIMATE:** The climate is mainly Sub Tropical. The winter, summer and rainy seasons are well marked. Winter season starts from around November and is generally not very severe. However, nights are extremely cold in December and January. The summers are hot, and dry, rising gradually over the year. The onset of Monsoon brings great relief in the area. The monsoons generally start from the last week of June and continue up to mid-September.

**TEMPERATURE:** There is variation in altitude and physical features in the tract resulting in variation in the temperature range. The Shivalik tract has hot summer days and is cooler during nights. The hot dust storms in the area produce desiccating effect. The southern slopes of Dharti Dhar and the Doon have very hot summer days but nights are cool and dewy. During winters, the day temperature is quite low and during nights it often falls to single digit temperatures.

**Table 1.1 TEMPERATURE DATA FROM 2012-13 TO 2022-23**

| YEAR    | MAXIMUM TEMPERATURE (°C) | MINIMUM TEMPERATURE (°C) |
|---------|--------------------------|--------------------------|
| 2012-13 | 42                       | 0                        |
| 2013-14 | 40                       | 1                        |
| 2014-15 | 40                       | 5                        |
| 2015-16 | 40                       | 4                        |
| 2016-17 | 39                       | 3                        |
| 2017-18 | 39                       | 5                        |
| 2018-19 | 40                       | 4                        |
| 2019-20 | 40                       | 4                        |
| 2020-21 | 39                       | 4                        |
| 2021-22 | 38                       | 5                        |
| 2022-23 | 41                       | 6                        |





**FROST:** In ‘Doon’ valley the frost is a common occurrence in winters but damage is not high.

**RAINFALL:** This region receives most of the rainfall during the monsoons. The average rainfall varies from 1900mm. to 1270mm., winter rains are received during December-January. The monsoons generally start from last week of June upto mid-September. Pre-monsoon showers sometimes occur during May-June. Annual rainfall data recorded at Paonta Sahib on an average is 1424 mm.

**Table 1.2: Monthly Temperature and Rainfall Data for Paonta Sahib**

|                                     | January              | February             | March                | April                | May                  | June                 | July                 | August               | September            | October              | November             | December             |
|-------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Avg. Temperature °C (°F)            | 11.3 °C<br>(52.4) °F | 14 °C<br>(57.2) °F   | 18.8 °C<br>(65.9) °F | 24.6 °C<br>(76.3) °F | 28.1 °C<br>(82.6) °F | 28.7 °C<br>(83.7) °F | 26.6 °C<br>(80) °F   | 26.1 °C<br>(78.9) °F | 24.8 °C<br>(76.6) °F | 21 °C<br>(69.9) °F   | 16.7 °C<br>(62) °F   | 12.7 °C<br>(54.8) °F |
| Min. Temperature °C (°F)            | 4.4 °C<br>(39.8) °F  | 6.6 °C<br>(44) °F    | 10.5 °C<br>(50.8) °F | 15.7 °C<br>(60.3) °F | 19.8 °C<br>(67.6) °F | 22.7 °C<br>(72.8) °F | 23.7 °C<br>(74.7) °F | 23.3 °C<br>(73.9) °F | 20.5 °C<br>(68.9) °F | 14.3 °C<br>(57.8) °F | 9.6 °C<br>(49.3) °F  | 5.6 °C<br>(42.1) °F  |
| Max. Temperature °C (°F)            | 17.8 °C<br>(64.1) °F | 20.8 °C<br>(69.5) °F | 26.3 °C<br>(79.3) °F | 32.4 °C<br>(90.3) °F | 35.1 °C<br>(95.2) °F | 33.9 °C<br>(93) °F   | 29.8 °C<br>(85.6) °F | 29.1 °C<br>(84.4) °F | 28.8 °C<br>(83.8) °F | 27.5 °C<br>(81.5) °F | 23.8 °C<br>(74.8) °F | 19.6 °C<br>(67.3) °F |
| Precipitation / Rainfall<br>mm (in) | 37<br>(1)            | 54<br>(2)            | 28<br>(1)            | 21<br>(0)            | 28<br>(1)            | 160<br>(6)           | 450<br>(17)          | 423<br>(16)          | 191<br>(7)           | 16<br>(0)            | 2<br>(0)             | 14<br>(0)            |
| Humidity(%)                         | 73%                  | 67%                  | 54%                  | 38%                  | 40%                  | 56%                  | 83%                  | 85%                  | 81%                  | 69%                  | 66%                  | 70%                  |
| Rainy days (d)                      | 3                    | 4                    | 3                    | 3                    | 5                    | 9                    | 19                   | 19                   | 12                   | 1                    | 0                    | 1                    |
| avg. Sun hours (hours)              | 8.8                  | 9.4                  | 10.6                 | 11.5                 | 11.9                 | 10.7                 | 8.2                  | 7.7                  | 8.8                  | 9.8                  | 9.4                  | 8.9                  |

Data: 1991 - 2021 Min. Temperature °C (°F), Max. Temperature °C (°F), Precipitation / Rainfall mm (in), Humidity, Rainy days. Data: 1999 - 2019: avg. Sun hours

As per the 20-year analysis, the variation in the precipitation between the driest and wettest months is almost 448 mm. The variation in temperatures throughout the year is almost 17.4 °C. The month with the most relative humidity is August (85.16 %). The month with the least



relative humidity is April (38.21 %). The wettest month is July (25.73 days), while the driest is November (0.60 days).

**WATER SUPPLY:** Yamuna, Tons, Giri are the perennial rivers flowing in this tract. Others are Bata and Pilhori Khol which either dry up during summer or have very little water flow, except in monsoon.

In summer season water supply is scarce in Doon and Shiwalik areas. The ‘Nalas’ remain dry for most of the year in these regions. Water supply in TransGiri area is better, as the streams are perennial, though the flow is low during summer.

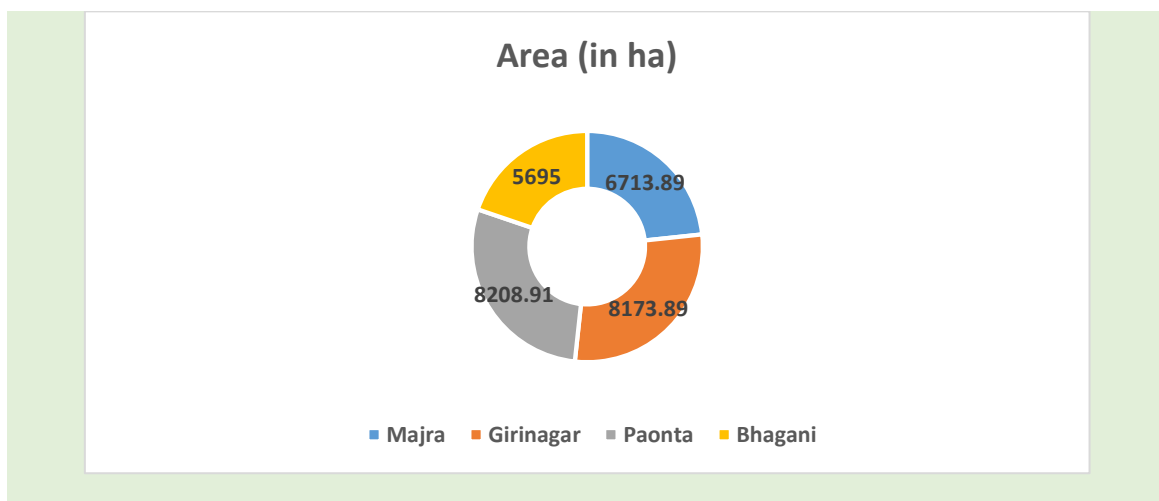
In the Trans Giri area, irrigation is done by “Kuhls” taken from nalas. An irrigation canal from Bangran Ghat near Giri has been taken which irrigate Paonta Sahib area. Other Kuhls have been dug up in the Doon valley for irrigation. Tube wells have also been dug up in the area. Two canals have been constructed from the reservoir of Giri Bata project, which irrigate the area of the right and left banks of Bata. One small canal taken from left bank of Giri, irrigates the Trans-Giri areas of Puruwala, Gorkhuwala etc.

## DISTRIBUTION OF AREA

This working plan covers four Ranges whose areas are as under: -

**Table 1.3: Area statement of Ranges**

| <b>Name of Forest Range</b>    | <b>Area in ha.</b> | <b>No. of Blocks</b> | <b>No of Beats</b> |
|--------------------------------|--------------------|----------------------|--------------------|
| Majra                          | 6713.89            | 4                    | 15                 |
| Girinagar                      | 8173.89            | 3                    | 15                 |
| Paonta Sahib                   | 8208.91            | 4                    | 17                 |
| Bhagani                        | 5695               | 3                    | 11                 |
| <b>Total Area: 28791.69 ha</b> |                    | <b>14</b>            | <b>58</b>          |



The area figures have been taken from Vineet Kumar's Plan. Since many years, plantations are being raised in this Division. These plantations are not restricted to RFs but have also been done on various Shamlat lands. These Shamlat lands have been vested in the Government. The further progress regarding their status as forest lands is not clear. The position is yet to be cleared after completion of the settlement work. Therefore, at this stage all the plantations have been raised or not, are not taken in the working plan.

All the forests which were named and numbered in Arya's Plan and were called compartments, had been treated as forests or block and were further divided into compartments and serially numbered in Chauhan's plan continued in Vineet Kumar's plan. In this Working plan, generally compartment boundaries have been kept as such for management.

## CHAPTER- 2

### MAINTENANCE/ INCREASE IN THE EXTENT OF FOREST AND TREE COVER

#### 2.1 Area of forests under different legal classes (RF, PF, UF and others)

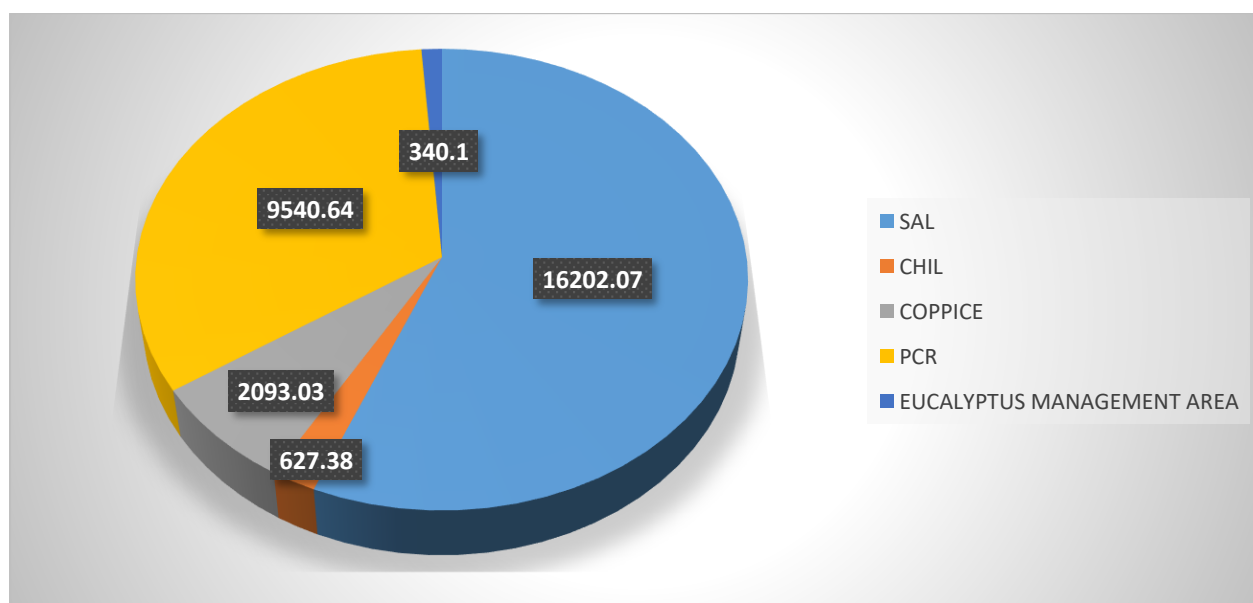
Entire forest area is notified as Reserve forest and Shamlats. Area of the forests under different legal classes as under: -

**Table 2.1: Legal classification of land**

| Forest Classification                                                                                                                                   | Area(ha.)       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Reserve Forest                                                                                                                                          | 28791.69        |
| Shamlats & ceiling land which is entered in revenue records of Paonta Sahib Forest Division in the name of HP and possession is with Forest Department. | 776.47          |
| <b>Total</b>                                                                                                                                            | <b>29568.16</b> |

**2.2 Forest area under different working circles/ management plan:** Entire forest area is covered under Working plan of Paonta Sahib Forest Division and working circle wise distribution of area range wise is as under: -

**Table 2.2: Area-wise distribution (ha) of Working Circles/Management Area**



| <b>Working circle</b>                 | <b>RANGE</b> | <b>AREA (Hac.)</b> |
|---------------------------------------|--------------|--------------------|
| <b>Sal</b>                            | Bhagani      | 2289.43            |
|                                       | Paonta Sahib | 4947.84            |
|                                       | Majra        | 4040.49            |
|                                       | Giri Nagar   | 4924.31            |
|                                       | <b>Total</b> | <b>16202.07</b>    |
| <b>Chil</b>                           | Bhagani      | 0                  |
|                                       | Paonta       | 0                  |
|                                       | Majra        | 0                  |
|                                       | Giri Nagar   | 627.38             |
|                                       | <b>Total</b> | <b>627.38</b>      |
| <b>Coppice</b>                        | Bhagani      | 0                  |
|                                       | Paonta Sahib | 324.16             |
|                                       | Majra        | 87.13              |
|                                       | Giri Nagar   | 1681.74            |
|                                       | <b>Total</b> | <b>2093.03</b>     |
| <b>PCR</b>                            | Bhagani      | 3289               |
|                                       | Paonta Sahib | 2917.59            |
|                                       | Majra        | 2415.69            |
|                                       | Giri Nagar   | 918.36             |
|                                       | <b>Total</b> | <b>9530.1</b>      |
| <b>Eucalyptus<br/>Management area</b> | Bhagani      | 114.47             |
|                                       | Paonta Sahib | 31.96              |
|                                       | Majra        | 171.57             |
|                                       | Giri Nagar   | 22.1               |
|                                       | <b>Total</b> | <b>340.1</b>       |

Note for change from Vineet Kumar Plan: Khair working circle (Overlapping) has now been made completely overlapping in true sense with Sal working circle for an area of 160.84 hac. The remaining area of 545.47 hac. which was originally in PCR working circle in older working plans and was shifted to Khair overlapping after plantations were carried out in 1950s onward, have now been kept back in PCR working circle as per CEC guidelines for Khair felling (CEC guidelines issued in I.A No. 87648 of 2020 in Writ Petition (C) No. 202 of 1995 TN Godaverman Thirumlkpad Vs UoI and Ors.) and keeping in view the ecological safeguards of riverine tracts prone to erosion, illicit mining and felling as well as boundaries with states of Uttarakhand and Haryana. Details have been shared in Khair chapter of Part II of this working plan.

### 2.3 Percentage of forest with secured boundaries

In compliance with the orders of Hon'ble Supreme Court of India in IA No.3840 of 2014 in Writ Petition (Civil) No 202/1995 of T.N. Godavarman Thirunulpad versus Union of India &Ors. , all the boundary pillars were constructed in Paonta Sahib Forest Range during 2019-20. The forests in Paonta Sahib Forest Division are reserved forests and are delineated and boundaries well defined through boundary pillars and record maintained at range level in boundary pillar register. The status of pillars is not proper, as they are damaged and broken at many locations due to increased biotic pressure, natural calamities and sometimes deliberately displaced by miscreants. The GPS coordinates of boundary pillars are entered in the boundary pillar register. A general note on the state of existing boundaries and boundary pillars especially on the status of demarcation and/or need for fresh demarcation should be described. Locations of the boundary pillars should be shown on the map with latitude/longitude on village map or such other map of convenient scale.

**Table 2.3: Boundary Pillars Works in respect of Paonta Sahib Forest Division since previous Working Plan**

| Year of works | Working Range      | No. of Boundary Pillars constructed/repaired |
|---------------|--------------------|----------------------------------------------|
| 1999-2000     | Bhagani Range      | 258                                          |
| 2000-2001     | Paonta Sahib Range | 62                                           |
|               | Bhagani Range      | 54                                           |
| 2003-2004     | Bhagani Range      | 12                                           |
| 2007-2008     | Girinagar Range    | 37                                           |
| 2013-2014     | Majra Range        | 14                                           |
|               | Girinagar Range    | 12                                           |
|               | Paonta Sahib Range | 5                                            |
| 2014-2015     | Girinagar Range    | 20                                           |
| 2018-2019     | Bhagani Range      | 21                                           |
| 2019-2020     | Paonta Sahib Range | 575                                          |
| 2020-2021     | Girinagar Range    | 17                                           |
|               | Paonta Sahib Range | 1534                                         |
| 2021-2022     | Bhagani            | 25                                           |
|               |                    | <b>2646</b>                                  |

**2.4 Land use, land use change and forestry (LULUCF):** -There is a land use change since the last working plan due to diversion of forest land for non- forestry purpose under Forest Conservation Act, `1980 and Forest Rights Act,2006 and some encroachments on the forest land have been detected and recorded by Divisional Forest Officer. However, over the years, there is a perceptible change in the forest density classes due to tremendous increase in biotic and abiotic pressure. A total of 1026.2767 hectares of forest land has been diverted for non-forestry purpose under FCA since 1980 and 87.533 since 2012-13. Total Area diverted under Forest Rights Act, 2006 uptill 2021-22 is 37.1794 hectares. Details are available in **Appendix V**. Summary of land use change under FCA and FRA cases for the period 2012-13 to 2022-23 is shown below.

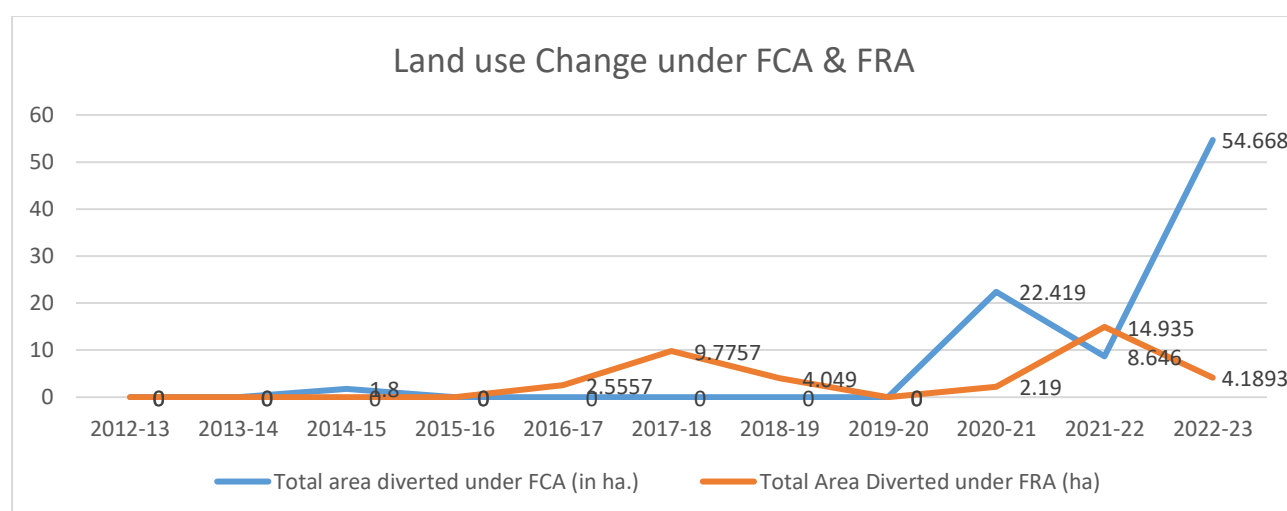


**Table 2.4: Abstract of Land Use Change under FCA w.e.f. 2012-13 to 2022-23**

| Year of sanction | Total cases approved under FCA | Total area diverted (in ha.) |
|------------------|--------------------------------|------------------------------|
| 2012-13          | 0                              | 0                            |
| 2013-14          | 0                              | 0                            |
| 2014-15          | 1                              | 1.80                         |
| 2015-16          | 0                              | 0                            |
| 2016-17          | 0                              | 0                            |
| 2017-18          | 0                              | 0                            |
| 2018-19          | 0                              | 0                            |
| 2019-20          | 0                              | 0                            |
| 2020-21          | 1                              | 22.419                       |
| 2021-22          | 2                              | 8.646                        |
| 2022-23          | 1                              | 54.668                       |
| <b>Total</b>     | <b>5</b>                       | <b>87.533</b>                |

**Table 2.5: Abstract of Land Use Change under F.R.A., 2006 w.e.f. 2016-17 to 2022-23**

| <b>Year of sanction</b> | <b>Total cases approved under FRA</b> | <b>Total Area Diverted (ha)</b> |
|-------------------------|---------------------------------------|---------------------------------|
| <b>2016-17</b>          | 6                                     | 2.5557                          |
| <b>2017-18</b>          | 22                                    | 9.7757                          |
| <b>2018-19</b>          | 6                                     | 4.049                           |
| <b>2019-20</b>          | 0                                     | 0                               |
| <b>2020-21</b>          | 3                                     | 2.19                            |
| <b>2021-22</b>          | 33                                    | 14.935                          |
| <b>2022-23</b>          | 16                                    | 4.1893                          |
| <b>Total</b>            | <b>86</b>                             | <b>37.6947</b>                  |

Land use change due to encroachment has also occurred in the Division, the details of all of which have been updated on MOFEES portal of HP Forest Department. The summary of cases is as follows (It is to be noted in Hon'ble High Court HP Orders, the areas have been evicted in 6 no. cases after retaining 5 bigha i.e. 2.4 ha).

**Table 2.6: Summary of Encroachment cases**

| <b>Total no. of cases with Forest Department</b> | <b>Total Area</b> | <b>Actually Evicted</b> | <b>Yet to be evicted</b> | <b>Under Trial</b> |
|--------------------------------------------------|-------------------|-------------------------|--------------------------|--------------------|
|                                                  |                   | Cases                   | Area                     | Cases              |
| 188                                              | 37.44 hac.        | 133                     | 32.485 hac.              | 30                 |

## **2.5 Threats to the forest**

The Forest in Paonta Sahib Forest Division are prone to the following threats: -

### **a) Forest fires**

Forest fires are dangerous for both, the Forest and wildlife. During the dry and hot season fire breaks in forest blocks where bhabar and other grasses, dry leaves and twigs of lantana and other weeds are abundant. The problem of forest fire becomes grave when pre-monsoon showers are either delayed or absent. Fire prevention is undertaken by clearance of fire lines on the ridges and control burning during winter. Travelers, nomadic graziers, villagers may carelessly throw unextinguished cigarettes, bidis or match sticks in forest areas and when the wind picks up these small sparks build into forest fires. The villagers also set fire to their agricultural fields after harvest which some time spread to the adjoining forest area. In some cases, miscreants may set the forests on fire in order to settle scores with the forest department or its staff. Forest fires may also be started in order to hide the stumps of illicit felling. The

local people set fire to the forest before rainy season in order to get good growth of grass for their cattle in the monsoon. Whenever fire breaks out in the forest it is controlled by traditional way of fire beating and counter-fires, it is felt that maximum public awareness may be created regarding the detrimental effects of forest fire and its consequential environmental losses. Training of field staff and others engaged in fire prevention and control in modern forest fire techniques with improved tools is required. Maintenance of the fire lines is of utmost importance besides creation of new fire lines in one vulnerable area, clearing of all possible routes inspection path, compartment boundaries before the fire season may be especially helpful in prevention of spreading of fire. Joint Forest Management Committees may also be given necessary inputs regarding fire control. In the fire season involvement of JFM committees is also vital in this respect to forge security for the forests.

With the onset of summers, fires are quite common in the region. They are accidental as well as deliberate, as the fires occur, burning of areas lead to a clean flush of grass, but of inferior quality leading to devastating infernos. However, in most of the cases, results are extremely dangerous. There is a tremendous loss to both flora and fauna. The following table shows the areas burnt from 2013-14 onwards:

| <b>Table 2.7 FIRE INCIDENCES IN DIVISION FOR THE LAST 10 YEARS</b> |             |                          |                                |                                       |                         |
|--------------------------------------------------------------------|-------------|--------------------------|--------------------------------|---------------------------------------|-------------------------|
| <b>Sr. No</b>                                                      | <b>Year</b> | <b>Total No of cases</b> | <b>Total Area burnt in ha.</b> | <b>Percentage of Total area burnt</b> | <b>Total loss (Rs.)</b> |
| 1.                                                                 | 2013-14     | 2                        | 9.5                            | 0.03                                  | 10000                   |
| 2.                                                                 | 2014-15     | 2                        | 21                             | 0.07                                  | 18500                   |
| 3.                                                                 | 2015-16     | 13                       | 71                             | 0.24                                  | 383750                  |
| 4.                                                                 | 2016-17     | 51                       | 407                            | 1.41                                  | 238000                  |
| 5.                                                                 | 2017-18     | 11                       | 81.5                           | 0.28                                  | 350600                  |
| 6.                                                                 | 2018-19     | 46                       | 308                            | 1.06                                  | 289000                  |
| 7.                                                                 | 2019-20     | 18                       | 10                             | 0.03                                  | 635885                  |
| 8.                                                                 | 2020-21     | 2                        | 22                             | 0.07                                  | 10200                   |
| 9.                                                                 | 2021-22     | 23                       | 166                            | 0.57                                  | 469080                  |
| 10.                                                                | 2022-23     | 36                       | 207.8                          | 0.72                                  | 249300                  |



**(b) Area damaged by natural calamities:** No such data recorded however the following factors are responsible for damage to forest crop.

### **1. Drought**

Absence of rains, scanty rainfall, less number of rainy days etc. result in drought like conditions in these forests which some time persist for long periods. As the soil being well drained and having low capacity to retain moisture some spells of drought or late arrival of monsoon affects the growth of young plants badly. The regeneration as well as growth of flora are retarded due to inadequate moisture. Erratic rainfall also affects the growth of plants. Prolonged drought also results in heavy mortality of seedlings and due to heavy accumulation of litter on ground floor risk of fire is considerably enhanced.

### **2. Frost**

Pool frost is common in this area from December to January. The survival of Frost tender species in young plantations are affected by frost to a great extent. The survival of young plantation is also affected severely by frost and many casualties are seen in some recent plantations. Frost tender species covered with locally available grasses help to protect them against frost. \*Severe frost is not common in this tract. However mild frost does occur purely in winter. Young Sal crop is damaged to a great extent by frost as its frost tender.

### **3. Soil erosion**

Bank and slip erosion is very common in the Forest of Paonta Sahib Forest Division due to its typical geological formation. This type of erosion is particularly common in Paonta Sahib and Girinagar Ranges. Sheet erosion is common in many forests especially near habitations, where it is a result of over grazing. The beds of nallahs has been raised due to deposition of stones and pebbles brought down from upper slope. The geological formation of Shiwaliks is loose, unstable and prone to soil erosion. The denuded Shiwalik hill sides, with sub soil exposed, is an example of destruction and loss of top soil. Heavy landslides and soil erosion occur during rains. The silt and boulder carried by the hill torrents not only scour the bed and deepen it, but also cut, and widen the banks.

### **(c) Grazing, lopping and cutting**

The problem of grazing lopping and cutting is very common in the forests of division. Overgrazing has deteriorated the soil condition by compaction and rendering it unsuitable for proper growth and regeneration of forest, it also promotes soil erosion illicit grazing and cutting of bamboos especially in the rainy season does a great harm, stray cattle grazing during the

rainy season being an impending problem causes irreparable damage to the crop, illicit cutting of raw and immature trees for fencing, basket making and other purposes also cause damage to the crop.

There are rules and regulation stipulating freezing the numbers of the animals that are to be allowed to graze in a particular area, but practically but it is very difficult to control the menace. All the forests dealt in this plan are Reserve forests and grazing restriction are in vogue in them. But in reality, unabated grazing is going unchecked and uncontrolled. This has adversely affected the regeneration of forests both natural and artificial.

The graziers include Gujjars, Gadis and local inhabitants. The Gujjars and Gadis are issued grazing permit in their respective “Paros”. But this restriction is hardly focused. Staff need to remain vigilant and they should have dialogue with on the stake holders on a regular basis. Chronic offenders should be lopped under the law.

Lopping of miscellaneous trees is allowed with some restrictions. These restrictions areas under:

- (i) Top 1/3rd crown of a tree will be left intact.
- (ii) No branch over 3 cm. in dia will be cut out in lopping.
- (iii) Heavy cutting instruments, like axe will not be used.
- (iv) No tree below 20 cm d.b.h shall be lopped. However; these restrictions are not been followed in practice. Trees are badly lopped for fodder. Sometimes leading shoot is also lopped. This leads to several ill effects. Fungus attacks and stuntedness are a few consequences of this. Restriction number (i) listed above is seldom followed. This leads to a stunted, malformed and unhealthy crop. This practice must be checked by the field staff. The species which are badly looped include Sal. Sain, Khair and Chhal etc.

#### **d) Illicit felling**

Unauthorized felling by local people for private use as well as a commercial use, have increased many folds in the last decade. With the increasing demand of timber and Khair wood, availability of markets their of adjoining areas, illicit felling and smuggling of timber/khair wood has become a routine feature. There have been instances of organised illicit felling and smuggling. The field staff will have to be extremely cautious and vigilant to check this menace.

#### **(e) Storms**

Mild case of storms in the tract during March, April, September and October. They cause severing of the crowns and branches of trees. However, sometimes Chil and few other species are also uprooted by such storms. Generally, storms of severe nature are very rare in the area.

#### **(f) Parasites**

Parasites feed on the sap of the host, weaken the tree, prevents its growth and development and gradually cause its death. Banda (*Loranthus* species) is the most common parasites found in Sal forests.

**(g) Fungi** Sal trees with developed heartwood are susceptible attack by the heart rotting fungi Polyporus Species. The sporus of this fungus enter through the wounds. In the crop of coppice origin, it spreads from the stumps into the poles. The fungi cause the rot in the trees locally termed as “Goj”. The rot is more common in the forest which are overgrazed, lopped or burnt annually. The mature and over-mature trees are invariably affected by this rot. This not only reduces the quality of timber but also useful volume of a tree.

Khair is lopped heavily for fodder, throughout the tract. Heavy lopping makes the tree susceptible to attack by a heart rot fungi. It is very difficult to find a sound of Khair tree as a most all the Khair trees are invariably affected by this heart rot.

#### **(h) Climbers**

The common climbers found in this tract include Maljan (*Bauhinia vahlii*), Gauj (*Milletia auriculata*), Vallaris sheynei, Pueraria tuberosa, Panibel (*Vitis latifolia*) and Roel (*Combretum decandrum*). It is said to note that no climber cutting is done in the forest, as apart of silvicultural operation. The result, the climbers koel around the trunks or fasten the crowns of tree which lead to strangulation, bending, forking and stuntedness in the crop. Regular climber cutting should be done to keep the forests healthy.

#### **(i) Wild Animals**

The damage caused by the wild animals is not uncommon. Wild boars, porcupine and monkeys do cause some damage to the crop, especially the young crop and regeneration by nibbling and digging. Of late, the threat of crop damage by elephants raiding from Uttarakhand borders have increased as well.

#### **(j) Insect Pests**

(i) During 1948 Sal heart borer (*Hoplocerambyx spinicornis*) attacked in epidemic form good quality Sal areas of the division. This beetle breeds in the slash and felling refuse and is the most important insect pest of Sal trees. In the recent past and currently no appreciable damage by the Sal heart wood borer has been noticed. Now-a-days the fallen debris is removed as Fuelwood and the better hygienic conditions are probably responsible for reducing the damage.

(ii) Occasionally swarm of locusts may these localities and attack the foliage of the trees and cause considerable damage.

(iii) Ordinarily a sporadic attack of geometrid leaf defoliator-*Ascotis selenaris* takes place every year. This affects the growth of individual trees but there is never a large-scale damage.

(iv) Leaf hoppers and scale insects (*Monophiebus stebbingii*) also attack the young shoots of Sal and other species during March and April and retard their growth. During the attack of the scale insect, the floor gets covered with a shining sticky substance exuded by the insect.

(v) Termites are the greatest enemies of the vegetation. These attack the young plants in the plantations during post-monsoon days in September and also during spring when the moisture regime is favorable for their spread. They also attack the dead bark of the trees and at times penetrate to the live bark and thus retard the growth of the trees. The termites damage the coppiced stumps also.

#### **(k) Infestation by invasive weed species in forests**

The forests have been invaded by invasive weed species like *Lantana*, *Parthenium*, *Ageratum*, *Ardisia solanacea* etc. which has caused negative impact on native biodiversity causing economical loss and harming human health. *Lantana* has done maximum invasion for which extensive survey for determining the extent of invasion with categorization up to 25% invasion, 25 to 50%, 50 to 75% and more than 75% categories has been defined and survey reports have been posted in Compartment History files.

#### **(l) Non-Working of forests**

In the past non-working of forest has caused immense damage to the crop due to congestion and stagnation of new growth. Regular thinning and silviculture operations like seeding and final felling as per working plan is of utmost importance to keep forest healthy and growing. However, experimental silviculture felling done in 2018-20 in the Division over app. 284 ha has yielded encouraging results and is key to justifying the need for proper silviculture practices in the Division.

#### **(m) Climate Change: Impact**

Forests in Himachal Pradesh are an important ecological and natural resource and have been aptly termed as "Green Pearl" in the Himalayas. About 26% of the State's geographical area is the repository of 3,295 species out of which 95% are endemic to the state and 5% (150) species are exotic, most of the people in rural areas in the State depend directly or indirectly on forests for their livelihood and use significant quantity of forest goods and services like non-wood forest products, ecotourism, fodder, timber etc.

The immediate repercussions of climate change on the forests are visible over recent years in the form of extreme weather events, erratic seasonal shifts, torrential floods leading to bank erosion and species loss. Studies are required to be conducted in this regard for working out ecological solutions for stock-taking and halting losses.

### **2.6 Distribution of different forest types**

The base year status of forest types along with GIS map may be referenced for any further change/shift. The forest of the tract is mainly tropical and subtropical with a small portion having temperate vegetation Sal is the chief economic species Chilis limited to Dharti Dhar area of Girinagar and Paonta Sahib Range. The tract is the only area in the state which supports of moist deciduous and semi deciduous type. Pure Sal Forest are found in a belt on the Northern side of the main Shivalik ridge and on the southern side of the outer Himalayan range. The controlling factor viz soil, aspect, altitude, topography, soil mixture, biotic factors play an important role in the composition of the crop. However, pure Sal is gradually being replaced by dry mixed deciduous species and scrubs on hot dry and poor localities. In riverine areas, Shisham and Khair are coming up while on the clay soils Chhal, Sain etc. are the main species. Edaphic factors have local influence in pockets. According to classification of Champion and Seth, forests covered by this plan fall under the following types and subtypes:

**Table 2.8: Forest Types of Paonta Sahib Division**

|                                           |                                                   |
|-------------------------------------------|---------------------------------------------------|
| <b>Group 3</b>                            | <b>Moist Deciduous Forests</b>                    |
| Sub-group 3C                              | North Indian Tropical Moist Deciduous Forests     |
| Type 3C/C <sub>2</sub>                    | Moist Sal bearing forests                         |
| Sub-type 3C/C <sub>2a</sub>               | Moist ShiwalikSal                                 |
| Sub-type 3C/C <sub>2b</sub>               | Moist <i>bhabar</i> Sal                           |
| Variety 3C/C <sub>2b(i)</sub>             | Moist <i>bhabar-dun</i> Sal                       |
| <b>Group 5</b>                            | <b>Dry Deciduous Forests</b>                      |
| Sub-group 5B                              | Northern Tropical dry Deciduous Forests           |
| Sub-type 5B/C <sub>1a</sub>               | Dry Shiwalik Sal Forests                          |
| Type 5B/C <sub>2</sub>                    | Northern dry mixed Deciduous Forests.             |
| Sub-type 5B/DS <sub>1</sub>               | Dry Deciduous scrub                               |
| Sub-type 5B/1S <sub>2</sub>               | Khair -Sissoo Forests                             |
| <b>Group 9</b>                            | <b>Sub-Tropical Pine Forest</b>                   |
| Type 9/C <sub>1</sub>                     | Himalayan Sub Tropical Pine Forests               |
| Subtype 9/C <sub>1a</sub>                 | Lower Himalyan or ShiwalikChil Pine Forests       |
| Subtype 9/C <sub>1b</sub>                 | Upper or Himalayan Chil Pine Forests              |
| Subtype 9/C <sub>1</sub> /DS <sub>1</sub> | Himalayan Sub Tropical Scrub                      |
| <b>Group 12</b>                           | <b>Himalayan Moist Temperate Forests</b>          |
| Type 12/C <sub>1</sub>                    | Lower Western Himalayan Temperate Forests         |
| Subtype 12/C <sub>1a</sub>                | Lower Western Himalayan Temperate Ban Oak Forests |

As already mentioned, the forests of this tract are mainly tropical moist deciduous forest. Natural regeneration of Sal, Shisham and Sain is lacking, the main reason for this is heavy biotic pressure on the forest due to excessive grazing, lopping etc. Natural regeneration has become extremely difficult and rare most in most of the forests existing in this tract and growing in tension zone and do not really carry the characteristics which tally exactly with those given by the Champion and Seth, therefore one forest may appear in more than one type.

### **Group 3 Tropical Moist Deciduous Forests**

#### **(I) Sub-Group 3C Northern Tropical Moist Deciduous Forests**

##### **(a) Sub Type 3C/C<sub>2a</sub>- Moist Shivalik Sal**

This type of forest has Sal as a single gregarious species. Sal is generally more aggressive than its associates because of its natural gregarious habit, good coppicing power, resistance to fire, regeneration potential under burning and grazing, adaptability of Sal to site conditions and its longevity. Though it is prone to frost it survives where few other species could not Sal comes up nicely on clayey and Sandy soils avoiding the two extremes. Sal consists of 90% of the crop the other associates in the top storey are Sain and Chhal. Under-storey is either missing or is very sparse and consists mostly of suppressed Sal, Amaltas, Rohini, Jamun, Sandan, Amla etc. The bushy growth consists of Rohini, Ghandhela, Dhai Colebrookia, Flemingia species. The common climbers are Malijhan, Gaj, Penibal, Dioscorea etc. The quality of the Sal crop is generally III. Although Sal is considered as a climax species in this type of forest but because of the biotic interference the conditions in most of the areas have become drier. Good Sal crop, in pole stage is seen in patches, however, the natural regeneration is deficient. Moderately sloping areas with good soil cover away from habitation having little human interference are having good natural regeneration of Sal and Sain, for example RF Ganyoni. Natural regeneration of other species is generally absent in these forests.

**Distribution:** This type of vegetation is found in suitable locations in the following forests:

##### **Girinagar range: -**

Khararu, Ganyoni, Gullarwala, Dunga, Jalmusa & Janglot

##### **Majra range: -**

Garhi, Garhi-Banswali, Sudanwala, Naurangabad, Pipliwali, Bherewala, Jamnawali, Tokion, Sainwala, Paniwali, Sukhmelion, Badhi-ghati, Kiarda, Bansewali Katapathar, Surajpur, Mahadev-ka-Khala, Ghutanpur Kothewali, Mastali, Ambwali.

## **(b) Subtype 3C / C<sub>2b</sub>(1) Moist Bhabbar-Dun-Sal**

These are the best quality Sal forests of the tract found in the Majra, Paonta Sahib and Bhagani Ranges. In Dun, Sal is the main species with 80 to 90% proportion of the main crop. Site quality of Sal is II/III to III. Other associates of the Sal in the top canopy are *Terminalia* species (Sain and Behera) Jhingan, Kaem, Chiroli and occasional trees of Bargad. Understorey is not prominent. The trees found in the under storey are Rohini, Sandan, Kumbhi, Chandan, Jaman etc. Suppressed Sal also forms a part of the under storey. There is dense shrub growth of Rohini, Gurbheli, Gandhala. Since the ground is covered either by Sal or by the evergreen bushes, grasses are almost absent. Climbers are also not very common. However, Malijhan, Gaj and Panibes, sometimes do lot of damage to the trees. However, the damage by climber is not very prominent in the areas protected from human interference of grazing, lopping etc, there is a reasonable regeneration of Sal. However, as these areas fall in the fertile Doon Valley the main agriculture area, there is a lot of pressure of grazing and unregulated tree felling in these forests.

### **Distribution;**

**Bhagani Range:** - Khojar, Meruwala, Danda-Amboya, Kandhela, Dhandla

**Paonta Sahib Range:** -Garibnath, Mantaruwala, Rajban, Gorakhpur, Jammu-Khala, Jamotwa, Jamniwala, Kukron, Khara, Lai, Mankundion, Jhara.

**Giri Nagar Range:** Beas, Chandpur, Parduni, Mehrar, Majri

## **(II) Group 5 Tropical Dry Deciduous Forests**

### **Sub type 5 B Northern Tropical Dry Deciduous Forests**

#### **(a) 5B/C<sub>1(a)</sub> Dry Siwalik Sal: -**

Sal is again the main species in this type. The quality of Sal is poor and is mostly IV. The proportion of Sal varies from 40 to 80% The other associates are Sain, Chhal, Jhingan, Chiroli, Khair, Bauhinia species and Sal. Chir Pine is also found occasionally. This type of forest is found on the exposed southern slopes of the Shivalik ridge and is exposed to severe hot winds and dry spells. The slopes are fairly steep. Soil is shallow sandy with clay pockets and devoid of humus, the soil also has boulders and pebbles on bed of the sandstones. Sal itself is a middle-sized tree in this zone and as such the middle storey is not at all prominent. Undergrowth consists of Karonda, Chhanchra, Rada, Dhari, Bida etc. Grasses are Bhabbar and Sarala. Climbers found are Malijhan, Gaj, Dioscorea species etc. Climbers do lot of damage to the tree crop and festoons the trees resulting in stuntedness in trees and sometimes leading to death of

trees. The regeneration of the main gregarious species like Sal is deficient. As a result, other species like Chhal, Sal etc. are increasing in proportion.

**Distribution: This type is found in following forests: -**

**Bhagani Range** Khodri –Majri

**Giri Nagar Range** Malgi, Khararu, Ganyoni, Gullarwala, Dunga Jalmusa, Janglot, Barthal

**Majra:** KataPather, Surajpur, Mahadev-Ka –Khala, Ghuttanpur, Kothewali, Mastali, Ambwali,

**(b) Type 5B/C<sub>2</sub> Northern dry mixed deciduous forest: -**

This type of forest is found on steep Shivalik reaches areas close to the plains. Rainfall is low. Vegetation cover is also poor, soil is shallow with loose boulders or beds of clay and sandstones. The main tree species found in this type are Sain, Chhal, Khair, Chiroli, Tendu, Sal, Jhingan, Dhak and occasional trees of Chil and Sal. The small trees found in the understorey are Amaltas, Chamror, Rohini, Bel, Amla, Chila, Mandher. Bushes growth consists of Chilli, Bamboo, Kandai, Dhai, Basutti, Kuri, Kura, Bida. Common grasses found are Bhabbar and Sarala etc. Climbers found in the area are Malijhan, Gaj etc. There is a heavy pressure of grazing and lopping. Consequently, the regeneration of various species is poor. *Anogeissus* comes up nicely in burnt areas and forms substantial proportion of the crop. Khair and Sain also come naturally if protected from grazing, browsing, lopping and fire. Fires are quite frequent in this region. They are deliberate as well as natural and causes a lot of damage to vegetation, specially regeneration.

**Distribution: -This type is found in following Forests: -**

**Bhagani Range:** - Badhana

**Giri Nagar Range:** - Kando-Bharog, Beas, Chandpur, Parduni, Mehrar, Majri and Ganyoni.

**Paonta Sahib Range:** - Chhacheti, Sarah, Malgi, Gorakhpur, Kukron, Khara, Lai, Jhara

**Majra Range:** - Kiarda, Gharatwali, Sunkron.

**(c) Sub Type /1S<sub>2</sub> Khair-Sissoo Forest: -**

This type of forest is restricted to new formations in the river beds or high banks. Soil is shallow, sandy, with gravels having good drainage. Khair and Shisham forms more or less a pure crop with other scattered associates like simbal (*Bombax Ceiba*), Gutel, Papri (*Holoptelea integrifolia*). Natural re-generation of Khair and Shisham comes up in abundance if the area is closed to grazing and protected from fires. Shrub by growth consists of Rohini, Gandhala, Basuti, Jhau and Lantana. Herbs found are Cassia tora, Bhaga etc. Common grasses are Kahi, Bhabbar and Dab.



**Distribution of this type is found in following Forests:**

|                           |              |
|---------------------------|--------------|
| <b>Bhagani Range</b>      | Giri, Yamuna |
| <b>Paonta Sahib Range</b> | Rampurbeli   |
| <b>Majra Range</b>        | Kaunchbeli   |

**Group 9 Sub-Tropical Pine Forest**

**Type 9/C<sub>1</sub> Himalayan Sub- Tropical Pine Forest**

Two types of Chil pine forests i.e., Shiwalik Chil pine and Himalayan Chil pine occur in the tract. In these forests Chil pine is the main crop with understorey consisting of other broad-leaved deciduous species such as Sain, Chhal, Jhingan, Amaltas, Khair, Ban and Buras. Sometimes stunted Sal in patches are also found. The bushy growth consists of Kandai, Kainth, Tung, Kangoo, Gandela etc. Grasses found are *Crysopogon* spp, *Cymbopogon* spp. and *Dicanthium annualatum* etc. Climbers are not many and one may come across occasionally Maljhan, Jungli gulab species etc.

**Distribution**

**Giri Nagar Range** Kando-Bhaila, Kando- Bharog, Samon-Kanon, Barthal, Kanser

**Paonta Sahib Range** Chhacheti

**Type 9/C<sub>1</sub>/DS<sub>1</sub> Himalayan Sub- Tropical Scrub Forest:**

This type of forest is found in the Kamraoo- Bharlidhar area, having altitude between 600 to 1000 meters and having exposed ridges, poor soil and lime-stone as the parent rock and bears only scrub forests. Slopes are fairly steep. Exposed rock, soil and biotic factors like grazing, lopping are the inhibiting factors for the growth of tree species. The scrub occupying the area are Kandai, Mehandu, Tung, Thor etc. Chil, Khair etc can come up in these areas if effective protection and closure can be provided.

**Distribution**

**This Type is found in following Forest**

**Bhagani Range:** Rajpur, Salatha

**Group 12 Himalayan Moist Temperate Forest**

**Type (12/C<sub>1a</sub>) Ban Oak Forest**

This type of forest is found over elevations between 1000 meters to 2000 meters on Kamraoo- Bharli Dhar. Ban Oak is the main species in these forests. The associates are Kainth, Kaphal, Parag and phoebe species. Ban oak is subjected to heavy lopping for fodder. In general the forests are of poor quality. Some Deodar has been introduced in this zone forest during the last 60 to 70 years. However, the success is not very encouraging with stunted growth. Soil is

shallow except in patches where it is fairly deep. It is sandy to clayey- loam. The under lying rocks are sandstone, quartzite or limestone.

### Distribution

This type is found in the Kandhela forest of Bhagani Range.

### Abstract of area under each type of forests:

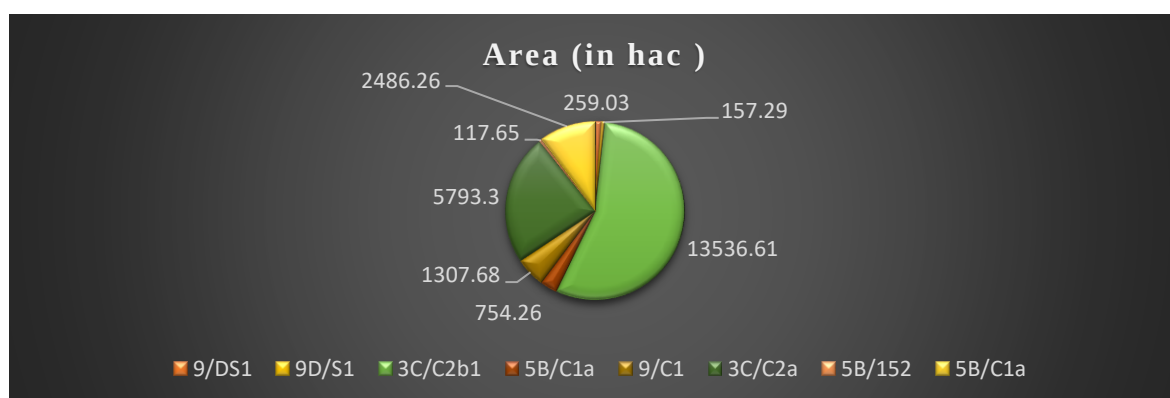
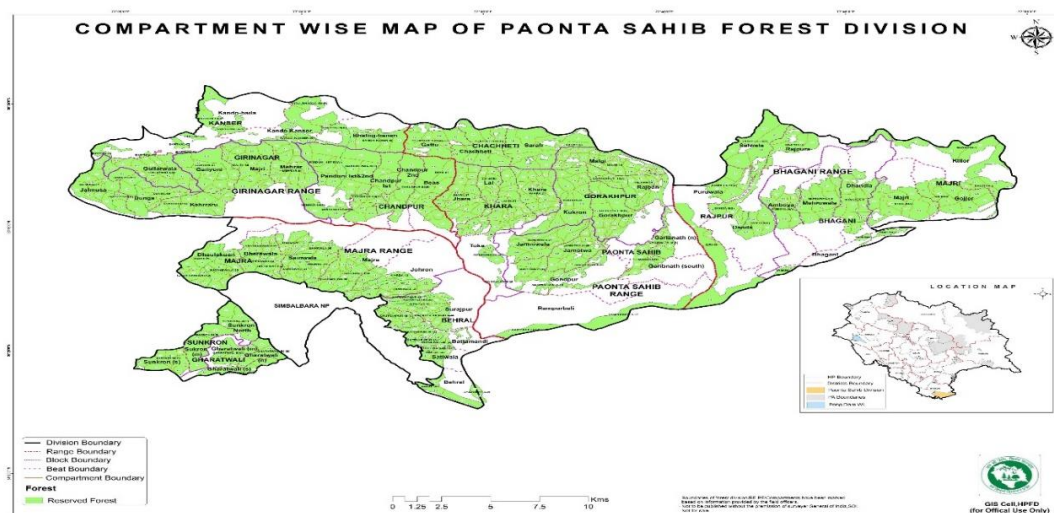


**Table 2.9: Forest Types of Paonta Sahib Division by Area**

| Type                | Area (in hac) |
|---------------------|---------------|
| 9/DS <sub>1</sub>   | 259.03        |
| 9D/S <sub>1</sub>   | 157.29        |
| 3C/C <sub>2b1</sub> | 13536.61      |
| 5B/C <sub>1a</sub>  | 754.26        |
| 9/C <sub>1</sub>    | 1307.68       |
| 3C/C <sub>2a</sub>  | 5793.3        |
| 5B/1 <sub>s2</sub>  | 117.65        |
| 5B/C <sub>1a</sub>  | 2486.26       |

**Map No. 2.9**



## **CHAPTER-3**

### **MAINTENANCE, CONSERVATION AND ENHANCEMENT OF BIODIVERSITY**

#### **3.1 FOREST COMPOSITION AND DISTRIBUTION: -**

The forests of the tract are mainly tropical and sub-tropical with a small portion having temperate vegetation. Sal is the most economically important species. Chil is limited to Dharti Dhar areas of Giri Nagar and Paonta Sahib Ranges. The tract is the only area in the State which supports extensive forests of moist deciduous and semi deciduous type. Pure Sal forests are found in a belt on the Northern side of the main Shiwalik ridge and on the Southern side of the outer Himalayan range. The controlling factors, viz soil, aspect, altitude, topography, soil, mixtures, biotic, factors play an important role in the composition of the crop. However pure Sal is gradually being replaced by dry mixed deciduous species on hot, dry and poor localities, riverine areas bear Shisham and Khair and on the clayey soils, Chhal, Sain etc are the main species. Edaphic factors have local influence in pockets.

As already mentioned the forests of this tract are mainly tropical moist deciduous forest. It can be generally said that natural regeneration is not adequate for Sal, Khair, Shisham, Sain. The main reasons for this include heavy biotic pressure on the forest, due to excessive grazing, lopping etc. as well as ban on green felling and silvicultural operations. Most of the forests existing in this tract are growing in tension zone and do not really carry the characteristics which tally exactly with those given by Champion and Seth. Therefore, one forest may appear in more than one type.

#### **3.2 PLANT SPECIES DIVERSITY**

Species diversity is the most commonly used representation of ecological diversity. Species diversity is defined as the number of species and abundance of each species live in a certain location. Ecosystems with higher species diversity are generally more stable and resistant to disasters than those with fewer species because substantial number of species consists of different traits that are resilient to ecological changes and can also contribute to various ecosystem functions. Therefore, it is prudent to look at some of the parameters depicting the picture of plant species diversity of the various working circles.

Regarding the calculation of various parameters for assessing the plant species diversity in the Division, the technique of Survey and Assessment of Forest Resource using Grid and Quadrants method (Sample Plots) has been adopted. The data collected during enumeration

such as the number of individuals of each species and the d.b.h of each tree were utilized to derive secondary attributes like basal area, density, frequency, IVI and Shannon-Weiner indices.

### Importance Value Index

Importance value index (IVI) which is a measure of how dominant a species is in a given forest ecosystem has been calculated as under.

$$\text{IVI} = \text{Relative frequency} + \text{Relative basal area} + \text{Relative density}$$

Frequency is a measure of abundance of a species present in a mixed community.

Frequency is calculated as number of plots where species is observed divided by total number of survey plots. Relative frequency is calculated by dividing the frequency of a species by the sum of all the species, multiplied by hundred.

Density is calculated as total number of individuals of a species divided by total number of plots. Relative density is calculated by dividing the density by the sum of densities of all species multiplied by hundred.

Dominance is calculated as the total basal area of a species in order to quantitatively measure different type of species in forest communities and measure dominance of species. Relative basal area is calculated as basal area of the species divided by basal area of all the species multiplied by hundred.

The frequency, density, basal area and IVI of most important trees and shrubs found in forests are given in Table 3.1.

**Table 3.1(a): Ecological parameters of Trees**

| Working Circle | Species    | Relative Density | Relative Frequency | Relative Abundance | IVI    |
|----------------|------------|------------------|--------------------|--------------------|--------|
| Sal            | Sal        | 68.01            | 29.32              | 78.16              | 175.49 |
|                | Chil       | 0.00             | 0.12               | 0.06               | 0.18   |
|                | Eucalyptus | 0.57             | 0.72               | 1.06               | 2.35   |
|                | Amaltas    | 1.19             | 4.29               | 0.46               | 5.94   |
|                | Chhal      | 1.03             | 2.86               | 0.96               | 4.85   |
|                | Jamun      | 4.31             | 7.63               | 2.31               | 14.25  |
|                | Jhingan    | 1.85             | 6.67               | 1.23               | 9.75   |
|                | Khair      | 1.11             | 2.38               | 0.42               | 3.92   |
|                | Rohini     | 9.32             | 13.35              | 2.46               | 25.13  |
|                | Sain       | 5.13             | 12.16              | 7.77               | 25.06  |
|                | Shisham    | 0.08             | 0.60               | 0.02               | 0.70   |
|                | Simbal     | 0.08             | 0.48               | 0.31               | 0.87   |
|                | Tendu      | 1.64             | 5.12               | 0.90               | 7.67   |
|                | Kokat*     | 5.67             | 14.30              | 3.88               | 23.85  |

Kokat list of species is added in Appendix XI.

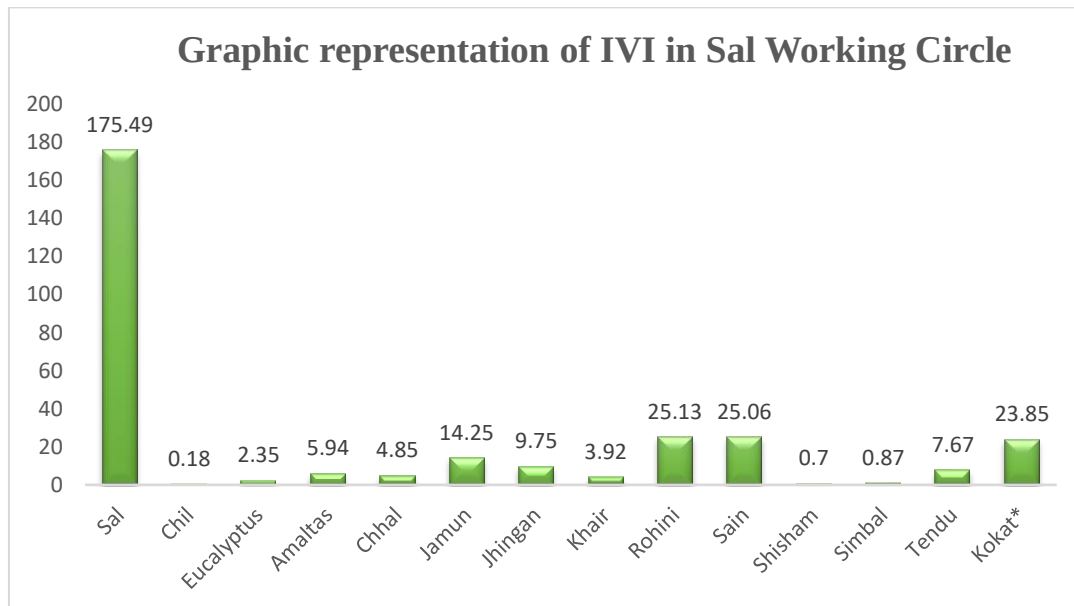


**Table 3.1(b): Ecological parameters of Trees**

| Working Circle | Species | Relative Density | Relative Frequency | Relative Basal Area | IVI    |
|----------------|---------|------------------|--------------------|---------------------|--------|
| Chil           | Chil    | 45.07            | 37.93              | 33.8                | 116.38 |
|                | Sal     | 32.32            | 27.58              | 33.43               | 93.33  |
|                | Kokat   | 20.99            | 31.03              | 19.30               | 71.32  |
|                | Sain    | 1.60             | 3.44               | 13.37               | 18.41  |

**Graphical representation of IVI in Chil Working Circle**

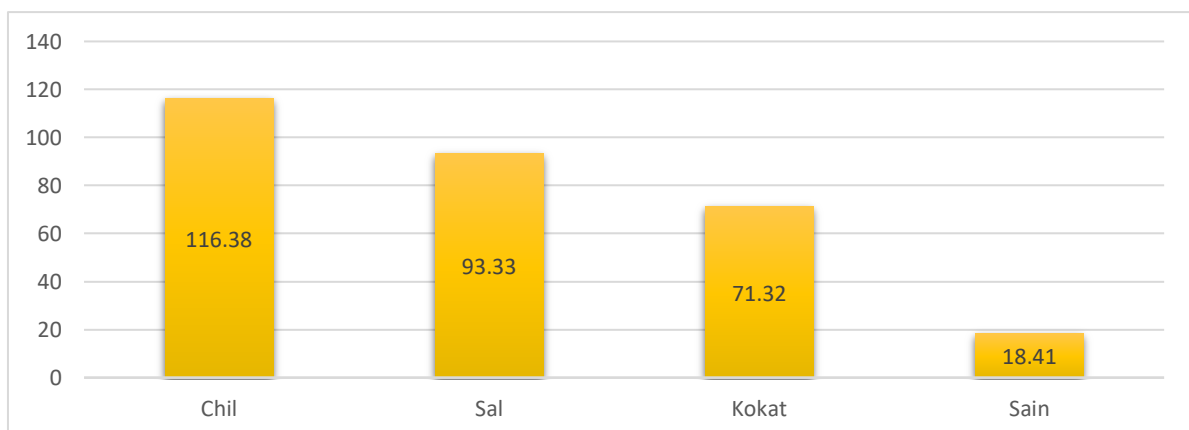


**Table 3.1(c): Ecological parameters of Trees**

| Working Circle | Species    | Relative Density | Relative Frequency | Relative Abundance | IVI   |
|----------------|------------|------------------|--------------------|--------------------|-------|
| PCR            | Amaltas    | 1.67             | 4.00               | 1.06               | 6.73  |
|                | Chhal      | 6.30             | 7.50               | 3.88               | 17.68 |
|                | Chil       | 5.20             | 3.00               | 3.82               | 12.02 |
|                | Eucalyptus | 0.76             | 1.00               | 1.13               | 2.89  |
|                | Jamun      | 1.57             | 4.50               | 1.44               | 7.51  |
|                | Jhingan    | 5.49             | 11.50              | 4.69               | 21.68 |
|                | Khair      | 5.20             | 6.75               | 2.75               | 14.70 |
|                | Rohini     | 10.07            | 8.25               | 3.07               | 21.39 |
|                | Sain       | 8.68             | 11.50              | 10.26              | 30.45 |
|                | Sal        | 31.40            | 16.00              | 42.24              | 89.64 |
|                | Shisham    | 1.57             | 1.75               | 1.00               | 4.33  |
|                | Simbal     | 0.43             | 1.75               | 1.00               | 3.18  |
|                | Tendu      | 2.53             | 5.75               | 1.38               | 9.66  |
|                | Kokath     | 19.80            | 16.75              | 22.28              | 58.83 |

**Graphic representation of IVI in PCR Working Circle**

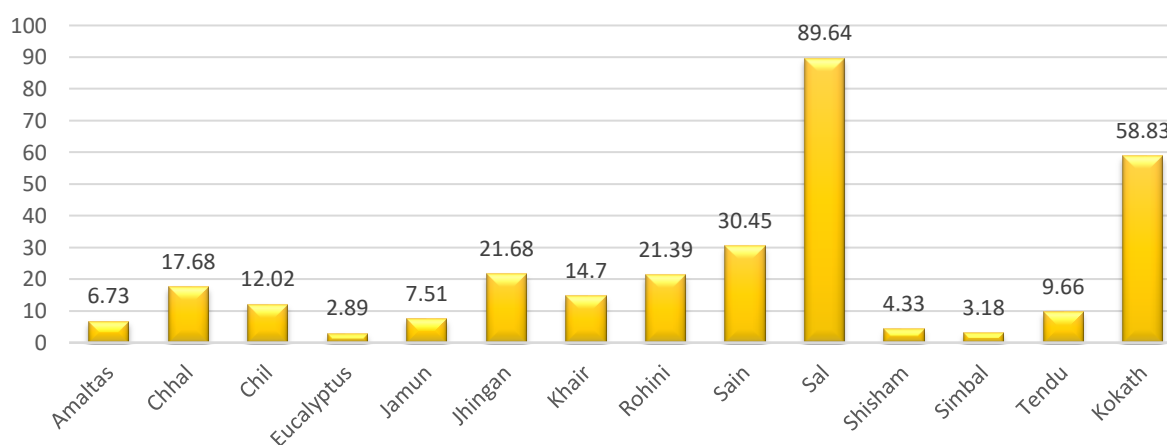


**Table 3.1(d): Ecological parameters of Trees**

| Management area | Species    | Relative Density | Relative Frequency | Relative Abundance | IVI    |
|-----------------|------------|------------------|--------------------|--------------------|--------|
| Eucalyptus      | Eucalyptus | 82.61            | 35.86              | 66.667             | 185.14 |
|                 | Sain       | 4.35             | 31.51              | 13.333             | 49.19  |
|                 | Sal        | 13.04            | 32.63              | 20.000             | 65.67  |

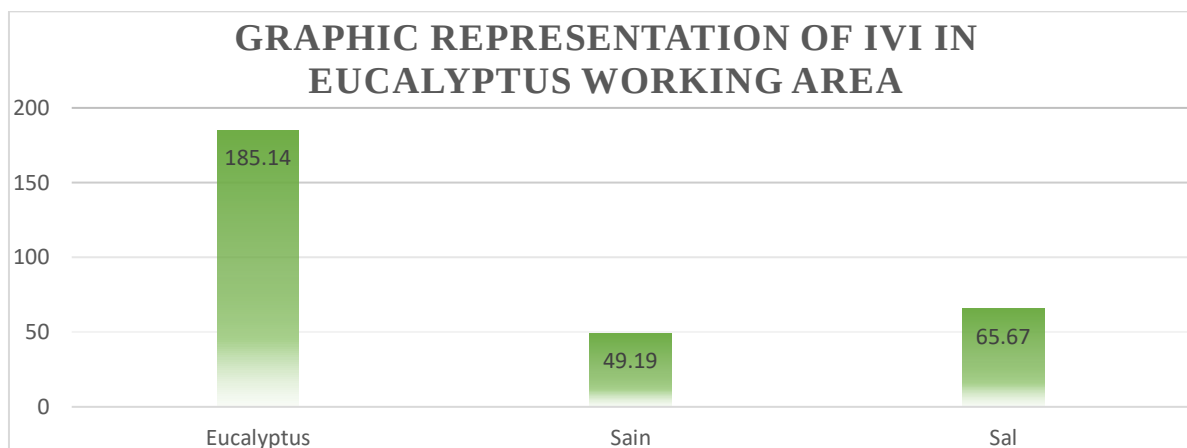
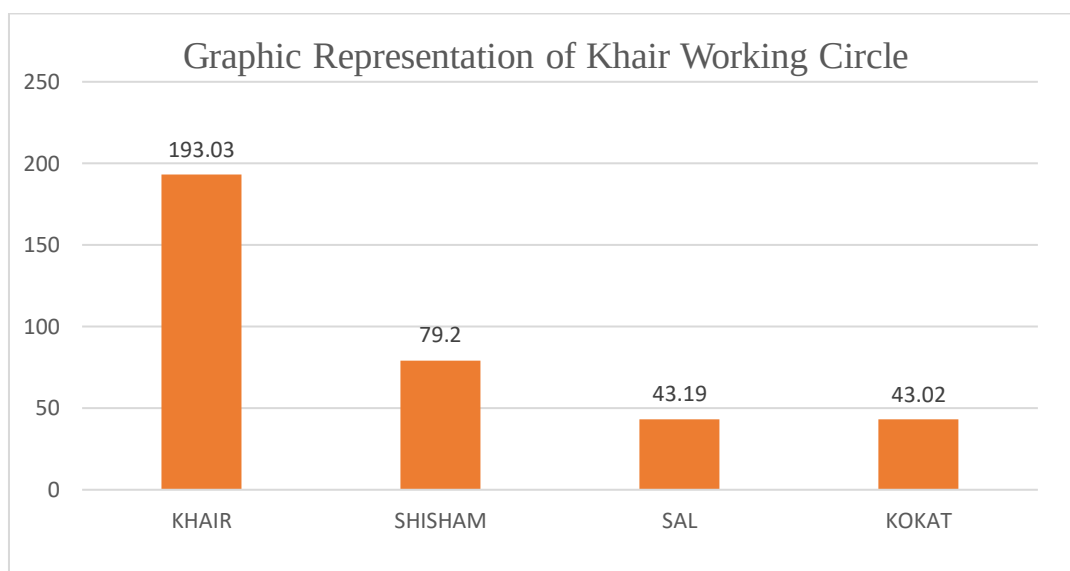


**Table 3.1(e): Ecological parameters of Trees**

| Working Circle | Species | Relative Density | Relative Frequency | Relative Basal Area | IVI           |
|----------------|---------|------------------|--------------------|---------------------|---------------|
| KHAIR (OL)     | Khair   | 85.75            | 38.46              | 68.81               | <b>193.03</b> |
|                | Shisham | 62.28            | 12.82              | 4.10                | <b>79.20</b>  |
|                | Sal     | 4.25             | 20.51              | 18.43               | <b>43.19</b>  |
|                | Kokat   | 6.16             | 28.21              | 8.65                | <b>43.02</b>  |



- The results show that in Sal Working Circle the relative frequency of Sal species is the highest, followed by Kokat species, Rohini and Sain. Sal has maximum density of 16.56 stems/100m<sup>2</sup> followed by Rohini (2.27), Kokat species (1.38) and Sain (1.25). The IVI of Sal is highest at 175.49, followed by Rohini (25.13) and Sain (25.06).
- In Chil Working Circle the frequency of Chil species is maximum followed by Sal, Kokat. Chil has maximum density of 7.69 stems/100m<sup>2</sup> followed by The IVI of Sal is 99.42 followed by Chil (85.77), BL species (47.42) and Jamun (35.47).

- In PCR Working Circle the frequency of Kokat species is maximum followed by Sal and followed by Sain and Jhingan with Rohini at fourth place. Sal has maximum density of 6.58 stems/100m<sup>2</sup> followed by Kokat (4.15). The IVI of Sal is 89.64 followed by Kokat (58.83) and Sain (30.45).
- In Khair (Overlapping) Working Circle, Khair (IVI **193.03**) is the most frequently occurring and dominant species, followed by Shisham (IVI: **79.20**), Sal (IVI **43.19**) and then Kokat species (IVI: **43.02**).
- In Eucalyptus Working Area the frequency of Eucalyptus, Sal and Sain is 100% with density of Eucalyptus as 19 stems /100 m<sup>2</sup>, Sal as 3 stems /100 m<sup>2</sup> and Sain as 1 stem /100m<sup>2</sup>. The IVI value of Eucalyptus is 185.14 followed by Sal 65.67 and Sain as 49.19.

### Shannon-Weiner Diversity Index

The Shannon-Weiner Species Diversity Index is calculated by taking the number of each species, the proportion each species is of the total number of individuals, and sums the proportion times the natural log of the proportion for each species.

$$H = \sum [(p_i) \times \ln(p_i)]$$

Where –

- $p_i$  = proportion of total sample represented by species  $i$ . Divide no. of individuals of species  $i$  by total number of samples.

The Index calculated for the various Working Circles is given as follows:

| Working Circle          | Shannon-Weiner Index |
|-------------------------|----------------------|
| Sal                     | 1.55                 |
| Chil                    | 1.64                 |
| PCR                     | 2.17                 |
| Khair (OL)              | 1.39                 |
| Eucalyptus Working area | 0.927                |

It can be seen that maximum diversity is seen in Protection-cum-Rehabilitation Working Circle, followed by Chil. The low value reported for Eucalyptus working area as well as Khair is in line with literature that man-made, uniformly-raised mono-culture plantations will have low SW Index. Also, forests with Climax communities have greater species diversity as evidenced in Sal & Chil Working circles.



**Table 3.2: Ecological parameters of Shrub species**

| Sr. No. | Species Name                     | Frequency | Density | Abundance | IVI     |
|---------|----------------------------------|-----------|---------|-----------|---------|
| 1       | <i>Adhatoda vasica</i>           | 0.7752    | 0.0078  | 1         | 2.7398  |
| 2       | <i>Achyranthes aspera</i>        | 2.3256    | 0.0233  | 1         | 3.9054  |
| 3       | <i>Asperagus racemosus</i>       | 0.7752    | 0.0078  | 1         | 2.7398  |
| 4       | <i>Berberis lyceum</i>           | 1.5504    | 0.0155  | 1         | 3.3226  |
| 5       | <i>Bidens Pilosa</i>             | 1.5504    | 0.0155  | 1         | 3.3226  |
| 6       | <i>Boehmeria virgata</i>         | 1.5504    | 0.0465  | 3         | 8.3483  |
| 7       | <i>Carissa spinarum</i>          | 54.2636   | 1.3256  | 2.4429    | 64.0363 |
| 8       | <i>Clematis vitalba</i>          | 5.4264    | 0.1705  | 3.1429    | 13.5277 |
| 9       | <i>Clerodendrum infortunatum</i> | 13.1783   | 0.4419  | 3.3529    | 24.2572 |
| 10      | <i>Clerodendrum viscosum</i>     | 3.8760    | 0.0388  | 1.0000    | 5.0710  |
| 11      | <i>Clerodendrum spp</i>          | 4.6512    | 0.1705  | 3.6667    | 14.2527 |
| 12      | <i>Colebrookea oppositifolia</i> | 2.3256    | 0.0853  | 3.6667    | 11.0808 |
| 13      | <i>Cucurbita spp</i>             | 4.6512    | 0.0465  | 1         | 5.6538  |
| 14      | <i>Flacourtia sapida</i>         | 6.2016    | 0.0620  | 1         | 6.8193  |
| 15      | <i>Flemengia semialata</i>       | 0.7752    | 0.0078  | 1         | 2.7398  |
| 16      | <i>Ichnocarpus frutescens</i>    | 3.1008    | 0.0930  | 3         | 10.2256 |
| 17      | <i>Ipomia</i>                    | 0.7752    | 0.0078  | 1         | 2.7398  |
| 18      | <i>Jatrophaa curcas</i>          | 0.7752    | 0.0078  | 1         | 2.7398  |
| 19      | <i>Lantana camara</i>            | 24.0310   | 0.3643  | 1.5161    | 24.1839 |
| 20      | <i>Mentha arvensis</i>           | 2.3256    | 0.0233  | 1         | 3.9054  |
| 21      | <i>Murraya koenigii</i>          | 43.4109   | 0.7829  | 1.8036    | 44.5339 |
| 22      | <i>Opuntia humifusa</i>          | 0.7752    | 0.0078  | 1         | 2.7398  |
| 23      | <i>Protium serratum</i>          | 1.5504    | 0.0155  | 1         | 3.3226  |
| 24      | <i>Urtica dioica</i>             | 0.7752    | 0.0078  | 1         | 2.7398  |
| 25      | <i>Woodfordia fruticosa</i>      | 10.0775   | 0.5814  | 5.7692    | 31.0525 |

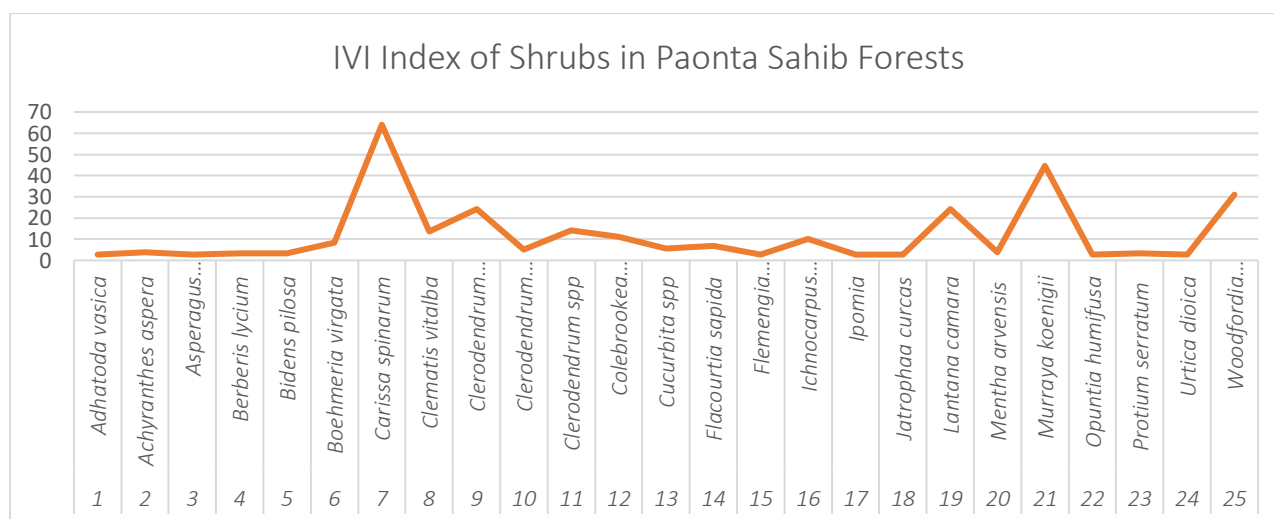


**Figure no. 3.2**

**Medicinal Plants:** Some of the important medicinal plants, encountered are *Adhatoda vesica*, *Aegle marmelos*, *Azadirachta indica*, *Bacopa monnieri*, *Cordia dichotoma*, *Terminalia*

*chebula*, *Terminalia bellirica*, *Moringa oleifera*, *Emblica officinalis*, *Acacia catechu* and *Tinospora cordifolia*, *Holarrhena antidysenterica*. *Berberis lyceum*, *Vitex negundo*, *Asparagus racemosus*.

**Economically Important Species:** There are many species that are considered important for food, fuel, fodder, fiber, timber, medicinal value, oil, gums and others. On these parameters many economically important species present in these forests are: *Acacia catechu*, *Dendrocalamus strictus*, *Moringa oleifera*, *Holoptelia integrifolia*, *Aegle marmelos*, *Emblica officinalis*, *Achryranthes aspera*, *Adhatoda vesica*, and *Azadiachta indica*.

### 3.3 STATUS OF BIODIVERSITY CONSERVATION IN FORESTS

The state has prepared the strategy and action plan for conservation of biodiversity under the scheme “Himachal Pradesh State Biodiversity Strategy and Action Plan” in 2020. The strategies include augmentation of forest resources by making efforts to restore original ecosystem, promotion of indigenous tree species, declaring climax communities as closed forest areas, improving canopy density in the existing forests, promotion of natural regeneration, growing of medicinal plants through inter departmental consultations and introduction of dwindling species. The strategic action plan also lays emphasis on involvement of local communities, especially women, in protection of forests making them important components of forest management, also linking forestry with livelihood issues and conducting economic evaluation of biological resources conserved by communities.

### 3.4 FAUNA AND THEIR HABITS

**General:** - The Siwaliks and the Sub-Himalayan hill zone with the streams and river forming this tract are ideally suitable for a variety of wild birds, wild animals and fishes, Wild life was in great abundance when the human populations was not such a multitude in the area, with the increase in population, their interference with the natural surroundings of wild birds and animals, wild life population receded to the more sheltered and protected woods and water. Even in such places the poachers have killed a substantial number of wild birds and wild animals. At one time herds of Cheetal and Sambar deer were found in grassy blanks of Majra range and Simbalwara Wild Life Sanctuary, now notified as Colonel Sherjung National Park. Now one may be lucky to spot such an animal even in this National Park.

The value and importance of wild life from scientific aesthetic, economic and recreational stand points is immense and is recognized all over the world. All forms of wild life including vermins play a very important role in keeping a balance of wild life populations.

Though with the increased human activity in the forests more particularly the poaching, the population of wild animals is very much reduced nevertheless, a few are seen in sheltered places, important species of wild animals is briefly described as under:-

**Sambar (*Cervus unicolor*):-** This largest deer also occasionally met with in the Sal forest of this division. It is possible to spot this animal in Simbalwara area, though the stag are located outside also. This deer has more nocturnal habit and it retreats into heavy forest cover at dawn. It feeds on grass, leaves and wild fruits. Its coat is coarse and brown in colour with yellowish tinge. Its height at shoulder may be upto 140 cm and may weigh upto 300 kg. It is capable of moving very silently in even the dense forest. Mating takes place in winter months.

**Kakar Muntjac/Barking deer (*Muntiacus muntjak*):-** This is a small deer mostly found in thickly wooded areas and coming out for grazing in open grassy blanks. It feeds on grass, leaves and wild fruits. When heard from a distance its call sounds like a bark of dog. The unbranched antlers are small and measure 5 to 8 cm. The coat is bright chestnut which darkens in the aged animals. Its height at shoulder is 50 to 75 cm and a full-grown animal may weight about 29 kg. It is believed to breed all the year round. In this area it is found in all the wooded and grassy areas.

**Goral (*Nemorhaedus goral*):** - This goat antelope is found on rugged grassy and rocky hill sides covered with tree growth, in all the range of this division. It has goat-like build, teeth short, cylindrical horns and a short tail. Usually, it is blackish grey in color. On rocky mountainous area this animal may be seen in mornings and evenings. It is about 60-70 cm at the shoulders and weighs from 25 to 30 kgs. The ringed or ridged horns which curve slightly backwards are 10-12 cm long.

**Jungli Suar/ wild boar (*Sus scrofa*):-** This omnivorous wild animal lives in grassy, bushy and also thickly wooded areas. It feeds on field crops, wild roots and tubers, and even insects and snakes. It usually feeds during mornings and evenings. It is black in color, the skin is covered by a sparse growth of bristles which form a conspicuous mane, wild boar is a prolific animal and gives at least two litters, one in the beginning of rains and the second after the rains. A well grown male is about 80 to 90 cm at the shoulder and may weigh up to 200kg.

**Indian Porcupine (*Hytrix indica*):** - This destructive rodent is found in all areas of this Division. It adapts itself to any type of land but favours rocky hill sides where it lives in burrows dug by itself. The burrows consist of an entrance gallery and a few bolt holes or emergency exists. The burrows or galleries some times are 15-18 meters in length. The porcupines are characterized by the spines borne on the neck, back and hind quarters. The porcupines feed on field crops, fruits roots and tubers. They are very much destructive to field

crops and gardens when adequate food is not available in the forests. The young ones are born usually in springs.

**Indian Hare (*Lepus ruficaudams*):**- This rufous tailed hare is found all over the area. It likes bushy forest growth and generally lives in the neighborhood of cultivations and villages. Early wheat and other crops in the field are badly nibbled by this animal. It is in general, nocturnal in habit. It weighs from 1.5 to 2.5 kg and has a rufous brown coat mixed with black hair on back face. It is believed to give young ones- one to two in number, in early winter months.

**Tendua/ Leopard (*Panthera pardus*):**- This animals lives in forest areas or even in open country among rocks. It can prey during the day if it is unable to catch anything by night. It can prey on anything ranging from cattle, sheep, goat, pet, dogs, deer, monkeys and even rodents like porcupines. It is more dangerous to man and his cattle than tiger. It seizes its prey from a hiding or leaps on it from a tree on which it climbs easily. It has bright fulvous or buff coat with closely set rosettes. Average total length varies from 215 cm to about 245 cm, the females are smaller than the males. While the full-grown male may weigh from 50 to 68 kg, the females weigh 40 to 50 kg. Panthers breed all the year round and probably one litter of 2 to 4 is given every year.

**Sher/ Tiger (*Panthera tigris*):** - About six decades ago when the area had dense forests, it is said that quite a large number of tigers were found in these Sal forests. Large number of them have been killed in the past. The forest cover has gone thin now and even the Colonel Sherjung National Park (Simbalwara) area is thronged by large number of human beings. The presence of tiger is reported inside the National Park, which has been substantiated by camera trap images in February 2023. Tiger requires plenty of forest cover and shade for sleeping, water for drinking and large wild animal for preying on. It is a rich colored and striped animal and measures from 275 to 290 cm in length and 180 to 230 kg. in weight. The females are smaller than the males.

**Kala Bhalu, Himalayan Black Bear (*Ursus thibetanus*):** - In Trans-Giri area, the black bear descends down during winters and even in rains when it becomes a nuisance to the maize fields and fruits crop. This animal lives almost in solitary condition, is nocturnal in habit and spends the day sleeping in a rock cave or hollow of a tree. It mostly feeds on wild fruits, honey and bees and honey insects etc. Fruits orchards and corn fields are frequently raided by it. It is a compact built, typical black in color with a “V” shaped white mark on its breast, a typical character of this animals.

**Asiatic Elephant (*Elephas maximus*)** The mega-herbivore is found in the adjoining areas of this region. The Asian Elephants are active during twilight hours and are known for their huge

consumption (about 150 kg per day) of plant matter. They feed on at least 112 different species of plants such as legumes, palm and true grass. During the dry season tree barks also form a major part of their diet. The Asian elephant consumes at least 80 – 200 liters of water a day, hence they are never far from a ready water source. In the recent past, elephant movement from the neighboring state of Uttarakhand's Rajaji National Park has been on the rise, leading to human-wildlife conflicts, even though occasional movement has been existing since 1990s.

### **Birds**

**Jangli Murga/The Red Jungle Fowl (*Gallus gallus*):**- This bird is believed to be the ancestor of all domestic breeds of fowls. It is found in pairs of parties in the Sal forests and scrub jungles of this Division. It is spotted on the fringes of cultivations and forests clearings in the morning and evening. It is a very shy and cunning bird. Scuttles into cover on slightest disturbance or suspicion. It roosts on thick crowned trees or bamboo clumps, feeds on grains, vegetable shoots, insects etc. Nesting season is generally from March to May. The hens are plain streaked brown with rufous brown under parts.

**Teeter/ Black Partridge (*Francolinus francolinus*):**- A small bird, about half the size of a village hen, generally black and spotted with white. The hens are paler and speckled black and white. It is found on grassy blanks and cultivated land of sugarcane fields. On the mornings and evenings it feeds on grains, grass seeds, white ants and other insects. It is a swiftly running bird relying upon its legs to escape, lives singly or in pairs. Nesting season is April to July.

**Bater/The common or Grey Quail (*Coturnix coturnix*):**- It is almost a tailless partridge like bird. It is buffish-brown in color with pale reddish brown and black streaks. It is found in pairs or parties in grass lands and cultivations and hides very well in grass and bushes. It files straight for short distance. Their population swells during winter when they migrate from central and western Asia to this region. It feeds on grains, grass seeds. Nesting season is from March to May. Rain quail (*Coturnix coromandelica*) which migrate locally is also found in this region.

**Lowwa/ Jungle bush quail (*Perdicula asiatica*):** - It is of the size of a rain quail with fulvous brown, mottled black and buff feathers above and white below. In females the lower parts are pale-pinkish. It is found in open deciduous forests and dry scrub jungle area. It lives in colony of 5 to 20 which rest together and rise suddenly when almost trodden. It feeds on, grass seeds, tender shoots, and grains. Nesting season is well not defined, it ranges from August to April.

**Kabutar/Blue Rock Pigeon (*Columba livia*):** It is the common grey bird with glistening green purple and magenta sheen on the neck and breast. It is found in open and rocky cliffs. It also lives in a semi domesticated condition and favours old buildings and rock holes. It generally feeds on cereals, grasses, pulses etc. Nesting season is not well defined.

**Ghugi/ Dove (*Streptopelia* species):** This common dove is found in pairs or small parties in open places and cultivated fields. It approaches houses and even verandahs if not scared. Its flight is straight and swift. Its nesting season is also not well defined.

Besides these the Indian National Bird, Peacock (*Pavo cristatus*) is also found in this area. Other birds of occurrence in the Division include house and jungle crows (*Corvus* species), Tree pies (*Dendrocitta* species), the Jungle Babbler (*Turdoides* species), the Bulbul (*Pycnonotus* species), the Magpie-Robin (*Copsychus* species), Golden Oriole (*Oriolus* species), The Common Myna (*Acridotheres* species), the common Baya (*Ploceus* species), Red Rumped Swallow (*Cecropis* species), Parakeets (*Psittiaciformes* species), the Common Kingfisher (*Alcedo* species), Vultures (*Gyps* species), Eagles (*Aquila* species) etc. which are equally important from aesthetic , forest cleanliness and health, bird watching and balance of nature point of views.

## **FISH**

Fresh water fishes are found in Bata, Giri, Tons and Yamuna rivers. The species found in these waters include Mahseer (*Tor* species), Rohu (*Labeo* species), Lachi (*Wallago* species) and in Yamuna river sometimes Goonch (*Bagarius* species) is also found.

### **3.5 THREATS AND CHALLENGES RELATED TO WILDLIFE**

- Habitat fragmentation pertaining to transit of elephants into Paonta Sahib Forest Division area from neighbouring states also leading to crop-depredation
- Human-wildlife conflicts and loss of livestock in context of leopards and black bears
- Monkey-menace in township areas due to change in food-behavior habits and garbage dumping nearby
- Snakes occasionally come in conflict in habitation areas primarily during monsoon period
- Electrocution and threat to wildlife including elephants, monkeys have been reported in the Division due to naked-wires

**3.6 PROTECTION AND MANAGEMENT OF FAUNA** Various measures have been initiated in the Division. A broad view of the same have been summarized here. However, a more detailed discussion regarding future course of action is discussed in Chapter 12 of Part II of this Working Plan.

- Monkey sterilization measures fulfilling annual targets in order to curb the monkey population.

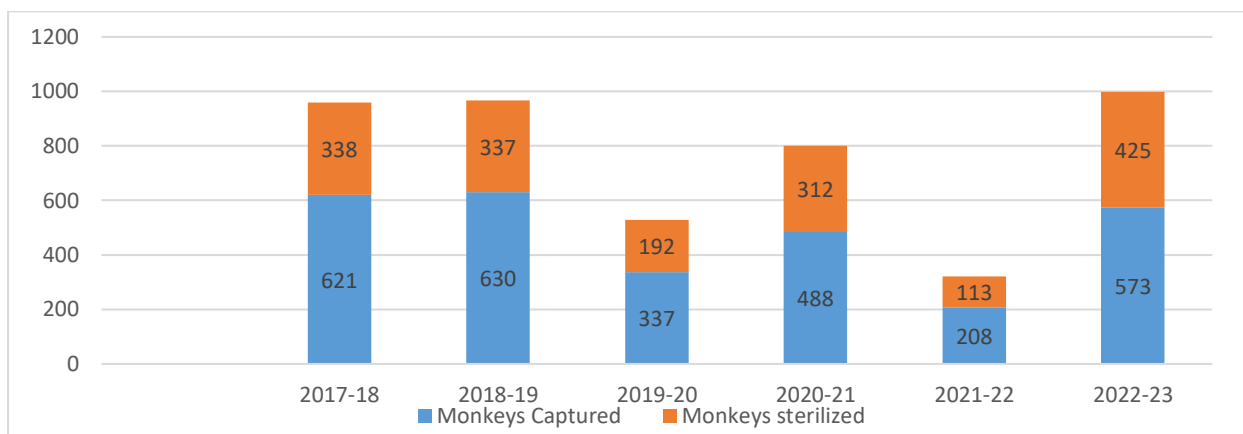


**Table 3.3: Monkey Sterilization Data**

| Year    | Monkeys Captured | Monkey Sterilization |            |       |
|---------|------------------|----------------------|------------|-------|
|         |                  | M (Male)             | F (Female) | Total |
| 2017-18 | 621              | 198                  | 140        | 338   |
| 2018-19 | 630              | 216                  | 121        | 337   |
| 2019-20 | 337              | 103                  | 89         | 192   |
| 2020-21 | 488              | 163                  | 149        | 312   |
| 2021-22 | 208              | 69                   | 44         | 113   |
| 2022-23 | 573              | 236                  | 189        | 425   |

(Out of the total monkeys captured, only those monkeys were non-sterilized due to reasons including captured monkeys being either pregnant, young in age and some were already sterilized before.)

- Trap Cages installation and capturing of wild animals including monkeys and leopards
- Awareness campaigns and pamphlet distribution regarding elephant behavior and Dos and Don'ts
- Census of monkeys, ungulates have been carried out in the past and survey for black bear and leopards are ongoing
- Rescue and rehabilitation of animals found in distress or through complaints by locals
- Snakes-handling training provided to field staff
- Elephant Anti-Depredation teams formed timely for smooth passage of elephants in transit

## CHAPTER 4

### MAINTENANCE AND ENHANCEMENT OF FOREST HEALTH AND VITALITY

#### 4.1 STATUS OF REGENERATION

Due to adverse effects of biotic interference, grazing and non-working of forests due to ban on fellings, the natural regeneration in the forests of Paonta Sahib Forest Division forests is varying from below satisfactory level with high biotic pressures to promising in enclosed areas and interior forests of Sal. Forests cannot be worked with the prescriptions of the working plan due to moratorium on green felling, thus there was no scientific management of the forests. The green cover remained intact but the regeneration in the forest got neglected as felling and pace of regeneration are directly related to each other. In order to supplement the natural regeneration, plantations of indigenous species like Sal, Khair, Shisam, Bamboos, Jamun, Amaltas, Toon etc. has been undertaken and fast-growing species like *Eucalyptus*, *Tectona grandis*, etc have also been planted with various degrees of success. The conditions which affects regeneration of species can be enumerated as follows:

1. Condition of grass and other competing weed growth – The competing weed growth may be grass alone, a mixture of grass and shrubs or shrubs alone have a great influence on the establishment of regeneration. *Lantana camara*, *Clerodendron infortunatum* and *Ardesia solanacea* are harmful for Sal regeneration. However, *Flemengia chappar* indicate favorable conditions for the natural regeneration of Sal.
2. Grazing and browsing- Control of grazing by strictly following closures should be ensured as it otherwise completely destroys regeneration.
3. Composition of the crop - The composition of the crop affects soil conditions and therefore affects the establishment. A mixed crop is believed to create more favorable conditions for seedling establishment than pure crops.
4. Light - Light is a very important factor in seedling establishment but its requirement varies from species to species and even in the same species according to climatic conditions and age. All the major species of this division like, Sal, Khair, Shisham, Chil are predominantly light demanders.
5. Impact of good seed-year for the predominant species in forests also play a major role in regeneration results. For example, in the case of Sal, a good seed year occurs every 3-5 years.



### Observations and analysis for regeneration in Experimental Silviculture areas

The regeneration survey results of the experimental Silvicultural Felling Program (conducted in Paonta Sahib Range from 2018-19 to 2019-20) in the Sal forests in RF Kukron, RF Rajban and RF Lai of Paonta Sahib Forest range have been conducted since 2019 annually.

The compartments were found to have regeneration, albeit the same was in very early stage. A number of young saplings in two-leaved, four-leaved and six-leaved stage were seen. The data of regeneration survey undertaken in October of every year suggests that the regeneration score is following a slow but steady trend. It is seen that the regeneration percentage is more in the felled PB-1 area of Rajban than Kukron. In order to assist natural regeneration, fencing of the forests after silviculture fellings have been done and bush cutting of *Ardisia solanacea* in Sal forests is done on a yearly basis.

**Table 4.1: Regeneration Results of experimental silviculture felling**

| Forest (PB I areas)    | Regeneration Percentage |                 |                 |                 | October 2023-24 |
|------------------------|-------------------------|-----------------|-----------------|-----------------|-----------------|
|                        | October 2019-20         | October 2020-21 | October 2021-22 | October 2022-23 |                 |
| RF Kukron C14 (20 Ha)  | 17.6 %                  | 23.8 %          | 19.56 %         | 18.85%          | Ongoing         |
| RF Rajban C10 (7.5 Ha) | 20.9 %                  | 28.5 %          | 24.7 %          | 29.3%           | 31.75%          |

Also, as a comparative study, regeneration survey was also carried out in adjacent compartment of RF Rajban C10 (with regeneration 29.3% in Oct 2022-23). In RF Rajban C9 (PB-I area), where silviculture operations were not carried out, regeneration survey was done using the same methodology of Line plot. The regeneration status owing to denser canopy and no cultural operations leading to heavy weed infestation for RF Rajban C-9 was observed at only 13.71%. One can derive that the regeneration of Sal in silviculture areas has more than doubled, in line with expected results.

Due regard must be given to the phenomenon of dying back of Sal seedlings and the slow growth that the Sal saplings are known to have as a result of the dying back. The dying back phenomenon (as described by Troup in his seminal book ‘The Silviculture of Indian Trees’) involves dying of the stem and new shoots coming up in the following season. The new shoots may come from buds in the axils of the cotyledons or the axillary buds on the stem. Dying back with subsequent recovery takes place when the taproot has developed with sufficient vigour to withstand the adverse influences that may cause the death of the aerial portion of the root. The time-period between seedling to sapling stage (where the plants begin to produce

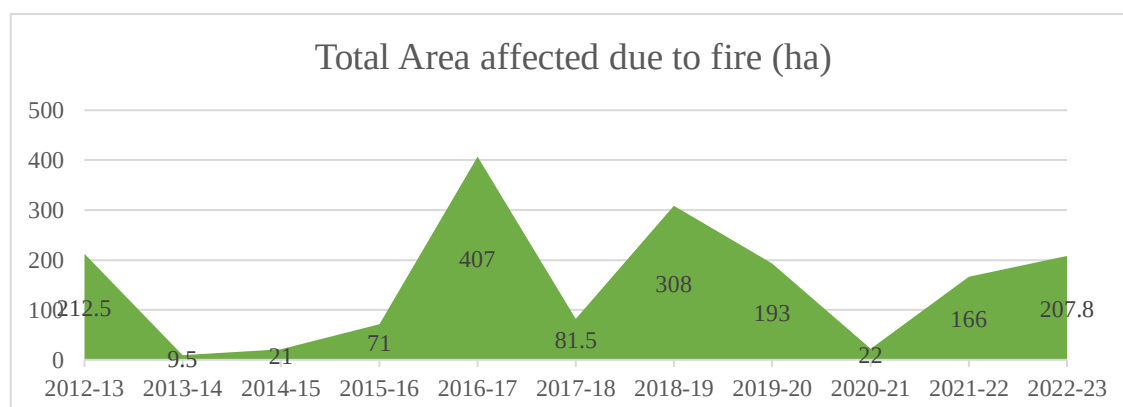
rough bark) in natural conditions is long and variable and has been described to take at least ten years or more in many cases in North-western India. With this time-frame in context, any deduction on the establishment of seedlings at present shall be far-fetched. The Working Plan of the division also recommends carrying out regeneration survey for at least 12 years post felling. On these lines, it can only be recommended that the regeneration surveys are repeated till the twelfth year after felling and the results be analysed continuously.

Reasons for deficient natural regeneration in Sal Forest under Experimental Silviculture Felling. The seeding felling has been undertaken in years 2018 and 2019, the same has not been followed up by further opening of canopy, something which is being observed to be genuinely required presently in the experimental silviculture plots. The primary reasons include dense canopy owing to no secondary felling operations, delay in bush cutting of *Ardisia* and weeding operations, the die-back phenomenon and slow growing rate in Sal as discussed, and the last good seed year for Sal was in 2019-20, typically 3-5 years for Sal.

## 4.2 AREA AFFECTED BY FOREST FIRES

In summers the temperature shoots up and humidity fall, there is a fire hazard build up in the starting with April till June. This period is the fire season of the area. All the forest fires in this division are due to anthropogenic causes. The temperature ranges from 35°C to 40°C but may rise to a maximum of 44°C and the rainfall is scanty in these months. The leaf fall of Sal begins from March lasts up to beginning of May which results in accumulation of leaf litter due to which the fire hazard gets multiplied. The summary of fire incidences in the division are given in Illustration 4.2.

**Illustration 4.2: Area affected by fire**



Methodology for forest fire damage assessment has been devised by the department. Fire assessment report is prepared by the concerned Range Officer in two stages i.e, immediate assessment after fire (Stage-I) and final assessment after rains (Stage-II). In case the fire damaged area is less than 5 ha then the area is inspected by D.F.O and if the area is more than 10 ha then the damaged area will be inspected by the C.F. The fire-incidences are reported online as well through Forest Management Information System.

There is no denial of the fact that besides causing economic loss, damage to biodiversity, soil, flora and fauna by forest fires is immense. Successive forest fires in an area can lead to retrogressive succession thereby replacing palatable species with non-palatable species.

**Table 4.3: Fire lines constructed in the past working plan period**

| Sr. No | Name of Fire Line         | GPS Location                     |                                  |
|--------|---------------------------|----------------------------------|----------------------------------|
|        |                           | Starting Point                   | Ending Point                     |
| 1      | Fire line Kanon to Kansar | 30°33'19 N<br>77°32'45" E        | 30°33'30 N<br>77°28'58" E        |
| 2      | Rajban to Jhara           | 30°30'57 N<br>77°37'50" E        | 30°31'07 N<br>77°33'37" E        |
| 3      | Simbalwara to Bedhara     | 30°42'86.94' N<br>77°56'12.71" E | 30°42'49.86' N<br>77°56'15.94" E |

#### **4.3 AREA DAMAGED BY NATURAL CALAMITIES**

Kiarda Dun valley also known as Paonta valley is one of the important physiographic features of this division, it is located in Markanda and Dharti ranges and is encompassed by two main rivers, Giri and Yamuna. River Yamuna separated it from Dehra Dun. River Giri divides the Sirmour District in Cis-Giri and Trans-Giri region and a major part of the valley falls in the Cis-Giri region and a small part lies in the Trans Giri region. Every year heavy monsoon rains cause torrential floods in this low-lying area which further leads to Bank erosion. Bank erosion occurs in two primary mechanisms, the direct removal of soil particles by flowing water is called fluvial erosion and Mass failure causes the bank to collapse. The riverine tract of the division containing Khair and Shisham forests is prone to bank erosion. When the roots of trees are undercut by such erosion, the trees get uprooted and swept away in the rivers.

#### **4.4 AREA PROTECTED FROM GRAZING:**

It may be mentioned that there is no pasture land in the villages and the animals are totally dependent on the forest areas for grazing. The graziers include Gujjars, Gaddis, and local

inhabitants (right-holders). Gujjars and Gaddis are issued grazing permits and there is restriction in increasing the number of cattle in grazing permits as per the Grazing Policy of Himachal Pradesh, 1989. However, the number of cattle grazing in the forests exceeds the number permitted by the department. P.B.I and P.B.IV areas of Sal Working Circle should not be permitted for grazing. The animals presently grazing in Forests of Paonta Sahib Forest Division are far above the carrying capacity of the forest area. A study conducted in 2018-19 reveals the same as depicted below, where the actual area required for grazing by the total cattle is far more than the actual area of the entire Division. Detailed discussion has been given in Chapter 10 of Part II of this Working Plan.

**Table 4.4 Carrying Capacity Study Results of Grazing Pressure Based on Live-Stock Population in Paonta Sahib**

| Total area of Paonta Sahib Forest Division | Closed area with plantation etc. | Area available for grazing | Name of cattles/ animals | No. of units | No. of animals | Total No. of units | Carrying capacity required for cattle @ 0.25 ha per unit grazing incidence (in ha.) | Actual area required for grazing (in ha.) |
|--------------------------------------------|----------------------------------|----------------------------|--------------------------|--------------|----------------|--------------------|-------------------------------------------------------------------------------------|-------------------------------------------|
| 28791.69 ha.                               | 3843.47 ha.                      | 24948.22 ha.               | Goat                     | 1.5          | 16707          | 25060.50           | 6265.125                                                                            | 41417.125                                 |
|                                            |                                  |                            | Sheep                    | 1            | 10722          | 10722              | 2680.50                                                                             |                                           |
|                                            |                                  |                            | Buff.                    | 6            | 10051          | 58182              | 14545.5                                                                             |                                           |
|                                            |                                  |                            | Ox/ Cow                  | 4            | 19904          | 71704              | 17926                                                                               |                                           |
|                                            |                                  |                            | <b>Total</b>             |              | <b>57384</b>   | <b>165668.50</b>   | <b>41417.125</b>                                                                    |                                           |

Due to incessant grazing and spread of lantana, the number of palatable grasses has reduced. The main grass species of this division are, *Chrysopogon fulvus*, *Chrysopogon montanus*, *Cymbopogon martini*, *Cynodon dactylon*, *Thamnocalamus falcata*, *Eulaliopsis binata*, *Imperata cylindrica*, *Arundo donax*, *Heteropogon contortus*, *Sacharum munja*, and *Sorghum halepense*.

#### 4.5 LOPPING PRACTICES

Sal, Sain, Rehni, Khair, Chhal, Amaltas and various species are lopped for fodder and fuelwood. The lopping is usually carried out in the winter season when grasses are weathering. The loppers do not have consideration for the age of the tree when found in forestland. Usually, trees are lopped up to top, leaving a few small growing branches at the top are spared. This heavy lopping leads to drying of trees in the season of severe cold and frost. Restrictions on lopping have been imposed like, one third of the crown of the tree will be left intact, no tree below 20 cm d.b.h. will be lopped and no branch over 3 cm dia will be cut in lopping. However, these restrictions are not followed in practice.

#### 4.6 AREA INFESTED BY INVASIVE WEED SPECIES IN FORESTS

*Lantana camara*, *Parthenium hysterophorus*, *Ageratum conyzoides*, *Eupatorium odoratum*, *Ardisia solanacea* and *Artimisia vulgaris* are the invasive weed species that infested large tracts of forest areas affecting biodiversity and regeneration adversely. The two main weed species however causing maximum damage to the forests and regeneration are *Lantana camara* and *Ardisia solanacea*.

*Lantana camara* is the most obnoxious weed of this area. The weed is considered to have been introduced from tropical Central America. Because of its wide adaptability, prolific seed-bearing capacity and its ability to propagate vegetatively as well, fast growth and a strong light demanding habit, has invaded the forests in a big way. Being an alien species, it has invaded areas so thickly that it has affected the species diversity, productivity of land and thereby changing the ecology of the area. It has also deleterious effects on the health of animals, particularly cows, when browsed accidentally. The areas infested by lantana neither favor palatable nor non-palatable species under its cover. Because of its fast growth, it overtakes the economically important species and negates the effort of afforestation as well. The areas infested with lantana are tabulated as under,

**Table 4.5: Areas infested with lantana**

| Detail of Lantana Infestation and treatment thereof |                                               |                                |
|-----------------------------------------------------|-----------------------------------------------|--------------------------------|
| Name of Range                                       | Infested area (as per report of 2015-16) (ha) | Treated area (ha) till 2021-22 |
| BHAGANI                                             | 2605                                          | 953.1                          |
| PAONTA SAHIB                                        | 2300                                          | 1081                           |
| MAJRA                                               | 1794                                          | 456                            |
| GIRINAGAR                                           | 1420                                          | 352                            |
| <b>Total</b>                                        | <b>8119</b>                                   | <b>2842.1</b>                  |

##### ***Ardisia solanacea***

It is extensively present as undergrowth in moist Sal forests. It is mostly an evergreen shrub but at some places it reaches a height of 6 meters. As far as the stratum of the forest is considered, it occupies the second layer which is above grasses and herbs. The widespread occurrence of *Ardisia* in Sal forests hampers the regeneration of Sal as it provides competition to the emerging Sal seedlings in terms of light and shade. Sal is a light demander but young seedlings require lateral shade for protection against frost. However, *Ardisia* growth inhibits total overhead light

to the Sal seedlings, thus negatively affecting the natural regeneration of Sal. This weed requires special attention due to its complex taproot system and effects on Sal regeneration.

#### **4.7 INCIDENCE OF PESTS AND DISEASES:**

Infestation of Sal forests by Sal Heartwood borer (*Hoplocerambyx spinicornis*) was last reported in late 1990's. after that no outbreak of the Sal Heartwood borer has been reported. Leaves of Shisham are defoliated by Shisham-defoliator (*Plecoptera reflexa*), but no major damage to Shisham trees have been reported by this defoliator. *Ganoderma lucidum* causes root rot mortality and *Fomes badius* causes heart rot in scattered Khair trees. Wilt in Shisham has been observed at some places caused by *Fusarium solani* causing the tree to turn leafless.

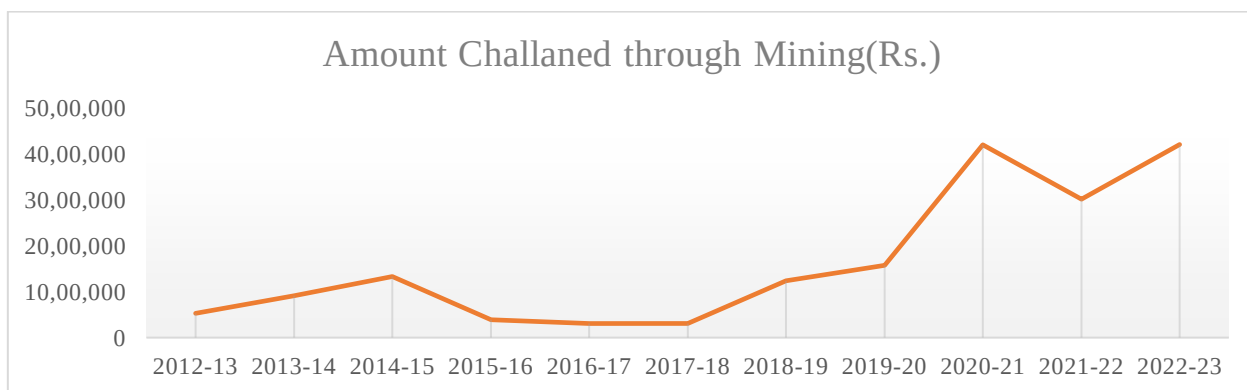
#### **4.8 FOREST DEGRADATION AND ITS DRIVERS:**

There are no two opinions that forests have degraded over the years. The degradation process has started long back with the permission to graze the animals in the forests even in the growing season. Later with the rise of population of both humans and animals, opening of forests for right holders for villages in the fringe of forests, and the increasing incidences of illicit removal, the crop degradation has obviously happened. Coupled with the non-working of forests, non-adherence to cleaning operations, the crop has deteriorated, owing to this the natural regeneration is dwindling in forest areas and they require to be enriched with planting of indigenous species. The main reasons for poor regeneration in forests are as under:

1. Invasion of weeds: Due to heavy invasion of weeds like *Lantana camara* & *Ardisia solanacea*, the regeneration has ceased to occur or highly reduced.
2. Biotic pressures of fringe villages: Biotic pressure due to grazing and illicit removal has damaged the crop and regeneration.
3. Encroachments: - Human habitation in Poanta Sahib Forest Division is scattered across the forest lands and due to increasing population there has been tremendous pressure on the land resources. Encroachments in forest areas are mainly done for agriculture and for domestic purposes. The forest area adjoining township are more prone to illegal construction e.g Gondpur beat, Jamotwa beat, Rampurbelli beat, Jamniwala beats of Paonta Sahib Forest Range.
4. Mining: - Illegal mining is a major menace near the river beds of Yamuna, Giri and Bata where sand and stone mining is a rampant issue. The stone crushers within the Division as well

as local communities are involved in illegal mining from the forest land. The boundaries of the permitted mining lease area should be permanently fixed in order to check illegal mining from the forest land. Mining by mechanical means is not permitted however, the regulations are not followed in practical due to unscientific mining the flow of the rivers gets changed which leads to floods and bank erosion.

**Illustration 4.6: Mining challan details since 2012-13 in the Division**



#### **4.9 POLLUTION CONTROL AND PROTECTION OF ENVIRONMENT: -**

The main Industrial area in Paonta Sahib is located in Gondpur near RF Jamotwa, RF Mantaruwala, RF Jammukhala of Paonta Sahib Range. Proper vigil needs to be kept by the concerned staff in regard to the discharge of liquid and solid waste by the industrial units in the adjoining forest land.

The Solid waste including garbage, refuse etc. obtained from the household of Paonta Sahib town was dumped by the Municipal Committee Paonta Sahib in the Forest land of Rampurbeli beat in Paonta Sahib. The department took stringent action against this practice of the town administration as it not only caused land pollution but also polluted the adjoining river Yamuna. Total fine imposed against the people involved in this illegal activity over the years has been Rs. **5,76,615/-**. Under the provisions of Indian Forest Act, 1927 details of Challan amount and quantum of waste are as under: -

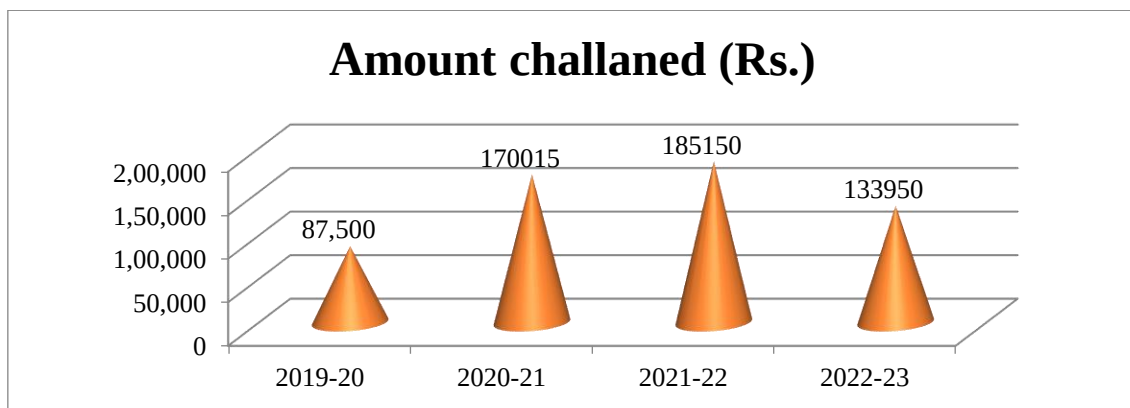


**Table 4.7: Quantum of waste on which action was taken**

| Sr. No. | Name of Division | Name of Year | Quantity in m <sup>3</sup> |
|---------|------------------|--------------|----------------------------|
| 1       | Paonta Sahib     | 2019-20      | 35 m <sup>3</sup>          |
| 2       |                  | 2020-21      | 38.65 m <sup>3</sup>       |
| 3       |                  | 2021-22      | 22.9 m <sup>3</sup>        |
| 4       |                  | 2022-23      | 28.13 m <sup>3</sup>       |
| Total   |                  |              | 126.18 m <sup>3</sup>      |

After a series of interventions by the department now the town administration has stopped illegal dumping at the site and it is now reclaimed by the department and being developed as Yamuna River Front under Nagar Van Yojana, NCAP, DMFT schemes.



## Chapter 5

### CONSERVATION AND MAINTENANCE OF SOIL AND WATER RESOURCES

The area of Paonta Sahib Forest Division is dominated by a good cover of sedimentary rocks of Shiwalik group in upper ridges and sediments transported by two major river system viz, Yamuna and Bata rivers in lower valley region. Primarily, three ranges of Paonta Sahib namely Girinagar, Paonta Sahib and Majra get mapped under Bata river watershed. The upper ridges of this watershed are mainly dominated by sandstone with alternate bands of shale or shale associated with some calcareous material. Lower valley and flat region of this area is mainly dominated by a good cover of transported clayey Silty soil and sandy soils of Doon group, where the settlement and agriculture land is situated. The Shiwalik hills being geologically younger, suffer from various forms of land degradation. The steep slopes and undulating terrain accelerate soil erosion during the monsoon season giving rise to ever deepening gullies and formation of torrents which further degrade productive lands and causes wide spread damage to infrastructure.

#### 5.1 AREA TREATED UNDER SOIL AND WATER CONSERVATION MEASURES:

Various Soil and water conservation measures have been adopted throughout this division such as Loose-boulder check dams, Crate Wire-Gabion structures, ponds, trenches, spurs and vegetative measures. The description of such works for the year 2022-23 is provided below.

**Table 5.1: Soil and moisture conservation works carried out in 2022-23**

| Sr. No. | Name of Beat | Name of RF   | Compartment | Type: Brush Wood Check dam/ Crate-wire structure/Trenches Water Pond/Dry stone check dam | Capacity in volume (m <sup>3</sup> )/ Rmt |
|---------|--------------|--------------|-------------|------------------------------------------------------------------------------------------|-------------------------------------------|
| 1       | Rajban       | RF Rajban    | C-6         | Dry stone check dam                                                                      | 38.576 m <sup>3</sup>                     |
| 2       | Rajban       | RF Rajban    | C-6         | Trenches                                                                                 | 21 Rmt                                    |
| 3       | Gorakhpur    | RF Gorakhpur | C-7         | Dry stone check dam                                                                      | 53.476 m <sup>3</sup>                     |
| 4       | Gorakhpur    | RF Gorakhpur | C-17        | Trenches                                                                                 | 14 Rmt                                    |

|    |             |             |        |                           |                       |
|----|-------------|-------------|--------|---------------------------|-----------------------|
| 5  | Kukron      | RF Kukron   | C-15   | Dry stone check dam       | 53.476 m <sup>3</sup> |
| 6  | Kukron      | RF Kukron   | C-15   | Trenches                  | 17 Rmt                |
| 7  | Toka        | RF Toka     | C-4    | Retaining Wall            | 30 mt                 |
| 8  | Jamotwa     | RF Jamotwa  | C-9    | Dry stone check dam       | 98.45 m <sup>3</sup>  |
| 9  | Sarah       | RF Sarah    | C-10   | Dry stone check dam       | 48.81m <sup>3</sup>   |
| 10 | Gattu       | RF Gattu    | C-4    | Dry stone check dam       | 50.07m <sup>3</sup>   |
| 11 | Gattu       | RF Gattu    | C-1    | Dry stone check dam       | 25.02m <sup>3</sup>   |
| 12 | Toka        | RF Lai      | C-27   | Water Pond                | 12.9 m <sup>3</sup>   |
| 13 | Gattu       | RF Gattu    | C-1    | Crate Wire Structure      | 28.66 m <sup>3</sup>  |
| 14 | Toka        | RF Lai      | C-24   | Dry stone check dam       | 36.50m <sup>3</sup>   |
| 15 | Toka        | RF Lai      | C-25   | Dry stone check dam       | 44.25 m <sup>3</sup>  |
| 16 | Toka        | RF Lai      | C-28   | Trenches                  | 184 Rmt               |
| 17 | Toka        | RF Lai      | C-28   | Trenches                  | 340 Rmt               |
| 18 | Toka        | RF Lai      | C-28   | Trenches                  | 340 Rmt               |
| 19 | Sarah       | RF Sarah    | C-4    | Trenches                  | 31.96 Rmt             |
| 20 | Jamotwa     | RF Jamotwa  | C-9    | Trenches                  | 40 Rmt                |
| 21 | Gattu       | RF Gattu    | C-4    | Trenches                  | 725 Rmt               |
| 22 | Parduni Ist | RF Parduni  | C10    | Dry stone check dam       | 115.54m <sup>3</sup>  |
| 23 | Puruwala    | R.F Kandela | C4, C5 | Dry stone check dam       | 17.65 m <sup>3</sup>  |
| 24 | Puruwala    | R.F Giri    | C1     | Crate wire check dam      | 128.70 m <sup>3</sup> |
| 25 | Killor      | R.F Salatha | C2     | Retaining Protection Wall | 98.42 m <sup>3</sup>  |
| 26 | Killor      | R.F Salatha | C3     | Crate Wire check dam      | 131.13 m <sup>3</sup> |
| 27 | Dhandhla    | RF Dhandhla | C9     | Crate Wire check dam      | 64.36 m <sup>3</sup>  |
| 28 | Killor      | R.F Bhadana | C4     | Dry Stone Check Dam       | 106.75 m <sup>3</sup> |

## DRY STONE CHECK DAM WORKS EXECUTED IN 2022



### Success Model of Project Jalodari

Project Jalodari was carried out in collaboration Himmothan society, an arm of Tata trust in Dhaulakuan beat of the Paonta Sahib Forest Division. Elaborate Consultative meetings apprising ground-water and forest degradation issues/ workshops on technical aspects were held among all stakeholders and a detailed project was devised and approved by Government of Himachal Pradesh.

The working model of the groundwater recharge project involved

- (i) Geological/technical expertise and funding of Himmothan
- (ii) Terrain knowhow and monitoring of forest department
- (iii) Labor and consequential employment of local villagers
- (iv) All the structures were made by participants of local Van Samiti who were provided wage labour.



- (v) The geographical location of all structures was inventorised.
- (vi) The protection walls and check-dams yielded instant results, the change in recharge and water-table owing to trenches and percolation ponds shall be measured in medium-term.



### **Rainwater percolation**

A combination of proper surveying, intensive treatment measures with expertise and CSR contribution proved to be a model for recharging of a portion of Bata watershed area. The Project went on to win President's Award of 'Swachh Sujal Shakti Samman' under 'Catch the Rain' Programme by Ministry of Jal Shakti in February 2023.

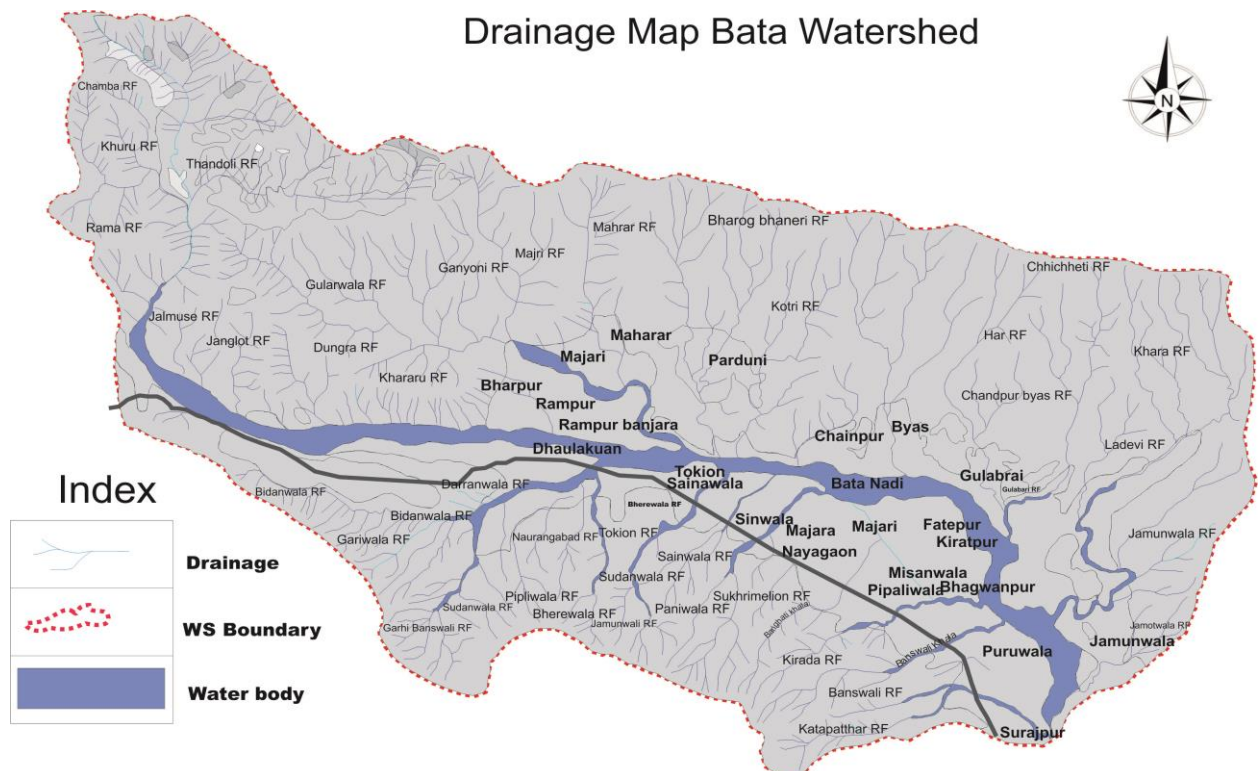


## 5.2 DURATION OF WATER FLOW IN THE SELECTED SEASONAL STREAMS:

The rainy season usually begins in the middle of June and lasts till the middle of September. A shower or two are received in April and May. The April and May rains may also bring hailstorms. During monsoon, rains are more active in the months of July and August. About 80 percent of the annual rainfall is received by the area during July and August. On an average the area annually, the area receives around 1424 mm of rainfall.

**Drainage Pattern:** - The watershed is dominated by a good number of dendritic drainage patterns. This type of drainage pattern is commonly results due to the homogeneous subsurface geology. All drainages are emerging on the higher altitude and flowing towards the lower altitude and feeding the rivers in valley region. The drainage map of Bata river, the primary river passing through the extent of Paonta Sahib Division is given below.

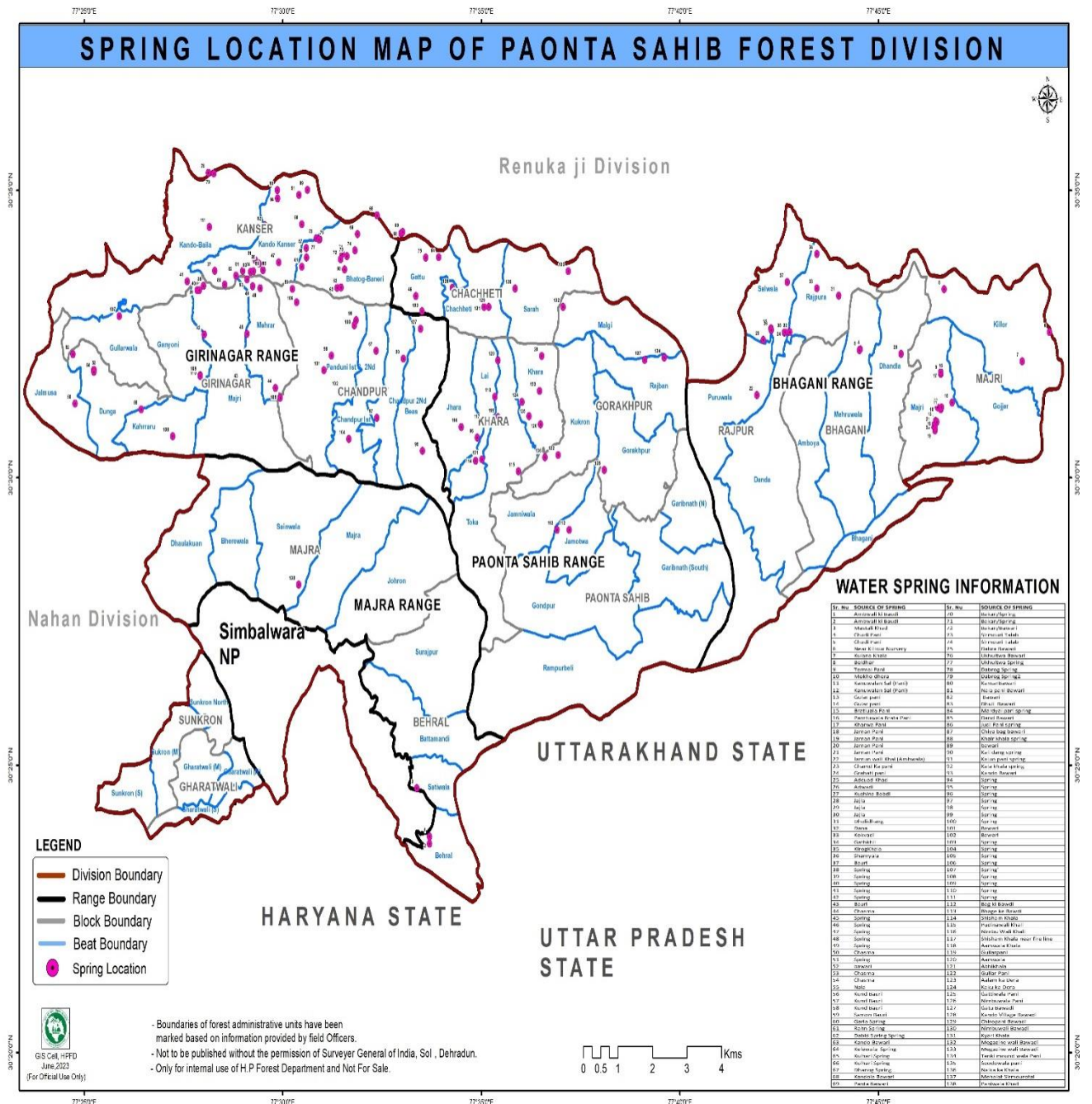
**Map No. 5.2**



The field survey was conducted and different information sources were compiled. Further, the list of spring sheds of this division has been mapped and prepared as shown here.



**Map No.- 5.2 (a): - MAP OF SPRING SHEDS**



**5.3 WETLANDS IN FOREST AREAS:** There are no wetlands in the forests of Paonta Sahib Forest Division. However, Asan Barrage (Conservation Reserve) is in the vicinity falling under the state of Uttarakhand and is also an Important Bird Area and a Ramsar wetland site.

**5.4 WATER LEVEL IN THE WELLS IN THE VICINITY (UPTO 5 KM) OF FORESTS AREA-**

Himmothan Pariyojana, an initiative of Sir Ratan Tata Trust (SRTT- Now Know as Tata Trusts) submitted a Technical Report of Bata Watershed to Divisional Forest Officer Paonta Sahib in 2021. They also conducted personal interviews and surveys with borewell-owners in Dunga, Janglot, Naurangabad & Byas-Beats based on fact that level of groundwater is rapidly depleting since last two decades. The groundwater assessment report of Central Groundwater Board also reported average draw-down of 6 m in this area. Data of some surveyed bore-well locations is given below in tabular form.

**Table no. 5.2**

| <b>Bore-well Data</b> |                |                 |                  |                        |                      |                   |                          |                   |
|-----------------------|----------------|-----------------|------------------|------------------------|----------------------|-------------------|--------------------------|-------------------|
| <b>Sr. No</b>         | <b>Village</b> | <b>Latitude</b> | <b>Longitude</b> | <b>Elevation (Mtr)</b> | <b>Drilling Year</b> | <b>Depth (Ft)</b> | <b>Re-Deepening Year</b> | <b>Depth (Ft)</b> |
| 1                     | Belwali        | 30°29'00.6"     | 77°27'50.2"      | 464                    | 2002                 | 150               | 2017                     | 250               |
| 2                     | Bodiwala       | 30°30'33.9"     | 77°25'31.9"      | 512                    | 2010                 | 80                | 2017                     | 105               |
| 3                     | Bodiwala       | 30°30'34.4"     | 77°25'29.8"      | 514                    | 2017                 | 280               | -                        | -                 |
| 4                     | Parduni        | 30°30'58.7"     | 77°30'38.9"      | 436                    | 2014                 | 110               | 2019                     | 140               |
| 5                     | Parduni        | 30°31'02.7"     | 77°30'31.5"      | 433                    | 2011                 | 85                | 2019                     | 105               |
| 6                     | Parduni        | 30°30'55.7"     | 77°30'46.8"      | 452                    | 2008                 | 120               | 2015                     | 185               |
| 7                     | Parduni        | 30°30'53.9"     | 77°30'50.7"      | 450                    | 2010                 | 120               | 2015                     | 185               |

**Groundwater use pattern:** The community of this valley is consuming the groundwater for drinking and other domestic needs through shallow and deep depth bore-wells and Hand-pumps. Major part of agriculture is depending on the groundwater and some lowland area is irrigated through irrigation canal connected to the Girinagar dam. The industries are also surrounding the village settlement are consuming a large part of groundwater through deep bore-well. Land Use Map for Bata watershed is depicted below.

**Map No. – 8 (5.4)**





# CHAPTER 6

## MAINTENANCE AND ENHANCEMENT OF FOREST RESOURCE PRODUCTIVITY

Analysis of growing stock is necessary to know the capacity and potential of the forest to have tree growth and also to calculate harvestable yield in the working plan as also for future management to maintain the forest in the similar condition as a selection forest. As the objective of forest management is gradually shifting towards regular flow of income and ecosystem services to local community keeping conservation and ecological security as the larger objective, the harvestable yield and the increment of the forest has to be considered to arrive at the crucial decision of sustainable management.

### 6.1 Growing Stock of Wood

Forest inventory and analysis of growing stock is necessary to quantify tree growth and its sustainable utilization. Growing stock can be defined as the living tree component of the standing volume. Growing stock analysis is essential to calculate harvestable yield in the working plan and is necessary to ensure sustained income flow and ecosystem services to local communities, considering conservation and ecological security.

The forest resource assessment methodology prescribed in the National Working Plan Code – 2014 was followed to conduct assessment of the total growing stock of trees and biomass. Grid based Systematic Sampling was carried out. Systematically classified randomly sampled grid with sample plot locations are mentioned in Figure 6.1. Sample plots were laid out and observational assessment of site quality, tree species, composition, its health, density and crop age etc. were recorded. Blanks, important scattered trees, plantations raised were noted.

Sample points were taken by adopting the method as provided in the National Working Plan Code 2014. Plot locations are shown through figure 6.1. After navigating to each sample point using a hand-held GPS, a square plot of 0.1 ha was laid by measuring 22.36 m horizontal distance i.e. half of the diagonal in all the four directions. After checking the dimensions of the plot, the latitude, longitude and altitude at the centre of the plot were recorded using the handheld



**Figure 6.2: Growing Stock Analysis of Paonta Sahib Forest Division**

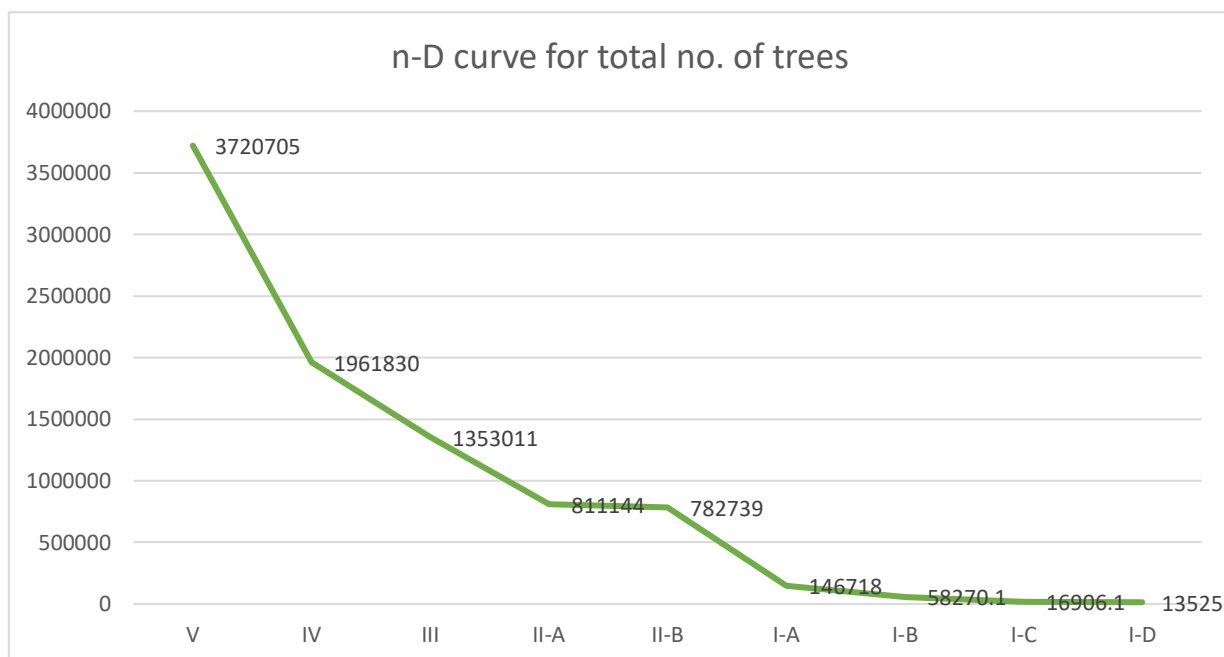


**TABLE 6.2a : SPECIES-WISE NO. OF TREES**

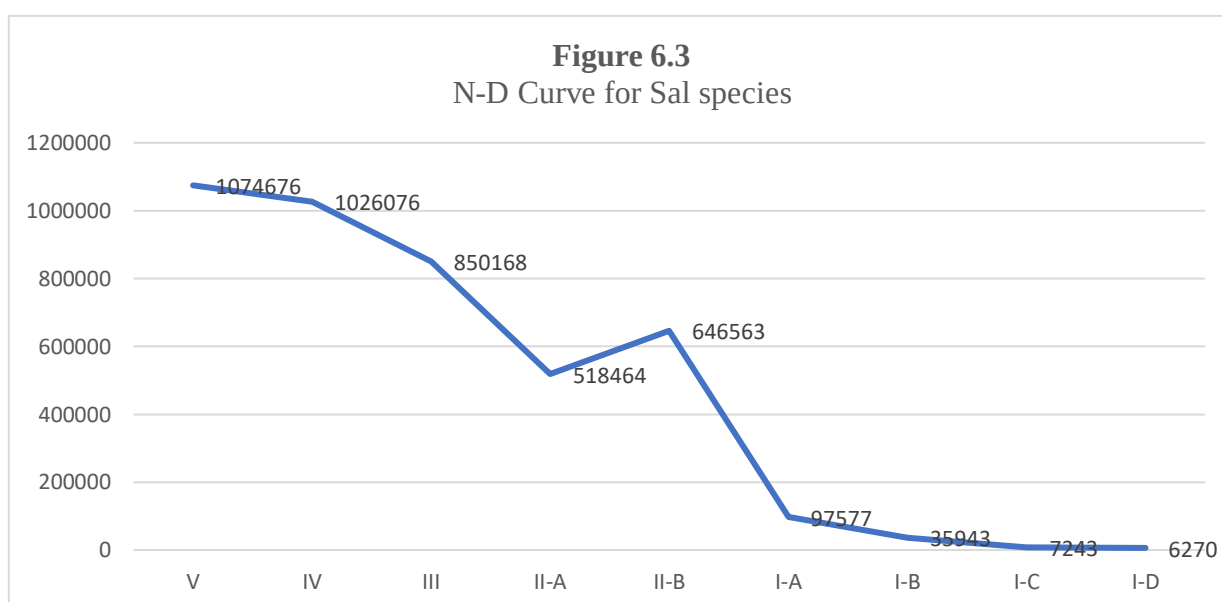
| DIA CLASS    | SAL            | KHAIR          | EUCALYPTUS    | CHIL          | MISC.          | TOTAL          |
|--------------|----------------|----------------|---------------|---------------|----------------|----------------|
| V            | 1074676        | 1121754        | 12229         | 59016         | 1453030        | 3720705        |
| IV           | 1026076        | 250209         | 58501         | 80936         | 546108         | 1961830        |
| III          | 850168         | 198364         | 17084         | 31665         | 255730         | 1353011        |
| II-A         | 518464         | 121539         | 12423         | 11517         | 147201         | 811144         |
| II-B         | 646563         | 61469          | 2688          | 4764          | 67255          | 782739         |
| I-A          | 97577          | 21465          | 860           | 595           | 26221          | 146718         |
| I-B          | 35943          | 11712          | 683           | 1244          | 8688           | 58270.1        |
| I-C          | 7243           | 1960           | 0             | 514           | 7189           | 16906.1        |
| I-D          | 6270           | 2598           | 0             | 0             | 4657           | 13525          |
| <b>TOTAL</b> | <b>4262980</b> | <b>1791070</b> | <b>104469</b> | <b>190250</b> | <b>2516079</b> | <b>8864847</b> |

**TABLE 6.2b : Total Growing Stock (Volume m<sup>3</sup>) For Paonta Sahib Division**

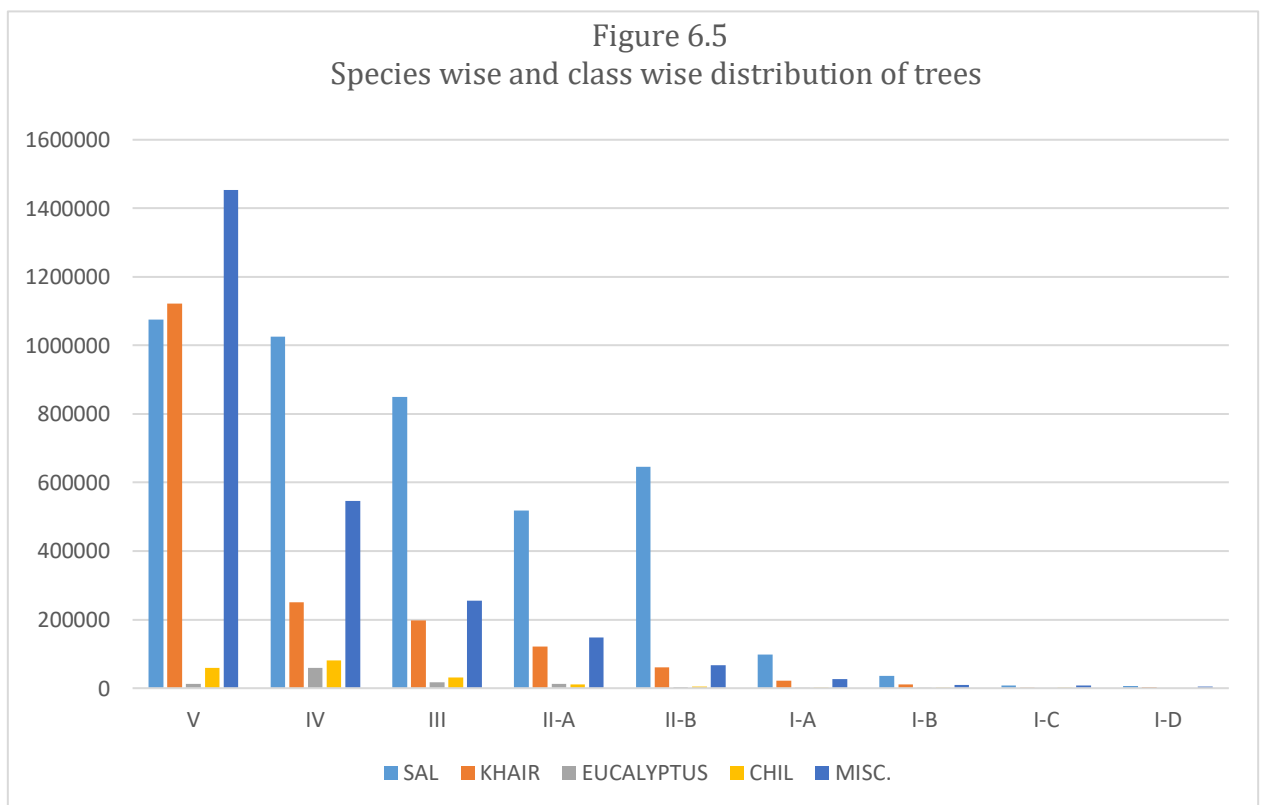
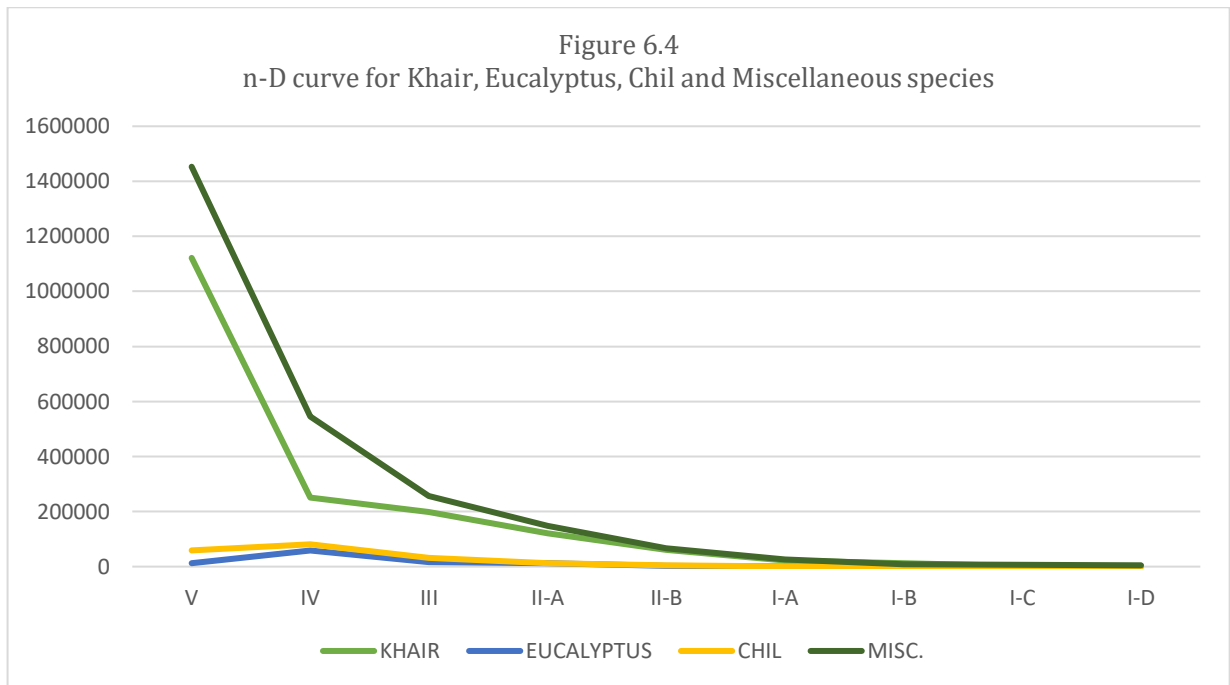
| DIA CLASS | SAL       | KHAIR     | EUC.     | CHIL     | MISC.     | TOTAL      |
|-----------|-----------|-----------|----------|----------|-----------|------------|
| V         | 136485.00 | 127983.00 | 1394.10  | 2974.42  | 93021.80  | 361858.32  |
| IV        | 377669.00 | 52721.10  | 18252.40 | 20225.88 | 100673.00 | 569541.38  |
| III       | 710062.00 | 103680.00 | 8542.07  | 21677.86 | 107395.00 | 951356.93  |
| II-A      | 917995.00 | 126857.00 | 7453.81  | 15597.96 | 130879.00 | 1198782.77 |

|              |                   |                  |                 |                 |                  |                   |
|--------------|-------------------|------------------|-----------------|-----------------|------------------|-------------------|
| II-B         | 1959440.00        | 78864.70         | 1612.81         | 10762.40        | 102454.00        | 2153133.91        |
| I-A          | 447973.00         | 27539.60         | 515.92          | 2022.64         | 60251.30         | 538302.46         |
| I-B          | 229496.00         | 15026.50         | 409.97          | 5939.60         | 27739.40         | 278611.47         |
| I-C          | 46243.70          | 2514.68          | 0.00            | 3281.84         | 22955.40         | 74995.62          |
| I-D          | 40034.00          | 3333.23          | 0.00            | 0.00            | 15011.60         | 58378.83          |
| <b>TOTAL</b> | <b>4865397.00</b> | <b>538520.00</b> | <b>38181.10</b> | <b>82482.60</b> | <b>660381.00</b> | <b>6184961.70</b> |

The results show that growing stock is represented as an inverse J-curve but not in the complete sense, as an anomaly is seen with the increase in IIB class of trees, depicting the non-working of forests in the Division for the last 40 years (except for 284 ha in experimental silviculture felling in 2018-2020), leading to abnormality in age-class distribution.



The anomaly is more distinctly observed in Sal trees as the trees shift towards higher dia classes, especially IIA onward. This again points towards abnormal, uneven aged forests.



Species of plantation origin i.e Eucalyptus has negligible number of trees in Vth class due to absence of natural regeneration. In Chil, regeneration is very low as depicted in Figure 6.5. The

miscellaneous species include Kokath species i.e. Sain, Arjun, Jhingan, Rohini etc. and find a near-normal distribution of age-classes. However, the same cannot be said for the most predominant species of this Division i.e. Sal for the factors explained above.

## 6.2 Increment in volume of identified timber species:

No exercises were conducted regarding assessment of increment; however, details of growth and increment have been discussed in Chapter 12 of Part I of this Working Plan.

## 6.3 Efforts towards enhancement of forest productivity through quality plantation activities:

To enhance the productivity of forests, it is imperative to stock the blank areas by planting with improved planting material. Further well drained soils can be planted with Khair and *Sal*. However, the success of the plantation will depend on the eradication of *lantana* till the establishment age after which the species will take care to suppress *lantana* with their shade. There is a considerable scope to enhance the productivity of these forests with silvicultural measures and providing protection.

To supplement natural regeneration in the Division, artificial regeneration operations are also carried out in the Division annually as an objective of National Forest Policy 1988. In the last 10 years, 1230 ha area of the Division has been taken under plantations. The abstract of plantations raised in the past in these forests is given below.

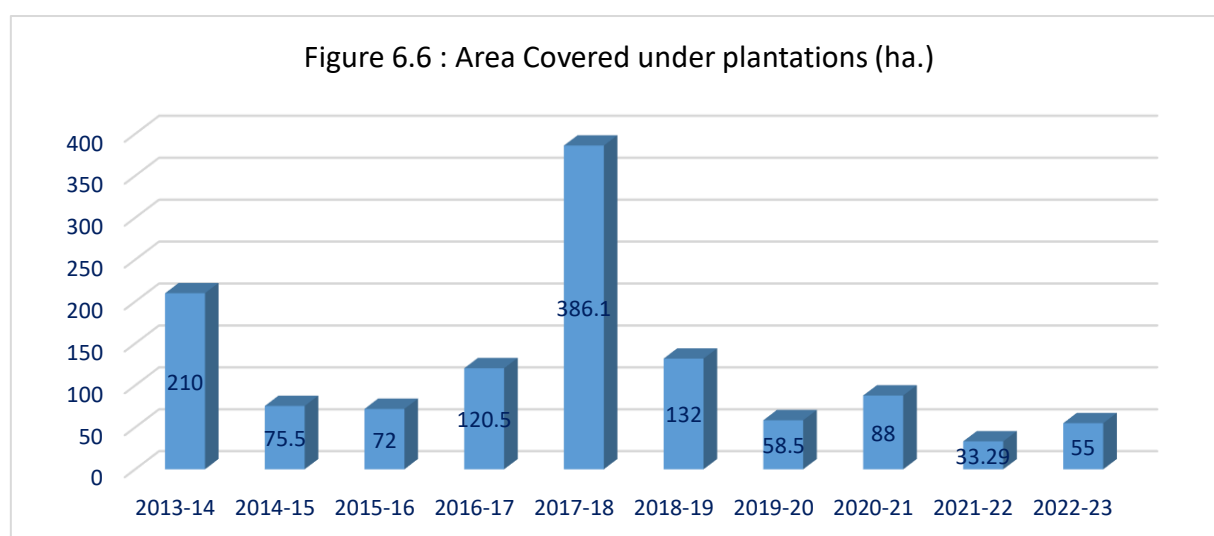


**Table No. 6.7**

| Year | Reserved Forest | Compartment No. | Species Planted | No. of plants planted | Area Covered (ha.) |
|------|-----------------|-----------------|-----------------|-----------------------|--------------------|
|------|-----------------|-----------------|-----------------|-----------------------|--------------------|

|         |                 |              |                                                                                               |               |            |
|---------|-----------------|--------------|-----------------------------------------------------------------------------------------------|---------------|------------|
| 2013-14 | RF Sainwala     | C-6          | Amla, Arjun, Bel Patra, Behra, Bamboo, Harar, Jamun, Khair, Kachnar, Siris, Shisham,          | 11000         | 10         |
|         | RF Mahadev      | C-2          | Amla, Behra, Jamun, Khair, Kachnar, Mango, Shisham, Tatpatanga                                | 11000         | 10         |
|         | RF Gharatwali   | C-1          | Amla, Bel Patri, Jamun, Kachnar, Tatpatanga, Papri                                            | 11000         | 10         |
|         | RF Beas         | C-8          | Amla, Amaltas, Behra, Bamboo, Jamun, Kachnar, Robinia                                         | 16500         | 15         |
|         | RF Mastali      | C-2          | Amla, Bel Patri, Jamun, Khair, Shisham, Tatpalanga, Papri                                     | 11000         | 10         |
|         | RF Gullarwala   | C-9, 10 & 11 | Amla, Amaltas, Bamboo, Khair, Kachnar, Mulberry, Mango, Robinia, Ritha, Shisham               | 27500         | 25         |
|         | RF Kandela      | C-2 & C-3    | Amla, Behra, Bamboo, Harar, Jamun, Khair, Kachnar, Siris, Shisham, Papri,                     | 27500         | 25         |
|         | RF Mastali      | C-1          | Amla, Behra, Jamun, Khair, Mango, Shisham, Tatpatanga                                         | 7500          | 10         |
|         | RF Samon-Knon   | C-3          | Amla, Kachnar, Robinia, Shisham                                                               | 7500          | 10         |
|         | RF Majri        | C-14         | Behra, Bamboo, Jamun, Kachnar, Robinia                                                        | 11250         | 15         |
|         | RF Jamotwa      | C-19         | Bamboo, Khair, Jamun, Shisham,                                                                | 11250         | 15         |
|         | RF Jhara        | C-20         | Amla, Arjun, Behra, Buch, Giloe, Harar, Jamun, Khair, Kachnar, Lemon Grass, Van haldi, Ramban | 52800         | 14.5       |
|         | RF Kukron       | C-11         | Amla, Behra, Buch, Giloe, Jamun, Vitex, Kachnar, Lemon Grass, Van haldi, Ramban               | 52800         | 14.5       |
|         | RF Danda-Amboya | C-14         | Behra, Bamboo, Khair                                                                          | 1000          | 5          |
|         | RF Amboya       | C-6          | Amla, Bel Patri, Behra, Harar, Jamun, Neem, Shatawar                                          | 5500          | 5          |
|         | RF Gharatwali   | C-2          | Amltas, Belpatri, Bamboo, Jamun, Khair, Shisham, Shahunjna, Tatpatanga                        | 5500          | 5          |
|         | RF Danda-Amboya | C-14         | Bamboo, Khair, Jamun                                                                          | 1050          | 1          |
|         | RF Sunkron      | C-10         | Bamboo                                                                                        | 2100          | 5          |
|         | RF Kansar       | C-4          | Bamboo                                                                                        | 2100          | 5          |
|         |                 |              |                                                                                               | <b>275850</b> | <b>210</b> |
|         | RF Garhi        | C-2          | Amla, Arjun, Behra, Bamboo, Jamun, Kachnar, Shisham,                                          | 7700          | 7          |
|         | RF Malgi        | C-26         | Amla, Bamboo, Kachnar,                                                                        | 5500          | 5          |
|         | RF Majri        | C-2          | Amla, Behra, Kachnar, Siris                                                                   | 5500          | 5          |
|         | RF Majri        | C-3          | Amla, Behra, Kachnar, Siris                                                                   | 5500          | 5          |
|         | RF Dhandla      | C-9          | Amla, Behra, Bamboo, Jamun, Khair, Kachnar, Siris,                                            | 775           | 0.5        |
|         | RF Dhandla      | C-7          | Amla, Behra, Bamboo, Jamun, Khair, Kachnar, Siris,                                            | 16500         | 15         |
|         | RF Amboya       | C-10         | Amla, Behra, Bamboo, Jamun, Khair, Kachnar, Siris,                                            | 24500         | 25         |

|                |                 |           |                                                                              |               |              |
|----------------|-----------------|-----------|------------------------------------------------------------------------------|---------------|--------------|
|                | RF Salatha      | C-3       | Bamboo                                                                       | 840           | 2            |
|                | RF Chachheti    | C-9       | Bamboo                                                                       | 1260          | 3            |
|                |                 |           |                                                                              | <b>76875</b>  | <b>75.5</b>  |
| <b>2015-16</b> | RF Pipalwali    | C-3       | Amla, Arjun, Behra, Bamboo, Jamun, Khair, Shisham,                           | 5500          | 5            |
|                | RF Banswali     | C-4 & C-9 | Amla, Arjun, Behra, Bamboo, Jamun, Khair, Shisham,                           | 8000          | 10           |
|                | RF jamotwa      | C-17      | Amla, Behra, Harar, Jamun,                                                   | 5500          | 5            |
|                | RF Badi Ghati   | C-2 & C-3 | Amla, Arjun, Behra, Bamboo, Harar, Jamun, Khair, Shisham,                    | 11000         | 10           |
|                | RF Naurangabad  | C-5 & C-7 | Amla, Arjun, Belpatri, Bamboo, Harar, Jamun, Khair, Kachnar, Shisham,        | 22000         | 20           |
|                | RF Khojjar      | C-8       | Amla, Belpatri, Bamboo, Siris,                                               | 16500         | 15           |
|                | RF Mehruwala    | C-6       | Bamboo                                                                       | 1680          | 4            |
|                | RF Amboya       | C-6       | Bamboo                                                                       | 1260          | 3            |
|                |                 |           |                                                                              | <b>71440</b>  | <b>72</b>    |
| <b>2016-17</b> | RF Khojjar      | C-7       | Amla, Kanak Champa                                                           | 2500          | 5            |
|                | RF Sarah        | C-4       | Amla, Kachnar                                                                | 2500          | 5            |
|                | RF Sarah        | C-1       | Amla, Bamboo, Tun, Behra, Jamun, Kachnar, Acacia, Khair,                     | 8250          | 7.5          |
|                | RF Sarah        | C-10      | Amla, Bamboo, Tun, Jamun, Kachnar, Acacia,                                   | 2750          | 2.5          |
|                | RF Sarah        | C-9       | Amla, Bamboo, Tun, Jamun, Kachnar, Khair,                                    | 11000         | 10           |
|                | RF Mehrar       | C-17      | Bamboo, Jamun, Acacia, Shisham,                                              | 16500         | 15           |
|                | RF Barthal      | C-4       | Amla, Bamboo, Tun, Jamun, Kachnar, Khair, Lucinia                            | 7700          | 7            |
|                | RF Kando Baila  | C-2       | Amla, Bamboo, Tun, Jamun, Harar, Kachnar, Khair                              | 8800          | 8            |
|                | RF Kando Bharog | C-2       | Amla, Bamboo, Tun, Jamun, Harar, Kachnar, Khair, Lucinia                     | 5500          | 5            |
|                | RF Tokion       | C-3       | Amla, Arjun, Bamboo, Behra, Kanak Champa, Tun, Drek Harar, Jamun, Kachnar, . | 11000         | 10           |
|                | RF Majri        | C-1 & C-2 | Amla, Bamboo, Behra, Kachnar, Shisham, Khair,                                | 33000         | 30           |
|                | RF Salatha      | C-3       | Amla, Bamboo, Behra, Harar, Kachnar, Shisham, Khair                          | 16500         | 15           |
|                | RF Surajpur     | C-1       | Arjun, Behra, Jamun, Kachnar,                                                | 240           | 0.5          |
|                |                 |           |                                                                              | <b>126240</b> | <b>120.5</b> |
| <b>2017-18</b> | RF Dandhla      | C-9       | Amrood, Arjun, Bamboo, Behra, Neem, Shisham                                  | 10000         | 10           |
|                | RF Dandhla      | C-11      | Amrood, Arjun, Bamboo, Behra, Neem, Kachnar, Shisham,                        | 11000         | 10           |



|                |            |                                                                                                                 |       |     |
|----------------|------------|-----------------------------------------------------------------------------------------------------------------|-------|-----|
| RF Giri        | C-2        | Amrood, Arjun, Bamboo, Behra, Kachnar, Shisham,                                                                 | 7700  | 7   |
| RF Giri        | C-3        | Bamboo, Harar, Jamun, Khair, Shisham                                                                            | 8800  | 8   |
| RF Danda       | C-20       | Amla, Amrood, Arjun, Bamboo, Behra, Jamun, Kachna, Khair, Neem, Shisham                                         | 23100 | 21  |
| RF Majri       | C-7        | Amla, Amrood, Arjun, Bamboo, Behra, Cjangesia, Deu/Lakoocha, Kachnar, Kanak-champa, Mango, Sagwan, Shisham, Tun | 19500 | 18  |
| RF Khojjar     | C-4        | Amla, Arjun, Cjangesia, Jamun, Kachnar, Shisham,                                                                | 12500 | 25  |
| RF Khojjar     | C-8        | Amla, Arjun, Cjangesia, Jamun, Kachnar, Shisham                                                                 | 12500 | 25  |
| RF Kandela     | C-5        | Amla, Amrood, Bamboo, Behra, Arjun, Jamun, Kachnar, Neem, Shisham, Sagwan                                       | 22000 | 20  |
| RF Khojjar     | C-9 & C-10 | Amla, Bamboo, Behra, Arjun, Harar, Siris, Kachnar, Neem, Shisham, Sagwan                                        | 19800 | 18  |
| RF Majri       | C-7 & C-8  | Amla, Behra, Jamun, Kachnar, Shisham, Kanak Champa, Sagwan, Tun                                                 | 14300 | 13  |
| RF Salatha     | C-3 & C-4  | Amla, Amrood, Bamboo, Behra, Arjun, Jamun, Kachnar, Kanak-Champa, Neem, Shisham, Sagwan                         | 22000 | 20  |
| RF Amboya      | C-4        | Amrood, Bamboo, Behra, Arjun, Jamun, Kachnar, Neem, Shisham, Sagwan                                             | 22000 | 20  |
| RF KandoBharog | C-2        | Amrood, Arjun, Bamboo, Behra, Neem, Kachnar, Shisham,                                                           | 11000 | 10  |
| RF Kansar      | C-2        | Amrood, Arjun, Bamboo, Behra, Neem, Kachnar,                                                                    | 3960  | 3.6 |
| RF Gullarwala  | C-12       | Amla, Arjun, Jamun, Kachnar, Shisham,                                                                           | 15500 | 15  |
| RF Barthar     | C-3        | Amrood, Arjun, Bamboo, Behra, Neem, Kachnar,                                                                    | 13012 | 12  |
| RF Ghuttanpur  | C-13       | Amla, Amrood, Bamboo, Behra, Arjun, Jamun, Kachnar, Kanak-Champa, , Neem, Shisham, Sagwan                       | 26900 | 25  |
| RF Ghuttanpur  | C-20       | Amla, Amrood, Bamboo, Behra, Arjun, Jamun, Kachnar, , Neem, Shisham, Sagwan                                     | 22000 | 20  |
| RF Baswali     | C-1        | Amla, Behra, Jamun, Kachnar, Shisham, Kanak Champa, Sagwan, Tun                                                 | 16500 | 15  |
| RF Sudanwala   | C-2 & C-3  | Amla, Amrood, Bamboo, Behra, Arjun, Jamun, Kachnar, , Neem, Kanak-Champa, Shisham, Sagwan                       | 22000 | 15  |
| RF Jamanwali   | C-2        | Amla, Behra, Jamun, Kachnar, Shisham, Kanak Champa, Sagwan, Tun                                                 | 16500 | 15  |
| RF Sukhmelion  | C-2 & C-3  | Amla, Amrood, Bamboo, Behra, Arjun, Jamun, Kachnar, , Neem, Kanak-Champa, Shisham, Sagwan                       | 22000 | 20  |

|                |                 |             |                                                                              |               |              |
|----------------|-----------------|-------------|------------------------------------------------------------------------------|---------------|--------------|
|                | RF Sarah        | C-4         | Amla, Behra, Harar, Jamun,                                                   | 5500          | 5            |
|                | RF Chhachheti   | C-10        | Amla, Behra, Harar, Jamun,                                                   | 5500          | 5            |
|                | RF Sarah        | C-9         | Amla, Bamboo, Tun, Jamun, Kachnar, Khair                                     | 6600          | 6            |
|                | RF Mantaruwala  | C-4         | Amla, Bamboo, Tun, Jamun, Kachnar, Acacia                                    | 2250          | 4.5          |
|                |                 |             |                                                                              | <b>394422</b> | <b>386.1</b> |
| <b>2018-19</b> | RF Khojjar      | C-1         | Behra, Kachnar                                                               | 8000          | 20           |
|                | RF Majri        | C-3         | Arjun, Jamun, Kachnar,                                                       | 8000          | 20           |
|                | RF Salatha      | C-1 & C-2   | Arjun, Jamun, Kachnar, Shisham,                                              | 12500         | 25           |
|                | RF Danda        | C-19 & C-20 | Amla, Bamboo, Behra, Harar, Jamun, Kachnar,                                  | 13200         | 12           |
|                | RF Giri         | C-3         | Amla, Harar, Khair, Shisham                                                  | 11000         | 10           |
|                | RF Giri         | C-4         | Arjun, Jamun, Kachnar, Shisham                                               | 5000          | 10           |
|                | RF Danda        | C-18        | Amla, Arjun, Bamboo, Behra, Jamun, Kachnar, Khair, Shisham                   | 2200          | 2            |
|                | RF Amboya       | C-6         | Amla, Arjun, Bamboo, Jamun, Kachnar                                          | 7700          | 7            |
|                | RF Badhana      | C-1         | Jamun, Shisham                                                               | 1000          | 5            |
|                | RF Kando-Bharog | C-3         | Amla, Bamboo, Jamun, Mango,                                                  | 2920          | 6            |
|                | RF Surajpur     | C-1 & C-2   | Amla, Amrood, Arjun, Bamboo, Jamun, Kachnar, Khair, Mango, Shisham, Tek, Tun | 16500         | 15           |
|                |                 |             |                                                                              | <b>88020</b>  | <b>132</b>   |
| <b>2019-20</b> | RF Surajpur     | C-3         | Amla, Arjun, Jamun, Kachnar, Shisham, Teak                                   | 13200         | 12           |
|                | RF Giri         | C-2         | Amla, Arjun, Bamboo, Jamun, Kachnar, Shisham,                                | 3700          | 18.5         |
|                | RF Mehruwala    | C-4         | Amla, Arjun, Bamboo, Jamun, Kachnar, Shisham,                                | 5000          | 10           |
|                | RF Dhandhla     | C-10 & C-11 | Amla, Arjun, Bamboo, Jamun, Kachnar, Shisham,                                | 5000          | 10           |
|                | RF Jhara        | C-20        | Amla, Bamboo, Sain, Jamun, Kachnar, Acacia,                                  | 4000          | 5            |
|                | RF Rampurbeli   | C-1         | Shisham, Khair                                                               | 1200          | 3            |
|                |                 |             |                                                                              | <b>32100</b>  | <b>58.5</b>  |
| <b>2020-21</b> | RF Malgi        | C-26        | Arjun, Kachnar, Kanak-Champa, Teak                                           | 1000          | 5            |
|                | RF Amboya       | C-4         | Amla, Sain, Jamun, Kachnar                                                   | 2000          | 10           |
|                | RF Khojjar      | C-10        | Amla, Sain, Jamun, Kachnar                                                   | 2000          | 10           |
|                | RF Badhana      | C-3         | Amla, Sain, Jamun, Kachnar                                                   | 2000          | 10           |
|                | RF Badi Ghati   | C-3         | Amla, Sain, Jamun, Kachnar                                                   | 2000          | 10           |
|                | RF Banswali     | C-3         | Amla, Sain, Jamun, Kachnar                                                   | 2000          | 10           |
|                | RF Ghuttanpur   | C-7         | Amla, Arjun, Sain, Jamun, Teak, Kachnar                                      | 4000          | 8            |
|                | RF Kandela      | C-5         | Amla, Arjun, Sain, Kachnar, Shisham, Teak                                    | 2500          | 5            |
|                | RF Danda        | C-17        | Amla, Harar, Arjun, Sain, Jamun, Kachnar, Shisham, Teak, Behra               | 1000          | 5            |

|                |                 |           |                                                          |              |               |
|----------------|-----------------|-----------|----------------------------------------------------------|--------------|---------------|
|                | RF Khararu      | C-8 & C-9 | Harar, Jamun, Shisham, Sagwan                            | 5000         | 10            |
|                | RF Mehruwala    | C-8       | Amla, Arjun, Sain, Jamun, Kachnar, Shisham, Teak, Sagwan | 2500         | 5             |
|                |                 |           |                                                          | <b>26000</b> | <b>88</b>     |
| <b>2021-22</b> | RF Rajpur       | C-1       | Jamun Kank, Champa, Amla, Kachnar, Arjun, Sagwan         | 5000         | 10            |
|                | RF Gharatwali   | C-1       | Jamun Amla, Arjun, Sagwan, Behra, Sain                   | 2500         | 5             |
|                | RF Giri         | C-3       | Mango, Jamun Arjun, Sagwan, Behra, Shisham, Harar        | 5000         | 10            |
|                | RF Badhana      | C-3       | Jamun Amla, Kachnar, Sagwan, Shisham, Sain               | 9121         | 8.292         |
|                |                 |           |                                                          | <b>21621</b> | <b>33.292</b> |
| <b>2022-23</b> | RF Kandela      | C-1       | Behra, Harar, Arjun, Kachnar, Shisham, Sain              | 7500         | 15            |
|                | RF Sukhimelion  | C-2 & 6   | Jamun Amla, Arjun, Sagwan, Behra, Sain                   | 3000         | 10            |
|                | RF Konchbeli    | C-1       | Jamun Amla, Arjun, Sagwan, Behra, Sain                   | 2500         | 5             |
|                | RF Khararu      | C-8       | Harar, Jamun, Shisham, Sagwan                            | 2500         | 5             |
|                | RF Kando-Bharog | C-1       | Amla, Bamboo, Jamun, Mango,                              | 4000         | 5             |
|                | RF Kanon-Samon  | C-6       | Amla, Bamboo, Jamun, Mango, Kachnar                      | 4000         | 5             |
|                | RF Sarah        | C-1       | Arjun, Kachnar, Kanak-Champa, Teak                       | 8000         | 10            |
|                |                 |           |                                                          | <b>31500</b> | <b>55</b>     |

#### 6.4 CARBON STOCK:

The enumeration of stock is done as per the methodology adopted by the Forest Survey of India for conducting National Forest Inventory. From these observations, the above ground biomass is calculated. For below ground biomass, biomass of litter, rhizomes and the soil are taken separately and added to the above ground biomass to arrive at the total biomass. The carbon stock is finally calculated using the biomass-carbon relationship applied by the FSI. Thus, total carbon stock of these forests is arrived at. This will be useful as a baseline to find out the carbon sequestration capacity of these forests and their management keeping in view this object in mind.

The management of terrestrial carbon sinks is of paramount importance to contain and arrest the carbon dioxide from the atmosphere as it is one of the main greenhouse gases contributing to global warming. Thus, forests play a very important role in the dynamics of the global carbon cycle. In order to assist the policy makers in on climate change related issues, an attempt has been made to assess the carbon stocks in living biomass in Paonta Sahib Forest Division.

#### METHODOLOGY: -

Forest and climate change are intimately intertwined forest regulate the climate, rain, ground water and soil of the earth. Forest is both sources and sinks of carbon. A growing forest captures carbon from the atmosphere and mature forest in a store house of carbon. The living portion of

biomass carbon is classified in two pools: The Above Ground Biomass (AGB) and Below Ground Biomass (BGB) which are stores of significant amount of carbon. The dead organic Matter (DOM) which contains substantial amount of organic carbon. The FSI has the major contributor on forest biomass estimation and carbon stock change. The growing stock (volume) data is first converted into biomass by using species wise specific gravity of wood. In forests, enormous carbon is stored which is classified into 5 pools by ‘Good Practices Guidance for LULUCF’ of IPCC. The living portion of the biomass is classified into two parts:

1. Above Ground Biomass
2. Below Ground Biomass

The dead organic matter is also classified into 2 pools:

1. Dead wood
2. Litter

The fifth pool is soil organic matter which contain substantial amount of organic carbon.

| DIFFERENT FOREST CARBON POOLS |                      |                                                                                                                                                                              |
|-------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POOLS                         | DESCRIPTION          |                                                                                                                                                                              |
| Living biomass                | Above Ground Biomass | All Living Biomass Above The Soil; Includes stump , Branches , Bark, Seeds, Foliage Etc.                                                                                     |
|                               | Below Ground Biomass | All Living Biomass of Roots. Fine Roots Of Less Than 2mm dia Are Excluded As They can not Be Empirically Distinguished From Soil Organic Carbon Or Litter                    |
| Dead organic matter           | Deadwood             | Includes all non-living biomass not included in litter either standing or lying on the ground. Also includes dead wood and stumps larger than or equal to 10 cm in diameter. |
|                               | Litter               | Includes all non-living biomass having diameter less than 5 cm (FSI), lying dead in various states of decomposition on ground.                                               |
| Soil                          | Soil organic matter  | Includes organic carbon in mineral and organic soil to a specific depth chosen by a country                                                                                  |

| Table 6.8: Species-Wise Volume In m <sup>3</sup> |            |           |          |          |           |            |
|--------------------------------------------------|------------|-----------|----------|----------|-----------|------------|
| SPECIES                                          | SAL        | KHAIR     | EUC.     | CHIL     | MISC.     | TOTAL      |
| TOTAL                                            | 4865397.47 | 538520.12 | 38181.08 | 82482.60 | 660380.53 | 6184961.80 |

**Table 6.9: Living Biomass calculation table**

| Sr. No | Species | Volume (m3) | Specific Gravity | Woody Biomass (kg) | ABEF | AGB (kg) | R/S ratio | BGB (kg) | Total Living biomass (kg) |
|--------|---------|-------------|------------------|--------------------|------|----------|-----------|----------|---------------------------|
|        |         | A           | B                | C=A*B              | D    | E=C*D    | F         | G=E*F    | G+E                       |

|   |              |          |      |          |     |          |      |            |            |
|---|--------------|----------|------|----------|-----|----------|------|------------|------------|
| 1 | Khair        | 538520.1 | 0.88 | 473897.7 | 3.4 | 1611252  | 0.24 | 386701     | 1997952.73 |
| 2 | Chil         | 82482.6  | 0.4  | 32993.04 | 1.3 | 42890.95 |      | 10293.8285 | 53184.7805 |
| 3 | Eucalyptus   | 38181.08 | 0.65 | 24817.7  | 3.4 | 84380.19 |      | 20251.2    | 104631.432 |
| 4 | Sal          | 4865397  | 0.72 | 3503086  | 3.4 | 11910493 |      | 2858518    | 14769011.3 |
| 5 | Misc (Kokat) | 660380.5 | 0.6  | 396228.3 | 3.4 | 1347176  |      | 323322     | 1670498.59 |
| 6 | Total        |          |      |          |     | 14996192 |      | 3596414    | 18595278.9 |

*ABEF (Average Biomass Expansion factor): as per IPCC 'Good Guidance' manual, for tropical climatic zone Pines: 1.3 & BL: 3.4*

## 6.5 Carbon Sequestration and Mitigation

### 6.5.1 Weight of Carbon dioxide Sequestered

50% of biomass by weight is carbon. Carbon is completely assimilated from atmospheric CO<sub>2</sub>. From the amount of carbon stored within a tree, the amount of CO<sub>2</sub> sequestered can be calculated using the molecular weights of carbon and oxygen. The ratio of CO<sub>2</sub> to C (44/12) is multiplied by the weight of carbon in the tree to determine the weight of Carbon dioxide sequestered in the tree. The following table gives a perspective on the amount of CO<sub>2</sub> sequestered in the forests of Paonta Sahib Forest Division.

**Table 6.10: Carbon Dioxide Sequestration Data for Paonta Sahib Division**

| Species       | Total living biomass (kg) | Carbon Content (50% of A) | Carbon dioxide Sequestered (kg) | Carbon dioxide (tonne) |
|---------------|---------------------------|---------------------------|---------------------------------|------------------------|
|               | <b>A</b>                  | <b>B = A/2</b>            | <b>C = B*3.66</b>               | <b>C/1000</b>          |
| Khair         | 1997952.72                | 998976.4                  | 3656253                         | 3656.25                |
| Chil          | 53184.78                  | 26592.39                  | 97328.14                        | 97.32                  |
| Eucalyptus    | 104631.43                 | 52315.72                  | 191475.5                        | 191.47                 |
| Sal           | 14769011.33               | 7384506                   | 27027291                        | 27027.29               |
| Misc (Kokath) | 1670498.58                | 835249.3                  | 3057012                         | 3057.01                |
| <b>Total</b>  | 18595278.84               | 9297639.81                | 34029359.64                     | 34029.342              |

Greenhouse Gases (GHG) have the capability to reflect back shorter wavelength infra-red (IR) radiation. GHGs allow the longer wavelength IR radiation from sun to reach earth through the atmosphere. Earth absorbs the IR radiation, and radiates shorter wavelength IR radiation back into the atmosphere, which is reflected back into earth by the GHGs. So, the GHGs (such as water vapor, CO<sub>2</sub>, CH<sub>4</sub>, SF<sub>6</sub>, HFCs, PFCs and O<sub>3</sub> (in troposphere)) form a blanket around earth and ensure there is no huge variation in night and day temperatures, which is critical for life to flourish. This phenomenon is called greenhouse effect. However, due to the increase in

consumption of fossil fuels after the industrial revolution and other sustained life style patterns of humans, the concentration of GHGs in the atmosphere increased, leading to an increase in the average temperatures on land as well as oceans. This increase in temperature caused the air and ocean circulation systems to behave differently, and change course patterns in certain cases, resulting in a change in climatic patterns in the world. Further, life on earth will have to adapt to this increase in temperatures in a very short period. This phenomenon, which threatens the very existence of life on earth, is called Global Climate Change or GCC. Since these changes have been brought about due to human action, these are also called anthropogenic climate change. Mitigation strategies include reduction in emissions of GHGs from sources as well as capture and storage of GHGs over a long period of time (sequestration).

Trees use the energy from sunlight to convert CO<sub>2</sub> in the atmosphere to sugars through the process of photosynthesis. Melvin Calvin was awarded the Nobel Prize in 1961 in Chemistry for his research on the process of carbon dioxide assimilation in plants using carbon isotopes, which proved that the carbon assimilated in trees, are absorbed from atmospheric CO<sub>2</sub>. This way trees and forests act as a major sink of carbon in the natural carbon cycle. Destruction of forests leads to release of CO<sub>2</sub> into atmosphere, which has been calculated to be more than the global vehicular emissions. Harvested wood traps and stores the carbon within it over a long period of time. So, promoting carbon sequestration in trees is a practical and cost-effective way to capture carbon from atmosphere and store away for a long period of time. Hence the emission reductions are real and long term.

# CHAPTER 7

## OPTIMISATION OF FOREST PRODUCE UTILISATION

### 7.1 RECORDED REMOVAL OF TIMBER:

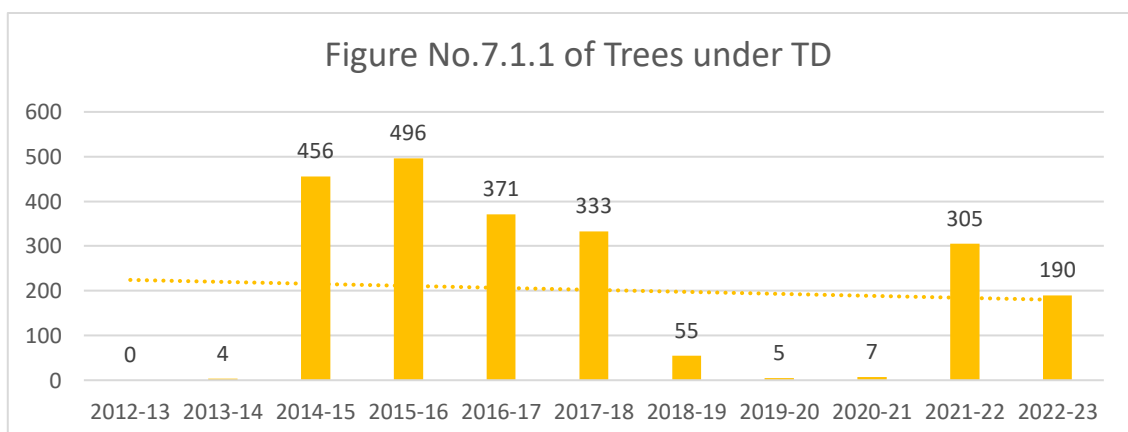
During year 1986, green felling in Himachal Pradesh was banned by the State government. Further in the year 1996, Hon'ble Supreme Court of India passed a landmark Judgement in W.P.(Civil) No. 171/96 titled as 'T.N Godavarman V/S Union of India' in which a blanket ban on green felling was imposed in the State. Thus, the forests were never worked according to the prescriptions of the approved working plans except for Silviculture felling programme in 2018-20 basis Supreme Court judgment in I.A No 87648 of 2020 in WP (Civil) No 202/1995. Timber removals from the areas allotted to different working circles were essentially on account of;

- Timber distribution to local right holders
- Salvage removals
- Removal under F.C.A 1980 & F.R.A 2006
- Experimental Silviculture Felling Program in 2018 to 2020

#### 7.1.1. Timber distribution to the local right holders:

Timber is distributed to the right holders under Himachal Pradesh Forest (Timber distribution to Right holders) Rules 2013 in consonance with the Settlement Report i.e, '*Faisla -E-Janglat* '. Range-wise details of trees-granted under T.D from year 2010-11 to 2022-23 have been provided. In addition to this timber is provided to the right holders for cremation purpose. The details of such timber distributed is maintained by the Beat Guard.

#### Details of Timber Distribution to the Right Holders Paonta Sahib Forest Division from 2012-11 to 2022-23



### Total No.7.1.1 of Trees under TD

| Year    | Total No. of Trees |
|---------|--------------------|
| 2012-13 | 0                  |
| 2013-14 | 4                  |
| 2014-15 | 456                |
| 2015-16 | 496                |
| 2016-17 | 371                |
| 2017-18 | 333                |
| 2018-19 | 55                 |
| 2019-20 | 05                 |
| 2020-21 | 07                 |
| 2021-22 | 305                |
| 2022-23 | 190                |

It is to be noted that 90 % of the Timber Distribution to right holders is for Sal species (*Shorea robusta*) and remaining includes Shisham (*Dalbergia Sissoo*).

### 7.1.2 Trees for cremation (right holders): -

The range-wise details for distribution of trees to right-holders for cremation purpose is summarized below.

**Fig No. 7.1.2**

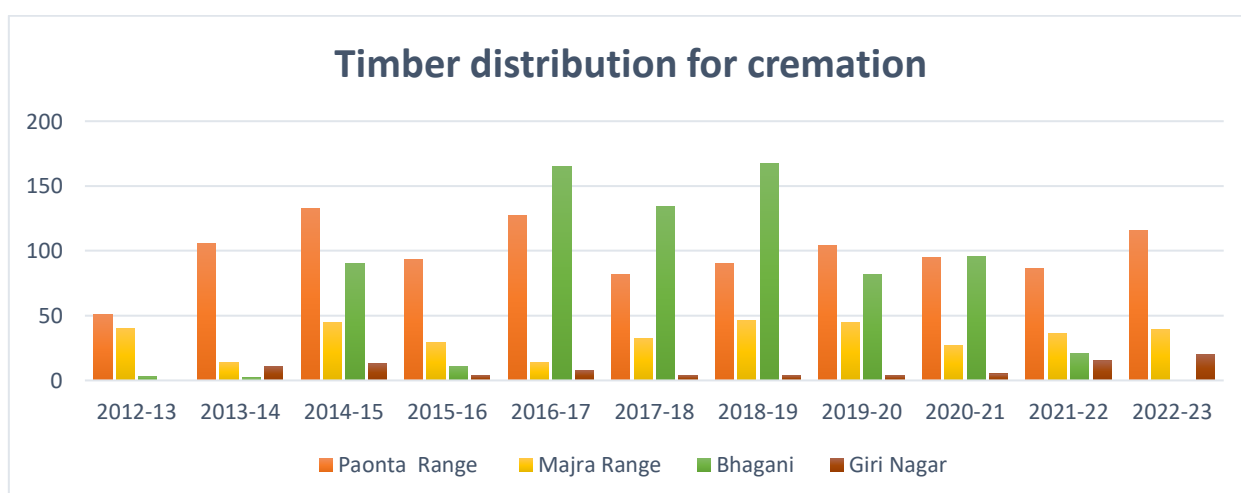




**Table No. 7.1.2**

| Sr. No. | Year    | Paonta Sahib | Majra | Bhagani | Giri Nagar | Total |
|---------|---------|--------------|-------|---------|------------|-------|
| 1       | 2012-13 | 51           | 40    | 3       | 0          | 94    |
| 2       | 2013-14 | 106          | 14    | 2       | 11         | 133   |
| 3       | 2014-15 | 133          | 45    | 90      | 13         | 281   |
| 4       | 2015-16 | 93           | 29    | 11      | 4          | 137   |
| 5       | 2016-17 | 127          | 14    | 165     | 8          | 314   |
| 6       | 2017-18 | 82           | 32    | 134     | 4          | 252   |
| 7       | 2018-19 | 90           | 46    | 167     | 4          | 307   |
| 8       | 2019-20 | 104          | 45    | 82      | 4          | 235   |
| 9       | 2020-21 | 95           | 27    | 96      | 5          | 253   |
| 10      | 2021-22 | 86           | 36    | 21      | 15         | 158   |
| 11      | 2022-23 | 116          | 39    | 0       | 20         | 175   |

**7.1.3 Salvage markings** include fallen trees diseased and dry standing timber. The lots of such trees are prepared on annual basis and are handed over to the Himachal Pradesh State Forest Corporation for felling and extraction. The detail of salvage removals from 2012-13 to 2022-23 is as under.

**7.1.3 Salvage abstract year wise volume-wise for 2012-13 to 2022-23**

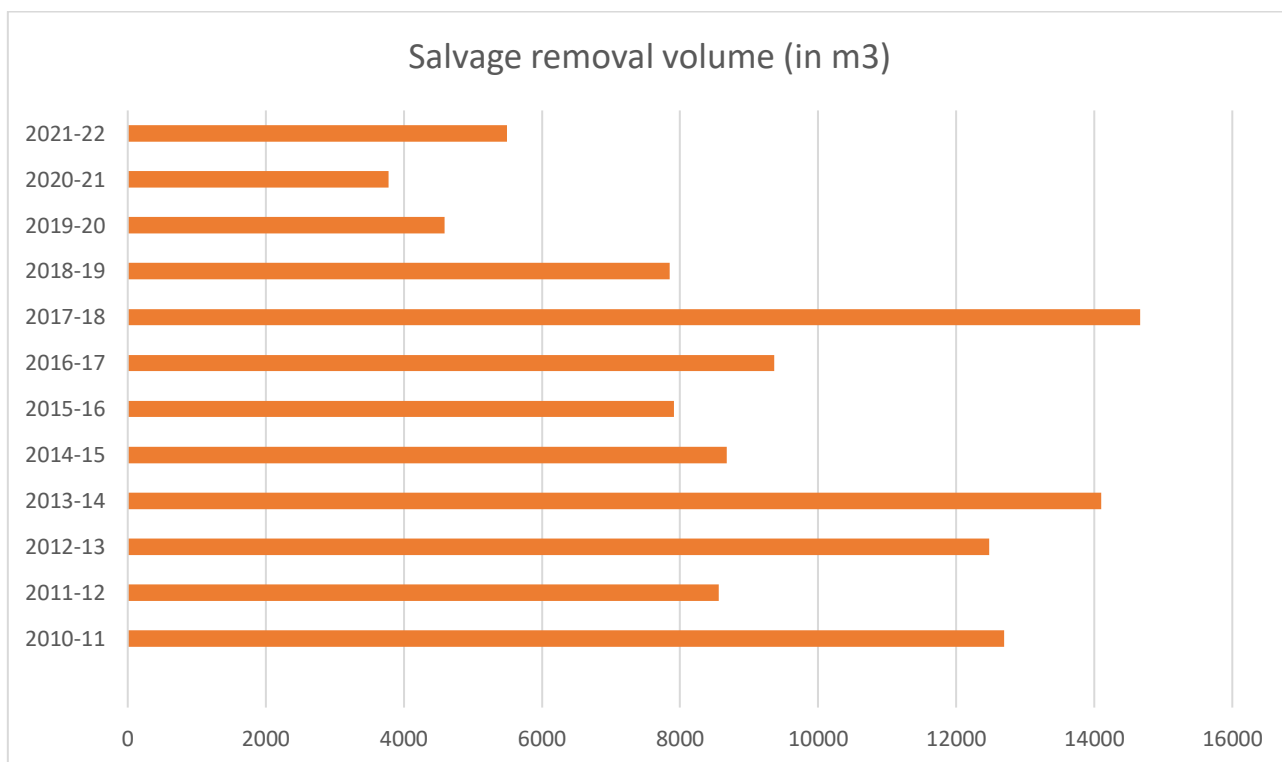


**Figure no.:- 7.1.3**

**Table No.: - 7.1.3(a)**

| Year    | Salvage removal volume (in m <sup>3</sup> ) |
|---------|---------------------------------------------|
| 2010-11 | 12695.859                                   |
| 2011-12 | 8559.8671                                   |
| 2012-13 | 12481.8984                                  |
| 2013-14 | 14104.839                                   |
| 2014-15 | 8675.715                                    |
| 2015-16 | 7911.565                                    |
| 2016-17 | 9365.0884                                   |
| 2017-18 | 14667.8786                                  |
| 2018-19 | 7849.2136                                   |
| 2019-20 | 4591.4356                                   |
| 2020-21 | 3778.7729                                   |
| 2021-22 | 5490.3485                                   |

**Species-wise abstract of Salvage removal abstracts in the last 10 years**

**Table No.: - 7.1.3(b)**

| VOLUME EXTRACTED (M <sup>3</sup> ) |          |           |          |          |            |          |          |        |        |           |
|------------------------------------|----------|-----------|----------|----------|------------|----------|----------|--------|--------|-----------|
| YEAR                               | Chil     | Sal       | Sain     | Shisham  | Eucalyptus | Kokat    | Khair    | Toon   | Poplar | Total     |
| 2013-14                            | 696.688  | 10320.918 | 1650.341 | 110.648  | 78.86      | 875.137  | 368.449  | 3.998  | 0      | 14105.04  |
| 2014-15                            | 221.055  | 6357.416  | 851.192  | 189.796  | 44.31      | 580.341  | 429.808  | 1.797  | 0      | 8675.715  |
| 2015-16                            | 336.166  | 5812.844  | 689.458  | 110.147  | 45.726     | 466.94   | 450.185  | 0      | 0      | 7911.466  |
| 2016-17                            | 383.4524 | 7215.318  | 603.485  | 175.859  | 39.512     | 404.983  | 559.326  | 1.153  | 0      | 9365.0884 |
| 2017-18                            | 253.165  | 6752      | 554.5    | 140.741  | 58.752     | 342.676  | 377.143  | 1.153  | 0      | 8480.125  |
| 2018-19                            | 344.096  | 5749.283  | 445.234  | 211.36   | 51.3       | 382.857  | 647.593  | 0.643  | 16.851 | 7849.2136 |
| 2019-20                            | 454.6256 | 3059.152  | 441.908  | 92.926   | 29.14      | 289.388  | 191.921  | 20.185 | 12.19  | 4591.436  |
| 2020-21                            | 82.2054  | 2572.7434 | 200.591  | 124.8384 | 66.0499    | 434.2958 | 277.406  | 13.272 | 7.371  | 3778.7729 |
| 2021-22                            | 537.0745 | 3276.862  | 364.05   | 102.249  | 60.078     | 603.634  | 521.95   | 24.451 | 0      | 5490.3485 |
| 2022-23                            | 339.0861 | 3625.912  | 424.912  | 150.792  | 61.77      | 366.122  | 304.214  | 8.903  | 0      | 5281.7111 |
| TOTAL                              | 3647.614 | 54742.45  | 6225.671 | 1409.356 | 535.4979   | 4746.374 | 4127.995 | 75.555 | 36.412 | 75546.924 |

**Figure No 7.1.3(b)**

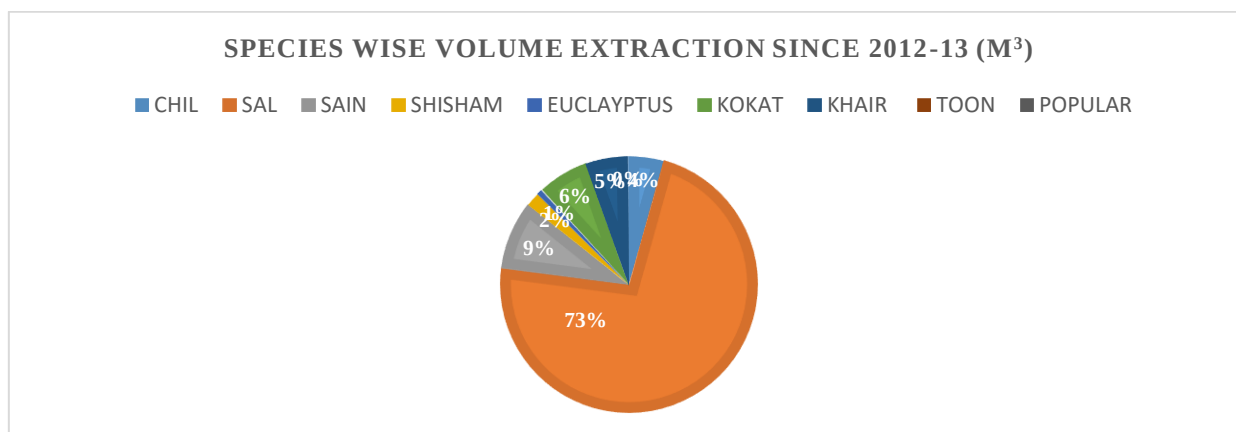
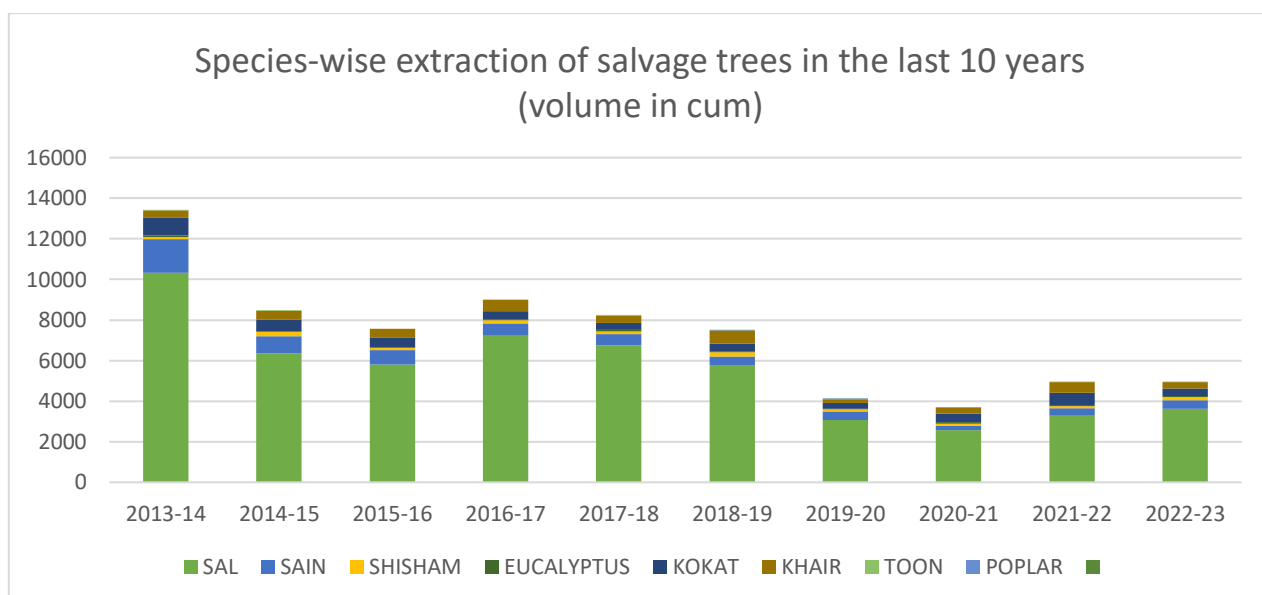


**Figure No.: - 7.1.3(b)**



As can be seen, the extraction for salvage removal is in consonance with the actual proportion of species distribution in the forests of Paonta Sahib Forest Division. Sal is the species undergoing maximum extraction under salvage removal, followed by Sain and Kokat species.

**7.1.4. Removals under F.C.A & F.R.A cases:** Trees involved in the land diverted under Forest Conservation Act, 1980 cases and which are to be removed for developmental activities under Forest Rights Act, 2006 are marked and handed over to HPSFC for felling and extraction. The last 10-year details of FRA and FCA cases have been given in **Appendix V**.

#### **7.1.5 Experimental Silviculture Felling Program:-**

In 2018, the Hon'ble Supreme Court of India lifted a 22 -year old ban on green felling on an experimental basis in three divisions of Himachal Pradesh, one of which included Sal working area of Paonta Sahib Forest Division in Paonta Sahib Range. Consequently, Government of India approved the Management Plan for experimental Silviculture Felling of Sal trees in Paonta Sahib Forest Division for the year 2018-19 to 2019-20. The details of timber removals under experimental Silviculture Felling Program is as under

**Table No: - 7.1.5 (a)**

| Silviculture Felling Programme 2018-19 of Paonta Sahib Forest Division |             |                                |             |            |     |                   |                    |                  |
|------------------------------------------------------------------------|-------------|--------------------------------|-------------|------------|-----|-------------------|--------------------|------------------|
| Sr. No                                                                 | Code No     | Compartment / RF & area in ha. | Area in ha. | Lot No.    | Spp | Total no. of Tree | Volume Handed Over | Handed over Date |
| 1                                                                      | P/1-2018-19 | RF Rajban C-6                  | 30.96       | 28/2018-19 | Sal | 225               | 197.441            | 13.11.18         |

|   |             |                  |      |            |              |                  |                               |          |
|---|-------------|------------------|------|------------|--------------|------------------|-------------------------------|----------|
| 2 | P/3-2018-19 | RF Rajban C-10   | 8.57 |            | Sal          | 496              | 1019.263                      |          |
|   |             |                  |      |            | <b>Total</b> | <b>721</b>       | <b>1216.704</b>               |          |
| 3 | P/2-2018-19 | RF Kukron C-14   | 20   | 30/2018-19 | Sal          | 988              | 2609.069                      | 13.11.18 |
| 4 | P/4-2018-19 | RF Gorakhpur C-7 | 20   | 29/2018-19 | Sal          | 1408             | 2538.868                      | 13.11.18 |
| 5 | E/1-2018-19 | RF Giri C-2      | 8.5  | 32/2018-19 | Eucalyptus   | 379              | 189.944                       | 16.01.19 |
|   |             |                  |      |            | Total:       | <b>3496 Nos.</b> | <b>6554.585 m<sup>3</sup></b> |          |

**Table No.: - 7.1.5 (b)**

| Silviculture Felling Programme 2019-20 of Paonta Sahib Forest Division |                |                                    |            |       |                   |                                |                  |
|------------------------------------------------------------------------|----------------|------------------------------------|------------|-------|-------------------|--------------------------------|------------------|
| Sr. No                                                                 | Code No        | Compartment/RF & area in ha.       | Lot No.    | Spp.  | Total no. of Tree | Volume Handed Over             | Handed over Date |
| 1                                                                      | P/4(B)-2019-20 | Gorakhpur C-7 (30 hec.)            | 01/2019-20 | Sal   | 1411              | 2226.449                       | 30.07.2019       |
| 2                                                                      | P/5-2019-20    | Rajban C-7 (7.50 hec.)             | 02/2019-20 | Sal   | 26                | 46.764                         | 30.07.2019       |
| 3                                                                      | P/2(B)-2019-20 | Kukron C-14 (25 hec.)              | 03/2019-20 | Sal   | 752               | 1550.617                       | 30.07.2019       |
| 4                                                                      | P/8-2019-20    | Lai C-28 (22.56 hec.)              | 04/2019-20 | Sal   | 1021              | 1888.265                       | 30.07.2019       |
|                                                                        |                |                                    |            | Eucl. | 118               | 41.034                         |                  |
|                                                                        |                | <b>Total of lot No. 04/2019-20</b> |            |       | <b>1139</b>       | <b>1929.299</b>                |                  |
| 5                                                                      | P/6-2019-20    | RF Kukron C-15 (70.12 hec.)        | 17/2019-20 | Sal   | 1270              | 2764.149                       | 18.09.2019       |
| 6.                                                                     | P/7-2019-20    | RF Gorakhpur C-7 (50 ha.)          | 18/2019-20 | Sal   | 2545              | 5060.434                       | 30.09.2019       |
|                                                                        |                | <b>Grand total:-</b>               |            |       | <b>7143 Nos</b>   | <b>13577.712 m<sup>3</sup></b> |                  |

The details of Royalty Rates (in Rs.) for the last 10 years have also been provided for understanding the demand-supply dynamics of various species of economic value.

**Table No.:- 7.1.5 (c)**

| Sr. No. | Year    | Chil | Eucalyptus | Shisham/Tun | Sain | Sal  | Khair | Other/BL |
|---------|---------|------|------------|-------------|------|------|-------|----------|
| 1       | 2012-13 | 739  | 1416       | 2928        | 2006 | 1467 | 794   | 300      |
| 2       | 2013-14 | 693  | 1790       | 3421        | 2001 | 1376 | 1190  | 457      |
| 3       | 2014-15 | 774  | 2181       | 4018        | 1924 | 1280 | 1719  | 453      |
| 4       | 2015-16 | 637  | 2284       | 3142        | 1825 | 1335 | 1473  | 270      |
| 5       | 2016-17 | 535  | 2656       | 3119        | 2114 | 1356 | 1781  | 459      |
| 6       | 2017-18 | 468  | 2060       | 3628        | 1769 | 1340 | 2570  | 428      |
| 7       | 2018-19 | 626  | 1665       | 4094        | 2045 | 1882 | 2829  | 450      |
| 8       | 2019-20 | 809  | 1742       | 4242        | 2562 | 2632 | 2046  | 359      |
| 9       | 2020-21 | 338  | 790        | 2198        | 1192 | 2082 | 1318  | 254      |
| 10      | 2021-22 | 308  | 803        | 1934        | 1146 | 2062 | 1337  | 613      |

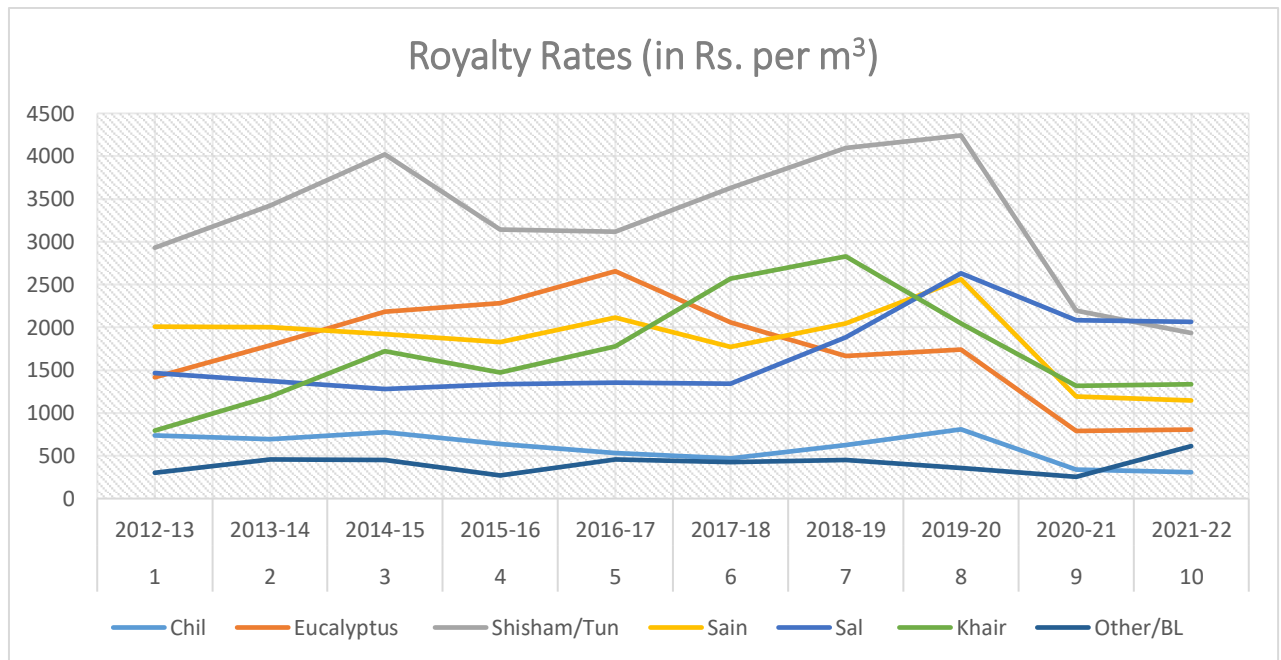
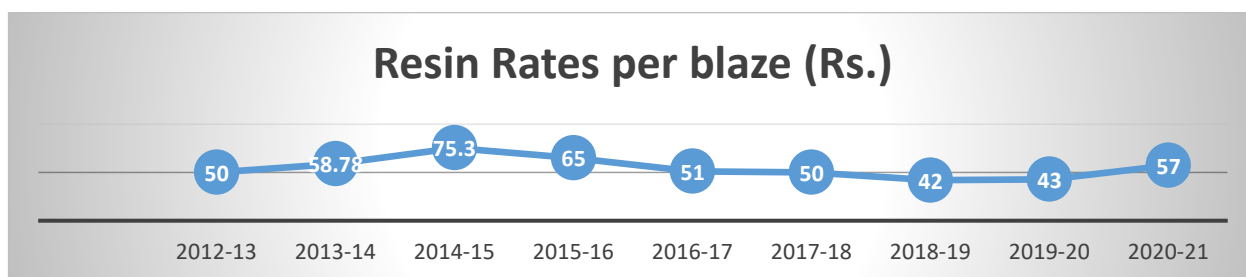


**Figure No.:- 7.1.5 (c)**

**Resin Rates available for extraction: -**



## 7.2 RECORDED REMOVAL OF FUELWOOD:

The locals have been granted rights and concessions as per the Settlement report for collection of dry fallen fuelwood for bonafide use. However, no such record is maintained. The use of fuelwood for cooking has also reduced due to popular Government schemes like Pradhan Mantri Ujjwala Yojana.

**7.3 RECORDED REMOVAL OF LOCALLY IMPORTANT NTFPS:** While recorded removal has not been done, there is limited scope of planting, augmentation, harvest and marketing of NTFPs in these forests.

## 7.4 DEMAND AND SUPPLY OF TIMBER AND IMPORTANT NON-TIMBER FOREST PRODUCTS:

Local timber market is established. Khair is traded for its heartwood. A local katha factory in Majra Range has demand for Khair wood. It also imports timber from other states.

Road network being extensive, timber and non-timber products are traded far and wide. The rates of timber have increased manifold in the past decade due to increased demand and inadequate availability of timber

### 1. Detail of Katha factories registered as depot in Paonta Sahib Forest Division -:

| SR. NO | NAME & ADDRESS                                                                        | RANGE |
|--------|---------------------------------------------------------------------------------------|-------|
| 1      | Doon Katha Udyog, Vill. Jagatpur P.O Misserwala Teh. Paonta Sahib Dist. Sirmour (H.P) | MAJRA |

### 2. Number of Saw mills and depots registered under Himachal Pradesh (Sale of Timber Act, 1968)

| Sr. No | Name of Range | Total No. Of Saw Mills |
|--------|---------------|------------------------|
| 1      | Bhagani       | 11                     |
| 2      | Paonta Sahib  | 28                     |
| 3      | Majra         | 10                     |
| 4      | Girinagar     | 6                      |

|  |              |           |
|--|--------------|-----------|
|  | <b>Total</b> | <b>55</b> |
|--|--------------|-----------|

**3. Number Of Imported Sale Depots Registered Under H.P (Sale Of Timber Act, 1968)**

| <b>Sr. No</b> | <b>Name of Range</b> | <b>Total No. Of Saw Mills</b> |
|---------------|----------------------|-------------------------------|
| 1             | Bhagani              | 0                             |
| 2             | Paonta Sahib         | 3                             |
| 3             | Majra                | 1                             |
| 4             | Girinagar            | 1                             |
|               | <b>Total</b>         | <b>5</b>                      |

**4. Number of Private Sale Depots Registered Under Himachal Pradesh (Sale Timber Act, 1969)**

| <b>Sr. No</b> | <b>Name of Range</b> | <b>Total No. Of Private Sale Depots</b> |
|---------------|----------------------|-----------------------------------------|
| 1             | Bhagani              | 3                                       |
| 2             | Paonta Sahib         | 3                                       |
| 3             | Majra                | 4                                       |
| 4             | Girinagar            | 0                                       |
|               | <b>Total</b>         | <b>10</b>                               |

**5. Number of Furniture Shops Registered**

| <b>Sr. No</b> | <b>Name of Range</b> | <b>Total No. Of Furniture Workshops</b> |
|---------------|----------------------|-----------------------------------------|
| 1             | Bhagani              | 4                                       |
| 2             | Paonta Sahib         | 2                                       |
| 3             | Majra                | 10                                      |
| 4             | Girinagar            | 9                                       |
|               | <b>Total</b>         | <b>25</b>                               |

It is to be noted that demand of timber of native Species like Sal, Shisham is on a decline subjected to less availability and high rates. In order to meet the over increasing demand of timber many imported Sale depots dealing in Malaysian Sal, Imported Pine have been registered in Paonta Sahib Forest Division. Under H.P (Sale of Timber Act ,1968).

## CHAPTER 8

### MAINTENANCE AND ENHANCEMENT OF SOCIAL, ECONOMIC, CULTURAL AND SPIRITUAL BENEFITS

As envisaged in the National Forest Policy, 1988 the participation of people in the protection, management and development of forests has assumed more and more significance over the years. In order to make the local communities as protectors and managers of forests rather than destroyers, there is an urgent need to establish a continuous dialogue with them. It is felt that foresters and local communities should work together in the formulation of plans for the management of forest resources. It is also envisaged that local communities would participate in the decision-making process on choice of species to be planted, areas to be afforested, protection of forests and benefit-sharing of usufructs. The concept of Joint Forest Management has been developed after a series of experiments and resolutions.

It is also crucial for identification of various ecotourism destinations holding future potential for sustainable ecotourism development as well as creating livelihood generation opportunities for different stakeholders in forest and natural resources management and conservation. The training, capacity building of identified stakeholders and user groups in effective management of ecotourism assets is also to be ensured that can be linked with Joint Forest Management concept.

#### 8.1 NUMBER OF JFM COMMITTEES

**Table 8.1 Status of JFMCs in respect of Paonta Sahib Forest Division (Registered under Society Act, 1860)**

| Sr. No. | Name of JFMC                                      | Name of Range | Date of Registration of JFMC | Area       | Functionality |
|---------|---------------------------------------------------|---------------|------------------------------|------------|---------------|
| 1       | Van Sarankshan Samiti, Ram Nagar                  | Bhagani       | 2008-09                      | Bhagani    | Active        |
| 2       | Mahila Van Evam Paryavaran Surksha Samiti, Amboya | Bhagani       | 2008-09                      | Amobya     | Active        |
| 3       | Van Vikas Evam Sarankshan Samiti, Khodowala.      | Bhagani       | 2008-09                      | Khodowala  | Active        |
| 4       | Sayed Peer Evam vikash Samiti, Gorkhuwala         | Bhagani       | 2008-09                      | Gorkhuwala | Active        |



|    |                                                 |              |         |              |               |
|----|-------------------------------------------------|--------------|---------|--------------|---------------|
| 5  | Van Samrat Vikash Samiti, Gorkhuwala.           | Bhagani      | 2008-09 | Gorkhuwala   | <b>Active</b> |
| 6  | Baba Balanath Vikas Samiti Khodowala.           | Bhagani      | 2009-10 | Khodowala    | <b>Active</b> |
| 7  | Nagdevta Van Vikas Samiti                       | Bhagani      | 2009-10 | Puruwala     | <b>Active</b> |
| 8  | Jai Santoshi Maa Van Samiti, Pager Tuniwala     | Bhagani      | 2009-10 | Puriwala     | In-active     |
| 9  | Guru Van Vikas Samiti, Khorowala                | Bhagani      | 2009-10 | Khoronwala   | <b>Active</b> |
| 10 | Gram Van Vikas Evam Sarnkshan Samiti, Dandiwal  | Bhagani      | 2008-09 | Dandiwal     | In-active     |
| 11 | Van Vikas Samiti, Gojjar                        | Bhagani      | 2008-09 | Gojjar       | In-active     |
| 12 | Gramin Harit Vikas Samiti Killour.              | Bhagani      | 2008-09 | Killour      | <b>Active</b> |
| 13 | Paryavaran Suraksha Pilhori.                    | Majra        | 2008-09 | Pilhori      | <b>Active</b> |
| 14 | Van Vikas Samiti Pilhori.                       | Majra        | 2008-09 | Pilhori      | <b>Active</b> |
| 15 | Shiv Vikas Samiti Kumbhigarh                    | Paonta Sahib | 2008-09 | Kumbhigarh   | In-active     |
| 16 | Van Vikas Samiti, Malgi.                        | Paonta Sahib | 2009-10 | Malgi        | <b>Active</b> |
| 17 | Mahila Mandal Dadwa Kailla                      | Paonta Sahib | 2009-10 | DedwaKailla  | In-active     |
| 18 | Van Vikas Samiti Dhigali.                       | Bhagani      | 2008-09 | Dhigali      | Active        |
| 19 | Van Vikas Samiti Kansar                         | Girinagar    | 2009-10 | Kansar       | Active        |
| 20 | Van Sangini Mahila Mandal Bharog Baneri.        | Girinagar    | 2009-10 | BharogBaneri | Active        |
| 21 | Van Vikas Samiti Purli                          | Girinagar    | 2009-10 | Purli        | In-active     |
| 22 | Van Vikas Samiti Majra                          | Majra        | 2010-11 | Majra        | In-active     |
| 23 | Shiva Van Vikas Samiti Sirmouri Tal             | Paonta Sahib | 2011-12 | Sirmouri Tal | Active        |
| 24 | Shri Radhe Krishan, Van Vikas Samiti, Ambiwala. | Bhagani      | 2016-17 | Ambiwala     | Active        |
| 25 | Baba Balaknath Van Vikas Samiti, Danda          | Bhagani      | 2008-09 | Khorowala    | Active        |
| 26 | Forest Development Committee, Dhoulakuan        | Majra        | 2019-20 | Dhoulakuan   | Active        |
| 27 | Van Vikas Samiti, Kansar                        | Girinagar    | 2022-23 | Kansar       | Active        |

To address the long-standing problems of deforestation and land degradation, the approach of involving local communities in an effective and meaningful manner, is gaining acceptance significantly. Even the present National Forest Policy 1988, emphasizes on participatory management and common property management. It also specifically mentions that to achieve the objectives of the policy, a massive people's movement should be created, especially involving women. Consistent with the NFP of 1988, the Government of India, on 1<sup>st</sup> June 1990, issued policy instruction to all state governments supporting greater participation of village

communities and NGOs in regeneration, management and protection of the forests. In keeping with the above notification, the Government of Himachal Pradesh has formulated a policy vide No. Forest(C) 3-4/80-V dated 12.5.1993, supporting Joint management arrangements. Ever since village communities are being involved by the Forest Department to further the aim of protection and management of forests and continuation of forest cover. The recognition of the link between socio-economic incentives and forest development has been singularly responsible in eliciting community participation. A new resolution of the Ministry of Environment and Forests dated February 21, 2000 has further strengthened the JFM program and this circular inter alia contemplates:

- (a) Legal back up to the JFM committees;
- (b) 50% members of the General Body should be women.
- (c) Extension of JFM in good forests areas, with sharper focus on activities concentrating on NTFP/NWFP management.

This resolution is an attempt to evolve a proactive and people friendly framework for meaningful implementation of the program, though the detailed operational modalities to translate these concerns have not been spelt out.

There are various schemes and projects, initiated by the H.P. Government and some financed through External agencies e.g. externally aided projects that lay emphasis on people's involvement in forestry and schemes like 'Sanjhi Van Yojana', 'Van Samridhi Jan Samridhi Yojana' and 'Samudayik Van Samvardhan Yojana' aimed at strengthening people's participation in sustainable forest management through a sense of joint ownership. The Government of Himachal Pradesh had also issued a notification No. Fts-II(B)15-10/87 dated 23<sup>rd</sup> August 2001, called the Himachal Pradesh Participatory Forest Management Regulations, 2001. These rules shall be applicable to such government forests and lands, including common lands, where participatory management is envisaged.

## **8.2 STATUS OF EMPOWERMENT OF JFMCS**

The JFMCs are constituted under Forest Development Agency (FDA) which is already registered under the Societies Act. The flow of fund is designed in a purely "Decentralized Module" and the JFMCs have been empowered to draw the sanctioned fund and execute the works after taking resolution from the Gram Sabha. The President, who is a villager, heads the JFMC with other Executive Members who are also from the same village. The Block Officer is the Member Secretary of a particular JFMC. The Committee must have at least a Member of the Panchayat. The Block Officer cum Member Secretary maintains the "Joint Account" in the Bank with the

President of the JFMC and can draw fund jointly as per sanctioned work and after due resolution in Gram Sabha. The villagers of a particular village(S) are the 'General Members' of the JFMC. The Executive Committee can be changed periodically if the Members decide so. All other activities are performed as per Societies Act. Out of all the JFMCs registered in the Division, two JFMCs have conspicuously done well in field of forest conservation and protection. The detail of their works discussed as under: -

**1) Mahila Van Evam Paryavaran Suraksha Samiti: -**

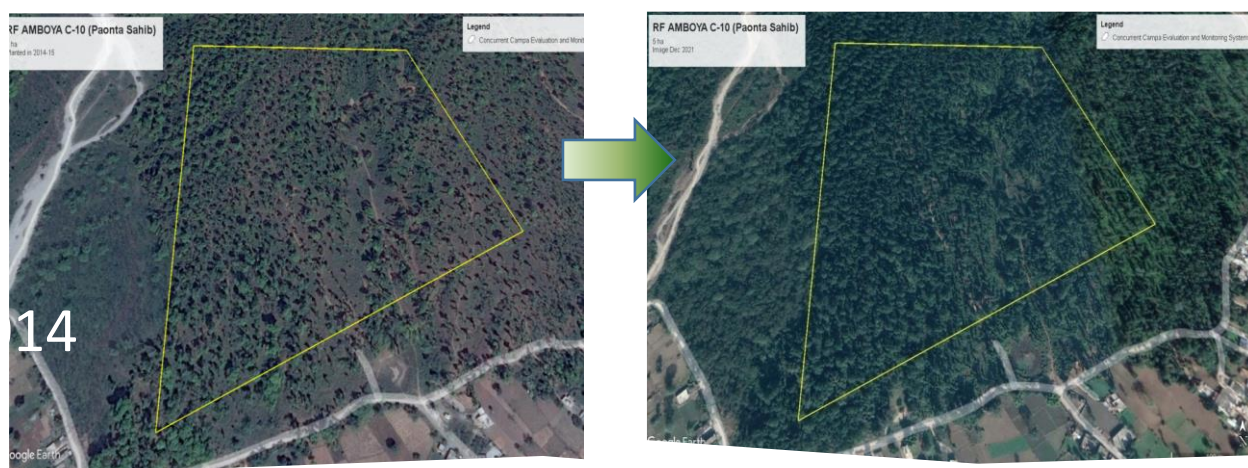
Mahila Van Evam Paryavaran Suraksha Samiti, Amboya has been constituted in 2008-09 at village Amboya of Amboya beat of Bhagani Range and registered under Himachal Pradesh Societies Registration Act 2006. The JFMC has received the Certificate of 'Best Joint Forest Management Committee' by PCCF (HoFF), HP during 2013-14. Further, it has also received Mukhyamantri Sarvottam Van Prabandhan Samiti Puraskar for its exemplary works in the field of forest conservation during 2019-2020. The JFMC has undertaken plantation and protection works on forest land, thereby converting open/degraded forest areas into dense vegetation cover. The committee has faced various challenges during their journey of forest protection and conservation. There is presence of live stock livestock in vicinity, which puts pressure on forest resource, especially the ones protected by the JFMC, thereby inviting tension with fellow villagers. The women constituting the JFMC are illiterate and engaged in day long household works, yet they are able to find out time for conservation. There has been delay in the provision of funds, yet all the seasonal plantation works has been completed by the committee well within the time. Before working in association with forest department, the group showed dedication towards forest protection by discouraging grazing, lopping, felling in forests nearby their native village. Starting from year 2009-10 onwards, the committee was engaged in plantation works by Paonta Sahib Forest division of Himachal Pradesh forest department via funding from Forest Development Agency (FDA) at division level. The committee held regular monthly meetings where they charted strategy to carry out the works. Maintenance works were also completed by the committee on time so as to aid the planted material in successive years. Members also maintained vigil of the planted areas, and actively informed the concerned forest staff about any intrusion attempts be it grazing or illicit felling.

At present there's about 35 Hac of area that has been afforested by the group. This area was afforested by group in year 2007/08 in RF Amboya C-7 & C-8. Most of these patches have turned from open/degraded forests to thickly woody patches. The areas converted include NTFP areas, bamboo grooves and Sal regeneration area. After effective protection, there is an effective social fencing of the forest. Every year delegates ranging from forestry students

to trainees to in-service employees of forest department visit the group to take a firsthand experience of joint forest management.

The group has already shown success across different areas and activities, including Bamboo plantation, NTFP Plantation, enrichment plantation with broad-leave species etc. The group is a good candidate for inclusion under the forest department's new scheme 'Samudayik Van Samvardhan Yojna'.

The group has ten women, all of whom are capable of writing, yet they hold regular meeting and get their deliberations documented diligently by engaging a literate woman from the village. The group got a green dress made for its members, which is worn by them during collective exercises like meetings, field work etc. thereby displaying solidarity.



This JFMC has been constituted in 2008-09 at village Ram Nagar of Mehruwala beat of Bhagani Range. The committee has been involved in conservation and protection of forest area around village Ram Nagar by participation of locals. A five-year management plan including protection and forest conservation has been created for this Samiti, where funding of conservation work shall be provided by the department and execution work will be done by the Samiti. The Samiti has managed, the pressure of collection of fuel wood and grazing in the forests adjoining the

villages. Closure of forest areas has resulted in better regeneration. The Samiti participated in Samudayik Van Samvardhan Yojna of H.P. Forest Department in which they have closed 10 ha forest area in RF Mehruwala C-7 which has provided good regeneration results, and planting in 5 ha area has been undertaken in RF Mehruwala C-8 during 2019-20. Other villages of the vicinity have come forward for creation of forest committees after getting inspired from the works Van Sarankshan Samiti Ram Nagar. This Samiti has led to participation of villagers and inculcated the understanding for forest conservation among locals.

### **8.3 LABOR WELFARE**

All wages paid to labor are based on notified wage rates by Himachal Forest Department from time to time. The JFMC members, fringe forest dwellers are employed in all forestry related works both inside and outside RF area. Works include plantations, nursery maintenance, soil and moisture conservation works etc. Forest Villagers should be engaged in all forestry and non-forestry operations of Forest Department.

### **8.4 USE OF INDIGENOUS KNOWLEDGE**

Documentation of the indigenous traditional knowledge and incorporation of the same in the micro-plans and other prescriptions of the plan has not been done so far in the Division. During the tenure of this Working Plan traditional and indigenous knowledge will be identified and systematically documented. A list of Species for religious, medicinal, culinary and aesthetic importance have been given in **Appendix XII**.

### **8.5 EXTENT OF CULTURAL/SACRED GROVES**

There are no documented reports of the presence of any sacred grove in the Division's forests. However, Gorakhpur, Garibnath, Lai and Mahadev temples in Paonta Sahib Forest Division falling within reserved forest areas have a high spiritual value among local people, therefore also the forests nearby hold cultural and sacred importance. During the tenure of this Working Plan, the exact extent of cultural/sacred groves will be identified and systematically documented.

### **8.6 ECO-TOURISM AREAS AND ACTIVITIES**

The city of Paonta Sahib is popular among tourists across India for the famous Paonta Sahib Gurudwara. The town occupies a strategic location bordering with Uttarakhand, Uttar Pradesh and Haryana and is richly bestowed with Sal forests, riverine tracts of Yamuna, Giri, Bata and Tons and Shiwalik hills in the landscape. Col. Sher Jung National Park at Simbalwara, Renukaji wetland and sanctuary, Kalesar National Park in Haryana, Asan Bird Conservation Reserve are famous attractions of natural wealth in the vicinity. Serving as the gateway to Himachal Pradesh,

Paonta Sahib holds a lot of potential for sustainably tapping ecotourism in the area. Eco-spiritual tourism can also be tapped with various spiritual centers located in and around the town.

Camping sites, nature parks, nature trails, nature interpretation centers are all various facets of ecotourism that can be tapped in the Division. In 2017-18, the Division's first Eco-Park was opened in Rampurbeli area of Paonta Sahib Range with nature trails, landscaping, nature-awareness boards spread across. The park has been gaining traction among youngsters of the town. Similarly, Eco-restoration project under the name of Yamuna Van Vihar – for converting a dumping yard to a green zone was taken up in 2021. In 2022, Yamuna Van Vihar along the banks of Yamuna, close to Paonta Sahib Gurudwara, was opened to public and is a major tourist attraction in the area.

### **8.7 SOCIAL CUSTOMS**

The local culture has been traditionally linked with forests for basic bonafide needs of fuelwood, grazing etc. A reasonable percentage of population of the Division resides in the rural areas and many in forest fringe areas, and are dependent on natural resources for their sustenance. Traditionally, the people residing in the fringe areas collect fire wood and other timbers for making their agricultural equipment. However, in recent years the dependency of the local people on forests has greatly reduced due to changing agricultural practices. Fairs and festivals near famous spiritual sites also bring people and forests closer to one another.

### **8.8 STATUS OF COMPLIANCE OF FOREST RIGHT ACT (FRA)**

The cases under FRA approval have already been discussed in Chapter 2 of Part I.

**8.9 OTHER RIGHTS AND CONCESSIONS:** - All forests (except Shamlat areas) in Paonta Sahib Forest Division are Reserved Forests. Some concessions are incorporated in the settlement report "FAISLA-E-JANGLAT" later notified by Himachal Pradesh Govt. Notification No. Ft43-241B/49-3 dated Feb.25-1952. The following rights have been included:

Grazing of cattle and other domestic animals, lopping of miscellaneous tree species for fodder, salvage timber trees for house construction & cowsheds, dry fallen fuelwood for bonafide use, approach to drinking water sources for human being and cattle, and collection of dry wood for cremation.

The concessions have been exercised and misused to such an extent that they have threatened the very existence of forests. Details of the same have been provided in Appendix III. The rates charged from the right holders for various concession are given in Dastur-ul- Amal (Schedule of rates).

### 8.10 DEPENDENCY OF LOCAL PEOPLE ON NTFPS

NTFPs are used only for limited bonafide needs like grass collection, bamboo, gums, resins, medicinal plants. However, it is to be noted that the economic dependency on NTFPs in this Division compared to other parts of Himachal Pradesh is very low. Some of the relevant NTFPs include the following:

**Table No. 8.10**

| Sr. No. | NTFP                                  | Particulars | Uses                     |
|---------|---------------------------------------|-------------|--------------------------|
| 1.      | Amla ( <i>Emblicaofficinalis</i> )    | Fruit       | Pickles, candies         |
| 2.      | Desi Mango ( <i>Mangiferaindica</i> ) | Fruit       | Fruit                    |
| 3.      | Neem ( <i>Azadirachtaindica</i> )     | Leaves      | Medicinal use            |
| 4.      | Amaltas ( <i>Cassia fistula</i> )     | Fruits      | Medicinal                |
| 5.      | Giloe ( <i>Tinosporacordifolia</i> )  | Leaves      | Food additive, medicinal |
| 6.      | Gandla ( <i>Murrayakoengii</i> )      | Leaves      | Food additive            |
| 7.      | Basuti ( <i>Adhatodavesica</i> )      | Flower      | Medicinal                |
| 8.      | Bhabhar ( <i>Eulaliopsisbinata</i> )  | Grass       | Rope-making, mat making  |

## CHAPTER 9

### ADEQUACY OF POLICY, LEGAL & INSTITUTIONAL FRAMEWORK

#### 9.1 EXISTING POLICY AND LEGAL FRAMEWORK AND THEIR COMPLIANCE

Forest resources have been regulated since early times. The roots of legislations, policies and guidelines for natural resource management in India can be traced back to the days of British Colonialism. The relevant constitutional frameworks at the backdrop of management of forests resources are briefly enumerated as following.

##### 9.1.1 *The Constitution of India*

**Article 48** of the Directive Principles, states that the State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country.

**Article 51 A** deals with the fundamental duties of citizens, which includes the citizen's duty to value and preserve the rich heritage of our composite culture and to protect and improve the natural improvement including forests, lakes, rivers and wildlife and to have compassion for living creatures.

**Article 246** points towards the Seventh Schedule to the Constitution, which enlists (in the union list, and the concurrent list) the subjects that the Central and State governments are to legislate upon. Forest is one of the subjects placed in the Concurrent List on which both the Central and State Government shall legislate upon.

In 1952, the erstwhile Ministry of Food and Agriculture, Government of India enunciated a Forest Policy to be followed in the management of Forests in the country. Subsequently, due to large scale deforestation and diversion of forest land for non-forestry uses finally led to the formulation of a new forest policy in 1988. The Forest Policy of 1988 was a pro people document, placing greater emphasis on the ecological role of forests and recognizing for the first time the rights of the people, especially the tribals, with the direction that their domestic requirements of fuel wood, minor forest produce and construction timber would be the first charge on forest produce.



Legal protection is provided to the forest through Acts and Regulations. The Indian Forest Act, 1927 was adopted in the state before independence. The Act provide the procedure for the declaration of Protected and Reserved Forest and also control over forests, timber and other forest produce. The Indian Forest Act, 1927 (Himachal Pradesh IInd amendment 1991) prescribe the procedure for confiscation of vehicle involved in forest offences under section 52A. The Wildlife (Protection) Act 1972 as amended till date and the Wildlife Protection Rule 1995 are other Acts and Rules in force for dealing with the matter related to Wildlife in the Division. Other Acts and Rules which are held by the Division for discharging its functions for management of Forests are Himachal Pradesh (Sale of Timber) Act, 1968. Himachal Pradesh Land Preservation Act, 1978. Himachal Pradesh Public Premises and Land (Eviction and Rent Recovery) Act, 1971. Himachal Pradesh Forest Produce (Regulation of Trade) Act, 1982. Apart from this the Forest Officers of the State are empowered to take cognizance against mining related offences under Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2015. The Forest Officers are also authorized for taking cognizance against contravention of the provisions of Himachal Pradesh Non– Biodegradable (Control) Act, 1999. The Forest Conservation Act, 1980 is being implemented in the State from 25<sup>th</sup> October 1980.

## 9.2 STATUS OF APPROVED WORKING PLAN AND COMPLIANCE

*The Working Plan by Sh. Vineet Kumar was implemented from 1998-1999 to 2012-2013 which was further extended after seeking approval of Govt. of India for five-years upto 2017-2018, the prescriptions of the plan and their compliance is given in table 9.1*

**Table 9.1: Status of prescriptions and their compliance**

| Sr. No. | Prescription                                         | Working Circle            | Status                                                                                                                        |
|---------|------------------------------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 1.      | Closure for grazing                                  | All Circles               | Not strictly implemented                                                                                                      |
| 2.      | Felling / removals                                   | Sal, Chil, Coppice        | Not implemented due to ban on green felling except in experimental green felling programme under Hon'ble Supreme court orders |
| 3.      | Soil and water conservation measures                 | All Circles               | Carried out under State Plan, CAMPA and other schemes. However, many areas were left untreated                                |
| 4.      | Plantations                                          | Plantation Working Circle | Plantations done in certain areas as discussed in Chapter 6, but some blank areas also exist for future plantations           |
| 5.      | Active participation of Forest Protection Committees | All Circles               | Some success models discussed in Chapter 5 & 8 of Part I. However, more scope for comprehensive and proactive engagement      |

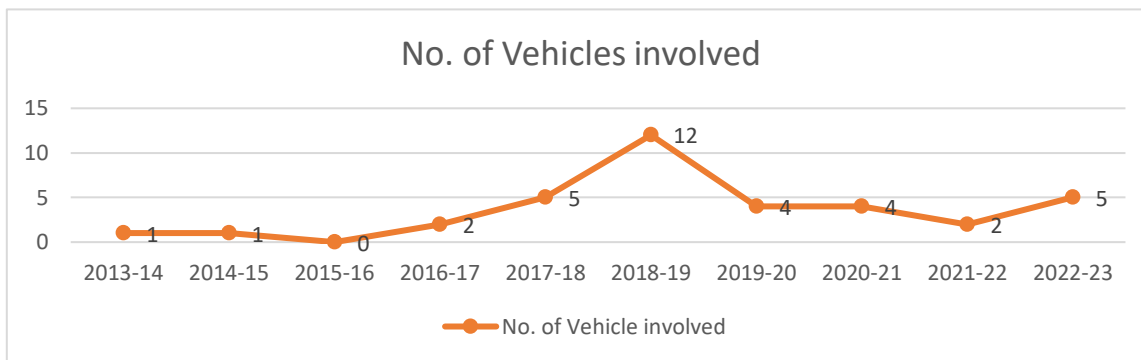
|    |                                               |                  |                                                                                                                                                                                            |
|----|-----------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                                               |                  | of these committees                                                                                                                                                                        |
| 6. | Construction of new buildings                 | Misc-regulation  | Some new buildings were constructed as per requirement for field staff and ministerial staff as well as upgradation of Forest Rest Houses basis budget allotment                           |
| 7. | Checking and maintenance of forest boundaries | Misc. regulation | Not done as per program provided. However, in Paonta Sahib Range this has been completed in compliance of Hon'ble Supreme Court directions under Experimental Silviculture Felling program |

### 9.3 NUMBER OF FOREST OFFENCES

The forest offences registered can be categorized into 5 categories. Illicit felling from forest land/ Govt. land is dealt under the provisions of section 26 of IFA 1927 and in cases involving theft of timber, FIR is registered under section 379 of IPC. Cases involving smuggling of timber and violation transit rules are booked under section 41 and 52A of IF Act. Petty offences like grazing and lopping in prohibited areas are the most common type of offences involving local right holders and the objective behind these offences is the fulfillment of bonafide livelihood needs. The offences categorized as others include violation of land preservation act, 1978, Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2015, Mining from forest land, collection of fuelwoods, cutting of saplings from forest and dumping of garbage in forest land.

**Table 9.2a: Year wise No. of Vehicles involved apprehended u/s 52 A**

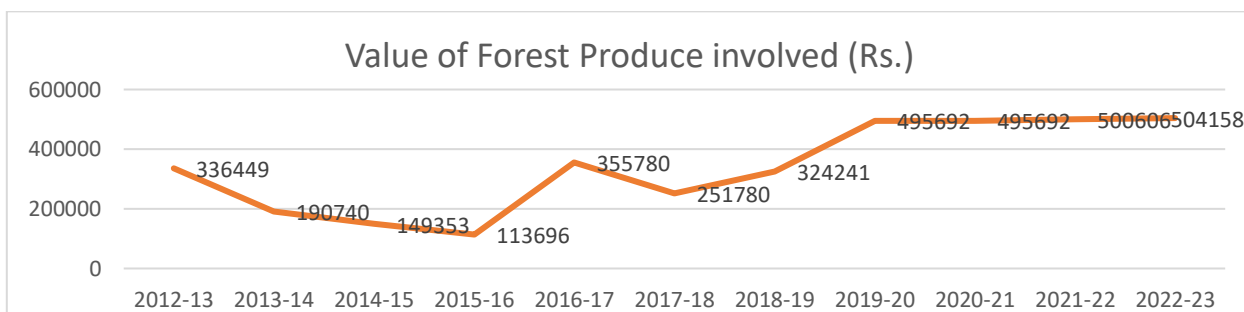
| Year    | No. of Cases | No. of Vehicle involved |
|---------|--------------|-------------------------|
| 2013-14 | 1            | 1                       |
| 2014-15 | 1            | 1                       |
| 2015-16 | 0            | 0                       |
| 2016-17 | 1            | 2                       |
| 2017-18 | 3            | 5                       |
| 2018-19 | 7            | 12                      |
| 2019-20 | 3            | 4                       |
| 2020-21 | 3            | 4                       |
| 2021-22 | 2            | 2                       |
| 2022-23 | 4            | 5                       |



**Table**

### 9.2b: ILLICIT FELLING CASES DETECTED

| Year    | No. of cases |
|---------|--------------|
| 2012-13 | 24           |
| 2013-14 | 21           |
| 2014-15 | 19           |
| 2015-16 | 26           |
| 2016-17 | 24           |
| 2017-18 | 23           |
| 2018-19 | 24           |
| 2019-20 | 26           |
| 2020-21 | 26           |
| 2021-22 | 27           |
| 2022-23 | 27           |



### Table 9.2c: LOPPING CASES DETECTED

| Year    | No. of cases |
|---------|--------------|
| 2012-13 | 989          |
| 2013-14 | 872          |
| 2014-15 | 849          |
| 2015-16 | 855          |
| 2016-17 | 857          |

|                |     |
|----------------|-----|
| <b>2017-18</b> | 861 |
| <b>2018-19</b> | 817 |
| <b>2019-20</b> | 876 |
| <b>2020-21</b> | 861 |
| <b>2021-22</b> | 864 |
| <b>2022-23</b> | 832 |

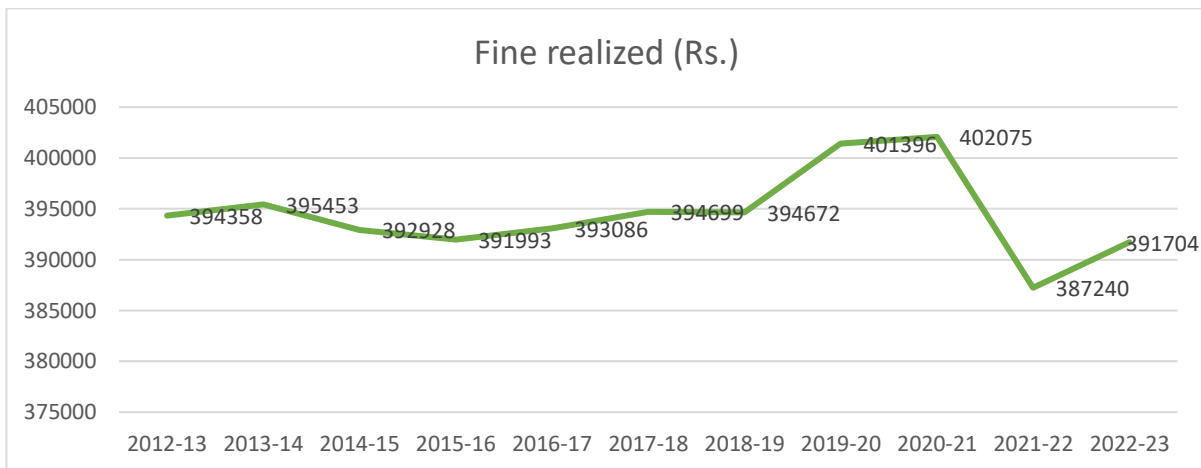
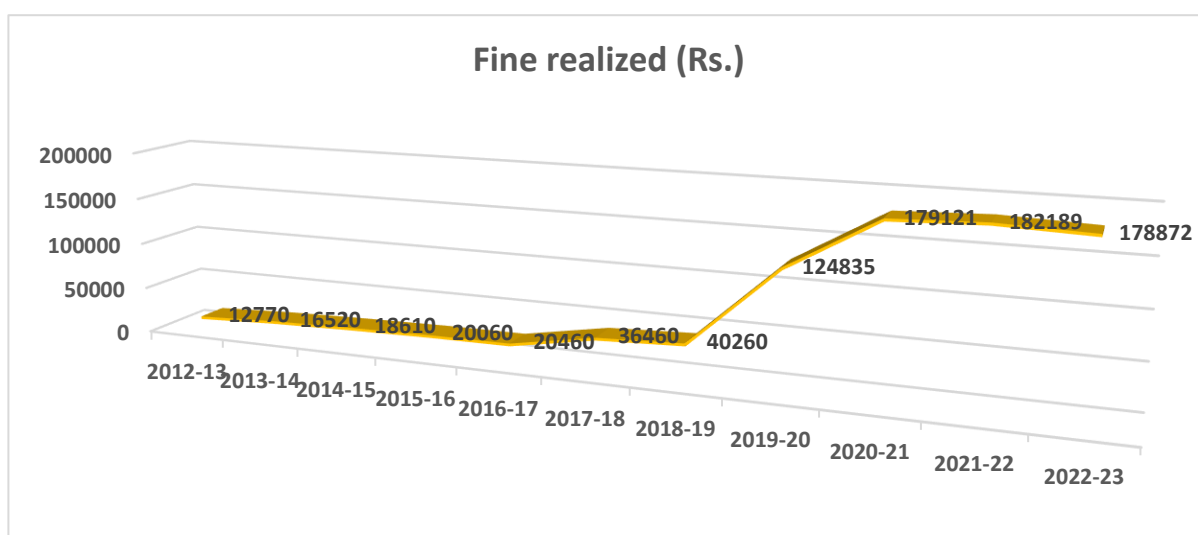


**Table 9.2d: GRAZING CASES DETECTED**

| <b>Year</b>    | <b>No. of cases</b> |
|----------------|---------------------|
| <b>2012-13</b> | 202                 |
| <b>2013-14</b> | 200                 |
| <b>2014-15</b> | 201                 |
| <b>2015-16</b> | 200                 |
| <b>2016-17</b> | 202                 |
| <b>2017-18</b> | 203                 |
| <b>2018-19</b> | 206                 |
| <b>2019-20</b> | 145                 |
| <b>2020-21</b> | 153                 |
| <b>2021-22</b> | 159                 |
| <b>2022-23</b> | 160                 |



Paonta Sahib Forest Division share its borders with Haryana and Uttrakhand and is sensitive in terms of timber smuggling and illegal mining. The conditions of Working for the field staff are very challenging and handful incidences have been encountered in which the frontline staff got assaulted by the offenders while discharging their duties.

**Table 9.2e: Overview of the cases of assault against forest department officials of Paonta Sahib Forest Division, Himachal Pradesh**

| Sr. No. | Range        | Date of incidence | Name of Forest Staff       | Action taken by State Govt.                                                    |
|---------|--------------|-------------------|----------------------------|--------------------------------------------------------------------------------|
| 1       | Majra        | 03.04.2017        | Sh. Vijay Singh Fgd.       | FIR No. 0137 dated 4.4.2017 registered at P.S                                  |
| 2       | Majra        | 12.02.2019        | Sh. Amrik Singh, Fgd       | FIR No. 0054 dated 12.2.2019 registered at P.S                                 |
| 3       | Paonta Sahib | 30.03.2020        | Sh. Hari Singh, Dy. Ranger | FIR No. 0029 dated 30.3.2020 registered at P.S Puruwala                        |
| 4       | Bhagani      | 19.05.2020        | Sh Dhanvir Singh, Fgd      | FIR lodge with Police. Puruwala                                                |
| 5       | Bhagani      | 16.02.2021        | Sh. Praveen Kumar, Fgd     | Complaint case file in Ld. ACJM Court Paonta Sahib U/s 186, 504/IPC and 26/IFA |
| 6       | Paonta Sahib | 05.03.2022        | Smt Seema Devi, Fgd        | FIR No. 0033 dated 08.03.22                                                    |
| 7       | Paonta Sahib | 07.05.2022        | Sh Deep Ram, Fgd           | FIR No. 0058 dated 07.05.2022 registered at P.S Paonta Sahib                   |
| 8       | Paonta Sahib | 04.12.2022        | Sh Deep Ram, Fgd           | FIR No. 0169 dated 04.12.22 registered at P.S Paonta Sahib                     |
| 9       | Majra        | 03.05.2023        | Sh Alamgir, Forest Worker  | Reported to Yamuna Nagar Police and registered vide GD No 029 dated 03.05.23.  |

#### 9.4 STATUS OF RESEARCH AND DEVELOPMENT

Preliminary studies of regeneration have been carried out under experimental Silviculture Program for Sal. However, there is a scope for further advanced research with regard to the effects of Experimental Silvicultural Felling Programme. Research Institutions like the Forest Research Institute Dehradun, the Y.S. Parmar University of Horticulture and Forestry may be invited for conducting research and development activities in this regard.

## **9.5 HUMAN RESOURCE CAPACITY BUILDING EFFORTS**

To develop the human resource, capacity building for developmental works, this Division organizes several programmes at circle level. Short term training/refresher course is also initiated by the department for managing and developing human resources. Training to the Forest Guards is conducted at Forest Training Institute (FTI) at Chail and Training to Deputy Rangers is provided at Himachal Pradesh Forest Academy at Sundernagar. Refresher courses for officers are also conducted at HPFA Sundernagar at regular intervals.

## **9.6 FOREST RESOURCE ACCOUNTING**

Tangible benefits from forest are timber, NTFPs, fuelwood, fodder, livelihood, ecotourism, biodiversity, etc. The non-tangible benefits of forests are carbon sequestration, soil erosion control, water recycling, oxygen production, control of air pollution, animal habitat, etc. During the tenure of this Working Plan positive efforts will be made to quantify intangible benefits.

## **9.7 BUDGETARY ALLOCATION TO THE FORESTRY SECTOR**

Himachal being a predominantly a forest dominated state having approximately 66% of land classified as forests, the allocation is low as compared to Agriculture, Irrigation and Rural Development Departments. Nevertheless, the budget allocation has been sufficient to meet the plan and non-plan expenditure. But the budget allocation is neither projected on the basis of working plan prescription by the department, nor allocated accordingly, therefore most of the prescriptions given in the working plan remain unfulfilled. Plan and non-plan expenditure details are given in Table No. 9.3.

**Table 9.3 Plan and non-plan expenditure in Paonta Sahib Forest Division (Rs)**

| Sr. No. | Year    | Non Plan  |             | Plan Scheme |             |
|---------|---------|-----------|-------------|-------------|-------------|
|         |         | Allotment | Expenditure | Allotment   | Expenditure |
| 1       | 2012-13 | 54534744  | 545355205   | 9850600     | 9850496     |
| 2       | 2013-14 | 60736600  | 60736628    | 14343700    | 14343492    |
| 3       | 2014-15 | 60660800  | 60660721    | 6458900     | 6458900     |

|              |         |                  |                   |                  |                  |
|--------------|---------|------------------|-------------------|------------------|------------------|
| 4            | 2015-16 | 60222700         | 60222544          | 2360140          | 2360123          |
| 5            | 2016-17 | 72864700         | 72864314          | 6107000          | 6106907          |
| 6            | 2017-18 | 77278220         | 77267763          | 12601649         | 12600694         |
| 7            | 2018-19 | 79075328         | 79029949          | 14307975         | 14307926         |
| 8            | 2019-20 | 82373369         | 82108785          | 21724932         | 18809415         |
| 9            | 2020-21 | 104206159        | 103988799         | 15504347         | 15119265         |
| 10           | 2021-22 | 127963632        | 106750377         | 3837596          | 3823746          |
| 11           | 2022-23 | 127534575        | 127521671         | 5656731          | 5656731          |
| <b>Total</b> |         | <b>907450827</b> | <b>1376506756</b> | <b>112753570</b> | <b>109437695</b> |

## **9.8 EXISTENCE OF MONITORING, ASSESSMENT AND REPORTING MECHANISM**

Monitoring and Evaluation of plantations and other forestry field works is crucial to assess the outcome of these works. An instruction manual for monitoring and evaluation of plantations, salvage checking, soil & water conservation works, nurseries and other field works has been issued vide Technical Order No. 01/2018 dated 24-03-2018 by Pr. Chief Conservator of Forest (HoFF) HP. The Mandatory Field Touring regime by the field officers prescribed in the instructions manual is based on the Pr. Chief Conservator of Forest, HP's letter No. Ft/3-17/66(PA) dated 04-05-1994, FC-cum-Secretary (Fts)'s No. Fts. -1 (B) (15)-20/87-II dated 20-04-2001 and Pr. Chief Conservator of Forest (HoFF) HP's No. Ft. 3-17/66(PA)-II dated 15-02-2007 with some changes in the reporting formats.

## **9.9 PUBLIC AWARENESS AND EDUCATION:**

Publicity and extension education are an important part of the Forest Department. At present, one Division based at Shimla is providing extension services to the people. Forest education and awareness is provided through distribution of literature in the form of posters, pamphlets, manuals and handouts on forest laws to the public. Awareness regarding Conservation of Environment and forest is provided to the people during public gatherings at local fairs, and Van Mahotsav Wildlife week, World Environment Day, World Biodiversity Day and Earth Day. Awareness meeting are also conducted in context of forest fires, water conservation, forest protection, handling human-animal conflicts related to monkeys, elephants, leopards etc.

## **9.10 ADEQUATE MANPOWER IN FOREST DIVISION**

The Paonta Sahib Forest Division has 4 Territorial Ranges viz. Bhagani, Paonta Sahib, Girinagar and Majra. The Ranges are further divided into Blocks which are further divided into beats. The Division has sanctioned staff strength of 5 Range Officers, 21 Deputy Rangers, 70 Forest Guards.

This is the existing establishment of the executive and ministerial staff in the Division as on June 2023.

**Table –9.4 Manpower Details**

| <b>Sr. No.</b> | <b>Name of Post</b>        | <b>Sanctioned cadre</b> | <b>Working No.</b> | <b>Vacant post</b> |
|----------------|----------------------------|-------------------------|--------------------|--------------------|
| 1              | DFO                        | 1                       | 1                  | 0                  |
| 2              | ACF                        | 1                       | 1                  | 0                  |
| 3              | Superintendent             | 1                       | 1                  | 0                  |
| 4              | Forest Ranger              | 5                       | 4                  | 1                  |
| 5              | Senior Assistant           | 3                       | 0                  | 3                  |
| 6              | Deputy Ranger              | 21                      | 14                 | 7                  |
| 7              | Forest Guard               | 70                      | 67                 | 3                  |
| 8              | Driver                     | 1                       | 0                  | 1                  |
| 9              | Clerk/ Jr. Asstt.          | 6                       | 6                  | 0                  |
| 10             | Peon                       | 12                      | 9                  | 3                  |
| 11             | Multipurpose worker        | 0                       | 1                  | 0                  |
| 12             | Chowkidar                  | 15                      | 14                 | 1                  |
| 13             | Mali                       | 12                      | 12                 | 0                  |
| 14             | Mali-cum-Plantation worker | 0                       | 4                  | 0                  |
| 15             | Kanungo                    | 1                       | 0                  | 1                  |
| 16             | Forest Worker              | 62                      | 41                 | 21                 |
| 17             | Dak Runner                 | 2                       | 0                  | 2                  |
| 18             | Sweeper                    | 2                       | 0                  | 2                  |
|                | <b>Total</b>               | <b>215</b>              | <b>175</b>         | <b>45</b>          |



# CHAPTER 10

## FIVE YEAR PLANS

### 10.1 INTRODUCTION

The economy of India since independence till the year 2014 has been based on planning through its five-year plans, which were developed, executed and monitored by the Planning Commission of India. Planning in India derives its objectives and social premises from the Directive Principles of State Policy enshrined in the Constitution of India, Article 38 and Article 39 (a), (b) and (c) are cited in the resolution of 15<sup>th</sup> March, 1950 by which the Planning Commission was setup. These are: -

“The State shall strive to promote the welfare of the people by securing and protecting, as effectively as it may a social order in which justice, social, economic and political, shall inform all the institutions of natural life” (Article 38 of Constitution)

The State shall in particular, direct its policy towards securing: -

- a) That the citizens, man and women, equally, have the rights to an adequate means of livelihood,
- b) That the ownership and control of the material resources of the community are so distributed as best to sub-serve the common good.
- c) That the operation of economic system does not result in the concentration, if wealth, and means of production to the common detriment.

The national planning process was started in 1951 in India with the formulation of First Five Year Plan. The first three five year plans laid thrust on the promotion of agriculture and industrialization, environment-related issues pertaining to the improvement of human environment such as sanitation, public health, nutrition, water supply and housing got due priority in national programmes under the three five-year plans. However, environment protection did not receive significant recognition under the development planning.

The brief description of the Working Plans implemented in the Division during the respective Five-Year Plans of Indian economic planning is given as under: -

**10.2 First Five Year Plan (1951-56):** - The First Five Year Plan showed maximum concern about rehabilitation of forest areas, which had been over exploited either to meet the Second World War needs. Little efforts were made to help stabilize soil in highly eroded areas through

Afforestation. In response to the Forest Policy of 1952, the Central Board of Forestry, constituted in 1950 to provide guidance to the Central Government in the formulation of policy and programmes in the field of forestry. The wastage in conversion and felling of trees was minimized. Besides, manmade forests of economic species were raised.

After the merger of states in 1949, the forests were densely stocked and exploited commercially. By enlarging the scope of 1894 forest policy, the new National Forest Policy which was formulated in 1952 i.e. during First Five Year Plan, the forests of this division were also managed as per the prescription of the Working Plan. In this Division, **Sewal's Working Plan (1933-34 to 1952-53, and Sharma & Tikku's Working Plan 1953-54 to 1962-1963)** fall in the first five-year plan. Under Sewal's Working Plan the main objects of management were to

- Preserve, improve and extend the existing Sal, Chil and miscellaneous forests.
- Satisfy the demands of local population in respect to forest produce.
- Ensure sustained annual yield to and attain the normal forest and establish normal re-generation.
- Maintain and improve the forest cover along the slopes adjoining the Giri and on the bare outer hills of the Shiwaliks which are particularly liable to erosion.

Keeping in view the large-scale import of food grains and inflationary pressures on the economy, the First Five Year Plan (1951-56) accorded the highest priority to agricultural including irrigation etc. rather than forestry operation. However, the country adopted a national festival of tree planting 'Van Mahotsava', in 1950 which was started with the objective of creating mass awareness about the value of forests in human well-being. At the same time, the drawback of the Forest Policy of 1894 necessitated a fresh look at the forest policy. The earlier forest policy was revised in 1952 and a new National Forest Policy was formulated. The main objectives of the policy were: -

- a) Cover one-third of total geographical area with forests, 60% in hilly regions and 20% in the plains.
- b) Functional classification of forests viz, "Protection Forests, National Forests and Village Forests.
- c) Guarding National interests on top priority basis.
- d) Curbing indiscriminate extension of agriculture.

It is interesting to note that Forest Policy of 1952 retained the concept of ‘reserved forests’ which was enunciated under the earlier Forest Policy of 1894 and placed them under the exclusive control of State Government. Although, the policy accepted the category of “Village Forests” to serve the needs of people in surrounding villages, but it did not grant them the right to manage these forests.

### **10.3 Second Five Year Plan (1956-57 to 1960-61): -**

The Second Five Year Plan laid stress to rebuild rural India, built the foundations of industrial progress, and aimed to secure to the greatest extent feasible opportunities for weaker and under-privileged sections of our people and the balanced development of all parts of the country. Both the First and Second Plan put considerable emphasis on preservation processes, improvement of communication, rehabilitation of degraded forests, establishment of new plantations, especially of fast-growing species, application of modern systems of intensive forest management, improvement of timber of inferior varieties by seasoning and preservation processes, and introduction of modern techniques. Large tracts of degraded forests situated in the former Zamindari estates and princely States came under Government control. Schemes for the demarcation of such areas and preparation of maps were taken up.

During this period two working plans viz, **Sharma and Tikku’s Working Plan (1953-54 to 1962-1963)** was being implemented in this Division. The objects of management set forth were the same as envisaged in **Sewal’s Plan**. Demarcation of forests was carried out and the old iron pillars were replaced by masonry boundary pillars. But the entire work of demarcation and construction of boundary pillars was not completed. During this period quite a large number of useful buildings, roads and paths were constructed. Bamboo parks were established at Dhudhla and Simbalwara.

### **10.4 Third Five Year Plan (1961-62 to 1965-66): -**

The Third Five Year Plan aimed to give a more precise content to the social objectives of the Constitution. It takes account of the successes and failures in the first two Plans and sets the tasks to be fulfilled in the perspective of development over the next fifteen years and more. The plan incorporated the development of forest resources as an integral part of the programme for optimum land utilization. During this period, **Sharma and Tikku’s Working Plan** was implemented one year and for rest of the period of the five-year plan i.e. from 1963-1964 to 1965-1966 the felling programme were framed by the **Conservator of Forests, Nahan** and approved by the Chief Conservator of Forests, Himachal Pradesh. Allotment remained the same

as in Sharma and Tikku's Working Plan. The prescription was also the same. During this five-year plan lot of emphasis was laid on industrial plantations. Under this programme, a total area of 2163 ha. in Sal belt (Nahan & Paonta Sahib combined) and in the miscellaneous forests (leaving some standards) was felled. These areas were further planted with *Eucalyptus tereticornis*.

Grazing policies remained unimplemented and increasing cattle population continued to affect forestry's conservation principles. By and large, forests were accorded low priority in the States on account of other needs of more immediate concern. The indiscriminate use of forest land for non-forestry purposes increased considerably.

#### **10.5 Fourth Five Year Plan (1969-70 to 1973-74): -**

The main objectives of the Fourth Plan in forestry sector were: -

- (i) To increase the productivity of the forests,
- (ii) To link up forest development with various forest-based industries
- (iii) To develop forests as a support rural economy. The increase per hectare production per annum of forests in India was estimated at about 0.53 cubic meters as against the world average of 2 cubic meters. Emphasis was laid on measures to meet the immediate and long-term agricultural and industrial requirements, since the demand for various forest products, timber, domestic fuel and raw materials for industries has rapidly increased.

To increase forest production, the Fourth Plan envisaged further efforts at creating large scale plantations of valuable quick-growing species and species of economic and industrial importance. A concerted effort at regenerating areas, where forest produce was removed for industrial uses was taken. The basic principle of Government policy was that the minor forests, pastures and grazing grounds must be managed mainly in the interest of the population of the tract and particularly to serve their requirements of fuel and fodder requirements.

The year **1972** marks a watershed in the history of environment management in India. It was the year in which a conference on Human Environment was held in Stockholm under the aegis of the United Nation. Late Mrs. Indira Gandhi, then Prime Minister, addressed the conference wherein she attracted the attention of the world community towards our peculiar environmental problems. Pointing out the causes of environmental degradation, she asserted that 'poverty and need' are the biggest polluters. She added that "the environmental problems of developing countries are not the side effects of excessive industrialization, but reflect the inadequacy of development. The rich countries may look upon development as a cause of environmental destruction, but to us it is one of the primary means of improving the environment

for living or providing food, water, sanitation and shelter, of making the desert green and the mountain habitable”.

In 1972, a comprehensive national law, the Wild Life (Protection) Act, 1972 was enacted intended solely to protect wild life. A Centrally sponsored scheme “Project Tiger” was launched in 1973 to ensure maintenance of a viable population of tigers in India for scientific, economic, aesthetic, cultural and ecological values and to preserve for all times, areas of such biological importance as the national heritage for the benefit, education and enjoyment of the people. During this period also only one Working Plan of **Arya’s Working Plan (April 1968-March 1978)** was implemented. The General objects of management were

- to preserve and improve the vegetational cover all over especially on the Shiwaliks,
- to replace the inferior miscellaneous patches with suitable and more economic plantation preferably of fast growing pulp wood species,
- to meet the legitimate and bonafide requirements of the local population, of timber, fuel wood, grazing, fodder and other forest produce and fuel requirement.
- To attain, as far as practicable, normal forest and normal regeneration in due course of time.

Consistent with the above objectives to obtain maximum annual yield in perpetuity (of various forests products including timber fuel-wood, bhabbar grass and bamboo etc.) Arya constituted four Working Circles in respect of Paonta Sahib Forest Division namely, Sal conversion Working Circle, Selection Working Circle, Protection Working Circle and Plantation (Over lapping).

#### **10.6 Fifth Five Year Plan (1974-75 to 1978-79): -**

The fifth plan was formulated against the backdrop of severe inflationary pressures. The major objectives of the plan were to achieve self-reliance and adopt measures for raising the consumption standard of people living below the poverty line.

The major objective identified in forestry in the fifth plan was the creation of large-scale manmade forests through institutional financing. The plan proposed a network of State Forest Corporations for establishment and management of manmade forests. The birth of Forest Corporation and the economic considerations further pushed the ecological consideration to secondary place. The second important objective of the fifth plan was to develop farm forestry and to improve degraded forests so as to increase the fuel and timber supply in rural areas. Wild

Life Protection also was attended during this plan. Programmes for development of national parks, strengthening of research on endangered animals including project tiger were taken during this plan.

The Constitution originally did not make any specific provision to deal with the environment, forest protection and wild life of the country. The Constitutional 42<sup>nd</sup> Amendment is also significant from environmental protection point of view as it was through it that the natural commitment of environment protection and improvement was explicitly incorporated into our Constitution. The overriding concern for environmental protection with this amendment has now been inserted Articles 48 A and 51 A (g) in the Constitution of India.

The subjects mentioned in the Concurrent List, inter alia, include forests, protection of wild animals and bird's population control and family planning, minor ports, factories and boilers – these were inserted in the Concurrent List by the Constitution (42<sup>nd</sup> Amendment) Act, 1976. Earlier these subjects were found in State List. Thus, during 1970s, the genesis of environment policy and planning in India had taken place.

During this period **Arya's Working Plan (1968-1978)** was in operation. Felling of Sal was conducted for earning revenue for the State's economic prosperity. Proper demarcation exercises in form of laying down of 247 boundary pillars were conducted and there was a massive improvement in the infrastructure as forests roads and quarters for the staff were constructed during this plan period. The HP State Forest Corporation Limited also came into existence w.e.f 25-3-1974, registered under **The Companies Act, 1956**. The timber extraction was gradually transferred to corporation since 1976 onward.

### **10.7 Sixth Five Year Plan (1980-85)**

'Development without destruction' was the theme of the sixth five-year plan, which laid emphasis on the ecological and social security, the major thrust of the plan as regards forest management and protection was saving the natural forests from further depletion, formation of new fuel and fodder reserves to meet the growing needs of local population and creation of more National Parks and Wild Life Sanctuaries.

The sixth five-year plan framework document as approved by the National Development Council States, "It is imperative that we carefully harvest our renewable resources of soil, water, plant and animal life to sustain our economic development. A full chapter on 'Environment and Development' has been included in the sixth plan. This chapter was devoted to the discussion on problem of environmental degradation such as land use, agriculture, forestry, wildlife, water, air,

marine environment, minerals, fisheries, renewable resources, energy and human settlement, with a view to evolve sound environmental and ecological principles.

On the basis of Tiwari Committee recommendations, the Govt. of India setup a Department of Environment (DOE) with effect from November 1<sup>st</sup>, 1980, some States namely Karnataka, Uttar Pradesh, Punjab & Madhya Pradesh also established separate department of Environment at the State Level. In 1985, the Department of Environment was replaced by an Integrated Department of Environment, Forest and Wild life. In addition to this, two powerful agencies were created to tackle specific environmental problem; namely, the National Waste Land Development Board and the Central Ganga Authority, to further improve the implementation of environmental law and policy decisions.

With a view to meeting the basic and economic needs of community, the programme of social forestry initiated in 1981-82 remained continuing. The social forestry programme which inter-alia includes Farm Forestry, Extension Forestry, and Reforestation on degraded forests and Recreation Forestry; those programmes were assisted by several external agencies, including the World Bank, United State Agency for International Development and Overseas Development Agency of United Kingdom. The 20 Point Economic Programme also included Afforestation Social Forestry and Farm Forestry programmes. **Arya's plan** expired during 1977-1978 and for a period of four years, till 1982 prescriptions of Arya's Working Plan were implemented actual removal were much in excess prescribed yield. **B.S. Chauhan's plan** from 1982 to 1992 was then implemented.

#### **10.8 Seventh Five Year Plan (1985-90):-**

The seventh five-year plan was envisaged in the development strategy of generation of productive employment. Given the twin emphasis on employment and productivity in the Seventh Plan, the objective was to expand employment opportunities consistent with increase in productivity. The basic approach to the Seventh Plan was also, sustainable development in harmony with the environment. Towards this end, it would have to be ensured that all development programmes, in all sectors, will take environmental considerations fully into account. Environmental management, a term encompassing environmental planning, protection, monitoring, assessment, research, education, conservation and sustainable use of resources, was now accepted as a major guiding factor for national development in India.

As regards, the policy perspective on forest management, the seventh plan envisaged "Forest for survival" as its theme. The plan, giving highest priority to restore the forest cover with 33% of the geographical area of the country being brought under forests from the present

level of about 23%: asserted for preserving biological diversity, increase the vegetal cover by massive Afforestation and development Afforestation into a people's movement (Social Forestry) enhance the productivity of existing forest areas, etc.

The failure of the National Forestry Policy, 1952 particularly inadequate management of forests, negligible efforts made to improve the availability of fuel wood and fodder to forest dwellers which resulted in social conflicts on forest resources use, the short comings of social forestry programme and dwindling forest cover, necessitated a fresh look at the Forest Policy of 1952. The States came under increasing pressure in order to involve people in the protection and management of forests resources and therefore to re-orient its earlier policies. In **1988, a National Forest Policy** was formulated with principle aim of ensuring environmental stability and maintenance of ecological balance.

Since forestry is a Concurrent List subject, a State forest policy under the ambit of the National Forest Policy was enunciated by the Government of Himachal Pradesh in 1988. Fellings of Eucalyptus and Sal were carried out as per prescription upto 1987-1988, 1986-1987 respectively. Restrictions on green felling were imposed by the state government after 1986-1987. Thus fellings were discontinued and only salvage marking were carried out. No working of Khair was done according to prescription but during 1991-1992 green Khair was felled after taking special approval from the State Government. Thus prescription given in the Working Plan was not followed. The Afforestation programme under the social forestry has failed to achieve its objectives of people's movement for Afforestation due to less public participation in this scheme. During this period **Chauhan's Working Plan (1982-1992)** remained operative in this division.

### **10.9 Eighth Five Year Plan (1992-97)**

The Eighth Plan was aimed to undertake re- examination and reorientation of the role of the Government as well as the process of planning. The plan was to work out the ways and means of involving people in the developmental task and social evolution. The emphasis was to strengthen the people's participatory institutions.

To ensure the protection of natural environment the plan suggests preventive and regulatory strategies. The strategy of prevention involving raising of public awareness, strict enforcement of laws, statutory assessment of environmental impact of projects, and efforts to regenerate the productivity of ecosystem, can be useful in many cases of environmental degradation. Stringent laws, rigorously implemented, through stringent punitive measures and by marking an undesirable action expensive for the offender, can prevent environmental



destructions. The plan calls for the necessity of statutory environmental impact assessment of all projects and activities before their implementation, as such would prevent environmental degradation by making it obligatory on the part of executing agencies to undertake compensatory measures.

A number of programmes of afforestation were taken up to secure people's participation. Under this scheme, priority was given to: -

- a) Establishment of decentralized nurseries and school nurseries.
- b) Block plantations especially on community land and lands of SC/ST and people living below the poverty line.
- c) Pasture development through people's institutions and involvement, and
- d) Assistance in the implementation of the Tree Patta Schemes.

The scheme of decentralized people's nurseries was initiated in 1986-87 to encourage seedling production by farmers, especially small and marginal farmers to establish small, dispersed nurseries to cater to local needs of planting material and provide income generating activities to the beneficiaries.

An appraisal of the Afforestation schemes undertaken during the plan period has appeared some deficiencies. They have no specific plan of action for meeting fuelwood and fodder requirements except for the continuance of the scheme for rural fuel wood plantation, which does directly address these issues. Under the social forestry programme, the efforts have already been departmental mode. During this period **no functional Working plan** existed in this division, considering the ban on green felling in the State and no working was undertaken in the forest.

#### **10.10 Ninth Five Year Plan (1997-2002)**

The Ninth Five Years' Plan was launched in the 50<sup>th</sup> year of India's Independence, and the aim was to take the country into the new millennium. The emphasis was given to the Integrated Watershed Approach. Since the smallest viable geographical unit is the watershed, it was therefore, imperative that the integrated watershed approach should be followed. The watershed is a geo-hydrological natural unit which has evolved through interaction of rain water with the topography. The measures such as conserving rain water, through treatment of drainage lines in the micro-watersheds and promoting in-situ moisture were proposed. This includes 3-tier appropriate vegetation consisting of grasses, shrubs and trees for fodder, fuel, timber and fruit in a topo sequence which is in consonance with soil depth and moisture. The objectives were:

- i. Eco-restoration and Eco-preservation
- ii. Involvement of the local population

- iii. Gender sensitive planning
- iv. Use of appropriate technology
- v. Redevelopment of traditional agro-eco-systems based on traditional knowledge and technology
- vi. Scientific approach to agriculture, animal husbandry and horticulture in order to raise productivity
- vii. Development of ecologically sustainable industries and tourism.

The need to conserve natural resources and the environment particularly to prevent damage to fragile and irreplaceable eco-systems, the Hill Areas Development Programme (HADP) during the 5<sup>th</sup> Plan was introduced. The programmes implemented during the 5<sup>th</sup> Plan period were mainly beneficiary oriented. While emphasizes shifted to eco-development in the 6<sup>th</sup> Plan, the general tenor of HADP remained substantially the same as that of the normal State Plan following the same sectoral approach. In the 7<sup>th</sup> Plan laid particular emphasis on the development of ecology and environment as summed up in three phrases, namely, **eco-restoration, eco-preservation, and eco-development**. It aimed at evolving plans and programmes to take care of socio-economic growth, development of infrastructure and promotion of ecology of the areas covered by the HADP. During the 8<sup>th</sup> Plan attention was focused on productive sectors of the hill economics especially in modernizing agriculture practices and small-scale industries at household, cottage and village levels. For this involvement of people was considered of paramount importance. The aim was to meet actual basic needs of the people through improved management of the land and water resources.

The major environmental problems being faced by Hills were deforestation and soil erosion, which was leading to the drying up of water resources, flash flood, cloud bursts and decline in the yield of food and cash crops, fodder, fuel and other minor forest produce. Besides water retention capacity and productivity of land had been adversely affected. Similarly, poverty in the hills, intensive human & livestock pressures along with encroachment on forest land and indiscriminate felling of trees for commercial purposes in hill areas had already led to loss of soil and rapid depletion and destruction of forest cover. Development activities like construction of buildings, roads, hydro power projects, large and medium industries and mining etc. had aggravated environmental problems. Consequently, perennial sources of water such as springs and small streams have dried up in many hill areas.

The strategy for Himachal Pradesh stated that the degraded forest lands, the village common lands and waste lands will be rehabilitated through various state plans/centrally

sponsored and externally aided projects schemes so that a forest cover of 50% by 2000 AD as per policy of the State Govt. is arrived at". The National Forest Policy, 1988 has also recommended that at least 2/3<sup>rd</sup> of the total geographical area of Himachal Pradesh should be under forests.

On an average, an area of 172.5% Sq. Km. was planted every year. Recent trends show a continuous decline in the area planted each year, because of paucity of funds and a ban on silviculture and Working Plan operation in the State under an order of the Supreme Court in T.N. Godavarman case dated 12-12-1996, except for the right holders. However dry and fallen trees i.e. salvage marking can be removed through the H.P. State Forest Department Corporation Ltd.

The Govt. of H.P. Constituted the Forest Corporation in 1974, the only agency responsible for the harvesting and exploitation of forests, including resin extraction. Earlier, private contractors carried out all activities related to forests.

The most valued forest product in 2001-02 was timber, followed by medicinal plants and herbs and resin. The total forest produce was worth Rs. 231.30 Crore. Until 1970, timber removal from the forests was more than the annual prescribed yield, which was unsustainable. Since 1985, the annual removal from the forest has always remained below the prescribed yield due to ban imposed by the Govt. on silvicultural operation and also under an order of the Supreme Court dated 12-12-1996. During this plan period **Vineet Kumar's Working Plan (1998-1999 to 2012-13)** was applicable, however no silvicultural operation as prescribed in the Working Plan had been carried out due to ban on green felling and blank/open areas were also not taken up planting/regeneration in planned way. Plantations as prescribed had been carried out under various departmental schemes. Ban on green felling kept the green cover intact but the regeneration in the forests suffered.

#### **10.11 Tenth Five Year Plan (2002-2007):-**

The Tenth Five Year Plan (2002-07) has been prepared against a back drop of high expectations arising from some aspects of the recent performance. GDP growth in the post-reforms period has improved from an average of about 5-7% of the 1980 to an average of about 6.1% in the Eighth and Ninth Plan period, making India one of the ten fastest growing countries in the world.

These positive developments are, however, clouded by other features which give cause for concern. The situation in this regard is much worse in the rural areas. Land and forest degradation in hills areas and over exploitation of ground water is seriously threatening sustainability of rural livelihood and food production.

The country's forest resources are under tremendous pressure. Intensified shifting cultivation, indiscriminate removal of timber, fuelwood, fodders and other forest produce, forest fires and encroachment has led to forest degradation and deforestation. Forests meet nearly 40% of the country's energy needs and 30% of the fodder needs. It is estimated that about 270 MT. of fuelwood, 280 MT. of fodder, over 12 million m<sup>3</sup> (cubic meter) of timber and countless non-wood forest products (NWFPs) are removed from forests annually. The future management need for meeting the requirements of the community.

Forest plays an important role in environmental and economic sustainability. They provide numerous goods and services, and maintain life support systems essential for life on earth. Some of these life support systems of major economic and environmental importance are:

- (i) Supply of timber, fuel wood, fodder and a wide range of non-wood products.
- (ii) Natural habitat for bio-diversity, and repository of genetic wealth.
- (iii) Provision of recreation and opportunity for ecotourism.
- (iv) Playing an integral part of the watershed to regulate the water regime, conserve soil, and control floods.
- (v) Carbon sequestration and carbon sink.

Despite significant resource flows and national concern, the potential of forests to reduce poverty, realize economic growth, and their contribution to the local and global environment has not been fully realized. A combination of market and institutional failures has led to forests falling to contribute as significantly to rural incomes and poverty alleviation and economic growth as would be possible under good economic and technical management.

The following strategies were proposed in order to address the concerns of forests sector and to achieve the objectives of sustainable forests management:

- i) The role of forests to maintain the hydrological balance is complementary. Successful models of watershed development have helped conserve soil and moisture, improve ground water recharge and the water regime and mitigated the adverse impacts of drought. The watershed approach should be universally adopted for the maintenance and development of forests.
- ii) Due to the increase in human and cattle population, the existing forest resource is under intensive pressure to meet the demands for various forest produce, i.e food, fodder, fuel, fertilizer, timber, bamboo, medicinal plant, etc. About 41% of the forest area is degraded due to over exploitation of forest produce. However, no strategy to conserve the forest eco-system would be successful unless the basic needs of the society are met. The future

management strategy must, therefore, take into account this compelling need of the community to meet their requirements.

- i) The forest areas near population centre's/villages have degraded faster due to over-exploitation and the forest resources has become impoverished. It has adversely affected the livelihood security and employment opportunity of people dependent on forests. Therefore, a special programme needs to be drawn up for development of such villages and to provide alternative sources of income.

**10.11.1 Forest Plantations:** -The following initiatives were proposed for improving the productivity of forest plantation: -

- i) The plantation strategy should be based on creating new forest resources that help reduce pressure on natural forests and preferably reverse the negative impact of deforestation while meeting the increasing demand. India can benefit from the experience of other countries, which have developed policies and incentives to promote private sector participation in accelerating the pace of Afforestation.
- ii) At present, the performance of forest plantations in terms of survival, growth and yield is poor. The mean annual increment (MAI) of forest plantations varies from about 2m<sup>3</sup>/ha/year for valuable timber species to about 5-8 m<sup>3</sup>/ha/year for eucalyptus and other fast-growing species. This is far below the MAI of over 10m<sup>3</sup> and about 50m<sup>3</sup>/ha/year for good quality plantations in different countries.
- iii) The productivity and success of plantations can be improved by appropriate site selection, site species matching, planting of elite clones, proper maintenance and protection, timely tending, thinning, irrigation, application of manures and pesticides, etc.
- iv) Reduction in harvesting and post harvesting losses should be achieved by adopting improved technologies.

**10.11.2 Green India Programme:** -Out of the 328.27 m ha total geographical area of the country; around 300 m ha is the available productive land. The actual forest cover is 63.73 m ha of which only 37.73 m ha has good forests. About 20 m ha is covered under tree plantations (agro-forestry, farm forestry, social forestry and other plantations). Thus, in order to bring one-third area under forest/tree cover,  $(100-37.73-20 = 42.27)$  43 m ha of area should be covered under the greening programme over 10 years. The detail programme should be as follows:

- \* 15 m hac. of degraded forest land to be covered under JFM.
- \* 10 m hac. of irrigated area to be brought under commercial agro-forestry.
- \* 18 m hac. of rain-fed area to be brought under subsistence agro-forestry.

Significant efforts are required for greening India to address the food security and environmental challenges. The country is facing the problem of surplus food production on one hand and unemployment, poverty and food deficiency on the other. The implementation of Greening Programme through “food for work” scheme will ensure meeting the basic needs of people, environmental protection, food accessibility and productive employment generation to 10 crore people (mainly tribals, dalits, backwards, other backward classes, landless and women).

Participatory arrangements have existed in Indian Forestry for several years, in the form of forest labour co-operatives, resin tappers, NWFP Collector’s Co-operatives societies and other associations. The JFM programme has led to several positive outcomes in many states in India. The major ones are (i) change in the attitude & relationship of local communities and forest officials towards each other and the forests, (ii) improvement in the condition of forests (iii) reduction in encroachments but in this division results are not encouraging as compared to low lying areas of Himachal Pradesh. Similarly, tree plantation has been expressed over the low productivity of plantation due to several factors such as steep slope, FRA, and Nautor claims, inadequacies in the site selections and site species matching, poor plantation stock, lack of proper maintenance and protection, fire hazard, financial and capacity constraints etc. During this period the **Vineet Kumar’s Working Plan (1998-2012)** was in vogue and continued to exist in this division.

**10.12 Eleventh Five Year Plan (2007-08 to 2011-12):** - India entered the Eleventh Plan period with an impressive record of economic growth. After a lacklustre performance in the Ninth Plan period (1997–98 to 2001–02), when gross domestic product (GDP) grew at only 5.5% per annum, the economy accelerated in the Tenth Plan period (2002–03 to 2006–07) to record an average growth of 7.7%, the highest in any Plan period so far. Besides, there was acceleration even within the Tenth Plan period and the growth rate in the last four years of the Plan has averaged 8.7%, making India one of the fastest growing economies in the world.

National Forest Policy, 1988 acknowledged the importance and primacy of local communities and provided for a sustainable management approach with maintenance of environmental stability as the prime objective. Commitment to conservation of nature was highlighted by the targets of maintaining one-third of land under the forest/tree cover.

Plan investment in forestry and wildlife sector so far, including State and Central plan, was about 1% of the total plan outlay. The National Forestry Commission (2006) had recommended an investment of 2.5% of the plan outlay in the forestry and wildlife sector. Our total plan outlay of the State and central plan in forestry and wildlife sector was 1% only.

The Integrated Forest Protection Scheme was redesigned to aid the states for building capacity and basic infrastructure for modern forest management. Improving Management Planning and Survey (land records) set-up was the first priority for Central assistance. The following components were provided for modernization of the State forest management:

- i) Modernization of the management planning (Working Plan) units with equipment, infrastructure, and manpower. This may include forest inventories, training and satellite imagery processing, and GIS facilities. This included professional services such as ecologists and sociologists for relevant inputs.
- ii) Forest Land Information System for land records, with modern and empowered survey, and land record maintaining mechanisms for documenting the legally recognized individual rights, concessions, ownerships including those under the Scheduled Tribes and other Forest Dwellers (Recognition of Forest Rights) Act, 2006.
- iii) Forest boundary demarcation by providing assistance for the state-of-the-art infrastructure, training/outsourcing survey work, fixing permanent boundary pillars, updating the forest block indices and compartment histories.
- iv) Installation of forest fire surveillance and warning systems, along with fire management planning in participatory mode.
- v) Assistance for general infrastructure for accommodation in remote areas, communication, improvement of road network, etc. was a part of this programme. During this period the **Vineet Kumar's Working Plan (1998-2012)** was in vogue and continued to existence to this division. Timber removals from the area allocated to different Working Circle were essentially on account of salvage removal, timber distribution to local right holder and removals under Forest Conservation Act, 1980. No silviculture removals were carried out during the approved plan period due to moratorium on green fellings in the State. The incidental timber removal from the forest were far below from the prescribed annual yield under various Working Circle, except in the case Chil Working Circle and Eucalyptus Working Circle where removal are in excess of the prescribed yield due to salvage removals.

### **10.13 Twelfth Five Year Plan (2012-17):-**

The objectives of the Twelfth Plan were faster, sustainable and more inclusive growth and the initiatives taken in Eleventh Plan period had resulted in substantial progress towards these objectives. Inevitably, there were some weaknesses that need to be addressed and new challenges that need to be placed. However, available evidence suggested that there have been significant gains on many of these fronts, even though there are shortfalls in some areas on which further work is needed.

Several issues have been flagged during the Planning Commission consultations with different stake holders which deal with land, mining, forest and wild life management, climate change, waste management, reduction of pollution, conservation of forests and biodiversity etc. These must be viewed in the light of the enormous inter connection that exist within the broader dynamics of environmental management. Important issues that required focused attention during the Twelfth Plan are:-

- i) Securing ecology of watershed and catchment.
- ii) Cumulative Environmental Impact Assessment (CEIAs) for vulnerable regions.
- iii) Carrying capacity studies in selected river basins.
- iv) Maintaining acceptable water quality and quantity through pollution control of water resources.
- v) Restoration of wet lands & lakes etc., and
- vi) Management of waste water discharge from Industrial and Commercial establishment into major water bodies.

A midterm review of Working Plan of **Sh. Vineet Kumar** for carried out at the end of 2012 and extended Working Plan was approved from 2013-14 to 2017-2018. This extended Working Plan contained largely the prescriptions of Vineet Kumar's Working Plan.

#### **10.14 NITI AAYOG (The National Institution for Transforming India):-**

The twelfth five years plan (2012-2017) ended during 2017 and the central government had decided to discontinue with the five-year plans set. Thereafter, the NITI Aayog, (National Institution for Transforming India) has replaced the Planning Commission in 2015. The central body created a platform to monitor, evaluate and review various schemes and also to specify targeted results through Key Performance Indicators.

Niti Aayog aims to replace Five years plan with a 15-year blueprint with a shorter seven-year strategy, as part of its National Development Agenda. The National Development Agenda will include a seven-year action plan, with a focus on defense and internal security, besides social and development goals.

In the recent years, with the realization of forests as a key solution for combating global issues of climate changes, India has strengthened its commitment towards fighting global environmental challenges as well as fulfillment of Sustainable Development Goals.



India's commitments in its 'Nationally Determined Contributions' post Paris agreement include:

- reducing emissions intensity of its GDP by 45 per cent by 2030, from 2005 level
- to create **additional carbon sink of 2.5-3 billion tonnes of CO<sub>2</sub> equivalent through additional forest and tree cover by 2030**
- achieving 50 per cent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030

**Paris Agreement:** Paris agreement is a legally binding international treaty on climate change, it was adopted by 196 parties at COP-21 in Paris on 12.12.2015 entered into force on 4.11.2016. Its goal is to limit **global warming** well below 2°C, preferably to 1.5 °C compared to pre-industrial level. Climate change action needs to be massively increased to achieve the goal of Paris agreement years, giving into new concepts of carbon-based solutions and new market. Countries, region and cities are establishing carbon neutrality targets. Zero carbon solution is becoming competitive across economic sector representing 25% of emission. The strategy involves energy and climate policy including the 20/20/20 target namely reduction of CO<sub>2</sub> emission by 20%, increasing renewable energy market share to 20% and increase in 20% in energy efficiency. Paris deal is world's first comprehensive climate agreement.

**Paris Agreement:** What are India's climate commitments?

In 2015 ahead of UN significant climate conference in Paris, India announced three major voluntary commitments called the National Determined Contributions.

- Improving the emission intensity of its GDP by 30-35% by 2030 over 2005 level.
- Increase share of non-fossil fuels-based electricity to 40 % by 2030.
- **Enhancing forest cover, thereby absorbing 2.5 to 3 billion ton of CO<sub>2</sub>.**

India's progress in fulfilling its climate commitment:

- India has reduced emission intensity by 21% over 2005 level.
- Massive plantation activities across states YoY to increase forest cover and highlighting ToF (Trees Outside Forests).
- Solar capacity has grown from 2.63 GW in 2014 to 36GW in 2020.
- Renewable energy capacity is the 4<sup>th</sup> largest in the world and will reach 175 GW before 2022.
- India has set new target of 450 GW by 2030.
- Onward stage India has pioneered two major initiatives:

ISA (International Solar Alliance)  
Coalition for Disaster Resilient Infrastructure

In this context, recent initiatives in expanding green cover, carbon sequestration include expanding plantation areas, National Mission for Green India (GIM), Nagar Van Yojana, Lifestyle for Environment (Mission LIFE), National Clean Air Program, CAMPA (Compensatory Afforestation) and State schemes like Samudayik Van Samvardhan Yojana, Ek Buta Beti ke Naam and Van Samridhi Jan Samridhi have all laid stress on the importance of forests and their role in mitigating global issues like climate change and conservation of biodiversity at all levels.

Regarding Paonta Sahib Forest Division, in addition to many of these schemes under implementation, a view for revival of forest health was also taken up in the form of experimental silviculture felling which was permitted by the Hon'ble Supreme Court for the years 2018-19 and 2019-20 for Sal Working circle. Silviculture working of Sal Forest in 2018-19 in Paonta Sahib Forest division yielded 6364 cum standing volume of Sal timber. This resulted in a revenue of approx. Rs. 1700,000,00 (Rs. Seventeen Crore). Similarly, despite COVID-19 restrictions, there was revenue of about Rs. 20 Crore from Sal timber extracted in subsequent year. This contributed substantially in HPSFDC registering profit after a decade. If silviculture practices are permitted, there will be further immense scope for livelihood, revenue generation for the state.

## CHAPTER 11

### PAST SYSTEMS OF MANAGEMENT

(Combined previous working plan was having jurisdiction over present Nahan and Paonta Sahib Forest Divisions, as such the past system of management has been taken as common).

**11.1 GENERAL HISTORY OF THE FORESTS:** No authentic record before 19<sup>th</sup> century, in fact 1890, regarding the type of vegetation and forest management in the tract dealt with is available. Like other parts of the country, forests of Sirmour district had richness, vastness and was a coveted place for wild life hunting. Mr. John Northem says in his book, ‘Guide to Masuri’, 1884 *‘Nearly the whole of the dominions of the Raja of Sirmour is one vast forest, the open valleys, a dense jungle of high grass, and the consequence is, that instead of thousands upon thousands of happy and contented villagers, the land is given upto the beasts of the field the birds of the air, it is useless to dwell on the short-sightedness of a policy so manifestly opposed to every principle of political economy. Timber might pay a contractor; it never paid a nation. If population is the wealth of a country, it is useless to ask it to feed on timber. The earnings of a prolific population pay the most to the State in a hundred ways, with this description, it is clear that the tract was once occupied by dense forests inhabited by wild animals like Elephant, Tiger Panther, Sambar, Chittal, Barking Deer etc.’*

With the passage of time, it seems that the policy of the Government changed and clearance of woods to bring more and more land under agriculture continued unabated. Land revenue being the main source of revenue to the State. During the regime of Raja Shamsher Prakash, agriculturists like *Bahaties* and *Sainies* were invited from Hoshiarpur areas of Punjab to clear the forest of Dun valley in today’s Paonta Sahib. At one stage in the late nineteenth century, it was felt that there has been extreme destruction of forests leading to high floods in the Markanda river. Shri Bal Gobind in 1901 has mentioned in the biography of Raja Shamsher Singh Parkash, *“Once upon a time when the Markanda flood washed away many villages, roads and bridges, the railway company wrote to the Raja, holding him responsible for this loss of life and property, as being the result of his carelessly ordering the cutting of the forests on the banks*

and the source of the River Markanda, which is not more than seven miles from Nahan.’’ On reading the letter, Raja Shamsher Parkash, at last awoke to the absolute necessity of taking vigorous measures for the preservation of the forests.

11.1.1 After the Gorkha war of 1804-1815, forests were leased to traders at a fixed annual income not exceeding Rs. 20,000/-. There was no restriction regarding the number of trees to be felled. Traders removed best quality Sal, Sain, Haldu, Khair and Shisham trees ruthlessly, which lead to deterioration of the quality of forests.

11.1.2 First step to manage the forests on some scientific principles was taken by the enlightened Maharaj Shri Shamsher Parkash (1856-1898) who introduced in 1890 the “Rawana System” to control the felling and extraction of trees. He also took steps to demarcate and declare the forests as Reserved Forests under Chapter II of the Indian Forest Act 1927. During this very period, Forest Settlement and Revenue Settlement were also carried out. The Forest Settlement was termed as ***Faisla-e-Janglat***. No rights were admitted to the local people but numerous concessions were allowed. Practically nothing was done in the direction of regenerating the forests. Despite the fact that the main emphasis was on controlling the fellings, selected good quality trees of important species which were in great demand, continued to be felled on large scale leading to depletion of the stock and quality of the forests.

11.1.3 It was only in 1895 that the first regular working plan for the tract was prepared. A timeline of the working plans prepared is tabulated below:

**Table No. 11.1.3**

| Sr. No. |                                                 | Period             |
|---------|-------------------------------------------------|--------------------|
| 1       | Chintamani Joshi / R. Bhattacharya Working Plan | 1895 - 1915        |
| 2       | The Period without working Plan                 | 1916-1932          |
| 3       | Sewal’s Working plan                            | 1933-34 to 1952-53 |
| 4       | Sharma and Tikku’s Working Plan                 | 1953-54 to 1962-63 |
| 5       | Period without working Plan                     | 1963-68            |
| 6       | Arya’s Working Plan                             | 1968-69 to 1977-78 |
| 7       | Period without working Plan                     | 1978-82            |
| 8       | Chauhan’s Working Plan                          | 1982-83 to 1991-92 |
| 9       | Period without working Plan                     | 1992-98            |
| 10      | Vineet Working Plan                             | 1998-99 to 2012-13 |

### TIME SERIES OF WORKING PLAN IN PAONTA SAHIB FOREST DIVISION

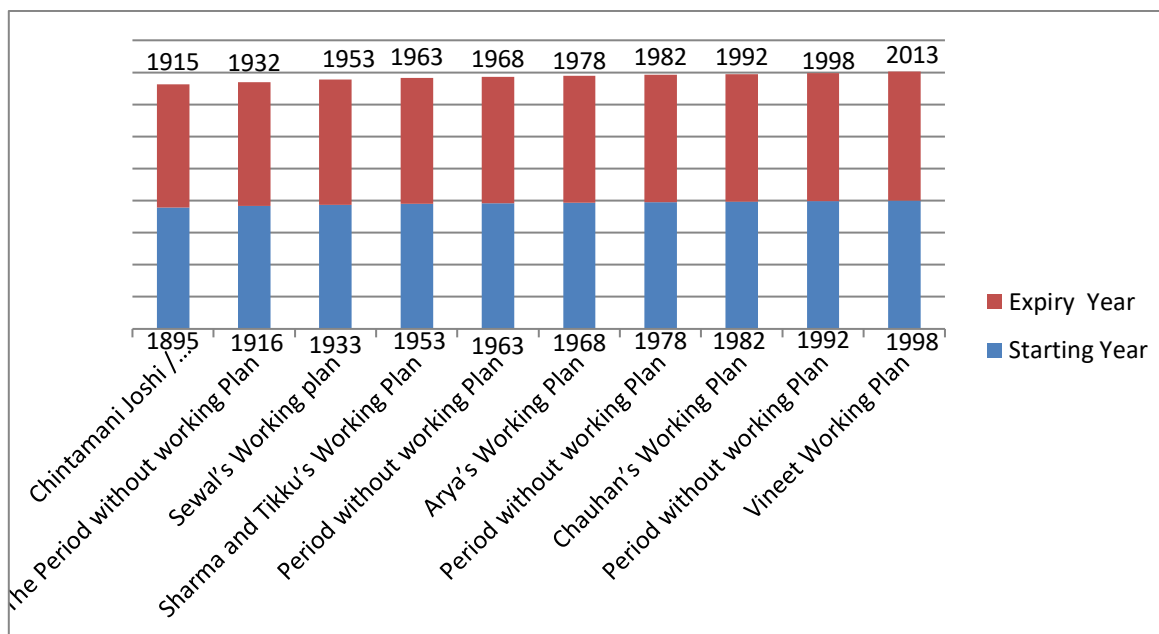


Figure No. 11.1.3

## 11.2 PAST SYSTEMS OF MANAGEMENT AND RESULTS

### Chinta Mani Joshi, S. Bhattacharya and Ram Chandra's Plan 1895-1915

The first working plan for the area was prepared by Chinta Mani Joshi, S. Bhattacharya and Ram Chandra who were trained from Forest College Dehradun. This working plan was prepared for 20 years. By that time the entire state of Sirmour was divided into two Forest Divisions viz: Paonta Sahib and Nahan. Bhagani, Paonta Sahib and Majra ranges were part of Paonta Sahib Forest Division. The remaining area was in Nahan Forest Division. **This working plan covered the area of only Paonta Sahib Forest Division viz: Bhagani, Paonta Sahib and Majra ranges.** Each range was termed as a Working Circle and were further divided into 3 sub-circles based on the type of crop. Sub-blocks and compartment were also constituted. Improvement-cum-selection fellings for Sal and miscellaneous forests were provided. For Chil and Ban areas, Selection system was provided.

**Result:** The sequence of felling prescribed in the working plan for a period of 20 years had to be revised after the expiry of 8 years and this revised felling program was followed till 1915. This working plan did not provide any silvicultural system but only systematized the

extraction of trees and some control/record regarding the fellings. The result of these felling was that selected trees of commercial important species like Sal, Sain, Haldu, Shisham, Khair, Chil etc. were felled. Large scale fellings were carried out in easily accessible areas with the result that the remaining crop was malformed and congested. Wherever regeneration came up naturally, it was not tended. The overall result of working in Sal forests was depletion of bigger diameter class trees and neglect of young crop. No silvicultural operations were done in miscellaneous scrub forests. Shifting cultivation was being practiced in Chil areas. Profuse natural regeneration of Chil came in, when such areas were abandoned, which was not tended properly.

**11.3 Period from 1916-1932:** There was no regular working plan during this period. Forest officials/officers selected the annual coupes. During this period generally, retired Forests Officers from British India were employed. These officers selected the best and easily approachable areas to provide higher revenue to the State exchequer. This resulted in depletion of good quality, healthy trees of valuable species like Sal, Sain, Shisham, Khair and Chil.

**11.4 Sewal's Plan (1933-34 to 1952-53):** Maharaja Amar Parkash Bahadur of Sirmour State took keen interest in the scientific management of the forests of the State. He invited Mr. F.W. Parrie, IFS, the then President, Forest Research Institute, Dehradun to inspect the forests of Sirmour state. He visited these forests in 1927 and drafted a Preliminary Report for the future management of these forests.

At that time there were two Forest Divisions viz: Rajgarh and Nahan, covering the forests of Sirmour State. Nahan Forest Division comprised of Dharti, Nahan, Majra, Paonta Sahib and Bhagani ranges. Dharti range covered mostly the Chil areas; Sewal's Working Plan provided management for the entire tract of Nahan Forest Division. The present working plan under revision does not cover the area of then Dharti range and Chil forests and as such the past management of Chil forests covered under Sewal's Plan is not being described.

Sewal's Working Plan was in fact the first working plan of the area prescribing scientific management of the forests. Under this working plan following general objects of management were aimed at;

- i) To preserve, improve and extend the existing Sal, Chil, Bamboo and miscellaneous forests wherever the soil and other factors are suitable for the species.
- ii) To satisfy the legitimate demands of the local population for forest produce and grazing in accordance with the Faisla-e-Janglat.

- iii) To ensure sustained annual yield and to attain the normal forest and establish normal regeneration.
- iv) To maintain and improve forest cover on the Bairunidhar, along the slopes adjoining the Giri and on the bare outer hills of the Siwaliks which are particularly liable to erosion.
- v) Sewal anticipated difficulties like encroachments, poor quality and extreme limit of habitat of Sal, lack of demand for ballies, fuel, grazing by local people and grazing and lopping by migratory Gujjars, for achieving and objects of management. To achieve the objects of management following Working Circles were constituted (combined for present Nahan and Paonta Sahib Forest Divisions).

|      |                                   |                 |
|------|-----------------------------------|-----------------|
| i)   | The Sal Conversion Working Circle | 16032 Ha        |
| ii)  | The Bamboo Working Circle         | 13456 Ha        |
| iii) | The Miscellaneous Working Circle  | 41156 Ha        |
| iv)  | The Chil Working Circle           | 8519 Ha         |
| v)   | Un-allotted areas                 | 17139 Ha        |
|      | <b>Total Area</b>                 | <b>99302 Ha</b> |

**The Sal Conversion Working Circle:** All pure Sal forests fit for conversion to uniform shelter-wood fellings were allotted to this Working Circle. Some pure Sal forests which offered difficulty in regeneration and conversion to uniform were excluded. The total area allotted was 16032ha. The silvicultural system adopted was Conversion to Uniform under with natural regeneration. Rotation and conversion period of 100 years, with regeneration period of 25 years was adopted. four periodic blocks (P.Bs.) were formed. P.B.I. was allotted and the remaining area was grouped as P.B. un-allotted. Following forests were allotted to P.B.I.

**Table No. 11.2**

| <b>Name of Range</b> | <b>Name of Forest</b> | <b>Area in Ha</b> |
|----------------------|-----------------------|-------------------|
| Bhagani              | Mehruwala             | 496.112           |
| Paonta Sahib         | Jamniwala             | 645.996           |
|                      | Jamotwa               | 479.548           |
|                      | Jammukhala            | 113.12            |
|                      | Rajban                | 232.704           |
|                      | Gorakhpur             | 557.924           |
|                      | Kukron                | 373.296           |
|                      | Khara                 | 342.592           |
|                      | <b>Total</b>          | <b>3241.3</b>     |

P.B.I.: - Growing stock above 30 cm. dbh was enumerated in 10 cm. dia. classes. Yield from P.B.I. was prescribed by volume and the total annual yield was 3428.796 cum. Marking rules for P.B.I. were prescribed. Most of the area allotted to P.B.I. had established regeneration. Trees upto 30 cm. d.b.h were to be retained as advance growth. Some trees upto 40 cm. d.b.h. could also be retained as advance growth, if they were likely to merge with other crop retained. Sain and Kokat was to be retained unless it interfered with Sal. All dead, dying and unsound trees were to be marked for felling. Subsidiary silvicultural operations for P.B.I. areas were prescribed. These included felling and girdling of marked trees, coppicing of damaged poles, climber cutting and regenerating the blanks artificially. After felling all areas were to be closed to grazing for 10 years.

Areas of P.B. un-allotted were divided into 20 felling coupes. In these areas thinning with specific marking rules were prescribed. No yield was prescribed. The method of executing felling in these areas included the removal of all trees with negative increment e.g. dead, dying or rotting, thinning of congested crop, removal of inferior species in favour of valuable species and removal of over mature trees over 60 cm. d.b.h. unless required for soil conservation. Cleaning and climber cutting in these areas was prescribed. The demand of the right holders was to be met from these areas. Chief Forest Officer, was enjoined to select P.B.II areas and take steps to help their regeneration and inducing the same.

**Result of working:** Felling in the forests allotted to P.B.I. and P.B. un-allotted were carried out as prescribed till 1947-48. There was an epidemic attack of Sal borer (*Hoplocerambyx spinicornis*) after 1947-48 causing serious destruction of Sal trees and thus upsetting all the prescribed fellings. About 66% of the P.B.I. area was successfully regenerated. This included Mehruwala, Jamotwa, Kukron, and parts of Mehruwala and Gorakhpur and Jamniwala forests. Selection of P.B.II area for special treatment was ignored leading to deficiency of regenerated areas. This also resulted in the depletion of the growing stock of bigger class trees. Ever increasing demand of right holders also depleted the growing stock of healthy and bigger trees. Since the control forms were not maintained it cannot be ascertained whether the fellings were within the prescribed limits or not.

**The Miscellaneous Working Circle: (41,156 Ha.):** More than 50% of the total area covered under Sewal's Working plan was allotted to this Working Circle. Pure of mixed Sal forests considered unsuitable for working under Uniform system and areas under miscellaneous species without extensive blanks were allotted to this Working Circle.

Selection-cum-improvement fellings were prescribed with a view to meet local demands and improve the existing crop. It was envisaged that due to lack of demand, Sale of marked trees may



not be feasible. 50 annual coupes were formed. Marking rules prescribed for marking of Sal and Sain trees over 37.5 cm. and 45 cm. d.b.h. respectively for improving the existing crop. No trees were to be marked for felling unless its removal benefited the existing crop. Climber cutting was prescribed. Gujjars grazing was to be excluded except in the areas near Nahan town, where it was to be accommodated for supply of milk to town. No closure to grazing for artificial regeneration was prescribed due to heavy burden of grazing by local people.

**Result of working:** The marking rules and sequence of felling was not followed. Heavy fellings were carried out in accessible areas and fellings were deferred in inaccessible areas. Overgrazing continued. The proportion of valuable species was reduced due to selective felling. No cultural operations were carried out. During this period the condition of these forests deteriorated leading to the depletion of bigger size trees of valuable species.

**The Chil Working Circle (8,519 ha.):** Except a few forests of Paonta Sahib Range Viz Samon-Kanon, Kando-Bharog, Kanser and Kando-Bhaila, all other areas allotted to this Working Circle are not covered under the present working plans and as such the management of the Chil forests is not discussed here.

**Un-allotted Areas (17,139 ha.):** These areas comprised mostly precipitous, bland, hill sides, Halah beds, grassy blanks, scrub forests and isolated patches of Sal, Chil or Kokat forests. Most of the areas were heavily grazed.

Except for Khair/Sissoo area of Giri and Yamuna R.F's, no working was prescribed. Deodar plantation areas were to be closed for regeneration and Khair and Sissoo were to be felled on demand.

Due to closure, the Deodar plantation patches were protected. Khair fellings were done indiscriminately. Due to excessive grazing and lopping the condition of the remaining areas deteriorated and forests cover became scanty. There was reduction in the growing stock of Khair. Big sized trees were felled and younger regeneration was not allowed to grow due to indiscriminate lopping and uncontrolled grazing.

**Special Works of Improvement Under-taken:**

(a) **Sowing and Plantation:** No sowing and planting on any large scale was done. Propagation of bhabbar was undertaken in Siwaliks. Planting under "Tongya system" was undertaken in Dondli-tapper and Khojjar forests of Bhagani Range. Areas has been permanently occupied by the Tongya cultivators.

- (b) **Fire Protection:** Fire lines were planned and control burning was carried out. 5 metres wide, Block line separating good quality Sal forests of Majra and Paonta Sahib Ranges from miscellaneous and poor-quality Sal was cleared.
- (c) **Demarcation:** All the forests reserved under chapter II of Indian Forest Act were demarcated. Boundary separating Ambala district was demarcated by construction large lime mortar masonry pillars.
- (d) **Building:** New Forest Guard-huts were constructed at Gurdwara, Matter, Pilhori, and Dandla.
- (e) **Roads:** No new roads were constructed.
- (f) **Forest Settlement:** Forest settlement was also carried out simultaneously with the revision of working plan. A detailed record of right (Faisla-e-Junglat) for each forests was prepared.

**Results of Working:** The objects of management set forth were not even partially achieved. The prescriptions of working led to the preservation and improvement of Sal forests allotted to Sal Conversion Working Circle. In case of other forests there were unregulated fellings leading to deterioration of the growing stock. No regeneration operations were carried in any forests and thus no extension of the forest area took place.

Legitimate demands of the local people were fully met with. Grazing however, continued unchecked except on closed areas of Sal Conversion Working Circle. Gujjar grazing continued as earlier.

Although no control form was maintained prior to 1947-48 but the yield was probably regulated as per prescriptions of the working plan. No yield by volume was prescribed except for P.B.I of Sal Conversion Working Circle and this prescription gave ample latitude for the untrained staff to flout the marking rules leading to fellings in easily accessible areas. The object to attain the normal forest was not fulfilled. No closures or planting operations were carried out in Siwalik ridges and thus there was no improvement of the vegetation.

**11.5 Sharma's and Tikku's Working Plan (1953-54 to 1962-63) combined for Nahan and Paonta Sahib Forest Division:** Sewal's Working Plan expired in 1952-53. Revision of the working plan was taken up in 1953-54 and the final draft of this working plan was submitted to Chief Conservator of Forests in 1961-62. Thus, the entire period of Working Plan was over when the working plan was finalised.

In this Working plan the objects of management set forth were the same as envisaged in Sewal's Plan with the addition of meeting the requirement of fuel for Nahan town. To achieve the objects of management following Working Circles were constituted:

|                    |                                   |                   |
|--------------------|-----------------------------------|-------------------|
| (a)                | The Sal Conversion Working Circle | 13,357Ha.         |
| (b)                | The Selection Working Circle      | 26,987Ha.         |
| (c)                | The Protection Working Circle     | 26,987Ha.         |
| (d)                | The Plantation Working Circle     | 2,981Ha.          |
| (e)                | The Bamboo (0.1) Working Circle   | 7,305Ha.          |
| <b>Total Areas</b> |                                   | <b>77,617 Ha.</b> |

This working plan covered the entire area of Nahan, Majra, Paonta Sahib and Bhagani Ranges.

**The Sal Conversion Working Circle (13,357ha.):** All good Sal forests suitable for conversion to uniform crop were allotted to this Working Circle. In Sewal's plan the area allotted to this Working Circle was 16032 ha. Malgi, Garibnath, Garhi, Banswali, Pipalwali, Bherewala, Jamotwa, Paniwali, Kiarda, Katapather, Surajpur, Mahadev-ka –Khala, Kothewali, Ambwali and Katasan forests allotted to Sal conversion Working Circle in the previous plan, were not allotted to this Working Circle. Kandela and Uttamwala-Baraban forests were added to this Working Circle.

Silvicultural system, rotation, regeneration period adopted were the same as in the last plan, Definite areas were allotted to P.B. I, II and V. P.B. III and IV were grouped together and termed as P.B. inter. The area allotted to each P.B. was:

|                   |       |     |
|-------------------|-------|-----|
| P.B. I            | 2,362 | Ha. |
| P.B. II           | 2,837 | Ha. |
| P.B. Intermediate | 5,839 | Ha. |
| P.B. V            | 2,319 | Ha. |

The entire growing stock in this Working Circle was enumerated in 10 cm d.b.h. classes down to 20 cm. d.b.h. Sal and Sain were enumerated separately and other species were grouped together as Kokat. The yield from P.B. I. was prescribed by volume and annual yield prescribed was 3002 cum. No definite annual coupes were formed, but sequence of felling was suggested. Definite marking rules for P.B.I. were prescribed and those were the same as in the previous plan. C/D grade thinning was also prescribed in advance growth which was not prescribed in the previous plan. Subsidiary silvicultural operation after fellings in P.B.I. areas were also prescribed.

**P.B. II:** Definite areas with middle aged to mature crop capable of putting on appreciable increment with deficient or no advance growth were allotted to P.B. II. The object of treatment of these areas was to enable middle aged crop to put on maximum increment and to induce natural

regeneration. It was to be ensured that small openings are done in the canopy to induce regeneration but mature stock was not to be depleted till the areas are transferred to P.B.I. As per yield calculations 40 % of the selection trees (50 c.m. d-b-h-) were to be felled in the felling period. Openings were to be created in canopy (Pepper Pot) by felling the selection trees and D-grade thinning. Felling cycle of 10 years was fixed. Subsidiary silvicultural operation were also prescribed.

**P.B. Intermediate:** Middle aged crops not allotted to other P.B. were allotted to this P.B. Controlled fellings with thinnings were prescribed. As per yield calculations 33% of selection trees were to be felled in the felling period of 10 years. Definite fellings coupes were laid down. C/D thinning was prescribed. Subsidiary silvicultural operations were also prescribed which included felling of marked trees and climber cutting.

**P.B.V.** Those areas which were having established regeneration were allotted to this P.B.

Removal of over wood and cleaning and thinnings in young crop were prescribed. The yield was prescribed by area and definite allotment into annual felling coupes were made. All marked trees and cutting bank of damaged regeneration and clumber cutting were prescribed in subsidiary silvicultural operations.

**Results: The** working plan was finalized only two years before the expiry of the working plan period and as such it is not expected that the prescription of the working plan were followed even before the plan was finalized. As per the details of fellings given in succeeding working plan by Arya, no over fellings were done in P.B.I. The pace of regeneration was poor as the areas could not be effectively closed. Although the regeneration period was suggested as 35 years but closures of P.B.I. felled areas was suggested for only 10 years. Even this could not be enforced. Subsidiary silvicultural operations were ignored.

Fellings in P.B. II. areas were done as prescribed. 40% of the selection fellings were prescribed to be removed in 10 years. Closures could not be enforced which led to the lack of regeneration. The overall effect was depletion of selection trees and lack of new regeneration. Subsidiary silvicultural operations were not carried out. Thus, the existing regeneration was not tended properly. Quite large number of selection trees were given to right-holders which resulted in further depletion of the stock of selection trees.

In P.B. Inter also the general character of crop did not improve and a large number of selection trees were granted to right holders. Trees were badly lopped. In P.B.V. the sequence of felling prescribed was not followed. The markings did not conform to marking rules.

In nut shell during this period there was depletion of growing stock and lack of regeneration in Sal forests of this Working Circle.

**The Selection Working Circle (23,282 Ha.):** Sal areas not considered suitable for conversion to uniform crop due to poor quality and steep slopes and Chil forests were allotted to this Working Circle. The area of Chil forests allotted was 1174 ha.

Selection fellings and thinning in Sal forests and thinning –cum-improvement fellings in Chil areas were prescribed with a view to improve the existing growing stock. A felling cycle of 10 years was prescribed. No enumerations were carried out. Yield was regulated by area and the yield by volume or number of trees was not fixed. Definite annual coupes were fixed. Exploitable diameter fixed for various species was, Sal and Sain 45 cm. d.b.h. for better quality areas and 40 cm. d.b.h. for poor quality areas, Chhal 40 cm. d.b.h. Chil 60 cm. d.b.h. and all other species 40 cm. d.b.h.

Mature groups of Sal were to be opened for obtaining regeneration. Such areas were to be closed to grazing. Cutting back of malformed and suppressed advance growth was prescribed. Cleaning in Chil regeneration was prescribed.

**Results: Neither** the sequence of fellings prescribed was followed nor the entire area prescribed for felling was felled. Felled areas were not closed to grazing. Marking rules were not followed properly. The result was the depletion of mature trees and lack of regeneration. Considerable damage was done to the crop by indiscriminate lopping. Due to continued grazing, new regeneration was not allowed to come up. There are Gujjar-paraos in these forests and these Gujjars did considerable damage to trees in the paraos and adjoining areas.

**The Protection Working Circle (26,986 Ha.):** Forests having mixed miscellaneous Kokat species with poor quality Sal and open blanks, steep and precipitous terrain were allotted to this Working Circle. Some bamboo forests were also included in this Working Circle.

No commercial fellings were prescribed. Afforestation and soil conservation measures were prescribed to be carried out. Bhabbar planting was also to be done. The area to be tackled annually was prescribed as 1010 ha. This was very small keeping in view the total area of 26,986 ha. of the Working Circle.

**Results:** Against the prescribed area of 1010 ha. during the working plan period, 1711 ha. area was closed and soil conservation measures were carried out. Forests closed were Mandpa, Haripur, Lohgarh, Shishamwala. Thaska, Saketi, Trilokpur, Gumti Sambhalwa, Paniwali,

Rampur Gainda, Anderi, Gurdwara, Sangholi and Todderpur, Parts of these forests were closed. The vegetation improved. Bhabber grass planting was successful. Natural regeneration of other species, especially Khair came up. Fencing of the closed area was done by thorny bushes. Closure was not very effective but still there was improvement in the vegetation. Since the extent of area treated was very small, (not even 0.5% of the total area), the results of working were not very prominently visible. There were forest fires which further reduced this impact. Most of the areas treated were along Haryana border and subjected to heavy illicit grazing.

**The Plantation Working Circle :(2,981 ha.):** Existing plantations of Ban and Deodar, riverain areas and grass lands with scanty trees growth were allotted to this Working Circle. 40 ha. area was prescribed to be planted annually. Deodar, walnut, Simbal, Khair, Shisham, Ailanthus, Chil, Kikkar, Willows, Tun and Mulberry were to be raised in sites suited to these species.

**Result: Plantations** were carried in a total area of 162 ha. Nothing was carried out in Deodar plantation. With the closure, natural regeneration also came in. Plantations carried out were encouraging although the closures were not very effective. Plantations were attempted in Giri, Rampur Beli, Yamuna and Jamotwa, Rajpur, Naurangabad and Gorakhpur. Plantations of Giri, Rampur Beli and Yamuna which form the beds of Giri and Yamuna were damaged by floods grazing and lopping.

**Special works of improvement Undertaken.**

(a) **Roads:** Following roads and paths were constructed during the period of this plan:

|       |                                                 |           |
|-------|-------------------------------------------------|-----------|
| (I)   | Rajban-Mehrar motorable road                    | 25.3 Km.  |
| (ii)  | Mehrar-Rama motorable road                      | 7.8 Km.   |
| (iii) | Surajpur-Simbalbara motorable road              | 11.00 Km. |
| (iv)  | Khadar-Ka-Bagh to Bikrambagh                    | 6.9 Km.   |
| (v)   | Dunga Forest to Jalmusa Forests motorable road. | 10.4 Km.  |
| (vi)  | Dhaura Kuan to Birla Jeepable Road              | 21.4 Km.  |
| (vii) | Bikrambabh-Singoli inspection path              | 12.00 Km. |

(b) **Buildings:** Following buildings were constructed during the working plan period.

|      |                                    |                                           |
|------|------------------------------------|-------------------------------------------|
| i)   | DFO Residence                      | Nahan                                     |
| ii)  | Range Quarters                     | Paonta Sahib and Nahan                    |
| iii) | Forest Rest House/Inspection huts. | Bhagani, Simbalbara, Trilokpur and Khara. |
| iv)  | Forester Quarters                  | Majra, Nahan and Paonta Sahib             |

|       |                  |                                                  |
|-------|------------------|--------------------------------------------------|
| v)    | F.G.Huts         | Danda,Tibri, Kotri, Khodri, Majri, Majra, Kilour |
| vi)   | Labour/Mali huts | Kandon, Simbalbara, Dhudla.                      |
| vii)  | Clerk quarters   | 4 Nos. Nahan                                     |
| viii) | Peon Quarters    | 2 Nos. Nahan                                     |

During this period quite a large number of useful buildings were added at a total cost of Rs. 2,37,305/-

(c) **Demarcation:** Demarcation of forests was carried out and the old iron pillars were replaced by masonry boundary pillars. 9,631 pillars were constructed at a total cost of Rs. 1,10,536/-. The entire work of demarcation and construction of boundary pillars was not completed.

(d) **Fires and fire line :** No new fire lines were laid. 2,388 ha. area was burnt in 16 fires during the plan period.

(e) **Grazing:** Grazing incidence increased due to the increase in cattle population. Migratory graziers of sheep and goats did illicit grazing in Govt. Forests and damaged the trees by lopping.

(f) **Resin tapping:** Resin was extracted from the forests as per past practice.

(g) **Bamboo Park:** Bamboo park were established at Ramuwala, Dhudla and Simbalbara. Bamboo did well only in Dhudla and some remnants are visible. Bamboos have failed in Ramuwala and Simbalbara.

**11.6 Period from 1963 to 1968:** Sharma and Tikku Plan expired in 1963 and Arya's plan was operative from 1968. During this period felling program were framed by Conservator of Forests, Nahan and approved by the Chief Conservator of Forests, Himachal Pradesh. Allotment remained the same as in Sharma and Tikku Working plan. The prescriptions were also the same. The result of working were the same as described in proceeding paras while discussing the result of past management under Sharma and Tikku Plan. The only additional feature was the felling for eucalyptus plantations.

**Eucalyptus Plantations:** During III Five Year Plan lot of emphasis was laid on Industrial plantation. Under this crash program total area of 2163 ha. in Sal belt and in the miscellaneous forests (leaving some standards) was felled during 1963-64 to 1967-68 and was planted with Eucalyptus, (mostly Mysore hybrid). The species was later identified as *Eucalyptus tereticornis*. The breakup of this area falling in each Working Circle is as under:

|                               |                 |
|-------------------------------|-----------------|
| Sal Conversion Working Circle | 353 ha.         |
| Selection Working Circle      | 731 ha.         |
| Protection Working Circle     | 820 ha.         |
| Plantation Working Circle     | 261 ha.         |
| <b>Total</b>                  | <b>2165 ha.</b> |

**Results:** Eucalyptus planted in localities with deep soil and good moisture regime grew very well but it failed in sloping land with poor soil. Further planting of eucalyptus was stopped keeping in view its poor performance of growth.

**11.7 Arya's Working Plan (April, 1968 to March 1978):** Shri S.R. Arya revised the working plan for Nahan Forest Division and his working plan was for a period of 10 years from April, 1968 to March, 1978.

**The General objects of management were:**

- i) To preserve and improve the vegetational cover all over especially on the Siwaliks and thereby check soil erosion and conserve the moisture.
- ii) To cover the blank hill sides with tree, cover and replace the inferior miscellaneous patches with suitable and more economic plantation preferably of fast-growing pulp wood species.
- iii) To arrest erosion by afforestation and other soil conservation measures.
- iv) To meet the legitimate and bonafide requirements of the local population, of timber, fuel wood, grazing, fodder and other forest produce and fuel requirement of Nahan and Paonta Sahib.
- v) To attain, as far as practicable, normal forest and normal regeneration in due course of time.
- vi) Consistent with the above, to obtain maximum annual yield in perpetuity, of various forests products timber fuel-wood, bhabbar grass and bamboo etc.

With these objects of management in view, he constituted the following working circles:

|    |                               |           |
|----|-------------------------------|-----------|
| a) | Sal conversion Working Circle | 10866 ha. |
|----|-------------------------------|-----------|



|    |                                          |           |
|----|------------------------------------------|-----------|
| b) | The Selection Working Circle             | 21780 ha. |
| c) | The Protection Working Circle            | 28104 ha. |
| d) | The Plantation (over lapping)            | 4109 ha.  |
| e) | The Bamboo (over lapping) Working Circle | 2000 ha.  |

The result of management of the forests allotted to different Working Circles is discussed herein after:

**The Sal conversion Working Circle (10866 ha.)** All forests containing almost pure Sal and situated on gentle slopes were allotted to this Working Circle. The system of management adopted was Modified Uniform System for converting the existing irregular crop into a more or less uniform crop. Rotation period of 125 years was adopted. Area was divided into 5 P.B's;

The entire growing stock of this Working Circle was enumerated into different dia classes down to 10 cm d.b.h. for Sal, Sain and other species grouped as Kokat.

**P.B.I. :** An area of 2067 ha. was allotted to P.B.I. Yield from P.B.I. was calculated by (i) C.A.I., (ii) Haufnagale formula. However, while carrying out these calculations, the volume was divided by half the rotation period, where as it should have been divided by the regeneration period. The total yield fixed was 3000 cum for Sal and Sain. This mistake was not detected till last 2 years of the plan. There were specific instructions in the plan to carry out subsidiary silvicultural operations. These were badly ignored. The result was the lack of regeneration and protection, where ever existed as observed by Sh. Chauhan in his plan, the result were not satisfactory because markings could not be done as per rules because yield fixed was on lower side and also because subsidiary silvicultural operations were not carried out as prescribed. The detail of P.B.I. areas felled and the yield position compared with the prescribed yield is given below: -

| Financial year | Forest prescribed for          | Forest actually felled | Volume prescribed for felling (in cum) | Actual volume felled (in cum) | Annual deviation (in cum) | Deviation   |
|----------------|--------------------------------|------------------------|----------------------------------------|-------------------------------|---------------------------|-------------|
| 1968-69        | Lai(c)                         | Lai(c)                 | 3000                                   | 2888.87                       | (-) 111.13                | (-) 111.13  |
| 1969-70        | Lai(a)                         | Lai(a)                 | 3000                                   | 1800.71                       | (-) 1199.29               | (-) 1310.42 |
| 1970-71        | Danda-Amboya (b)<br>Rajban (b) | Rajban(b)              | 3000                                   | 3789.49                       | (+) 789.49                | (-) 520.92  |

|         |                                                    |                                                   |      |         |             |             |
|---------|----------------------------------------------------|---------------------------------------------------|------|---------|-------------|-------------|
| 1971-72 | Garhi                                              | Rajban (Road & Transmission line.)                | 3000 | 2012.53 | (-) 987.47  | (-) 1508.39 |
| 1972-73 | Bias(b) & Lai(b)                                   | Garhi                                             | 3000 | 5340.03 | (+) 2340.03 | (+) 831.63  |
| 1973-74 | Naurangabad (b) & (c)                              | Danda-Amboya (b)                                  | 3000 | 2913.96 | (-) 86.06   | (+) 745.59  |
| 1974-75 | Garhiwala                                          | Garhi & Naurangabad (a)                           | 3000 | 2065.15 | (-) 934.85  | (-) 189.24  |
| 1975-76 | Danda-Amboya (c) & Sukhimelion (a)                 | Gorakhpur (b)                                     | 3000 | 8440.20 | (+) 5440.22 | (+) 5250.98 |
| 1976-77 | Lai(d) & Bias(c)                                   | Gorakhpur (b)                                     | 3000 | 9506    | (+) 6506    | (+) 1756.98 |
| 1977-78 | Rajban(a) & Lai (c) Munkundion and Naurangabad (a) | Sukhimelion (a) Lai(a),(c) & (e) Rajban (a) & (b) | 3000 | 2961.56 | (-) 38.44   | (+) 11718.5 |

**TREATMENT OF P.B. II. AREAS:** A total area of 2269 ha. was allotted to P.B.II. The canopy of the most of the forests allotted to this P.B. was open. Definite marking rules provided to marking of dead, dying and diseased trees, C/D grade thinning in young crop and very conservative marking in nallahs and tappars was prescribed. Yield was to be regulated by area and a definite sequence was to be followed. No control of yield by volume in this P.B. was prescribed. Subsidiary Silvicultural operations as prescribed for P.B.I. were also prescribed for P.B.II. The following table gives the detail of the area prescribed and felled year wise:

| Year    | Forest Prescribed for felling |           | Forest actually felled |           | Volume   |
|---------|-------------------------------|-----------|------------------------|-----------|----------|
|         | Name of Forest                | Area(ha.) | Name of Forest         | Area(ha.) | (in cum) |
| 1968-69 | Dhandla (a)                   | 168       | Dhandla                | 168       | 2414.10  |
| 1969-70 | Darranwala                    | 181       | Darranwala             | 181       | 1837.76  |

|         |                             |     |                                                             |            |         |
|---------|-----------------------------|-----|-------------------------------------------------------------|------------|---------|
| 1970-71 | Kukron & Tokion             | 281 | Kukron & Tokion.                                            | 281        | 2018.30 |
| 1971-72 | Dhandla (b)                 | 285 | Dhandla (b)                                                 | 285        | 1085.92 |
| 1972-73 | Khara (a)                   | 57  | Khara                                                       | 57         | 616.23  |
| 1973-74 | Khararu (c)                 | 218 | Khararu (c) & Dhandla (b)                                   | 218<br>285 | 14181.6 |
| 1974-75 | Danda Amboya (a)            | 281 | Sainwala                                                    | 129        | 989.24  |
| 1975-76 | DandaAmboya (d)             | 139 | Danda Amboya(d)                                             | 139        | 526.92  |
| 1976-77 | Kandhela(a)                 | 364 | -                                                           | -          | -       |
| 1977-78 | Sudowala (a) & Banswali (a) | 285 | Danda Amboya(b)<br>Banswali(a)<br>Lai(b)<br>Naurangabad (a) | 436        | 1837.86 |

The average annual volume felled of trees more than 30cm.d.b.h. works out to 1312 cum. It seems neither the marking rules were strictly followed nor the subsidiary silvicultural operations were carried out. The natural regeneration of Sal did not progress satisfactorily and the overall result was depletion of growing stock and lack of regeneration.

**TREATMENT OF P.B. INTER AREAS:** Area with the middle-aged crop was allotted to this P.B. Thinning-cum-improvement fellings were prescribed. Definite sequence of felling was given in the working plan. Yield was to be regulated by area and no volume control was prescribed. All dead, dying and diseased trees were to be marked for felling. Light crown thinning in congested groups was provided. Over mature trees were to be marked for felling. Subsidiary silvicultural operations like climber cutting were to be done in the year following the felling. The following gives the statement of areas prescribed for felling alongwith actually felled areas and volume of trees over 30 cm. d.b.h. marked for fellings:

| Year | Forest prescribed for felling |             | Forest actually felled |             | Volume of trees over 30 cm. d.b.h. marked for felling (in cum) |
|------|-------------------------------|-------------|------------------------|-------------|----------------------------------------------------------------|
|      | Name of Forest                | Area in Ha. | Name of Forest         | Area in ha. |                                                                |
|      |                               |             |                        |             |                                                                |

|         |                                                           |     |                                              |     |         |
|---------|-----------------------------------------------------------|-----|----------------------------------------------|-----|---------|
| 1968-69 | Gorakhpur(d)<br>Jammukhala and<br>Mehrar (b)              | 445 | Gorakhpur(d)<br>Jammukhala<br>and Mehrar (b) | 445 | 2133.75 |
| 1969-70 | Chandpur (a)                                              | 392 | Chandpur (a)                                 | 392 | 2260.4  |
| 1970-71 | Gorakhpur (c)                                             | 281 | Gorakhpur(c)                                 | 131 | 693.40  |
| 1971-72 | Ganyoni(a)                                                | 218 |                                              |     | 1201.92 |
| 1972-73 | Ganyoni(a) (Part) &<br>Gullarwala.                        | 576 |                                              |     | 129.23  |
| 1973-74 | Dunga & Majri (a)                                         | 521 |                                              |     | 687.28  |
| 1974-75 | Jhara (a) & (b)<br>Parduni(c)                             | 558 |                                              |     | 676.31  |
| 1975-76 | Jhara (c) Mehruwala(d).<br>Chandpur(b)                    | 492 |                                              |     | 287.45  |
| 1976-77 | Mehruwala(a) & (b)<br>Khararu(a)                          | 331 |                                              |     | 918     |
| 1977-78 | Kolar-Karondewali,<br>Sudanwala(b),<br>Uttamwala-Baraban. | 505 |                                              |     | 2795.83 |

In general, the crop was already open and there was hardly any need to carry out thinning. Markings in the areas of this P.B. were generally left to lower subordinate like Block officer which could not properly enforce the marking rules and the net result was depletion of growing stock without any appreciable improvement of the remaining crop.

**Treatment of P.B.V. Areas:** In this P.B. a total area of 1783 ha. was allotted. A definite sequence of felling was prescribed. Yield was to be regulated by area but it was indicated that about nine hundred cubic meter will be available per annum for removal. All the trees above 20 cm. d.b.h. were to count towards the yield. It was prescribed that all trees above 40 cm. d.b.h. will be marked for felling unless these are needed for protection of soil. Standing single trees of 30 to 40 cm. d.b.h. over established regeneration were also to be marked for felling. Dead dying trees were to be removed. Congested young regeneration was to be thinned. Climber cutting was also to be done.

Subsidiary Silviculture Operations like climber cutting, felling of marked unfelled trees, cutting back of damaged poles and saplings, bush cutting etc. were to be carried out. Following table gives the data regarding the area prescribed for felling and actually felled.

| Year    | Forest Prescribed for felling |             | Areas actually felled |             | Vol. Marked felled (in cum.) |
|---------|-------------------------------|-------------|-----------------------|-------------|------------------------------|
|         | Name of forest                | Area in ha. | Name of forest        | Area in ha. |                              |
| 1968-69 | Gorakhpur(a)                  | 55          | Gorakhpur (a)         | 55          | 1563                         |
| 1969-70 | Jamniwala(a)                  | 234         | Jamniwala (b)         | 234         | 4245                         |
| 1970-71 | Kukron(a)(part)               | 137         | Kukron(a)(Part)       | 137         | 300                          |
| 1971-72 | Kukron(a)(part)               | 138         | Kukron(a)(Part)       | 138         | 11648                        |
| 1972-73 | Kukron(b)                     | 283         | --                    | --          | 53.91                        |
| 1973-74 | Jamotwa (a)                   | 242         | --                    | --          | 3.68                         |
| 1974-75 | Gorakhpur(b)                  | 143         | --                    | --          | 387.10                       |
| 1975-76 | Jamniwala(c)                  | 236         | --                    | --          | 52.74                        |
| 1976-77 | Jamniwala(a)                  | 176         | --                    | --          | 502.16                       |
| 1977-78 | Gorakhpur(e)                  | 139         | --                    | --          | 2022.48                      |

Against the anticipated annual yield of 900 cum the actual average annual removal was 1078 cum. In general the P.B.V. areas contain well stocked forests with adequate regeneration in sapling and pole stages. These forests contain middle aged trees in quite big proportion, the removal of which would have lead to more fellings than prescribed viz. 900 cum annually. These forests (regenerated fully) give the appearance of irregular forests and the object of converting these forests into uniform crop was not achieved even partially.

**Results:-** The result of working have briefly been indicated above in respect of each P.B. The overall results was improper marking without following the marking rules, subsidiary silvicultural operations were not carried out leading to lack of regeneration.

**Selection Working Circle (21780 ha.) :** All Sal forests which were not considered suitable for conversion into uniform and mixed forests with good proportion of Sal were allotted to this working circle. Areas with Chil as main crop were also allotted to this Working Circle. The objects of management were (i) To improve and increase the growing stock (ii) To nurse the

young crop (iii) To meet the requirements of local people for timber, fuel, fodder etc. (iv) To obtain progressively increasing yield. Enumeration of the entire growing stock in 10cm diameter classes upto 10 cm. dbh was done. The forests were prescribed to be worked under selection system with thinning in groups of young crop. Exploitable dia for Sal, Sain, Shisham was fixed at 40 cm. and that for Chil as 60 cm. dbh for Khair 30 cm., and for all other species as 40 cm. d.b.h. 10 year felling cycle was fixed. Annual coupes for felling were prescribed. The entire area was to be gone over in 10 years. Some suggestions to restrict grazing and enforcement of lopping rules were incorporated in the plan, but they could not be followed in letter and spirit. Resin tapping in the Chil forest continued.

**Result:** There was no prescription for regeneration in this Working Circle. Natural regeneration was deficient due to excessive biotic pressure. Fellings led to depletion of growing stock. In general the forests were badly neglected. Standard of resin tapping was poor and very deep channels were made leading to uprooting and death of trees.

**Protection Working Circle 28104 ha.:** All mixed miscellaneous type of forests were allotted to this Working Circle. The objects of management were (i) To improve the vegetation cover (ii) To carry out sowings and planting (iii) To check soil erosion and conserve moisture (iv) To conserve and improve bhabbar grass (v) To raise Chil and deodar in blank areas of Kamraoo-Bharlidhar. The total area allotted to this Working Circle was 28104 ha. No enumerations were done. No fellings were prescribed. Treatment of soil conservation and planting was suggested.

**Results:** Small patches were treated and planted. Due to continuous grazing and lopping by local people” gujjars and illicit grazing by migratory graziers, the conditions of these forests deteriorated. Planting activity was negligible. About 42% of the area was not even touched.

**Plantation Working Circle (4109 ha. ),** Forests allotted to this Working Circle overlapped with the areas of Sal conversion, Selection and Protection Working Circles.

**New Plantations:** About 3514 ha. area was taken under plantations in different forests from 1968-69 to 1977-78. Annual target of 50 ha. Planting was fixed. Areas to be planted in different years were prescribed.

**Results:** Eucalyptus plantations were not attended to. The success of planting in other areas planted was very good. Flood in Giri and Yamuna damaged the plantation in R.F's, Giri, Yamuna, Konchbeli and Rampurbeli.

**Special works of Improvement Undertaken:** During the period from 1968-69 to 1977-78 following special works of improvement were undertaken:

**(a) Roads : Following roads were constructed:**

| Year of Construction | Name of Road                             | Type     | Length (kms.) | Cost (Rs.) |
|----------------------|------------------------------------------|----------|---------------|------------|
| 1969-70              | Approach road to Forest colony at Nahan. | Jeepable | 0.16          | 7000       |
| 1973-76              | Through Danda-Amboya P.B.II Forest.      | Jeepable | 0.372         | 416.93     |

**(b) Buildings: Followings were constructed during the plan period**

| Year of Construction | Name of Building                 | Range        | Place       | Cost (Rs.) |
|----------------------|----------------------------------|--------------|-------------|------------|
| 1969-70              | Forest Check Post                | Bhagani      | Sataun      | 4167.10    |
|                      | One Double storey clerk Quarter  | Nahan        | Nahan       | 30000.00   |
| 1970-71              | Two Class IV Quarters            | Nahan        | Nahan       | 25620.00   |
|                      | Two Double Storey Clerk Quarters | Nahan        | Nahan       | 4380.00    |
| 1973-74              | Two Double Storey Clerk Quarter  | Nahan        | Nahan       | 40000.00   |
|                      | Two Chowkidar Quarters           | Paonta Sahib | Mantaruwala | 17300.00   |
|                      | Two Forest Guard Huts            | Paonta Sahib | Mantaruwala | 23500.00   |
| 1974-75              | One Depot Office                 | Paonta Sahib | Mantaruwala | 18300.00   |
| 1976-77              | One Library room in CF Office.   | Nahan        | Nahan       | 5570.00    |
|                      | One Labour Hut                   | Bhagani      | Salwala     | 5369.53    |
|                      | One Labour Hut                   | Bhagani      | Rajpur      | 12454.91   |
|                      | Two Forest Guard Huts            | Paonta Sahib | Mantaruwala | 29999.90   |
| 1977-78              | One Seed Store                   | Nahan        | Rama        | 8500.89    |
|                      | One Seed Store                   | Majra        | Haripur     | 9499.11    |
|                      | One Seed Store                   | Bhagani      | Bhagani     | 8603-41    |
|                      | One Seed Store                   | Paonta Sahib | Kansar      | 9400.03    |
|                      | W.P.O. Nahan                     | Nahan        | Nahan       | 5125.54    |

**(c) Demarcation:** During this period the detail of boundary pillars constructed are given below with expenditure.

---

| Year of Construction | Number of boundary Pillar | Cost (Rs.) |
|----------------------|---------------------------|------------|
| 1976-77              | 117                       | 2455.84    |

|         |     |         |
|---------|-----|---------|
| 1977-78 | 130 | 2126.25 |
|---------|-----|---------|

(d) **Fires and Fire-lines:** No new fire lines were laid. Existing one were maintained. Number of accidental fires and the area burnt year wise is given below:

| Year    | No. of fires | Area burnt by fires (in ha.) | Percentage of total area burnt. |
|---------|--------------|------------------------------|---------------------------------|
| 1968-69 | 7            | 93                           | 0.1                             |
| 1969-70 | 40           | 8448                         | 12.6                            |
| 1970-71 | 54           | 4486                         | 6.7                             |
| 1971-72 | 7            | 242                          | 0.4                             |
| 1972-73 | 92           | 4910                         | 7.3                             |
| 1973-74 | 28           | 964                          | 1.4                             |
| 1974-75 | 45           | 4671                         | 7.0                             |
| 1975-76 | 33           | 1750                         | 2.6                             |
| 1976-77 | 13           | 620                          | 0.9                             |
| 1977-78 | 17           | 454                          | 0.7                             |
| Annual  | 34           | 2665                         | 3.9                             |

(e) **Resin Tapping:** Resin tapping continued in pre-dominantly Chil forests. The general standard of resin tapping deteriorated and oversized blazes were made than prescribed. Number of blazes tapped year-wise are given below:

| Year    | Number of Blazes |
|---------|------------------|
| 1968-69 | N.A.             |
| 1969-70 | 36912            |
| 1970-71 | 36015            |
| 1971-72 | 38483            |
| 1972-73 | 35486            |
| 1973-74 | 35634            |
| 1974-75 | 46752            |
| 1975-76 | 46752            |
| 1976-77 | 47502            |



|         |       |
|---------|-------|
| 1977-78 | 39540 |
|---------|-------|

(f) **Grazing and Lopping:** The problem of grazing and lopping by local people and also migratory shepherds and gujjars continued. There was general deterioration of the growing stock because of these two inimical factors. The cattle population kept by local People continued to increase.

(g) **Nautors and encroachments:** Some Nautors to landless people have been allowed even in Reserve Forests. There are quite large number of cases of encroachments in government forests especially near cultivation/habitation. Gujjars have illegally encroachments upon and are cultivation forest areas in Kukron forests.

(h) **Timber and Other produce for concessionists:** During this period liberal grant of trees to concessionists were made. This leads to deterioration/decrease of good quality trees. Un-prescribed and un-silvicultural fellings leading to reduction of better-quality trees.

(i) **Khair and its yield:** The annual yield of Khair was fixed as 420 trees of 30 cm. d.b.h. and over Marking rules were prescribed and annual coupes were also fixed. No subsidiary silvicultural operations were anticipated.

(j) Only few forests containing Khair trees were prescribed for working. Other areas where Khair was found scattered were not prescribed. No planting of Khair was prescribed. Mostly over mature trees were felled. In general, there was depletion of mature trees and rotting/deterioration in areas like Haripur. Lohgarh, which were not prescribed for felling.

(k) **Management of Wild life:** Management of wild was discussed and described in one complete chapter in Arya's plan. Practically nothing was done to implement the suggestions. In general, the conditions of wild life deteriorated.

(l) **Soil Conservation and Water-Shed Management:** Although broad principles for soil conservation and water shed management were given in Arya's Plan but no specific programme of areas to be tackled yearly was given. Soil conservation operations were carried out subject to availability of funds. Due to neglect of miscellaneous scrub forests, deterioration of vegetative cover and excessive grazing, the soil erosion was accelerated.

**11.8 Period from 1978 to 1982 :** Aray's plan expired during 1977-78. Chauhan's plan was prepared and made operative from 1982-83 onwards for a period of 10 years. The intervening gap of 4 years from 1978-79 to 1981-82 was covered by prescription given in Arya's plan. The result of working were the same as described in the preceding paras while discussing the result of Past management under Arya's plan. One of the additional features was that at the beginning

of Chauhan's Plan, actual removals were much in excess than the prescribed yield with the only exception being the removals carried out in P.B.II The condition of regeneration and the crop remained much the same as described in the analysis of Arya's Plan. The growing stock continued to deplete. There were heavy pressures on forests.

**11.9 B.S. Chauhan's Plan (1982-92):** This plan was for a period of ten years beginning from 1982-83. However, the approved working plan was available only in 1992, i.e. after the expiry of the plan period Late approval of working plan created a lot of confusion in the working of forests. The copy of the draft working plan available in the forest divisions prescribed following Working Circles in the plan:

- i) Sal Conversion Working Circle.
- ii) Coppice Working Circle.
- iii) Protection-cum-afforestation Working Circle.
- iv) Chil Working Circle.
- v) Eucalyptus (O.L.) Working Circle

The forests were to be worked in accordance with the prescriptions of the draft plan. However, the approved plan actually has the following Working Circles:

- i) Sal conversion Working Circle.
- ii) Protection-cum-afforestation Working Circle.
- iii) Chil Working Circle.
- iv) Eucalyptus (O.L.) Working Circle.
- v) Bamboo (O.L.) Working Circle.

Thus, the forests coming under, "Coppice Working Circle", as shown in the draft plan, were finally allotted to "Protection-cum-afforestation Working Circle" in the approved plan. Although some of these forests were actually worked as coppice lots in accordance with the prescriptions of draft plan. However, the results of these workings were highly discouraging. Not even a single forest worked under coppice has regenerated fully. The main reason for this sorry state is the total neglect of subsidiary operations. No felled area was fenced properly. This resulted in heavy grazing in these areas and consequently no regeneration could come up. At present these areas give a very eroded look. The control forms for the years 1982-92 were also approved in accordance with provisions/guidelines contained in the draft plan. Even the "Preliminary working plan report" for the revision of the Chauhan's Plan was approved as per the prescriptions

of the draft plan. All this happened due to the late approval of the working plan and late receipt of the approved plan.

### **Sal Conversion Working Circle: (18298.89 ha.)**

All pure Sal forests of comparatively good quality, growing in flat lands and gentle slopes were allotted to this Working Circle. Some of the Sal forests allotted to Selection Working Circle in Arya's plan, were also allotted to this Working Circle. The main criteria of allotment were that the forests contained mostly pure Sal crop and the conditions being such that natural regeneration of Sal could be obtained. The main object of constituting this Working Circle was to convert the existing irregular crop into more or less uniform crop. Only one felling series was formed. Five periodic blocks were constituted, namely P.B.I., P.B.II., P.B. un-allotted and P.B.V. P.B. un-allotted actually covered areas of P.B.II & P.B. IV. Rotation and conversion period of 125 years was adopted with regeneration period of 25 years. The silvicultural system adopted was "Uniform system with fixed periodic blocks". No enumerations were carried out in this plan.

**Treatment of P.B.I. areas:** An area of 2808.91 ha. was allotted to this P.B. The main criteria of allotment were the presence of adequate regeneration which required opening of over-wood and cutting back of the regeneration for its further uniform growth. Most of these areas were reasonably well stocked. For the calculation of yield, Arya's plan data and P.I.S. data was used. This was certainly a lapse in the Chauhan's plan, as no enumerations were carried out at all. Using of old data, led to over estimation of yield. Yield for Sal was calculated on the basis of (i) Von Montel's formula, (ii) C.A.I., (iii) Howards formula, (iv) Hufnagles formula, using the growing stock figures of the entire Working Circle. Finally, the yield figure for the entire Working Circle, as worked out by Hufnagles formula, was adopted. This worked out to be 40310 cum. However, this was reduced to 35000 cum due to the fact that the forests were not fully stocked. Yield for Sain and other species in the entire Working Circle was worked out to be 6,000 cum, by using Von Montal's formula. Thus, the ANNUAL YIELD for the entire Sal Conversion Working Circle was fixed as 41,000 cum for Sal, Sain and other species. The prescribed yield for this Working Circle, suddenly increased from 3000 cum per annum as prescribed in Arya's plan to 41,000 cum per annum in Chauhan's Plan. Though the yield calculations were correct but perhaps the biggest folly was using the old data of Arya's plan and not calculating the volume

actually available for removal from P.B.I. As no definite yield was prescribed from any other periodic block, practically the entire yield was to be had from P.B.I. only. But, before prescribing and fixing the annual yield, it should have been checked from the available data, whether this much of volume was actually available for removal in the forests allotted to P.B.I. or otherwise. However, this was never done. Although, the yield figures were sub-satiated by the actual removals done in the following couple of years, but this was not an acceptable check, as the areas felled were not necessarily representative areas. This led to an overestimation of yield, as would be evident from the results of working. Although the overall yield of the Working Circle was fixed as 41,000 cum, the annual yield prescribed from P.B.I. areas was, Sal 19,000 cum, Sain 1000 cum and Kokat 2000 cum, i.e. total 22,000 cum. However, it was proposed as 25,550 cum for P.B.I. in the draft plan. Now this was again an incorrect prescription. As no definite yield was prescribed from any other P.B., the yield prescribed for P.B.I. should have been equal to the total yield prescribed for the entire Working Circle. But actually, these were two largely different figures. In fact, since no definite yield was prescribed from any other P.B. except for P.B.I, the volume available for removal annually in P.B.I, should have been prescribed as the annual yield for P.B.I. as well as the entire Working Circle. This would have given a realistic yield figure. However, this was not done and with the result, annual yield estimation was quite off the mark. The annual coupe to be felled in P.B.I. areas was fixed as 112 ha. (approx.). The balance volume was to be felled from other P.B.'s although no definite yield was suggested from other P.B.'s. The details of P.B.I. areas felled and volume extracted is produced below:

| Year of felling | Forest due for felling                                                        | Forest actually felled                      | Yield prescribed (cum) | Actual Vol-felled (cum) |
|-----------------|-------------------------------------------------------------------------------|---------------------------------------------|------------------------|-------------------------|
| 1982-83         | R.F. Mehruwala C4, RF Jamotwa C1, RF Garhi C4,                                | RF. Jamotwa C1, RF. Lai C23, RF Garhi C4,   | 22000                  | 15350.29                |
| 1983-84         | RF. Danda Amboya C7, RF. Lai C14, RF. Jamanwali C4                            | RF. Jamanwali C4, RF. Lai C14,              |                        | 7542.48                 |
| 1984-85         | RF. Danda/Amboya C10, RF. Ganyoni C2, RF Sukhimelion C2,                      | RF. Ganyoni C2, RF Sukhimelion C2,          |                        | 8957.64                 |
| 1985-86         | RF. Danda/Amboya C4, RF. Malgi C25 , RF. Garhi-Banswali C1, RF. Uttamwala C2. | RF. Danda/Amboya C4, RF. Garhi-Banswali C1, |                        | 6830.61                 |
| 1986-87         | RF. Kandela C1,                                                               | RF. Kandela C1,                             |                        | 20878.84                |

|         |                                                                                               |                   |  |       |
|---------|-----------------------------------------------------------------------------------------------|-------------------|--|-------|
|         | RF. Pipalwali C3.                                                                             | RF. Pipalwali C3. |  |       |
| 1987-88 | RF. D/Ambuya C12<br>RF. Malgi C27.<br>RF. Kiyarda C4.                                         | -Nil-             |  | -Nil- |
| 1988-89 | RF. Kandela C4,<br>RF. Garibnath C18,<br>RF. Lai C32,<br>RF. Katapathar C3<br>RF. Mastali C5. | -Nil-             |  | -Nil- |
| 1989-90 | RF. Gorakhpur C18,<br>RF. Jamniwala C1,<br>RF. Lai C20,                                       | -Nil-             |  | -Nil- |
| 1990-91 | RF. Jamotwa C4,<br>RF. Jamniwala C1,<br>RF. Lai C20,                                          | -Nil-             |  | -Nil- |
| 1991-92 | RF. D/Ambuya C2,<br>RF. Kukron C10,<br>RF. Badighati C3,<br>RF. Sainwala C1,                  | -Nil-             |  | -Nil- |

A quick glance of the above table reveals that the forests were not worked in accordance with the prescriptions. Moreover, the volume available for removal was nowhere near the prescribed yield. No working of green lots was done after 1986-87. In any case, the total yield of 41,000 cum from the entire Working Circle, and that of 22,000 cum from P.B.I. was never to be reached (as would be evident from discussions done in the coming paras, as no felling was to be done from other P.B's except P.B.I. and P.B.V).

There were specific provisions for executing fellings, and subsidiary silvicultural operations such as period of felling, debris removal, fencing, climber cutting, shrub cutting, thinning and lopping of inferior Kokat, thinning of coppice shoots in 2<sup>nd</sup> year etc. All these operations were badly ignored.

**Result:** The forests were never worked in accordance with the prescriptions of the plan. In fact, no area was felled after 1986-87. Subsidiary silvicultural operations were badly ignored. The removals were much below the prescribed yield mainly due to restrictive fellings and quantum increase in the prescribed yield. In fact, there was a deficit in removals equivalent to 357782.78 cum, till the end of 1991-92, in the yield position, as shown in the control forms for P.B.I. removals. With the result the regeneration suffered badly. The forests under regeneration became very congested and could not put on the required growth. Over all, in some forests the crop has degraded due to excessive biotic pressures as already mentioned in the respective compartment history files. However, the regeneration was satisfactory in the areas felled except forests like

Kandela C1 & Danda-Amboya C4. The failure in these forests was mainly due to ineffective protection and heavy biotic interference and lack of subsidiary silvicultural operations.

**Treatment of P.B. II. Areas:** An area of 4170.56 ha. was allotted to P.B.II. The areas bearing open crop of over mature and/or middle-aged trees were allotted to this Working Circle. The idea was to close the areas to induce regeneration and stock the under stocked forests. It was presumed that since the regeneration of Sal takes a long time, it would be in the fitness of things to undertake the regeneration operation in P.B.II areas. Approximately half of the area under P.B.II was to be fenced during the plan period to induce regeneration. A definite sequence of closure was suggested. However, this was never followed. Moreover, this was not a very sound idea as this was practically not possible to close areas for a very long period due to heavy biotic pressures. No fellings were prescribed in this periodic block. Fencing, bush cuttings, thinning of Kokat, climber cutting etc. were supposed to be done. However, all these operations were badly ignored.

**Result:** Closures of P.B.II areas were carried out in some areas to induce regeneration, as prescribed in the plan, but, that was not very effective due to insufficient post care by the staff. Subsidiary silvicultural operations were badly ignored. As the areas allotted to this P.B. were already quite open they further deteriorated. Regeneration could never be induced and the very basic objective was not even partially achieved. Some forests became degraded due to excessive biotic interference, as already detailed in the compartment history files.

**Treatment of P.B. Un-allotted:** The area allotted to this periodic block was 10774.30 ha. Most of the forests allotted to this Working Circle contained well stocked middle aged to young crop. No felling were prescribed. Thinning were not prescribed either. Felling of trees to meet the requirement of right holders, was to be done from this P.B. Gab planting was also suggested and prescribed.

**Result:** Since there were no specific prescriptions, nothing was done either. T.D. was given quite liberally from this P.B. Gap planting was done wherever possible. However, the results were not very encouraging. One very unusual and unwarranted fact was that Khair was planted in such gaps. This changed the entire composition of the crop.

**Treatment of P.B. V:** An area of 545.12 ha. was allotted to this P.B. It comprised of the forests that were felled during the years 1975-76 to 1981-82. Many of these areas were not yet fully regenerated but were still taken to this block. The earliest felled area allotted to this P.B. was felled in 1975-76 and the final felling of this area was proposed in 1985-86 depending upon the progress of the crop. Final felling was to be done in areas where the Sal regeneration was well stocked and had attained a height of 6 meters. There was again a confusion in regard to sequence of felling in this periodic Block in draft plan vis-a-vis approved plan. The draft plan contained a

definite sequence of felling, whereas, no such sequence figured in the approved plan. The selection of the annual felling coupe was left to the discretion of the Divisional Forest Officer. In any case, final felling was never done in any of the areas.

**Result:** Almost nothing was done in the areas allotted to P.B.V. No final felling was carried out. Thinning, bush cutting, climber cutting was neither prescribed in the approved plan nor done. This resulted in poor progress of regeneration. It remained suppressed, unhealthy and branchy. Multiple coppice shoots were never singled out. The regeneration was present both in unestablished sapling stage and also in established pole stage. The thick bushy growth prevented the regeneration from attaining the required growth.

**Result of Sal Conversion Working Circle:** The results of working in each P.B. has been discussed separately. The overall result was improper working, ignoring of subsidiary silvicultural operations, restrictions on green felling after 1986-87, variance in the prescriptions of draft plan and that of approved plan, over prescription of yield. The overall yield of this Working Circle was prescribed as 41,000 cum, which was a gross over estimation and it was never achieved. All this led to lack of regeneration. Some damage was caused due to migratory as well as local graziers.

**Protection Cum Afforestation Working Circle (40925.17 ha.):** All areas excluding areas allotted to Sal Conversion Working Circle, Chil Working Circle and pockets of Eucalyptus plantation, were allotted to this Working Circle. This included poor quality Sal forests which were allotted to Selection Working Circle in Arya's Plan. All miscellaneous scrub forests were also included in this Working Circle. The total area of this Working Circle was 40,925.17 ha. out of which about 27,612 ha. had moderately stocked miscellaneous broad leaved forests or moderately stocked poor quality Sal forests. Actually this area was initially allotted to Coppice Working Circle in the draft working plan and a definite yield by area (552 ha per annum) was prescribed. A few forests had in fact been worked as coppice lots as prescribed in the sequence of felling for coppice Working Circle in the draft plan. However, later on in the approved plan, the entire area was put into protection cum Afforestation Working Circle. This was a serious lapse and mistake which resulted due to late approval and receipt of the approved Chauhan's plan. In fact, a few good Sal forests of Paonta Sahib Range were also allotted to this Working Circle, perhaps inadvertently. The main objectives of management of this Working Circle were (i) Improvement of vegetative cover (ii) To maintain existing forests for aesthetic reasons (iii)

To carry out planting of timber, fuel, fodder and other species (iv) To protect and introduce bhabbar grass (v) To conserve soil and water by carrying out suitable measures.

No enumerations were carried out in this Working Circle. No felling were prescribed. Only Khair was to be felled under miscellaneous regulations. Forests were to be protected against illicit felling, grazing and lopping. Strict fire protection measures were suggested. Specific treatment for closed areas was prescribed. Year-wise plantation program was given. Miscellaneous regulations, e.g. planting, choice of species, bush cutting, period of closure etc. were suggested. However, all this was badly ignored. Felling of Khair was carried out under special program during: 1991-92 in R.F. Sunkron C-13,14, 15; R.F. Gharatwali C-3,5,6,7,8,9,10,11,12 ; R.F. Yamuna C-1,2 ; RF Khojjar C-7 ; R.F. Dhandla C-19,20, RF Mehruwala C-8, RF Dhandla C-11.

**Results:** There was a lot of variation in the prescription of the draft plan and approved plan. There was a confusion in working as well. Although R.F. Dhandla C-11 & Danda-Amboya C-5 were felled during 1984-85 under coppice system but they should not have been felled because coppice system was done away with in the approved plan. Although, these areas were felled as coppice lots but no attention was given on subsidiary silvicultural operations for regenerating the felled areas. With the result, the areas could not be regenerated effectively. There were heavy biotic interference in these areas, which badly affected the regeneration. Other prescriptions were also not followed strictly. Planting program was never adhered to. The forest were continuously subjected to heavy biotic pressures. The new plantations were not very successful. Soil erosion went on unabated. As a result, the forest continued to degrade and growing stock depleted. No regeneration came up in the felled areas listed above, mainly due to ineffective and untimely closure and heavy grazing, browsing and lopping.

**Chil Working Circle :(1027.04 ha) ::** Chauhan's Plan included the Chil areas of Nahan and Paonta Sahib Forest Divisions in this Working Circle. Chil was however confined to kanser block of Girinagar Range. The forests contained good quality Chil with poor stocking. The main object of constituting this Working Circle was to improve the stocking of existing forests. Since the area under Chil was limited, no regular working on the principles for Chil management was prescribed. Salvage marking and markings of trees to meet the requirement of local right holders was prescribed. Bi-Annual planting program in blanks was suggested. Resin tapping in accordance with the Punjab forest leaflet no. 13 was to be carried out.

**Results:** Since no specific working prescriptions were given, nothing specific was carried out. Planting programme was not followed. However certain areas were taken up for planting without



any significant achievement. T.D. was also given from the forests. This resulted in depletion of overall growing stock. Resin tapping was carried out in gross violation of the instructions on the subject and deep channels were dug. Consequently, several trees got uprooted or died. In nutshell, the basic objective of improving the stocking could not be achieved at all.

**Eucalyptus (Over Lapping) Working Circle (727.62 ha):** This Working Circle overlapped the areas of Sal Conversion Working Circle and protection cum Afforestation Working Circle. Eucalyptus was planted from 1964-65 to 1977-78. The main objectives of management include (i) Felling of stagnating Eucalyptus plantations and the area be regenerated with coppice crop and supplemented by planting fodder species. (ii) To fell Eucalyptus to meet the local requirement of fuelwood and small timber.

No enumerations were carried out in this Working Circle. Specific marking rules were framed. Specific subsidiary silvicultural operations such as bush cutting, fencing, singling of coppice shoots in the 2<sup>nd</sup> year, planting of suitable species etc, were suggested. Miscellaneous regulations were prescribed. It was provided that management of these areas should be reviewed after first rotation of 10 years. (The entire area was to be felled in a period of 10 years.)

The details of areas prescribed for felling and the areas actually felled is given below:

**Eucalyptus Working Circle (OL.)**

| <b>Year of felling</b> | <b>Forest due for (Area name)</b>                                                                                                            | <b>Forest Felled</b>                                                                                                    | <b>Approx. Area prescribed (ha)</b> | <b>Actual felling felled (Ha.)</b> |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------------------|
| 1982-83                | RF Dhandla C-9<br>RF Dhandla C-10<br>RF Garibnath C15, C17, C18<br>RF. Jamanwali C1, C2, C4<br>RF. Tokion C3, C7.                            | RF Dhandla C-9<br>RF Dhandla C-10<br>RF Jamnwali C1, C2, C4.<br>RF. Tokion C3, C7.                                      | 63                                  | 50.97                              |
| 1983-84                | RF. Khodri Majri C1&C2<br>RF. Khojjar C3<br>RF. Mehruwala C2<br>RF. Sainwala C1, C3, C4<br>RF. Paniwali C3 & C4<br>RF. E. Behron C1, C2 & C3 | RF. Khodri-Majri C1&C2<br>RF. Khojar C3<br>RF. Sainwala C1, C3, C4<br>RF. Paniwala C3 & C4<br>RF. E. Behron C1, C2 & C3 | 63                                  | 58.56                              |
| 1984-85                | RF. Giri C1 & C2<br>RF. Jamotwa C2 to C5                                                                                                     | RF. Giri C1 & C2<br>RF. Jamotwa C2 to C5                                                                                | 63                                  | 38.94                              |
| 1985-86                | RF. Chandpur C13 & C14<br>RF. S. Melion C1 & C2<br>RF. Teeb C1                                                                               | -Nil-<br>RF. Bikarmbag C1<br>RF. Teeb C3                                                                                | 63                                  | Nil                                |
| 1986-87                | RF. Janjli C5<br>RF. Sataun C1 & C2                                                                                                          | RF. Mandapa C1                                                                                                          | 63                                  | 46.66                              |

|         |                                                                                                                                                         |                                             |    |       |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----|-------|
|         | RF. Badighati C3<br>RF. Mandapa C1                                                                                                                      |                                             |    |       |
| 1987-88 | RF. D/Amboya C4 & C18<br>RF. Kangniwala C2, C3, C4                                                                                                      | RF Dandla C9 (Part)<br>RF D/Amboya C4 & C18 | 63 | 10.40 |
| 1988-89 | RF Yamuna C2<br>RF. Khararu C8, C9<br>RF. Kiyarda C1, C2, C4<br>RF Mahadav Ka khala C3, C4, C6<br>RF. Bhrahmanwali C2, C3<br>RF. Kalabhood C3, C8 & C10 | Nil                                         | 63 |       |
| 1989-90 | RF. Ghuttanpur C9<br>RF. Ambwali C2<br>RF. Gharatwali C5, C8, C9, C12<br>RF. Sunkron C15, C16<br>RF. Mandapa C2                                         | Nil                                         | 63 | Nil   |
| 1990-91 | RF. Haripur C10<br>RF. Banswali C1, C7<br>RF. BhagpurKotla C1                                                                                           | Nil                                         | 63 | Nil   |
| 1991-92 | RF. Lohgarh C19, C20, C32<br>RF. Bhabbarwali C1, C2<br>RF. Mandapa C4                                                                                   | Nil                                         | 63 | Nil   |

**Results:** As is evident from the above table, no area was felled after 1987-88. Even before that, areas were not felled strictly in accordance with the prescriptions. However, all the areas felled have regenerated well with coppice crop which has almost reached pole stage. It is sad to point out that no subsidiary silvicultural operations were carried out as per the provisions. Coppice shoots were not signed out. The regeneration has not put up the desired growth. The crop has become quite congested. There is a thick bushy growth of rohini, lantana, gurbheli etc. besides the regeneration, which has hampered the growth of the crop. Thus, despite the fact that felled areas have regenerated, the objectives of management were not achieved fully.

**Special Works of improvement undertaken in Chauhan's Plan:** During the period from 1981-82 to 1991-92, following special works of improvement were undertaken in Nahan and Paonta Sahib Forest Divisions.

**Buildings:** Following buildings were constructed during the plan period. p166. rm90

| Year Construction | Name of building | Qty.    | Range   | Place   | Cost   |
|-------------------|------------------|---------|---------|---------|--------|
| 1981-82           | Seed Store       | Bhagani | Bhagani | Bhagani | 3,5000 |
| 1982-83           | Nil              | Nil     | Nil     | Nil     | Nil    |
| 1983-84           | Nil              | Nil     | Nil     | Nil     | Nil    |

|         |                                                                          |                                          |                                                                       |                                            |                                                     |
|---------|--------------------------------------------------------------------------|------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------|
| 1984-85 | Fgd Hut                                                                  | 1 No.                                    | Paonta Sahib                                                          | --                                         | 54,000/-                                            |
|         | Range-cum-Residence                                                      | 1 No.                                    | Girinagar                                                             | Girinagar                                  | 1,00,000/-                                          |
|         | <b>Total</b>                                                             | <b>2 No.</b>                             |                                                                       |                                            |                                                     |
| 1985-86 | Range-cum-Residence                                                      |                                          | Girinagar                                                             | Girinagar                                  | 80,000/-                                            |
| 1986-87 | Fgd. Hut - 1 No.                                                         |                                          | Bhagani                                                               | Majri                                      | 64,098/-                                            |
| 1987-88 | Log Hut                                                                  | 1 No.                                    | Bhagani                                                               | Rajpur                                     | 1,20,000/-                                          |
|         | -----<br>L/Hut<br><b>Total</b>                                           | 1 No.<br>1 No.<br><b>3 Nos.</b>          | Paonta Sahib<br>Girinagar                                             | -<br>Parduni                               | 60,000/-<br>3,000/-                                 |
| 1988-89 | Fgd. Hut<br>Fgd. Hut<br><b>Total</b>                                     | 3 No.<br>1 No.<br><b>4 Nos.</b>          | Paonta Sahib<br>Girinagar                                             | --<br>Girinagar                            | 2,10,000/-<br>60,000/-                              |
| 1989-90 | I/Hut<br><br>Fgd. Hut                                                    |                                          | Part-<br>completion<br>Bhagani<br>Part-<br>completion<br>Paonta Sahib | Rajpur<br><br>---                          | 34,000/-<br><br>70,000/-                            |
| 1990-91 | B.O. Qtr                                                                 | 1 No.                                    | Bhagani                                                               | Majri                                      | 74,400/-                                            |
|         |                                                                          | Part Completion<br>Bhagani               |                                                                       |                                            |                                                     |
| 1991-92 | B.O. Qtr<br><br>I/Hut<br>Fgd Hut<br>Fgd Hut<br>Type i Qtr<br>Typw ii Qtr | <br><br>1 No.<br>1 No.<br>2 No.<br>2 No. | <br><br>Girinagar<br>Girinagar                                        | Majri<br><br>Rajpur<br>K/Baila<br>B/Baneri | 34,885/-<br><br>1,581/-<br>1,00,000/-<br>1,00,000/- |

(c) Demarcation: During the plan period, the following boundary pillars were constructed:

| Year    | No. of B.P.'s Constructed | Cost (Rs) |
|---------|---------------------------|-----------|
| 1981-82 | --                        | ----      |
| 1982-83 | 257                       | 9001.00   |
| 1983-84 | 150                       | 5510.00   |
| 1984-85 | 35                        | 1236.00   |
| 1985-86 | 73                        | 1875.00   |
| 1986-87 | 29                        | 1087.00   |
| 1987-88 | 356                       | 15000.00  |
| 1988-89 | 11                        | 600.00    |
| 1989-90 | --                        | --        |
| 1990-91 | --                        | --        |
| 1991-92 | --                        | --        |

**(d) Fires and fire lines:** No new fire line was constructed during the plan period. However, repairs were carried out on the existing fire lines. Number of fires and the area burnt has already been given in chapter II.

**(e) Resin Tapping:** Resin was tapped in the Chil forests. However, it was not done according to rules/guidelines, Deep channels were dug. Blazes were oversized. The general standard of tapping deteriorated.

**(f) Grazing and Lopping:** This problem has assumed dangerous proportions in the recent years. Grazing has been admitted in Faisla-e-Junglat, with some restriction but in practice no regulations have been followed and it has almost gone out of control. Illicit grazing and lopping is being done by local people, gujjars and migratory graziers. This has very adversely affected the regeneration in forests. The quality of crop and its health has deteriorated in general, due to heavy lopping and grazing.

**(g) Nautors and Encroachments:** Nautors were allowed in the early eighties. However, no nautors have been granted in the recent past. But the problem of encroachments has increased manifold. There are large number encroachments on government forests. Gujjars and local people have illegally encroached the forest areas. The process of eviction is very slow and consequently the progress in this direction is very tardy.

**(h) Timber and Other produce for right holders:** T.D. has been sanctioned quite liberally during the period. This has led to deterioration of forests, especially due to the fact that the best free is removed while marking T.D. Principles of Silvicultural markings are hardly adhered to, by the subordinate staff, while giving timber to the right holders. This has resulted in reduction of better-quality trees.

**(i) Management of Wild Life:** This aspect has been totally neglected during the plan period. There was no provision for management of wild life in the scheme and nothing was done. Although, there is complete ban on shooting and hunting, there have been instances of poaching and illegal hunting. In general, the condition of wild life has deteriorated due to negligence and overall degradation of forests.

**(j) Soil Conservation and Watershed Management:** No specific mention of soil conservation works is found in Chauhan's Plan. However, it has been recommended that soil conservation works should be carried out as and where required. Soil conservation works have been done in different areas during the plan period.

However, much more is required to be done as the problem of soil erosion has increased almost alarmingly.

**(k) Khair Working:** Khair is found scattered in the forests allotted to Protection cum Afforestation Working Circle and also on the fringes of few areas felling in Sal Conversion Working Circle. No enumerations were carried out in Chauhan's plan. As no separate, compact areas of Khair were available, no separate Working Circle was constituted for Khair working. The exploitable size of Khair was fixed as 30 cm d.b.h. and the felling cycle was fixed as 10 years. No yield of Khair was prescribed. Specific marking rules were provided. Following felling programme for Khair was in 1986-87 onward in Paonta Sahib Forest Division.

| Year    | Range        | Forest Area                                            |
|---------|--------------|--------------------------------------------------------|
| 1986-87 | Bhagani      | Mehruwala, Rajpur, Dhandla, D/Amboya, Giri,            |
|         | Paonta Sahib | Chhacheti, Sarah                                       |
|         | Girinagar    | Barthal, Kando Baila, Kansar, Kando Barog, Samon-Kanon |

However, no working of Khair was done according to the prescriptions. During 1990-91 and 1991-92 green Khair was felled after taking special approval from the Government, for the forests listed below.

-----**Khair Green Lots**-----

| Year    | Name of Forest Area                                                                                                                                                              | Working Circle                                                         |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 1991-92 | RF. Gharatwali C3<br>RF Sunkron C15<br>RF. Gharatwali C5, C6, C8, C9, C10<br>RF. Yamuna C1 &C2<br>RF. Dhandla C11<br>RF. Mehruwala C1<br>RF. Khojjar C7<br>RF. Dhandla C19 & C20 | Earlier coppice working circle but actually Protection working circle. |
| 1991-92 | RF. Sunkron C13, C14 & C16<br>RF. Gharatwali C7, C11 & C12                                                                                                                       | Protection cum afforest Working Circle.                                |

It is evident that working was not done according to the prescriptions. Since subsidiary silvicultural operations were not prescribed, nothing was done either. Planting of Khair was done in some of the felled areas, but the success was poor to moderate. In general, there was a depletion of growing stock.

**Past Revenue and Expenditure:** The following table gives the past revenue and expenditure for the period 1981-82 to 1991-92 for Paonta Sahib Forest Division:

| Financial Year | Revenue (Rs.) | Expenditure (Rs.) |
|----------------|---------------|-------------------|
|----------------|---------------|-------------------|

| -----Paonta Sahib Forest Division----- |                          |             |
|----------------------------------------|--------------------------|-------------|
| 1984-85                                | 8,12,807, +NA            | 33,53,788   |
| 1985-86                                | 45,09,679, +NA           | 32,47,744   |
| 1986-87                                | 4,00,325+NA              | 53,05,838   |
| 1987-88                                | 2,07,923                 | 62,49,240   |
| 1988-89                                | 5,31,958                 | 79,45,316   |
| 1989-90                                | 2,43,530                 | 84,14,720,  |
| 1990-91                                | 3,06,446                 | 1,00,55,441 |
| 1991-92                                | 2,30,479* + 44,99,767#   | 1,35,56,997 |
| 1992-93                                | 67,800* + 29,64,225#     | 1,84,19,627 |
| 1993-94                                | 5,21,462* + 59,65,014#   | 1,21,03,469 |
| 1994-95                                | 5,91,801* + 26,20,584#   | 1,19,40,627 |
| 1995-96                                | 9,34,976* + 11,83,562#   | 1,48,19,049 |
| 1996-97                                | 2,53,405* + 1,54,70,234# | 2,01,40,997 |
| 1997-98                                | 27,50,087* + 34,21,490#  | 1,57,08,090 |

NA- Not applicable/Available. Indicates the Miscellaneous revenue from sources like compensation, T.D. rent of buildings.

II Indicates the revenue from Sale of trees to the H.P.S.F.C. Ltd.

The expenditure increased mainly due to rising costs and increased establishment, there was a substantial decrease in the revenue because of the fact that almost no green markings were carried out after mid-eighties.

**Plantations:** -Various plantations were raised in the tract. The list of plantations raised from 1979-80 onwards is appended as Appendix XII. Most of these plantations are a failure. This is because of poor maintenance resulting in suppression of the young plants by heavy weed growth. Frequent fires have also played havoc with the plantations.

**Ban on green fellings:** - It is to be noted here that there is practically a ban on felling of green trees except for meetings right holder's requirements since 1986.

**11.10: Period from 1992-1998:** - B.S Chauhan's Working Plan expired in 1992 and Sh. Vineet Kumar Plan was operative from 1998. Considering the ban on green felling no working was undertaken in forests of this division.

#### **11.11: Sh. Vineet Kumar Plan (1998-99 to 2012-13 and extended up to 2017-18)**

This plan was for a period of 15 years beginning from 1998-99 to 2012-13 which was extended up to 2017-18 and approved by MOEF&CC., The working plan prescribed following Working Circles.

1. Sal Working Circle
2. Coppice Working Circle
3. Chil Working Circle
4. Protection-cum-Rehabilitation Working Circle
5. Eucalyptus (Overlapping) Working Circle
6. Khair (Overlapping) Working Circle

**Sal Working Circle:** - The poor Sal forests which were allotted in Chauhan's Working Plan under Protection-cum-afforestation Working Circle were also included in this Working Circle. The Sal forests were bifurcated into two categories.

- 1) **Type A:** It included Sal Forest having predominant mature Sal trees. Coppice regeneration was deficient.
- 2) **Type B:** It included the area where regeneration is mainly from Coppice and was supplemented by artificial planting. All the areas not categorised type A were presumed as TYPE B.

Complete enumeration have been carried out in PB 1 & PB 1V area. Growing stock in others PB's has been assessed randomly by sample technique. The class wise, forest wise, species wise, details are given in CH files. The result indicates that, Sal constitute 69% by number and 84% by volume. Sain come next as 4% & 8%, Kokat constitute 22% & 6% respectively.

Shelter wood system with fixed periodic block was adopted for this Working Circle. Preference was given to regeneration with coppice origin in TYPE B forest and in Type A category areas emphasis was given to regeneration of seed origin and artificial sowing /planting of Sal and its associates.

The local species like Sain, Mulberry, Jamun were planted as per site quality, which were desirable due to various reason. The proportion of Sal & other species was about 60 % & 40%. The common associate species like Sandan, Arjun, Behra, Neem, Jamun etc. were also given space.

The Working Circle was divided into 4 periodic blocks. P.B.I included areas having mature & over mature over wood having some regeneration with low crown density. PB II areas included supporting nearly mature over wood without regeneration or scanty regeneration. The PB III included all others areas which were not included in any of the PB's discussed as above. Forests worked from 1975 to early 1980's having established regeneration, have been allotted to P.B. IV. This is the young P.B and includes area which have been converted into quasi-uniform crop. The felling cycle was fixed as 30 years keeping in view the regeneration period of Sal. The rotation was fixed as 120 years. Yield was calculated for P.B.I and P.B.IV area. In P.B.I area during

seeding felling seed bearers were retained at the average rate of 60 trees per hect. and 50% of Vth class crop was retained as advance. Further, the yield was calculated separately for those P.B.I areas, which were already felled and where final felling were to be executed. Here trees of class III and above were to felled but for the sake of simplicity entire volume of such area was taken into account for the calculated of yield. Yield from P.B.IV was also calculated and all the trees above 30 cm d.b.h (standards) were considered for final felling.

| Periodic Block          | Prescribed Yield (*) |
|-------------------------|----------------------|
| P.B.I (Seeding felling) | 23660                |
| P.B.I (Final felling)   | 3588                 |
| P.B.IV                  | 3000                 |

\*Prescribed yield is for both Nahan and Paonta Sahib Forest Division. \*

Other regulations like closure, lopping, & grazing, fire protection, right holder's requirements, prevention against Sal borer attack, special treatment for various small blanks, regeneration assessment survey, regeneration programme were also described in detail.

**Results:** Due to ban on green fellings, the forests were never worked in accordance with prescription of the plan. Planting programmes were not adhered to. There was heavy biotic pressure on the forests of the division. New plantations were not very successful. Soil erosion went on unabated.

#### **Coppice Working Circle (2093.3 ha.)**

The area of this Working Circle was carved out from the areas of Protection & The Sal Working Circle of earstwhile Chauhan's Plan. It covered miscellaneous Broad-Leaved forest species like Khair, Chhal, Amaltas, Tendu, Jhingan etc. and poor-quality Sal areas which were not fit to be managed under Sal Working Circle

Complete enumeration of only Khair trees had been done in 5cms dia classes down to 10 cms dia. For other species, assessment of the growing stock sampling technique. Coppice with Reserves system, supplemented by artificial planting was adopted. The local species were preferred with emphasis on fuel & fodder.

Rotation of 30 year is fixed for coppice having a dia of 20 cm d.b.h. & 60 year for standards with dia of 30 cm d.b.h had been adopted. Two thinning were done during rotation at interval of 10 years, felling cycle was of 10 years. Yield was prescribed by area. The total yield was 500 hac.



Calculation of yield was not done by volume. A deviation of (+) 30 % in a year, and (+) 20 % cumulative at the end of each five-year block was permissible.

In these areas closure against grazing may be done in the year of felling before 28th February, so as to take full advantage of coppice shoot.

The detail of subsidiary silvicultural operation like slash disposal, singling out of coppice shoots, bush cuttings, closure of areas, weeding, mulching etc. were described in detail.

**Results:** Prescriptions of working plan were not followed due to ban on green felling, which resulted in poor crop.

**Chil Working Circle (627.38):** A small portion of Paonta Sahib Division falling in Girinagar Range was included in this plan. Only one felling series was constituted. The complete enumeration was done in PBI and PB IV areas. The random sampling was adopted for enumeration in other PBs. The forests were managed under Indian Irregular Shelter wood system. Keeping in view the MAI and CAI & out turn of standard size timber, the exploitable diameter was kept 55 cms d.b.h. Rotation of 100 years was prescribed. The regeneration period was 25 years. Four periodic blocks were constituted. The crop was open, thus felling cycle was kept as 25 years. The yield has been prescribed from PB I areas and that of Chil only. There were two type of fellings, 1. Seeding felling 2. Final felling. Annual yields were also prescribed based on the yield regulation under the Indian irregular shelter wood system. However, following a ban on the green felling in the hills these Chil forests could not be worked in accordance to prescriptions laid down in this working plan. Thus, only Salvage extraction of the dead and dry trees were allowed and such extraction was mainly done through the HPSFDC Ltd. As no final felling could be carried out due to the ban, the canopy could not be opened that would have favoured the forest to be fully stocked with well-established regeneration. Hence, generally, there is a lack of natural regeneration in these forests. However, in some Chil forests, one can come across small patches of natural regeneration of Chil.

Annual yield 2000 cum/ year was fixed for PB I areas for both type of fellings. The yield was controlled by volume. The annual deviation of 10 % was allowed.

**Seeding Felling:** About 20-24 healthy vigorous growing trees with clear bole and good crown are retained as seed bearer per hac. The distance between mother trees was kept 20 to 22 meter & on warm aspects 20 to 19 meter. The number was increased to 24 to 28 trees. The mother trees were prescribed to be kept at uniform space. The isolated pole was to be removed.

**FINAL FELLING:** It applied to fully regenerated areas having where regeneration has reached a height of 5 meters. All the seed bearer were to be removed except the ones standing over un-regenerated small gaps exceeding 0.20 hac.

Due to ban on green felling during working plan period no such activities could be carried out. Other Regulations like fire protection, control burning, resin tapping was described in detail.

**Results:** Following a ban on felling of green trees in the hills, these Chil forests could not be worked in accordance with the prescriptions. Only Salvage extraction of the dead and dry trees were allowed and such extraction was mainly done through HPSFCL. As no final felling could be carried out due to ban, the canopy could not open up to favour natural regeneration. Hence here is generally a lack of regeneration in these forests.

**Protection-cum-Rehabilitation Working Circle (8984.63 hac.): -**

The Working Circle covers poor quality Miscellaneous Broad-leaved forests situated on moderate or steep eroding formations, poor/ refractory soil generally inferior for supporting good forest growth.

No enumeration has been carried out in this Working Circle. Crop density varied greatly in these areas from eroded well stocked forests. Natural regeneration was almost absent. No commercial fellings were prescribed. Although no scientific felling was prescribed but Salvage removal of dry dead fallen trees was prescribed to be carried out. No yield, exploitable diameter, regeneration / rotation was prescribed.

The forests were mainly divided into 3 categories.

- a) **Badly eroded areas.** These areas are to be protected very effectively so that further soil erosion and denudation is prevented, no removals should be done from such areas. Suitable soil conservation measure should be carried out here, small vegetative measure and check dams may be constructed to check soil erosion.
- b) **Grassy Blank:** These areas fall in Bhagani range. They were proposed to be planted with local species.
- c) **Wooded areas:** The forests were merely for protection purpose. Gap planting was proposed with small vegetative measure.

Other regulations were effective closure against grazing & lopping, planting of suitable species and fire protection.

**Results:** Due to heavy biotic pressure and absence of effective closure the condition of the forests further deteriorated. No specific planting programme was followed.

**Eucalyptus (Overlapping) Working Circle (340.10 hac.):**

**GENERAL CONSTITUTION/ CHARACTER OF VEGETATION:** Eucalyptus in the tract is a result of plantation raised during third five-year plan under crash programme of raising large scale plantations of industrial pulpwood. The areas where these plantations were carried out fall

in Sal Conversion Working Circle, Selection Working Circle, Protection Working Circle and Plantation Working Circle.

The Sal belts with blank patches were selected for this purpose. The working of eucalyptus was first prescribed by Chauhan's Plan (1982-83 to 1991-92). In the present Working Plan, the areas generally overlap with the forest falling under Sal Working Circle & Coppice Working Circle. The successful plantations have resulted in small compact patches. Only compact patches were taken in this Working Circle. Scattered Sal, Sain, Khair, Shisham, and other natural species were found along with Eucalyptus in these areas.

The eucalyptus patches were existing in blocks and compartment which have been allotted to their respective Working Circle. This was overlapping Working Circle. So, it was not separated into independent compartment. Coppice with Standard System was to be adopted and the eucalyptus regenerated by coppice. In case of failure other indigenous species were proposed to be planted. No diameter was prescribed. However, a diameter of 20 cm. d.b.h was found suitable for pulpwood.

The coppice attained 20 cm. d.b.h in 15 years and a rotation of 15 years was fixed for coppice & 30 years for standards. Felling cycle of 15 years was prescribed. Yield was controlled by area.

**OTHER REGULATION:** Extension of eucalyptus crop over area having alternative crop was proposed to be avoided. If the coppice crop does not respond favourably the area was to be planted with other fast-growing indigenous species.

**Results:** Following a ban on felling of green trees, these forests could not be worked in accordance with the prescriptions.

**Khair (Overlapping) Working Circle (706.30 hac.)**

It included various established Khair plantation all over the tract. The areas under this Working Circle support pure even aged Khair crop (above 75 %). Over the period of time openings have occurred in these plantations mainly due to salvage /illicit felling. At some places Khair trees show signs of heart rot (*Fomes badius*) and Witch's Broom. Due to infestation of bushes like *Lantana*, *Adathoda*, *Carissa* etc. natural regeneration was absent. Khair forests pose a severe protection problem for the staff especially in the border areas/ beats adjoining to UK / Haryana State, owing to its illicit felling. The standing volume, heartwood volume, weight of chips and katha quantity has been prescribed as per Nurpur Forest Division Working Plan by Sh. Nanak Chand.

After 1996-97 no green felling of Khair trees has been carried out from Govt. Forests. Presently a large number of mature and over mature Khair trees are standing in the forests. Coppice with Standards system was prescribed for this Working Circle rotation was fixed at 30 years for

Coppice during which crop is expected to attain d.b.h. of 20 cm. The rotation for standards was fixed at 40 years. However, Shisham, Simal, Eucalyptus and Broad-Leaved trees were prescribed to be exploited on selection basis. Felling cycle was fixed for 10 years, with two thinning at an interval of 10 years and rotation of 30 years. Annual yield was prescribed by area and other regulations proposed were closure, lopping, fire protection and TD regulation.

**Results:** After 1996-97 no green felling of Khair trees has been carried out from Govt. forest. Presently a large number of mature and over mature trees are standing in the forests. These are not only getting affected by the rot and hollowness of the heart wood but are also a severe protection problem for the staff especially in the border areas.

**Special Works of Improvement Undertaken:**

Summary and results of works such as fire protection, improvement in communication, interface activities, amenities to staff etc. shall be given by WPO as done in division during WP period under revision.

a) Building works

| <b>The details regarding Constructed building in Paonta Sahib Forest Divisionw.e.f. 1998 - 99 to 2022-23</b> |             |                                      |                 |                      |                          |
|--------------------------------------------------------------------------------------------------------------|-------------|--------------------------------------|-----------------|----------------------|--------------------------|
| <b>Sr. No.</b>                                                                                               | <b>Year</b> | <b>Name of Building</b>              | <b>Quantity</b> | <b>Name of Range</b> | <b>Expenditure (Rs.)</b> |
| 1                                                                                                            | 1999-2000   | Gang Hut at Kansar                   | 1               | Girinagar            | 154000                   |
| 2                                                                                                            | 1999-2000   | Gang hut at Pilhori                  | 1               | Majra                | 152000                   |
| 3                                                                                                            | 1999-2000   | Rain Shelter/Gate room Man -Taruwala | 1               | Paonta Sahib         | 48000                    |
| 4                                                                                                            | 2002-04     | Fgd Hut Charatwali                   | 1               | Majra                | 300000                   |
| 5                                                                                                            | 2008-09     | BO Qtr Chhacheti                     | 1               | Paonta Sahib         | 738600                   |
| 6                                                                                                            | 2008-09     | Fgd Hut Parduni                      | 1               | Girinagar            | 700000                   |
| 7                                                                                                            | 2009-10     | Nil                                  | Nil             | Nil                  | Nil                      |
| 8                                                                                                            | 2010-11     | Nil                                  | Nil             | Nil                  | Nil                      |
| 9                                                                                                            | 2011-12     | Gang Hut Garibnath(S)                | 1               | Paonta Sahib         | 500000                   |
| 10                                                                                                           | 2012-13     | Van Thana Puruwala                   | 1               | Bhagani              | 2680000                  |
| 11                                                                                                           | 2013-14     | Nil                                  | Nil             | Nil                  | Nil                      |
| 12                                                                                                           | 2014-15     | Divisional Office, Paonta Sahib      | 1               | Paonta Sahib         | 700000                   |
| 13                                                                                                           | 2017-18     | BO Qtr Kansar                        | 1               | Girinagar            | 1500000                  |
| 14                                                                                                           | 2017-18     | BO Qtr Khara                         | 1               | Paonta Sahib         | 1200000                  |
| 15                                                                                                           | 2018-19     | Nil                                  | Nil             | Nil                  | Nil                      |
| 16                                                                                                           | 2019-20     | BO Qtr Paonta Sahib                  | 1               | Paonta Sahib         | 1181616                  |
| 17                                                                                                           | 2019-20     | BO Qtr Sunrkon                       | 1               | Majra                | 885500                   |
| 18                                                                                                           | 2019-20     | BO Qtr Rampurbeli                    | 1               | Paonta Sahib         | 826800                   |
| 19                                                                                                           | 2020-21     | BO Qtr Rajpur                        | 1               | Bhagani              | 1221235                  |
| 20                                                                                                           | 2020-21     | BO Qtr Chandpur                      | 1               | Girinagar            | 1225283                  |

|    |         |                                           |   |              |         |
|----|---------|-------------------------------------------|---|--------------|---------|
| 21 | 2020-21 | Fgd hut Lai                               | 1 | Paonta Sahib | 725336  |
| 22 | 2020-21 | Type II Qtr in Forest Colony, Mantaruwala | 1 | Paonta Sahib | 1490578 |
| 23 | 2021-22 | Fgd hut Gatu                              | 1 | Paonta Sahib | 1215084 |
| 24 | 2021-22 | Major maint of RO Office-cum-residence,   | 1 | Bhagani      | 1400000 |
| 25 | 2022-23 | One additional set in FRH Mantaruwala.    | 1 | Paonta Sahib | 1453215 |
| 26 | 2022-23 | Fgd hut Dunga                             | 1 | Girinagar    | 1029307 |
| 27 | 2022-23 | Fgd hut Sunkron (M)                       | 1 | Majra        | 880428  |
| 28 | 2022-23 | Conference hall in O/o DFO Paonta Sahib.  | 1 | Paonta Sahib | 524701  |
| 29 | 2022-23 | Fgd hut Bata-Mandi                        | 1 | Majra        | 1264437 |
| 30 | 2022-23 | BO Qtr Majri                              | 1 | Girinagar    | 1858883 |

- b) **Sowing and Plantation:** Efforts towards enhancement of forest productivity through quality plantation activities have been done in this Working period. Details of which have been discussed in Chapter 6 under Part 6.4.
- c) **Demarcation:** In compliance with the orders of Hon'ble Supreme Court of India in IA No.3840 of 2014 in Writ Petition (Civil) No 202/1995 of T.N. Godavarman Thirunulpad versus Union of India & mOrs., all the boundary pillars were constructed in Paonta Sahib Forest Range during 2019-20. The forests in Paonta Sahib Forest Division are reserved forests and are delineated and boundaries well defined through boundary pillars and record maintained at range level in boundary pillar register. In all, from 1999-2000 period till 2022-23, 2646 boundary pillars were constructed/repared in total.

## CHAPTER -12

### STATISTICS OF GROWTH AND YIELD

No fresh studies were carried out to determine local volume tables, diameter growth, mortality rate and relationship of volume and diameter with age in respect of different species while preparing this working plan. Instead, as per the guide lines in the approved preliminary working plan report, all the data regarding statistics of growth and yield has been adopted from working plan by Sh. Vineet Kumar IFS (2003-04 to 2012-13). The same is reproduced here in detail incorporating a few changes in enumerations, stock mapping etc.

#### **12.1 GENERAL:**

The main species found in the region are Sal, Chil, Khair, Shisham, Eucalyptus etc. Apart from these species, several miscellaneous species also exist in the area which are generally termed as “Kokat. The statistics of growth, volume and yield of these species are discussed below.

##### **12.1.1 Sal (*Shorea robusta*)**

Following references were consulted in the case of Sal in the previous working plans:

- (i) Yield and stand table for Sal, Indian Forest records (N.S) Silviculture vol. 4-A No.4, 1643 by Griffith and Bakshi Sant Ram.
- (ii) Stand tables for Sal even aged high forest and coppice, Indian Forest records, Silviculture series, Volume X part XVI 1935.
- (iii) General volume table for Sal, Indian Forest records, Silviculture series, Vol. X part VI, 124 by S.H. Howard.
- (iv) Volume and outturn tables for Sal, Indian Forest Record, Silviculture Series Vol XII part I, 1925 by S.H. Howard.
- (v) Branch small wood tables for *Shorea robusta*, Indian Forest records Silviculture Series, Vol, XV, Part VI, 1932.

Generally, the forest of this region supports Sal of quality III. In some portions (dry and exposed ridges), the quality recedes to III/IV or even IV. However, in good areas, the quality class goes upto II. In general, the standing volume factor for quality class III are applicable and applied and is as under

**Table No. 12.1.1**

**Table showing standing volume of Sal (As applicable)**

| Diameter class | DBH in cm  | Total Standing Volume (m <sup>3</sup> ) |
|----------------|------------|-----------------------------------------|
| V              | 10-20      | 0.127                                   |
| IV             | 21-30      | 0.368                                   |
| III            | 31-40      | 0.835                                   |
| IIA            | 41-50      | 1.770                                   |
| IIB            | 51-60      | 3.030                                   |
| IA             | 61-70      | 4.587                                   |
| IB & above     | 71 & above | 6.385                                   |

**Table No. 12.1.1(a)**

**Table showing standing volume of Sal (Quality class wise)**

| Diameter class | DBH in cm  | Standing Volume(m <sup>3</sup> ) quality III | Standing Volume m <sup>3</sup> quality II | Standing Volume(m <sup>3</sup> ) quality IV |
|----------------|------------|----------------------------------------------|-------------------------------------------|---------------------------------------------|
| V              | 10-20      | 0.127                                        | 0.156                                     | 0.113                                       |
| IV             | 21-30      | 0.368                                        | 0.425                                     | 0.347                                       |
| III            | 31-40      | 0.835                                        | 0.913                                     | 0.772                                       |
| IIA            | 41-50      | 1.770                                        | 1.890                                     | 1.692                                       |
| IIB            | 51-60      | 3.030                                        | 3.235                                     | 2.924                                       |
| IA             | 61-70      | 4.587                                        | 4.878                                     | 4.389                                       |
| IB & above     | 71 & above | 6.385                                        | 6.385                                     | 6.074                                       |

***Shorea robusta* (Sal)**

**SITE QUALITY I**

| Diameter Class | Stem Length of Commercial bole | Stem commercial timber in round Sound trees | Stem sawn timber absolutely sound straight boles | Stem Sawn timber normal good coupe | Stem sawing Factor of absolutely sound straight boles | Stem Sawn timber normal good coupe | Add for branches column 4 & 5 |
|----------------|--------------------------------|---------------------------------------------|--------------------------------------------------|------------------------------------|-------------------------------------------------------|------------------------------------|-------------------------------|
| 1              | 2                              | 3                                           | 4                                                | 5                                  | 6                                                     | 7                                  | 8                             |
| (cm D.B.H)     | (meters)                       | Cum                                         | Cum                                              | Cum                                |                                                       |                                    | Cum                           |
| Over 20-30     | 10.66                          | 0.28                                        | 0.1                                              | 0.09                               | 0.4                                                   | 0.35                               | -                             |
| Over 30-40     | 14.63                          | 0.76                                        | 0.35                                             | 0.35                               | 0.47                                                  | 0.46                               | -                             |
| Over 40-50     | 16.45                          | 1.38                                        | 0.76                                             | 0.65                               | 0.55                                                  | 0.47                               | -                             |
| Over 50-60     | 17.67                          | 2.17                                        | 1.28                                             | 1.04                               | 0.59                                                  | 0.48                               | 0.01                          |
| Over 60-70     | 18.28                          | 3.11                                        | 1.92                                             | 1.49                               | 0.62                                                  | 0.48                               | 0.05                          |
| Over 70-80     | 18.89                          | 4.13                                        | 2.6                                              | 2.03                               | 0.63                                                  | 0.49                               | 0.14                          |

|            |      |      |      |      |      |      |      |
|------------|------|------|------|------|------|------|------|
| Over 80-90 | 19.2 | 5.15 | 3.29 | 2.53 | 0.64 | 0.49 | 0.21 |
|------------|------|------|------|------|------|------|------|

*Shorea robusta* (Sal)

SITE QUALITY II

| Diameter Class | Stem Length of Commercial bole | Stem commercial timber in round Sound trees | Stem sawn timber absolutely sound straight boles | Stem Sawn timber normal good coupe | Stem sawing Factor of absolutely sound straight boles | Stem Sawn timber normal good coupe | Add for branches column 4&5 |
|----------------|--------------------------------|---------------------------------------------|--------------------------------------------------|------------------------------------|-------------------------------------------------------|------------------------------------|-----------------------------|
| 1              | 2                              | 3                                           | 4                                                | 5                                  | 6                                                     | 7                                  | 8                           |
| (cm D.B.H)     | (meters)                       | Cum                                         | Cum                                              | Cum                                |                                                       |                                    | Cum                         |
| Over 20-30     | 7.62                           | 0.22                                        | 0.08                                             | 0.08                               | 0.4                                                   | 0.37                               | -                           |
| Over 30-40     | 10.66                          | 0.62                                        | 0.28                                             | 0.26                               | 0.47                                                  | 0.45                               | -                           |
| Over 40-50     | 13.1                           | 0.013                                       | 0.62                                             | 0.52                               | 0.55                                                  | 0.46                               | -                           |
| Over 50-60     | 14.63                          | 1.21                                        | 1.04                                             | 0.83                               | 0.59                                                  | 0.47                               | 0.01                        |
| Over 60-70     | 15.54                          | 2.54                                        | 1.58                                             | 1.23                               | 0.62                                                  | 0.48                               | 0.05                        |
| Over 70-80     | 16.15                          | 3.45                                        | 2.17                                             | 1.69                               | 0.63                                                  | 0.49                               | 0.14                        |
| Over 80-90     | 16.15                          | 4.41                                        | 2.83                                             | 2.17                               | 0.64                                                  | 0.49                               | 0.21                        |

*Shorea robusta* (Sal)

SITE QUALITY III

| Diameter Class | Stem Length of Commercial bole | Stem commercial timber in round Sound trees | Stem sawn timber absolutely sound straight boles | Stem Sawn timber normal good coupe | Stem sawing Factor of absolutely sound straight boles | Stem Sawn timber normal good coupe | Add for branches column 4&5 |
|----------------|--------------------------------|---------------------------------------------|--------------------------------------------------|------------------------------------|-------------------------------------------------------|------------------------------------|-----------------------------|
| 1              | 2                              | 3                                           | 4                                                | 5                                  | 6                                                     | 7                                  | 8                           |
| (cm D.B.H)     | (meters)                       | Cum                                         | Cum                                              | Cum                                |                                                       |                                    | Cum                         |
| Over 20-30     | 5.18                           | 0.16                                        | 0.07                                             | 0.05                               | 0.4                                                   | 0.33                               | -                           |
| Over 30-40     | 8.53                           | 0.48                                        | 0.22                                             | 0.22                               | 0.47                                                  | 0.47                               | -                           |
| Over 40-50     | 10.66                          | 0.87                                        | 0.48                                             | 0.48                               | 0.55                                                  | 0.47                               | -                           |
| Over 50-60     | 11.27                          | 1.38                                        | 0.82                                             | 0.82                               | 0.59                                                  | 0.46                               | 0.01                        |
| Over 60-70     | 11.88                          | 2                                           | 1.24                                             | 1.24                               | 0.62                                                  | 0.46                               | 0.05                        |
| Over 70-80     | 12.19                          | 2.74                                        | 1.72                                             | 1.72                               | 0.63                                                  | 0.48                               | 0.14                        |
| Over 80-90     | 12.19                          | 8.53                                        | 2.26                                             | 2.26                               | 0.64                                                  | 0.5                                | 0.21                        |

*Shorea robusta* (Sal)



#### SITE QUALITY IV

| Diameter Class | Stem Length of Commercial bole | Stem commercial timber in round Sound trees | Stem sawn timber absolutely sound straight boles | Stem Sawn timber normal good coupe | Stem sawing Factor of absolutely sound straight boles | Stem Sawn timber normal good coupe | Add for branches column 4&5 |
|----------------|--------------------------------|---------------------------------------------|--------------------------------------------------|------------------------------------|-------------------------------------------------------|------------------------------------|-----------------------------|
| 1              | 2                              | 3                                           | 4                                                | 5                                  | 6                                                     | 7                                  | 8                           |
| (cm D.B.H)     | (meters)                       | Cum                                         | Cum                                              | Cum                                |                                                       |                                    | Cum                         |
| Over 20-30     | 3.96                           | 0.14                                        | 0.05                                             | 0.04                               | 0.4                                                   | 0.3                                | -                           |
| Over 30-40     | 7.01                           | 0.36                                        | 0.16                                             | 0.16                               | 0.47                                                  | 0.46                               | -                           |
| Over 40-50     | 9.14                           | 0.7                                         | 0.39                                             | 0.33                               | 0.55                                                  | 0.48                               | -                           |
| Over 50-60     | 10.05                          | 1.16                                        | 0.67                                             | 0.55                               | 0.59                                                  | 0.48                               | 0.01                        |
| Over 60-70     | 10.66                          | 1.69                                        | 0.04                                             | 0.8                                | 0.62                                                  | 0.48                               | 0.05                        |
| Over 70-80     | 10.66                          | 2.26                                        | 1.42                                             | 1.1                                | 0.63                                                  | 0.49                               | 0.14                        |
| Over 80-90     | 19.2                           | 5.15                                        | 3.29                                             | 2.53                               | 0.64                                                  | 0.49                               | 0.21                        |

##### 12.1.2 Sain (*Terminalia tomentosa*)

**Reference:** - General standard and commercial volume table for *Terminalia tomentosa* W & A. Indian Forest Records, (N.S.) Silviculture vol. 4A No. 5, 1947 by A.I. Griffith and Bakshi Sant Ram. Majority of the Sain trees are found scattered alongwith Sal, forming a very small composition of the crop. For convenience, volume of Sal (quality Class III) shall be applicable for Sain.

##### 12.1.3 Chil (*Pinus roxburghii*)

**References:** -

- ‘The Yield and Stand Tables for Chil’ by S.K. Seth, S.N. Dabral and M.L. Lala. Indian Forest Record volume II No. 8.
- ‘Growth and yield statistics of common Indian timber species’ (Himalyan region) volume
- ‘Growth and yield statistics of common Indian timber species’ (Plain region) Vol II.

Since the forests of the area are generally un-even aged, under stocked and not subjected to regular thinning in the past, local volume tables were prepared by felling 219 trees by Sh. O.P Sharma. for Rajgarh Working Plan. This volume table will be adopted for the purpose of calculations in the present plan. It is reproduced below: -

**Table No: - 12.1.3**

**Table showing standing volume of Chil**

| <b>Diameter class</b> | <b>DBH in cm</b> | <b>Total Standing Volume (m<sup>3</sup>)</b> |
|-----------------------|------------------|----------------------------------------------|
| V                     | 10-20            | 0.0504                                       |
| IV                    | 21-30            | 0.2499                                       |
| III                   | 31-40            | 0.6846                                       |
| IIA                   | 41-50            | 1.3544                                       |
| IIB                   | 51-60            | 2.2593                                       |
| IA                    | 61-70            | 3.3994                                       |
| IB                    | 71 -80           | 4.7746                                       |
| IC                    | 81-90            | 6.3849                                       |
| ID & above            | 91 & above       | 8.2303                                       |

**Age –diameter relationship obtained is given below: -**

Age. Height and diameter relationship

| <b>Age in years</b> | <b>Height (m)</b> | <b>Diameter (cm)</b> |
|---------------------|-------------------|----------------------|
| 10                  | 5.8               | 6                    |
| 20                  | 8.3               | 11.5                 |
| 30                  | 10.8              | 17.2                 |
| 40                  | 13.3              | 22.8                 |
| 50                  | 16.9              | 28.3                 |
| 60                  | 18.3              | 33.6                 |
| 70                  | 20.6              | 39                   |
| 80                  | 22.7              | 44.3                 |
| 90                  | 24.5              | 49.6                 |
| 100                 | 25.4              | 54.4                 |
| 110                 | 26.2              | 58.7                 |
| 120                 | 26.8              | 62.3                 |
| 130                 | 27.1              | 65                   |

**Increment Percent:** The current annual growth percent for each diameter class has been adopted the same as in O.P Sharma's plan which was calculated by increment boring and by collection of felled trees data in coordination with Pre-Investment Survey of Forest Resources Organization. The data was compiled by Data Processing Officer P.I.S Centre, Dehradun. The results obtained are given below: -

### Current Annual Growth Percent

| Dia class (cm) | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90 & over |
|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-----------|
|                | 15    | 25    | 35    | 45    | 55    | 65    | 75    | 85    | 95        |
| 1972-82        | 4.56  | 3.75  | 2.69  | 2.26  | 1.99  | 1.56  | 1.14  | 0.92  | 0.66      |
| 1962-72        | 4.66  | 4.60  | 3.24  | 2.35  | 2.13  | 1.88  | 1.14  | 0.92  | 0.66      |

#### 12.1.4 Khair (*Acacia catechu*)

Keeping in view the increasing prices of Khair wood and low exploitable diameter (20 cm), the volume factor is based on 5 cm dia class as was adopted in previous Working Plan by Sh. Vineet Kumar and reproduced as under: -

Table No: - 12.1.4

| Dia        | Dia class   | Commercial timber in round (m3) | Heartwood M3 |
|------------|-------------|---------------------------------|--------------|
| 10-15      | V-1         | 0.083                           | -            |
| 15-20      | V-2         | 0.115                           | 0.068        |
| 20-25      | IV-1        | 0.149                           | 0.093        |
| 25-30      | IV-2        | 0.218                           | 0.139        |
| 30-35      | III-1       | 0.340                           | 0.303        |
| 35-40      | III-2       | 0.530                           | 0.405        |
| 40-45      | IIA-1       | 0.768                           | 0.503        |
| 45-50      | IIA-2       | 1.047                           | 0.660        |
| 50 & above | IIB & above | 1.283                           | 0.883        |

Because the trees of size IIA-2 are generally hollow, so the volume factor are given only upto IIB class and for higher classes to the volume factor of IIB will be followed. The diameter, total volume, heartwood, katha as adopted in the Working plan of Hamirpur Forest division by Sh. Anil Joshi is proposed to be adopted and will be made applicable after approval of this working plan which is tabulated as under.

Table: The diameter, total volume, heartwood, Katha

| Diameter(cm) | Height (m) | Volume (cum) | Heartwood vol (cum) | Wt. of heartwood for Katha(kg) | Wt. of Katha (kg) |
|--------------|------------|--------------|---------------------|--------------------------------|-------------------|
|--------------|------------|--------------|---------------------|--------------------------------|-------------------|

|       |       |          |          |       |      |
|-------|-------|----------|----------|-------|------|
| 10-15 | 8.30  | 0.02570  | 0.011220 | 11.2  | --   |
| 15-20 | 10.10 | 0.06860  | 0.03100  | 31.6  | 2.5  |
| 20-25 | 11.80 | 0.11810  | 0.05760  | 50.6  | 5.0  |
| 25-30 | 12.90 | 0.216970 | 0.10960  | 78.7  | 8.0  |
| 30-35 | 13.40 | 0.25280  | 0.17570  | 128.3 | 14.0 |
| 35-40 | 13.40 | 0.25280  | 0.17570  | 128.3 | 14.0 |
| 40-45 | 13.40 | 0.33310  | 0.24060  | 197.4 | 23.0 |
| 45-50 | 13.40 | 0.5680   | 0.38980  | 280.1 | 29.0 |

#### 12.1.5 Eucalyptus: -

The volume table as per Rewari Forest Division Working Plan (2009-10 to 2023-24) of Haryana has been adopted for Eucalyptus species.

**Table No: - 12.1.5**

| Class | Diameter<br>(centimeter) | Girth<br>(centimeter) | Standing Volume<br>(Cubic meter) |
|-------|--------------------------|-----------------------|----------------------------------|
| V     | 10-20                    | 30-59                 | 0.10                             |
| IV    | 21-30                    | 60-89                 | 0.42                             |
| III   | 31-40                    | 90-119                | 0.95                             |
| IIA   | 41-50                    | 120-149               | 1.71                             |
| IIB   | 51-60                    | 150-179               | 2.70                             |
| IA    | 61-70                    | 180-209               | 3.90                             |
| IB    | 71 and above             | 210 and above         | 5.32                             |

#### 12.1.6 Shisham and Kokat

The volume factors as were applicable in previous working plan will be continued and are reproduced as under:

**Table No: - 12.1.6**

| Diameter class | DBH in cm | Shisham<br>Volume (m <sup>3</sup> ) | Kokat<br>Volume (m <sup>3</sup> ) |
|----------------|-----------|-------------------------------------|-----------------------------------|
| V              | 10-20     | 0.064                               | 0.064                             |
| IV             | 21-30     | 0.176                               | 0.184                             |
| III            | 31-40     | 0.467                               | 0.418                             |
| IIA            | 41-50     | 0.977                               | 0.885                             |
| IIB            | 51-60     | 1.523                               | 1.515                             |
| IA             | 61-70     | 2.265                               | 2.294                             |
| IB & above     | 71 -80    | 2.265                               | 3.193                             |

**Growth:** - No local data was collected to show the growth rate of miscellaneous broad-leaved species. However, the data collected elsewhere may give some idea about growth of broad-leaved species. As per the species published by the FRI Dehradun the growth rate of some of the species as under: -

**Table No: - 12.1.6 (a)**

| <b>Crop dia (Cm.)</b> |              |                |              |                               |                              |             |
|-----------------------|--------------|----------------|--------------|-------------------------------|------------------------------|-------------|
| <b>Age in years</b>   | <b>Chhal</b> | <b>Shisham</b> | <b>Semul</b> | <b>Sal (Site quality III)</b> | <b>Sal (Site quality IV)</b> | <b>Sain</b> |
| <b>10</b>             | 8.832        | 5.08           | --           | 5.84                          | 4.22                         | 8.64        |
| <b>20</b>             | 13.208       | 9.65           | 13.72        | 10.16                         | 7.62                         | 14.28       |
| <b>30</b>             | 17.272       | 22.35          | 21.34        | 13.37                         | 10.82                        | 20.38       |
| <b>40</b>             | 20.828       | 31.24          | 28.7         | 17.53                         | 13.57                        | 27.43       |
| <b>50</b>             | 23.875       | 38.12          | 35.56        | 21.08                         | 17.02                        | 29.48       |
| <b>60</b>             | 26.416       | 46.23          | 39.12        | 24.38                         | 17.27                        | 33.27       |
| <b>70</b>             | 28.702       | --             | 41.92        | 27.69                         | 22.61                        | 36.83       |
| <b>80</b>             | 30.48        | --             | 43.69        | 30.73                         | 23.18                        | 40.13       |

**QUALITY CLASS ASSESSMENT:**

The quality class of each compartment has been followed and adopted as per previous working plan by Sh. Vineet Kumar and has been depicted in compartment history files.

# **PART II**

# **FUTURE MANAGEMENT**

**Discussed & Prescribed**

## **CHAPTER- 1**

### **BASIS OF PROPOSALS**

The Working Plan of Paonta Sahib Forest Division is a technical document prepared to manage the forests scientifically on a sustainable basis. The overall objective of the working plan of management is based on 'Ecosystem Approach to Forest Management', eco-restoration of degraded forest areas and to ensure participation of local communities along with Forest department in controlling and prevention of any degradation of the forests. Further, the imperative is also to increase area under forest cover and consequently Carbon sink capacity, enhance biodiversity, improve growing stocks and maintain the environmental stability in the areas under the Division. The working plan is aimed at meeting the national and global needs in general and necessity of the local people, the primary objective of management of forest covered by this working plan would be conservation and protection of the existing forests, improvement of growing stock and extension of the woodlands wherever feasible. The objectives are framed within the ambit of National Forest Policy 1988. Sustainable management of forests and its biodiversity by keeping in mind ecological, economic and social dimensions is the key priority. For plan preparation and implementation of the plan it is also necessary to examine the relevant policies, Laws, Rules, Court orders and various administrative orders issued by the Government of India and Himachal Pradesh, so that all the prescriptions are brought under the ambit of existing policy framework.

#### **1.1 THE NATIONAL FOREST POLICY**

The National Forest Policy was first enunciated in 1894 and was revised in 1952, after Independence. It was again revised in shape of the National Forest Policy 1988, presently in force. The basic objectives and thrust areas enshrined in the National Forest Policy 1988 are given as under:

- Maintenance of environmental stability through preservation, restoration of the ecological balance that has been adversely disturbed by serious depletion of forests
- Increasing productivity of forests to meet essential needs.
- Conserving the natural heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna, which represents the remarkable biodiversity and genetic resources of the country.

- Checking the soil erosion and denudation in the catchment area of the rivers, lakes and reservoirs in the interest of soil and water conservation for mitigating flood and droughts and for retardation of siltation of reservoirs.
- Increasing the forest/tree cover in the country through massive afforestation and social forestry programmes, especially, on all denuded, degraded and unproductive lands
- Meeting the requirements of fuel wood, fodder, minor forest produce and small timber of the rural and tribal populations

## **1.2 NATIONAL FORESTRY ACTION PLAN**

Having about 2.5% of world's geographic area, India at present is supporting 16% of world's human population and 18% of cattle population. About 41% of forest cover of the country has already been degraded and dense forests are losing its crown density and productivity continuously. A large number of India's livestock population graze in the forests causing serious damage to soil, ground flora, including regeneration, and productivity of the forests. The use of forests beyond its carrying capacity and encroachments are the main cause of continuous degradation of forests.

To reverse the process of degradation and for sustainable development of forests, the Government of India has prepared National Forestry Action Plan (NFAP), a comprehensive strategic programme. These programmes are as follows:

- Protect Existing Forest Resources
- Improve Forest Productivity
- Reduce Total Demand of Forest Produce
- Strengthen Policy and Institutional Framework
- Expand Forest Area

### **Strategy:**

For sustainability and productivity of forests, the production to be increased at least 3 to 5 m<sup>3</sup> per ha per year by promoting appropriate silvicultural treatments.

- Hygiene of forests to be improved through suitable silvicultural practices.
- Efforts to be made to bring one-third geographic area of the country under forest and tree cover by plantations on all categories of wastelands and agro forestry.
- Plantations on non-forest wastelands to be done mostly with fuel wood species as 70% of the wood produced from forests are used as fuel wood.



### 1.3 NATIONAL WILDLIFE ACTION PLAN

Ministry of Environment and Forests, Govt. of India has formulated National Wildlife Action Plan (2002-2016) based upon the decision taken in the 21st meeting of the Indian Board of Wildlife held on January 2002. National Wildlife Action Plan outlined the strategies and action points for conservation of wildlife.

Strategies:

- Strengthening and Enhancing the Protected Area Network,
- Effective Management of Protected Areas,
- Conservation of Wild and Endangered Species and Their Habitats,
- Restoration of Degraded Habitats Outside Protected Areas,
- Human Resource Development and Personnel Planning,
- Ensuring People's Participation in Wildlife Conservation,
- Conservation Awareness and Education,
- Wildlife Tourism,
- Monitoring and Research
- Domestic Legislation and International Conventions, and
- Enhancing Financial Allocation for Ensuring Sustained Fund Flow to the Wildlife Sector

### 1.4 COURT JUDGMENTS AND RELATED COMMITTEES

In the famous Godavarman case, Hon'ble Supreme Court Order in judgement dated 12-12-1996 directed that ***“the felling of trees in all forests is to remain suspended except in accordance with the Working Plan”***. It was also directed that ***“... for the state of Himachal Pradesh and the hill regions of the state of Uttar Pradesh and West Bengal: there will no felling in any forest: public or private.”***

While other applications were being covered under the above-mentioned case, the *amicus curiae* on 14.02.2000 submitted before Hon'ble Supreme Court that there were reports in the press that the State of Himachal Pradesh had passed some orders lifting the ban on felling of trees. The Court, thereafter, issued notice to the State of Himachal Pradesh and also made it clear that if any such orders have been passed, the operation of the same were stayed and no felling of trees be done. In the affidavit filed by the State of Himachal Pradesh, in response to the order dated 14.02.2000, it was pointed out that the intention of the State was to resume silviculture operations consisting of regeneration, felling and thinning of the trees as per the Working Plan duly

approved. The State of Himachal Pradesh also informed the Court that though the State had intended to do silvicultural felling but in actual fact this decision has not been given effect to. It was clearly mentioned that no felling of trees has taken place except of those allowed by this Court specifically. It is also pertinent to mention that the Government of India vide G.O. dated 11.10.2002 suspended the Working Plan for various States including the State of Himachal Pradesh. The State then approached the Central Empowered Committee (for short ‘the CEC’), which advised the State to approach the Supreme Court for modification or vacation of the earlier stay order. This led to the filing of INTERLOCUTORY APPLICATION NO 3840 **seeking permission to resume silviculture Operations** on 09-01-2015 by the Govt. of Himachal Pradesh.

On February 16, 2018, Hon’ble Supreme Court in the same interlocutory application noted that *”As per the affidavits filed by the State of Himachal Pradesh, some amount of silviculture felling is necessary, because if no felling is done then regeneration of trees is not as fast as it should be”*.

Based on this the Hon’ble SC ordered that ..*”We are of the view that on an experimental basis we may permit silviculture felling of trees to a very limited extent and such felling should be monitored very carefully to see whether such silviculture felling actually helps in the regeneration of forests or not”*. While hearing the IA, Hon’ble SC on 04.12.2017 had directed the State to identify two or three ranges where the process of silviculture felling may be carried out. Thus an affidavit was filed where it was pointed out that for felling of Khair (*Acacia catechu*) trees, Nurpur Forest Range of Nurpur Forest Division (Dharamshala Forest Circle), for Chil (*Pinus roxburghii*) Bharari Forest Range of Bilaspur Forest Division (Bilaspur Forest Circle) and for Sal (*Shorea robusta*) Paonta Sahib Forest Range of Paonta Sahib Forest division (Nahan Forest Circle) was identified. And that is how the ‘experimental’ silviculture operations were restarted in the three divisions. A total area of 284.71 ha was worked on in Sal Working Circle in the Division from 2018 to 2020, including 100 percent enumerations in experimental plots. In Paonta Sahib Division alone, 28000 trees and 98000 trees were enumerated in 2019-20 and 2020-21 respectively. Following this, marking was undertaken. In Paonta Sahib Forest Division, 6364 cum of Sal timber marked for felling in 2018-19. Approx. 13,400 cum timber was marked in 2019-20. The timber was extracted and sold through open auction by the Himachal Pradesh State Forest Development Corporation (HPSFDC). Post-felling operations of fencing, leaf litter cleaning, weeding, artificial regeneration, fire control, regeneration survey etc. were taken up by the department. Some of them (weeding, fire-control, regeneration survey) continue to this day.

#### **1.4.1 Regarding Working Plan**

Hon'ble Supreme Court passed an Order in Writ petition (202 of 1995) in the matter of "Godavarman Thirumulpad" V/s Union of India. The order speaks about the felling of trees in all forests is to remain suspended except in accordance with the working plans of the State government, as approved by Central government. Hon'ble Supreme Court passed an order on 22.09.2000 in Inter-Locutory application No 424 saying that regeneration of forest should be commensurate with felling carried out under a working plan. To achieve this, it must be ensured that no felling be carried out without allocating necessary fund to regenerate the felled areas. In the event of failure in regeneration or any shortfall in carrying out regeneration operation no further felling shall be undertaken until the failure/shortfall is made up.

Following the directions of Hon'ble Apex court in their order dated 22.09.2000 in IA No 424; a core group was constituted to decide the extent of felling. As per these Orders, felling are to be carried out by the State Governments only after obtaining the permission from core group constituted by the Ministry of Environment and Forests, New Delhi.

#### **1.5 THE SCHEDULED TRIBES AND OTHER TRADITIONAL FOREST DWELLERS (RECOGNITION OF FOREST RIGHTS) ACT, 2006**

After the enactment of this Act, the administration of the forest has been greatly influenced, as this act recognizes several individual as well as the community rights over the forest land and its produce. The provisions of this Act will have to be taken into consideration while managing the forests.

#### **1.6 BROAD OBJECTIVES OF MANAGEMENT**

The national goal is to have a minimum of one-third total geographical area of the country under tree cover. Effort should focus for consolidation and preservation of the existing forest cover and increase their productivity. With the passage of time, much reliance has been on sustainable management of natural resources. The principles of sustainable forest management wherein thrust is laid on conservation of the forest resources vis-à-vis utilization of forest usufructs shall be the underlying objective of the revised working plan. The revised working plan shall incorporate holistic management of forest resources keeping in view the need for conservation as well as utilization of forest produce. Reliance shall be on scientific working parameters that confirm to the set criteria indicators of sustainable forest management. The broad objectives of the revised working plan would be as under:

- To restore scientific management of the forests and revive forest health
- To identify the right silvicultural systems for various working circles with the goal to move towards normality of forests and sustainable yield regulation
- To enhance the forest/tree cover through various forestry interventions and to assist in derivation of all kinds of *provisioning, regulatory and supporting* Ecosystem Services (ES).
- To restore the ecological balance and to address the demand of the local community without destroying the natural ecosystem
- To develop forests as carbon sink for absorption of toxic carbon contents of industry and other polluting agents to enhance the role of *regulatory* Ecosystem Services.
- To protect and conserve the large and compact areas of forests to ensure environmental services such as perennial supply of water, wildlife migration
- To ensure sufficient carbon sink storage through eco-restoration and plantation meeting India's Sustainable Development Goals
- To replace the exotic species planted in the Paonta Sahib Forest Division with native/indigenous species.
- To minimize the damage to ecology and environment through the various threats that forests face through proper landscape and ecosystem management
- To facilitate a Revival Action Plan for water resource management practices in the Division
- To mitigate human-animal conflicts and to increase community participation in conservation of biodiversity and mitigation of conflict
- To tap on the success models in the Division pertaining to water security and enhancement of forest cover including eco-restoration by looking at scalability and replicability

### **1.7 METHODS OF TREATMENT TO BE ADOPTED:**

Forests are mainly Sal (*Shorea robusta*) bearing with other tree species including *Terminalia tomentosa*, *Mallotus philippinensis*. Due to closure of canopy, they have been invaded by fast growing species like *Ardisia solanacea*, the openings are also infused with *Lantana camara*. Along the choes and streams, *Syzigium cumini*, *Acacia catechu* and *Dalbergia sissoo* have shown their presence whereas attempts in the past have been made to introduce Teak (*Tectona grandis*), Khair (*Acacia catechu*) and *Albizia* species. As the species introduced are definite light demanders, growth is not commensurate with invasive species growth; therefore, the stocking

has not improved either in terms of Sal or other species. Similarly, due to lack of silviculture operations for more than 40 years now, the quality of growing stock has also been severely affected.

To maintain Sal and other flagship crops and to fill the gaps through interventions, redressing of degraded areas, restocking the blanks as well as different silvicultural treatments will be required especially suited to different species and Working circles. Rehabilitation of degraded forests will need an intensive approach through exhaustive soil and water conservation as well as afforestation efforts based on the knowledge and experience gained in the past treatment of these forests. It needs to be emphasized that the replenishment must continue to follow the felling and damage to the new crop is reduced to the minimum keeping off grazing and lopping and continually cleaning the crop for quality growth.

The silvicultural treatments must be directed to reduce the invasion of *Ardisia* and Lantana and stop them further invasion to new areas. The felling operations should be such sufficient sunlight is received so that new regeneration esp. for Sal is encouraged, at the same time the flagship species finds opportunities for regeneration by timely cleaning, thinning and cultural operations with respect to weed management.

Poor quality forests will need special treatment for soil and water conservation along with plantings of suitable species which are hardy and resistant to desiccation and frost. The area invites no felling of any kind throughout the working plan period.

Due regard to steep slopes liable to erosion, along the banks of Nalas and streams and areas on the South-West direction shall be taken while working owing to the paucity of growing stock. Dealing with human-wildlife conflicts in a proactive manner involving both short term and long-term measures are also to be considered.

Involving the communities in conservation and protection of forests and wildlife, and to create opportunities for their livelihood is required to be facilitated, especially by learning from the past success models of the past in the Division itself and nation-wide best practices.

Finally, there is an urgent need for a plan to develop Ecotourism in the region keeping in view ecological and cultural tenets and values of Paonta Sahib Forest Division, with a landscape management approach so that ecology and branding find a convergence, so does adding to Himachal Pradesh's tourism potential.

## 1.8 CONSTITUTION OF WORKING CIRCLES/MANAGEMENT AREAS:

In accordance with the above facts, the following working circles/management areas are proposed

| Sno. | Name of Working Circle/Management area                                       |
|------|------------------------------------------------------------------------------|
| 1    | Sal Working Circle                                                           |
| 2    | Coppice Working Circle                                                       |
| 3    | Chil Working Circle                                                          |
| 4    | Protection cum- rehabilitation Working Circle                                |
| 5    | Eucalyptus Plantation Restoration & Rehabilitation Management Plan           |
| 6    | Khair (Overlapping) Working Circle                                           |
| 7    | Water Resource Management & Soil Conservation (Overlapping) Working Circle   |
| 8    | Forest Protection (Overlapping) Working Circle                               |
| 9    | Wildlife Management & Biodiversity Conservation (Overlapping) Working Circle |
| 10   | Joint Forest Management (Overlapping) Working Circle                         |
| 11   | Ecotourism (Overlapping) Working Circle                                      |

### 1. Sal Working Circle:

This working circle will comprise of forest areas having Sal (*Shorea robusta*) as main crop. The total area of the working circle will be 16202.07 ha. The increase in area from previous Working Plan of 16041.23 ha has been 160.84 ha, which is basically the area overlapping with Khair (which now has been made an overlapping working circle in the true sense. There is also a shift in Periodic Blocks owing to a very long period of non-working that has impacted both the quality of forests and regeneration. The new allotment of Sal WC includes PBI, PB-Unallotted and PB IV. The silvicultural system adopted is Indian Irregular Shelterwood System.

### 2. Coppice Working Circle:

This working circle will comprise of forests having miscellaneous broad-leaved species. The total area allotted to this working circle will be 2093.03ha. The Silviculture system adopted is Coppice with Reserves System.

### **3. Chil Working Circle:**

This working circle will comprise all Chil forest areas of Paonta Sahib Forest Division, falling under Girinagar range. The total area of working circle will be 627.38ha. The Silviculture system adopted is Indian Irregular Shelterwood System.

### **4. Protection-cum-Rehabilitation Working Circle :**

This working circle shall comprise areas of all forests which needs to be protected and rehabilitated. This Working Circle covers poor quality miscellaneous forests situated on steep eroding formation with poor and scanty vegetative cover. Open areas and also closed areas where plantations have not established so far are also included in this working circle. Riverine tracts prone to erosion and mining threats have also been placed under this working circle. The total area allotted to this working circle will be 9530.1 ha.

### **5. Eucalyptus Plantation Restoration & Rehabilitation Management Plan :**

This area has been carved from those areas which have been planted with Eucalyptus in the past. This includes the areas where eucalyptus plantation has been carried out in the past and has become well established. It generally overlaps Sal working circle and Coppice working circle. The total area allotted is 340.1 ha. The plan incorporates removal of Eucalyptus with artificial regeneration of native species in the area.

### **6. Khair (Overlapping) Working Circle :**

Khair working circle (Overlapping) has now been made completely overlapping in true sense with Sal working circle for an area of 160.84 hac. The remaining area of 545.47 hac. which was originally in PCR working circle in older working plans and was shifted to Khair overlapping after plantations were carried out in 1950s onward, have now been kept back in PCR working circle as per CEC guidelines for Khair felling (CEC guidelines issued in I.A No. 87648 of 2020 in Writ Petition (C) No. 202 of 1995 TN Godaverman Thirumlkpad Vs UoI and Ors.) and keeping in view the ecological safeguards of riverine tracts prone to erosion, illicit mining and felling as well as boundaries with states of Uttarakhand and Haryana. The Silviculture system adopted is Coppice-with-Standards System.

### **7. Water Resource Management & Soil Conservation (Overlapping) Working Circle :**

This will be overlapping Working Circle comprising areas of forests which needs to be protected against soil erosion and needs water conservation. The overarching theme would be that based

on identifying the recharge zones and spring-sheds, forest management would be linked with watershed management. The object is to basically enhance the hydrological regime building on the success models implemented in the past.

#### **8. Forest Protection (Overlapping) Working Circle:**

This Working Circle includes all forests which overlaps with other Working Circles and is constituted to address the forest protection problems like Fire, Illicit felling, Encroachment, Illegal mining etc. The forest areas which are vulnerable to fire, status of damage reports, progress in prosecution/ compounding and illicit removal of forest produce, mining etc. along with their future strategies are also discussed in detail under this Working Circle.

#### **9. Wildlife Management (Overlapping) Working Circle**

This will be an overlapping working circle comprising all forest areas. The objective will be to identify important areas for wildlife and conservation, to reduce the man-animal conflict and address associated problems including the recent increase in elephant movement in the Division. This Working Circle is constituted for emphasizing the necessity of conservation of wildlife and collection of information for better management of wild life. The whole tract has a variety of wild animals and birds since Paonta Sahib Forest Division lies in the vicinity of several contiguous wildlife protected areas including Colonel Sher Jung National Park, Renukaji Wildlife Sanctuary, Rajaji National Park of Uttarakhand and Kalesar National Park of Haryana. Therefore, this working circle overlaps all other working circles and becomes crucial in the area of extensive wildlife management and conservation.

#### **10. Joint Forest Management (Overlapping) Working Circle:**

This will be another overlapping working circle giving role to community participation in management of forest areas through village level joint forest management committees. Sharing benefits with community in a sustainable manner shall be the objective of this Working Circle. The framework for JFM in HP is provided by the Government of HP Order of 12 May 1993, which followed the June 1990 Government of India (JFM) Circular enabling the spread of JFM. The concept of Joint or Participatory Forest Management is an intervention to evolve organized and collective thinking on the issues of forest management keeping in view the fact that the forest resources are limited and the claim over these are varied, no single solution can satisfy the needs of all. The philosophy aims at involving all the stakeholders in resource generation activities



through motivation, active involvement in the process of management and sharing of benefits through adequate institutional arrangements.

#### **11. Ecotourism (Overlapping) Working Circle**

The Working Circle will look into aspects that will look into the multiple aspects of ecotourism prospects and natural resource conservation in the Division with the eventuality of developing an ecotourism circuit. The existing and future proposed hotspots along-with mode of operation, sustainability and associated issues like livelihood generation shall be discussed.

**Additionally,** Chapter 17 under ‘Weed Management’ discusses the common weeds of Paonta Sahib Forest Area and Chapter 18 discusses the background of ‘Climate Change’ and its visible impacts in mountainous ecosystems and Paonta Sahib Division area.

#### **1.9 Period of Working Plan and necessity for intermediate revision:**

This working plan will be in place for 10 years w.e.f. 2023-24 to 2032-33. A mid-term review shall be undertaken for mid-course correction by the consultative committee under the chairmanship of the PCCF (HoFF) with representation from the Regional officer (MoEF&CC).

## CHAPTER- 2

### SAL WORKING CIRCLE

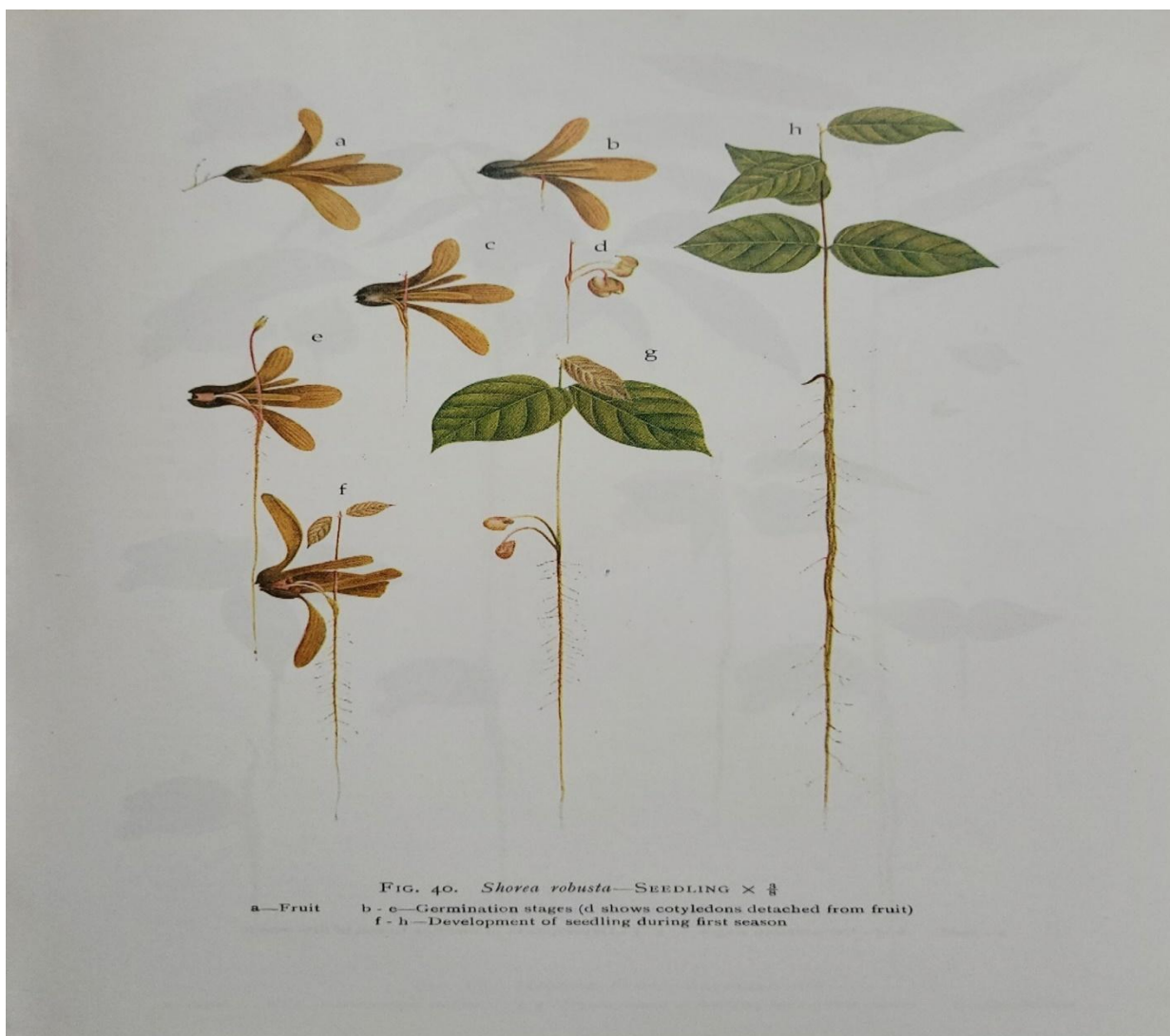
#### **2.1 Name of Working Circle:** Sal Working Circle

**2.2 General Constitution of Working Circle:** This working circle comprises of all commercially important and well stocked forests of Sal situated on the almost flat valley floor and the lower slopes of the Himalayas towards the north of the division. The gross area of the Sal Working Circle is **16202.07 ha**. The increase in area from previous Working Plan of 16041.23 ha has been 160.84 ha, which is basically the area overlapping with Khair (which now has been made an overlapping working circle in the true sense). The main criteria of allotting any particular Sal forest to this working circle are the presumption that Sal regeneration (whether of coppice or seed origin) can be obtained. Field observations indicate that the main regeneration in Sal forests is of coppice origin. The natural regeneration of seed origin is relatively much less vigorous and profuse as compared to the regeneration of coppice origin. Planting of Sal has been tried but without any significant achievement for want of proper techniques and the inherent characteristics of Sal. The density and quality of Sal crop varies from area to area. There are forests where stocking is low. This is due to enormous pressure of right holders. Natural regeneration is almost absent in such areas, but promising in areas where experimental silviculture felling is under implemenetation. Special efforts will be required to restock and assist natural generation with application of appropriate systems in such areas as well as apt protection. Also, due to a long period of non-working of forests, abnormality has set in with preponderance of mature trees affecting regeneration. This working circle is constituted to manage the irregular Sal forests as well as the abnormality in age-class gradation so as to maintain the sustainability of forests and enhance regeneration as was evidenced through the Experimental Silviculture Felling program carried out in the Division in 2018-2020 over 284.71 ha area of Sal Working Circle.



***C-28, RF Lai, Sal forest, Paonta Sahib Range***

**2.3 General Characteristics of Vegetation:** The crop has been described in Chapter 2, Part I as per ‘Champion and Seth’s’ revised classification. It conforms mainly to the types/sub-types 3C/C<sub>2b</sub>, 3C/C<sub>2a</sub>, 5B/C<sub>2a</sub>, 5B/C<sub>2</sub> and 5B/C<sub>1</sub>. Sal (*Shorea robusta*) is the dominant species in the working circle with its composition more than 75% in proportion by volume in PBI areas and 88-93% in others. The natural associates of Sal found in the forests include Sain, Jamun, Chiroli, Tendu, Rohini, Chhal, Haldu etc. The weeds like *Lantana*, *Ardisia* (major challenge as widespread in Paonta Sahib Sal forests), *Ageratum* are interfering with Sal and other associate species regeneration in the lower canopy.



***Germination stages of Sal seedling (Ref: Silviculture of Indian Trees, Vol I, R.S. Troup)***

**2.4 Felling Series, Cutting Sections and JFM areas:** The area under this working circle worked under felling series of ten years for the execution of felling and regeneration operations. Two felling series have been formed, one each for PBI and PBIV areas.

**2.5 Blocks, Compartments and JFM areas:** Generally, the nomenclature used in Vineet Kumar's plan has been followed. No changes have been done in the boundaries of forests and compartments as given in the plan under revision. Blocks and compartment wise area of this working plan has been given in para 2.6.7.

**2.6 Special Objectives of Management:** Consistent with the general objects of management, special objectives of management are:

- i) To convert the irregular crop into more or less uniform crop and manage abnormality in forests.
- ii) To protect and regeneration the existing Sal crop, giving preference to natural regeneration of seed origin wherever possible and also tapping the potential of coppice regeneration.
- iii) To progress towards attaining normal series of age classes.
- iv) To obtain sustained yield of timber in consonance with the above objects.
- v) To meet the genuine and bonafide needs of local people of fuel wood and timber.

### **2.6.1 Analysis of the Crop:**

**2.6.1.1 Stock Maps:** Stock maps have been prepared using modern technologies of open series maps (OSMs) on a scale 1:15000 both in digital and analogue form. The maps have been placed in Compartment History files.

**2.6.1.2 Selection of Sampling units and Enumerations:** The technique of Survey and Assessment of Forest Resource using Grid and Quadrants method (Sample Plots) has been adopted and complete counting of all tree species, class wise has been done in the sample plots. A total of 259 Sample Plots of 0.1 ha were laid in this working circle covering all PBs. The detail of PB wise sample plots is as under:

| <b>Sr.No.</b> | <b>Periodic Blocks</b> | <b>No. of plots</b> | <b>Total area counted (ha)</b> |
|---------------|------------------------|---------------------|--------------------------------|
| 1             | PB-I                   | 97                  | 9.7                            |
| 3             | PB-unallotted          | 93                  | 9.3                            |
| 4             | PB-IV                  | 69                  | 6.9                            |
|               | <b>Total</b>           | <b>259</b>          | <b>25.9</b>                    |

It is also pertinent to mention here that **100% enumerations** were decided by the Monitoring Committee during the Experimental Silviculture Felling Program which were carried out in app 284.71 ha of Sal Working Circle (PBI & PB IV) in Paonta Sahib Range of the Division in 2018-20 under IA 3840 of 2014 in WP(Civil) No. 202/1995 with directions from the Hon'ble Supreme Court. A good idea of floristic composition was obtained, even though the exercise was exhausting. Therefore, for the actual execution of felling in forests, this may be adopted considering the forest areas are accessible and the Division size is also small. For the Working Plan prescriptions however, the sample data has been analysed.



**2.6.1.3 Mean of Quality:** Generally, the forests of this region support Sal of quality III. In some portions (dry and exposed ridges), quality recedes to III/IV or even IV. However, in good areas the quality class goes upto II. In general, the standing volume factor for quality class III is applicable and applied and is as under:

Table No.:2.6.1.3

Table showing standing volume of Sal (As applicable)

| Diameter class | DBH in cm | Total Standing Volume (m <sup>3</sup> ) |
|----------------|-----------|-----------------------------------------|
| V              | 10-20     | 0.127                                   |
| IV             | 21-30     | 0.368                                   |
| III            | 31-40     | 0.835                                   |
| IIA            | 41-50     | 1.770                                   |
| IIB            | 51-60     | 3.030                                   |
| IA             | 61-70     | 4.587                                   |

The crown density is variable and varies from 0.3 to 0.9 and as per ocular estimation the average being 0.7.

**2.6.1.4 Assessment of NTFP bearing species:** The major NTFPs available in the working circle are Maljhan leaf (*Bauhinia vahlii*), Tendu leaf (*Diospyros montana*) in very small quantity, Baib grass (*Eulaliopsis binata*), Bamboos (*Dendrocalamus strictus*, *Bambusa bambos*) and of medicinal value (Harad, Baheda, Bansa, Amaltas, Gandhela etc).

#### 2.6.1.5 Growing Stock:

##### 2.6.1.5.1 Analysis of Growing Stock of PB I: (Area change of PBs is discussed in 2.6.7)

Tables 2.1 a, b and c reveal the per ha growing stock, number of trees of different species and total volume of growing stock of PB I in Sal working circle.

Table 2.1 a Per ha Growing Stock (cu m) of PB I

| Species            | Tree Classes  |              |              |              |                |             |             |             |              | Total         |
|--------------------|---------------|--------------|--------------|--------------|----------------|-------------|-------------|-------------|--------------|---------------|
|                    | V             | IV           | III          | II-A         | II-B           | I-A         | I-B         | I-C         | I-D          |               |
| Miscellaneous spp. | 41            | 17           | 8.5          | 4.89         | 1.935          | 1.075       | 0.36        | 0.285       | 0.28         | 75.325        |
| Chil               | 0             | 25           | 0            | 25           | 49.26          | 0           | 0           | 0           | 0            | 99.26         |
| Eucalyptus         | 0             | 0.14         | 0            | 0.14         | 0.28           | 0           | 0           | 0           | 0            | 0.56          |
| Khair              | 86.85         | 0.14         | 0.14         | 0            | 0              | 0           | 0           | 0           | 0            | 87.13         |
| Sal                | 15.5          | 29.5         | 42.5         | 51.5         | 62.21          | 4.605       | 2.15        | 0.355       | 0.355        | 208.675       |
| <b>Total</b>       | <b>143.35</b> | <b>71.78</b> | <b>51.14</b> | <b>81.53</b> | <b>113.685</b> | <b>5.68</b> | <b>2.51</b> | <b>0.64</b> | <b>0.635</b> | <b>470.95</b> |

Table 2.1 b Growing Stock in terms of number of trees in PB I

| Species            | V              | IV            | III           | II-A          | II-B          | I-A          | I-B          | I-C         | I-D         | Total          |
|--------------------|----------------|---------------|---------------|---------------|---------------|--------------|--------------|-------------|-------------|----------------|
| Miscellaneous spp. | 366839         | 151900        | 75569         | 43660         | 17307         | 9632         | 3144         | 2516        | 2499        | <b>673066</b>  |
| Chil               | 0              | 638           | 0             | 638           | 1276          | 0            | 0            | 0           | 0           | <b>2552</b>    |
| Eucalyptus         | 3236           | 638           | 638           | 0             | 0             | 0            | 0            | 0           | 0           | <b>4512</b>    |
| Khair              | 969631         | 173180        | 177738        | 118492        | 61160         | 21465        | 11712        | 1960        | 2598        | <b>1537936</b> |
| Sal                | 558072         | 435522        | 376211        | 242350        | 539423        | 46949        | 19266        | 3821        | 4485        | <b>2226099</b> |
| <b>Total</b>       | <b>1897778</b> | <b>761878</b> | <b>630156</b> | <b>405140</b> | <b>619166</b> | <b>78046</b> | <b>34122</b> | <b>8297</b> | <b>9582</b> | <b>4444165</b> |

Table 2.1 c Growing Stock in terms of Volume (cu m) in PB I

| Species            | Tree Classes    |                 |                 |                 |                |                 |                 |                 |                 | Total          |
|--------------------|-----------------|-----------------|-----------------|-----------------|----------------|-----------------|-----------------|-----------------|-----------------|----------------|
|                    | V               | IV              | III             | II-A            | II-B           | I-A             | I-B             | I-C             | I-D             |                |
| Miscellaneous spp. | 23477.7         | 27949.6         | 31587.85        | 38639.11        | 26220.11       | 22095.81        | 10038.79        | 8033.58         | 7979.31         | 196021.9       |
| Chil               | 0               | 159.44          | 0               | 864.11          | 2882.87        | 0               | 0               | 0               | 0               | 3906.42        |
| Eucalyptus         | 368.9           | 199.06          | 319             | 0               | 0              | 0               | 0               | 0               | 0               | 886.96         |
| Khair              | 111507.6        | 37753.24        | 94201.14        | 124061.1        | 78468.28       | 27539.6         | 15026.5         | 2514.68         | 3333.23         | 494405.4       |
| Sal                | 70875.14        | 160272.1        | 314136.2        | 428959.5        | 1634452        | 215355.1        | 123013.4        | 24397.09        | 28636.73        | 3000097        |
| <b>Total</b>       | <b>206229.3</b> | <b>226333.4</b> | <b>440244.2</b> | <b>592523.8</b> | <b>1742023</b> | <b>264990.5</b> | <b>148078.7</b> | <b>34945.35</b> | <b>39949.27</b> | <b>3695318</b> |

The total area of Periodic Block I consists of **8844.35** ha as per current plan. The n-D curve of PBI revealed that there are maximum Sal trees in higher diameter classes (II A to ID classes). No. of trees in IIA show a clear abnormality in distribution of age-classes. The n-D curve of this PB revealed that due to non-opening of canopy since more than 30-40 years due to ban on green felling, the regeneration potential of the Sal has been reduced and there is maximum number of preponderances of mature trees. Lower diameter classes (IV, V and III) also have sufficient advance growth in the compartments. Seeding felling will improve the advance growth by removal of overhead canopies of mature trees. The middle and lower canopies are also required to be thinned for providing sufficient space and light for advance regeneration of Sal. Eucalyptus will be removed if planted in gaps in the past. Removal will be far less than increment; hence the forest will be sustained in future. The trees in lower diameter classes will then grow in and will take place of trees in higher diameter classes if higher diameter trees are to be removed.

The felling in PB I was not done since imposition of ban on green felling since 30-40 years, but Hon'ble Supreme Court vide its order in February, 2018 ordered HPFD that Experimental Silvicultural felling in Sal forest can be taken up to observe the impact of silvicultural felling on Sal crop with the recommendation of Central Empowerment Committee (CEC). An area of 184.71 ha under PB-I was worked under with 100% enumeration of trees. Results have been discussed ahead in 2.6.8.

Sal is the predominant species with proportion of 81% by volume. There is an inter-specific competition of miscellaneous species of Rohini, Chamror, Kala tendu etc. (table 2.2 b) and weeds like *Ardisia solanacea*, *Lantana camara*, *Ageratum conyzoides* etc.

The biggest challenge is however that of ***Ardisia solanacea* (Gudbeli)** being widespread in Sal forests of Paonta Sahib and which has a very strong and complex taproot system affecting the regeneration of Sal and requires continuous removal till establishment of regeneration annually.

**2.6.1.5.2 Analysis of PB Un-allotted:** It is clear from figure 2.1 below that there is preponderance of immature crops of Sal mostly in classes V, IV and III. All the removal from this PB will be counted towards the yield of this working circle, since thinning and salvage removal has been prescribed. The area of the PB is 6107.65 ha.

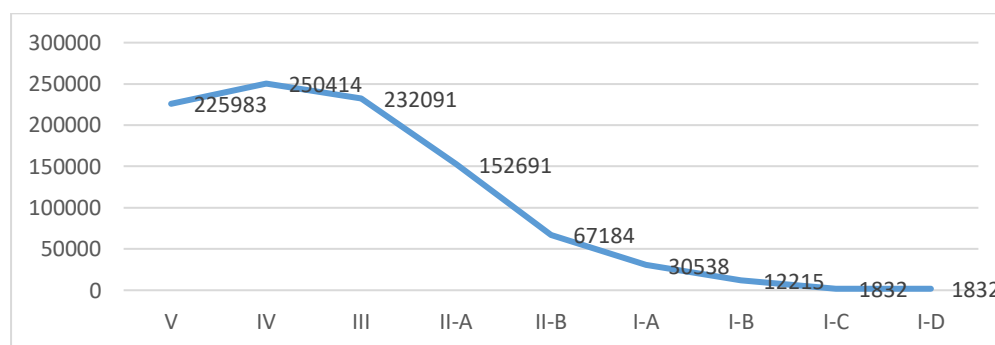


Figure 2.1. Number of Sal trees in Different Diameter Classes in PB Un-allotted

The proportion of advance growth (V, IV & III) is high in this PB. Sal proportion among all species by volume is almost 88% in this block (table 2.2 b).

Table 2.2 a. Per ha Growing Stock (cu m) of PB Un-allotted

| Species            | Tree Classes |              |             |             |             |            |            |            |            | Total         |
|--------------------|--------------|--------------|-------------|-------------|-------------|------------|------------|------------|------------|---------------|
|                    | V            | IV           | III         | II-A        | II-B        | I-A        | I-B        | I-C        | I-D        |               |
| Miscellaneous spp. | 37           | 13           | 6           | 4           | 3           | 1          | 0.2        | 0.3        | 0          | 64.5          |
| Chil               | 0            | 0            | 0           | 0           | 0           | 0.1        | 0          | 0          | 0          | 0.1           |
| Eucalyptus         | 0            | 0.4          | 1           | 1.3         | 0.4         | 0.1        | 0.1        | 0          | 0          | 3.3           |
| Khair              | 2.65         | 1.22         | 0.5         | 0.1         | 0           | 0          | 0          | 0          | 0          | 4.47          |
| Sal                | 37           | 41           | 38          | 25          | 11          | 5          | 2          | 0.3        | 0.3        | 159.6         |
| <b>Total</b>       | <b>76.65</b> | <b>55.62</b> | <b>45.5</b> | <b>30.4</b> | <b>14.4</b> | <b>6.2</b> | <b>2.3</b> | <b>0.6</b> | <b>0.3</b> | <b>231.97</b> |



Table 2.2 b. Growing Stock of PB Un-allotted in terms of number of trees

| Species            | Tree Classes  |               |               |               |              |              |              |             |             | Total          |
|--------------------|---------------|---------------|---------------|---------------|--------------|--------------|--------------|-------------|-------------|----------------|
|                    | V             | IV            | III           | II-A          | II-B         | I-A          | I-B          | I-C         | I-D         |                |
| Miscellaneous spp. | 225983        | 79399         | 36646         | 24431         | 18323        | 6108         | 1222         | 1832        | 0           | 393943         |
| Chil               | 0             | 0             | 0             | 0             | 0            | 611          | 0            | 0           | 0           | 611            |
| Eucalyptus         | 0             | 2443          | 6108          | 7940          | 2443         | 611          | 611          | 0           | 0           | 20155          |
| Khair              | 16185         | 7451          | 3054          | 611           | 0            | 0            | 0            | 0           | 0           | 27301          |
| Sal                | 225983        | 250414        | 232091        | 152691        | 67184        | 30538        | 12215        | 1832        | 1832        | 974781         |
| <b>Total</b>       | <b>468151</b> | <b>339707</b> | <b>277898</b> | <b>185673</b> | <b>87950</b> | <b>37867</b> | <b>14048</b> | <b>3665</b> | <b>1832</b> | <b>1416792</b> |

Table 2.2 c. Growing Stock (cu m) of PB Un-allotted in terms of Volume of trees

| Species           | Tree Classes   |                 |                 |                 |                 |                 |                |                |                | Total            |
|-------------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|------------------|
|                   | V              | IV              | III             | II-A            | II-B            | I-A             | I-B            | I-C            | I-D            |                  |
| Miscellaneous spp | 14462.9        | 14609.5         | 15318.0         | 21621.1         | 27759.3         | 14011.0         | 3900.3         | 5850.5         | 0.0            | <b>117532.6</b>  |
| Chil              | 0.0            | 0.0             | 0.0             | 0.0             | 0.0             | 2076.2          | 0.0            | 0.0            | 0.0            | <b>2076.2</b>    |
| Eucalyptus        | 0.0            | 762.2           | 3053.8          | 4764.0          | 1465.8          | 366.5           | 366.5          | 0.0            | 0.0            | <b>10778.8</b>   |
| Khair             | 1861.3         | 1624.4          | 1618.5          | 639.5           | 0.0             | 0.0             | 0.0            | 0.0            | 0.0            | <b>5743.7</b>    |
| Sal               | 28699.9        | 92152.2         | 193795.7        | 270263.5        | 203568.0        | 140079.0        | 77994.7        | 11699.2        | 11699.2        | <b>1029951.3</b> |
| <b>Total</b>      | <b>45024.1</b> | <b>109148.3</b> | <b>213786.1</b> | <b>297288.0</b> | <b>232793.1</b> | <b>156532.6</b> | <b>82261.5</b> | <b>17549.7</b> | <b>11699.2</b> | <b>1166082.6</b> |

**2.6.1.5.3 Analysis of PB IV:** The PB IV contains a total area of 1250.07 ha. However, the area of 184 ha was undertaken in experimental Silviculture Program ordered by Hon'ble Supreme Court and its monitoring is being done by Central Empowerment Committee (CEC). This area will be treated separately. Periodic Block IV is having a preponderance of regeneration and immature crop of Sal that need proper canopy opening through final felling operations for proper and healthy growth. (figure 2.2).

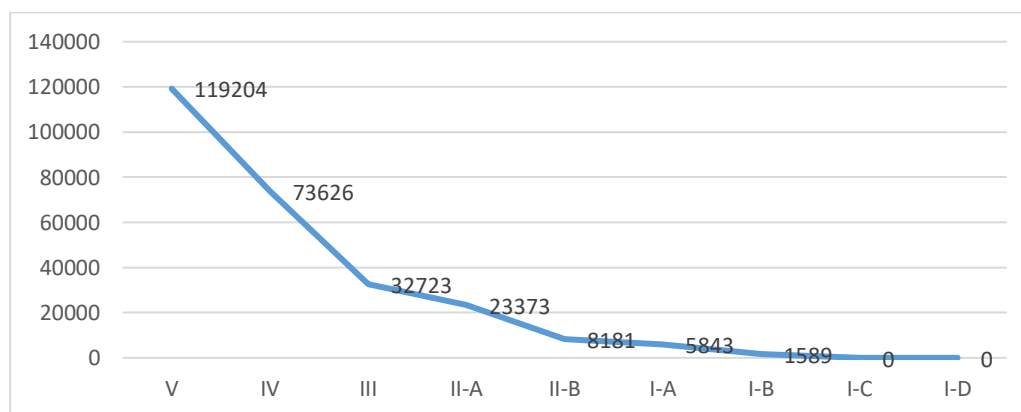


Figure 2.2 n-D curve for Sal of different Diameter Classes in PB IV

Table 2.3 a. Per ha Growing Stock (cum) of PB IV in terms of Volume of trees

|                   | Tree Classes |           |           |           |          |            |             |          |          |               |
|-------------------|--------------|-----------|-----------|-----------|----------|------------|-------------|----------|----------|---------------|
| Species           | V            | IV        | III       | II-A      | II-B     | I-A        | I-B         | I-C      | I-D      | Total         |
| Miscellaneous spp | 9            | 15        | 4         | 2         | 1        | 0.4        | 0.45        | 0        | 0        | 31.85         |
| Khair             | 3            | 0         | 0         | 0         | 0        | 0          | 0           | 0        | 0        | 3             |
| Sal               | 102          | 63        | 28        | 20        | 7        | 5          | 1.36        | 0        | 0        | 226.36        |
| <b>Total</b>      | <b>114</b>   | <b>78</b> | <b>32</b> | <b>22</b> | <b>8</b> | <b>5.4</b> | <b>1.81</b> | <b>0</b> | <b>0</b> | <b>261.21</b> |

Table 2.3 b Growing Stock of PB IV in terms of number of trees

|                   | Tree Classes  |              |              |              |             |             |             |          |          |               |
|-------------------|---------------|--------------|--------------|--------------|-------------|-------------|-------------|----------|----------|---------------|
| Species           | V             | IV           | III          | II-A         | II-B        | I-A         | I-B         | I-C      | I-D      | Total         |
| Miscellaneous spp | 10518         | 17530        | 4675         | 2337         | 1169        | 467         | 526         | 0        | 0        | 37222         |
| Khair             | 3506          | 0            | 0            | 0            | 0           | 0           | 0           | 0        | 0        | 3506          |
| Sal               | 119204        | 73626        | 32723        | 23373        | 8181        | 5843        | 1589        | 0        | 0        | 264539        |
| <b>Total</b>      | <b>133228</b> | <b>91156</b> | <b>37398</b> | <b>25710</b> | <b>9350</b> | <b>6310</b> | <b>2115</b> | <b>0</b> | <b>0</b> | <b>305267</b> |

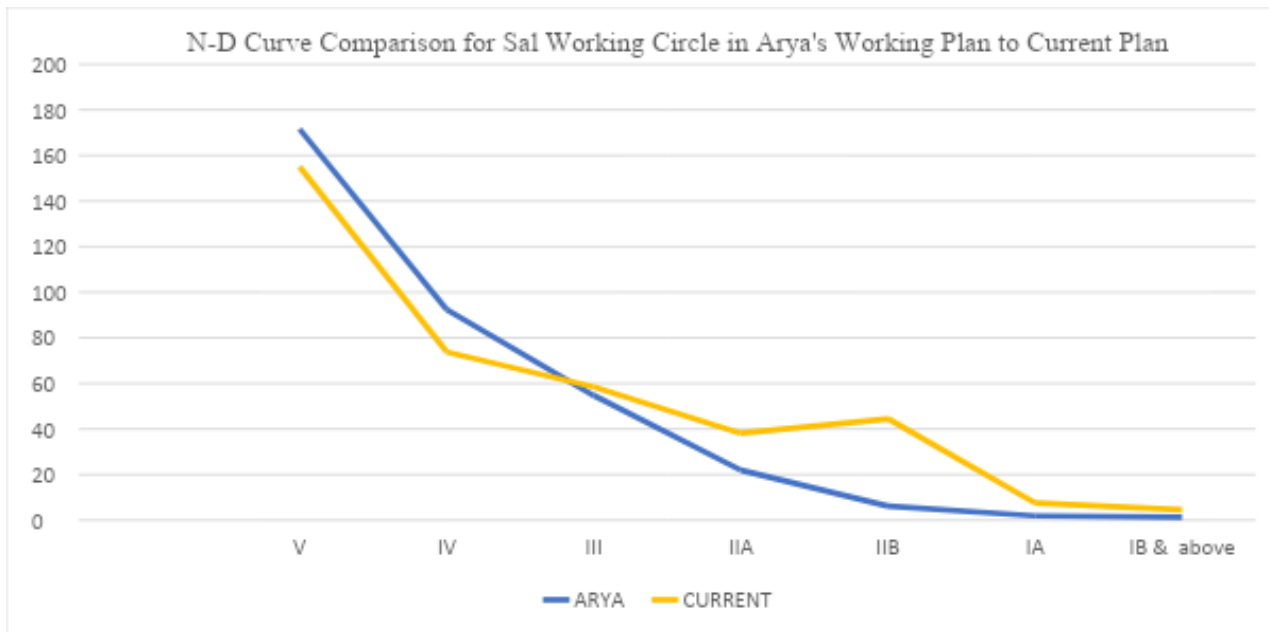
Table 2.3 c. Growing Stock (cu m) of PB IV in terms of Volume of trees

|                   | Tree Classes    |                 |                 |                 |                 |                 |                 |             |             |                  |
|-------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------|-------------|------------------|
| Species           | V               | IV              | III             | II-A            | II-B            | I-A             | I-B             | I-C         | I-D         | Total (cum)      |
| Miscellaneous spp | 673.15          | 3225.52         | 1954.15         | 2068.25         | 1771.04         | 1071.30         | 1679.52         | 0.00        | 0.00        | 12442.92         |
| Khair             | 403.19          | 0.00            | 0.00            | 0.00            | 0.00            | 0.00            | 0.00            | 0.00        | 0.00        | 403.19           |
| Sal               | 15138.91        | 27094.37        | 27323.71        | 41370.21        | 24788.43        | 26801.84        | 10145.77        | 0.00        | 0.00        | 172663.23        |
| <b>Total</b>      | <b>16215.25</b> | <b>30319.89</b> | <b>29277.86</b> | <b>43438.46</b> | <b>26559.47</b> | <b>27873.14</b> | <b>11825.28</b> | <b>0.00</b> | <b>0.00</b> | <b>185509.34</b> |

**2.6.1.5.4 Comparison of Growing Stock with previous data:** Comparison of growing stock with previous working plans is given below.

| DIA   | ARYA'S PLAN |        | PIS    |        | V KUMAR'S PLAN |        | CURRENT |        |
|-------|-------------|--------|--------|--------|----------------|--------|---------|--------|
| Class | No./ha      | Vol/ha | No./ha | Vol/ha | No./ha         | Vol/ha | No./ha  | Vol/ha |
| V     | 171.6       | 17.6   | 136.2  | 19.4   | 148.4          | 14.8   | 155.0   | 16.6   |
| IV    | 92.4        | 31.1   | 132.3  | 41.7   | 94.2           | 30.2   | 73.8    | 22.6   |
| III   | 54.7        | 44     | 69.4   | 45.5   | 68.9           | 52.9   | 58.5    | 42.2   |
| IIA   | 22          | 37.7   | 27.9   | 32.1   | 37.4           | 62.6   | 38.1    | 57.7   |
| IIB   | 6.2         | 18     | 7.3    | 13.6   | 15             | 43.2   | 44.5    | 124.4  |

|              |              |              |              |              |              |              |              |              |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| IA           | 1.9          | 7.8          | 2.3          | 6.8          | 5.6          | 24.1         | 7.6          | 27.8         |
| IB & above   | 1.3          | 6.4          | 1            | 6.3          | 4.6          | 26.9         | 4.6          | 21.4         |
| <b>Total</b> | <b>350.1</b> | <b>162.6</b> | <b>376.4</b> | <b>165.4</b> | <b>374.1</b> | <b>254.7</b> | <b>382.1</b> | <b>312.7</b> |



One rider to be mentioned here is that previous plans included Nahan Division as well, while this plan considers the area of Paonta Sahib Division only. Either way, the normality of forests is quite distinct in inverse J-curve looking at Arya's plan when silviculture was followed in practice (1968-78) (i.e. normal distribution of age classes in uneven age forests) versus now when there has been a long period of non-working of forests and a substantial deviation can be seen.

Similarly, comparing with the data of previous working plan of Vineet Kumar (combined for Paonta Sahib & Nahan however), it is observed that there has been an increase in volume in higher diameter classes of IIA, IIB and IA, while there has been decrease in lower dia classes of IV and III. However, a small increase is seen in Vth class while a decrease is seen in IB & above as compared to Vineet Kumar's plan. This is because, owing to ban on green felling has led to irregularity in the forests in terms of distribution of age-classes. It can be seen that silvicultural removal from IIB class will also shift the curve towards normality.

**2.6.2 Silvicultural System:** Indian Irregular Shelterwood system with fixed Periodic Blocks has been adopted for this working circle. 80% of IV & V class trees have been retained as advance growth constituting of immature poles and trees up to 30 cm dbh as a part of future crop in the areas with recalcitrant regeneration and where the regeneration is difficult to be induced and even where it is induced, it takes long number of years to complete the character of the crop therefore will be irregular and the crop produced shall be uneven aged. Preference will be given to

regeneration of coppice origin, without ignoring the seed regeneration. The regeneration will be in the areas felled for seeding felling and the areas should be taken for regeneration invariably from the year of felling itself in order to take the advantage of coppice shoots.

**2.6.3 Rotation Period:** From Sal forests of quality III, diameter class of an average diameter of 40 cm is attained in 120 years. Thus, the rotation has been kept as 120 years with a regeneration period of 30 years. An established regeneration will be considered as saplings which are reasonably straight, apparently sound and vigorously growing and more than 3m in height.

**2.6.4 Harvestable Diameter:** Keeping in view the rate of growth and market favored size as well as CEC guidelines, the exploitable diameter is fixed as 40 cm dbh.

**2.6.5 Reducing Factors and Reducing area:** The area has not been reduced in this working circle.

**2.6.6 Felling Cycle:** Felling cycle will be equal to regeneration period i.e. 30 years.

**2.6.7 Divisions into Periodic and allotment of Periodic Blocks:** The area statement of Periodic Blocks allotted to Sal forest in current **plan** is given as under:

**Summary of the area under different PBs in the division**

| Division     | Range        | AREA UNDER PB (ha) |                |                |                 |
|--------------|--------------|--------------------|----------------|----------------|-----------------|
|              |              | PB I               | PB Un-Allotted | PB IV          | Total           |
| Paonta Sahib | Bhagani      | 735.59             | 1441.88        | 111.96         | 2289.43         |
|              | Paonta Sahib | 2363.25            | 1715.96        | 868.63         | 4947.84         |
|              | Majra        | 1782.1             | 2022.87        | 235.52         | 4040.49         |
|              | Girinagar    | 3963.41            | 926.94         | 33.96          | 4924.31         |
|              | <b>Total</b> | <b>8844.35</b>     | <b>6107.65</b> | <b>1250.07</b> | <b>16202.07</b> |

Area statement depicting shift in Periodic Blocks (ha)

| Plan              | PB I (old) | PB II (old) | PB I (new) | PB III (old) | PB Unallotted (new) | PB IV (old) | PB IV(new) |
|-------------------|------------|-------------|------------|--------------|---------------------|-------------|------------|
| Vineet Kumar Plan | 2657.23    | 6732.97     |            | 5946.81      |                     | 704.22      |            |
| Current Plan      |            |             | 8844.35    |              | 6107.65             |             | 1250.07    |

The current working circle has now been divided into three Periodic Blocks. The area which have mature and over mature over wood having some regeneration and are generally with heavy crown density have been allotted to PB I. In the previous working plan, PB I area was 2657.23 ha, out

of which 545.65 ha (184.71 ha of PB-I experimental silviculture felling & 361.14 ha in which final felling was prescribed under previous working plan) has been shifted to PB IV. Also, it was observed that PB II with area of 6732.97 ha in the previous working plan should also be converted into PB I as the over-wood was not removed since 40-50 years due to ban on green felling. There is preponderance of mature and over mature trees with few advance growth. This PB is required to be worked for enhancement of regeneration. Therefore, entire area of PB II in the previous plan will be converted into PB I which makes the total area of new PB I as **8844.35 ha**.

The forests where seeding felling has been conducted in the past including the 184.71 ha under Experimental Silviculture felling program in 2018-20 and 361.14 ha area in which final felling was prescribed under previous working plan have been allotted to PB IV. Mature over-wood (mother trees) is present in this P.B. Total area of PB IV is **1250.07 ha**.

All other areas, not coming in any of the PB's discussed above, have been allotted to PB un-allotted i.e. **6107.65 ha**. This also now includes the area of 160.84 ha, which is basically the area overlapping with Khair (OL) Circle (which now has been made an overlapping working circle in the true sense). There will be no commercial felling in this PB except uprooted and dry trees and petty fellings to meet the bonafide TD rights of communities. The PB wise proportion of Sal and other species in percentage as per sampling results is as under:

| Sl. No | Species            | PB I    |         | PB un-allotted |         | PB IV   |         |
|--------|--------------------|---------|---------|----------------|---------|---------|---------|
|        |                    | No. (%) | Vol (%) | No. (%)        | Vol (%) | No. (%) | Vol (%) |
| 1      | Sal                | 50.00   | 75.00   | 68.80          | 88.32   | 86.65   | 93.07   |
| 2      | Miscellaneous spp. | 14.77   | 5.23    | 27.8           | 10.07   | 12.19   | 6.7     |
| 3      | Khair              | 34.92   | 15.39   | 1.92           | 0.49    | 1.14    | 0.21    |

The proportion of Sal is predominant, with >75% by volume in PB I and in fact 88.32 % by volume in PB un-allotted. The areas allotted in different Periodic Blocks in different compartments of the division in this working plan is as follows:

#### Periodic Block I:

| Range   | Block   | Beat   | PF-RF       | Compart-no. | Type | Area(ha) |
|---------|---------|--------|-------------|-------------|------|----------|
| Bhagani | Bhagani | Amboya | Amboya-9(a) | C-8         | RF   | 30.43    |
|         |         |        |             | C-7         | RF   | 35.72    |

|           |          |                               |                    |       |    |        |
|-----------|----------|-------------------------------|--------------------|-------|----|--------|
|           |          |                               |                    | C-3   | RF | 18.11  |
|           |          |                               |                    | C- 10 | RF | 86.04  |
|           |          | Mehruwala                     | Mehruwala-8        | C-4   | RF | 49.8   |
|           | Rajpur   | Danda                         | Danda-9(b)         | C-12  | RF | 47.79  |
|           |          |                               |                    | C-11  | RF | 63.12  |
|           |          | Puruwala                      | Kandela-11(a)      | C-5   | RF | 63.35  |
| Bhagani   | Bhagani  | Dhandla                       | Dhandla-6          | C-9   | RF | 29.91  |
|           |          | Mehruwala                     | Mehruwala-8        | C-9   | RF | 56.84  |
|           |          |                               |                    | C-8   | RF | 56.84  |
|           | Rajpur   | Danda                         | Danda-9(b)         | C-18  | RF | 34.19  |
|           |          |                               |                    | C-14  | RF | 37.73  |
|           |          |                               |                    | C-13  | RF | 51.77  |
|           |          | Puruwala                      | Kandela-11(a)      | C-4   | RF | 73.95  |
|           |          |                               |                    | TOTAL |    | 735.59 |
| Girinagar | Chandpur | Beas                          | Beas-61            | C-5   | RF | 25.15  |
|           |          |                               |                    | C-4   | RF | 10.07  |
|           |          |                               |                    | C-3   | RF | 31.19  |
|           |          |                               |                    | C-2   | RF | 55.23  |
|           |          | Chandpur -<br>1 <sup>st</sup> | Chandpur-62(a)     | C-9   | RF | 32.95  |
|           |          |                               |                    | C-8   | RF | 46.53  |
|           |          |                               |                    | C-16  | RF | 42.76  |
|           |          | Chandpur<br>2 <sup>nd</sup>   | Chandpur-62(b)     | C-6   | RF | 93.06  |
|           |          |                               |                    | C-5   | RF | 62.88  |
|           |          |                               |                    | C-17  | RF | 45.27  |
|           |          |                               |                    | C-12  | RF | 42.76  |
|           |          | Parduni -1 <sup>st</sup>      | Mehrar-64(b)       | C-16  | RF | 60.62  |
|           |          |                               | Parduni -1st-63(a) | C-5   | RF | 52.82  |

|           |           |                               |                    |       |    |        |
|-----------|-----------|-------------------------------|--------------------|-------|----|--------|
|           |           | Parduni 2 <sup>nd</sup>       | Parduni 2nd-63(b)  | C-15  | RF | 51.06  |
|           |           |                               |                    | C-12  | RF | 43     |
|           |           |                               | Parduni 2nd - 63-b | C-8   | RF | 110.67 |
|           |           |                               |                    | C-11  | RF | 50.3   |
|           | Girinagar | Dunga                         | Dunga-69           | C-4   | RF | 28.4   |
|           |           |                               |                    | C-3   | RF | 45     |
|           |           |                               | Janglot-70b        | C-5   | RF | 58.1   |
|           |           | Ganyoni                       | Ganyoni-67         | C-6   | RF | 37.73  |
|           |           |                               |                    | C-4   | RF | 31.44  |
|           |           |                               |                    | C-3   | RF | 42.76  |
|           |           | Jalmusa                       | Jalmusa-71         | C-2   | RF | 35.04  |
|           |           | Majri                         | Majri -65          | C-8   | RF | 30.18  |
|           |           |                               |                    | C-13  | RF | 50.31  |
|           |           |                               |                    | C-11  | RF | 40.5   |
|           |           |                               |                    | C- 10 | RF | 33.45  |
|           | Kansar    | Gullarwala                    | Gullarwala-68      | C-9   | RF | 73.7   |
|           |           |                               |                    | C-7   | RF | 32.7   |
|           |           |                               |                    | C-5   | RF | 56.1   |
|           |           |                               |                    | C-3   | RF | 47.54  |
|           |           |                               |                    | C-2   | RF | 42.76  |
|           |           |                               |                    | C-14  | RF | 13.83  |
|           |           |                               |                    | C-11  | RF | 50.3   |
| Girinagar | Chandpur  | Beas                          | Beas-61            | C-9   | RF | 68.91  |
|           |           |                               |                    | C-8   | RF | 40.75  |
|           |           | Chandpur -<br>1 <sup>st</sup> | Chandpur-62(a)     | C-15  | RF | 52.68  |
|           |           |                               |                    | C-14  | RF | 37.73  |
|           |           |                               |                    | C-13  | RF | 18.87  |
|           |           |                               |                    | C-11  | RF | 36.22  |

|  |           |                             |                    |       |    |        |
|--|-----------|-----------------------------|--------------------|-------|----|--------|
|  |           | Chandpur<br>2 <sup>nd</sup> | Chandpur-62(b)     | C-18  | RF | 20.5   |
|  |           |                             |                    | C- 10 | RF | 25.4   |
|  |           | Parduni -1 <sup>st</sup>    | Mehrar-64(b)       | C-17  | RF | 85.77  |
|  |           |                             | Parduni -1st-63(a) | C-9   | RF | 41.75  |
|  |           |                             |                    | C-3   | RF | 54.08  |
|  |           |                             |                    | C- 10 | RF | 52.06  |
|  |           | Parduni 2 <sup>nd</sup>     | Parduni 2nd-63(b)  | C-14  | RF | 28.42  |
|  |           |                             | Parduni 2nd-63-b   | C-13  | RF | 55.59  |
|  | Girinagar | Dunga                       | Dunga-69           | C-2   | RF | 55     |
|  |           |                             |                    | C-1   | RF | 56     |
|  |           | Ganyoni                     | Ganyoni-67         | C-9   | RF | 46.53  |
|  |           |                             |                    | C-8   | RF | 35.21  |
|  |           |                             |                    | C-7   | RF | 46.28  |
|  |           |                             |                    | C-5   | RF | 33.96  |
|  |           |                             |                    | C-12  | RF | 109.41 |
|  |           |                             |                    | C-11  | RF | 59.61  |
|  |           |                             |                    | C-1   | RF | 41.25  |
|  |           |                             |                    | C- 10 | RF | 77.97  |
|  |           | Jalmusa                     | Jalmusa-71         | C-5   | RF | 59.32  |
|  |           |                             | Janglot-70a        | C-6   | RF | 50.3   |
|  |           | Kharraru                    | Kharraru-66        | C-9   | RF | 23.41  |
|  |           |                             |                    | C-8   | RF | 47.15  |
|  |           |                             |                    | C-7   | RF | 33.96  |
|  |           |                             |                    | C-6   | RF | 57.85  |
|  |           |                             |                    | C-5   | RF | 37.23  |
|  |           |                             |                    | C-4   | RF | 25.66  |
|  |           |                             |                    | C-3   | RF | 40.5   |
|  |           |                             |                    | C-1   | RF | 56.59  |



|       |        |            |                     |       |    |         |
|-------|--------|------------|---------------------|-------|----|---------|
|       |        | Majri      | Majri -65           | C-6   | RF | 67.67   |
|       |        |            |                     | C-14  | RF | 35.97   |
|       |        |            |                     | C-12  | RF | 32.95   |
|       |        | Mehrar     | Mehrar-64           | C-9   | RF | 21.38   |
|       |        |            |                     | C-8   | RF | 37.73   |
|       |        |            |                     | C-7   | RF | 30.69   |
|       |        |            |                     | C-6   | RF | 58.35   |
|       |        |            |                     | C-5   | RF | 29.43   |
|       |        |            |                     | C-14  | RF | 30.18   |
|       |        |            |                     | C-13  | RF | 36.22   |
|       |        |            |                     | C-11  | RF | 32.7    |
|       |        |            |                     | C- 10 | RF | 22.64   |
|       | Kanser | Gullarwala | Gullarwala-68       | C-8   | RF | 21.88   |
|       |        |            |                     | C-6   | RF | 20.12   |
|       |        |            |                     | C-4   | RF | 51.57   |
|       |        |            |                     | C-15  | RF | 49.05   |
|       |        |            |                     | C-13  | RF | 46.79   |
|       |        |            |                     | C-12  | RF | 43.51   |
|       |        |            |                     | C-1   | RF | 37.48   |
|       |        |            |                     | C- 10 | RF | 39.02   |
|       |        |            |                     | TOTAL |    | 3963.41 |
| Majra | Behral | Battamandi | Ghuttanpur - 45 (a) | C-3   | RF | 40.75   |
|       |        |            |                     | C-16  | RF | 14.84   |
|       |        |            | Kothewali-46 (a)    | C-4   | RF | 37.73   |
|       |        |            | R-45 Ghuttanpur     | C-5   | RF | 40.5    |
|       |        | Satiwala   | Mastali-47          | C-5   | RF | 22.64   |
|       |        |            |                     | C-2   | RF | 46.05   |
|       |        | Surjpur    | Kattapathar-42      | C-4   | RF | 23.2    |
|       |        |            |                     | C-3   | RF | 22.64   |

|  |       |            |                     |       |    |       |
|--|-------|------------|---------------------|-------|----|-------|
|  |       |            |                     | C-2   | RF | 38.99 |
|  |       |            | Mahadev ka khala-44 | C-3   | RF | 39.88 |
|  |       |            |                     | C-2   | RF | 37.23 |
|  |       |            | Surjpur-43          | C-2   | RF | 25.91 |
|  | Majra | Bherewala  | Bherewala-33        | C-2   | RF | 27.42 |
|  |       |            | Naurangabad-31      | C-5   | RF | 14.84 |
|  |       |            |                     | C-3   | RF | 23.64 |
|  |       | Dhaulakuan | Garhi banswali-29   | C-6   | RF | 25.15 |
|  |       |            |                     | C-2   | RF | 14.84 |
|  |       |            | Garhi-28            | C-2   | RF | 65.4  |
|  |       |            |                     | C1    | RF | 30.69 |
|  |       |            | Sudanbwala-30       | C-3   | RF | 45.24 |
|  |       |            |                     | C-1   | RF | 16.32 |
|  |       | Johron     | Banswalli-41        | C-8   | RF | 23.14 |
|  |       |            |                     | C-7   | RF | 30.09 |
|  |       |            |                     | C-14  | RF | 16.35 |
|  |       |            |                     | C-13  | RF | 28.92 |
|  |       |            |                     | C-12  | RF | 42.25 |
|  |       |            | Kiarda-40           | C-4   | RF | 26.48 |
|  |       |            |                     | C-3   | RF | 30.7  |
|  |       |            |                     | C-2   | RF | 23.65 |
|  |       | Majra      | Badhighatti-39      | C-3   | RF | 23.68 |
|  |       |            | Sukhimelion-38      | C-3   | RF | 28.92 |
|  |       |            |                     | C-1   | RF | 28.95 |
|  |       |            |                     | C- 10 | RF | 65.65 |
|  |       | Sainwla    | Jamanwali-34        | C-1   | RF | 28.34 |
|  |       |            | Paniwali-37         | C-2   | RF | 42.72 |

|                 |           |            |                   |       |    |        |
|-----------------|-----------|------------|-------------------|-------|----|--------|
|                 |           |            | Sainwala-36       | C-4   | RF | 18.21  |
|                 |           |            |                   | C-3   | RF | 17.78  |
|                 |           |            |                   | C-2   | RF | 14.84  |
|                 |           |            |                   | C-1   | RF | 13.87  |
|                 |           |            | Tokian-35         | C-2   | RF | 18.08  |
|                 |           |            |                   | C-1   | RF | 27.68  |
| Majra           | Behral    | Behral     | Ambali-48         | C-1   | RF | 52.57  |
|                 | Majra     | Bherewala  | Bherewala-33      | C-5   | RF | 25.65  |
|                 |           |            |                   | C-4   | RF | 28.42  |
|                 |           |            | Naurangabad-31    | C-4   | RF | 28.67  |
|                 |           |            |                   | C-2   | RF | 21.93  |
|                 |           |            |                   | C-1   | RF | 63.13  |
|                 |           |            | Pipliwali-32      | C-4   | RF | 27.67  |
|                 |           |            |                   | C-2   | RF | 50.3   |
|                 |           | Dhaulakuan | Garhi banswali-29 | C-5   | RF | 22.13  |
|                 |           |            |                   | C-4   | RF | 13.08  |
|                 |           |            | Sudanbwala-30     | C-2   | RF | 19.68  |
|                 |           | Majra      | Badhighatti-39    | C-2   | RF | 41.75  |
|                 |           |            |                   | C-1   | RF | 29.68  |
|                 |           | Sainwla    | Jamanwali-34      | C-5   | RF | 12.07  |
|                 |           |            |                   | C-2   | RF | 41.78  |
|                 |           |            | Sainwala-36       | C-5   | RF | 25.15  |
|                 |           |            | Tokian-35         | C-6   | RF | 17.12  |
|                 |           |            |                   | C-5   | RF | 13.12  |
|                 |           |            |                   | C-4   | RF | 44     |
|                 |           |            |                   | TOTAL |    | 1782.1 |
| Paonta<br>Sahib | Gorakhpur | Kukron     | Kukron-23         | C-9   | RF | 43.72  |
|                 |           |            |                   | C-5   | RF | 35.21  |
|                 |           |            |                   | C-16  | RF | 21.75  |
|                 |           |            |                   | C-13  | RF | 38.88  |

|  |          |          |                |       |    |       |
|--|----------|----------|----------------|-------|----|-------|
|  |          |          |                | C-12  | RF | 45.12 |
|  |          |          |                | C-11  | RF | 21.14 |
|  |          |          |                | C- 10 | RF | 58.54 |
|  |          | Malgi    | Malgi-14       | C-8   | RF | 18.08 |
|  |          |          |                | C-27  | RF | 18.88 |
|  |          |          |                | C-25  | RF | 17.76 |
|  |          |          |                | C-24  | RF | 28.32 |
|  |          |          |                | C-23  | RF | 15.04 |
|  |          |          |                | C-22  | RF | 20.32 |
|  |          |          |                | C-18  | RF | 15.04 |
|  |          |          |                | C-17  | RF | 17.76 |
|  |          | Rajban   | Rajban-18      | C-7   | RF | 12.37 |
|  |          |          |                | C-9   | RF | 11.32 |
|  |          |          |                | C-10  | RF | 21.61 |
|  | Gorkhpur | Gorkhpur | Gorkhpur-19(b) | C-9   | RF | 68.41 |
|  |          |          |                | C-18  | RF | 27.16 |
|  |          |          |                | C-17  | RF | 22.64 |
|  |          |          |                | C-13  | RF | 25.15 |
|  | Jamotwa  | Jamotwa  | Jamotwa-21(b)  | C-8   | RF | 20    |
|  |          |          |                | C-4   | RF | 25.12 |
|  |          |          |                | C-3   | RF | 22.08 |
|  |          |          |                | C- 10 | RF | 36.96 |
|  | Khara    | Jhara    | Jhara-27       | C-8   | RF | 27.52 |
|  |          |          |                | C-20  | RF | 35    |
|  |          |          |                | C-11  | RF | 32.64 |
|  |          | Khara    | Khara-24       | C-17  | RF | 12.48 |
|  |          |          |                | C-14  | RF | 22.24 |
|  |          | Lai      | Lai-25(b)      | C-32  | RF | 12.48 |
|  |          |          |                | C-29  | RF | 28.32 |
|  |          |          |                | C-26  | RF | 30.08 |
|  |          |          |                | C-17  | RF | 21.76 |
|  |          | Toka     | Lai-25(a)      | C-24  | RF | 37    |
|  |          |          |                | C-20  | RF | 21.6  |

|                 |                 |              |                 |      |    |       |
|-----------------|-----------------|--------------|-----------------|------|----|-------|
|                 |                 |              |                 | C-19 | RF | 24.8  |
|                 |                 |              |                 | C-15 | RF | 38.88 |
|                 |                 |              | Mankundion-26   | C-1  | RF | 13.6  |
|                 | Paonta<br>Sahib | Garibnath(n) | Garibnath-15(b) | C-12 | RF | 8.14  |
|                 |                 | Garibnath(s) | Garibnath       | C-5  | RF | 28.8  |
|                 |                 |              |                 | C-18 | RF | 24.52 |
|                 |                 |              |                 | C-1  | RF | 12.48 |
|                 |                 | Gondpur      | Jambu khala-20  | C6   | RF | 7.52  |
|                 |                 | Jamniwala    | Jamniwala-22    | C-9  | RF | 55.2  |
|                 |                 |              |                 | C-8  | RF | 55.2  |
|                 |                 |              |                 | C-7  | RF | 27.52 |
|                 |                 |              |                 | C-11 | RF | 32.64 |
|                 |                 |              |                 | C-1  | RF | 32.64 |
|                 |                 | Jamotwa      | Jamotwa-21(b)   | C2   | RF | 35.2  |
| Paonta<br>sahib | Chachhati       | Sarah        | Sarah-13        | C-6  | RF | 48.06 |
|                 | Gorakhpur       | Kukron       | Kukron-23       | C-8  | RF | 34.92 |
|                 |                 |              |                 | C-7  | RF | 15.85 |
|                 |                 |              |                 | C-6  | RF | 22.39 |
|                 |                 |              |                 | C-4  | RF | 60.87 |
|                 |                 | Malgi        | Malgi-14        | C-9  | RF | 35.52 |
|                 |                 |              |                 | C-7  | RF | 30.08 |
|                 |                 |              |                 | C-6  | RF | 6.24  |
|                 |                 |              |                 | C-5  | RF | 17.28 |
|                 |                 |              |                 | C-4  | RF | 27.84 |
|                 |                 |              |                 | C-3  | RF | 17.6  |
|                 |                 |              |                 | C-21 | RF | 28.21 |
|                 |                 |              |                 | C-2  | RF | 19.56 |
|                 |                 |              |                 | C-15 | RF | 26.08 |
|                 |                 |              |                 | C-14 | RF | 15    |
|                 |                 |              |                 | C-13 | RF | 25.6  |

|  |                 |           |              |                 |    |                |
|--|-----------------|-----------|--------------|-----------------|----|----------------|
|  |                 |           |              | C-12            | RF | 25.08          |
|  |                 |           |              | C-11            | RF | 19.8           |
|  |                 | Rajban    | Rajban-18    | C-8             | RF | 31.19          |
|  |                 |           |              | C-12            | RF | 30.18          |
|  |                 |           |              | C-11            | RF | 27.42          |
|  | Gorkhpur        | Gorkhpur  |              |                 |    |                |
|  | Khara           | Jhara     | Jhara-27     | C-7             | RF | 30.08          |
|  |                 |           |              | C-19            | RF | 28.8           |
|  |                 |           |              | C-18            | RF | 30.08          |
|  |                 |           |              | C-17            | RF | 37.6           |
|  |                 |           |              | C-16            | RF | 29.92          |
|  |                 |           |              | C-15            | RF | 33.44          |
|  |                 |           |              | C-14            | RF | 35.2           |
|  |                 |           |              | C-12            | RF | 25.28          |
|  |                 |           |              | C- 10           | RF | 30.56          |
|  |                 | Khara     | Khara-24     | C-20            | RF | 29.6           |
|  |                 |           |              | C-19            | RF | 19.84          |
|  | Paonta<br>Sahib | Jamniwala | Jamniwala-22 | C-2             | RF | 31.2           |
|  |                 |           |              | C- 10           | RF | 50.24          |
|  |                 |           |              | <b>TOTAL</b>    |    | <b>2363.25</b> |
|  |                 |           |              | <b>G. TOTAL</b> |    | <b>8844.35</b> |

**Un-allotted Periodic Block:**

| Range   | Block   | Beat    | PF-RF        | Compart-<br>no. | Type | Final<br>area |
|---------|---------|---------|--------------|-----------------|------|---------------|
| BHAGANI | BHAGANI | AMBOYA  | AMBOYA-9 (A) | C-9             | RF   | 22.64         |
|         |         |         |              | C-6             | RF   | 33.96         |
|         |         |         |              | C-5             | RF   | 26.41         |
|         |         |         |              | C-2             | RF   | 15.34         |
|         |         |         |              | C-10            | RF   | 7.27          |
|         |         |         |              | C-1             | RF   | 9.97          |
|         |         | DHANDLA | DHANDLA-6    | C-8             | RF   | 27.67         |
|         |         |         |              | C-7             | RF   | 49.05         |

|           |           |               |                    |       |    |                |
|-----------|-----------|---------------|--------------------|-------|----|----------------|
|           |           |               |                    | C-6   | RF | 75.71          |
|           |           |               |                    | C-5   | RF | 65.4           |
|           |           |               |                    | C-4   | RF | 22.89          |
|           |           |               |                    | C-3   | RF | 47.79          |
|           |           |               |                    | C-2   | RF | 55.34          |
|           |           |               |                    | C-1   | RF | 80.49          |
|           |           |               |                    | C- 10 | RF | 46.79          |
|           |           | MEHRUWALA     | MEHRUWALA-8        | C-7   | RF | 45.5           |
|           |           |               |                    | C-6   | RF | 81.74          |
|           |           |               |                    | C-5   | RF | 40.5           |
|           |           |               |                    | C-3   | RF | 48             |
|           | DHANDLA   | MEHRUWALA     | MEHRUWALA-8        | C-2   | RF | 43.18          |
|           | MAJRI     | GOJER         | KHOJJAR-5          | C-9   | RF | 100.62         |
|           |           |               |                    | C-8   | RF | 42.76          |
|           |           |               |                    | C-4   | RF | 65.4           |
|           |           |               |                    | C-3   | RF | 49.24          |
|           |           |               |                    | C- 10 | RF | 55.33          |
|           |           | MAJRI         | MAJRI-4            | C-8   | RF | 56.17          |
|           | RAJPUR    | DANDA         | DANDA-9(B)         | C-17  | RF | 21.38          |
|           |           |               |                    | C-16  | RF | 41.5           |
|           |           |               |                    | C-11  | RF | 8.56           |
|           |           |               |                    | C-13  | RF | 3.56           |
|           |           |               |                    | C-15  | RF | 29.43          |
|           |           | PURUWALA      | KANDELA-11(A)      | C-3   | RF | 48.29          |
|           |           |               |                    | C-2   | RF | 69.92          |
|           |           |               |                    | C-5   | RF | 4.08           |
|           |           |               | <b>TOTAL</b>       |       |    | <b>1441.88</b> |
| GIRINAGAR | CHANDPUR  | BEAS          | BEAS-61            | C-7   | RF | 27.16          |
|           |           |               |                    | C-6   | RF | 35.21          |
|           |           |               |                    | C-1   | RF | 53.85          |
|           |           |               |                    | C- 10 | RF | 51.3           |
|           |           | CHANDPUR -1ST | CHANDPUR-62(A)     | C-7   | RF | 27.92          |
|           |           |               |                    | C-4   | RF | 62.88          |
|           |           |               |                    | C-3   | RF | 40.24          |
|           |           | PARDUNI -1ST  | PARDUNI -1ST-63(A) | C-4   | RF | 74.2           |
|           |           | PARDUNI 2ND   | PARDUNI 2ND-63-B   | C-6   | RF | 96.84          |
|           | GIRINAGAR | DUNGA         | JANGLLOT-70(B)     | C-3   | RF | 17.61          |
|           |           | JALMUSA       | JALMUSA-71         | C-7   | RF | 45.56          |
|           |           |               |                    | C-6   | RF | 44.48          |
|           |           |               |                    | C-4   | RF | 52.32          |
|           |           |               | JANGLLOT-70A       | C-4   | RF | 39.24          |
|           |           | KHARRARU      | KHARRARU-66        | C-2   | RF | 67.68          |

|       |        |             |                        |       |    |               |
|-------|--------|-------------|------------------------|-------|----|---------------|
|       |        |             |                        | C-11  | RF | 26.41         |
|       |        |             |                        | C-9   | RF | 10            |
|       |        |             |                        | C- 10 | RF | 52.82         |
|       |        | MAJRI       | MAJRI -65              | C-9   | RF | 37.98         |
|       |        | MEHRAR      | MEHRAR-64              | C-12  | RF | 33.96         |
|       | KANSER | KANDO-BAILA | BARTHAL-72             | C-2   | RF | 10.08         |
|       |        |             |                        | C-1   | RF | 19.2          |
|       |        |             | <b>TOTAL</b>           |       |    | <b>926.94</b> |
| MAJRA | BEHRAL | BATTAMANDI  | GHUTTANPUR-45 (A)      | C-9   | RF | 18.08         |
|       |        |             |                        | C-8   | RF | 35.21         |
|       |        |             |                        | C-7   | RF | 24.15         |
|       |        |             |                        | C-4   | RF | 25.15         |
|       |        |             |                        | C-20  | RF | 28.93         |
|       |        |             |                        | C-2   | RF | 29.93         |
|       |        |             |                        | C-19  | RF | 35.21         |
|       |        |             |                        | C-17  | RF | 16.85         |
|       |        |             |                        | C-15  | RF | 32.96         |
|       |        |             |                        | C-13  | RF | 44.53         |
|       |        |             |                        | C-12  | RF | 31.44         |
|       |        |             |                        | C-11  | RF | 24.15         |
|       |        |             | KOTHEWALI-46 (A)       | C-8   | RF | 25.15         |
|       |        |             |                        | C-5   | RF | 22.68         |
|       |        |             |                        | C-3   | RF | 37.48         |
|       |        |             |                        | C-2   | RF | 30.18         |
|       |        | BEHRAL      | AMBALI-48              | C-4   | RF | 32.26         |
|       |        |             |                        | C-3   | RF | 35.21         |
|       |        |             |                        | C-2   | RF | 29.36         |
|       |        | SATIWALA    | KOTHEWALI-46(B)        | C-9   | RF | 20.37         |
|       |        |             |                        | C- 10 | RF | 23.89         |
|       |        |             | MASTALI-47             | C-7   | RF | 27.67         |
|       |        |             |                        | C-4   | RF | 35.21         |
|       |        |             |                        | C-3   | RF | 54.84         |
|       |        |             |                        | C-1   | RF | 36.73         |
|       |        | SURJPUR     | KATTAPATHAR-42         | C-9   | RF | 14.64         |
|       |        |             |                        | C-8   | RF | 9.85          |
|       |        |             |                        | C-7   | RF | 29.5          |
|       |        |             |                        | C-6   | RF | 32.2          |
|       |        |             |                        | C-5   | RF | 35.56         |
|       |        |             |                        | C-1   | RF | 4.02          |
|       |        |             |                        | C- 10 | RF | 27.67         |
|       |        |             | MAHADEV KA<br>KHALA-44 | C-8   | RF | 29.93         |
|       |        |             |                        | C-7   | RF | 12.58         |
|       |        |             |                        | C-5   | RF | 24.15         |



|  |       |            |                   |       |    |                |
|--|-------|------------|-------------------|-------|----|----------------|
|  |       |            |                   | C-4   | RF | 35.3           |
|  |       |            |                   | C-1   | RF | 42.26          |
|  |       |            | SURJPUR-43        | C-6   | RF | 15.09          |
|  |       |            |                   | C-5   | RF | 35.97          |
|  |       |            |                   | C-1   | RF | 17.86          |
|  | MAJRA | BHEREWALA  | BHEREWALA-33      | C-3   | RF | 46.78          |
|  |       |            |                   | C-1   | RF | 30.69          |
|  |       |            | PIPLIWALI-32      | C-1   | RF | 20.12          |
|  |       |            | NAURANGABAD-31    | C-7   | RF | 20.12          |
|  |       |            |                   | C-6   | RF | 20.62          |
|  |       | DHAULAKUAN | GARHI BANSWALI-29 | C-3   | RF | 49.05          |
|  |       |            | GARHI-28          | C3    | RF | 29.93          |
|  |       |            |                   |       |    | 0              |
|  |       |            | SUDANBWALA -30    | C-9   | RF | 28.96          |
|  |       |            |                   | C-8   | RF | 42.84          |
|  |       |            |                   | C-5   | RF | 22.4           |
|  |       |            |                   | C-4   | RF | 38.72          |
|  |       |            |                   | C- 10 | RF | 36.48          |
|  |       |            |                   |       |    | 0              |
|  |       | JOHRON     | BANSWALLI-41      | C-9   | RF | 20.37          |
|  |       |            |                   | C-6   | RF | 30.68          |
|  |       |            |                   | C-5   | RF | 21.88          |
|  |       |            |                   | C-4   | RF | 12.36          |
|  |       |            |                   | C-3   | RF | 37.22          |
|  |       |            |                   | C-2   | RF | 27.16          |
|  |       |            |                   | C-11  | RF | 13.83          |
|  |       |            |                   | C-1   | RF | 18.72          |
|  |       |            |                   | C-8   | RF | 15             |
|  |       |            |                   | C- 10 | RF | 32.7           |
|  |       |            | KIARDA-40         | C-6   | RF | 22.13          |
|  |       |            |                   | C-5   | RF | 36.3           |
|  |       |            |                   | C-3   | RF | 2              |
|  |       |            |                   | C-1   | RF | 24.92          |
|  |       | MAJRA      | SUKHIMELION-38    | C-8   | RF | 22.38          |
|  |       |            |                   | C-7   | RF | 10             |
|  |       |            |                   | C-6   | RF | 13.83          |
|  |       |            |                   | C-5   | RF | 30.43          |
|  |       |            |                   | C-4   | RF | 36.97          |
|  |       | SAINWLA    | JAMANWALI-34      | C-3   | RF | 18.1           |
|  |       |            | PANIWALI-37       | C-1   | RF | 32.28          |
|  |       |            | SAINWALA-36       | C-7   | RF | 5.03           |
|  |       |            |                   | C-6   | RF | 27.67          |
|  |       |            | <b>TOTAL</b>      |       |    | <b>2022.87</b> |

|                 |           |           |                  |      |    |       |
|-----------------|-----------|-----------|------------------|------|----|-------|
| PAONTA<br>SAHIB | CHACHETI  | GATTU     | CHHACHHETI-12(A) | C-6B | RF | 23.58 |
|                 | CHACHHATI | SARAH     | SARAH-13         | C-8  | RF | 93.2  |
|                 |           |           |                  | C-7  | RF | 79.35 |
|                 | CHACHHETI | CHACHHETI | CHACHHETI-12(B)  | C-11 | RF | 81.17 |
|                 | GORAKHPUR | KUKRON    | KUKRON-23        | C-3  | RF | 42    |
|                 |           | MALGI     | MALGI-14         | C-16 | RF | 23.52 |
|                 |           |           |                  | C-1  | RF | 28.8  |
|                 |           |           |                  | C-10 | RF | 18.52 |
|                 | GORKHPUR  | GORKHPUR  | GORAKHPUR-19(A)  | C-5  | RF | 34.71 |
|                 |           |           | GORKHPUR-19(B)   | C-16 | RF | 30.69 |
|                 |           |           |                  | C-14 | RF | 40.24 |
|                 |           |           |                  | C-12 | RF | 23.14 |
|                 |           |           |                  | C-11 | RF | 35.21 |
|                 |           |           |                  | C-10 | RF | 27.67 |
|                 |           |           |                  | C-4  | RF | 17.61 |
|                 |           |           | RAJBAN           | C-6  | RF | 4     |
|                 |           |           |                  | C-15 | RF | 55.33 |
|                 | JAMOTWA   | JAMOTWA   | JAMOTWA-21(B)    | C-6  | RF | 30.4  |
|                 |           |           |                  | C-5  | RF | 37.44 |
|                 |           |           |                  | C-13 | RF | 40.16 |
|                 | KHARA     | JHARA     | JHARA-27         | C-9  | RF | 23.04 |
|                 |           |           |                  | C-6  | RF | 22.88 |
|                 |           |           |                  | C-5  | RF | 25.12 |
|                 |           |           |                  | C-4  | RF | 30.08 |
|                 |           |           |                  | C-3  | RF | 27.52 |
|                 |           |           |                  | C-20 | RF | 5     |
|                 |           |           |                  | C-13 | RF | 21.6  |
|                 |           | KHARA     | KHARA-24         | C-16 | RF | 27.52 |
|                 |           |           |                  | C-15 | RF | 35.2  |
|                 |           |           |                  | C-13 | RF | 37.92 |
|                 |           |           |                  | C-12 | RF | 30.88 |
|                 |           |           |                  | C-11 | RF | 18.08 |
|                 |           | LAI       | LAI-25(B)        | C-31 | RF | 18.24 |
|                 |           |           |                  | C-30 | RF | 29.28 |
|                 |           |           |                  | C-13 | RF | 21.6  |
|                 |           | TOKA      | LAI-25(A)        | C-33 | RF | 19.84 |
|                 |           |           |                  | C-27 | RF | 37.6  |
|                 |           |           |                  | C-25 | RF | 20    |
|                 |           |           |                  | C-22 | RF | 15.04 |
|                 |           |           |                  | C-21 | RF | 25.12 |
|                 |           |           |                  | C-18 | RF | 24.8  |
|                 |           |           |                  | C-23 | RF | 7     |

|  |        |               |                 |       |    |                |
|--|--------|---------------|-----------------|-------|----|----------------|
|  |        |               |                 | C-16  | RF | 17.6           |
|  |        |               | MANKUNDION-26   | C-3   | RF | 31.84          |
|  | PAONTA | GARIBNATH (N) | GARIBNATH-15(B) | C-9   | RF | 17.6           |
|  |        |               |                 | C-7   | RF | 27.52          |
|  |        |               |                 | C-6   | RF | 66.56          |
|  |        |               |                 | C-14  | RF | 17.6           |
|  |        |               |                 | C-13  | RF | 15.04          |
|  |        |               |                 | C-11  | RF | 15.04          |
|  |        |               |                 | C-12  | RF | 1.78           |
|  |        |               |                 | C- 10 | RF | 4.96           |
|  |        | GARIBNATH (S) | GARIBNATH       | C-4   | RF | 27.52          |
|  |        |               |                 | C-3   | RF | 9.92           |
|  |        |               |                 | C-17  | RF | 26.08          |
|  |        |               |                 | C-16  | RF | 19.12          |
|  |        |               |                 | C-15  | RF | 17.6           |
|  |        | GONDPUR       | JAMBU KHALA-20  | C2    | RF | 37.76          |
|  |        |               |                 | C1    | RF | 18.56          |
|  |        |               | JAMOTWA-21(A)   | C15   | RF | 44.96          |
|  |        |               | MANTARUWALA-16  | C3    | RF | 8.8            |
|  |        |               | <b>Total</b>    |       |    | <b>1715.96</b> |
|  |        |               | <b>Total</b>    |       |    | <b>6107.65</b> |

#### Periodic Block IV:

| Range     | Block     | Beat       | PF_RF                | Compart No. | Type | Area(ha)      |
|-----------|-----------|------------|----------------------|-------------|------|---------------|
| BHAGANI   | BHAGANI   | AMBOYA     | AMBOYA-9(A)          | C-4         | RF   | 46.56         |
|           | RAJPUR    | PURUWALA   | KANDELA-11(A)        | C-1         | RF   | 65.4          |
|           |           |            | <b>TOTAL</b>         |             |      | <b>111.96</b> |
| GIRINAGAR | GIRINAGAR | GANYONI    | GANYONI-67           | C-2         | RF   | 33.96         |
|           |           |            | <b>TOTAL</b>         |             |      | <b>33.96</b>  |
| MAJRA     | MAJRA     | BHEREWALA  | PIPLIWALI-32         | C-3         | RF   | 47            |
|           |           | DHAULAKUAN | GARHI<br>BANSWALI-29 | C-1         | RF   | 19.03         |
|           |           |            | GARHI- 28            | C-4         | RF   | 48.54         |
|           |           |            | SUDANWALA-30         | C-6         | RF   | 36.44         |
|           |           |            |                      | C-7         | RF   | 30.4          |
|           |           | MAJRA      | SUKHIMELION-38       | C-2         | RF   | 17.98         |

|                 |           |           |                     |                        |    |                |
|-----------------|-----------|-----------|---------------------|------------------------|----|----------------|
|                 |           | SAINWLA   | JAMANWALI-34        | C-4                    | RF | 36.13          |
|                 |           |           | <b>TOTAL</b>        |                        |    | <b>235.52</b>  |
| PAONTA<br>SAHIB | GORAKHPUR | KUKRON    | KUKRON-23           | C-15                   | RF | 70.12          |
|                 |           |           |                     | C-14                   | RF | 45             |
|                 |           | RAJBAN    | GORAKHPUR-<br>19(A) | C-6                    | RF | 79.23          |
|                 |           |           | RAJBAN-18           | C-7                    | RF | 7.5            |
|                 |           |           |                     | C-6                    | RF | 30.96          |
|                 |           |           |                     | C- 10                  | RF | 8.57           |
|                 | GORKHPUR  | GORKHPUR  | GORKHPUR-19<br>(B)  | C-8                    | RF | 83.5           |
|                 |           |           |                     | C-7                    | RF | 196.19         |
|                 | JAMOTWA   | JAMOTWA   | JAMOTWA-21<br>(B)   | C-1                    | RF | 25.12          |
|                 | KHARA     | TOKA      | LAI-25 (A)          | C-28                   | RF | 22.56          |
|                 |           |           |                     | C-23                   | RF | 32.36          |
|                 |           |           |                     | C-14                   | RF | 37.6           |
|                 | PAONTA    | JAMNIWALA | JAMNIWALA-22        | C-6                    | RF | 62.88          |
|                 |           |           |                     | C-5                    | RF | 47.68          |
|                 |           |           |                     | C-4                    | RF | 62.88          |
|                 |           |           |                     | C-3                    | RF | 56.48          |
|                 |           |           |                     | <b>TOTAL</b>           |    | <b>868.63</b>  |
|                 |           |           |                     | <b>GRAND<br/>TOTAL</b> |    | <b>1250.07</b> |

**2.6.8 Calculation of Yield:** The yield from PB I will be mainly from seeding felling. In seeding felling, the trees are retained as seed bearers (mother trees) and as advance growth. Retention on other accounts is normal and can be ignored from initial calculations. Number of retained seed bearers are fixed as 40 trees/ha (as per guidelines of CEC report). These 40 trees are from class III, II A and II B and for the sake of calculations, the average volume per tree of these classes are considered  $(0.83 + 1.77 + 3.0/3) = 1.87 \text{ m}^3/\text{ha}$ . The total area of felling series is proposed to be 3000 ha (workable area). For the purpose of advance growth, 80% of class V and IV will have to be retained.

**Area considered for working in this plan period:** The total area of PB I is 8844.35 ha. Considering the regeneration period of Sal as 30 years, and the working plan period of 10 years, the workable area has been taken as approximately one-third of the total PB area i.e. 3000 ha. Thus, the yield from final felling of PB I can be derived as: -

Total proposed area of PB I forfelling in 10 years: 3000 ha

V1: Total growing stock of Sal in PB I working area i.e. 3000 ha

(Av. per ha volume, of total growing stock of Sal=208.67 cu m/ha) =  $3000 \times 208.67$  i.e. 626010m<sup>3</sup>

V2: Volume of seed bearers @ 40 trees/ha (74.8 m<sup>3</sup>) =  $74.8 \times 3000=224400\text{m}^3$

(III, II A and II B average volume/tree = 1.87 m<sup>3</sup>/ha)

V3: 80% Volume of V<sup>th</sup> class crop= 56,700 m<sup>3</sup>

V4: 80% Volume of IV<sup>th</sup> class crop= 1,28,217 m<sup>3</sup>

**Total Yield = V1- (V2+V3+V4) = 5,21,675-(1,87,000+56,700+1,28,217) =216693 m<sup>3</sup>**

(Annual Prescribed Yield from PB I)/Plan period =  $216693 /10 = 21669.3 \text{ m}^3$

**Annual Yield from PB I: 21670 m<sup>3</sup>**

**Yield from PB IV:** Total workable area proposed for felling in this PB is **956.28 ha**. Out of the total 1250.07 ha area allotted to PB IV in this Working Plan, an area of 956.28 ha has been considered since 100\* ha area working under PB IV (final felling) was already done during experimental silviculture felling program in 2018-20, and another 184.71 ha area was worked under PB I (seedling felling) of previous Working Plan, which is now included in PB IV.

(\*Separate treatment for the 100 ha: However, there is **need for further canopy opening in the above mentioned 100 ha area of PB IV** since conservative marking was done, and no other species other than Sal were felled, resulting in inadequate regeneration results of Sal. Therefore, consideration for middle storey canopy opening must be ensured by the Marking Officer for other middle-sized species as well including Jamun, Rohini, Sain etc. This additional yield will count towards total yield of PB IV calculated below. Final felling for the 184.71 ha area can be put on hold till the time regeneration gets established but must not be ignored for the experimental area to establish itself in PB IV properly. Regeneration surveys must be monitored across atleast 12 years to verify the same, till the Sal sapling has crossed the die-back stage and gets established. The annual yield therefore estimated for the remaining annual approximate 95 ha (total 956.28 ha) workable area is given as under; -

**Annual Yield of PB IV:** Safeguarding of mother trees in PB IV areas has to be factored in, on account of both encroachment protection along forest boundaries as well as regeneration safeguarding of new crop, since mother trees removal can affect both. Therefore, considering ecological safeguards (also mentioned in CEC report regarding steep slopes/streams & nullahs), 30% of the mother trees should be retained. Also, there is threat of *Ardisia*, *Lantana* and other weed invasion in the open areas, therefore retention is necessary.

Yield = 70% of volume of IIA/IIB/IA and above

Total Volume of trees above 40 cm dbh= 41,370 (IIA)+ 24788 (IIB)+ 26,801(IA) + 10145 (IB)cum = 76303 m<sup>3</sup>

Yield (70% of total volume) = 0.7x 76303 = 53412.1 m<sup>3</sup>

**Annual Yield: 5341.21 cum or 5340 m<sup>3</sup>**

Thinning is also to be carried out based on site-specific conditions. The Marking Officer should consider this in areas where there is high congestion of advance growth. Ordinary thinning of V<sup>th</sup>&IV<sup>th</sup> class trees should be carried out i.e. thinning from below including inferior advance growth as well as under-storey& dead, dying, dried trees which interfere with the growth of advance growth and regeneration.

**Total Prescribed Yield of PB I + PB IV: 21670 + 5340= 27010m<sup>3</sup>**

**Also, Yield as per Von Mantel formula:** (2\*Total Growing Stock of PBI)/Rotation Period  
= (2\*(3695318+185509.34)) / 120 = 64680.45 m<sup>3</sup>

**Regulation and calculation of yield:** The yield is to be regulated by growing stock and will be Periodic block wise and all the species felled of the diameter class V<sup>th</sup> and above are to be counted in it. The yield comes as under:

The current Annual Increment for Sal was worked out in previous plan. The CAI for Sal for the current plan comes as: -

| Dia Class | Mean Dia | C.A.I./tree  | Total No. of Sal trees | Total C.A.I of the dia class (m <sup>3</sup> ) |
|-----------|----------|--------------|------------------------|------------------------------------------------|
| 10-20     | 15       | 0.007        | 897371                 | 6281.59                                        |
| 20-30     | 25       | 0.018        | 753037                 | 13554.66                                       |
| 30-40     | 35       | 0.025        | 634977                 | 15874.42                                       |
| 40-50     | 45       | 0.025        | 414436                 | 1036.09                                        |
|           |          | <b>Total</b> |                        | <b>36746.76</b>                                |

**Remarks:** Data for C.A.I above 40-50 cm, d.b.h class is not available in yield tables. The rate of increment in trees above so cm is also low; as such the increment (C.A.I) off trees above so cm d.b.h. has been ignored. Thus, we note the C.A.I. comes out to be 36747 m<sup>3</sup> for Sal.

We intend to do silviculture felling in PB I and PB IV. The yield will be from PB I and PB IV. This is calculated as per the marking rules. (Without packing into consideration, the increments in the crop from the time of enumeration till the expiry of the plan.)

It is, therefore, clear that harvest prescribed of 27010 m<sup>3</sup> is less than annual increment i.e.36747 m<sup>3</sup> annually. The forest will be sustained and will be with normal increment and crop in the future.

The Von Mantel yield (64680 cum) is rejected on the basis that it exceeds the CAI value of Sal. Therefore, **final annual prescribed yield for Sal Working circle as a conservative measure is 27010 m<sup>3</sup>.**

**Table for comparison of yield obtained under experimental silviculture program and prescribed yield of current plan**

| RESULTS OF EXPERIMENTAL SILVICULTURE FELLING (2018-2020) |              |                                         |                      |                                                                                 | PRESCRIBED YIELD FOR<br>CURRENT WORKING PLAN         |
|----------------------------------------------------------|--------------|-----------------------------------------|----------------------|---------------------------------------------------------------------------------|------------------------------------------------------|
| PB I                                                     |              |                                         |                      |                                                                                 | PB I                                                 |
| Year                                                     | Area<br>(ha) | Volume marked<br>(Total yield in<br>m3) | Per ha<br>yield (m3) | Projected Annual Yield for<br>Working Area (300 ha) by<br>extrapolating results | Prescribed Annual Yield for Working<br>Area (300 ha) |
| 2018-19                                                  | 59.53        | 3825.77                                 | 64.27                | 16431 m³                                                                        | 21670 m³ (for 300 ha annually)                       |
| 2019-20                                                  | 125.18       | 6290.83                                 | 50.25                |                                                                                 |                                                      |
| Total                                                    | 184.71       | 10116.6                                 | 54.77                |                                                                                 |                                                      |
|                                                          |              |                                         |                      |                                                                                 |                                                      |
| PB IV                                                    |              |                                         |                      |                                                                                 | PB IV                                                |
| Year                                                     | Area<br>(ha) | Volume marked<br>(Total yield in<br>m3) | Per ha<br>yield (m3) | Projected Annual Yield for<br>Working Area (95 ha) by<br>extrapolating results  | Prescribed Annual Yield for Working<br>Area (95 ha)  |
| 2018-19                                                  | 20           | 2538.87                                 | 126.94               | 9334 m3                                                                         | 5340 m3 (for 95 ha annually)                         |
| 2019-20                                                  | 80           | 7286.88                                 | 91.09                |                                                                                 |                                                      |
| Total                                                    | 100          | 9825.75                                 | 98.26                |                                                                                 |                                                      |
| Total                                                    | 284.71       | 19942.35                                | 153.02               | 25765 m³                                                                        | 27010 m³                                             |

The table gives a comparative analysis of the yields obtained from the experimental silviculture felling in Paonta Sahib Division from 2018-19 to 2019-20 and the prescribed yield as per this Working Plan. It can be observed that the results of the felling program find a comparable convergence with the prescribed yields when looked at the same workable area. However, since the marking in the experimental felling was more conservative leading to inadequate regeneration, further canopy opening and middle-storey removal has been recommended as per field report submitted to CEC in February 2023, there is a marginal increase in overall yield which has been prescribed now.

**2.6.9 Table of Felling:** Felling will be carried out in the compartments of PB I and PB IV. The total compartment wise felling area of PB I will be 3000 ha. In PB IV, final felling will be carried out in 956.28 ha of area in the plan period (10 years). Felling would be tabulated year-wise by ranges, blocks, compartments, and sub-compartments for each felling series, village level JFMC areas. WPO shall also adhere to Silvicultural felling of Sal as per the directions of Hon'ble Supreme Court and CEC as per order dated 16.02.2018 passed in IA No. 3840 of 2014.

#### **FELLING SERIES FOR PB I AREAS**

| YEAR OF FELLING | NAME OF RANGE | NAME OF FOREST | COMPT. NO.   | AREA (Ha.)    |
|-----------------|---------------|----------------|--------------|---------------|
| 2023-24         | Bhagani       | Danda Amboya   | C7           | 35.72         |
|                 | Paonta        | Rajban         | C7           | 12.37         |
|                 | Paonta        | Rajban         | C10          | 21.61         |
|                 | Paonta        | Jamotwa        | C3           | 22.08         |
|                 | Paonta        | Jamotwa        | C4           | 25.12         |
|                 | Bhagani       | Mehruwala      | C4           | 49.80         |
|                 | Paonta        | Jamniwala      | C1           | 32.64         |
|                 | Paonta        | Jamniwala      | C11          | 32.64         |
|                 | Paonta        | Kukron         | C12          | 45.12         |
|                 | Bhagani       | Danda Amboya   | C8           | 30.43         |
|                 |               |                | <b>Total</b> | <b>307.53</b> |
| 2024-25         | Bhagani       | Dandaamboya    | C12          | 47.79         |
|                 | Paonta        | Kukron         | C9           | 43.72         |
|                 | Paonta        | Jamniwala      | C7           | 27.52         |
|                 | Paonta        | Jamniwala      | C8           | 55.20         |



|         |           |             |              |               |
|---------|-----------|-------------|--------------|---------------|
|         | Paonta    | Jamniwala   | C9           | 55.20         |
|         | Paonta    | Gorakhpur   | C9           | 68.41         |
|         |           |             | <b>Total</b> | <b>297.84</b> |
| 2025-26 | Paonta    | Gorakhpur   | C13          | 25.15         |
|         | Paonta    | Kukron      | C5           | 35.21         |
|         | Bhagani   | Dandaamboya | C3           | 18.11         |
|         | Paonta    | Kukron      | C13          | 38.88         |
|         | Paonta    | Garibnath   | C5           | 28.80         |
|         | Paonta    | Garibnath   | C18          | 24.52         |
|         | Bhagani   | Kandela     | C5           | 63.35         |
|         | Paonta    | malgi       | C17          | 17.76         |
|         | Paonta    | Malgi       | C27          | 18.88         |
|         | Paonta    | Rajban      | C9           | 11.32         |
|         | Paonta    | Lai         | C20          | 21.60         |
|         |           |             | <b>Total</b> | <b>303.58</b> |
| 2026-27 | Paonta    | kukron      | C10          | 58.54         |
|         | Paonta    | Gorakhpur   | C18          | 27.16         |
|         | Paonta    | Jamotwa     | C2           | 35.20         |
|         | Paonta    | Lai         | C32          | 12.48         |
|         | Paonta    | Khara       | C14          | 22.24         |
|         | Paonta    | kukron      | C16          | 21.75         |
|         | Paonta    | kukron      | C11          | 21.14         |
|         | Bhagani   | Dandaamboya | C10          | 86.04         |
|         | Paonta    | Malgi       | C25          | 17.76         |
|         |           |             | <b>Total</b> | <b>302.31</b> |
| 2027-28 | Paonta    | Malgi       | C8           | 18.08         |
|         | Paonta    | Khara       | C17          | 12.48         |
|         | Paonta    | Malgi       | C23          | 15.04         |
|         | Paonta    | Malgi       | C24          | 28.32         |
|         | Paonta    | Lai         | C24          | 37.00         |
|         | Girinagar | Majri       | C8           | 30.18         |
|         | Girinagar | Beas        | C5           | 25.15         |
|         | Girinagar | Beas        | C3           | 31.19         |

|         |           |             |              |               |
|---------|-----------|-------------|--------------|---------------|
|         | Girinagar | Ganyoni     | C3           | 42.76         |
|         | Girinagar | Chandpur    | C8           | 46.53         |
|         | Girinagar | Beas        | C4           | 10.07         |
|         |           |             | <b>Total</b> | <b>296.08</b> |
| 2028-29 | Majra     | Naurangabad | C5           | 14.84         |
|         | Girinagar | Chandpur    | C6           | 93.06         |
|         | Majra     | Badighatti  | C3           | 23.68         |
|         | Girinagar | Chandpur    | C5           | 62.88         |
|         | Girinagar | Ganyoni     | C6           | 37.73         |
|         | Girinagar | Chandpur    | C9           | 32.95         |
|         | Girinagar | Ganyoni     | C4           | 31.44         |
|         |           |             | <b>Total</b> | <b>296.58</b> |
| 2029-30 | Majra     | Garhi       | C2           | 65.40         |
|         | Majra     | Mastali     | C2           | 46.05         |
|         | Majra     | Katapathar  | C3           | 22.64         |
|         | Majra     | Mastali     | C5           | 22.64         |
|         | Girinagar | Janglot     | C5           | 58.10         |
|         | Majra     | Kiyarada    | C4           | 26.48         |
|         | Majra     | Sainwala    | C1           | 23.90         |
|         | Majra     | Banswali    | C13          | 28.92         |
|         |           |             | <b>Total</b> | <b>294.13</b> |
| 2030-31 | Bhagani   | Dhandla     | C9           | 29.91         |
|         | Bhagani   | Mehruwala   | C8           | 56.84         |
|         | Bhagani   | Mehruwala   | C9           | 56.84         |
|         | Bhagani   | Dandaamboya | C11          | 63.12         |
|         | Paonta    | Sarah       | C6           | 48.08         |
|         | Paonta    | Jamotwa     | <b>C8</b>    | 20.00         |
|         | Paonta    | Lai         | C19          | 24.80         |
|         |           |             | <b>Total</b> | <b>299.59</b> |
| 2031-32 | Majra     | Garhi       | C1           | 30.69         |
|         | Majra     | Sudanwala   | C3           | 45.24         |
|         | Majra     | Naurangabad | C1           | 63.13         |
|         | Majra     | Pipalwali   | C2           | 50.30         |

|         |           |                  |              |               |
|---------|-----------|------------------|--------------|---------------|
|         | Girinagar | Dunga            | C1           | 56.00         |
|         | Girinagar | Khararu          | C1           | 56.59         |
|         |           |                  | <b>Total</b> | <b>301.95</b> |
| 2032-33 | Girinagar | Beas             | C9           | 68.91         |
|         | Girinagar | Parduni          | C3           | 54.08         |
|         | Girinagar | Mehrar           | C6           | 58.35         |
|         | Majra     | Banswali         | C12          | 42.25         |
|         | Majra     | Ghuttanpur       | C3           | 40.75         |
|         | Majra     | Mahadev ka khala | C2           | 37.23         |
|         |           |                  | <b>Total</b> | <b>301.57</b> |

### FELLING SERIES IN PB IV

| YEAR OF FELLING | NAME OF RANGE | NAME OF FOREST | COMPT. NO.   | AREA (Ha)     |
|-----------------|---------------|----------------|--------------|---------------|
| 2023-24         | Bhagani       | Amboya         | C-4          | 46.56         |
| 2023-24         | Paonta sahib  | Jamniwala      | C-5          | 47.68         |
|                 |               |                | <b>Total</b> | <b>94.24</b>  |
| 2024-25         | Bhagani       | Kandela        | C-1          | 65.4          |
| 2024-25         | Paonta sahib  | Lai            | C-23         | 32.36         |
|                 |               |                | <b>Total</b> | <b>97.76</b>  |
| 2025-26         | Paonta sahib  | Gorakhpur      | C-7          | 96.19         |
|                 |               |                | <b>Total</b> | <b>96.19</b>  |
| 2026-27         | Paonta sahib  | Jamotwa        | C-1          | 25.12         |
| 2026-27         | Paonta sahib  | Gorakhpur      | C-6          | 79.23         |
|                 |               |                | <b>Total</b> | <b>104.35</b> |
| 2027-28         | Girinagar     | Ganyoni        | C-2          | 33.96         |
| 2027-28         | Paonta sahib  | Jamniwala      | C-6          | 62.88         |
|                 |               |                | <b>Total</b> | <b>96.84</b>  |
| 2028-29         | Majra         | Sudanwala      | C-7          | 30.4          |
| 2028-29         | Majra         | Pipalwali      | C-3          | 47            |
| 2028-29         | Majra         | Sukhimelion    | C-2          | 17.98         |
|                 |               |                | <b>Total</b> | <b>95.38</b>  |
| 2029-30         | Majra         | Garhi banswali | C-1          | 19.03         |
| 2029-30         | Majra         | Sudanwala      | C-6          | 36.44         |

|         |              |           |                    |               |
|---------|--------------|-----------|--------------------|---------------|
| 2029-30 | Majra        | Jamanwali | C-4                | 36.13         |
|         |              |           | <b>Total</b>       | <b>91.6</b>   |
| 2030-31 | Paonta sahib | Jamniwala | C-4                | 62.88         |
| 2030-31 | Paonta sahib | Lai       | C-14               | 37.6          |
|         |              |           | <b>Total</b>       | <b>100.48</b> |
| 2031-32 | Majra        | Garhi     | C-4                | 48.54         |
| 2031-32 | Paonta sahib | Jamniwala | C-3                | 56.48         |
|         |              |           | <b>Total</b>       | <b>105.02</b> |
| 2032-33 | Paonta sahib | Gorakhpur | C-8                | 83.5          |
|         |              |           | <b>Total</b>       | <b>83.5</b>   |
|         |              |           | <b>Grand Total</b> | <b>965.36</b> |

### 2.6.10 Method of Executive Felling:

**2.6.10.1 Felling in PB I:** Following general guidelines are laid down for marking and felling in PB I including recommendations of CEC:

- i) In areas with inadequate advance growth or regeneration, the felling should be of the nature of seeding felling creating gaps of about 1-1.25 m crown width between the crowns. It is prescribed that 40 trees per ha shall be retained as seed bearers. Trees retained should be preferably of class III or IIA.
- ii) Over mature trees standing over established regeneration or over advance growth be removed.
- iii) All trees over 40 cm d.b.h. should be marked unless their retention is required for soil conservation reasons for providing cover against frost.
- iv) All dry (completely dry) and fallen trees should be marked for felling.
- v) Very conservative marking should be done on steep slopes and along nalas.
- vi) Where suitable Sal seed bearers are not available, Sain seed bearers may be retained. In cases where Sain too is not available, other suitable associated species be retained.
- vii) All the retained trees over 10 cmd.b.h. should be enumerated and listed.
- viii) Miscellaneous species (other than Sal and Sain) like Rohini, Jamun etc. should be marked where they are obstructing the openings. This is prescribed keeping in view the fact that such species are gradually disappearing from Sal forests and their mixture is essential for biodiversity considerations and as prevention against the Sal borer (*Hoplocerambyx spinicornis*, Newman) attack.
- ix) All unhealthy malformed saplings should be cut back.

- x) Climber cutting should be done along with marking.
- xi) Trees should be lopped before final felling.
- xii) 80% of compact groups of poles (Vth and IVth) upto 30 cm d.b.h. shall be retained as advance growth but should be properly thinned.
- xiii) Isolated poles should be removed.
- xiv) In Borer affected PB I areas, advance felling of over mature (IIB and above) borer infested trees can be carried out.

**2.6.10.2 Treatment of Un-allotted PB:** The forests allotted to Un-allotted Periodic block is generally supporting middle aged crop with some proportion of mature trees. Salvage removals can be carried out as per instructions. Felling for right holders may be done from these forests. All removals will count towards the yield. These areas currently have trees that have reached class IV and III in many cases and are in need of subsequent thinning to provide better spacing and sunlight to the growing crop. The previous Working Plan prescribes for the average diameter and number of trees that should be present viz-a-viz the age of the crop. The extent of thinning should be site-specific and ordinary-thinning operations are prescribed.

#### **2.6.10.3 Felling in PB IV:**

Following guiding principles are laid down for executing felling in P.B. IV:

- 1) About 70% of trees over established regeneration which are free from frost danger should be marked for felling.
- 2) Completely dead/dry, fallen and borer attacked trees should be marked.
- 3) Trees and poles of miscellaneous species, if found interfering with the growth of Sal and Sain regeneration, should be marked.
- 4) On the broken ground, Nala banks and steep slopes, markings should be conservative.
- 5) Climber cutting should be done.
- 6) Thinning be carried out in the young crop.

It is also to be mentioned here that thinning will not only facilitate the growth of trees but will also reduce the chance of borer attack.

**2.6.11 Subsidiary Silvicultural Operations, Cleaning and Thinning:** Subsidiary silvicultural operations are very important for successful regeneration of Sal areas. They have to be carried out in Sal regeneration areas. They have to be carried out in the year following the main felling year. The subsidiary Silvicultural operations will be:

- 1) All damaged, malformed, stunted and diseased saplings should be cut back.

- 2) The bushy growth and climbers should be cut and removed. ***Ardisia solanacea* (Gudbeli)** being widespread in Sal forests of Paonta Sahib and which has a very strong and complex root system affects the regeneration of Sal and requires continuous removal till establishment of regeneration annually. The man-days involved in removal of this particular weed is higher since expertise is required to protect the regeneration of Sal growing in close proximity to Gudbheli. It is seen that despite yearly removal, the weeds have been growing back though their density and height is substantially lesser as compared to untreated areas. Clearing of weeds for five to seven years post-felling is recommended to be continued. It is stressed here that the budget for bush cutting be provided in time so that the same is done well before the monsoon season. Field Studies may also be conducted with FRI/UHF Nauni University for finding a scientific solution to the removal as well.
- 3) The miscellaneous tree growth likely to suppress the regeneration should be thinned and lopped.
- 4) The debris should be collected, removed out of the area and burnt.
- 5) Effective closure is perhaps the sole key to regeneration. This will continue for atleast 12 years till Sal establishes.
- 6) In the 3<sup>rd</sup> year after main felling, coppice shoots should be singled out. Two to three healthy, vigorous shoots should be retained on each stool.
- 7) Areas which are moist and lack regeneration, should be control burnt in the winter.
- 8) Bush cutting of *Lantana* can be done for five to seven years. For ***Ardisia* (Gudbeli)**, this has to be done **vigorously** each year till Sal seedlings establish otherwise it will be affecting regeneration as discussed above.
- 9) The miscellaneous tree growth will be removed when considered necessary to favour the growth of regeneration.
- 10) Cleanings in young crop (below 10 cm dbh) to be carried out as and when found necessary particularly when the crop becomes of more than 2m height and shows congestion. The table given in case of methods of executing felling in PB IV should be referred for number of stems per ha.

#### **2.6.12 Regeneration:**

**2.6.12.1 Status of Regeneration:** Regeneration of Sal is difficult to induce albeit slow for reasons already discussed including phenology of Sal and the die-back phenomenon coupled with the competition posed by *Ardisia* which has a better coppicing ability and much deeper roots than

corresponding Sal saplings. However, when regeneration survey was carried out in the experimental Silviculture felling area, the regeneration was definitely better (even though deficient) (20-30%) as compared to adjoining compartments where no silviculture practice was followed (13%), signifying the need for silviculture implementation. The natural regeneration of seed origin is relatively much less vigorous and profuse as compared to the regeneration of coppice origin. Regeneration is disturbed due to the anthropological factors in many of the compartments. Due regard must be given to the phenomenon of dying back of Sal seedlings and the slow growth that the Sal saplings are known to have as a result of the dying back. The dying back phenomenon (as described by Troup in his seminal book '*The Silviculture of Indian Trees* ') involves dying of the stem and new shoots coming up in the following season. The new shoots may come from buds in the axils of the cotyledons or the axillary buds on the stem. Dying back with subsequent recovery takes place when the taproot has developed with sufficient vigour to withstand the adverse influences that may cause the death of the aerial portion of the root. The time-period between seedling to sapling stage (where the plants begin to produce rough bark) in natural conditions is long and variable and has been described to take atleast ten years or more in many cases in North-western India.

**Field observations:**

- In context of regeneration results of experimental silviculture felling areas, deficient regeneration can be attributed to lack of further opening of canopy, something which is being observed to be genuinely required presently in the experimental silviculture plots. Primarily the reasons include dense canopy owing to no secondary felling operations, delay in bush cutting and weeding operations, the die-back phenomenon of Sal and slow growing rate in Sal as discussed, and the last good seed year for Sal was in 2019-20. 2023 has now been observed as being a good seed year for Sal, which has improved the regeneration of Sal in the range of 30-40 %.
- Large number of recruits was observed in almost all compartments which indicated that Sal germination is not much of a problem in these areas but require opening for growth to establish itself in the 7-12 years of the establishment period.
- For reference, in the case of C-1 Jamotwa forest of Paonta Range, now under PB IV area, the last proper silvicultural felling was done in 1982-83. Today the area is replete with young crops of Sal that require light grade thinning to eventually take the 1980s working to its logical conclusion of establishing the a well stocked Sal forest. The straight boles of mother trees of Sal are uniformly distributed with sufficient inter-tree spacing in the compartment and should now be removed under final felling.

- In the last plan period, no regeneration felling was carried out in PB I areas (except for experimental area). The density of the top canopy has reached a stage where without regeneration felling, recruits are unable to pass to the sub whippy/whippy stage. The areas were taken under ANR without regeneration felling. Hence except for those areas where the canopy was open, regeneration could not come successfully.
- In many compartments, Sal poles are available in good numbers but are suppressed by overhead canopy.
- The percentage of Sal associates was found to be inadequate. The enumerations showed that it is mostly 10-15%. Gujjars present in the forest area are doing indiscriminate lopping of the Sal associates especially Chhal, Sain & availability of seeds of these species is very minimal.
- Repeated forest fire & uncontrolled grazing have led to massive erosion of top soil.
- Introduction of Eucalyptus in Sal ecosystem in the previous plans have also adversely affected regeneration.

**2.6.12.2 Assessment of regeneration status:** The methodology has been discussed in Chapter of 'Science and Research' of Part II.

**2.6.12.3 ANR operations:** The following ANR operations for obtaining and establishing regeneration are suggested:

**Top canopy:** Proceeding of XI Silvicultural conference (1967) has recommended that opening of top canopy up to 0.5-0.6 density is conducive to seedling growth, subject to other factors. Hence, regeneration felling is to be done in PB I areas keeping in mind that this region is prone to severe frost & large-scale canopy opening may increase weed infestation. Eucalyptus trees shall be preferred first and should be uprooted except in areas prone for soil erosion.

- ii. **Middle storey:** In the middle storey light crowned species should be preferred. Low branching and dense foliage species like Rohini may be thinned where necessary. Poles of 'Kokath' species will be preferred for removal in place of middle storey Sal associates like Sain, Dhauri, Jamun, Bahera, Amla, Sandan, Dhaman etc. Regeneration of associate species of Sal will also be emphasized along with the regeneration of Sal.



- iii. **Soil working:** Thorough soil working preferably shall be carried out before seed fall.
- iv. **Seed:** To the extent if it is possible seed should be collected and sown by broadcast within its viability period and should be repeated in the second year also.
- v. **Fencing:** Effective 5-strand barbed-wire with RCC fence post (cement-grouted) must be ensured before regeneration felling. Regeneration felling may be deferred if fencing could not be ensured & the deviation need not require sanction if informed to the higher authorities in time.
- vi. **Weed/Shrub-cutting:** Thorough and preferably complete weeding should be done. This operation is to be continued till regeneration is established and thereafter intensive shrub cutting in rains is expected to suffice. The growth of weeds, particularly *Ardiasolanaceae* (locally known as Gudbheli) was found to be abundant. It is seen that despite yearly removal, the weeds have been growing back though their density and height is substantially lesser as compared to untreated areas. As per the theory and practices for silviculture systems by L.S Khanna (ISBN 81-85933-25-1), the cutting of weeds is prescribed for as long as the weed keeps impeding regeneration. Clearing of weeds for five to seven years post-felling is recommended to be continued. It is stressed here that the budget for bush cutting be provided in time so that the same is done well before the monsoon season.
- vii. **Fire Protection:** Fire brakes, control burning or contract with local forest users to assist in the protection of the site from fire is the need for successful regeneration. The object of control burning is to remove excess leaf litter from the forest floor & to stimulate growth of stagnating whippy seedlings. For achieving this object, control burning should be carried out latest by the middle of March in patches carrying mainly whippy regeneration. The patches of sub-whippy regeneration should be protected as burning proves inimical to their survival. Patches of well grown woody regeneration should also be protected as otherwise it causes avoidable loss of growth.
- viii. **Protection from Grazing:** The area must be effectively protected from internal (Gujjar) & external (villages surrounding the forest) biotic pressure. The Gujjars should not be allowed grazing permits in the areas under ANR. Also, lopping of the Sal associates should not be allowed. People participation in minimizing external biotic pressure should be tried.

### **2.6.13 Associated Regulations and Measures:**

**2.6.13.1 Fire Protection:** The repeated forest fire is main problem in Sal regeneration. Regeneration needs to be effectively protected from fire by careful planning & execution at the field level. Control burning should be carried out latest by the middle of February. Due to non-felling and no cultural operations being done for a long time, many areas of the working circle are having dense crop with all sorts of diameter classes and ages. There is always hazard of major fire in these areas. Care should be taken to protect these areas from forest fire. If Forest Corporation does any activity it should be its responsibility to protect the area from fire.

**2.6.13.2 Grazing:** Excessive grazing by the wild life as well as domestic cattle has very serious adverse effects on the regeneration of Sal and its associated species. Trampling and browsing of regeneration is common and the result is compactness of the top soil which is very detrimental to the regeneration of seeds specially Sal. Erosion is accentuated and thorny unpalatable shrubs like *Carissa opaca* increase proportionately. Excessive grazing also arrests seral development of vegetation and sometimes leads to retrogression. Hence, effective control on grazing is required & the following suggestions should be implemented at the field level:

- All P.B.I areas in the working circle should be remain closed to grazing for the cattle.
- Areas where special cultural operations are prescribed in this working circle shall remain closed to grazing for the plan period.
- Areas undertaken for ANR should be effectively fenced. The fencing must be cattle proof with the five-strand barbed wire under regular watch and vigil.

**2.6.13.3 Felling beyond prescription:** Felling other than prescribed in the working circle shall be treated as deviation. In areas where the trees are to be felled due to natural calamities like 'Hoplo attack' or Sal mortality (die back) etc. and if the actual yield obtained or expected to be obtained from such felling, more than the yield prescribed in this working circle, the proposal for such deviation will be sent in advance to CCF Working Plan, so that the prior approval may be obtained from Government of India well in time.

**2.6.13.4 Availability of Funds:** The various Silvicultural operations including felling in different PBs have been prescribed in this working circle. Marking, felling and Silvicultural operations should be treated as a combined activity. DFO through PCCF, therefore, will ensure the availability of appropriate funds for completing all cultural operations followed by felling. If these things cannot be ensured due to financial or other constraints, then felling may be differed

& the deviation will not require sanction if informed in time to higher authorities. 1/3<sup>rd</sup> of the revenue generated from such felling should be deposited in a corpus fund or in FD and this amount should be used for the ANR and other associated activities.

**2.6.13.5 Collection of seed:** Collection of Sal seed & seeds of its associates from whole of the working circle will not be allowed except for departmental works. In each compartment, some trees of the associates of Sal like Sain, Harad, Baheda, Semal should be declared as 'Plus Trees'. The trees should be properly marked (with tin plates) and not be allowed for lopping. A group of such trees may be declared as 'Seed Stand' & marked. The number of trees for each species & the number of species in a compartment will be decided by the DFO.

**2.6.13.6 Illicit Felling:** Illicit felling of trees by Van Mafia, saw-millers and unscrupulous elements is a major factor responsible for damaging the forest property. Therefore, DFO should ensure that there shall be no illicit felling in adjoining forests and in event of illicit felling of trees the case shall not be compounded in pursuance of the Hon'ble High Court's order dated 24.5.2016 in CWPIL No. 8/2015 and the case shall be registered with the police. All FIR of forest offences under section 154 Cr. PC issued by Police shall be sent to DFO office within two days by the Range Officers concerned and should be immediately entered in the damage Report register maintained in Range office. On aggrieved or refusal on the part of the in charge of Police station to record FIR referred to Sub-Section (1) of Section 154 may send the substance of such information in writing to the Superintendent of Police for registering FIR through e-mail or registered post under intimation to the DFO concerned under Sub Section 3 of Section of Section 154 Cr.PC. Trespass in Reserve Forest is not allowed Under Section 26 (d) whereas no restriction for trespass in Protected Forests. No new rights can be added or introduced after declaring it Reserve Forests under Section 20 read with Section 23 of IFA, 1927.

**2.6.14 Calendar of activities to be carried out (As per CEC report):**

**i. Pre-felling planning of operations in preceding year of felling:**

| Activity/Intervention                                                                                                   | Implementation Time   |
|-------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Preparation and submission of cost estimates for pre-felling, felling and post felling operations. Fencing and planting | April                 |
| Eradication of weeds in forests infested with Lantana and other obnoxious weeds                                         | September to February |

|                                                                                                                                                                                               |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Compartment wise basic technical data in relation to approved working plan and compartment history file to be checked by DFO and to be approved by CF                                         | November |
| Validation and approval in principle to take up the forest for silviculture felling by CCF/ APCCF-approval for deviations, if any, from working plan prescription to be sought from PCCF (WP) | December |
| Validation of areas and boundaries by GIS cell                                                                                                                                                | January  |

**ii. Operations in the year of Felling:**

| <b>Activity/Intervention</b>                                                                          | <b>Implementation Time</b> |
|-------------------------------------------------------------------------------------------------------|----------------------------|
| 100% enumeration for analysis floristic composition of each forest as per approved guidelines         | April-May                  |
| Silvicultural Marking which must include markings/removals for fire lines as per approved guidelines. | June-July                  |
| Approvals of Silvicultural marking by CF after field inspection                                       | 1-15 September             |
| Hand over lots to HPHFDC Ltd                                                                          | By 15 September            |
| Completion of felling and extraction operations                                                       | 31 March                   |
| Procurement of Barbed wire and RCC fence posts                                                        | March                      |

**iii. Post Felling Operations in the succeeding year for ensuring regeneration**

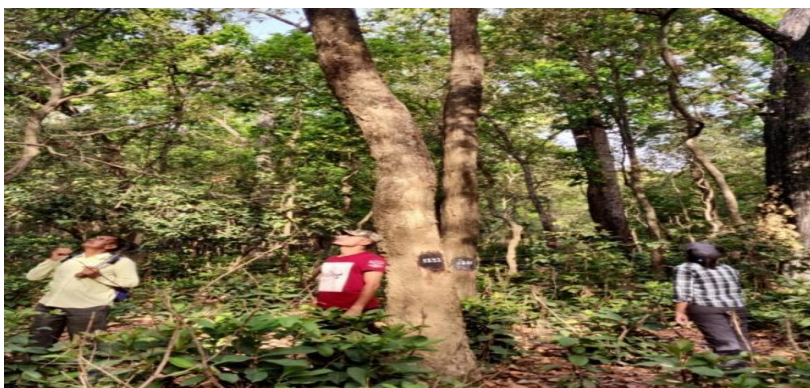
| <b>Activity/Intervention</b>                                                                                                                                                                           | <b>Implementation Time</b>                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Erection of RCC pole 5 strands barbed wire fencing as per the latest approved cost norms for approved forest to be certified by CF                                                                     | May-June                                     |
| Planting of only tall plants to augment/ supplement natural/coppice regeneration                                                                                                                       | First fortnight of July                      |
| Regeneration Survey Assessment- Natural/coppice/ artificial to be carried out in fenced forest twice a year in April and October as approved guidelines and methodology of assessment of regeneration. | October-November                             |
| Checking onsite compliance of approved interventions for ensuring regeneration by CCF/APCCF as per approved formats. Maintenance to be carried out annually till regeneration is fully established     | 15 <sup>th</sup> Nov to 15 <sup>th</sup> Dec |

## **2.7 LEARNINGS from Experimental Silviculture-Felling in Paonta Sahib Division, 2018-20: At a Glance (after 100% enumeration) with pointers for DFOs and staff in future (Courtesy: Sh. Kunal Angrish, IFS, then DFO, Paonta Sahib during execution of experimental silviculture program)**

The experiment was started in the field in summer of 2018 whereby forest plots (compartments) were selected for silviculture working. Compartment selection was done on the basis of felling series in the working plans of the division and those compartments where silviculture was imminent but not done in 1990s (due to the Godavarman judgment) were selected. These silviculture plots were traversed with GPS and digitally mapped by GIS cell. Hundred percent (100%) enumerations were done in experimental Plots. Trees of all species above 10 cm DBH were enumerated. The task was exhaustive and time-taking but gave a good idea of floristic composition.

In Paonta Sahib Division, 28000 trees and 98000 trees were enumerated in 2019-20 and 2020-21 respectively. Following this, marking was undertaken. In Paonta Sahib Division, 6364 cum of Sal timber marked for felling in 2018-19. Approx. 13,400 cum timber was marked in 2019-20. The timber was extracted and sold through open auction by the Himachal Pradesh State Forest Development Corporation (HPSFDC). Post-felling operations of fencing, leaf litter cleaning, weeding, artificial regeneration, fire control, regeneration survey were taken up by the department. Some of them (weeding, fire-control, regeneration survey) continue to this day.

### **1. Marking**



The prime factor for marking is canopy density, hence marking should be done while looking up at canopy (a common habit/mistake is to look straight at trunk/tree-thickness). This becomes even more important when trees are bent and canopy lies at a distance away from the trunk.

## 2. Debarking



- Should be low on the trunk (preferably on buttress) so that timber is not wasted.
- Should face away from the direction of felling.
- Debarking should provide a plain surface for carving. Fibres should be removed.
- In case wrong tree is debarked, the bark may be put back to prevent exposure and covered with soil.

## 3. Carving

This takes more time than debarking, painting and hammering. It is the Rate-limiting step of marking. Marking Officer should deploy more people on carving during marking. However, need to co-ordinate the numbers that are being put on the trees. Marked trees may be painted with coloured bands so that they can be seen from a distance.



## 4. Hammering

- Two/three clear hammer marks need to be put.
- Orientation of hammer should be such that the hammer mark is read clearly and is not in reverse



- Hammering must be got done in presence of DFO/ACF and whereabouts of hammer should be known at all times. Hammer must be collected at day end and kept in safe custody by DFO/ACF

## 5. Post felling operations: Fireline maintenance



- Fire prevention is more important than fire control
- Fire-line maintenance should be done in morning as wind is less.
- Staff should be present while maintaining fire-line to stop the spread.
- Leaf blower may be used to clear fire lines.
- In deciduous crops fire usually keeps to the ground, thus greater focus should be on ground clearing than lopping. In Sal areas leaf fall is complete by mid-march. So fire lines should be cleared in later half of March.

## 6. Bush Cutting & Leaf litter cleaning



- Thick bush cover may not be detrimental to Sal seed germination but badly affects their establishment. In addition, it may prevent seed from reaching the ground. Seed cycle, root system of the weed should be kept in account to decide treatment (uprooting v/s cutting).

- Clear directions should be given to labour to not destroy Sal seedlings during bush cutting.
- Sal sheds leaves in huge amount. Leaf litter on the ground prevents germination of seed and establishment of Sal seedlings.
- Mechanical pulverisation can be done thereby mixing leaf litter with soil and aiding decomposition. However, it should be avoided in case there is regeneration on ground.

## 7. Debris Collection



- Disposal of cut bushes is a huge task, especially in case control burning is not being done.
- Should not be postponed as the dry debris presents fire hazard.
- May be disposed manually if there are nearby *Nalas*. Can be carried away in tractors too.
- Dried bushes converted to husk make excellent fuel for industrial boilers. Clearing of bush/weed may be outsourced, taking into account yield per Hectare, labour cost and selling price of husk.

## 8. Boundary pillar construction





## 9. Coppice observation and Regeneration studies



- Sal is a moderate coppicer
- Coppice shoots come mostly in young trees (seldom in trees above 40 cm)
- Felling should be finished by March, around this time roots of Sal are flush with nutrition thereby giving vigorous growth to Coppice shoots.
- Lower the felling cut, better the coppice. Stumps of the pole crop should be flushed to the ground in case they have been cut above.
- Protection should be provided by fencing immediately after carrying cultural operations.
- Regeneration studies using Line Transect method approved by Hon'ble Supreme Court to be carried out till establishment of Sal and to assess improvement in regeneration status

### 2.7.1 Experimental Silviculture Program - Revenue Generation & the Future

Silviculture working of Sal forests in 2018-19 in Paonta Sahib Forest Division yielded 6364 cum standing volume of Sal timber. This resulted in a revenue of approx. Rs. 1700,000,00 (Rs. Seventeen Crore). Similarly, despite COVID-19 restrictions, there was revenue of about Rs. 20 Crore from Sal timber extracted in subsequent year. This contributed substantially in HPSFDC registering profit after a decade.

As per the current plan prescribed yield and marking rules for an overall area of 16041.23 ha, (annual working area 395 ha), annual yield is 27010 m<sup>3</sup>. At current prices (Rs 50,000 per cubic m) & conversion percentage (80% excluding fuelwood), the marking yield annual revenue works out to be Rs. 107.7 crore annually (for Sal timber alone).

### 2.7.2 Employment in Silviculture (2018-2022)

The details for Experimental felling calculated as follows:

- Wage expenditure on silviculture = Rs. 8000000
- Avg. Daily wage Rate = Rs 350 (between 250-375) from 2018-2022
- No. of Mandays =  $\frac{8000000}{350} = 22857$
- Area worked = 280 ha. App.
- Thereby, Mandays per ha of Silviculture =  $\frac{22857}{280} = 81$

The Sal Silviculture operations has generated 81 Days (almost 3 months) employment per person per Hectare. This in itself is a booster for employment generation opportunities under Forest Department and ensures people participation in the process.

Keeping the prescriptions of the working plan over an area of 395 ha annually, 114 days i.e almost 4 months of employment per person per hectare can be created for this Division alone.

## CHAPTER – 3

### COPPICE WORKING CIRCLE

**3.1 Name of Working Circle:** Coppice Working Circle

**3.2 General constitution of the Working Circle:** This Working Circle is carved out from the suitable areas of the Protection and the Sal Working Circles of Chauhan's Working Plan which was adopted in Vineet Kumar's plan. No changes have been made in the allotment of areas. The working circle has sporadic poor-quality Sal areas, which are not fit to be managed under the Sal Working Circle. The total area of this working circle is 2093.03 ha.

**3.3 General Characteristics of Vegetation:** This Working Circle covers primarily miscellaneous forests, having adequate vegetative cover of miscellaneous broad-leaved species like Chhal, Amaltas, Tendu, Jhingan etc. In general, the crop consists of poor-quality Sal and Sain, Khair, Chhal, Amaltas, Jhingan, Tendu and Papri as the main species with other Kokath species. In most of the areas, there is a dense undergrowth of Karonda, Lantana, Gandhella, Karu, *Woodfordia fruticosa* etc. In depressions and along the Nallas, Jaman, Mango and Bamboos are also found. Climbers like "Maljhan" are commonly seen. Natural regeneration is almost absent mainly due to heavy grazing.

**3.4 Felling Series, Cutting Sections and JFM areas:** Only one felling series will be constituted.

**3.5 Blocks, Compartments and JFM area:** The previous blocks and compartments as per previous plan have been retained as such in this working circle. The total area allotted to this Working Circle is 2093.03 ha. Range wise and compartment wise breakup of the area is as follows:

| Division     | Range        | Area in ha.    |
|--------------|--------------|----------------|
| Paonta Sahib | Paonta Sahib | 324.16         |
|              | Majra        | 87.13          |
|              | Giri Nagar   | 1681.74        |
|              | <b>Total</b> | <b>2093.03</b> |

| Range               | Block     | Beat                       | RF                 | Compartment no. | Area (ha)      |
|---------------------|-----------|----------------------------|--------------------|-----------------|----------------|
| Girinagar           | Chandpur  | Beas                       | Beas-61            | C-12            | 168.76         |
|                     |           |                            |                    | C-11            | 73.44          |
|                     |           | Chandpur - 1 <sup>st</sup> | Chandpur-62(a)     | C-1             | 120.73         |
|                     |           | Chandpur 2 <sup>nd</sup>   | Chandpur-62(b)     | C-2             | 163.49         |
|                     |           | Parduni -1 <sup>st</sup>   | Parduni -1st-63(a) | C-2             | 94.32          |
|                     |           |                            |                    | C-1             | 77.97          |
|                     |           | Parduni 2 <sup>nd</sup>    | Parduni 2nd-63-b   | C-7             | 98.1           |
|                     | Girinagar | Dunga                      | Dunga-69           | C-7             | 20.1           |
|                     |           |                            |                    | C-6             | 31.44          |
|                     |           |                            |                    | C-5             | 43.75          |
|                     |           |                            | Janglot-70(b)      | C-1             | 72.86          |
|                     |           |                            | Janglot-70b        | C-8             | 59.2           |
|                     |           |                            |                    | C-7             | 44.27          |
|                     |           | Jalmusa                    | Jalmusa-71         | C-9             | 15.52          |
|                     |           |                            |                    | C-3             | 26.4           |
|                     |           |                            |                    | C-1             | 51.84          |
|                     |           |                            | Janglot-70(a)      | C-2             | 48.3           |
|                     |           | Majri                      | Majri -65          | C-7             | 50             |
|                     |           |                            |                    | C-5             | 22.39          |
|                     |           |                            |                    | C-4             | 57.35          |
|                     |           |                            |                    | C-3             | 55.84          |
|                     |           |                            |                    | C-2             | 32.7           |
|                     |           |                            |                    | C-1             | 51.68          |
|                     |           | Mehrar                     | Mehrar-64          | C-4             | 49.3           |
|                     |           |                            |                    | C-3             | 43.76          |
|                     |           |                            |                    | C-2             | 51.31          |
|                     |           |                            |                    | C-1             | 56.92          |
| <b>Majra</b>        | Majra     | Sainwla                    | Jamanwali-34       | C-7             | 28.67          |
|                     |           |                            |                    | C-6             | 27.67          |
|                     |           |                            | Tokian-35          | C-7             | 24.62          |
|                     |           |                            |                    | C-3             | 6.17           |
| <b>Paonta Sahib</b> | Chachheti | Gattu                      | Chhachheti-12 (a)  | C-3             | 58.41          |
|                     |           |                            |                    | C-2             | 50.86          |
|                     | Chachheti | Chachheti                  | Chachheti-12 (b)   | C-13            | 55.89          |
|                     |           |                            |                    | C-12            | 61.67          |
|                     | Gorakhpur | Kukron                     | Kukron-23          | C-2             | 60.11          |
|                     |           |                            |                    | C-1             | 37.22          |
|                     |           |                            |                    |                 | <b>2093.03</b> |

**3.6 Special Objectives of Management:** The special objectives of Management are as under:

- (i) To improve the existing growing stock
- (ii) To meet the bonafide requirement of local people for fodder, fuel and small timber

### 3.6.1 Analysis of the Crop:

**3.6.1.1 Stock Maps:** Stock maps have been prepared on appropriate scale as per area of compartment and attached in respective Compartment history files.

**3.6.1.2 Enumerations:** The technique of Survey and Assessment of Forest Resource using Grid and Quadrants method (Sample Plots) has been adopted and complete counting of all tree species class wise has been done. A total of 31 Sample Plots of 0.1 ha were laid in this working circle. The detail of sample plots is as under:

| Sr. No. | WC      | No. of sample plots | Total area counted (ha) |
|---------|---------|---------------------|-------------------------|
| 1       | Coppice | 31                  | 3.1                     |

**3.6.1.3 Analysis of Growing Stock:** The growing stock comprised of miscellaneous broadleaved species which are having maximum proportion (54%). There is good regeneration of species in the compartments (Fig. 3.1). The proportion of miscellaneous species (54%) is found maximum followed by Sal (36.51%). Chil is found in patches on the slopes and ridges. The N-D curve shows that in mix species, felling should be carried out in more than 20 cm dbh classes of trees keeping 30 cm trees as standards. As regards Chil, the mature trees are removed selectively considering slopes and local ecological conditions.

Table 3.1 a. Per ha Growing Stock (cu m) of Trees

| Species            | Tree Classes  |              |              |              |             |             |             |             |             | Total         |
|--------------------|---------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|-------------|---------------|
|                    | V             | IV           | III          | II-A         | II-B        | I-A         | I-B         | I-C         | I-D         |               |
| Miscellaneous spp. | 88.00         | 29.00        | 14.00        | 7.40         | 5.16        | 2.25        | 0.00        | 0.64        | 0.64        | 147.09        |
| Chil               | 0.00          | 22.60        | 0.32         | 0.64         | 0.64        | 0.00        | 0.00        | 0.00        | 0.00        | 24.20         |
| Sal                | 16.00         | 41.00        | 25.00        | 12.00        | 2.90        | 1.30        | 0.33        | 0.00        | 0.00        | 98.53         |
| <b>GT</b>          | <b>104.00</b> | <b>92.60</b> | <b>39.32</b> | <b>20.04</b> | <b>8.70</b> | <b>3.55</b> | <b>0.33</b> | <b>0.64</b> | <b>0.64</b> | <b>269.82</b> |

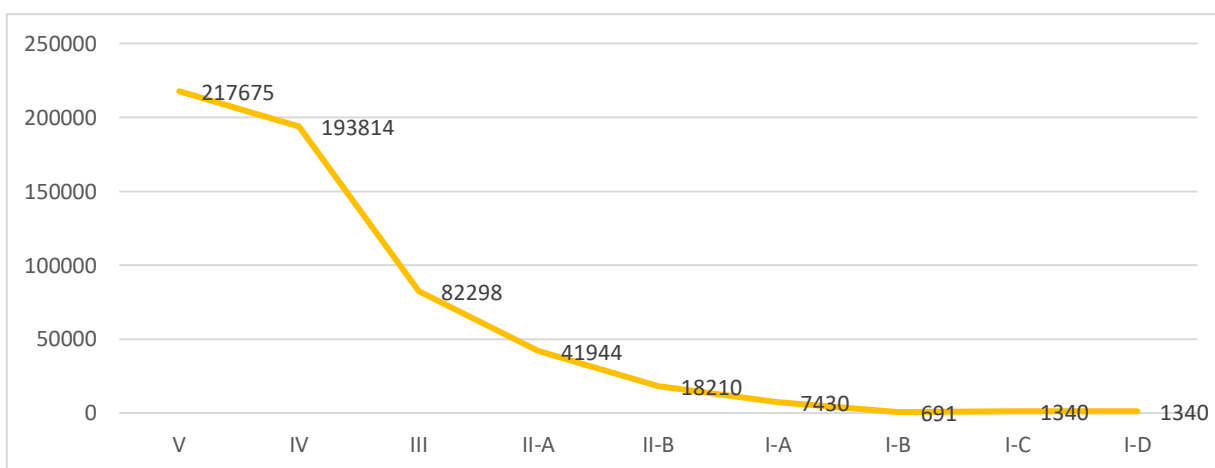
Table 3.1 b. Growing Stock in terms of number of Trees

|                    | Trees Classes |               |              |              |              |             |            |             |             |               |
|--------------------|---------------|---------------|--------------|--------------|--------------|-------------|------------|-------------|-------------|---------------|
| Species            | V             | IV            | III          | II-A         | II-B         | I-A         | I-B        | I-C         | I-D         | Total         |
| Miscellaneous spp. | 184187        | 60698         | 29302        | 15488        | 10800        | 4709        | 0          | 1340        | 1340        | 307864        |
| Chil               | 0             | 47302         | 670          | 1340         | 1340         | 0           | 0          | 0           | 0           | 50652         |
| Sal                | 33488         | 85814         | 52326        | 25116        | 6070         | 2721        | 691        | 0           | 0           | 206226        |
| <b>GT</b>          | <b>217675</b> | <b>193814</b> | <b>82298</b> | <b>41944</b> | <b>18210</b> | <b>7430</b> | <b>691</b> | <b>1340</b> | <b>1340</b> | <b>564742</b> |

Table 3.1 c. Growing Stock (cu m) of Trees

|                    | Tree Classes    |                 |                 |                 |                 |                 |                |                |                |                  |
|--------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|------------------|
| Species            | V               | IV              | III             | II-A            | II-B            | I-A             | I-B            | I-C            | I-D            | Total            |
| Miscellaneous spp. | 11787.97        | 11168.43        | 12248.24        | 13706.88        | 16362.00        | 10802.45        | 0.00           | 4278.62        | 4278.62        | 84633.20         |
| Chil               | 0.00            | 11820.77        | 458.68          | 1814.90         | 3027.46         | 0.00            | 0.00           | 0.00           | 0.00           | 17121.81         |
| Sal                | 4252.98         | 31579.55        | 43692.21        | 44455.32        | 18392.10        | 12481.23        | 4412.04        | 0.00           | 0.00           | 159265.42        |
| <b>GT</b>          | <b>16040.94</b> | <b>54568.75</b> | <b>56399.13</b> | <b>59977.10</b> | <b>37781.56</b> | <b>23283.67</b> | <b>4412.04</b> | <b>4278.62</b> | <b>4278.62</b> | <b>261020.43</b> |

n-D curve for Coppice WC



As is evident, there is preponderance of young crop in Vth and IVth classes across species, therefore the need for thinning to reduce congestion and improve existing and new regeneration.

**3.6.1.4 Density:** The areas are generally of low to moderate density (0.1 - 0.5)

**3.6.2 Silvicultural System:** Coppice with Standards system supplemented by artificial regeneration has been adopted for this working circle. Since the chances of coppice regeneration are not assured therefore, reliance has to be placed on artificial regeneration. For this purpose, nursery stock should be quite sturdy. It is, however, to be added that there are a few scattered patches of Chil. They are to be managed on selection principles as an exception. It is prescribed

that more bamboo species including *Dendrocalamus strictus* (Lathi bans) and *Bambusa bambos* (Katila bans) should be planted in nallah, depression sites and soil erosion areas.

**3.6.3 Rotation Period:** The 20 and 30 cm dbh is attained by most of the species in 30 and 60 years and so a rotation of 30 years for coppice and of 60 years for the standards has been adopted. Trees of medicinal and fruit values will be retained as standards.

**3.6.4 Reducing Factors:** The areas have not been reduced in this working circle.

**3.6.5 Thinning Cycle:** No final felling is prescribed as derived from the n-D curve, there is need for thinning (light thinning, A grade). With two thinnings to be done during rotation period (of 30 years for coppice) at an interval of 10 years, the thinning cycle will be 10 years.

**3.6.6 Calculation of Yield:** The yield has been prescribed by area as the silvicultural systems will be coppice with standards. The total area of this working circle is 2093.03 ha. For 1<sup>st</sup> thinning in rotation period of 30 years, the thinning cycle is fixed as 10 years. Therefore, annual area of working is  $2093/10 = 210$  ha app. No calculation of yield is done by volume, as the density and composition of the crop is extremely variable from one forest to another. As such, the estimated figures of the entire working circle cannot be applied to individual compartments. The area felled for thinning will count towards yield. The proportion of miscellaneous tree species in this working circle is maximum (54%). The species mixtures are Eucalyptus, Semal, Shisham, Sain, Amaltas, Khair, Chhal, Jhingan, Tendu, Papri etc. The proportion of Sal is 36% and Chil is 8.96%. If coppice regeneration is not viable or coppice vigour becomes weak, native plants can be raised artificially. Eucalyptus will be replaced gradually with native species. Thinning will also be carried out where shade is impacting on regeneration of Sal, Khair etc. Trees of medicinal and fruit bearing values such as Sain, Harad, Bahera, Amaltas, Bel, Shahtoot etc. will be kept as standards (not to be felled). Trees found distributed on soil eroded places or on the banks of rivers, springs, ponds and nallah will also be kept as standards.

**3.6.7 Thinning prescription:** No calculation of yield is done by volume, as the density and composition of the crop is extremely variable from one forest to another. As such, the estimated figures of the entire working circle cannot be applied to individual compartments. The programme can, however, be changed with the approval of the CCF (Working Plan) and settlement keeping in view the yield and deviation within prescribed limit. In such cases annual coupes of almost the prescribed area to be taken. Therefore, annually 210 ha area of Coppice Working Circle is to be considered for silviculture operations from the existing 2093 ha area of

the Circle in form of light grade thinning operations (A-Grade) as per site-specific conditions. Thinning is carried out in dense immature crop.

These should be along the prominent features so as to facilitate the constitution of compartments/sub compartments later on.

### **3.6.8 Subsidiary Silvicultural Operations:**

**i. Raising plants in the nursery and planting:** - A big problem with natural regeneration is that it is rather slow growing with a high mortality rate and uncertain growth pattern under rather hostile site conditions. Seed production from retained mother trees is primarily a specific character. All species do not seed annually and in equal abundance. Good seed years occur at intervals. In these circumstances, complete reliance on rather slow and uncertain pace of natural regeneration is considered somewhat risky to ensure adequate regeneration and restocking of a felled forest to its full potential.

The density in this area is generally low below 0.5 and the trees are generally young which are not to be felled therefore the coppice regeneration will be insignificant; consequently, reliance has to be placed mainly on artificial regeneration for it. Plantation shall have to be carried out intensively as suggested below:

**Choice of Species:** The species occurring locally should be preferred with emphasis on fuel and fodder yielding ones moving towards a multi-layered canopy. The species giving other minor forest produce and timber should be preferred next to them. In Chil pockets, interventions using fire resistant species to be introduced. Chil should, however, be not replaced by other species. In refectory areas, bamboo species will be tried in small patches. In unreachable areas, seed balls may also be used for sowing of seeds during rainy season. It is prescribed that tall trees should be preferred for planting.

**Species to be planted:** The following fuel and fodder yielding species will be planted as per the sites:

*Morus alba*, *Bauhinia purpuria*, *Albizialebbek*, *Dalbrgia sissoo*, *Acacia catechu*, *Cassia fistula*, *Grewia optiva*, *Adina cordifolia*, *Holoptelia integrifolia*, *Cedrela toona*, *Terminalia spp.*, *Buchnani alanzan*, *Pterospermum acerifolium*, *Hardwickia binata*, *Butea monosperma*, *Acacia lecophloa*, *Acacia auriculiformis*, *Dendrocalamus strictus*, *Bambusa tulda*, *Bambusa nutans*,



*Dendrocalamus hamiltoni*, *Dendrocalamus giganteus*, *Syzygium cuminii*, *Lannia coromandelica*, *Oojenja oojenesis* etc

(a) In pockets of good soil depth, along nallahs and easy slopes the planting of kachnar, mulberry, Harad, Behra, Amla and Toon be done. Kachnar be planted out with root shoot cuttings and about 1.5 to 2 years old plants grown in nursery at a spacing of 25x25 cm. The root shoot cutting is planted in monsoon. Mulberry can be raised in nursery probably by trees cuttings. The harar, behra, toon, papri be planted with year old plants with ball of earth and amla is to be tried naked rooted. The size of pit should be 45x45 x 45 cm.

(b) In refractory areas patch sowing of Kainth, berries in 30x 30x 15 cm patches is to be done. 5 to 6 berries can be tried in a patch. In such area, root-shoot cutting of Amaltas with three years old plants raised in nursery at a spacing of 25x 25 cm be also planted during monsoon.

(c) On freshly exposed soils, root-shoot cuttings of Shisham made out of about 1.5-year-old plants grown in nursery can be planted. The cutting should be about pencil thick at collar region.

(d) Along river banks, stream beds and nallah areas, bamboo species as mentioned under choice of species para can be tried. Other species like Dhak and Semal can be tried. Nursery raised bamboo plants either naked rooted or ball of earth can be planted in a pit size of 60 cm<sup>3</sup>. Bamboos can be raised in the nursery from macro-proliferation technique or vegetatively from branch cuttings.

(e) In suitable locations, mulberry can be tried.

(f) In some patches, some Shisham and Semal is to be also introduced. Much advanced and meticulous planning is required for regenerating these areas.

(g) In areas where Sain is natural, root-shoot cutting prepared out of 2-year nursery raised plants can be tried.

(h) Some trees of religious, aesthetic, medicinal and other local importance also to be planted at suitable places.

(i) In rest of the areas, Shisham, Siras, Papri, Jamun etc. are to be planted.

(j) For beating up of failures, 1-1.5-year-old root- shoot cuttings of khair or bakain grown in nursery at a spacing of 25x25 cm be used. For this purpose, amaltas root- shoot cuttings (3-year-old) grown in nursery at a spacing of 25x 25 cm be also be tried.

(k) Chal (*Anogeissus latifolia*) is an excellent fodder and is also very suitable for small timber, fuel wood, charcoal. But so far nursery techniques have not been evolved due to infertility of its seeds. Tata energy Research Institute New Delhi however has been preparing tissue culture seedlings and supplying to various states. It is, therefore, suggested that tissue culture raised seedlings be procured from TERI and tried in suitable areas. This species is also raised through root cuttings in the nursery. Rooted cuttings can be collected from the forests and can be raised in the nursery in growing season.

(m) In some of the refractory areas the feasibility of filling the pits 45 cm<sup>3</sup> cube with good soil imported from outside the area can be examined. In such cases, the in-depth study of results combined with expenditure incurred should be carried out.

**3.6.8.2 Slash disposal:** - The cut material is left out in the area should be collected in heaps outside the area and control burnt before fire season. The right holders can be also encouraged to carry slash for their use.

**3.6.8.3 Singling out of coppice shoots:** - Coppice shoots except eucalyptus should be tended in the fourth year (when shoots are three-year-old) after felling and only 2-3 shoots per stumps should be retained. In the seventh year only, the best growing shoots should be retained. In case of eucalyptus, the singling out of coppice shoots should be undertaken in the third year. The most robust shoot is to be retained. There is no need for two operations in case of eucalyptus.

**3.6.8.4 Bush cutting:** - Bush cutting should be carried till 5th years from the planting. All bushes need not to be cut but only those interfering with the growth of the plant can be cut.

**3.6.8.5 Closure:** - Close the felled areas for grazing for about 10 years till the regeneration attains suitable height which protects them from trampling and burning /browsing of cattle.

**3.6.8.6 Weeding:** - In the planting pits, weeding may be done after 10-15 days of planting and more after same interval. These may be repeated in two or three times in a year.

**3.6.8.7 Mulching:** - Mulching is done to provide moisture to soil and it also control weeds around planting pits. If required, this can be done.

**3.6.8.8 Regeneration:** The following ANR operations can be undertaken in regeneration areas:

**1. Closure:** Regeneration if noticed in coppice crops and seedlings from seeds, the area will be closed for grazing and it will be protected by erection of fencing around ANR areas.

**2. Fire Protection:** The ANR areas will be protected from forest fires. Fuel loads around ANR areas will be control burn before fire season. People should not be allowed to enter these areas in fire season. Any type of slash should be control burn away from ANR areas.

**3. Singling:** Singling of coppice regeneration is to be done after 3 years on each coppice shoots.

**4. Artificial Regeneration:** If natural regeneration is not relied on, planting in felled areas should be carried out with mixture of native species.

Regeneration assessment survey to assess the regeneration (both artificial and coppice) shall be undertaken each year after planting till 7 years and record should be invariably kept in the compartment history files.

### **3.6.9 Associated Regulations and Measures: -**

**I) Closure, Grazing, Grass cutting and lopping:** -The coppice coupes shall be strictly closed for grazing immediately after felling. No grazing is to be allowed for next twelve years. However, grass cutting can be permitted after seventh year. No lopping should be allowed till the area has completely regenerated and opened. Even after that, lopping is to be permitted as per guidelines/rules.

**II) Notification of Closure:** -Coppice areas shall be closed for grazing for a period of 12 years initially and got notified well in advance. No T.D will be granted from the felled areas till the areas have fully regenerated.

**III) Fire Protection:** - Necessary fire control measures shall be adopted in the felled areas.

## CHAPTER 4

### CHIL WORKING CIRCLE

#### 4.1 Name of Working Circle: Chil Working Circle

#### 4.2 General constitution of the Working Circle:

This working circle covers Chil forests of Paonta Sahib Forest Division covering 627.38 ha falling in Girinagar range, which was earlier also in Chil working circle in Vineet Kumar's plan. The Chil forests covered by the Kumar's plan bear Chil with poor stocking (mainly confined to Kansar Block of Girinagar Range). Other miscellaneous species growing with Chil in these areas include Sain, Chhal, Jhingan, Amla etc. Sal is also found adequately in several compartments. The bushy growth observed is mainly of Karonda, Kainth, Kangu and Lantana; some forests have low density, mainly due to large scale salvage removals. Frequent forest fires and defective resin tapping are primary causes of this phenomenon, this has created considerable openings in the forest. As a result, regeneration is seen in almost all the forests, whether in the regeneration block or otherwise. The quality of Chil trees varies from one forest to another. The young age classes predominate.

**4.3 General Characteristics of Vegetation:** The working plan area falls under Group 9/C1 Himalayan Sub- Tropical Pine Forests of 'Champion and Seth' Classification. At the lower elevation in the Shiwalik zone, it is mixed with moist Shiwalik Sal and in riverine areas, it is mixed with Khair and Shisham forests. Semal, Sain, Chhal are the other broadleaved species are mixed with Chil.

**4.4 Blocks, Compartments and JFM area:** The working Circle is spread across forests and 11 compartments of Girinagar range.

| Range     | Block  | Beat          | RF Name        | Comp. No | Area (ha) |
|-----------|--------|---------------|----------------|----------|-----------|
| Girinagar | Kansar | Bharog-Baneri | Bharog-59(A)   | C-2      | 67.91     |
|           |        |               |                | C-1      | 88.03     |
|           |        |               | Samon-Kanon-60 | C-6      | 40.32     |
|           |        |               |                | C-3      | 65.15     |
|           |        |               |                | C-2      | 70.52     |
|           |        |               |                | C-1      | 102.12    |

|  |  |              |             |            |               |
|--|--|--------------|-------------|------------|---------------|
|  |  | Kando-Baila  | Barthal-72  | <b>C-3</b> | 32.64         |
|  |  | Kando-Kanser | R-58 Kansar | <b>C-4</b> | 47.36         |
|  |  |              |             | <b>C-3</b> | 22.4          |
|  |  |              |             | <b>C-2</b> | 51.41         |
|  |  |              |             | <b>C-1</b> | 39.52         |
|  |  |              |             |            | <b>627.38</b> |

**4.5 Special Objectives of Management:** Consistent with the general objects of management, the special objects of management are: -

- i) To improve the stocking of the existing forest by cleaning/tending operations by effective closure and artificial planting in gaps and to create conditions for optimum growth of plants
- ii) To manage the forest primarily for meeting the bonafide timber requirement of local people.
- iii) To extract resin subject to the condition that no permanent harm is caused to the trees or the crop.

#### **4.6.1 Analysis of the Crop:**

**4.6.1.1 Stock Maps:** Stock maps have been prepared using modern technologies of open series maps (OSMs) on a scale 1:15000 both in digital and analogue form. The maps have been placed in Compartment History files.

**4.6.1.2 Enumerations:** The technique of Survey and Assessment of Forest Resource using Grid and Quadrants method (Sample Plots) has been adopted and complete counting of all tree species class wise has been done. A total of 11 Sample Plots of 0.1 ha were laid in this working circle covering all PBs. The detail of PB wise sample plots are as under:

| <b>Sr.No.</b> | <b>PB</b>    | <b>No. of plots</b> | <b>Total area counted (ha)</b> |
|---------------|--------------|---------------------|--------------------------------|
| 1             | PB-I         | -                   | -                              |
| 2             | PB-II        | 1                   | 0.1                            |
| 3             | PB-III       | 10                  | 1.0                            |
| 4             | PB-IV        | -                   | -                              |
|               | <b>Total</b> | <b>11</b>           | <b>1.1</b>                     |

**4.6.1.3 Comparison of Growing Stock with previous data:** Comparisons cannot be done as the previous working plan of Paonta Sahib Forest Division was part of joint working plan of Nahan

and Paonta Sahib Forest Divisions and growing stock has been shown / calculated jointly for both forest divisions.

**4.6.1.4 Site Quality:** The site quality is variable and is indicated in compartment history files. The average quality is however III / IV.

**4.6.1.5 Density:** The crown density is variable and varies from 0.3 to 0.6 and as per ocular estimation the average being 0.4.

**4.6.1.6 Growing Stock:**

**4.6.1.6.1 Growing Stock of PB II:** The data of compartments shows that there is preponderance of immature trees and few are mature. Resin tapping with rill method is applied for resin extraction from mature trees for resin extraction.

Table 4.1 a Per ha Growing stock (m<sup>3</sup>) of Chil WC in different classes of PB II

|         | TREE CLASSES |    |     |     |     |    |    |    |    |       |
|---------|--------------|----|-----|-----|-----|----|----|----|----|-------|
| Species | V            | IV | III | IIA | IIB | IA | IB | IC | ID | TOTAL |
| SAL     | 0            | 0  | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0     |
| SAIN    | 0            | 0  | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 0     |
| KOKAT   | 10           | 0  | 0   | 0   | 0   | 0  | 0  | 0  | 0  | 10    |
| CHIL    | 0            | 20 | 60  | 0   | 0   | 0  | 10 | 10 | 0  | 100   |
| TOTAL   | 10           | 20 | 60  | 0   | 0   | 0  | 10 | 10 | 0  | 110   |

Table 4.1 b. Growing stock in terms of number of trees of Chil WC in different classes of PB II

|         | TREE CLASSES |      |      |     |     |    |     |     |    |       |
|---------|--------------|------|------|-----|-----|----|-----|-----|----|-------|
| Species | V            | IV   | III  | IIA | IIB | IA | IB  | IC  | ID | TOTAL |
| SAL     | 0            | 0    | 0    | 0   | 0   | 0  | 0   | 0   | 0  | 0     |
| SAIN    | 0            | 0    | 0    | 0   | 0   | 0  | 0   | 0   | 0  | 0     |
| KOKAT   | 514          | 0    | 0    | 0   | 0   | 0  | 0   | 0   | 0  | 514   |
| CHIL    | 0            | 1028 | 3085 | 0   | 0   | 0  | 514 | 514 | 0  | 5141  |
| TOTAL   | 514          | 1028 | 3085 | 0   | 0   | 0  | 514 | 514 | 0  | 5655  |

Table 4.1c Growing stock (m<sup>3</sup>) in terms of volume of Chil WC in different classes of PB II

|         | TREE CLASSES |         |          |       |       |       |          |          |       |          |
|---------|--------------|---------|----------|-------|-------|-------|----------|----------|-------|----------|
| Species | V            | IV      | III      | IIA   | IIB   | IA    | IB       | IC       | ID    | TOTAL    |
| SAL     | 0            | 0       | 0        | 0     | 0     | 0     | 0        | 0        | 0     | 0        |
| SAIN    | 0            | 0       | 0        | 0     | 0     | 0     | 0        | 0        | 0     | 0        |
| KOKAT   | 32.890       | 0.000   | 0.000    | 0.000 | 0.000 | 0.000 | 0.000    | 0.000    | 0.000 | 32.890   |
| CHIL    | 0.000        | 256.897 | 2111.990 | 0.000 | 0.000 | 0.000 | 2454.140 | 3281.838 | 0.000 | 8104.865 |
| TOTAL   | 32.890       | 256.897 | 2111.990 | 0.000 | 0.000 | 0.000 | 2454.140 | 3281.838 | 0.000 | 8137.755 |

**4.6.1.6.2 Growing Stock of Periodic Block III:** The number of trees in different diameter classes revealed that there is some congestion of immature crop from diameter class range of 10-40 cm (figure 4.2).

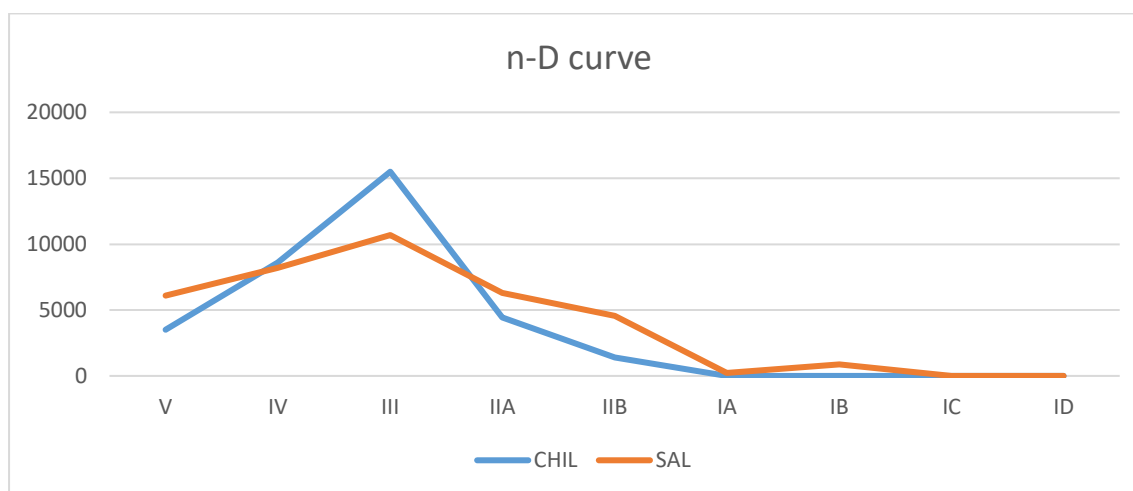


Figure 4.1 Growing Stock structure of Chil in PB III

**Table 4.2 a. Growing stock (m<sup>3</sup>) per ha in terms of volume for Chil working circle**

|         | TREE CLASSES |        |         |        |        |       |        |       |       |         |
|---------|--------------|--------|---------|--------|--------|-------|--------|-------|-------|---------|
| Species | V            | IV     | III     | IIA    | IIB    | IA    | IB     | IC    | ID    | TOTAL   |
| CHIL    | 0.3024       | 3.7485 | 19.1688 | 10.84  | 9.0372 | 0     | 0      | 0     | 0     | 43.0921 |
| SAIN    | 0.0254       | 0      | 0.0835  | 0      | 0      | 0     | 0      | 0     | 0     | 0.1089  |
| SAL     | 1.143        | 6.624  | 15.865  | 21.240 | 27.270 | 4.587 | 12.770 | 0.000 | 0.000 | 89.499  |
| KOKAT   | 1.792        | 1.656  | 0.836   | 0.885  | 1.515  | 0.000 | 0.000  | 0.000 | 0.000 | 6.684   |
| TOTAL   | 3.263        | 12.029 | 35.953  | 32.960 | 37.822 | 4.587 | 12.770 | 0.000 | 0.000 | 139.384 |

**Table 4.2 b. Growing stock in terms of number of trees for Chil working circle**

|         | TREE CLASSES |       |       |       |      |     |     |    |    |       |
|---------|--------------|-------|-------|-------|------|-----|-----|----|----|-------|
| Species | V            | IV    | III   | IIA   | IIB  | IA  | IB  | IC | ID | TOTAL |
| CHIL    | 3522         | 8602  | 15497 | 4428  | 1418 | 0   | 0   | 0  | 0  | 33466 |
| SAIN    | 1410         | 0     | 705   | 0     | 0    | 0   | 0   | 0  | 0  | 2116  |
| SAL     | 6087         | 8190  | 10688 | 6286  | 4563 | 224 | 877 | 0  | 0  | 36914 |
| KOKAT   | 17917        | 5867  | 1179  | 474   | 474  | 0   | 0   | 0  | 0  | 25910 |
| TOTAL   | 28937        | 22658 | 28069 | 11187 | 6454 | 224 | 877 | 0  | 0  | 98406 |

**Table 4.2 c. Growing stock (m3) in terms of volume of Chil working circle**

|         | TREE CLASSES |         |          |       |        |      |          |    |    |           |
|---------|--------------|---------|----------|-------|--------|------|----------|----|----|-----------|
| Species | V            | IV      | III      | IIA   | IIB    | IA   | IB       | IC | ID | TOTAL     |
| CHIL    | 177.524      | 2149.61 | 10609.25 | 5997  | 3202.8 | 0    | 0        | 0  | 0  | 22135.775 |
| SAIN    | 179.121      | 0       | 588.842  | 0     | 0      | 0    | 0        | 0  | 0  | 767.9628  |
| SAL     | 773.024      | 3013.74 | 8924.564 | 11127 | 13825  | 1027 | 5598.368 | 0  | 0  | 44289.037 |
| KOKAT   | 1146.69      | 1079.53 | 492.7384 | 419.1 | 717.5  | 0    | 0        | 0  | 0  | 3855.5944 |
| TOTAL   | 2276.36      | 6242.88 | 20615.39 | 17542 | 17746  | 1027 | 5598.368 | 0  | 0  | 71048.369 |

**Table 4.2 (d) Compartment wise detail & analysis of growing stock in the PB-III areas**

| Sr No. | Name of compartment | Existing growing stock                  |                             | Desired growing stock, * as per the Yield Table of the Sal and Chil pine for the PB-III (Site quality-III) (Average age, 40 yrs) (Reference: Companion of Indian Forester) |                             |
|--------|---------------------|-----------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
|        |                     | No. of stem per hectare                 | Volume Cum ha <sup>-1</sup> | No. of stem per hectare*                                                                                                                                                   | Volume Cum ha <sup>-1</sup> |
| 1      | Kansar C-3          | 100 (Sal & Misc.), 30 (Chil pine) = 130 | 20.88                       | 458 (Sal & Misc.), 432 (Chil pine) = 890                                                                                                                                   | 124.8                       |
| 2      | Kansar C-4          | 60(Sal & Misc.), 10(Chil pine) = 70     | 12.60                       | 510(Sal & Misc), 205 (Chil pine) = 715                                                                                                                                     | 113.10                      |
| 3      | Kansar C-1          | Chil pine= 130                          | 15.08                       | 1,442 (Chil pine)                                                                                                                                                          | 167.27                      |
| 4      | Barthal C-3         | 180 (Sal & Misc.), 30(Chil pine) = 210  | 34.71                       | 510 (Sal & Misc), 206 (Chil pine) = 716                                                                                                                                    | 112.63                      |
| 5      | Bharog C-2          | 180 (Sal & Misc.), 30 (Chil pine) = 210 | 34.80                       | 510 (Sal & Misc), 205 (Chil pine) = 715                                                                                                                                    | 112.52                      |
| 6      | Kando Bharog C-1    | 70(Sal & Misc.), 50 (Chil pine) = 120   | 17.98                       | 417 (Sal & Misc), 600(Chilpine)= 1017                                                                                                                                      | 142.15                      |
| 7      | Sumaon kanon C-6    | 180 (Sal & Misc.), 170(Chil pine) = 350 | 51.04                       | 306(Sal & Misc), 700 (Chil pine) = 1006                                                                                                                                    | 134.44                      |



|    |                  |                                         |       |                                       |        |
|----|------------------|-----------------------------------------|-------|---------------------------------------|--------|
| 8  | Sumaon Kanon C-3 | 170(Sal & Misc.), 50 (Chil pine) = 220  | 35.38 | 460 (Sal & Misc),721(Chil pine) =1181 | 163.67 |
| 9  | Sumon Kanon C-2  | 100(Sal & Misc.), 50 (Chil pine) = 150  | 23.20 | 397(Sal & Misc),480(Chil pine) =877   | 124.75 |
| 10 | Sumon Kanon C-1  | 100 (Sal & Misc.), 60 (Chil pine) = 160 | 34.80 | 425(Sal & Misc),540(Chil pine) = 965  | 136.59 |
| 11 | Barthal C-4      | 210 (Chil pine)                         | 39.44 | 1,442 (Chil pine)                     | 168.2  |
| 12 | Kanon C-2        | 150 (Chil pine)                         | 17.40 | 1,442 (Chil pine)                     | 168.2  |

- Growing stock (Number of stems per hectare and volume) extrapolated based on the proportionate distribution of stem number present in the respective compartment and the desired number required for exploiting the site production potential (Site quality III)

Analysis of the details reveal that:

1. All the compartments under consideration are heavily under under-stocked with respect to the distribution of number of stems on per hectare basis
2. For carrying out removals, it is recommended to remove only the dead, dying, diseased as the compartments are heavily understocked.
3. In exceptional cases suppressed trees can be removed where the congestion is heavy (only localised places)

**4.6.2 Silvicultural System:** The forest covered under this working circle will be managed under the Indian Irregular shelter wood system as this allows felling in accordance with nature of ground and introduces irregularity in the crop by way of retaining advance growth, the regeneration will be by natural means.

**4.6.3 Rotation Period:** A rotation of 100 years is prescribed keeping in view d.b.h of 55 cm. The regeneration period shall be 25 years as Chil crop after this age attains sufficient height to be out of danger from the ground fire.

**4.6.4 Harvestable Diameter:** Keeping in view the Mean Annual Increment (MAI) and Current Annual Increment (CAI), resin extraction and outturn of standard sized timber, the exploitable diameter is kept as 55 cm.

**4.6.5 Reducing Factors and Reduced area:** The areas are not reduced.

**4.6.6 Felling Cycle:** 25 years

**4.6.7 Divisions into Periods and Allotment to Periodic Blocks:** With the rotation of 100 years and regeneration period of 25 years, four periodic blocks have been constituted. In Paonta Sahib Division, only PB-II and PB-III areas exist, PB-II crop has age between 50-75 years and PB-III having crop ranging between 26-50 years.

#### 4.6.7.1 Abstract of areas allotted to various PB

The reason for not shifting the PBII to PBI & PBIII to PB II is because of the lack of mature trees and preponderance of advance growth and immature trees. Therefore, PB areas and allotment remain the same as Vineet Kumar Working Plan.

| Division     | Range     | PB-I | PB-II | PB-III | PB-IV | Total (ha) |
|--------------|-----------|------|-------|--------|-------|------------|
| Paonta Sahib | Girinagar | -    | 51.41 | 575.97 | -     | 627.38     |

#### Forest allotted to PB-II

| Range     | Block  | Beat        | RF | Comp. No | Type | Area (ha) |
|-----------|--------|-------------|----|----------|------|-----------|
| Girinagar | Kanser | Kanser R-58 | RF | C-2      | RF   | 51.41     |

#### Forest allotted to PB-III

| Range            | Block         | Beat          | RF             | Comp. No   | Area (ha)     |
|------------------|---------------|---------------|----------------|------------|---------------|
| <b>Girinagar</b> | <b>Kanser</b> | Bharog-Baneri | Bharog-59(A)   | <b>C-2</b> | 67.91         |
|                  |               |               |                | <b>C-1</b> | 88.03         |
|                  |               |               | Samon-Kanon-60 | <b>C-6</b> | 40.32         |
|                  |               |               |                | <b>C-3</b> | 65.15         |
|                  |               |               |                | <b>C-2</b> | 70.52         |
|                  |               |               |                | <b>C-1</b> | 102.12        |
|                  |               | Kando-Baila   | Barthal-72     | <b>C-3</b> | 32.64         |
|                  |               | Kando-Kanser  | R-58 Kansar    | <b>C-4</b> | 47.36         |
|                  |               |               |                | <b>C-3</b> | 22.4          |
|                  |               |               |                | <b>C-1</b> | 39.52         |
|                  |               |               |                |            | <b>575.97</b> |

**4.6.8 Calculation of Yield:** All the forests falling under Chil working circle in Paonta Sahib Forest Division fall under PB-II and PB-III periodic blocks. Further, analysis of Table 4.2 (d) and as consulted by silviculture experts from UHF, Nauni, following points are noted:

1. All the compartments under consideration are heavily under under-stocked with respect to the distribution of number of stems on per hectare basis
2. For carrying out removals, it is recommended to remove only the dead, dying, diseased as the compartments are heavily understocked. However, the salvage removals will allow some space and opening for Chil regeneration since Chil is a strong light demander. No thinning is prescribed for the lower age-classes during this Plan period.
3. However, in exceptional cases suppressed trees may be removed where the congestion is heavy (only localised places).

Therefore, no yield is prescribed except for the annual salvage removals in the area.

**4.6.9 Table of Felling:** Seeding felling and final felling is not prescribed.

**4.6.10 Method of Executing Felling:**

**4.6.10.1 Treatment in PB II:**

Recommendations have been made keeping in view the very limited area of 51.41 ha allotted to this Periodic Block.

- All dry (completely dry) and fallen trees should be marked for felling.
- Lantana and other bushes should be removed.
- After the debris and slash should be removed.
- All unhealthy malformed saplings should be cut back.
- Climber cutting should be done.

**4.6.10.2 Treatment in PB III:** Following guiding principles are laid down:

1. Completely dead/dry, fallen and all salvage trees should be marked. This will also help to give space and light for proper development of advance growth. However, in exceptional cases suppressed trees of lower classes may be removed where the congestion is heavy (only localised places).
2. On the broken ground, Nala banks and steep slopes, markings should be conservative.
3. Climber cutting should be done
4. Lantana and other bushes should be removed.
5. After the debris and slash should be removed.

#### 4.6.11 Subsidiary Silvicultural Operations:

Following subsidiary silvicultural operations shall be carried out areas:

- Lopping will not be allowed.
- Cuttings and removal of weeds like *Lantana*, *Eupatorium* etc. will be done for the next three to five years. Only unwanted weeds will be removed.
- Fire lines of 5 m width should be cleared before fire season. Control burning will be carried out in fire lines, roads and forest paths before fire season.
- Fast growing broadleaved species like Toon, Robinia, Papri, Siris, Ohi (*Albizzia stipulata*) will be planted. These will serve as firebreaks also. Similarly, along depressions the local fuel/fodder yielding broadleaved species will be planted. Bamboos should be preferred in depressions and nallah areas. In and around villages, fodder yielding trees may be planted.
- The Chil needles should be collected from felled area immediately after vacation and shall be distributed to local villagers for making of pine briquettes which may be used by the villagers for cooking purposes. Pine needles can also be used in making of brushwood check dams for control of soil erosion by the forest department.
- The lower most branches of the young plants /poles (fire ladders) should be pruned to avoid fire hazards before fire season.

**4.6.12 Regeneration:** The following regeneration operations will be carried in regeneration areas of Chil:

**i. Closure:** The compartments where regeneration is obtained will be closed for grazing. The area will be fenced with 5 strings of barbed wire with fence posts.

**ii. Fire Protection:** Chil is very susceptible to fire. In regeneration area, sign boards can be erected so that people may not enter the area during fire season. Small fire lines of 3-5 m width can be constructed on the periphery of regeneration area. These fire lines should be clear from fuel (pine needles) during fire season. A watcher can be engaged during fire season for policing.

**iii. Removal of Lantana and other bushes:** Lantana and other bushes which interfere with regenerating crop should be removed. The removal is done 2-3 times in a year in initial years of 5 years.

**iv. Artificial Regeneration:** If natural regeneration is not realized, planting will be done by nursery raised plants of one year old in vacant areas. Other mix native species suitable to the area can be planted around ANR areas.

#### **4.6.13 Associated Regulations and Measures:**

**i. Boundary Demarcation:** The boundaries of each of the compartments selected for silvicultural operations is to be demarcated with the help of GPS (GIS Survey) and Geo referenced maps will be prepared.

**ii. Fire Protection:** The repeated forest fire is main problem in Chil areas. Regeneration needs to be effectively protected from fire by careful planning & execution at the field level. Control burning should be carried out latest by the middle of March. Due to non-felling and no cultural operations being done for a long time, many areas of the working circle are having dense regeneration in patches. There is always hazard of major fire in these areas. Care should be taken to protect these areas from forest fire. If Forest Corporation does any activity it should be its responsibility to protect the area from fire.

**iii. Resin tapping:** It has been observed that smaller trees of 30 cm dbh and lesser are marked for resin tapping which should be controlled and not permitted. In the technique of resin tapping, Rill method is applied on mature trees of more than 35 cm of dbh. Resin tapping in smaller trees affects growth and timber quality of Chil trees. It is prescribed that resin should be tapped 5 years before felling of a tree. It may continue for 5 years till harvesting of mature tree. Resin tapping may not be carried out on soil erosion areas. Special care should be taken during fire season.

#### **Method for Resin tapping:**

**Rill method:** This is an improved method, standardized at Forest Research Institute, Dehradun to overcome the disadvantages of the cup and lip method. In rill method, the bark of the tree over a surface area of about 45 cm in height and 30 cm in width is removed with the help of a bark shaver. The surface is made very smooth and the thickness of the bark left should not be more than 2 mm to facilitate freshening of the blaze. The blaze frame is kept on the stem in the vertical portion, 15 cm above the ground level and the position of the blaze is marked with a marking gauge. The control groove is cut with a grove cutter by drawing it from top to bottom. The lip is then fixed in the tree with nails.

For freshening of the blaze, the tapper stands near the tree on one side of the blaze and holds the freshening knife at the lowest point of the control groove. The knife is then pulled up by the tapper along with blaze line marked on the tree. The depth of the rill is about 2mm into the wood.

After making a freshening on both arms of the blaze a 1:1 mixture of dilute Sulphuric acid (20%) and dilute nitric acid (20%) or Ethephon is sprayed on the freshly cut rill with the help of spray bottle. Exudation of oleoresin starts soon after the rills are made. The pot containing the oleoresin is emptied into a collection can. The resin adhering to the pot is removed with the help of a scraper. The control groove is also increased to avoid accumulation of resin in it. Resin from chil pine forests are tapped from April to November each year. Most of the forest trees are owned by Government while a small yield is also obtained from private or community forest.

**Yield:** Experiments conducted on trees growing at the Forest Research Institute, Dehradun, have shown that a maximum yield of 5.13 kg/blaze/year of resin can be obtained by rill method, while the corresponding yields by the other two traditional methods are 1.5 kg/blaze and 3.1 kg/blaze per year respectively (Chaudhari et al.,1990).

**iv Grazing:** Excessive grazing by the wild life as well as domestic cattle has very serious adverse effects on the regeneration of Chil. Trampling and browsing of regeneration is common and the result is compactness of the top soil which is very detrimental to the regeneration of seeds specially Chil. Erosion is accentuated and thorny unpalatable shrubs like *Carissa opaca* and *Lantana camara* increase proportionately. Excessive grazing also arrests seral development of vegetation and sometimes leads to retrogression. Hence effective control on grazing is required and the following suggestions should be implemented at the field level:

- All PB III areas in the working circle should be remain closed to grazing for the cattle.
- Areas where special cultural operations are prescribed in this working circle shall remain closed to grazing for the plan period.
- Areas undertaken for ANR should be effectively fenced. Five strand barbed wire fencing including one cross strand using concrete pillars strongly anchored in the ground with cement concrete on ground and side supports is prescribed.
- **Soil erosion treatment:** There are some Nalas in some pockets of Girinagar range which are prone to gully-erosion and scouring. It is prescribed that stable soil and moisture conservation & protection measures be taken to control further erosion.

## CHAPTER-5

### PROTECTION CUM REHABILITATION WORKING CIRCLE

**5.1 General Constitution:** - The Working Circle covers poor quality miscellaneous Broad-leaved forests situated on moderate or steep eroding formations, poor/refractory soil generally inferior for supporting good forest growth. The constitution remains same as was in the previous plan. The increase in area from previous Working Plan of 8984.63 ha has been of 545.47 ha, making the total area as **9540.64** ha, which is basically the area taken from Khair (Overlapping) Working circle which was originally a part of PCR .This was done keeping in view the CEC guidelines (in I.A. No. 87648 of 2020 in Writ Petition (C) no. 202 of 1995 -T.N. Godaverman Thirumlkpad Vs Union Of India and Ors ) wherein it has been stressed upon that No area under PCR WC has to be taken for silviculture working or green felling. Moreover, the area taken from Khair (overlapping) is of plantation origin that was carried out with the purpose of protection of the forests prone to erosion, illicit mining, felling owing to sharing boundaries with other states as well being along streams and nallahs.

**5.2 General Character of Vegetation:** The forest sub types vary from Northern Dry Mixed Deciduous forests) to lower Western Himalayan Temperate Ban, Oak Forests in Paonta Sahib and Bhagani Ranges. These areas have variable vegetation. On the gentle slopes, Chil, Pine occurs scattered, singly or in groups with deciduous species. In moist and shady areas, Sal is present. miscellaneous scrub is found in lower areas of Majra and Paonta Sahib Ranges. Bamboos, which thrived in some of the areas, have almost been destroyed due to gregarious flowering (during late fifties and early sixties) and extensive grazing, lopping and hacking. The forest falls in following categories of the Champions Revised Classification of the Forest Types of India:-

|                    |                                          |
|--------------------|------------------------------------------|
| 5B/C <sub>1a</sub> | Dry Shiwalik Sal Forest.                 |
| 5B/C <sub>2</sub>  | Northern Dry Mixed Deciduous Forest      |
| 5B/1S <sub>2</sub> | Khair Sissoo Forest                      |
| 9/C <sub>1a</sub>  | Lower Himalayan Chir Pine Forest         |
| 12/C <sub>1a</sub> | Lower Himalayan Temperate Ban Oak forest |

Easy accessibility to plains and heavy grazing and lopping of tree growth on these weak geological formations have almost made these areas devoid of the tree growth and caused serious

soil and subsoil erosions. The moisture retention capacity of the soil has been considerably reduced. There are substantial areas in the forests which are under-stocked, have less than 40 percent canopy density and areas with lantana infestation which need to be brought under tree cover of economical, indigenous, medicinal and fruit trees depending upon their suitability, ecological conditions. In the past, plantations of various species have been raised, some of which are successful and others not successful. Some of these forests have been reduced to mere scrubs and bushes. To rehabilitate these areas, plantation of indigenous species at suitable sites has been proposed.

**5.3 Special Objects of Management:** - Keeping in view the fact that these areas are generally badly eroded and support little or very little poor-quality vegetation, the special objects of management proposed are: -

- (a) To improve the vegetative cover by protection of the existing growth.
- (b) To supplement the existing growth by providing proper closures to encourage natural regeneration supplemented by artificial planting of suitable species.
- (c) To prevent and stabilize soil erosion by adopting vegetative measures and constructing masonry structures.
- (d) Afforestation of blank or understocked areas with suitable indigenous plant species,
- (e) Increasing overall forest density and productivity,
- (f) Controlling the growth of invasive species like lantana.

#### **5.4 Blocks and compartments**

No change in existing Blocks and compartments is made

#### **5.5 Area statement**

| <b>Range</b> | <b>Area in ha.</b> |
|--------------|--------------------|
| Bhagani      | <b>3289</b>        |
| Paonta Sahib | <b>2917.59</b>     |
| Majra        | <b>2415.69</b>     |
| Giri Nagar   | <b>918.36</b>      |
| <b>Total</b> | <b>9540.64</b>     |

As per CEC guidelines (CEC guidelines issued in I.A No. 87648 of 2020 in Writ Petition (C) No. 202 of 1995 TN Godaverman Thirumalkpad Vs UoI and Ors.) No area under PCR WC has to be taken for silviculture working, Therefore the area which was earlier part of PCR WC added into



Khair WC (545.47 ha) has been shifted back to parent WC i.e PCR WC. Further keeping in view of ecological condition of this area i.e. riverine and landslide prone region, threats of illegal felling, and river sand mining, no green felling should be prescribed as per CEC directions.

#### STATEMENT OF AREA ALLOTTED TO PCR WORKING CIRCLE

| Range   | Block   | Beat      | RF Name     | Compartment No. | Area(ha) |
|---------|---------|-----------|-------------|-----------------|----------|
| Bhagani | Bhagani | Bhagani   | Yamuna-7    | C-2             | 43.84    |
|         |         |           | Yamuna-7    | C-1             | 42.76    |
|         |         | Dhandla   | Dhandla-6   | C-12            | 10.76    |
|         |         |           | Dhandla-6   | C-11            | 70.45    |
|         |         | Mehruwala | Mehruwala-8 | C-1             | 85.47    |
|         | Majri   | Gojjer    | Khojjar-5   | C-7             | 72.19    |
|         |         |           | Khojjar-5   | C-6             | 55.84    |
|         |         |           | Khojjar-5   | C-5             | 58.35    |
|         |         |           | Khojjar-5   | C-2             | 56.84    |
|         |         |           | Khojjar-5   | C-1             | 73.95    |
|         |         | Killor    | Badahna-1   | C-4             | 84.01    |
|         |         |           | Badahna-1   | C-3             | 181.86   |
|         |         |           | Badahna-1   | C-2             | 128.42   |
|         |         |           | Badahna-1   | C-1             | 157.33   |
|         |         |           | Salatha-3   | C-4             | 38.7     |
|         |         |           | Salatha-3   | C-3             | 64.07    |
|         |         |           | Salatha-3   | C-2             | 28.67    |
|         |         |           | Salatha-3   | C-1             | 25.85    |
|         |         | Majri     | Majri-4     | C-9             | 34.96    |
|         |         |           | Majri-4     | C-7             | 59.03    |
|         |         |           | Majri-4     | C-6             | 71.69    |
|         |         |           | Majri-4     | C-5             | 51.81    |
|         |         |           | Majri-4     | C-4             | 37.73    |
|         |         |           | Majri-4     | C-3             | 55.53    |
|         |         |           | Majri-4     | C-2             | 60.35    |
|         |         |           | Majri-4     | C-1             | 73.19    |
|         |         |           | Majri-4     | C- 10           | 47.79    |

|           |           |               |                     |       |        |
|-----------|-----------|---------------|---------------------|-------|--------|
|           | Rajpur    | Danda         | Danda-9(b)          | C-20  | 71.68  |
|           |           |               | Danda-9(b)          | C-19  | 20.64  |
|           |           | Puruwala      | Giri-10             | C-3   | 409.98 |
|           |           |               | Giri-10             | C-2   | 15.15  |
|           |           |               | Giri-10             | C-1   | 132.09 |
|           |           | Rajpura       | Rajpur-r-2          | C-4   | 65.15  |
|           |           |               | Rajpur-r-2          | C-3   | 62.63  |
|           |           |               | Rajpur-r-2          | C-2   | 81.2   |
|           |           |               | Rajpur-r-2          | C-1   | 50.05  |
|           |           | Salwala       | Kandela-11(b)       | C-9   | 92.56  |
|           |           |               | Kandela-11(b)       | C-8   | 98.6   |
|           |           |               | Kandela-11(b)       | C-7   | 156    |
|           |           |               | Kandela-11(b)       | C-6   | 93.06  |
|           |           |               | Kandela-11(b)       | C- 10 | 168.77 |
| Girinagar | Girinagar | Jalmusa       | Jalmusa-71          | C-8   | 53.08  |
|           |           | Mehrar        | Mehrar-64           | C-15  | 44.02  |
|           | Kanser    | Bharog-baneri | Samon-kanon-60      | C-5   | 25.15  |
|           |           |               | Samon-kanon-60      | C-4   | 7.55   |
|           |           | Kando-baila   | Barthal-72          | C-5   | 77.92  |
|           |           |               | Barthal-72          | C-4   | 30.4   |
|           |           |               | Kando-baila-57      | C-4   | 90.03  |
|           |           |               | Kando-baila-57      | C-3   | 52.75  |
|           |           |               | Kando-baila-57      | C-2   | 95.72  |
|           |           |               | Kando-baila-57      | C-1   | 95.83  |
|           |           | Kando-kanser  | Kando-bharog-59 (b) | C-5   | 138.83 |
|           |           |               | Kando-bharog-59 (b) | C-4   | 94.32  |
|           |           |               | Kando-bharog-59 (b) | C-3   | 81.88  |
|           |           |               | R-58 kansar         | C-6   | 5.28   |
|           |           |               | R-58 kansar         | C-5   | 25.6   |
| Majra     | Behral    | Battamandi    | Kothewali-46 (a)    | C-7   | 6.29   |
|           |           |               | Kothewali-46 (a)    | C-6   | 12.32  |
|           |           |               | Kothewali-46 (a)    | C-1   | 67.91  |
|           |           |               | RFGhuttanpur -45    | C-6   | 56.1   |

|  |            |                 |                     |       |       |
|--|------------|-----------------|---------------------|-------|-------|
|  |            |                 | RFGhuttanpur -45    | C-18  | 57.86 |
|  |            |                 | RFGhuttanpur -45    | C-14  | 15.4  |
|  |            |                 | RFGhuttanpur -45    | C-1   | 54.84 |
|  |            |                 | RFGhuttanpur -45    | C- 10 | 68.43 |
|  |            | Behral          | Ambali-48           | C-6   | 98.1  |
|  |            |                 | Ambali-48           | C-5   | 57.85 |
|  |            |                 | Konchbelli-49       | C-2   | 26.66 |
|  |            |                 | Konchbelli-49       | C-1   | 17.56 |
|  |            | Satiwala        | Mastali-47          | C-9   | 29.18 |
|  |            |                 | Mastali-47          | C-8   | 23.89 |
|  |            |                 | Mastali-47          | C-6   | 35.21 |
|  |            |                 | Mastali-47          | C- 10 | 31.95 |
|  |            | Surjpur         | Mahadev ka khala-44 | C-6   | 14.21 |
|  |            |                 | Surjpur-43          | C-4   | 30.08 |
|  |            |                 | Surjpur-43          | C-3   | 22.64 |
|  | Gharatwali | Gharatwali -(n) | Gharatwali-50 (b)   | C-7   | 39.04 |
|  |            |                 | Gharatwali-50 (b)   | C-6   | 39.04 |
|  |            |                 | Gharatwali-50 (b)   | C-5   | 47.26 |
|  |            |                 | Gharatwali-50 (b)   | C-12  | 66.34 |
|  |            | Gharatwali-(m)  | Gharatwali-50 (a)   | C-4   | 66.72 |
|  |            |                 | Gharatwali-50 (a)   | C-3   | 64.96 |
|  |            |                 | Gharatwali-50 (a)   | C-2   | 40.8  |
|  |            |                 | Gharatwali-50 (a)   | C-1   | 50.24 |
|  |            | Gharatwali-(S)  | Gharatwali-50(c)    | C-9   | 45.84 |
|  |            |                 | Gharatwali-50(c)    | C-8   | 42.9  |
|  |            |                 | Gharatwali-50(c)    | C-11  | 49.28 |
|  |            |                 | Gharatwali-50(c)    | C- 10 | 41.44 |
|  | Majra      | Johron          | Kiarda-40           | C-8   | 15.09 |
|  |            |                 | Kiarda-40           | C-7   | 18.36 |
|  |            | Majra           | Badhighatti-39      | C-4   | 28.17 |
|  |            |                 | Sukhimelion-38      | C-9   | 36.47 |
|  |            |                 | Sukhimelion-38      | C-12  | 25.15 |
|  |            |                 | Sukhimelion-38      | C-11  | 26.16 |

|              |           |               |                  |       |        |
|--------------|-----------|---------------|------------------|-------|--------|
|              |           | Sainwala      | Paniwali-37      | C-5   | 44     |
|              |           |               | Paniwali-37      | C-4   | 41.53  |
|              |           |               | Paniwali-37      | C-3   | 16.23  |
|              | Sunkron   | Sunkron north | Sunkron-56(c)    | C-17  | 60.32  |
|              |           |               | Sunkron-56(c)    | C-16  | 35.86  |
|              |           |               | Sunkron-56(c)    | C-15  | 52.69  |
|              |           |               | Sunkron-56(c)    | C-14  | 67.84  |
|              |           |               | Sunkron-56(c)    | C-13  | 57.76  |
|              |           | Sunkron(S)    | Sukron-56(A)     | C-7   | 35.36  |
|              |           |               | Sukron-56(A)     | C-6   | 67.52  |
|              |           |               | Sukron-56(A)     | C-5   | 22.56  |
|              |           |               | Sukron-56(A)     | C-4   | 47.68  |
|              |           |               | Sukron-56(A)     | C-3   | 47.68  |
|              |           |               | Sukron-56(A)     | C-2   | 58.52  |
|              |           |               | Sukron-56(A)     | C-1   | 47.2   |
|              |           | Sunkron-m     | Sukron-56-b      | C-9   | 44.16  |
|              |           |               | Sukron-56-b      | C-8   | 48.48  |
|              |           |               | Sukron-56-b      | C-12  | 55.36  |
|              |           |               | Sukron-56-b      | C-11  | 40.16  |
|              |           |               | Sukron-56-b      | C- 10 | 55.04  |
| Paonta sahib | Chacheti  | Gattu         | Chhachheti-12(a) | C-7   | 79.6   |
|              |           |               | Chhachheti-12(a) | C-6   | 36.4   |
|              |           |               | Chhachheti-12(a) | C-5   | 64.78  |
|              |           |               | Chhachheti-12(a) | C-4   | 96.84  |
|              |           |               | Chhachheti-12(a) | C-1   | 38.26  |
|              | Chachhati | Sarah         | Sarah-13         | C-9   | 40.06  |
|              |           |               | Sarah-13         | C-5   | 72.94  |
|              |           |               | Sarah-13         | C-4   | 62.6   |
|              |           |               | Sarah-13         | C-3   | 118.32 |
|              |           |               | Sarah-13         | C-2   | 50.42  |
|              |           |               | Sarah-13         | C-1   | 70.77  |
|              |           |               | Sarah-13         | C- 10 | 64.25  |
|              | Chachheti | Chachheti     | Chachheti-12 (b) | C-9   | 35.36  |

|  |           |         |                  |       |        |
|--|-----------|---------|------------------|-------|--------|
|  |           |         | Chachheti-12 (b) | C-8   | 112.52 |
|  |           |         | Chachheti-12 (b) | C-15  | 75.46  |
|  |           |         | Chachheti-12 (b) | C-14  | 65.4   |
|  |           |         | Chachheti-12 (b) | C- 10 | 98.77  |
|  | Gorakhpur | Malgi   | Malgi-14         | C-28  | 15.04  |
|  |           |         | Malgi-14         | C-26  | 13.76  |
|  |           |         | Malgi-14         | C-20  | 22.88  |
|  |           |         | Malgi-14         | C-19  | 13.92  |
|  |           | Rajban  | Gorakhpur- 19(a) | C-3   | 42.76  |
|  |           |         | Gorakhpur- 19(a) | C-2   | 27.67  |
|  |           |         | Gorakhpur- 19(a) | C-1   | 37.23  |
|  |           |         | Rajban-18        | C-5   | 13.08  |
|  |           |         | Rajban-18        | C-4   | 10.06  |
|  |           |         | Rajban-18        | C-3   | 59.11  |
|  |           |         | Rajban-18        | C-2   | 5.04   |
|  |           |         | Rajban-18        | C-1   | 2.52   |
|  | Jamotwa   | Jamotwa | Jamotwa-21(b)    | C-9   | 66.42  |
|  |           |         | Jamotwa-21(b)    | C-7   | 36.58  |
|  |           |         | Jamotwa-21(b)    | C-12  | 57.84  |
|  |           |         | Jamotwa-21(b)    | C-11  | 32.32  |
|  | Khara     | Jhara   | Jhara-27         | C-2   | 33.44  |
|  |           |         | Jhara-27         | C-1   | 38.72  |
|  |           | Khara   | Khara-24         | C-9   | 30.08  |
|  |           |         | Khara-24         | C-8   | 31.84  |
|  |           |         | Khara-24         | C-7   | 25.12  |
|  |           |         | Khara-24         | C-6   | 25.28  |
|  |           |         | Khara-24         | C-5   | 30.4   |
|  |           |         | Khara-24         | C-4   | 29.92  |
|  |           |         | Khara-24         | C-3   | 29.92  |
|  |           |         | Khara-24         | C-2   | 40.48  |
|  |           |         | Khara-24         | C-18  | 17.6   |
|  |           |         | Khara-24         | C-1   | 24.8   |
|  |           |         | Khara-24         | C- 10 | 15.52  |

|  |        |               |                    |       |                   |
|--|--------|---------------|--------------------|-------|-------------------|
|  |        | Lai           | Lai-25(b)          | C-7   | 30.08             |
|  |        |               | Lai-25(b)          | C-5   | 35.36             |
|  |        |               | Lai-25(b)          | C-4   | 32.8              |
|  |        |               | Lai-25(b)          | C-2   | 29.92             |
|  |        |               | Lai-25(b)          | C-11  | 27.36             |
|  |        |               | Lai-25(b)          | C-1   | 25.12             |
|  |        |               | Lai-25(b)          | C- 10 | 22.88             |
|  |        | Toka          | Lai-25(a)          | C-9   | 27.52             |
|  |        |               | Lai-25(a)          | C-8   | 30.56             |
|  |        |               | Lai-25(a)          | C-6   | 37.44             |
|  |        |               | Lai-25(a)          | C-3   | 22.24             |
|  |        |               | Lai-25(a)          | C-12  | 42.4              |
|  |        |               | Mankundion-26      | C-4   | 14.56             |
|  |        |               | Mankundion-26      | C-2   | 25.76             |
|  | Paonta | Garibnath (N) | Garibnath-15 (b)   | C-8   | 17.6              |
|  |        | Garibnath (S) | Garibnath          | C-2   | 25.12             |
|  |        | Gondpur       | Jambu khala-20     | C5    | 28.64             |
|  |        |               | Jambu khala-20     | C4    | 17.28             |
|  |        |               | Jambu khala-20     | C3    | 10.56             |
|  |        |               | Jamotwa-21(A)      | C19   | 26.88             |
|  |        |               | Jamotwa-21(A)      | C18   | 47.52             |
|  |        |               | Jamotwa-21(A)      | C17   | 26.4              |
|  |        |               | Jamotwa-21(A)      | C16   | 44.96             |
|  |        |               | Jamotwa-21(A)      | C14   | 55.2              |
|  |        |               | Mantaruwala-16     | C5    | 38.08             |
|  |        |               | Mantaruwala-16     | C4    | 15.36             |
|  |        |               | Mantaruwala-16     | C2    | 17.6              |
|  |        |               | Mantaruwala-16     | C1    | 12.64             |
|  |        | Rampurbeli    | Rampurbeli-17      | C-1   | 117.65            |
|  |        |               | <b>Grand Total</b> |       | <b>9540.64 ha</b> |

As areas has been degraded due to grazing, lopping and sand mining, plantation activities are needed to rehabilitate these areas.

**Areas identified for Plantations through ground truthing -**

| <b>Sr.No</b> | <b>RANGE</b> | <b>BEAT</b>    | <b>RF/COMPARTMENT</b> | <b>Blank areas (ha)</b> | <b>Remarks</b>                                                             |
|--------------|--------------|----------------|-----------------------|-------------------------|----------------------------------------------------------------------------|
| 1            | Majra        | Sunkron (S)    | RF Sunkron C2         | 5                       | Already proposed for Renukaji Dam CA                                       |
| 2            | Majra        | Sunkron (M)    | RF Sunkron C9 & 12    | 9                       | Already proposed for Renukaji Dam CA                                       |
| 3            | Majra        | Gharatwali (M) | RF Gharatwali C3      | 5                       | Already proposed for Renukaji Dam CA                                       |
| 4            | Bhagani      | Mehruwala      | RF Mehruwala C1       | 20                      | RF Mehruwala C-1=20 ha is already proposed for CA against FCA Case.        |
| 5            | Bhagani      | Danda          | RF Danda C13          | 4.08                    | RF Danda C-13=12.50 ha. is already proposed in CA against FCA Case.        |
| 6            | Bhagani      | Bhagani        | RF Yamuna C1 & C2     | 45                      | RF Yamuna C-1=20 ha, C-2=25 is already proposed for CA against FCA case.   |
| 7            | Bhagani      | Killor         | RF Badhana C3 & C4    | 63.412                  | RF Badhana C-3=29.412 ha. C4=34 ha.                                        |
| 8            | Bhagani      | Majri          | RF Majri C6           | 7                       | RF Majri C-6=7 ha. is already proposed for CA against FCA Case.            |
| 9            | Bhagani      | Dhandla        | RF Dhandla C2 & C8    | 35                      | RF Dhandla C-2=30 ha, C-8=5 ha is Already Proposed in CA against FCA Case. |

|                    |              |          |                              |                |                                                                                              |
|--------------------|--------------|----------|------------------------------|----------------|----------------------------------------------------------------------------------------------|
| 10                 | Bhagani      | Salwala  | RF Kandhela C4 & C5, C7 & C8 | 31             | RF Kandhela C-4 & 5=5ha, C 7= 16 ha, C-8=10 ha. is already proposed for CA against FCA Case. |
| 11                 | Bhagani      | Puruwala | RF Giri C3                   | 9              | RF Giri C-3= 9 ha. is already Purposed                                                       |
| 12                 | Paonta Sahib | Jamotwa  | RF Jamotwa C9                | 2.25           | Jamotwa C-9=2.25 ha. is proposed in CA against FCA Case                                      |
| <b>Grand Total</b> |              |          |                              | <b>235.742</b> |                                                                                              |

Glimpses of successful plantations showcasing the purpose of PCR areas through enrichment and afforestation.



10 ha area plantation, 2020-21, C-8 & 9, RF Khardu, Khardu Beat, Girinagar Range



10 ha area plantation, 2021-22, C-3, RF Giri, Puruwala Beat, Bhagani Range



Site specific solutions should be proposed for the following types of degraded forests along with the learnings of established plantations and native biodiversity;

- a) **Blank areas:** In such areas, uprooting of lantana and weeds shall be done on the 3m broad contour lines and advance earth work shall be done after the disposal of felling debris. Consideration will also be given to fast growing species like *Bamboo*, *Shehtoot*, *Sahjan*, *Dhak*, *Shisham*, *Khirak* etc. This is because the fast growth of these species will overtake lantana in the establishment period.
- b) **Areas with sparse tree growth:** In areas with sparse tree growth, weed removal followed by trenching shall be done. The area shall be made contiguous by linking corridors for plantation so that protection and maintenance is practicable.
- c) **Areas failed in the past:** Such areas have the advantage that the trenches are already done and they are enriched with leaf litter and the moisture regime is better. The trenches shall be located and soil working done in advance. Beating up for maintenance shall be done in these areas with species of *Acacia catechu*, *Dalbergia sissoo*, *Bombax ceiba* and other indigenous species. Seed-ball planting should also be tried slopes.

## 5.6 Analysis and Evaluation of the crop:

**5.6.1 Stock maps:** Stock maps have been prepared on appropriate scale as per area of compartment and attached in respective compartment history files.

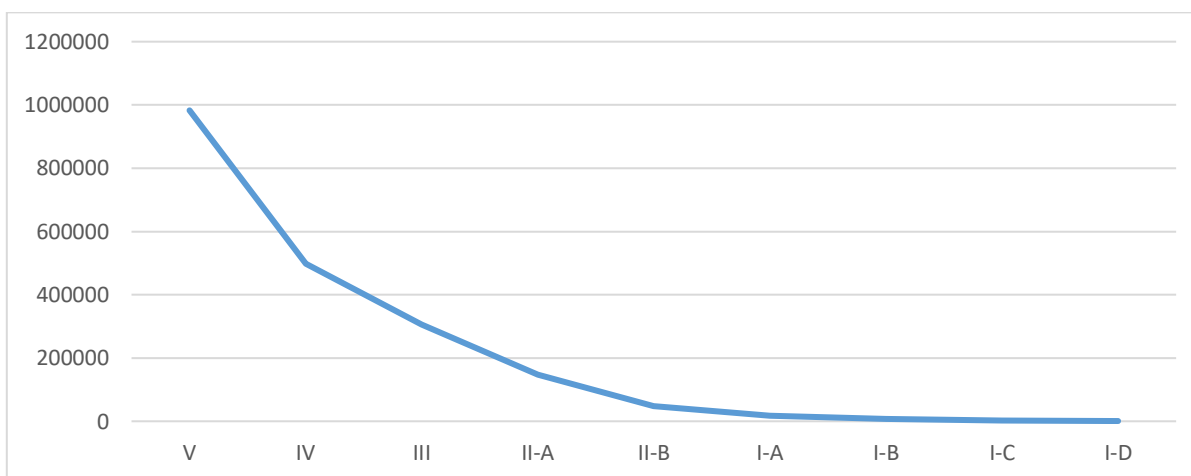
**5.6.2 Enumerations:** The technique of Survey and Assessment of Forest Resource using Grid and Quadrants method (Sample Plots) has been adopted and complete counting of all tree species class wise has been done. A total of 123 Sample Plots of 0.1 hac. were laid in this working circle. The detail of sample plots is as under;

| Sr. No | WC  | No. of sample plots | Total area counted Hac |
|--------|-----|---------------------|------------------------|
| 1      | PCR | 123                 | 12.3                   |

### Growing stock Estimation

| Per Ha. Growing Stock PCR |        |       |       |       |      |      |      |      |      |        |
|---------------------------|--------|-------|-------|-------|------|------|------|------|------|--------|
| Spp                       | V      | IV    | III   | II-A  | II-B | I-A  | I-B  | I-C  | I-D  | Total  |
| BL                        | 74.15  | 26.02 | 11.87 | 6.26  | 2.11 | 0.57 | 0.41 | 0.16 | 0.08 | 121.63 |
| Chil                      | 6.18   | 2.60  | 1.38  | 0.57  | 0.08 | 0.00 | 0.08 | 0.00 | 0.00 | 10.89  |
| Eucalyptus                | 0.24   | 0.49  | 0.41  | 0.49  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.63   |
| Khair                     | 6.99   | 3.09  | 0.73  | 0.08  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.89  |
| Sal                       | 15.61  | 20.16 | 17.64 | 8.05  | 2.85 | 1.22 | 0.24 | 0.16 | 0.00 | 65.93  |
| GT                        | 103.17 | 52.36 | 32.03 | 15.45 | 5.04 | 1.79 | 0.73 | 0.33 | 0.08 | 210.98 |

| Total Growing Stock of PCR (No.)                   |          |          |           |           |          |          |          |          |        |          |
|----------------------------------------------------|----------|----------|-----------|-----------|----------|----------|----------|----------|--------|----------|
| Spp                                                | V        | IV       | III       | II-A      | II-B     | I-A      | I-B      | I-C      | I-D    | Total    |
| BL                                                 | 706363   | 247847   | 113080    | 59639     | 20138    | 5421     | 3873     | 1549     | 774    | 1158684  |
| Chil                                               | 58863    | 24785    | 13167     | 5421      | 774      | 0        | 774      | 0        | 0      | 103784   |
| Eucalyptus                                         | 2324     | 4647     | 3873      | 4647      | 0        | 0        | 0        | 0        | 0      | 15491    |
| Khair                                              | 66608    | 29432    | 6971      | 774       | 0        | 0        | 0        | 0        | 0      | 103785   |
| Sal                                                | 148708   | 192081   | 168071    | 76678     | 27109    | 11618    | 2324     | 1549     | 0      | 628138   |
| GT                                                 | 982866   | 498792   | 305162    | 147159    | 48021    | 17039    | 6971     | 3098     | 774    | 2009882  |
| Total Growing Stock (Volume) PCR (m <sup>3</sup> ) |          |          |           |           |          |          |          |          |        |          |
| Spp                                                | V        | IV       | III       | II-A      | II-B     | I-A      | I-B      | I-C      | I-D    | Total    |
| BL                                                 | 45207.21 | 45603.83 | 47267.57  | 52780.08  | 30508.48 | 12436.44 | 12365.39 | 4944.8   | 2472.4 | 253586.2 |
| Chil                                               | 2966.7   | 6193.66  | 9013.86   | 7342.61   | 1749.42  | 0        | 3697.07  | 0        | 0      | 30963.32 |
| Eucalyptus                                         | 264.93   | 1449.85  | 1936.33   | 2788.19   | 0        | 0        | 0        | 0        | 0      | 6439.3   |
| Khair                                              | 7659.97  | 6416.08  | 3694.63   | 810.71    | 0        | 0        | 0        | 0        | 0      | 18581.39 |
| Sal                                                | 18885.85 | 70685.83 | 140339.12 | 135719.65 | 82139.07 | 53291.64 | 14838.87 | 9888.06  | 0      | 525788.1 |
| GT                                                 | 74984.66 | 130349.3 | 202251.5  | 199441.2  | 114397   | 65728.09 | 30901.33 | 14832.86 | 2472.4 | 835358.3 |



n-D Curve for PCR

**5.6.3 Density:** The crop density varies greatly in these forests from eroded blanks to fairly well stocked forests.

**5.6.4 Natural regeneration:** Natural regeneration is almost absent; some of the areas have been subjected to with artificial regeneration in the past.

**5.6.5 Weeds:** The forests have been invaded with *Lantana* infestation to greater extent along with *Ageratum*, *Colebrookia*, *Woodfordia*.

### **5.7 Silvicultural system:**

No commercial felling is prescribed in this working circle, and only salvage removals of dry and fallen trees are prescribed and their volume so removed will count towards overall yield prescribed for whole of Paonta Sahib Forest Division.

### **5.8 Salvage removals:**

Although no scientific fellings are described but Salvage removals of dry and fallen trees are prescribed and their volume so removed will count towards overall yield prescribed for whole of division.

### **5.9 Yield Exploitable Diameter Rotation/ Regeneration Period:**

No Yield, exploitable dia, Rotation or Regeneration Period is prescribed as these are not required but salvage removals can be done; their volume so removed will count towards overall yield prescribed for whole of division.

**5.10. Method of Treatment:** - The forests of this working circle are divided into four categories-viz (a) Badly eroded areas (b) Grassy blanks (c) Wooded areas (d) Riverine tracts. Their description and treatment are as follows.

**(a) Badly eroded areas:** -Such areas are mainly confined to Bhagani Range. These are to be protected very effectively so that further soil erosion and denudation is prevented. No removals should be done from such areas. Suitable soil conservation measures should be carried out here. Small vegetative measures and check dams may be constructed to check soil erosion. The areas should be closed to grazing and suitable species should be planted. Considerable areas within the division are blank or understocked, heavily infested with lantana and other weeds. These areas are proposed for plantation efforts. Good quality bamboos and grasses should be introduced here. The selection of areas, species and specific treatment is planned by A.C.F or R.O personally. However specific treatment, if any, have also been suggested add recorded compartment History Files.

**(b) Grassy Blanks:** -These areas are very limited and are mostly confined to sub Himalayan region of Bhagani Range. Such areas are covered by grasses or small shrubs. These grassy blanks be planted with indigenous species including Chil, Beul, Amaltas, Bheda, Sain, Shisham and Kachnar etc.

**(c) Wooded Areas:** - These areas included forests which are to be kept in this working circle for mere protection, aesthetics and other similar purpose. Although they bear moderate to well stocked crop. But they must be protected for one or the other purpose cited above. Gap planting and small vegetative measures, as and where required should be carried out.

(d) **Riverine tracts:** - Tracts along Rivers Yamuna and Giri in Paonta Sahib and Bhagani Ranges which are prone to illicit mining and extraction must be protected. These also include vast tracts of 'Kabza Van Vibhag land' and 'Gair Mumkin Nadi' entered in revenue records. Protection of Khair trees (prone to illicit felling) are to ensured by proper watch & ward, joint departmental operations to control illegal mining as well as closures wherever possible.

#### **5.11 Other Regulations: -**

(I) **Closure:** - All areas, which will be taken up for planting or soil conservation measures will remain closed for at least eight to ten years keeping in view the establishment of plantation. No grass cutting shall be allowed in areas falling under category (a) Para 5.10. In other closed areas, grass cutting may be allowed by the D.F.O.

(II) **Grazing & Lopping:** -The existing state of the areas falling under this working circle is mainly due to excessive uncontrolled grazing and lopping. This has to be checked at all costs. Stall feeding should be promoted in villages around such areas. Strict preventive measures should be adopted by field staff to stop/check grazing & lopping. Grass cutting however shall be allowed as per rights in *Fasla -e- junglat*.

(III) **Planting:** - The areas closed for grazing shall be planted by suitable tree species and grasses. Choice of species is guided by preference to Native/ Indigenous species, ability to grow or tolerate extreme weather, importance to wildlife, High growth rate which will compete to invasive species like lantana, species having NTFP value

(IV) **Fire:** - Accidental and deliberate fires occur every summer in some of the areas. Effective and strict fire control measures should be adopted by the field staff.

(V) **Right Holders requirement:** - Right holders' requirements can be met with from the forest of this working circle as per the rights admitted in the Settlement.

**5.12 Importance of Nursery:** Healthy nursery plantable stock with the optimum height and collar diameter is also a crucial criterion for ensuring survival of these plants in the forests. The Division currently has 3 nurseries in Dudhla, Tokiyo and Girinagar with a capacity of more than 4 lakh plants being raised now.

In addition to ensuring the basic infrastructure including vermicompost adequacy, it is also necessary for proper maintenance, shifting and grading of the plants being raised as per Nursery protocols. Monitoring by officers (CF, DFO, ACF, RO) as per Monitoring protocols must be ensured to keep track of growth and give technical inputs required, if any.

Species diversification is another aspect that has to be laid stress upon, especially to avoid monoculture planting and in order to create true mixed forests that are in line with biodiversity considerations. The rare and endangered species, slowly reducing from the native forests (eg Sandan *Ougenia* sp., Tatpatanga *Oroxylum* sp.) must be raised in nurseries as is being done in this Division, as also plants of medicinal and ethano-botanical values that serve the purpose of public distribution well and give Forest Department a positive interface with communities.

A list of nursery techniques has been devised for more than 38 species that are suitable for raising in Paonta Sahib nurseries and have been added in Appendix XIII for reference.



Dudhla Nursery Puruwala Beat, Bhagani Range

## CHAPTER-6

### **EUCALYPTUS PLANTATION RESTORATION & REHABILITATION MANAGEMENT PLAN**

#### **6.1 General Constitution of Working Area:**

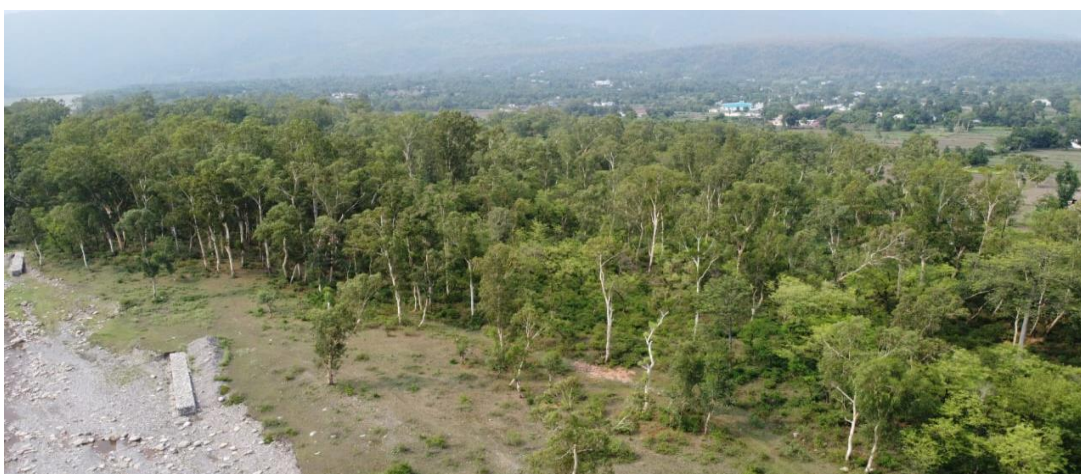
The plantations raised during last years of the third five-year plan under a crash programme of raising large scale plantations of industrial pulpwood. Suitable areas in Sal existing growth leaving some standards were planted with Eucalyptus, the seeds of which were imported from Karnataka. The Mysore hybrid as it was popularly known then was identified later on as *Eucalyptus tereticornis*. In all, 340.10 hectares plantations were carried out under the programme.

**6.2** In Sal belt, however, generally blanks and patches with miscellaneous growth were selected for the purpose. But, some forests in which Sal was growing sparsely were also taken up and there the canopy was opened up by the removal of Sal and miscellaneous growth and Eucalyptus was planted as under storey. The total plantations raised from 1964 to 1978 mentioned in Kumar's Plan were 340.10 ha.

In the current plan, the areas generally overlap the forests falling under Sal Working Circle and Protection cum Rehabilitation working Circle. The successful plantations have resulted in small compact patches whereas the failures in scattered trees are mixed with indigenous species. Only those areas are included in this management plan where Eucalyptus is found in compact patches.

**6.3 General Characteristics of vegetation:** Eucalyptus was planted in sparse Sal areas and other blank areas of forests for pulpwood production and local requirements. It has been observed that Eucalyptus crop in most of the areas has not responded favorably particularly as regards diameter growth. The main reason is the lack of good deep soil. Scattered Sal, Sain, Khair, Shisham and other naturally occurring or planted species are also found along with Eucalyptus in these areas





Eucalyptus plantation patches in RF Giri, Puruwala Beat, Bhagani Range

**6.4 Felling Series, Cutting Section and JFM areas:** There is one felling series prescribed in this Working Circle.

**6.5 Blocks, Compartments and JFM area:**

**Area Statement: -**

| Name of Division | Name of Range | Area (Ha.)   |
|------------------|---------------|--------------|
| Paonta Sahib     | Bhagani       | 114.47       |
|                  | Paonta        | 31.96        |
|                  | Majra         | 171.57       |
|                  | Giri Nagar    | 22.1         |
|                  | <b>Total</b>  | <b>340.1</b> |

### Compartment Statement:

| Range     | Block      | Beat             | RF                  | Compartment No | Eucalyptus Plantation (ha) |
|-----------|------------|------------------|---------------------|----------------|----------------------------|
| BHAGANI   | BHAGANI    | AMBOYA           | Amboya-9(a)         | C-4            | 3.74                       |
|           |            | BHAGANI          | Yamuna-7            | C-2            | 17.28                      |
|           |            | DHANDLA          | Dhandla-6           | C-9            | 12.85                      |
|           |            |                  |                     | C- 10          | 16.09                      |
|           | DHANDLA    | MEHRUWALA        | Mehruwala-8         | C-2            | 3.6                        |
|           | MAJRI      | GOJGER           | Khojjar-5           | C-3            | 3.39                       |
|           |            | MAJRI            | Majri-4             | C-2            | 2.53                       |
|           | RAJPUR     | DANDA            | Danda-9(b)          | C-18           | 6.05                       |
|           |            | PURUWALA         | Giri-10             | C-2            | 10                         |
|           |            |                  |                     | C-1            | 38.94                      |
|           |            |                  | <b>Total</b>        |                | <b>114.47</b>              |
| GIRINAGAR | CHANDPUR   | CHANDPUR -1ST    | Chandpur-62(a)      | C-15           | 2.65                       |
|           |            |                  |                     | C-13           | 3.52                       |
|           | GIRINAGAR  | KHARRARU         | Kharraru-66         | C-9            | 8                          |
|           |            |                  |                     | C-8            | 7.93                       |
|           |            |                  | <b>Total</b>        |                | <b>22.1</b>                |
| MAJRA     | BEHRAL     | BATTAMANDI       | Ghuttanpur-45 (a)   | C-9            | 2.04                       |
|           |            | BEHRAL           | Ambwali-48          | C-2            | 2.58                       |
|           |            | SURJPUR          | Kattapathar-42      | C-9            | 0.76                       |
|           |            |                  |                     | C-8            | 3.98                       |
|           |            |                  |                     | C-7            | 1.94                       |
|           |            |                  |                     | C-1            | 21.38                      |
|           |            |                  | Mahadev ka khala-44 | C-6            | 0.89                       |
|           |            |                  |                     | C-4            | 0.92                       |
|           |            |                  |                     | C-3            | 0.36                       |
|           | GHARATWALI | GHARATWALI - (N) | Gharatwali-50 (b)   | C-5            | 9.38                       |
|           |            |                  |                     | C-12           | 1.5                        |
|           |            | GHARATWALI-(S)   | Gharatwali-50(c)    | C-9            | 2                          |
|           |            |                  |                     | C-8            | 2.7                        |
|           | MAJRA      | JOHRON           | Banswalli-41        | C-7            | 5.12                       |
|           |            |                  |                     | C-1            | 10.2                       |
|           |            |                  | Kiarda-40           | C-4            | 3.7                        |
|           |            |                  |                     | C-2            | 1.5                        |
|           |            |                  |                     | C-1            | 4                          |
|           |            | MAJRA            | Badhighatti-39      | C-3            | 6                          |
|           |            |                  | Sukhimelion-38      | C-2            | 20                         |
|           |            |                  |                     | C-1            | 3.05                       |
|           |            | SAINWLA          | Jamanwali-34        | C-4            | 4.11                       |
|           |            |                  |                     | C-2            | 2.5                        |
|           |            |                  |                     | C-1            | 2.1                        |
|           |            |                  | Paniwali-37         | C-4            | 1.19                       |



|        |              |                    |               |      |               |
|--------|--------------|--------------------|---------------|------|---------------|
|        |              |                    |               | C-3  | 12.25         |
|        |              |                    | Sainwala-36   | C-4  | 4.43          |
|        |              |                    |               | C-3  | 4.86          |
|        |              |                    |               | C-1  | 10.03         |
|        |              |                    | Tokian-35     | C-7  | 3.22          |
|        |              |                    |               | C-3  | 10.95         |
|        | SUNKRON      | SUNKRON NORTH      | Sunkron-56(c) | C-16 | 4.3           |
|        |              |                    |               | C-15 | 7.63          |
|        |              |                    | <b>Total</b>  |      | <b>171.57</b> |
| PAONTA | JAMOTWA      | JAMOTWA            | Jamotwa-21(b) | C-12 | 10            |
|        |              |                    |               | C-11 | 8             |
|        | Paonta Sahib | GARIBNATH (S)      | Garibnath     | C-18 | 3             |
|        |              |                    |               | C-17 | 4             |
|        |              |                    |               | C-16 | 3.44          |
|        |              | GONDPUR            | Jamotwa-21(a) | C17  | 3.52          |
|        |              | <b>Total</b>       |               |      | <b>31.96</b>  |
|        |              | <b>Grand Total</b> |               |      | <b>340.1</b>  |

During the current working plan period treatment of 340.10 Hac. area under eucalyptus plantation is under taken for restoration and rehabilitation under this management plan as mentioned above. This 340.10 Hac. has been derived from Sal Working Circle, Coppice Working Circle etc. After the end of this working plan period the area restored and rehabilitated may be allotted to other working circles after the analysis of crop composition and other parameters.

**6.6 Special Objectives of Management:** Eucalyptus is a species of exotic origin. Eucalyptus was introduced on experimental basis as it finds use as pulp, fuel wood small timber and extensively used in various industries especially paper and pulp industry. The success achieved by Eucalyptus ecologically however has been contested and the plantations have far outlived the utility and continue to exist due to ban on green felling. Therefore, the special objects of management shall be as under: -

- (i) To exploit the existing mature Eucalyptus plantations and replace felled areas by artificial regeneration and plantation of indigenous species.
- (ii) To meet the local requirement of small timber and fuel wood etc.
- (iii) To rehabilitate the areas from long term ecological impacts of eucalyptus, to restore ground water levels and soil fertility

**6.6.1 Analysis of Crop:** Crop consisted of Eucalyptus plantation carried out in the gaps of sal and other indigenous species for paper and pulp production. In the current plan, the area generally overlaps the forests falling under Sal working circle and coppice working circle. The working in the working circle will be the area where Eucalyptus was planted in the patches. Eucalyptus has been impacting on adverse impact on regeneration of indigenous species and also damaging for the ecology and biodiversity of the areas due to allelopathic impact of its leaves on regeneration. Growth of Eucalyptus also not found to be good. Scattered trees of Sal, Sain, Khair and other naturally occurring are also found along with Eucalyptus in these areas.

**6.6.1.1 Stock Maps:** Stock maps have been prepared on appropriate scale as per area of compartment and attached in respective CHF.

**6.6.1.2 Enumerations:** The technique of Survey and Assessment of Forest Resource using Grid and Quadrants method (Sample Plots) has been adopted and complete counting of all tree species class wise has been done. A total of 123 Sample Plots of 0.1 ha were laid in this working area. The detail of sample plots is as under: -

| Sr.No. | Working Area                   | No. of sample plots | Total area counted (ha) |
|--------|--------------------------------|---------------------|-------------------------|
| 1      | Management plan for Eucalyptus | 123                 | 12.3                    |

**6.6.1.3 Growing Stock:** The current growing stock of Eucalyptus has been compiled and presented in tables 6.1 a, b and c. The data shows that there is very low (4%) proportion of miscellaneous native species in Eucalyptus patches. The proportion of Sal is also low (13%). Therefore, indigenous native species like Khair, Sain, Amaltas, Kachnar, Siris, Chhal, Dhuda, Shishametc. may be planted in the felled areas to encourage mixer of native species to improve biodiversity.

**Table 6.1 a. Per ha growing stock (cu m) of Eucalyptus**

| Species            | Classes of Tree |        |       |       |      |      |      |      |      | Total  |
|--------------------|-----------------|--------|-------|-------|------|------|------|------|------|--------|
|                    | V               | IV     | III   | II-A  | II-B | I-A  | I-B  | I-C  | I-D  |        |
| Miscellaneous spp. | 0.00            | 0.00   | 0.00  | 10.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.00  |
| Eucalyptus         | 20.00           | 150.00 | 20.00 | 0.00  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 190.00 |
| Sal                | 10.00           | 10.00  | 0.00  | 10.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 30.00  |

|              |              |               |              |              |             |             |             |             |             |               |
|--------------|--------------|---------------|--------------|--------------|-------------|-------------|-------------|-------------|-------------|---------------|
| <b>Total</b> | <b>30.00</b> | <b>160.00</b> | <b>20.00</b> | <b>20.00</b> | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>230.00</b> |
|--------------|--------------|---------------|--------------|--------------|-------------|-------------|-------------|-------------|-------------|---------------|

**Table 6.1 b. Growing stock in terms of number of trees of Eucalyptus**

|                    | Classes of Trees |              |             |             |          |          |          |          |          |              |
|--------------------|------------------|--------------|-------------|-------------|----------|----------|----------|----------|----------|--------------|
| Species            | V                | IV           | III         | II-A        | II-B     | I-A      | I-B      | I-C      | I-D      | Total        |
| Miscellaneous spp. | 0                | 0            | 0           | 3401        | 0        | 0        | 0        | 0        | 0        | 3401         |
| Eucalyptus         | 6802             | 51015        | 6802        | 0           | 0        | 0        | 0        | 0        | 0        | 64619        |
| Sal                | 3401             | 3401         | 0           | 3401        | 0        | 0        | 0        | 0        | 0        | 10203        |
| <b>Total</b>       | <b>10203</b>     | <b>54416</b> | <b>6802</b> | <b>6802</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>78223</b> |

**Table 6.1 c. Growing stock (cu m) of Eucalyptus**

|                    | Classes of Trees |                 |                |                |             |             |             |             |             |                 |
|--------------------|------------------|-----------------|----------------|----------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| Species            | V                | IV              | III            | II-A           | II-B        | I-A         | I-B         | I-C         | I-D         | Total (cum)     |
| Miscellaneous spp. | 0.00             | 0.00            | 0.00           | 3009.89        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 3009.89         |
| Eucalyptus         | 775.43           | 15916.68        | 3401.00        | 0.00           | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 20093.11        |
| Sal                | 431.93           | 1251.57         | 0.00           | 6019.77        | 0.00        | 0.00        | 0.00        | 0.00        | 0.00        | 7703.27         |
| <b>Total</b>       | <b>1207.36</b>   | <b>17168.25</b> | <b>3401.00</b> | <b>9029.66</b> | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>30806.26</b> |

**6.6.2 Management Practice:** It was recommended by Central Empowerment Committee in 2017 against writ petition (c) of 202 of 1995 that Eucalyptus may be replaced by a mix of native species by artificial regeneration. Silvicultural felling was done in accordance of the order of Hon'ble Supreme Court. Eucalyptus felling was done in Paonta Sahib Forest Division at two sites; RF Giri Compartment 3 (18.5 ha- 379 trees were felled), RF Lai C 28 (118 trees felled in approx 1 ha patch). In RF-Giri C 3 site, plantation of 18.5 ha land was taken up where the site was planted at a norm of 200 tall plants of native species (Shisham, Amla, Jamun, Arjun, Baheda etc.). A total of 3700 plants were planted. The survival percentage of planted mix species was 95%. Eucalyptus exists on multiple sites as an overlapping species in Paonta Sahib Forest Division. A substantial amount of area can be found under the Eucalyptus working area. Therefore, based on the positive experience with this silviculture exercise from both ecological and survival points of view, the objectives and prescriptions have been modified in this Chapter.

The felling period was kept at 15 years in most of the places in the past. The plantations have far outlived the utility and continue to exist due to ban on green felling. Apart from being an ecological misfit, the eucalyptus has limited value as timber or fodder species. As such the eucalyptus covered areas need to be felled and the exotic species needs to be replaced by native species. This will not only be restoring the ecosystem to its original state but will also provide revenue and employment to the locals. Therefore, the system is Clear-Felling (for only Eucalyptus species) with artificial regeneration of native species. As it was recommended by CEC and Hon'ble Supreme court order of 2018 that Eucalyptus be replaced through artificial regeneration using native species. The regeneration period of native species will be 10 years. It is expected that mix crops will attain a minimum of 20 cm dbh in 15 years. Therefore, a rotation of 15 years is prescribed. In case the dbh attained is high, the produce can be used as small timber.

**6.6.3 Felling cycle:** A felling cycle of 10 years is prescribed. Since the system is clear-felling with respect to Eucalyptus and object is to replace it with fast growing native species, the felling cycle is taken as 10 instead of 15 years.

**6.6.4 Calculation of Yield:** Yield shall be controlled by the area as the silvicultural system is clear felling of Eucalyptus followed by artificial regeneration. Total area is 340.10 ha and is to be felled in 10 years. Thus, each annual coupe area will be divided into 34 ha. The list of Forest compartment and areas to be felled is given. Since the rotation is on higher side and the crop is generally over mature and is found in small compact patches of widely varying areas scattered here and there. A 10% reservation especially along Nallahs and streams is however being done keeping in view the adverse ecological conditions that may arise as well as protection purpose.

Total growing stock of Eucalyptus in WC = 20093.11 m<sup>3</sup>

Harvestable Growing Stock: (90% of total GS) = 18083.8m<sup>3</sup>

Growing stock per ha = 53.1m<sup>3</sup>

Size of the coupe: 34 ha

**Annual Yield prescribed** (34 ha size of coupe) = 34x53.1 = **1808 m<sup>3</sup>**

### 6.6.5 Table of Felling:

|         | Name of Range | Name of Forest   | Comptt. No. | Total Area (ha) | Eucalypus management area (ha.) prescribed for felling |
|---------|---------------|------------------|-------------|-----------------|--------------------------------------------------------|
| 2023-24 | Majra         | R-38 Sukhimelion | C1          | 32.00           | 3.05                                                   |
|         |               |                  | C2          | 37.98           | 20.00                                                  |
|         | Paonta        | R-15 Garibnath   | C16         | 22.56           | 3.44                                                   |
|         |               |                  | C17         | 30.08           | 4.00                                                   |
|         |               |                  | C18         | 27.53           | 3.00                                                   |
|         |               | TOTAL            |             |                 | 33.49                                                  |
| 2024-25 | Majra         | R-39 Badhighati  | C3          | 29.68           | 6.00                                                   |
|         | Paonta        | R-21 Jamotwa     | C11         | 40.32           | 8.00                                                   |
|         |               |                  | C12         | 67.84           | 10.00                                                  |
|         |               |                  | C17         | 29.92           | 3.52                                                   |
|         | Girinagar     | R-66 Kharraru    | C8          | 55.08           | 7.93                                                   |
|         |               | Total            |             |                 | 35.45                                                  |
| 2025-26 | Majra         | R-40 Kiarda      | C1          | 28.92           | 4.00                                                   |
|         |               |                  | C2          | 25.15           | 1.50                                                   |
|         |               |                  | C4          | 30.18           | 3.70                                                   |
|         | Bhagani       | R-7 Yamuna       | C2          | 61.12           | 17.28                                                  |
|         |               | R-8 Mehruwala    | C2          | 46.78           | 3.60                                                   |
|         | Girinagar     | R-62 Chandpur    | C13         | 22.39           | 3.52                                                   |
|         |               |                  | C15         | 55.33           | 2.65                                                   |
|         |               | Total            |             |                 | 36.25                                                  |
| 2026-27 | Majra         | R-41 Banswali    | C1          | 28.92           | 10.20                                                  |
|         |               |                  | C7          | 35.21           | 5.12                                                   |
|         |               | R-56 Sunkron     | C15         | 60.32           | 7.63                                                   |
|         |               |                  | C16         | 40.32           | 4.30                                                   |

|         |           |                       |     |        |       |
|---------|-----------|-----------------------|-----|--------|-------|
|         | Girinagar | R-66 Kharraru         | C7  | 41.41  | 8.00  |
|         |           | Total                 |     |        | 35.25 |
| 2027-28 | Majra     | R-42 Kata Pather      | C1  | 25.40  | 21.38 |
|         |           |                       | C7  | 31.44  | 1.94  |
|         |           |                       | C8  | 13.83  | 3.98  |
|         |           |                       | C9  | 15.40  | 0.76  |
|         |           | R-44 Mahadev Ka-Khala | C3  | 40.24  | 0.36  |
|         |           |                       | C4  | 36.22  | 0.92  |
|         |           |                       | C6  | 15.10  | 0.89  |
|         |           | R-48 Ambwali          | C2  | 31.94  | 2.58  |
|         |           | Total                 |     |        | 32.81 |
| 2028-29 | Majra     | R-45 Ghutanpur        | C9  | 20.12  | 2.04  |
|         |           | R-50 Gharatwali       | C5  | 56.64  | 9.38  |
|         |           |                       | C8  | 45.60  | 2.70  |
|         |           |                       | C9  | 47.84  | 2.00  |
|         |           |                       | C12 | 67.84  | 1.50  |
|         |           | R-35 Tokian           | C3  | 17.12  | 10.95 |
|         |           |                       | C7  | 27.84  | 3.22  |
|         | Bhagani   | R-5 Khojjar           | C3  | 52.63  | 3.39  |
|         |           | Total                 |     |        | 35.18 |
| 2029-30 | Bhagani   | R-10 Giri             | C1  | 171.03 | 38.94 |
|         |           | Total                 |     |        | 38.94 |
|         | Majra     | R-37 Paniwala         | C3  | 28.48  | 12.19 |
|         |           |                       | C4  | 42.72  | 1.19  |
|         |           | R-36 Sainwala         | C1  | 23.90  | 10.03 |
|         |           |                       | C3  | 22.64  | 4.86  |
|         |           |                       | C4  | 22.64  | 4.43  |

|         |         |                  |     |       |       |
|---------|---------|------------------|-----|-------|-------|
|         |         | Total            |     |       | 32.70 |
| 2030-31 | Bhagani | R-4 KhodiMajri   | C2  | 62.88 | 2.53  |
|         |         | R-5 Khojjar      | C3  | 52.63 | 3.39  |
|         |         | R-9 DhandaAmboya | C4  | 50.30 | 3.74  |
|         |         |                  | C18 | 40.24 | 6.05  |
|         |         | R-34 Jamnjwali   | C1  | 30.44 | 2.10  |
|         |         |                  | C2  | 44.28 | 2.50  |
|         |         |                  | C4  | 40.24 | 4.11  |
|         |         | Total            |     |       | 24.42 |
| 2031-32 | Bhagani | R-6 Dhandla      | C9  | 42.76 | 12.85 |
|         |         |                  | C10 | 62.88 | 16.09 |
|         |         | Total            |     |       | 28.94 |

**6.6.6 Method of Executing Felling:** The felling of Eucalyptus will be governed by following marking rules:

- (1) All Eucalyptus trees shall be marked. No other species will be felled.
- (2) Unmarked and damaged poles below 10 cm diameter will be cut back at the time of felling.
- (3) In case where Eucalyptus is growing with other species the standards of other species will be kept.
- (4) The stumps in case of coppice felling will be about 15 cm high and will be given a sharp slanting cut facing the direction opposite to sun rays.

**6.6.7 Subsidiary Silvicultural Operations cleaning and thinning:** Following subsidiary operations shall be carried out:

- (1) The area felled shall be completely cleared of the felled material. Nothing will be left after felling. Debris will be collected in nallah and control burnt.

(2) Lantana and other weeds will be removed from the felled areas after felling. Fencing will be carried out well before coming out of coppice shoots of other native species. The fencing will be comprised of five strands of wires and posts

(3) The regeneration area will be fenced for 8-10 years i.e. period upto the establishment of plantation to control grazing/browsing.

(4) Tall plants of important indigenous species like Sain, Toon, Shisham, Kachnar, Siris, Khair etc. shall be planted in gaps.

(5) Removal of weeds and unwanted bush cutting will be continued upto next two-three years.

**6.6.8 Regeneration:** The following operations will be carried out in regenerating areas:

**i. Closure:** The compartments where regeneration is obtained will be closed for grazing. The area will be fenced with 5 strings of barbed wire with fence posts.

**ii. Fire Protection:** In regeneration area, sign boards can be erected so that people may not enter the area during fire season. Small fire lines of 3-5 m width can be constructed on the periphery of regeneration area. These fire lines should be clear from fuel during fire season.

**iii. Removal of Lantana and other bushes:** Lantana and other bushes which interfere with regenerating crop should be removed. The removal is done 2-3 times in a year in initial years of 5 years.

**iv. Regeneration Assessment Survey:** Regeneration assessment survey will be carried out every year till the area is fully regenerated with indigenous species and is closed completely for exercise of rights.

**6.6.9 Associated regulations and Measures:**

(1) Extension of Eucalyptus crop over areas having alternative crop shall be avoided. Suitable indigenous species (Semul, Amaltas, Shisham, Siris, Papdi etc.) should be planted in a mixture instead.

(2) Coppice shoots of Eucalyptus to be removed gradually.

**6.6.10** Calendar of activities to be carried out (As per CEC report) :

**i. Pre-felling planning of operations in preceding year of felling:**



| <b>Activity/Intervention</b>                                                                                                                                                                  | <b>Implementation Time</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Preparation and submission of cost estimates for pre-felling, felling and post felling operations. Fencing and planting                                                                       | April                      |
| Eradication of weeds in forests infested with Lantana and other obnoxious weeds                                                                                                               | September to February      |
| Compartment wise basic technical data in relation to approved working plan and compartment history file to be checked by DFO and to be approved by CF                                         | November                   |
| Validation and approval in principle to take up the forest for silviculture felling by CCF/ APCCF-approval for deviations, if any, from working plan prescription to be sought from PCCF (WP) | December                   |
| Validation of areas and boundaries by GIS cell                                                                                                                                                | January                    |

## **ii. Operations in the year of Felling:**

| <b>Activity/Intervention</b>                                                                          | <b>Implementation Time</b> |
|-------------------------------------------------------------------------------------------------------|----------------------------|
| 100% enumeration for analysis floristic composition of each forest as per approved guidelines         | April-May                  |
| Silvicultural Marking which must include markings/removals for fire lines as per approved guidelines. | June-July                  |
| Approvals of Silvicultural marking by CF after field inspection                                       | 1-15 September             |
| Hand over lots to HPHFDC Ltd                                                                          | By 15 September            |
| Completion of felling and extraction operations                                                       | 31 March                   |
| Procurement of Barbed wire and RCC fence posts                                                        | March                      |

## **iii. Post Felling Operations in the succeeding year for ensuring regeneration**

| <b>Activity/Intervention</b>                                                                                                                                                                           | <b>Implementation Time</b>                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Erection of RCC pole 5 strands barbed wire fencing as per the latest approved cost norms for approved forest to be certified by CF                                                                     | May-June                                     |
| Planting of only tall plants to augment/ supplement natural/coppice regeneration                                                                                                                       | First fortnight of July                      |
| Regeneration Survey Assessment- Natural/coppice/ artificial to be carried out in fenced forest twice a year in April and October as approved guidelines and methodology of assessment of regeneration. | October-November                             |
| Checking onsite compliance of approved interventions for ensuring regeneration by CCF/APCCF as per approved formats. Maintenance to be carried out annually till regeneration is fully established     | 15 <sup>th</sup> Nov to 15 <sup>th</sup> Dec |

## CHAPTER – 7

### **KHAIR (OVERLAPPING) WORKING CIRCLE**

#### **7.1 Name of Working Circle:** Khair (Overlapping) Working Circle

**7.2 General constitution of Working Circle:** The working circle consists of various established Khair plantations. These were raised from 1950s onward in suitable pockets all over the tract largely comprising of vulnerable and erosion-prone areas near streams, nallas etc to basically rehabilitate the degradation areas. The main crop in the compartment included generally miscellaneous broadleaved, scrub and in some cases, Sal is also found distributed. As per CEC guidelines (CEC guidelines issued in I.A No. 87648 of 2020 in Writ Petition (C) No. 202 of 1995 TN Godaverman Thirumlkpad Vs UoI and Ors.), “*No green felling in forest areas falling under Protection-cum-Rehabilitation Circle*”. Keeping in view the guidelines, the 545.47 ha of Khair overlapping (originally in PCR working circle in the past) has been shifted back exclusively to the PCR working circle. This was also done keeping in view the ecological conditions of the said area being prone to landslides, river-mining, illicit felling and bank erosions along border areas of three states (Uttarakhand, Haryana and Uttar Pradesh), therefore no felling of Khair is prescribed for area falling under PCR Working Circle.

Further remaining area of 160.84 ha area which is truly overlapping with Sal WC has been kept under this overlapping working circle. Thus, the final area of Khair working circle (Overlapping) in this Working Plan is 160.84 ha.

**7.3 General Characteristics of Vegetation:** Khair is distributed in Champion and Seth classification of forest types of 3C/C2<sub>b (1)</sub>-Moist Bhabar Sal-Bhabar-Dun Sal, Sub Group(5B)-Northern Tropical dry deciduous forest, 5B/C<sub>1a</sub>-Dry Shiwalik Sal forests and 5B/1<sub>s2</sub>- Khair- Sissoo Forests. The areas support pure even aged Khair crop (above 75%). This has come out mainly as a result of plantations. The earliest record of plantations available is of 1951-52. It shows that in Bhagani Range an area of 2 ha was planted, in Giri R.F 0.5 ha, in Kather and 0.4 ha in East Yamuna in 1951-52 with Khair/Shisham. The quantum of plantations remained very small upto 1968-69. From 1969-70 onwards, we come across larger areas. In many areas, Khair was planted pure whereas in some of them it carried a mixture of Shisham, Semal, Bahera or other broadleaved species. In some areas, trees like Sal and Sain are also found. These occur naturally as Khair planting was also undertaken in some suitable pockets in Sal/ scrub forests. At some places, Kachnar, Drek etc. are also found mixed. These species were also planted there along

with Khair. The spacing in plantations is generally 3 x 3 m. At some places, however, it is 2.5 x 2.5m also.

Over a period of time, openings have occurred in the plantations. These are mainly due to salvage removals/illicit felling in the past. Some trees show signs of heart rot (*Fomes badius* Berk.) and Witch's broom. No serious attack of any disease is, however, noted. Lopping is common throughout the area. Among the bushes, prominent is *Lantana camara* which has invaded the openings and forms a complete cover there. Others are *Murraya* (gandhela or kadipatta), *Carissa* (Kandlai or Katrarh) and *Adhatoda* (basooti or bansa).

It is also pertinent to mention here that Khair presence is also there in riverine tracts of land classified as *Malik- Himachal Pradesh Sarkar, Kashtkar/Kabza Van Vibhag, Type/Kism: Gair-mumkin Nadi* in revenue records. No records of the same are available with forest department. Moreover, no working is prescribed since the area is highly prone to mining and erosion.

**7.4 Felling Series, Cutting Section and JFM areas:** Felling series will be only one, named as Poanta Felling Series as mentioned in Table 7.6.9.

**7.5 Blocks, Compartments and JFM area:** The blocks and compartments area range wise are given as under:

| Range     | Block     | Beat     | RF            | Compartment no. | Area (ha)    |
|-----------|-----------|----------|---------------|-----------------|--------------|
| Bhagani   | Bhagani   | Amboya   | Amboya-9(a)   | C- 10           | 7.27         |
|           |           |          | Dhandla-6     | C- 10           | 8.64         |
|           | MAJRI     | Gojjer   | Khojjar-5     | C-9             | 5            |
|           |           |          | Khojjar-5     | C-8             | 15           |
|           |           |          | Danda-9(b)    | C-16            | 22.52        |
|           |           |          | Danda-9(b)    | C-13            | 3.56         |
|           |           |          | Danda-9(b)    | C-11            | 8.56         |
|           |           |          | Kandela-11(a) | C-5             | 4.08         |
|           |           |          | Kandela-11(a) | C-3             | 6.53         |
|           |           |          | Kandela-11(a) | C-2             | 16.28        |
|           |           |          | <b>Total</b>  |                 | <b>97.44</b> |
| Girinagar | Girinagar | Kharraru | Khrarraru-66  | C-9             | 10           |
|           |           |          | <b>Total</b>  |                 | <b>10</b>    |
| MAJRA     | MAJRA     | Johron   | Banswalli-41  | C-8             | 15           |
|           |           |          | Banswalli-41  | C- 10           | 2            |
|           |           |          | KIARDA-40     | C-3             | 2            |
|           |           |          | <b>Total</b>  |                 | <b>19</b>    |
|           |           | Rajban   | Rajban-18     | C-6             | 4            |
|           | Khara     | Jhara    | Jhara-27      | C-20            | 5            |

|  |  |      |                    |      |               |
|--|--|------|--------------------|------|---------------|
|  |  | Toka | Lai-25(a)          | C-33 | 2             |
|  |  |      | Lai-25(a)          | C-25 | 5             |
|  |  |      | Lai-25(a)          | C-23 | 7             |
|  |  |      | Garibnath-15(b)    | C-7  | 5.08          |
|  |  |      | Garibnath-15(b)    | C-12 | 1.78          |
|  |  |      | Garibnath-15(b)    | C-11 | 4.54          |
|  |  |      | <b>Total</b>       |      | <b>34.4</b>   |
|  |  |      | <b>Grand Total</b> |      | <b>160.84</b> |

**Figure 7.1 Range wise allotment of area under Khair WC**

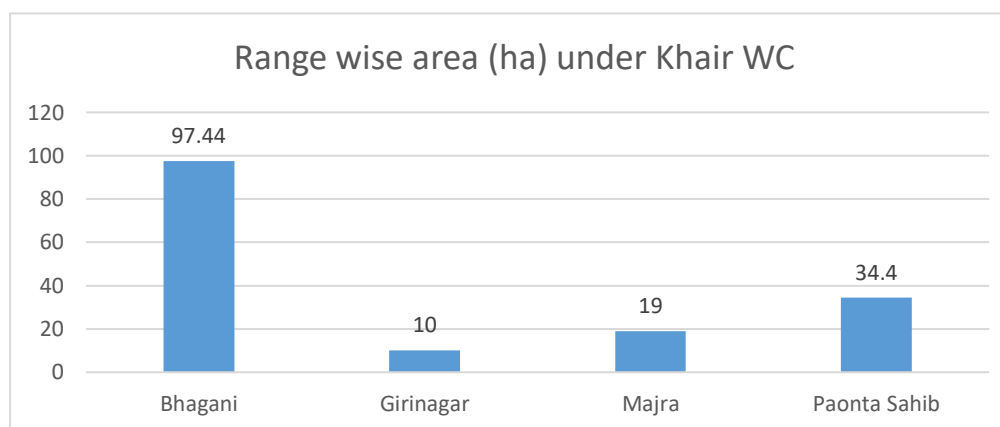


Figure 7.1 revealed that maximum workable area of Khair is in Bhagani range followed by Paonta, Girinagar and Majra ranges. On ground truthing of entire 160.84 ha of Khair WC, it was found that Khair plantations were actually found on 86.96 ha area. The plausible reasons for the reduction in actual area include rot, salvage and illicit removals, plantation failures etc. Therefore, for yield calculation purpose, same area of 86.96 ha has been considered so that maximum possible extent of the true picture of the yield will be reflected. The DFO shall ensure 100% enumeration when working for silviculture in Khair WC.

**7.6 Special Objectives of Management:** The followings are the objectives of this working circle:

- (i) To bring pure Khair (75% or above) plantation under scientific management
- (ii) To augment supply of Khair wood for Katha manufacture, fuel wood and fence posts
- (iii) To maintain ecological balance by planting of mixture of indigenous species along with Khair

### 7.6.1 Analysis of Crop:

**7.6.1.1 Stock maps:** Stock maps have been prepared on appropriate scale as per area of compartment and attached in respective Compartment history files.

**7.6.1.2 Enumerations:** The technique of Survey and Assessment of Forest Resource using Grid and Quadrants method (Sample Plots) has been adopted and complete counting of all tree species class wise has been done for the entire 160.84 ha area. A total of 28 Sample Plots of 0.1 ha were laid in this working circle. The detail of sample plots is as under:

| Sr. No | Working Circle      | No. of sample plots | Total area counted (ha) |
|--------|---------------------|---------------------|-------------------------|
| 1      | Khair (Overlapping) | 28                  | 2.8                     |

### 7.6.1.3 Growing Stock Estimation Results:

Table 7.1 below revealed the statistics of growth of Khair. Due to higher value of Khair tree and low exploitable diameter, the volume factor is based on 5 cm diameter class as was adopted in previous working plan by Sh. Vineet Kumar and reproduced as under:

Table 7.1 Volume (cu m) of Khair in different diameter classes

| Diameter Classes (cm) | Quality of Crop | Commercial timber in round (m3) | Heartwood (m3) |
|-----------------------|-----------------|---------------------------------|----------------|
| Oct-15                | V-1             | 0.083                           | -              |
| 15-20                 | V-2             | 0.115                           | 0.068          |
| 20-25                 | IV-1            | 0.149                           | 0.093          |
| 25-30                 | IV-2            | 0.218                           | 0.139          |
| 30-35                 | III-1           | 0.34                            | 0.303          |
| 35-40                 | III-2           | 0.53                            | 0.405          |
| 40-45                 | IIA-1           | 0.768                           | 0.503          |
| 45-50                 | IIA-2           | 1.047                           | 0.66           |
| 50 & above            | IIB & above     | 1.283                           | 0.883          |

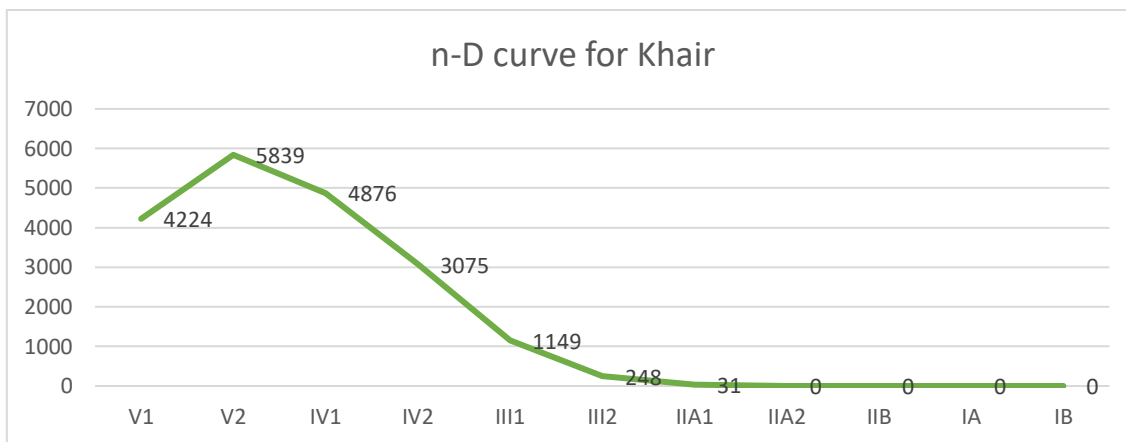
The tables 7.2 a, b, c, showed the number of trees in sample plots and growing stock in terms of per ha volume, total number of Khair trees in the working circle and total growing stock of trees for 86.96 ha. The data of growing stock revealed that maximum Khair crop in this working circle is at 15-20 cm dbh. Khair by volume is more than Sal, as well as in terms of no. of trees, Khair is the maximum. This also correlates with the fact that Khair of plantation origin were done in Sal forests and Sal Working Circle areas.

| Table 7.2a Per ha Growing stock (cum) of Khair WC |      |      |      |      |      |      |      |      |      |      |      |      |    |       |
|---------------------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|----|-------|
| Species                                           | V1   | V2   | IV1  | IV2  | III1 | III2 | IIA1 | IIA2 | IIB  | IA   | IB   | IC   | ID | TOTAL |
| Khair                                             | 4.03 | 7.68 | 8.35 | 8.25 | 4.66 | 1.14 | 0.27 | 0    | 0    | 0    | 0    | 0    | 0  | 34.38 |
| Sal                                               | 0    | 0    | 0    | 0.13 | 0    | 3.28 | 0    | 6.32 | 3.25 | 3.28 | 4.56 | 4.56 | 0  | 25.38 |
| Shisham                                           | 0    | 0.18 | 0    | 1.13 | 0    | 0.67 | 0    | 0.7  | 0    | 0    | 0    | 0    | 0  | 2.68  |
| Kokath                                            | 0    | 0.34 | 0    | 0.99 | 0    | 1.05 | 0    | 0.63 | 1.08 | 0.82 | 1.14 | 0    | 0  | 6.05  |
| TOTAL                                             | 4.03 | 8.21 | 8.35 | 10.5 | 4.66 | 6.13 | 0.27 | 7.65 | 4.33 | 4.1  | 5.7  | 4.56 | 0  | 68.49 |

| Table 7.2b Growing stock of Khair WC in terms of number of trees |      |      |      |      |      |      |      |      |     |    |    |    |    |       |
|------------------------------------------------------------------|------|------|------|------|------|------|------|------|-----|----|----|----|----|-------|
| Species                                                          | V1   | V2   | IV1  | IV2  | III1 | III2 | IIA1 | IIA2 | IIB | IA | IB | IC | ID | TOTAL |
| Khair                                                            | 4224 | 5839 | 4876 | 3075 | 1149 | 248  | 31   | 0    | 0   | 0  | 0  | 0  | 0  | 19442 |
| Sal                                                              | 0    | 0    | 0    | 31   | 0    | 342  | 0    | 311  | 93  | 62 | 62 | 62 | 0  | 963   |
| Shisham                                                          | 0    | 280  | 0    | 497  | 0    | 31   | 0    | 62   | 0   | 0  | 0  | 0  | 0  | 870   |
| Kokath                                                           | 0    | 466  | 0    | 528  | 0    | 217  | 0    | 62   | 62  | 31 | 31 | 0  | 0  | 1397  |
| TOTAL                                                            | 4224 | 6585 | 4876 | 4131 | 1149 | 838  | 31   | 435  | 155 | 93 | 93 | 62 | 0  | 22672 |

| Table 7.2c Growing Stock of Khair WC in terms of Volume (cum) |        |        |        |        |        |        |       |        |        |        |       |       |    |         |
|---------------------------------------------------------------|--------|--------|--------|--------|--------|--------|-------|--------|--------|--------|-------|-------|----|---------|
| Species                                                       | V1     | V2     | IV1    | IV2    | III1   | III2   | IIA1  | IIA2   | IIB    | IA     | IB    | IC    | ID | TOTAL   |
| Khair                                                         | 366.04 | 685.74 | 763.54 | 737.98 | 415.45 | 98.76  | 23.85 | 0      | 0      | 0      | 0     | 0     | 0  | 3091.37 |
| Sal                                                           | 0      | 7.89   | 0      | 11.43  | 0      | 285.26 | 0     | 549.71 | 376.41 | 427.38 | 594.9 | 594.9 | 0  | 2847.88 |
| Sain                                                          | 0      | 15.9   | 0      | 98.39  | 0      | 58.01  | 0     | 60.69  | 0      | 0      | 0     | 0     | 0  | 232.99  |

|               |               |               |               |               |               |               |              |               |               |               |               |              |          |                |
|---------------|---------------|---------------|---------------|---------------|---------------|---------------|--------------|---------------|---------------|---------------|---------------|--------------|----------|----------------|
| <b>Kokath</b> | 0             | 29.81         | 0             | 85.72         | 0             | 90.87         | 0            | 54.97         | 94.1          | 71.25         | 99.17         | 0            | 0        | <b>525.89</b>  |
|               | <b>366.04</b> | <b>739.35</b> | <b>763.54</b> | <b>933.52</b> | <b>415.45</b> | <b>532.91</b> | <b>23.85</b> | <b>665.37</b> | <b>470.52</b> | <b>498.62</b> | <b>694.06</b> | <b>594.9</b> | <b>0</b> | <b>6698.13</b> |



**7.6.1.4 Density:** The crop has moderate density owing to plantation origin patches as well as salvage removals or natural blanks.

**7.6.1.5 Site Quality:** The site qualities are not standardized, mostly ranging from III/IV. However, height measurement of Khair trees was taken from some plantation areas, which corroborated with Haldwani Forest Division studies – referring to poor site quality. In a few places e.g. RF Giri, the quality also goes up.

**7.6.2 Silvicultural System:** The silvicultural system will be Coppice with Standards system. Khair trees will be harvested (25cm dbh and above) in line with CEC approved guidelines approved By Hon’ble Supreme Court for I. A. Nos.12688 and 38050/2023). All young trees will also be retained for the future crop. The Khair forests are mixed with Shisham, Semal, Sal, Eucalyptus, Jhingan, etc. However, they will not be exploited as per recommendations of CEC with regard to Khair Working Circle.

**7.6.3 Rotation Period:** The rotation period is 30 years for Coppice during which the crop is expected to attain dbh of 25 cm in general. The rotation for standards is fixed at 40 years when the crop diameter attains 30 cm.

**7.6.4 Harvestable Diameter:** The CEC recommendation is ‘*minimum diameter of 25 cms at breast height in respect of natural forests.*’ The exploitable diameter is therefore fixed at 25 cm for Khair (for coppice) and 30 cm (for standards). Also, regarding the other species the

recommendation mentions, “no felling of broadleaved species be permitted in the compartments to be taken up for regeneration felling irrespective of any recommendations which might have been made in the Working Plans” is considered. Hence, other species will not be considered for felling.

**7.6.5 Reducing factors and reducing area:** No reduction is applied.

**7.6.6 Felling Cycle:** 30 years as per CEC Guidelines (Khair of plantation origin coppices fast after first removal. With reference from Troupe’s ‘Silviculture of Indian trees’, 30 years is proposed keeping in view the quality and quantity of *Katha* ‘as heartwood of very old trees would not be of good quality or quantity’.)

**7.6.7 Division into Periods and allotment to Periodic Blocks:** Since silvicultural system of this working circle is Coppice with standard and seeding felling will be carried out as per the annual coupes in the compartments. Therefore, no periodic block is allotted.

**7.6.8 Calculation of Yield:**

i) Total area under Khair (Overlapping) WC = 160.84 ha out of which Khair present in 86.96 ha

ii) Annual area (Coupe) to be felled =  $86.96/30 = 3$  ha (app.)

**Yield from the Final Felling:**

| Yield Calculations                                                | Vol. (m <sup>3</sup> ) |
|-------------------------------------------------------------------|------------------------|
| Total Growing Stock (V1) above 25 cm dia (Prescribed for felling) | 1276                   |
| Annual Yield V4 = V3/Felling Cycle (30 yrs)                       | 42.5                   |

\* I.A No. 87648 of 2020; CEC approved guideline by Hon’ble Supreme Court

**7.6.9 Table of felling:** The compartment wise area to be felled per year is indicated below:

| Sr No | Year      | Range   | Forest      | Compartment | Area (Ha) |
|-------|-----------|---------|-------------|-------------|-----------|
| 1     | 2023-2024 | Bhagani | Danda-9(b)  | C-11        | 3         |
| 2     | 2024-2025 | Bhagani | Danda-9(b)  | C-11        | 3         |
| 3     | 2025-2026 | Bhagani | Danda-9(b)  | C-11        | 3         |
| 4     | 2026-2027 | Bhagani | Danda-9(b)  | C-11        | 3.74      |
| 5     | 2027-2028 | Bhagani | Amboya-9(a) | C- 10       | 3         |
| 6     | 2028-2029 | Bhagani | Amboya-9(a) | C- 11       | 2.28      |



|    |           |              |                 |       |      |
|----|-----------|--------------|-----------------|-------|------|
| 7  | 2029-2030 | Girinagar    | Khrararu-66     | C-9   | 3    |
| 8  | 2030-2031 | Girinagar    | Khrararu-66     | C-9   | 3.49 |
| 9  | 2031-2032 | Bhagani      | Danda-9(b)      | C-16  | 3    |
| 10 | 2031-2032 | Bhagani      | Danda-9(b)      | C-16  | 0.77 |
|    |           | Bhagani      | Dhandla-6       | C- 10 | 2.17 |
| 11 | 2032-33   | Bhagani      | Kandela-11(a)   | C-2   | 3    |
| 12 | 2033-34   | Bhagani      | Kandela-11(a)   | C-2   | 3.5  |
| 13 | 2034-2035 | Bhagani      | Kandela-11(a)   | C-2   | 3.5  |
| 14 | 2035-2036 | Bhagani      | Kandela-11(a)   | C-2   | 3.7  |
| 15 | 2036-2037 | Paonta sahib | Lai-25(a)       | C-25  | 2.75 |
| 16 | 2037-2038 | Paonta sahib | Garibnath-15(b) | C-11  | 3    |
| 17 | 2038-2039 | Bhagani      | Danda-9(b)      | C-13  | 2.5  |
| 18 | 2039-2040 | Bhagani      | Danda-9(b)      | C-13  | 2.31 |
| 19 | 2040-2041 | Majra        | Banswalli-41    | C- 10 | 1.85 |
|    |           | Bhagani      | Khojjar-5       | C-9   | 0.96 |
| 20 | 2041-2042 | Bhagani      | Kandela-11(a)   | C-3   | 2.65 |
| 21 | 2042-2043 | Bhagani      | Kandela-11(a)   | C-3   | 2.65 |
| 22 | 2043-2044 | Majra        | KIARDA-40       | C-3   | 3    |
| 23 | 2044-2045 | Majra        | KIARDA-40       | C-3   | 1.68 |
|    |           | Paonta sahib | Garibnath-15(b) | C-12  | 1.2  |
| 24 | 2045-2046 | Bhagani      | Dhandla-6       | C- 10 | 2.5  |
| 25 | 2046-2047 | Bhagani      | Dhandla-6       | C- 10 | 2.5  |
| 26 | 2047-2048 | Bhagani      | Kandela-11(a)   | C-5   | 2.13 |
| 27 | 2048-2049 | Bhagani      | Kandela-11(a)   | C-5   | 2.13 |
| 28 | 2049-2050 | Bhagani      | Danda-9(b)      | C-16  | 3    |
| 29 | 2050-2051 | Bhagani      | Danda-9(b)      | C-16  | 3    |
| 30 | 2051-2052 | Bhagani      | Danda-9(b)      | C-16  | 3    |

**7.6.10 Method of Executing Felling:** The State of Himachal Pradesh has filed I.A No. 87648 of 2020 in Writ Petition (C) No. 202 of 1995 seeking permission of from Hon'ble Supreme Court to allow the State to carry out silviculture felling of Khair (*Acacia catechu*) trees in the forest areas of the State in accordance with the Approved Working Plans. **Recommendations of Central Empowered Committee approved By Hon'ble Supreme Court for I. A. Nos. 12688 and 38050/2023 in May 2023 are as follows basis which the prescriptions have been made.**

i) Subject to availability of Government of India approved working plans permission for silvicultural felling including thinning in the State of Himachal Pradesh in respect of Khair Working Circles be limited to forest areas occurring below 1500 MSL in ten forest divisions so as to encourage regeneration of the forests aimed at achieving mixed species forests with multi layered canopy.

- ii) The removal of Lantana weed to be an integral component of regeneration felling and first round of removal of Lantana has to be completed as per standard prescribed procedure before the felling operations commence;
- iii) The eradication operations of Lantana shall continue during 2nd and 3rd years of operations so as to ensure total elimination of the weed;
- iv) The mother trees / seed bearer trees are to be identified in advance i.e. at least one or two years prior to the proposed felling in the compartment and labelled as mother trees or standards and these trees are not permitted to be lopped by locals thereafter;
- v) There will be total ban on burning of debris including after seeding or over wood felling in order to encourage natural regeneration of broad-leaved species and reduce soil erosion
- vi) The demarcation and survey of boundaries and fencing of the area are to be scrupulously carried out as prescribed in the Reports of the Monitoring Committee and as prescribed in schedule;
- vii) No felling of broad-leaved species be permitted in the compartments to be taken up for regeneration felling irrespective of any recommendations which might have been made in the Working Plans;
- viii) Regeneration of Khair is undertaken through coppice with standards as well as artificial planting. In respect of pure Khair plantations the first two rotations regeneration is achieved through coppice supplemented by planting seedlings in gaps;
- ix) Rotation age of Khair be kept at 30 years with minimum dia. of 25 cm at breast height in respect of natural forests. However, in respect of pure plantations of Khair same rotation age of 30 years be followed without a limit on the girth of trees and such plantations are regenerated through coppice for at least another two rotations and supplemented with artificial regeneration;
- x) Each compartment will act as unit of regeneration area in Khair Working Circle. The officer in charge of the Forest Circle, while preparing the First Preliminary Working Plan, will fix an annual target for taking up silvicultural fellings of Khair in the working plan of a given forest division after dividing by twenty the total number of compartments in Khair working circle in a given territorial forest circle;

- xi) As far as possible the felling operations in the adjoining forest compartment of the already felled area/compartment in Khair Working Circle are to be taken up only after 5 years of regeneration felling in the given compartment and after ensuring that the regeneration is established in the already cleared forest area. This will ensure that the large tracts of the forest in a given locality are not closed for grazing at any given time and also large gaps are not created within the forest;
- xii) Planting component in Assisted Natural Regeneration shall include at least 50% seedlings of native broad-leaved and multipurpose use species and the rest shall be of Khair;
- xiii) All the un-authorized occupation of forest land within the forest area are evicted before undertaking planting of the compartments selected;
- xiv) Adequate soil and moisture conservation measures are to be undertaken in regeneration area;
- xv) **No green felling is to be carried out in steep slopes and along streams and nallas as per the standard prescription in the Working Plan Code and in the forest, area falling under Protection cum Rehabilitation Working Circle;**

#### **7.6. 11 Subsidiary Silvicultural Operations cleaning and thinning:**

**I) Slash Disposal:** Slash after felling will be removed from felling areas immediately and will be disposed of in nallah areas. The slash can also be provided to the local people for their needs.

**II) Bush/Lantana Cutting:** Lantana and other harmful weeds should be removed from the compartments before felling operations otherwise weeds and other bushes will suppress coppice regeneration. The regeneration takes 6-7 years to establish. It is prescribed to carry on bush/Lantana cutting by monkey jack after winter rains but before seed fall so as to take advantage of natural regeneration in freshly exposed soil which becomes available after uprooting the bushes by monkey jack. The eradication of Lantana weed should be an integral component of regeneration felling. Therefore, the removal of Lantana must be completed before the felling operations commence so that the regeneration of the felled area is taken up forthwith. Successful regeneration would depend on successful Lantana management. It is imperative that Lantana management operations are carried out in accordance with the protocol with no deviation. Staff must be adequately trained and must go through refresher courses at regular intervals. It has also been noticed that wherever correct protocol for Lantana management has

not been followed, the results of regeneration are not commensurate with the efforts and funds spent. The success of any silvicultural operation cannot be there without management of Lantana in accordance with the protocol.

**III) Planting:** (Only after Final Felling). The result of coppicing will be cleared in the year next to the year of felling. Therefore, planting shall have to be carried out in lieu of failed stumps as soon as the position becomes clear. Planting component in Assisted Natural Regeneration shall include at least 50% seedlings of native broad leaved and multipurpose use species and the rest shall be of Khair nursery stock should be raised accordingly. The planting of suitable species can be carried out. Beating up failures may also be also carried out as and when required.

**IV) Cleaning and thinning:** Cutting of climbers and other bushes interfering with regeneration are to be removed as and when required while singling operation in coppice stumps will be started after 3 years of felling stumps. Singling will improve growth at faster rate to single leaders.

**7.6.12 Regeneration:** As per CEC recommendation “*regeneration of Khair is undertaken through coppice with standards as well as artificial planting*”. ‘50% should comprise Khair, and remaining should be native broad-leaved species.’

The coppice regeneration shall have to be supplemented by artificial regeneration. This will have to be done immediately in the year next to the year of felling. The natural regeneration by seed, if appears, shall have to be well protected. Regeneration of the felled forests will be undertaken during the rainy season (planting season) using tall seedlings, more or less of same species, naturally occurring in the district. The regeneration of the area is achieved through coppice growth, artificial planting and natural regeneration to ensure development of broadleaved mixed forest. While taking up plantation it is ensured that at least 50% of the seedling are used other than the Khair species. The number of plants to be planted per hectare will be decided on the basis of site requirement and ranged from 200 to 800 plants per ha. The principal species Khair in these forests should constitute half the proportion (50%) in case of enrichment planting. Artificial regeneration operations which meant planting of tall nursery grown plants will be done on priority in the felled areas which have to be fenced. In respect of pure Khair plantations the first two rotations regeneration is achieved through coppice supplemented by planting seedlings in gaps.

The regeneration areas will be protected from forest fires. All the fuels/debris in the peripheral felled areas will be controlled burnt before fire season. All the necessary arrangement will also

be made for control of forest fires. All regeneration areas are to be inspected at CCF and DFO level.

#### **7.6.13 Associated regulations and Measures:**

**i. Closure:** All finally felled areas shall be closed for grazing till the crop is completely established i.e. becomes beyond the danger of being grazed/browed/trampled by cattle. A period of about 7-8 years is required for the purpose. Five strands of barbed wire fencing including one cross strand using concrete pillars strongly anchored in the ground with cement concrete on ground and side supports has been prescribed. Fencing of the proposed regeneration compartments is mandated to be done before the re-generation work commences. Lopping and grazing will be suspended till the establishment of regeneration. T.D. can be sanctioned in areas other than those under closure.

**ii. Boundary Demarcation:** As per CEC guidelines, felling compartments will be identified with GPS demarcation and polygons of felled compartments/sites will be prepared.

**iii) Fire Protection:** Effective fire prevention measures are to be ensured in regeneration areas. As also recommended by CEC, total ban on burning and Fire Protection: total ban on burning of debris arising from felling and weeding operations to encourage natural regeneration and reduce soil erosion. Cleaning/clearing of fire lines along the boundary fence is to be undertaken to protect the natural regeneration and plantation from damages of fire.

**iv) Adequate soil and moisture conservation measures:** The SMCs works will have to be undertaken in regeneration area. Creation of small water storage structures and check dams to strengthen water regime can go a long way in enriching soil and regulating soil moisture regime.

#### **7.6.14 Calendar of activities to be carried out (As per CEC report for Khair) :**

##### **i. Pre-felling planning of operations in preceding year of felling:**

| <b>Activity/Intervention</b>                                                                                                                          | <b>Implementation Time</b> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Preparation and submission of cost estimates for pre-felling, felling and post felling operations. Fencing and planting                               | April                      |
| Eradication of weeds in forests infested with Lantana and other obnoxious weeds                                                                       | September to February      |
| Compartment wise basic technical data in relation to approved working plan and compartment history file to be checked by DFO and to be approved by CF | November                   |

|                                                                                                                                                                                               |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Validation and approval in principle to take up the forest for silviculture felling by CCF/ APCCF-approval for deviations, if any, from working plan prescription to be sought from PCCF (WP) | December |
| Validation of areas and boundaries by GIS cell                                                                                                                                                | January  |

## ii. Operations in the year of Felling:

| Activity/Intervention                                                                                 | Implementation Time |
|-------------------------------------------------------------------------------------------------------|---------------------|
| 100% enumeration for analysis floristic composition of each forest as per approved guidelines         | April-May           |
| Silvicultural Marking which must include markings/removals for fire lines as per approved guidelines. | June-July           |
| Approvals of Silvicultural marking by CF after field inspection                                       | 1-15 September      |
| Hand over lots to HPHFDC Ltd                                                                          | By 15 September     |
| Completion of felling and extraction operations                                                       | 31 March            |
| Procurement of Barbed wire and RCC fence posts                                                        | March               |

## iii. Post Felling Operations in the succeeding year for ensuring regeneration

| Activity/Intervention                                                                                                                                                                                  | Implementation Time                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Erection of RCC pole 5 strands barbed wire fencing as per the latest approved cost norms for approved forest to be certified by CF                                                                     | May-June                                     |
| Planting of only tall plants to augment/ supplement natural/coppice regeneration                                                                                                                       | First fortnight of July                      |
| Regeneration Survey Assessment- Natural/coppice/ artificial to be carried out in fenced forest twice a year in April and October as approved guidelines and methodology of assessment of regeneration. | October-November                             |
| Checking onsite compliance of approved interventions for ensuring regeneration by CCF/APCCF as per approved formats. Maintenance to be carried out annually till regeneration is fully established     | 15 <sup>th</sup> Nov to 15 <sup>th</sup> Dec |

## CHAPTER-8

### WATER RESOURCE MANAGEMENT & SOIL CONSERVATION (OVERLAPPING) WORKING CIRCLE

#### 8.1 Constitution of Working Circle

The working circle is overlapping in nature and will include all working circles

Water resource management is the activity of planning, developing, distributing and managing the optimum use of water resources. It is an aspect of water-cycle management. The field of water resources management will have to continue to adapt to the current and future issues facing the allocation of water. With the growing uncertainties of global climate change and the long-term impacts of past management actions, this decision-making will be even more difficult. It is likely that ongoing climate change will lead to the situations that have not been encountered. As a result, alternative management strategies, including participatory approaches and adaptive capacity are increasingly being used to strengthen water decision-making.

Ideally, water resource management planning has regard to all the competing demands for water and seeks to allocate water on an equitable basis to satisfy all uses and demands. As with other resource management, this is rarely possible in practice so decision-makers must priorities issues of sustainability, equity and factor optimization to achieve acceptable outcomes. One of the biggest concerns for water-based resources in the future is the sustainability of the current and future water resource allocation.

Sustainable Development Goal no. 6 has a target related to water resources management: "*Target 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.*"

Like water, soil is an extremely valuable natural resource that is indispensable for supporting plant and animal life, including forests. In the absence of vegetal cover, soil gets lost through the process of erosion. In the forest estate under study, water erosion is the dominant form of erosion. Water erosion takes place through the formation of rills and gullies. The situation has been exacerbated by uncontrolled grazing, lopping, forest fires and defective extraction paths that make soil more vulnerable towards erosion. When the land is left barren, the flow of water results not only in the loss of soil cover, but also reduces water percolation, resulting in the depletion of water table and drying of water sources such as wells, ponds and springs. This working circle therefore also aims to prioritise critical areas that require immediate and effective preventive and remedial measures for water conservation and the control of soil erosion. It tries to stabilise the erosion infected areas by the use of vegetative cover and / or mechanical measures. On the

preventive front, it also tries to minimise troublesome anthropogenic activities in and around forested areas. Concomitantly, it endeavours to evolve an acceptable strategic methodology for diverse soil and water conservation works to be executed throughout the forest estate. All the areas of forest which are prone to soil erosion would also be part of this Working Circle. The main emphasis is to reduce top soil erosion and minimize soil loss during floods. The effective soil conservation measures along with the catchment and watershed management are the pre-conditions for a sustainable forest management. The forests are also sources of water (surface, sub-surface and ground water). Over exploitation of the ground water resources results in a decline in ground water levels; there is an urgent need to augment the ground water resources through suitable management interventions. It is desirable to have forest management practices with the principles of watershed-based development approach especially in the source areas of water. Such areas should have restrictions on tree felling but there should be operations to improve the water regimes and natural regeneration. Special provisions shall be made in the working plan to sustain water resources and to address the livelihood issues of the people living in and around the natural inland water sources. Further, areas susceptible to soil erosion such as steep slopes and areas in the vicinity of perennial streams shall be focused for soil and water conservation using mechanical or vegetative control measures.

**8.2 Special Objects of Management:** The special of Management are as under

1. To survey and identify the available source of water in the jurisdiction of working plan area'
2. To identify the recharge zones
3. To prepare and implement spring shed management plan.
4. To link forest management with watershed management.
5. To develop forest as to increase percolation and to reduce run-off.
6. To prioritize critical areas that requires immediate and effective preventive and remedial measures for water conservation and the control of soil erosion.
7. To stabilise the erosion infected areas by the use of vegetative cover and / or mechanical measures.
8. To periodically monitor the river flow pattern with reference to annual rainfall/duration to show the status of improvement due to various control measures proposed.



### **8.3 Core Strategy**

Watershed approach to protect soil and water would be undertaken in the Division. The stream/river sand will be protected as it acts as cushion for the meandering waterways. Catchment area treatment will be carried out based on the need to protect the fertile soil of the forest. The concept of springshed sanctuaries will be promoted. Hydrological regime will be maintained and flow of environmental goods and services is to be ensured by maintaining the runoff. The regenerative capacity of the endemic species will be enhanced by maintaining the optimum soil moisture. Activities would be undertaken with involvement of fringe village population.

A total ecosystem conservation concept will be adopted for conservation of the wildlife habitat and conservation of biodiversity in these forests. An effective naturalization plan needs to be devised based on principles for maintaining natural diversity. To enrich the low diversity areas, efforts should be made to restore native (indigenous) complementing natural species. Monocrop should be avoided. Natural regeneration should be encouraged and wherever necessary, aided natural regeneration should be taken up. Introduction of exotic species in the area will be restricted and plantation of both, slow and fast-growing native species of herbs, shrubs, and trees shall be promoted. Involvement of local communities especially youth, women from the forest and fringe villages will be sensitized in forest protection.

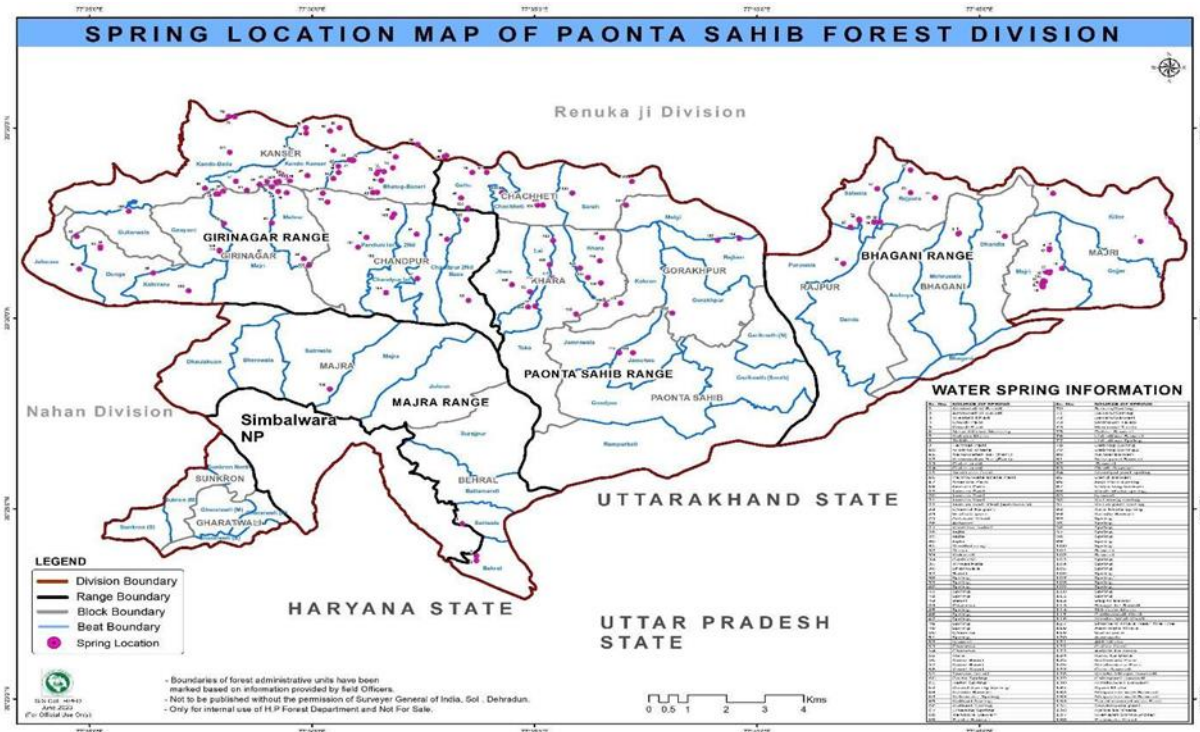
### **8.4 PROPOSED TREATMENT**

1. The recharge zone of water resource area be protected from biotic interferences
2. The forest cover around spring shed area should be increased by planting suitable tree, herb, shrubs and grasses species.
3. The rights and concessions of local right holders in recharge zone areas should be exercised in exigencies and in minimum quantities.
4. The measures like contour bunding, Contour trenching, percolation trenches etc. should be included in annual plan operations.
5. The engineering structures like water harvesting structures, farm ponds, percolation tanks /wells be included in annual plan of operations
6. The funding be ensured from various schemes like State plan, centrally sponsored schemes, CAMPA, CSR etc.

Summarily, for soil and water conservation works, the following model should be followed, as has been further discussed with the success of Project Jalodari:

- Identification of SWC related issues during micro planning.
- Technical and social feasibility of soil and water conservation works.
- Development of detailed project report.
- Gully plugging works to check further extension of the gullies.
- Minor engineering works in eroded areas and in slips prone areas to check the soil erosion and reduce runoff.
- Create works on the sides of diversion drains to checking further cutting of the drains/channels.
- Planting of cuttings of soil binding species in vegetative spurs but avoid exotic species.
- Gabion structures mainly retention walls, diversion drains if required after technical feasibility would be proposed. Proper anchorage of the gabion structures needs to be ensured.
- Creation of continuous trenches across the slope and planting of soil binding species in the pit. The dug-out soil will be placed towards the flow of water to check the soil erosion and reduce run-off.
- Riparian species and other less transpiring, water conserving species should be planted on the riparian areas and near water bodies.
- **Identification of spring sheds** The field survey was conducted and different

information sources was compiled as depicted below on the map:



### 8.5.1 Success Model of Project Jalodari

Project Jalodari was carried out in collaboration with Himmothan society, an arm of Tata trust in Dhaulakuan beat of the Paonta Sahib Forest Division. Elaborate consultative meetings apprising ground-water and forest degradation issues/ workshops on technical aspects were held among all stakeholders and a detailed project was devised and approved by Government of Himachal Pradesh. The working model of the groundwater recharge project involved

- Geological/technical expertise and funding of Himmothan.
- Terrain knowhow and monitoring of forest department
- Labor and consequential employment of local villagers
- All the structures were made by participants of local Van Samiti who were provided wage labour.
- The geographical location of all structures was inventorised.
- The protection walls and check-dams yielded instant results, the change in recharge and water-table owing to trenches and percolation ponds shall be measured in medium-term. The Project went on to win President's Award of 'Swachh Sujal Shakti Samman' under 'Catch the Rain' Programme by Ministry of Jal Shakti in February 2023.

#### Recharge ponds under Project Jalodri

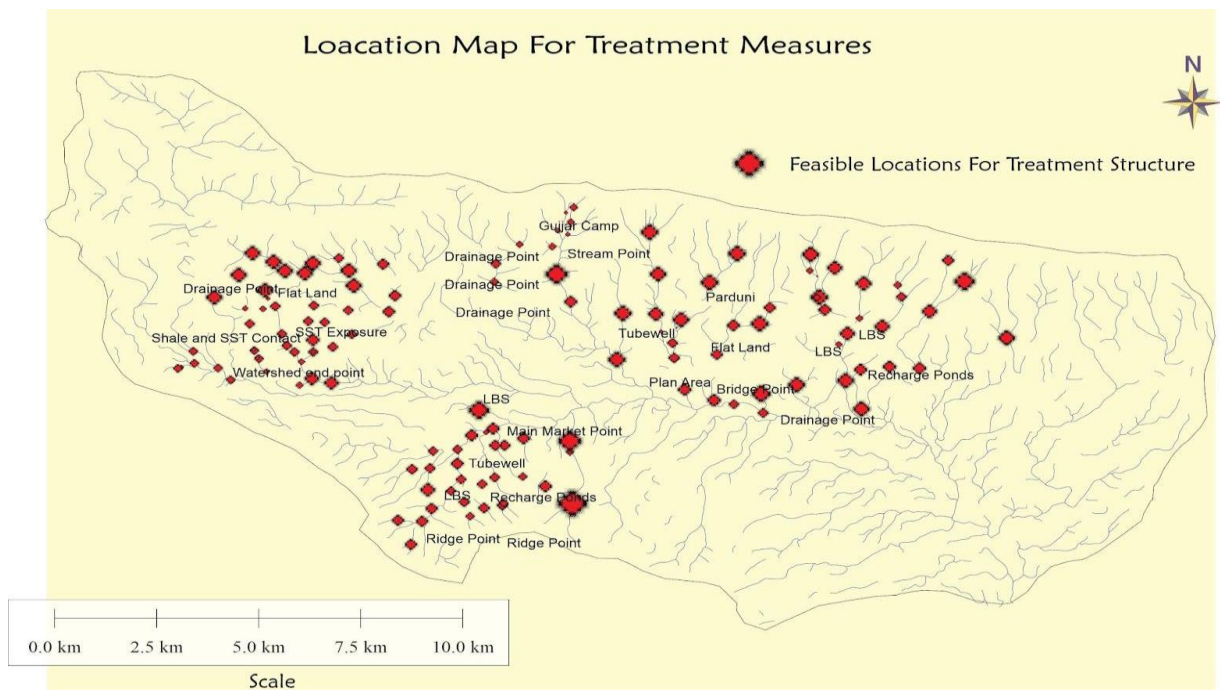






Rainwater percolation

## Location Map for Treatment Measure



## 8.6 UNDERSTANDING MODEL FOR HOLISTIC WORKS IN GIRINAGAR RANGE:

The works were conducted in the last two years under the Project Jalodri after comprehensive technical studies by geologists engaged with Himmothan society and Forest Department. With the success of this model, the future model of water resource management is proposed.

Soil and water conservation work: The groundwater development and conservation works are much essential for the sustainability of the aquifer system. Excavation of staggered contour trenches in the sloppy terrain and recharge ponds on comparatively flat areas are initiated in this area. The volumetric details of these structures are given below for one-time filling during monsoon season (taking 40% evaporation and other losses).

| Sr. No                          | Type of Structures | Total No's | Volume   |         |
|---------------------------------|--------------------|------------|----------|---------|
|                                 |                    |            | Cum      | Ltr     |
| 1                               | SCT                | 90         | 320.2    | 320200  |
| 2                               | Recharge Ponds     | 253        | 4245.754 | 4245754 |
| Sub-Total                       |                    | 343        | 4565.954 | 4565954 |
| Evaporation @40%                |                    |            |          | 1826382 |
| Total Groundwater recharge @60% |                    |            |          | 2739572 |



*Recharge Ponds Structures on comparatively flat area.*





*Staggered Contour Trenches on slopes*

About Catchment Treatment area and activities

The whole process for digging of trenches and recharge ponds activity was initiated in approx. 25 ha area of Byas reserve forest area. Details of treatment measures adopted for groundwater development is given below.

#### **8.6.1 Trenching**

Trenching is one of the major engineering measures for erosion control in non-arable lands and is mainly aimed to slope stabilization and drainage line treatment as well as groundwater development. The area with steep slope, are prone to soil erosion due to lack of vegetative cover and accelerated transportation of soil. The slopy area exhibits the characteristics of “high rainfall, quick drainage” that provides little retention time to the runoff to infiltrate into the soil profile. The overland flow velocity is often surpassing the safe limit to cause soil erosion from surface. The trenches constructed in these regions of address the problem of soil conservation to act as flow barrier (restricting the flow velocity within the safe limit from soil erosion point of view) and facilitating in-situ water conservation for establishment of vegetation.



#### **8.6.2 Recharge Ponds**

Recharge ponds are rectangular shape water conservation structures usually larger in length and width in comparison of trenches. These types of structures are usually recommended for the area

having slope ranges between 0-15% in average. The depth of these structures is depending on the thickness and strength of soil cover constituting the area.



| Volumetric Details of recharge Structures |                    |            |                 |                |
|-------------------------------------------|--------------------|------------|-----------------|----------------|
| Sr. No                                    | Type of Structures | Total No's | Volume          |                |
|                                           |                    |            | Cum             | Ltr            |
| 1                                         | SCT                | 90         | 320.2           | 320200         |
| 2                                         | Recharge Ponds     | 253        | 4245.754        | 4245754        |
| <b>Sub-Total</b>                          |                    | <b>343</b> | <b>4565.954</b> | <b>4565954</b> |

### 8.6.3 Drainage line treatment works

The drainage line treatment works are useful in the prevention of rapid erosion from drainage flow during rainy season. These works included construction of gabion structures, protection walls structures with crate/GI wire mess. Foundation excavation and filling of loose boulder into GI mess for gabion/protection wall structure was completed at Chandpur reserve forest area.

**8.6.4 Reason Behind large gabion wall:** -The construction of this large gabion cum loose boulder structure with crate wire mess was also a part of the submitted detail technical report to DFO Office during Nov-2019. The main objective of these structure is protection of local aquifer area from rapid erosion cause by the heavy flow of drainage and also helpful to local forest species. Another reason behind the construction of this structure is the availability of material required for short dimensional, feasible sites for gabion structures coming under the core zone of the reserve forest area and are much far from the reach of local labor.





### ***Construction of Gabion structures***

This gabion structure with crate wire structures is also saving the 37 no. of Sal trees from rapid erosion caused by the drainage. All volumetric and dimensional details of this structure is given below in tabular form. For long term sustainability of this structure, the construction is followed by two step design with crate wire mess.

| <b>Dimensional Details (Mtr)</b> |               |              |               |                         |
|----------------------------------|---------------|--------------|---------------|-------------------------|
| <b>Type</b>                      | <b>Length</b> | <b>Width</b> | <b>Height</b> | <b>Stone Used (Cum)</b> |
| Step-1                           | 92            | 2            | 1.5           | 276                     |
| Step-2                           | 91.4          | 1.5          | 1.2           | 164.52                  |

**Inspection visits by field staff:** Continuous visits to the catchment treatment sites for the technical feasibility, damage/loss of fauna or local flora and other quantitative or qualitative inspection of all structures built for water security purpose.

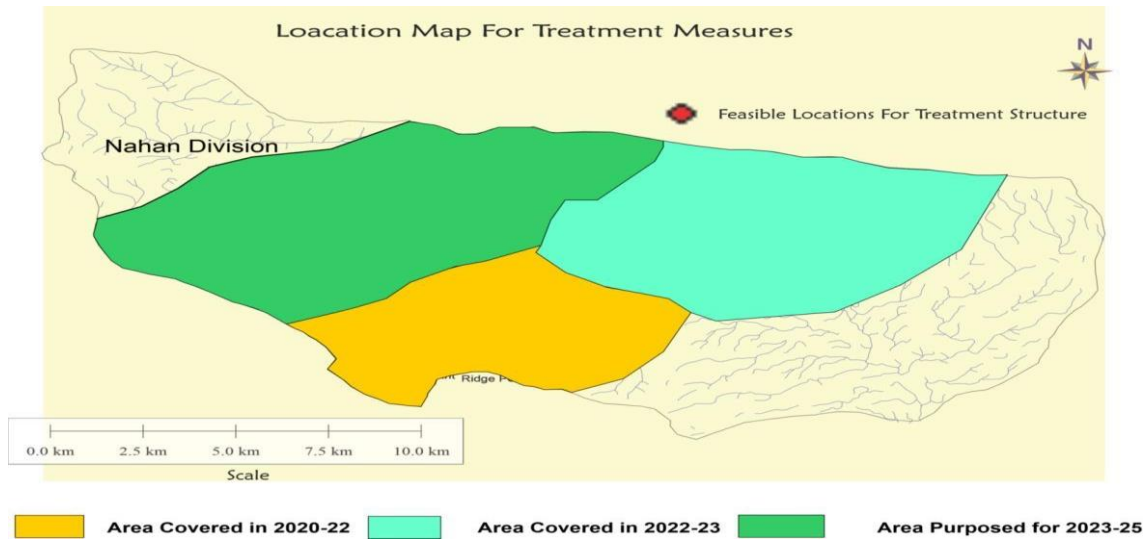
### **8.7 FUTURE SCOPE:**

A combination of proper surveying, intensive treatment measures with expertise and CSR contribution can prove to be a replicable model for recharging of watersheds and springsheds.

**The ongoing and future scope of treatment under Bata Watershed area is depicted below.**

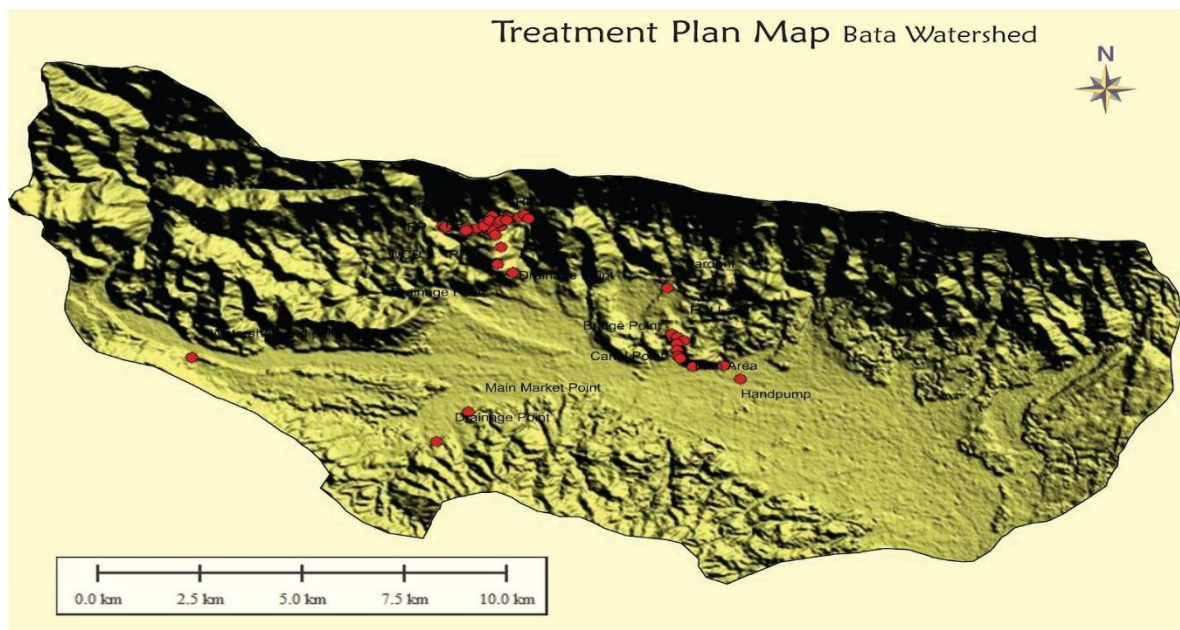
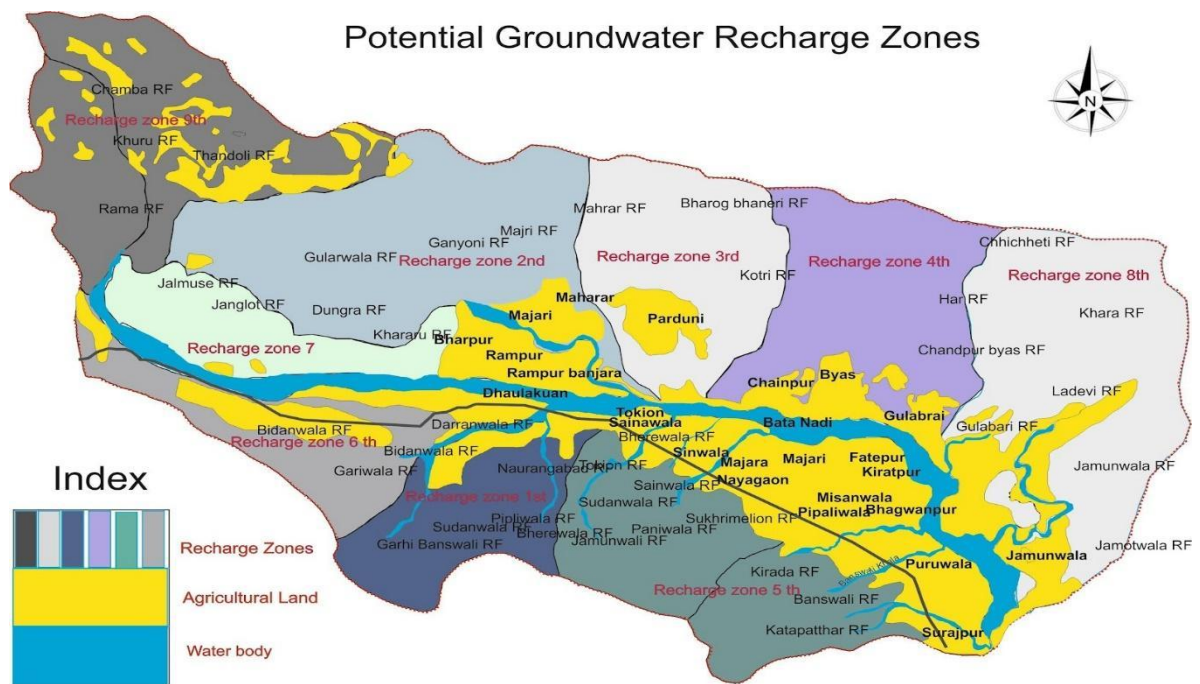


## Location Map for Treatment Measures



**8.7.1 Recharge Area Details:** - The possible recharge area of the aquifer system which is feeding the demand of groundwater in this valley situated near or surrounding the area dominated by loose unconsolidated soils with alteration of fine grained silty and clayey material, fluvial sediments deposited by the river's or drainages flowing in this area. Whole area is in a shape of valley bounded by two perennial rivers. Due to the presence of coarse-grained sandy material the storability and transmissivity of aquifer system is comparatively high and the river which is flowing throughout the year also playing an important role to recharge this aquifer system.

Treatment area for recharge activity (mechanical measures) falls in both right and left bank of Bata River, Northern direction of Bata watershed. Medium to Dense sal forest located in treatment area and treatment area falls under Girinagar range. Maximum and minimum altitude of the catchment area is 850m and 450m, average slope percentage of Catchment area is 19.8 % and slope range 0° to 15° as show in slope map. Treatment area comprise by sandstone in upper ridges sand clay to silt stone alternation of sandstone and siltstone observed in treatment area and thick cover of fine grained silty to clayey soil, various size boulders of sandstone, siltstone present in catchment area. Geomorphic slope aspect of treatment area show is NE to SW direction.



**Treatment plan to be implemented for Dunga & Janglot Beats of Paonta Sahib Forest Division in the next 2 years (technical analysis has been conducted)**

#### a) Recharge Ponds

| Sr. no. | Earthen Works                      | Location of structure          | Total Ponds | Rate/ Pond | Cost of Excavation (Rs.) |
|---------|------------------------------------|--------------------------------|-------------|------------|--------------------------|
| 1       | Recharge pond<br>(Size : 9x5x1 m3) | 30°31'20.05"N<br>77°25'51.83"E | 80          | 8775       | 702000                   |

### b) Contour & Staggered Trenching

| Sr.No | Line item        | Size of Structure |           |        | Location and                                        |                      | No's of Trenches & Rate |                         |               | Total Cost for |
|-------|------------------|-------------------|-----------|--------|-----------------------------------------------------|----------------------|-------------------------|-------------------------|---------------|----------------|
|       |                  |                   |           |        | Recharge area                                       |                      |                         |                         |               |                |
|       |                  | Leng<br>th        | Widt<br>H | Height | GPS                                                 |                      | No's of<br>Trenches     | Total<br>No Trench<br>h | Rate / Trench |                |
|       | Earthen<br>Works | (m)               | (m)       | (m)    | Location of<br>structure                            | Are<br>a<br>in<br>Ha | /Ha                     |                         |               | Excavation     |
| 1     | CCT/SC<br>T      | 3                 | 0.6       | 0.6    | 30°31'41.20"N<br><br>77°25'18.30"E<br>30°31'41.78"N | 6                    | 180                     | 1080                    | 210.6         | 227448         |
| 2     | CCT/SC<br>T      | 4                 | 0.9       | 0.6    | 77°25'19.66"E                                       | 5                    | 120                     | 600                     | 421.2         | 252720         |
| 3     | CCT/SC<br>T      | 5                 | 0.9       | 0.6    | 30°31'28.57"N<br><br>77°25'30.33"E                  | 4                    | 100                     | 400                     | 526.5         | 210600         |
| 4     | CCT/SC<br>T      | 3                 | 1         | 0.6    | 30°31'18.83"N<br><br>77°25'34.97"E                  | 3                    | 120                     | 360                     | 351           | 126360         |
| 5     | CCT/SC<br>T      | 4                 | 1         | 0.6    | 30°31'19.88"N<br><br>77°25'42.65"E                  | 5                    | 120                     | 600                     | 468           | 280800         |
| Total |                  |                   |           |        |                                                     | 23                   | -                       | 4140                    | -             | Rs. 1097928    |

### (c) Loose Boulder Check Dams

| Sno | Line item     | Size of Structure |           |            | Location                         | No's of Structure & Rate |             | Total Cost for Construction |
|-----|---------------|-------------------|-----------|------------|----------------------------------|--------------------------|-------------|-----------------------------|
|     | Earthen Works | Leng<br>th        | Wid<br>th | Heig<br>ht | GPS Location<br><br>of structure | Total No Ponds           | Rate / Stru |                             |
|     |               | (m)               | (m)       | (m)        |                                  |                          |             |                             |
| 1   |               | 12                | 1.5       | 1.5        | 30°30'59.18" N                   | 2                        | 77664       | 155328                      |
|     |               |                   |           |            | 77°25'33.71"E                    |                          |             |                             |

|    |                                    |    |     |     |                                    |   |       |        |
|----|------------------------------------|----|-----|-----|------------------------------------|---|-------|--------|
| 2  | Loose<br>Boulder<br><br>Check Dams | 11 | 1.5 | 1.5 | 30°30'59.13"<br>N                  | 2 | 71369 | 142738 |
| 3  |                                    | 10 | 1.5 | 1.5 | 77°25'31.94"E<br>30°30'59.52"<br>N | 2 | 65540 | 131080 |
| 4  |                                    | 8  | 1.5 | 1.5 | 77°25'30.32"E<br>30°30'58.02"<br>N | 2 | 54309 | 108618 |
| 5  |                                    | 8  | 1.5 | 1.5 | 77°25'27.85"E<br>30°31'01.74"<br>N | 2 | 54309 | 108618 |
| 6  |                                    | 5  | 1.5 | 1.5 | 77°25'27.12"E<br>30°31'06.03"<br>N | 2 | 34589 | 69178  |
| 7  |                                    | 10 | 1.5 | 1.5 | 77°25'23.04"E<br>30°31'08.64"<br>N | 2 | 65540 | 131080 |
| 8  |                                    | 10 | 1.5 | 1.5 | 77°25'23.03"E<br>30°31'12.90"<br>N | 2 | 65540 | 131080 |
| 9  |                                    | 10 | 1.5 | 1.5 | 77°25'23.50"E<br>30°31'15.04"<br>N | 2 | 65540 | 131080 |
| 10 |                                    | 8  | 1.5 | 1.5 | 77°25'22.21"E<br>30°31'15.74"<br>N | 2 | 54309 | 108618 |
| 11 |                                    | 8  | 1.5 | 1.5 | 77°25'22.46"E<br>30°31'16.97"<br>N | 2 | 54309 | 108618 |
| 12 |                                    | 6  | 1.5 | 1.5 | 77°25'22.27"E<br>30°31'22.36"<br>N | 2 | 40518 | 81036  |
| 13 |                                    | 7  | 1.5 | 1.5 | 77°25'22.54"E<br>30°31'30.72"<br>N | 1 | 47104 | 47104  |
|    |                                    |    |     |     | 77°25'21.36"E                      |   |       |        |

**d) Vegetative measures**

| <b>Sr. No</b> | <b>Type</b>  | <b>Area</b> | <b>Rate</b> | <b>Total</b>      |
|---------------|--------------|-------------|-------------|-------------------|
| 1             | Plantation   | 5Ha         | 96000       | 480000            |
| 2             | Grasses      | 27Ha        | 10000       | 270000            |
|               | <b>Total</b> |             |             | <b>Rs. 750000</b> |

All these activities are subjected to ground-water development soil moisture conservation and prevention of erosion. These structures can control the erosion rate of earth material as well as also raise the ground-water level of this area.

Similar studies can be conducted by DFO concerned for further identification of water resource management areas in other parts of Paonta Sahib Forest Division basis hydrological and climatic impact analysis in future. Since watershed approach converges with other Divisions as well including Nahan, Renukaji, Shimla (WL), convergence planning can be done for a holistic water treatment plan as per the watershed area spread and site-specific requirements that will lead to a long-term rejuvenation of water-resources in the region.

## CHAPTER 9

### THE FOREST PROTECTION (OVERLAPPING) WORKING CIRCLE

**9.1 General Constitution:** -This Working Circle includes all forests which overlaps with other Working Circles and is constituted to address the forest protection problems like Fire, Illicit felling, Encroachment, Illegal mining etc. The forest areas which are vulnerable to fire, status of damage reports, progress in prosecution/ compounding and illicit felling, mining etc. along with their future strategies are also discussed in detail under this Working Circle. This Working Circle is overlapping Working Circle which includes other land cutting across other Working Circles. The rivers Giri and Yamuna are prone to illicit mining in Paonta Sahib Forest Division. Yamuna River is also the border between Himachal Pradesh and Uttarakhand, it is difficult to act since the offenders can escape to neighboring state. Collaborative action with neighboring state is required. Some rivers contain extensive Khair patches which are difficult to protect on a porous boundary. About 60% of the forest cover in the division is Sal forest which sheds leaves in pre-summer posing potent fire danger. The Sal timber is commercially valuable too. The Paonta valley is much more densely populated than upper Himachal and thus pressure on forest is higher & encroachment issues prevail. Overall, protection issues are a major concern in this Division.

**9.2 General Character of Vegetation:** -The forests allotted to this Working Circle have their scattered distribution throughout the tract; hence, they represent various forest types starting from scrub and riverine in lower elevations to Sal and Chil forests extending up to higher elevation. These types are described under the different Working Circles constituted under this plan.

**9.3 Special objects of Management:** -The special objects of management of the forest allotted to this Working Circle are: -

1. To protect all forests from all types of forest offences, including indiscriminate exploitation and to preserve eco-systems of the region.
2. To protect and conserve all forest land to ensure no illegal mining, encroachment and non-forestry activities on forest land under the provision of Indian Forest Act, 1927, HP Mines & Mineral (Concession) Revised Rules, 1971, Mines & Minerals (Development & Regulation) Act, 1957, Forest (Conservation) Act, 1980, HP Land Revenue Act, 1954 and HP Public Premises & Land (Eviction & Rent Recovery) Act, 1971 etc.

3. To address the problem of forest fire to the best possible extent by adopting the legal measures and other preventive measures under the provision of Law i.e. IFA, 1927, IPC and Prevention of Damage to Public Property Act, 1984.
4. To manage grazing in the Division as per carrying capacity while keeping in view the rights of various stakeholders

#### **9.4 Illicit Felling: -**

**9.4.1 General:** -Though organized and large-scale illicit felling in this division has been largely contained by various administrative, patrolling and legislatives measures, but threat remains high in the Division. Also, owing to Paonta Sahib Forest Division's location being at the cusp of 4 state borders namely Himachal Pradesh, Uttarakhand, Uttar Pradesh and Haryana, the Division area becomes a crucial transit point for movement of forest produce. Open forest wealth is accessible to people especially near road side and multiple entry and exit routes. Illicit felling of trees by unscrupulous mafia is another factor responsible for damaging the forest property. The details of cases of illicit felling of trees detected for the period 2012-13 to 2022-23 is tabulated in Table No. 9.1

**Table No. -9.1**

| Year wise detail of illicit felling cases in respect of Paonta Sahib Forest Division for the period 2012-13 to 2022-23 |                                              |                          |                                  |                                |                         |                                  |              |                         |                                  |                                  |                          |                                     |                 |                              |                                      |                                  |
|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------------|----------------------------------|--------------------------------|-------------------------|----------------------------------|--------------|-------------------------|----------------------------------|----------------------------------|--------------------------|-------------------------------------|-----------------|------------------------------|--------------------------------------|----------------------------------|
| Year                                                                                                                   | Opening balance at the beginning of the year |                          |                                  | Cases detected during the year |                         |                                  | Total cases  |                         |                                  | Cases compounded during the year |                          | No. Of cases registered with police | Estimated value | Cases challaned in the court | Balance cases at the end of the year |                                  |
|                                                                                                                        | No. Of case                                  | Timber involved (In m3 ) | Value of trees involved (In Rs.) | No. Of cases                   | Timber involved (In m3) | Value of trees involved (In Rs.) | No. Of cases | Timber involved (In m3) | Value of trees involved (In Rs.) | No. Of cases                     | Amount realized (In Rs.) |                                     |                 |                              | No. Of cases                         | Value of trees involved (In Rs.) |
| 2012-13                                                                                                                | 17                                           | 10.791                   | 327079                           | 64                             | 44.978                  | 574325                           | 81           | 55.769                  | 901404                           | 56                               | 408071                   | 1                                   | 156884          | --                           | 24                                   | 336449                           |
| 2013-14                                                                                                                | 24                                           | 15.265                   | 336449                           | 81                             | 37.106                  | 591861                           | 105          | 52.371                  | 928310                           | 81                               | 664260                   | 2                                   | 73310           | 1                            | 21                                   | 190740                           |
| 2014-15                                                                                                                | 21                                           | 13.797                   | 159302                           | 95                             | 46.006                  | 596434                           | 116          | 59.803                  | 755736                           | 93                               | 506129                   | 2                                   | 100254          | 2                            | 19                                   | 149353                           |
| 2015-16                                                                                                                | 19                                           | 11.386                   | 114022                           | 59                             | 26.957                  | 357187                           | 78           | 30.343                  | 471209                           | 51                               | 308999                   | 1                                   | 48514           | --                           | 26                                   | 113696                           |
| 2016-17                                                                                                                | 26                                           | 11.461                   | 113696                           | 40                             | 21.705                  | 525603                           | 66           | 33.166                  | 639299                           | 30                               | 158152                   | 12                                  | 125367          | --                           | 24                                   | 355780                           |
| 2017-18                                                                                                                | 24                                           | 10.112                   | 255780                           | 17                             | 35.298                  | 1514475                          | 41           | 45.41                   | 1770255                          | 1                                | 4000                     | 17                                  | 1514475         | --                           | 23                                   | 251780                           |
| 2018-19                                                                                                                | 23                                           | 10.112                   | 251780                           | 8                              | 24.005                  | 1382412                          | 31           | 34.117                  | 1634192                          | -                                | --                       | 7                                   | 1309951         | --                           | 24                                   | 324241                           |
| 2019-20                                                                                                                | 26                                           | 17.35                    | 495692                           | 1                              | 1.462                   | 78986                            | 27           | 18.812                  | 574678                           | -                                | -                        | 1                                   | 78986           | --                           | 26                                   | 495692                           |
| 2020-21                                                                                                                | 26                                           | 17.35                    | 495692                           | 3                              | 3.198                   | 234617                           | 29           | 20.548                  | 730309                           | -                                | -                        | 3                                   | 234617          | --                           | 26                                   | 495692                           |
| 2021-22                                                                                                                | 26                                           | 17.35                    | 495692                           | 5                              | 5.297                   | 678820                           | 31           | 22.647                  | 1174512                          | 1                                | 25578                    | 3                                   | 648328          | --                           | 27                                   | 500606                           |
| 2022-23                                                                                                                | 29                                           | 18.336                   | 515039                           | 8                              | 2.501                   | 38932                            | 37           | 20.837                  | 553971                           | 10                               | 49813                    | -                                   | -               | --                           | 27                                   | 504158                           |



As per Indian Forest Act, 1927, any act causing damage by negligence or deliberately felling of a tree or breaking of land or clearing of land for cultivation or any other purpose in 'Reserved Forest', is an offence and punishable with imprisonment for a term may extend to two years or with fine up to five thousand rupees, or both.

Sub section (3) of Section 2 of Indian Forest Act, 1927 defines the term "Forest Offences" to mean an offence punishable under the Indian Forest Act or rules made there under. Nature of forest offence is varied. There may be serious aggravation of offences perspective of money value involved and similarly, criminal intent behind the offence may not be that serious as compared to the damage caused for forest ecology and environment. There are two types of forest offenders that one comes across. A section of the poor people and forest dwellers i.e. right holders who break the law and rules to keep up their livelihood and to meet their basic needs. The other class of forest offenders belongs to a chain of criminals e.g. forest mafia, encroachers or Company or Corporate bodies or Contractors who knowingly break the law and rules and commit forest offences to meet their illegal ends through gullible, needy groups and villagers.

#### **9.4.2 Causes of Illicit Fellings: -**

These are briefly enumerated as under: -

- .With ever increasing human population and urbanization of tract of Paonta Sahib Forest Division, the demand for constructional timber, fuelwood, and agricultural implements have increased manifolds. That is why some people indulge in illicit felling to satisfy their needs if their demands are not met with judiciously.
- i. Poor economic conditions of forest dwellers have compelled them to resort to illicit felling of trees who further sell timber to wood smugglers and other persons or building contractors to earn their livelihood.
- ii. Installation of imported timber depot, Saw Mills, furniture Industry and failure of the department to fulfill their requirement, sometimes, leads to illicit felling in the forests.

**9.4.3 Forests area Prone to Illicit Felling: -**Based on the field observation and record of illicit felling, following forests area are prone to illegal felling/cutting of trees which need effective protection and measures is tabulated as well as susceptibility of forest beats to forest fires.

**Table No.-9.2**

**List of Forest areas Prone to Illicit Felling**

| Sr. No | Name of Range                | Sensitive beats | Forest details                               | Compartment No.                                              |
|--------|------------------------------|-----------------|----------------------------------------------|--------------------------------------------------------------|
|        |                              |                 |                                              |                                                              |
| 1      | Paonta Sahib                 | Rampurbelli     | Khair, Shisham                               | RF Rampurbeli C-1                                            |
| 2      |                              | Rajban          | Sal, Khair                                   | RF Rajban C-4                                                |
| 3      |                              | Lai             | Sal, Sain                                    | RF Lai C-33                                                  |
| 4      |                              | Toka            | Sal                                          | RF Lai C-24                                                  |
|        |                              |                 | Sal                                          | RF Lai C-28                                                  |
|        |                              |                 |                                              |                                                              |
| 1      | Majra                        | Sunkron (N)     | Chal, Jingum, Tendu, Khair, Eucalyptus, Sain | RF Sunkron C- 1 to 7                                         |
| 2      |                              | Sunkron (M)     | Chal, Jingum, Tendu, Khair, Eucalyptus, Sain | RF Sunkron C- 8 to 12                                        |
| 3      |                              | Sunkron (S)     | Chal, Jingum, Tendu, Khair, Eucalyptus, Sain | RF Sunkron C- 13 to 17                                       |
| 4      |                              | Gharatwali (M)  | Chal, Jingum, Tendu, Khair, Eucalyptus, Sain | RF Ghratwali C- 1 to 4                                       |
| 5      |                              | Gharatwali (N)  | Chal, Jingum, Tendu, Khair, Eucalyptus, Sain | RF Ghratwali C- 5, 6, 7 & 12                                 |
| 6      |                              | Gharatwali (S)  | Chal, Jingum, Tendu, Khair, Eucalyptus, Sain | RF Ghratwali C- 8 to 11                                      |
| 7      |                              | Batamandi       | Sal, Sain, Khair, Behra, Tendu               | RF Ghuttanpur C-2, 3, 4, 5, 7, 8, 9, 11, 12, 13, 15, 16 & 20 |
| 8      |                              | Satiwala        | Khair, Shisham                               | UPF Satiwala                                                 |
| 9      |                              | Behral          | Papdi, Khair                                 | RF KonchBeli C-1 & 2                                         |
| 10     |                              | Johron          | Sal, Khair, Eucalyptus, Sain                 | RF Banswali C-1 to 14                                        |
| 11     |                              |                 | Sal, Khair, Eucalyptus, Sain                 | RF Kirarda C-1 to 8                                          |
| 12     |                              | Majra           | Sal, Khair, Eucalyptus, Sain                 | RF Badighati C-1 to 4                                        |
|        | Sal, Khair, Eucalyptus, Sain |                 | RF Sukhimelion C-1 to 12                     |                                                              |

|    |           |           |                              |                                 |
|----|-----------|-----------|------------------------------|---------------------------------|
| 13 |           | Sainwala  | Sal, Khair, Eucalyptus, Sain | RF Sainwala C-2                 |
|    |           |           | Sal, Khair, Eucalyptus, Sain | RF Tokion C-6                   |
|    |           |           |                              |                                 |
| 1  | Girinagar | Khararu   | Khair, Sal, Kokat            | RF Khararu C-8                  |
|    |           |           | Khair, Sal, Kokat            | RF Khararu C-9                  |
|    |           |           |                              |                                 |
| 1  | Bhagani   | Danda     | Sal, Khair, Shisham,         | RF Danda C-11, 13, 20           |
| 2  |           | Puruwala  | Khair, Shisham, Eucalyptus   | RF Giri C-1, 3                  |
| 3  |           | Salwala   | Khair, Sal                   | RF Kandela C-7, 8               |
| 4  |           | Gojjar    | Khair, Sal                   | RF Khojjar C-1, 2, 3            |
| 4  |           | Majri     | Khair, Sal                   | RF Majri C-1, 2                 |
| 5  |           | Yamuna    | Khair, Shisham, Eucalyptus   | RF Yamuna C-1, 2                |
| 6  |           | Amboya    | Khair, Sal                   | RF Amboya C-4, 8, 10            |
| 7  |           | Mehruwala | Khair, Sal                   | RF Mehruwala C-1, 4, 9          |
| 8  |           | Dhandla   | Khair, Shisham, Eucalyptus   | RF Dhandla C-2, 4, 5, 9, 10, 11 |

#### 9.4.4 Preventive/Remedial Measures: -

##### Strategy for Sensitive Beats:

- Need to ensure sensitive beats are not lying vacant or functioning on additional charge at either beat/block level. There is in fact need for provisioning of at least two Forest workers/manpower to be attached with forest guards especially in sensitive beats.
- Forest Guards must patrol the forests falling in jurisdiction of their respective beats regularly to avoid any chance of illicit felling. Range Officer & Block Officer are equally responsible to prevent large scale illicit felling in their respective jurisdiction and they should check all the sensitive forests periodically, preferable organizing group patrolling/night raids etc. Similarly, ACF should check sensitive forests fortnightly to plug any loopholes left by subordinate staff. Divisional Forest Officer himself should review the progress of detection of forest offences regularly and inspect the forest area prone to illicit felling monthly.

- Ensuring boundary pillars re-assessment is carried out for foresters to be clear about their forest boundaries / providing staff with GPS sets/compass individually.
- Carrying out proper demarcation exercises with revenue department (preferable if DFOs are provided with Forest ‘patwaris’ to avoid undue delays)
- Compounding powers to be redefined and better enable foresters to curb offences
- Increased joint patrolling and intelligence sharing from locals
- **Drone** usage as deterrence among locals as well as for actual monitoring purpose to identify damage in remote areas
- Capacity building of field staff with respect to making seizure memos/DR etc.
- Incentivising people for protection of forests in intelligence gathering and information sharing– rewards, Timber Distribution preference etc.
- Adequate awareness should be spread among local people regarding importance of forests
- Police should also be involved in group patrolling in highly sensitive beats. Investigation of forest offences by police after FIR is necessary for deterrence
- Provision of patrolling vehicle at range level round the clock; To check the illegal trade of timber and poaching, patrolling staff/ ROs must be provided with vehicle, mobile phone, rifle etc.
- Ensuring proper checking of salvage lots with mandatory monitoring by Range Officers, ACF, DFO, CF and strictly adhering to the time periods for carrying out operations
- Before provisioning of timber for TD distribution, proper stock-taking and record of available dry-standing trees beat wise with photographs and GPS coordinates
- Relooking at TD policy to automate the process through ‘e-TD’ (mobile based) so that actually affected are able to avail benefit on-time
- Adhering to the TD policy timelines and strict non-issuance during fire-seasons
- In coordination with District Administration convergence, create purposeful employment activities eg. under MGNREGA especially in the lean season when illicit threats increase
- Considering the concept of ‘smart forests’ and using of ‘green bots’ on experimental basis for early detection and warning of illicit activities
- Proposal for new check-post at Palori and upgradation of temporary infrastructure at Khodri Majri forest checkpost to further curb illegal movement of vehicles should be approved within first two years of the Working Plan Period.
- Frequent checking of saw mills and wood-based industries are indispensable to prevent illegal trade of timber.

- Whenever, a complaint is received by the staff by any means whether orally, telephonically or in writing, whether by name or anonymously or pseudonymously, the preliminary enquiry shall be initiated immediately and completed within two weeks if a forest offence is found to have been committed. Damage report shall be issued immediately and action shall be taken by following the rules and procedure including Court Challan. Major cases of illicit felling should invariably be registered with police immediately.

**9.4.5 Prosecution of Forest Offences:** - The cases of petty nature may be compounded or challaned in the court of law under the provision of Indian Forest Act, 1927, but the case involving large scale felling aggravate with Criminal offence under the provision of Indian Penal Code be registered with the Police. The first information report under Section 154 of Cr. PC is that information which is given to the police first in point of time, on the basis of which, investigation commences and relates to a cognizable offence. Non-cognizable offences cannot be investigated by the police without the special order from a competent Magistrate, when a police officer receives information of a non-cognizable offence committed within the limits of his police station, he enters the substance in his daily diary report and refers the information to the Magistrate. When the Police Officer receives the order from the Magistrate to investigate the case, he may exercise the same power in respect of investigation as in cognizable offence.

For the purpose of the Criminal Procedure Code, all the offences have been classified into different categories but the code has not given any guidelines to determine, whether, a particular offence belong to one category or the other. It all depends upon, whether, it is shown as cognizable or non-cognizable in the 1<sup>st</sup> schedule of the code. That schedule refers to all the offences under the Indian Penal Code and puts them into the cognizable and non-cognizable categories. The offences under the laws other than the Indian Penal Code which are punishable with imprisonment for three years or more have been in the 1<sup>st</sup> schedule as cognizable and those punishable with less than three years have been shown as non-cognizable. This rule is of course subject to any rule to the contrary provided in that law. In case of a cognizable offence, a police officer can arrest the accused person without any warrant or authority issued by a Magistrate and can investigate into such a case without any order or direction from a Magistrate under Section 156 (I) and 157 of Cr. P.C.

In the case of forest offences under the Indian Forest Act, 1927 or any other special law all those that are punishable with imprisonment of less than three years or with fine only, are

bail-able/non-cognizable offence unless there is a provision to the contrary. Hence, all forest offences are non-cognizable-bail-able offence as at present.

Proceeding in a non-cognizable offence start by means of a complaint addressed to a Magistrate, whereas, no complaint needs to be made in the case of cognizable offences. In cognizable offence Police begins the investigation on getting information of the crime under Section 154 read with Section 156 of Cr. P.C. Section 2 (d) of Cr. P.C ‘Complaint’ means any allegation made orally or in writing to a Magistrate, with a view to his acting under the code, that some person, whether, known or unknown has committed an offence but does not include a police report.

Therefore, the position with regard to forest offences under Indian Forest Act is that they are non-compoundable under the Criminal Procedure Code and treated as complaint cases under chapter XV of Cr. P.C; and under Section 68 of Indian Forest Act, all offences except those falling under Section 62/63 are declared as compoundable offence. Composition of forest offences is on a different footing and it is clearly distinguishable footing from the compounding of offences punishable under the Indian Penal Code as mentioned in Section 320 of Cr. P.C.

As per State Govt. instruction, it is the duty of every beat Guard to take cognizance of a forest offence committed to issue the damage report (DR) under Section 33 of Indian Forest Act, 1927, get the damage accepted by the offender also to seize the forest produce and the implements used in committing the offence. The forest offence cases can either be compounded by the forest officer himself or if, he is not competent to compound the cases, be registered with the police or prepare challan and put in court for prosecution under the provision of Indian Forest Act, 1927. If the offence is committed on non-forest land i.e. Govt. land other than Demarcated Protected Forests, Damage report shall not be issued under Section 33 of Indian Forest Act, 1927 and FIR shall be registered with the police by involving the provision of Indian Penal Code only and to take cognizance of offence which has been committed.

The Indian Forest Act is not self sufficient for dealing with all legal problems relating to forest protection and conservation of forests. So, it becomes quite often necessary to invoke the provision of the Indian Penal Code along with Indian Forest Act, 1927. Any Forest or Police Officer may without orders from a Magistrate and without a warrant, arrest any person in any forest offence punishable with imprisonment for one month or upwards under Section 64 of the Act, provided that nothing in this section shall be deemed to authorize such arrest for any act which is an offence under Chapter-IV, unless such act has been prohibited under clause (C) of

Section 30 of the Act. Meaning thereby arrest of offender cannot be made for the offences committed in protected forests in absence of notification under clause (C) of Section 30 of the Act.

Every officer making an arrest under sub section 2 of Section 64 shall, without unnecessary delay and subject to the provision of this Act as to release on bond take or send the person arrested before the Magistrate having jurisdiction in the case or to the office in-charge of the nearest Police Station. If there is reason to believe that such person comes under the provisions of Section 41 of Cr. P.C, a Police officer shall re-arrest him under Section 43 of Cr. P.C, but no police officer or forest officer shall detain in custody a person arrested without warrant for exceeding twenty-four hours exclusive of the time necessary for the journey from the place of arrest to the Magistrate's court under Section 57 of Cr. P.C. No person who has been arrested by a police officer shall be discharged except on his own bond, or on bail or under the special order of a Magistrate.

**9.4.6 Compounding of Forest Offences:** - Under Section 68 of the Indian Forest Act, 1927, the Conservator of Forests are empowered to fixed the rates of compensation for compounding of various forests offences vide H.P. Govt. notification dated 5-5-2010. The Forest field staff should act immediately as per instructions issued from Pr CCF H.P. in this regard and within the time frame.

**9.4.7 Disposal of Forest Offences:** - It has been observed that in spite of instruction issued from time to time by the Govt. due care is not taken regarding prompt and timely disposal of forest offence cases. The cases are not being challaned in the court of Law within the limitation period under Section 468 of Cr. P.C with the result that the accused even in serious forest offence cases involving property worth lac of rupees are being acquitted simply on the technical ground of limitation and non production of certified copies of notification under Section 29, 30/31 of Indian Forest Act, 1927 as required under Section 78 of the Evidence Act, 1972, which is not desirable.

**In order to avoid any such recurrence in future, it is hereby laid down that the following procedure will be followed for disposal of the forest offence cases: -**

- (i) It is the duty of every forest guard in beat to take cognizance of a forest offence which has been committed or is suspected to have been committed or is about to be committed. A report to the effect should be issued damage report immediately giving the date of

occurrence, time of offence, name and compartment of forest, detail of damage, name, age and address of offender and name and address of witnesses, if any.

- (ii) In case, repeated offence in the same year, reference to previous damage reports should be given.
- (iii) The report should be prepared in triplicate. In case a witness is not available on the spot, circumstantial evidence to be collected through photograph or video film in presence of the offender and the offender must be taken to the nearest village Panchayat authority or any influential person or reliable person of village in whose presence the arresting officer will make a report of the offence committed and got the report witnessed.
- (iv) The implements and the forest produce may be seized immediately at the time of arrest and will be placed in the custody of the Lambardar or any other reliable person near the place of offence under a proper receipt in the form of a supradnama or seizure memo etc.
- (v) If the offender admits the commission of the offence and express his willingness to compound the offence without being challaned in a court of law, he should be required to put signature or thumb impression on the 'Iqbal nama' printed on the back of the damage report, which should be got witnessed by two independent witnesses.
- (vi) Thumb impression or signature on the 'Iqbal nama' should be taken, even if the offender merely admits the commission of the offence and yet is not willing to compound the offences under Section 68 of the Act in the presence of witnesses.
- (vii) In case, where the identity of an offender is not known to the Forest Officer, it is his duty to arrest him, seize implements or tools used in the commission of offence including mobile phone etc. as well as forest produce and take him to the village Lambardar or Panchayat authority or in his absence any respectable or reliable person with a view to establishing his identity. After ascertaining his full particulars, the normal procedure prescribed above should be followed.
- (viii) In a case, where the offender has escaped arrest on the spot an immediate report will be made and got signed by the nearest Lambardar or an influential person or reliable person. The implements or tools or the forest produce seized will be entrusted to "Sapurdar" and efforts will be made to trace the offender. If the offender admits commission of the offence in his 'Iqbal nama' or restrain to discharge his duty should be taken in the manner described above. In case, an offender refuses to sign the 'Iqbal nama' he must be prosecuted through the Police and complete details of such case should be furnished to the police officer concerned for investigation. Wherever possible, the Range Officer will



release the offender on bond to appear, if and when, so required, before the Magistrate or before the officer incharge of the nearest Police Station under Section 65 of Indian Forest Act.

- (ix) Where an offender resists arrest, the nearest police officer or right holders may be called upon to render necessary assistance under Section 79 of Indian Forest Act, 1927.
- (x) The Police help may also be sought in case of aggravate of criminal offence or serious offences under the Indian Forest Act involving prolonged investigation. All cases of assault on departmental forest official or officers in the course of discharge of their official duties, voluntary causing of hurt to commit a forest offence, abetment of forest offence, criminal trespass, mischief by fire and injury to public property, giving false evidence, concealing offenders and forest produce, counterfeiting trade or property marks, selling goods marked with counterfeit trade mark or property mark and tempering with property mark with intent to cause injury or damage, theft of timber through organized fellings and damage to public property through setting fire etc or arrested person should be reported to the police for action under the Indian Penal Code read with IFA, 1927 or any other law applicable to the case. It is also emphasized that no premises can be searched without a search warrant either from the Conservator of Forests or DFO or from the Magistrate having jurisdiction.
- (xi) Any damage report issued by a forest guard should be reported to the concerned Deputy Ranger within 48 hours and reported to Range Officer concerned within 3 days and thereafter, within 4 days to the DFO concerned. If the matter is reported, it is the responsibility of the Forest Range Officer/ACF/DFO to take further action or otherwise in case of failure for the same field functionaries are responsible for lapses under H.P. Preservation of Specific Corrupt Practice Act, 1983 and CCS (CCA) Conduct Rules, 1965.
- (xii) Forest Guards and other concerned staff shall maintain a daily diary report on the lines of the ones maintained by the Police department, where they should record the events of the day, the forest/village visited and observation made or reports received. This daily diary should be inspected and maintained by the Block Officer and sent a fortnightly report to Range Officer concerned and Range Officer/ACF/DFO should inspect the daily diary of the forest guard and Van Thana staff when the jurisdiction of the respective forest guard.
- (xiii) On receipt of the damage report, the Range Officer will enter them in the Damage Report Register. In entering them he will ensure that the continuity of serial number of a damage report of beat is maintained and no damage report is missed or tempered. On the damage

- report itself the serial number of the 'Damage Report Register' will be filled. One copy of the damage report will be retained in the Range office and field by beats for record.
- (xiv) The Range Officer is responsible to see that the damage reports are either compounded or taken to court and filed (with Divisional Forest Officers sanction) within six months of the commission of the offence.
  - (xv) The register of cases compounded with the Range Forest Officer will show the disposal of each case. The disposal of each case will either be compounded or prosecuted or filed. In each case of the DFO sanction will be quoted. In the case of prosecution, a cross reference to the prosecution report will be given.
  - (xvi) In complete or defective damage reports or tempered D.R. which can neither be compounded nor can be taken to court will be filed or written off by the DFO with prior concurrence of Conservator of Forests provided that he is satisfied about error of judgment on the part of the beat guard and Deputy Ranger etc.
  - (xvii) At the close of the financial year, all undecided damage reports will be brought forward in red ink in the register of offences compounded with the Range Officer and dealt with in a normal way.
  - (xviii) The compounding of offences under Section-68, the compensation in all such cases must be realized within a period of 3 months of the commission of offences. In cases the offenders is/are not willing to compound the cases for which his/their statements must be recorded in presence of two independent witnesses. The cases should then be challaned in the court of law before the 6 months or expiry of limitation period under Section 468 of the Cr. P.C. However, all challan must be submitted by the Range Office to DFO for according sanction for the commission of offence.
  - (xix) The ACF will scrutinize the cases with the help of ADA (Assistant District Attorney) and enter the same in the Divisional prosecution register before these are put to DFO for his sanction. Thereafter, these cases will be challaned in the court of law under the signature of the RO/DFO concerned.
  - (xx) The cases must be put in court before the expiry of 6 months period positively or before the expiry of limitation period under Section 468 of Cr. P.C, failing which the responsibility for delay will rest with concerned Range Officer (whatsoever delays the prosecution of cases) who will be personally responsible to make good the loss of Government.

- (xxi) All FIR of forest offences under Section 154 of Cr. P.C issued by the Police officer may be sent to DFO within 3 days from the date of issuance of the FIR and should immediately entered in the damage register maintained in the Range Office.

The Public Prosecutors have been entrusted the job of prosecuting the forest offence cases. However, Dy. Ranger or Range Officer should assist the Public Prosecutor in conducting the forest offence case in CJM court and ACF should assist the Deputy District Attorney or District Attorney in District and Session Judge Court. They will also keep the DFO and ROs concerned and submits monthly progress report of the cases duly verified by the ADA/Dy. DA or DA concerned.

**9.4.8 Indian Forest (HP 2<sup>nd</sup> Amendment) Act, 1991:** -Vide Indian Forest (HP 2<sup>nd</sup> Amendment) Act, 1991 certain changes have been made in the Chapter-IX of the Indian Forest Act, 1927 in order to check the large-scale illicit felling and smuggling of forest produce particularly by engaging vehicle by certain unscrupulous person. The State Legislative in their wisdom amended the Indian Forest Act in many States in the country, creating another forum, namely the 'Authorized Officer' to order confiscation of property which is instrumental in the commission of forest offences. There were no provisions in the Act enabling the forest officers to confiscate such timber or forest produce and implements or tools or vehicle etc. used for committing forest offences even in a case where he was satisfied that a forest offence had been committed. In view of this, the State Govt. necessary amendments have been made in Section 52 and after Section 52, inserted the provision of Section 52 A and 52 B, 58 and 59 A in the Act.

Under Section 52(3) Authorized Office can passed order for confiscation of property on being satisfied that forest offence has been committed in respect thereof. It is true, as pointed out by Learned Counsel that the standard of proof required for confiscation proceedings in one case and that required for conviction of offender in the other case is not the same. But for that reason, these provisions cannot be regarded as confiscating or repugnant to each other. Conviction may result in sentence of imprisonment involving deprivation of right to life and liberty and other serious consequences, while order of confiscation of property under Section 52A does not such grave or serious consequences except to remove the vehicle out of circulation and as deterrent. The intention of the legislative is to ensure that the vehicle used in the transaction is no longer available for such misuse and to act as deterrent for the offender and others. These objects can be well served by confiscating the vehicle. Thus, the scheme of the Act providing for a separate confiscation procedure has a substantial public purpose to serve and is in tune with Articles 14, 48A and 51A(g) of the Constitution of India.

It is further provided under the provision to Section 52 B that no order confiscating the motor vehicle shall be made except after giving notice in writing to the registered owner of the vehicle and further after considering his objection, if any, it is so found that the vehicle was being used or used for carrying the timber without knowledge or connivance of the owner confiscation order shall not be passed. The burden of the proof, is generally, on the parties seeking relief or having the affirmative of an issue. The burden then shifts to the respondent to establish the contrary provision of the Act. In other words, in quasi-judicial proceedings, there is no burden cast on any party, similarly, to the one in criminal proceeding. The law does not ordinarily recognize the principle of criminal proceeding and giving the benefit of doubt to a party or whom the burden of proof lies.

## **9.5 Fire Protection: -**

**9.5.1 General:** - Forest fires over the years have increased, partly linked to the climatic changes and anthropogenic factors and more area is burnt each year. Fire is a major factor that causes considerable damage to the forests of this division. The fires both accidental and incendiary are very common in this tract due to the reason that majority of forests are easily approachable by roads/paths. Forest fires are a menace for nature, largely driven by anthropogenic factors, aggravated by varying climatic events like prolonged droughts, and people's false notions about forest fires, especially grazers. In the process, there is damage to new plantation, forest vegetation, fauna and even human beings where settlements are too close to the fires. Lack of co-operation between local people and forest field staff also results in deliberate starting of fires at times. In recent times, the effect of climate change is becoming more evident year after year, with longer spells of dryness that completely absorb the soil moisture necessary to fight back ground fires.

In State of Himachal Pradesh, as many as 5,280 forest fires were reported from November 2021 to June 2022, which saw a rise from 4,110 in November 2020 to June 2021. This is a significant rise from 536 fires reported from November 2019 to June 2020 and is an all-time high forest fires in the last three years. Records of the H.P. Forest Department suggest 22% or 8267 Sq. Kms. of the total forest area in the state is fire prone.

Fire has an adverse effect on soil, water and ecological balance of the affected area. Soil becomes vulnerable to soil erosion and its structure gets affected, thereby retarding plant growth. The soil building micro-organisms are destroyed and the area is ultimately rendered susceptible to erosion and decreasing productivity. The young regeneration is wiped out, growth of surviving

vegetation is adversely affected, the yield of forest produce is immensely reduced and the vegetation damaged by the fire becomes vulnerable to insect and fungal attack. The high salvage removals are attributed to this. In the fire burnt forests, change in crop pattern takes place, resulting in mixed crop in the forests.

The Sal and Chil forests in this Division are subjected to frequent fires in the months of April to June every year. If fires are not controlled in time, these cause serious damage. Year wise detail of fire incidences occurred since 2012-13 is tabulated below in Table 9.3:

**9.3 Fire Incidences Abstract in Paonta Sahib Forest Divisionsince 2012-13**

| Sr. No.            | Year    | No. of case | Total Area affected (ha) | Total loss (Rs.) |
|--------------------|---------|-------------|--------------------------|------------------|
| 1                  | 2012-13 | 25          | 212.5                    | 340070           |
| 2                  | 2013-14 | 2           | 9.5                      | 10000            |
| 3                  | 2014-15 | 2           | 21                       | 18500            |
| 4                  | 2015-16 | 13          | 71                       | 383750           |
| 5                  | 2016-17 | 51          | 407                      | 238000           |
| 6                  | 2017-18 | 11          | 81.5                     | 350600           |
| 7                  | 2018-19 | 46          | 308                      | 289000           |
| 8                  | 2019-20 | 35          | 193                      | 635885           |
| 9                  | 2020-21 | 2           | 22                       | 10200            |
| 10                 | 2021-22 | 23          | 166                      | 469080           |
| 11                 | 2022-23 | 36          | 207.8                    | 249300           |
| <b>GRAND TOTAL</b> |         | <b>246</b>  | <b>1699.3</b>            | <b>2994385</b>   |

Prevention and control of forest fire assumes great importance in Paonta Sahib Forest Divisionand there is an urgent need to take effective steps to counter menace of forest fires, with the aim of: -

- Protecting forests from damaging fires by taking up all preventive measures like administrative, technical, social, legal etc.
- Preparing adequately and taking appropriate action for controlling, suppressing and extinguishing forest fires, in order minimize the loss caused by them;
- Educating local people about fire damage and eliciting their cooperation in preventing, controlling and extinguishing fires.

**9.5.2 Causes of Forest Fires:** -The main causes attributable for the outbreak of forest are various and can be summarized as under: -

- i. **Natural:** -This caused due to lightening, friction between twigs, stones and dry grasses. However, such natural incidents of forest fires in the tract are not met with so far.
- ii. **Accidental:** Such fires are more common and are caused due to: -
  - a) Throwing of burning cigarette/Bidi pieces in forest areas by local people without visualizing possibility of causing forest fire there-from.
  - b) Burning fire left behind in forests by hunters, workers, fuelwood collectors and grazers-again without contemplating possibility of incidence of fire there from.
  - c) Sometimes, fires spreads to forests, from adjoining private fields/land where local inhabitants set fire to burn useless bushy growth, or to get new flush or grass shoots.
- iii. **Incendiarism:** -The outbreak of fire may be due to incendiarism. The general motives behind the cause of incendiarism in forest are given below: -
  - a) In case of illicit felling, the defaulters maliciously burn such forests to conceal their illegal actions.
  - b) Hunters/Poachers burn forests to facilitate killings.
  - c) Local people burn forests, plantations if their genuine requirement of timber, fuel are not catered judiciously by the department.
  - d) Local inhabitants set fire in the forests deliberately to get new flush of grass for their cattle and collector of Minor Forest Produce.
  - e) Sometimes encroachers intentionally burn forest area, adjacent to their cultivated lands, orchards to extend their holdings illegally in Government land.

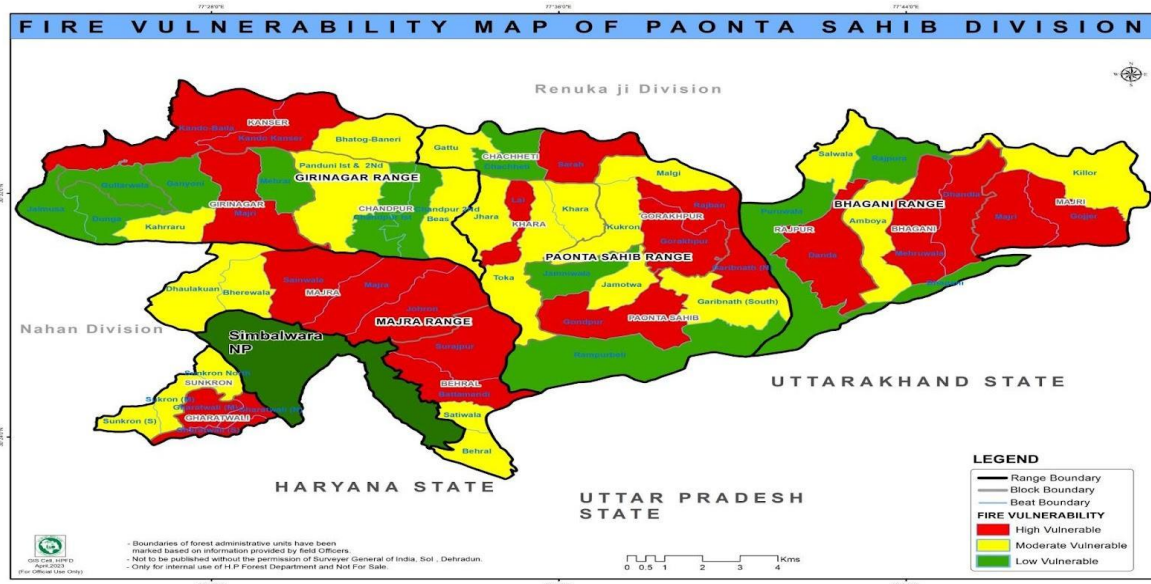
**9.5.3 Special Fire Risk Zones:** -The areas burnt during previous years indicate that the following blocks of forests are especially prone to fire is given in table No.9.4

**Table No.-9.4 List of Highly Sensitive Fire Prone beats**

| Sr. No. | Name of Range | Block     | Beat      |
|---------|---------------|-----------|-----------|
| 1       | Bhagani       | Majri     | Gojjar    |
| 2       |               |           | Majri     |
| 3       |               | Bhagani   | Mehruwala |
| 4       |               | Rajpur    | Dhandla   |
| 5       |               |           | Danda     |
|         |               |           |           |
| 1       | Paonta Sahib  | Gorakhpur | Gorakhpur |
| 2       |               |           | Kukron    |
| 3       |               |           | Rajban    |

|   |           |              |                |
|---|-----------|--------------|----------------|
| 4 |           | Khara        | Khara          |
| 5 |           |              | Toka           |
| 6 |           | Chhachheti   | Gatu           |
| 7 |           |              | Sarah          |
| 8 |           | Paonta Sahib | Jamotwa        |
| 9 |           |              | Gondpur        |
|   |           |              |                |
| 1 | Majra     | Majra        | Majra          |
| 2 |           |              | Johron         |
| 3 |           | Behral       | Surajpur       |
| 4 |           |              | Batamandi      |
| 5 |           |              | Sainwala       |
| 6 |           | Gharatwali   | Gharatwali (M) |
| 7 |           |              | Gharatwali (N) |
| 8 |           |              | Gharatwali (S) |
|   |           |              |                |
| 1 | Girinagar | Kansar       | Kando Baila    |
| 2 |           |              | Kansar         |

**Map No. 9.4 Highly Sensitive Fire Prone**



Special attention is required for the above forest zones during the fire season.

#### 9.5.4 Management of Fire Protection

The following steps will prove effective in fire management: -

- Fire prevention measures.
- Timely detection of forest fires and information to concerned staff.

- c) Process of fire control and fire fighting.
- d) Penal provisions and a system of rewards.

**a) Fire Preventive Measures:** - “Prevention is better than cure”, and this holds good in case of forest fires too. Prevention of fire is more beneficial and cost effective than fighting the fire. For this effective step should be taken well in time, such as summarized below: -

- Forest fire reviews in 1st week every month and weekly for fire-season for constant monitoring, preparedness and strategizing
- Database of concerned officials and locals in case of fire emergency to be shared across. Timely updating of contact numbers on FAMS (Forest Fire Alert Messaging System) with transfer postings of field staff.
- Ensuring rotational patrolling of forests with the help of field staff, R4F volunteers, Mahila and Yuvak mandals in fire-seasons
- Water ponds creation akin to Van Sarovars and Amrit Sarovars linking with ‘Catch the Rain’ scheme nearby sensitive forests and areas
- Tools procurement for fire-fighting. However, the challenge with the extreme slopes fire requires aerial interventions through water spraying from helicopters as often done in the West
- Village-level awareness meetings in fire-sensitive areas especially related to ‘ghasnis’ (grasslands) with ‘Dos and Dents’ including myth-busting that fires cause better grass growth and fertility!
- Division-level as well as Range level workshops for fire management and support
- Co-ordination with Fire Department, CISF and R4F volunteers
- Pine-needle collection before fire-season and utilization for micro check-dams, fibre and briquette making
- Reward system should be institutionalized annually for fire-fighting volunteers

**b. Fire Protection Staff:** -Divisional Forest Officer will engage sufficient number of fire watchers during the fire season. Fire watchers (preferably the local villagers), will patrol the areas extensively for detection and protection against fires and will ensure all preventive measures with the local forest field staff. During fire season, fire fighting squad be formed out as well. This squad should always be ready at every Range H.Q and as soon as any information of fire occurrence is received, they be rushed using fire-patrolling vehicles to that spot.



**c. Fire Protection Equipments:** -The field staff (near the fire prone forests) should be provided with sufficient fire equipments such as brooms, shovels, slashes, axes, hatches, forks, buckets, gunny bags etc., so as to meet any emergency and for facilitating the speedy extinguishing of fire. Field staff should be imparted training for effectively controlling forest fires.

**d. MCR formation:** Master Control Room to be setup as the nodal forest fire information centre, to be located in the Forest Divisional Headquarter. The MCR must be provided with Wireless Communication Network.

**9.5.5 Fire Lines:** -The existing fire lines be properly maintained and kept clear of all bushes, needles etc. to avoid any chance of fire. It is laid down that all such roads/paths and fire lines should be kept clear of all inflammable material especially during the fire season, so as to act as fire lines. The detail of fire lines existing have been discussed in Part I, however a new fire-line has been proposed in Table 9.5

**Table No.-9.5: List of Proposed Fire Line**

| Sr. No. | Range/ Block              | Beat       | RF            | Compartment    | Length | Width    | Remarks                              |
|---------|---------------------------|------------|---------------|----------------|--------|----------|--------------------------------------|
| 1       | Paonta Sahib / Chhachheti | Gatu       | RF Chhachheti | 3, 4           | 3Km    | 6 meters | Upto the boundary of Girinagar Range |
| 2       |                           | Chhachheti | RF Chhachheti | 12, 13, 14, 15 |        |          |                                      |
| 3       |                           | Sarah      | RF Sarah      | 6, 7, 8        |        |          |                                      |

**9.5.6 Construction of Watch Towers:** -A network of watch towers, at suitable commanding locations, at least one in each range (Majra, Bhagani, Girinagar, Paonta Sahib) should be constructed. These should be permanently manned by fire watchers/Forest Workers during the fire season. The fire watcher will immediately come to know and report to the beat guard, any outbreak of fire that may occur. The beat guard will take further necessary action for fire-fighting.

**9.5.7 Control Burning:** -

The detailed instructions on control burning are contained in the H.P. Forest Manual Vol. IV and are summarized as below: -

- i) The control burning should be done during winters in February-March.

- ii) Burning should progress from uphill to downhill in calm weather and special care should be taken, to keep the line of fire as straight as possible and under control.
- iii) The fire should start along the ridge, a cleared path or specially cleared lines.
- iv) The needles and other inflammable material should be fully raked to ensure through burning.
- v) Cleanings and early thinning in young regeneration areas must be completed before the control burning.
- vi) Burning shall be done always under strict supervision and control of the executive staff and shall never be left to the engaged labor.
- viii) The existing fire lines should be properly maintained and kept clear. The roads, bridle and inspection path etc. must be kept clear of all inflammable material, so as to act as fire lines.
- ix) Sufficient number of trained fire watchers should be employed during the fire season to help the field staff and provided with necessary equipments. No felling operations, even to the right holders, should be allowed during the fire season.

It is, however, to be noted that areas under regeneration should not be control burnt, until the regeneration reaches a height of about 2.5 m. In such areas, however, the grass cutting/needle collection by right holders be encouraged.

**9.5.8 Preparation of Annual Plan:** - Preparation of an exhaustive annual plan for the fire protection is also, recommended.

**9.5.9 Legal Measures:** - All cases of incendiarism should be properly investigated and punitive measures should be taken against the culprits. Legal provisions regarding forest fires are available under Indian Forest Act, 1927. Setting fire to Reserve Forest is punishable under Section 26 of the Act with imprisonment up to two years or fine up to Rs. Five thousand or both. Similarly, whenever, fire is caused willfully or by gross negligence in a protected forest, the State Government may, notwithstanding, that any penalty has been inflicted under this section, direct that in such forest or any portion thereof the exercise of any right of pasture or to forest produce shall be suspended for such period as it thinks fit.

Section 79 (1) of the Indian Forest Act, 1927 makes obligatory on every person, who exercises any right in a reserved or protected forest or who is permitted to take any forest produce from forest or Govt. employee shall be bound to furnish without un-necessary delay to the nearest

Forest Officer or Police Officer any information with respect to any commission of forest offence, and shall forthwith take steps, whether so required by Forest Officer or Police Officer or not:-

- a) To extinguish any forest fire in such forest of which he has knowledge or information.
- b) To prevent by any lawful means in his power any fire in the vicinity of such forest of which he has knowledge or information from spreading to such forest, and shall assist any Forest Officer or Police Officer demanding his aid.
- c) In preventing the commission in such forest of any forest offence.
- d) When there is reason to believe that any such offence has been committed in such forest in discovering and arresting the offender.

And any violation of the provision of this Section is punishable under Section 79(2) with imprisonment for term which may extend to one month, or with fine which may extend to two hundred rupees or with both.

Therefore, field functionaries/staffs must act accordingly so that the object of fundamental duty could be achieved.

Further, the H.P. Govt. has framed rules regarding fire protection known as Himachal Pradesh Forest (Protection from Fires) Rules, 1999 vide H.P. Govt. Notification No. FFE-A(C)7-1/96 dated 7-11-1999. The field functionaries should follow the Rules and instructions as contained in the given notification.

**9.5.10 Assessment of Loss Caused by Fire:** -Fire causes tangible and intangible damages to the forests & wild life. Loss of timber, resins etc. are tangible, whereas loss of soil fertility and soil constituent are intangible. Fire causes adverse effect on regeneration and destroys under growth leading to invasion by weeds. Being afraid of disciplinary action, the loss caused by forest fire is often not actually recorded by field staff and is also under estimated because of which calculation of exact magnitude of loss is hardly possible. The methodology for assessment of fire loss developed by the CCF, Forest Protection, Bilaspur shall be followed.

**9.5.11 Fire Record and updation on Integrated Forest Management System portal:** -A complete record of fires will be maintained, both in Range, as well as Divisional office. Maps of the forests showing the area burnt by fire will be maintained along with other relevant details regarding fire. The fire reports should contain a map of the area burnt. All the fire reports are

sent to higher authorities on the prescribed proforma along with inspection report of R.O/ACF and DFO and follow up action taken accordingly. Since 2022, regular updating at Range level regarding forest fire-incidences on **Integrated Forest Management System portal** of HPFD have begun which must be adhered to in future as well for linking with FSI portal of fire-reporting.

**9.6 Encroachment:** -The problem of encroachment is seriously persistent in forested region of Himachal Pradesh. There can be no denying fact that during the past three decades forest areas have been shaved off extensively for non-forestry purpose. Year by year, more and more land under forest cover is being brought under the plough even by way of large-scale encroachments. The land grabbers have evolved a strangely novel method to eliminate the forest growth.

Under the Forest (Conservation) Act, 1980, diverting of forest lands for non-forestry purpose without the prior approval of Govt. of India is not permissible. As such, even the settlement staff of the revenue department cannot divert forest land for non-forestry purposes without the permission of the Govt. of India. The provision of Indian Forest Act, 1927 are only punitive. For eviction of the encroachers, simultaneous action is to be taken to file a challan before the Assistant Collector Grade-I concerned for taking up proceeding under Section 163 of H.P. Land Revenue Act, 1954 for ejectment of the encroachers on the Govt. land i.e. other than forest land and whereas in respect of the encroachment on forest land eviction proceedings by the DFO-cum-Collector shall be commenced under the Himachal Pradesh Public Premises and Land (Eviction & Rent Recovery) Act, 1971, unless the proceedings are initiated under the Act, eviction of the encroachers will not be possible under the Indian Forest Act, 1927. The latest position of encroachment cases in Paonta Sahib Forest Division has been updated on MOFEES portal of HP Forest Department. The summary of cases is as follows **(It is to be noted in Hon'ble High Court HP Orders, the areas have been evicted in 6 no. cases after retaining 5 bigha i.e. 2.4 ha).**

**Table No.-9.6 Encroachment cases summary**

| Total no. of Cases | Total Area | Actually Evicted |             | Yet to be evicted |           | Under trial |           |
|--------------------|------------|------------------|-------------|-------------------|-----------|-------------|-----------|
|                    |            | Cases            | Area        | Cases             | Area      | Cases       | Area      |
| 188                | 37.44 hac. | 133              | 32.485 hac. | 30                | 1.384 hac | 25          | 1.171 hac |

**9.6.1 Causes of Encroachment:** -The main causes of encroachment can be summarized as under: -

- i) Due to increase in population, the greed for having more and more land for fulfilling their basic needs amongst the local people has increased.
- ii) The grant of Nautor land inside the forests is also responsible for encroachment on the forest land.
- iii) Forest Rights Act, 2006 {Scheduled Tribes & other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006}, the act's tendency to be misused by some cohorts (leaving out the genuine ones) is also responsible for large scale of encroachments.
- iv) Forest boundaries are not properly demarcated either on the ground or in the record.
- v) In a very large number of cases the notified forest areas have not been recorded properly in the land records, maintained by the revenue department and continue to be shown as non-forest areas.
- vi) There is no provision or mechanism to book and punish the abettors of encroachments. This encourages the highly organized land mafia, politicians and influential section of society to actively support and encourage large scale encroachments as they derive financial, political and social benefit from such benefits.
- vii) Influential persons with political affiliations not only promote encroachments, but also abet the entire process.
- viii) The punishment meted out to the offenders is insignificant compared to the gravity of the offence committed.
- ix) There is no special provision provided in the Indian Forest Act, 1927 for eviction of encroachment as like provision provided in the Wild Life (Protection) Act, 1972. Similarly, there is no provision for recovering environmental losses from the encroachers caused due to the damage to flora and fauna and for the loss of productivity of the forest land. This emboldens them to encroach more forest land.
- x) In the absence of proper demarcation under Section 107 of the H.P. Land Revenue Act, 1954 by the competent Revenue Authority, the proceeding initiated against encroachers cannot be held to be legal and valid.

- xi) Large scale encroachment removals result in serious law and order problem requiring a strong political will, contingent of police force and presence of a magistrate. These are not available to the forest department, whenever needed, which results abandoning such drives or eviction on spot in the past.

#### **9.6.2 Preventive Measures: -**

- i) Forest officials must be well conversant with boundaries of the forests falling in their respective jurisdictions. Range Officer, Block Officers and Forest Guards must check the boundary pillars frequently and if anything is found wrong, immediate step should be taken for maintenance of boundary pillars and booked the wrongdoer under the Act.
- ii) Forest Guard must issue the damage report under the provision of Indian Forest Act, 1927 and information in this regard be sent to his superior within 3 days. On the report of incharge beat guard, Block Officer/Range Officer, should get the area encroached upon demarcated under Section 107 of the H.P. Land Revenue Act, 1954 and challan the case before the DFO-cum-Collector court for initiating eviction proceedings under the H.P. Public Premises and Land (Eviction & rent Recovery) Act, 1971. Limitation period for challaning the forest offence under Section 468 of Cr. P.C is 3 years but challans should not be delayed unreasonably.
- iii) Periodic checking of all forest offence cases and review of progress etc. by ACF/DFO and CF is, therefore, necessary.

**9.6.3 Steps Taken for Eviction on Forest Land:** -All Divisional Forest Officer have been delegated with the powers of Collector under H.P. Public Premises and Land (Eviction & Rent Recovery) Act, 1971 within their respective jurisdiction vide H.P. Govt. Notification No. 1-21/71-SLG dated 8-6-1994 besides taking punitive action against the encroachers under Section 447 of IPC read with Section 26 of Indian Forest Act, 1927.

Powers of carrying out demarcation of disputed land in question are vested with Revenue Authority under Section 107 of the H.P. Land Revenue Act, 1954

The forest and revenue officers/officials are responsible and liable for detection/removal of encroachment cases ***under the provision of H.P. Prevention of Specific Corrupt Practice Act, 1983.***

Therefore, revenue officers/official are responsible for initiating eviction proceeding under Section 163 of the H.P. Land Revenue Act, 1954 against the encroacher who have

encroached upon the Govt. land i.e. other than forest land which is not a notified forest land under the provision of Indian Forest Act, 1927.

In compliance of the Hon'ble High Court order dated 28-8-2009, Pr. Secretary Forests issued notification on dated 5-5-2010 has directed that, *when encroachment is detected on forest land, action for removal of such encroachment shall be initiated under the Himachal Pradesh Public Premises and Land (Eviction and Rent Recovery) Act, 1971 and also action for committing forest offence by the encroacher shall be initiated under the Indian Forest Act, 1927. FIR under various provisions of Indian Penal Code shall be registered with Police in case: -*

- i) *Boundary pillars have been tampered with;*
- ii) *Permanent structure has been made;*
- iii) *Area encroached more than 10 bighas;*
- iv) *There is encroachment within the Protected Area Network (PAN) i.e. in a Wild Life Sanctuary or National Park.*
- v) *The cases involving avoidable damages exceeding rupees 10 lacs caused by the Companies or Corporate Bodies.*

Thus, it should be made clear to the field executive staff that encroachments are their direct responsibility. If any encroachments are allowed, the Forest Guard concerned shall be personally responsible for allowing such encroachment. In case the Forest Guard issue a damage, reports and submit the cases to the B.O. and the Block Officers/Range Officer do not take further action under the provision of law, they shall be responsible for the encroachment. The Range Officer and the Divisional Forest Officer shall also be held responsible for such cases, if these are kept pending in their respective office without taking further action in compliance of the Hon'ble H.P. High Court order. Therefore, the Range Officer has to ensure that no encroachments take place in reserved forests and wherever such encroachments have already taken place or to be taken, the case should be detected and challan be prepared for eviction and punishment after following the due process of law.

The field staff is required to carry out preliminary survey for detection of encroachment on forest land with the help of forest Patwari/Kanungo before getting demarcation from the revenue authority by the field functionary authorities. Further, the details of boundary pillars to be constructed/repared in the Division are given below.

| Sr. No | Name of Range | No. of boundary Pillars to be constructed/repared |
|--------|---------------|---------------------------------------------------|
| 1.     | Girinagar     | 634                                               |
| 2.     | Bhagani       | 1222                                              |

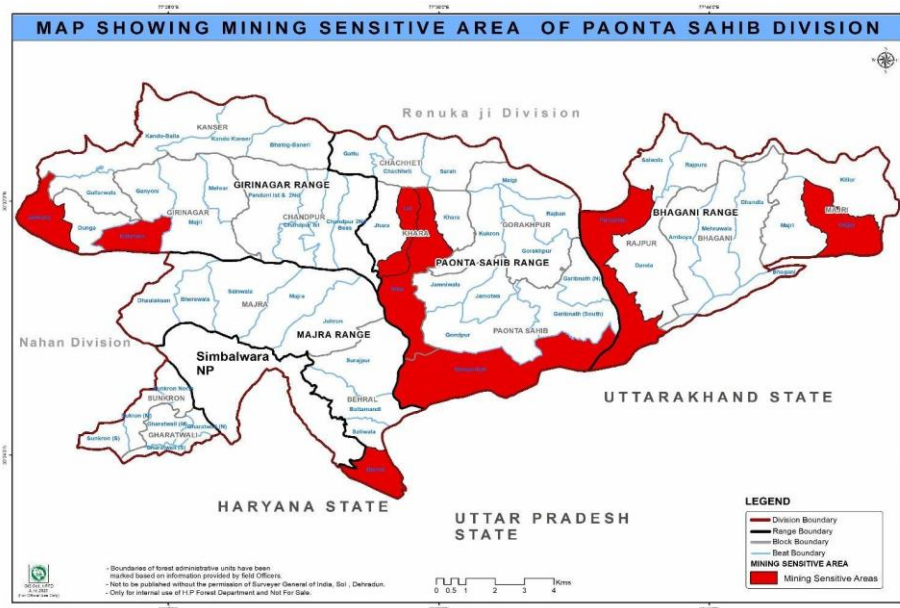
|    |              |      |
|----|--------------|------|
| 3. | Paonta Sahib | 99   |
| 4. | Majra        | 322  |
|    | <b>Total</b> | 2277 |

The ones already constructed have been discussed in Part I.

## 9.7 Mining

**9.7.1 General:** -The Western Himalayas and its foothills is a treasure house of the minerals being exploited by human being since time immemorial with the advent of society. The methods of extraction of the minerals became more and more mechanized which resulted in extraction of the minerals at a pace much faster than the pace at which the nature could meet itself with such a situation is recover from the onslaughts of human beings. The production of aggregate in a particular area is a function of the availability of resources, the size of population, the economy of the area and various development and infrastructural works being undertaken in the area i.e. road construction and Hydro power projects etc. It brought into sharp focus the conflict between development and conservation of natural resources, which served to emphasize need for reconciling the twin objectives into the large interest of the society. Illegal mining is a major menace near the river beds of Yamuna, Giri and Bata where sand and stone mining is a rampant issue. The map depicts the mining sensitive beats in the Division along riverine tracts.

**Map No. 9.7.1**





**9.7.2 Supreme Court on Mining:** -Mining in forest area is another cause of forest degradation and environmental pollution but in State of Himachal Pradesh there is few numbers of cases of mining in protected forest. Mining operation is being carried out in this tract on Govt. waste land i.e. River/streambed such as Gair Mumkin Khad/Nallah, Na-Kabil Charand and private land under the administrative Control of Himachal Pradesh Industries Department and State Environment Protection and Pollution Control Board. The State Geologist in the Director of Industries designated as Authority on behalf of the State Govt. to supervise and control of such work w.e.f. 19-12-1998. Thus, the forest department has major role only under Section 2 of the Forest (Conservation) Act, 1980 for granting or renewal of mining lease in forest area in compliance of the Hon'ble Supreme Court order dated 12-12-1996. The area applied for lease on non-forest land shall be inspected by a committee constituted as per River/Stream Bed Mining Policy guidelines for the State of Himachal Pradesh, 2004 dated 28-2-2004. Based on the approval of the sites for setting up of the Stone Crusher unit & grant of mining lease after obtaining consent to operate from the State Pollution Control Board, Forest Department and Mining Department etc. The permanent registration shall be issued to the owner of the Stone Crusher by the Geological Wing, Department of Industries is under the provisions of the Himachal Pradesh Minor Minerals (Concession) Revised Rules, 1971.

Thus, it clears that no mining operation is allowed on forest land without prior permission of Central Govt. under Section 2 of the Forest (Conservation) Act, 1980. In series of orders in the *T.N. Godavarman case, the Supreme Court* dealt at length and at times in minute details about instances of mining taking place in forest area. The Supreme Court, however, made it clear that it was not against mining per-se but against mining which is in violation of the Forest (Conservation) Act, 1980 and also mining in National Park and Sanctuaries in compliance of the court order dated 14-2-2000.

The Supreme Court kept a strict watch on the implementation of the order. Not only was it concerned about the fact that no illegal mining activities should take place in forest areas, but it also kept a vigil against any leniency shown to those involved in illegal mining. The court made it amply clear that it has to be informed about all development, which relate to illegal mining.

It is also pertinent of point out that as per directions given by the Hon'ble Supreme Court of India, in mining matters, the mining of any mineral is a non-forest purpose and is therefore, not permissible without prior approval of the Central Government.

The meaning of Forest shall be understood strictly in accordance with the law laid down by the Hon'ble Supreme Court of India in the case ***T.N. GodavarmanThirumulkpad etc. versus Union of India and others (AIR 1997 SC 1228)***. The word 'Forest' must be understood according to its dictionary meaning. This description covers all statutorily recognized forests, whether designated as reserved protected or otherwise for the purpose of Section 2(1) of the Forest (Conservation) Act, 1980.

For the purpose of application of Forest (Conservation) Act, 1980, the expression 'Forest' land would mean a tract of land covered with trees, shrubs, vegetation and undergrowth under mingled with trees with pastures, be it of natural growth or manmade forestation. The GairMumkin area i.e. river beds, nallas, khalas/dhank/junglejhari, such areas fall within the ambit of expression forest land.

In compliance to directions of Hon'ble Supreme Court, all the cases of mining lease, are required to be processed, under Forest (Conservation) Act, 1980 and further mining operation may be allowed subject to the following conditions: -

- i) No mining operation shall be allowed in forest land unless or until permission for its non-forestry purpose is obtained from Central Government under the provisions of Forest (Conservation) Act, 1980.
- ii) Mining operation in private land may be allowed, only if, it does not cause any damage to the adjoining forests that too after obtaining prior permission from the competent authority.
- iii) The mining shall be started from top to bottom by making benches 6mx6m keeping general angle of repose as 45°.
- iv) Dumping sites for mine works and top of soil shall be provided in such a way so that there is no damage to the adjoining land; the same does not roll down the slope. Top soil shall be used for afforestation purpose in the barren/exhausted paths.
- v) The lessee shall erect check dams of undressed stones at different suitable sites along the slope of the area and also along nalla to avert the flow of debris rolling down the slope and to check soil erosion.
- vi) The lessee shall take all necessary precaution while carrying out blasting operations, if needs.
- vii) Adequate measures shall be taken to check the air pollution.

- viii) Sufficient funds should be provided to Forest Department to carryout afforestation and soil conservation works after the lease is over apart from minor works carried out as mentioned above during the mining operations.
- ix) No extraction of sand, gravels, and stone shall be allowed along the roads and river bank to check the menace of erosion.
- x) Trees of suitable species shall be planted to develop a green belt within and along the boundary of the premises.

The Hon'ble Supreme Court further directed that before any mining operations commence, the lease holders shall obtain all statutory clearances including environmental clearance in term of MOEF notification dated 14-9-2006 and also the approval under the Forest (Conservation) Act, 1980 read with the Environment Protection Act, 1986. The details of stone crusher units and Mining leases is tabulated in **Tables No.-9.7a & 9.7b.**

**Table 9.7a: Detail of Stone crusher areas in Paonta Sahib Division**

| Sr. No | Name of Range | Name of Stone Crusher /Mining                       | Govt./ Pvt. Land | Khasra No.                             | Location with Area (Mauza)   |
|--------|---------------|-----------------------------------------------------|------------------|----------------------------------------|------------------------------|
| 1      | Paonta Sahib  | Mahinder Singh Devinagar                            | Pvt. Land        | 861/283                                | Kunja Matralion 2-12-1 Bigha |
| 2      | Paonta Sahib  | Balaji Stone Crusher                                | Pvt. Land        | 487/332 /148/3                         | Rampur Ghat 11.15 Bigha      |
| 3      | Paonta Sahib  | Rocklime And Allied Products                        | Pvt. Land        | 485/ 332/148/3                         | Rampur Ghat 3.00 Bigha       |
| 4      | Paonta Sahib  | Akhilesh Enterprises                                | Pvt. Land        | 470/71/72/73                           | Kedarpur 2.01 Bigha          |
| 5      | Paonta Sahib  | All Stone Mine & Minerals                           | Pvt. Land        | 383/285/153                            | Rampur Ghat 3-01-02 Bigha    |
| 6      | Paonta Sahib  | Sab Giri Industries                                 | Pvt. Land        | 575/542/485 /332/148/2                 | Rampur Ghat 5-01 Bigha       |
| 7      | Paonta Sahib  | Shubhgiri Crushing Company                          | Pvt. Land        | 542/485/332/148 /2/4                   | Rampur Ghat 3-01 Bigha       |
| 8      | Paonta Sahib  | Shubhgiri Industries                                | Pvt. Land        | 388/285/2                              | Rampur Ghat 3-00 Bigha       |
| 9      | Paonta Sahib  | Ashish Stone Crusher                                | Pvt. Land        | 350/148                                | Rampur Ghat 3-02-1 Bigha     |
| 10     | Paonta Sahib  | Yaksha Industries                                   | Pvt. Land        | 542/485/332/148/ 2/3/2                 | Rampur Ghat                  |
| 11     | Paonta Sahib  | Yaksha Industries                                   | Pvt. Land        | 907/679/908/ 679/ 729/270/472/ 9/270/5 | Manpurdevra 57.12 Bigha      |
| 12     | Girinagar     | Prempal S/O Gopalsingh R/O Village Mehat P.O kansar | Pvt. Land        | 57                                     | Mauza Mehat 24-12 Bigha      |

|    |           |                                                                  |               |                                |                                              |
|----|-----------|------------------------------------------------------------------|---------------|--------------------------------|----------------------------------------------|
| 13 | Girinagar | Dalipsingh S/O<br>Naryansingh R/O<br>Village Mehat P.O<br>Kansar | Pvt.<br>Land  | 58/1                           | Mauza Mehat 25-03<br>Bigha                   |
| 14 | Majra     | Sirmour Industries                                               | Pvt.<br>Land  | 953/2/2                        | Mauza Bata Mandi<br>3-52-81 Hactare          |
| 15 | Bhagani   | Devraj Stone Crusher                                             | Pvt.<br>Land  | 1114 / 609                     | Manpurdevra                                  |
| 16 | Bhagani   | Guru Nanak Stone<br>Crusher                                      | Pvt.<br>Land  | 1118 / 609                     | Manpurdevra                                  |
| 17 | Bhagani   | Chandel Associates                                               | Pvt.<br>Land  | 1248 / 1026/912                | Manpurdevra                                  |
| 18 | Bhagani   | Goyal Crushing                                                   | Pvt.<br>Land  | 1122/609/1123/ 609             | Manpurdevra                                  |
| 19 | Bhagani   | Meera Mines and<br>Mineral                                       | Pvt.<br>Land  | 1127/609/1128/<br>609/1130/609 | Manpurdevra                                  |
| 20 | Bhagani   | Himalyan Stone<br>Crusher                                        | Pvt.<br>Land  | 288/239/2/2/ 1                 | Bangran                                      |
| 21 | Bhagani   | Shree Krishna Stone<br>Crusher                                   | Pvt.<br>Land  | 522/02                         | Manpurdevra                                  |
| 22 | Bhagani   | Gopal Stone Crusher                                              | Pvt.<br>Land  | 222                            | Shyampurgorkhuwala                           |
| 23 | Bhagani   | Rj Stone Crusher                                                 | Pvt.<br>Land  | 638/613/590/188/ 13            | Mokampur Navada                              |
| 24 | Bhagani   | Mahadev Stone Crusher                                            | Pvt.<br>Land  | 1093/608                       | Manpurdevra                                  |
| 25 | Bhagani   | Yamuna Mines and<br>Minerals                                     | Pvt.<br>Land  | 330/254/155/2/2                | Gojaradain                                   |
| 26 | Bhagani   | Dev Raj Negi                                                     | Pvt.<br>Land  | 330/254/155/92/1/ 1<br>/1      | Gojaradain                                   |
| 27 | Bhagani   | Mohit Stone Crusher                                              | Pvt.<br>Land  | 255/155                        | Gojaradain                                   |
| 28 | Bhagani   | Randeep Singh, Mauza<br>And Mohalbhagani                         | Govt.<br>Land | ---                            | Mauza And Mohal<br>bhagani<br>54.668 Hactare |

**Table 9.7 b: Detail of mining lease areas in Paonta Sahib Division**

| Sr. No | Name of Range | Name of Stone Crusher /Mining        | Govt./ Pvt. Land | Khasra No.               | Location with Area (Mauza)    |
|--------|---------------|--------------------------------------|------------------|--------------------------|-------------------------------|
| 1      | Paonta Sahib  | Mahinder Singh Devinagar (Lease)     | Pvt. Land        | 861/283                  | Kunja Matralion 191.10        |
| 2      | Paonta Sahib  | Balaji (Lease)                       | Pvt. Land        | 637/613/188 &639/563/480 | Mohakampur Navada             |
| 3      | Paonta Sahib  | Rocklime And Allied Products (Lease) | Pvt. Land        | 238/168/242/169          | Bangran 121.12 Bigha          |
| 4      | Paonta Sahib  | Akhilesh Enterprises (Lease)         | Pvt. Land        | 53/2                     | Ganguwala 122.12 Bigha        |
| 5      | Paonta Sahib  | All Stone Mine & Minerals (Lease)    | Pvt. Land        | 431/322/1                | Mohakampur Navada 86.12 Bigha |

|    |              |                                    |           |                                        |                                      |
|----|--------------|------------------------------------|-----------|----------------------------------------|--------------------------------------|
| 6  | Paonta Sahib | Sab Giri Industries (Lease)        | Pvt. Land | 638/613/590/188/8                      | Manpurdevra<br>81.18 Bigha           |
| 7  | Paonta Sahib | Shubhgiri Crushing Company (Lease) | Pvt. Land | 288/239/2/1                            | Manpurdevra<br>111.01 Bigha          |
| 8  | Paonta Sahib | Shubhgiri Industries (Lease)       | Pvt. Land | 638/613/590/188/10 & 638/613/590/188/3 | Manpurdevra<br>162.15 Bigha          |
| 9  | Paonta Sahib | Ashish Stone Crusher (Lease)       | Pvt. Land | 250/228 /4/3 & 250/228 /4/4            | Bangran<br>70.12 Bigha               |
| 10 | Paonta Sahib | Aashutosh Stone Crusher (Lease)    | Pvt. Land | 162/1/2                                | Phoolpurshamshergharh<br>57.08 Bigha |

The mining activities in the Govt. land i.e. River beds/waste land falls under the provisions of forest department notification dated 25-12-1952. According to this notification every Govt. waste land over which the State Govt. has the proprietary right or the property of the Govt. is a forest land for the application of Forest (Conservation) Act, 1980 in compliance of the Hon'ble Supreme Court order dated 12-12-1996. Thus, River beds/waste lands of the tract in this division attract the provisions of Forest (Conservation) Act, 1980. Therefore, it is the duty of the Forest department to keep watch and ward over their properties primarily as nodal officer under the Forest (Conservation) Act, 1980. And after registration of stone crusher unit and mining lease area by the Geological Wing, Department of Industries under the provisions of H.P. Minor Minerals (Concessions) Revised rules, 1971, the Sub-Divisional Level Flying Squad or Committee under the chairmanship of the Sub-Divisional Magistrate constituted by the Govt. of H.P. vide notification No. Udyog-II(F) 6-20/2005 dated 30-4-2001 is responsible for all unauthorized or illegal and unscientific mining and stone crushing operation without realizing the proper compounding fee in terms of the law laid down by the Hon'ble High Court.

Vide H.P. Govt. Notification No. Rev. B.A (4)8/2004-loose dated 21-4-2006 notified that notification issued in the year 1952 by the Govt. of Himachal Pradesh, Forest Department, the provision of Indian Forest Act, 1927 and Forest (Conservation) Act, 1980 will not apply to the lands vested in the State Govt. under the provision of the H.P. Ceiling on Land Holding Act, 1972 and H.P. Village Common Lands Vesting and Utilization Act, 1974 unless any land which vested in the State Govt. under the aforesaid enactments was recorded as forest land in the revenue record before vestment etc.

**9.7.3 Mining Lease Mandatory for Running a Stone Crusher Unit:** -In order to ensure legal and regular supply of minor minerals, every owner of stone crusher, shall have a valid mining lease for this purpose.

No person shall install or run any stone crusher in any area within the State of Himachal Pradesh unless he obtains a provisional registration from the Geological Wing, Department of Industries. For this an application Form “A” shall be submitted and it shall be accompanied by fee of Rs. 2500/- only. Permanent registration shall be issued to the owner of the stone crusher by the Geological Wing, Department of Industries after obtaining consent to operate from the Pollution Control Board on Form-‘B’. in case of renewal of the registration, the owner of stone crusher shall apply for the renewal at least six months prior to the expiry of the registration in Form- “A”.

**9.7.4 Other Condition for Running of Stone Crusher:** -The owner of the stone crusher shall observe the provisions of: -

- i) The Forest (Conservation) Act, 1980 and rules framed thereunder.
- ii) The Air (Prevention and Control of Population) Act, 1981 and rules framed thereunder.
- iii) The Water (Prevention & Control of Population) Act, 1974 and rules framed thereunder.
- iv) The Environment (Protection) Act, 1986 and rules framed thereunder.
- v) The Noise Pollution (Regulation and Control) Rules, 2000.

**9.7.5 Condition for Mining Lease:** -As per strategy No. 9.6 of River/Stream Bed Mining Policy guidelines and Rule 21 (4) (i) of the H.P. Minor Mineral (Concession) Revised Rules, 1971 (as amended on 10-6-2004) every applicant shall submit Working-cum-Environment Management Plan for carrying out systematic and scientific mining.

**9.7.6 Delegation of Powers:-** All Deputy Commissioners/ CFs, Divisional Forest Officers/ACF’s and Range Forest Officers have been delegated with the powers under Sub Section (2) of Section 26 read with Section 21 (4) of the Mines & Minerals (Development & Regulation) Act, 1957 to empower to seize any minerals raised or transported or caused to be raised or transported by any person without any lawful authority, any mineral from any land for that purpose use any tool/equipment, vehicle or any other thing for this purpose

All forest guards have been delegated with powers under Section 22 of the Mines & Minerals (Development & Regulation) Act, 1957 to make complaint in written in the court of competent jurisdiction in respect of any offence punishable under the said Act or any rules made thereunder. Similarly, Assistant Conservator of Forests and Range Officers have also been delegated with powers under the Act to make complaints in courts in writing in respect of any offence punishable under the Act or any rules made there under in their respective jurisdiction

The powers also have already been delegated to all Deputy Commissioner/Executive Magistrates and SP in HP within their jurisdiction to seize any material raised by any person without any lawful or any tool, equipment, vehicle or any other thing brought on the land for the purpose, under Section 21 of Mines & Minerals (Development & Regulation) Act, 1957. Similarly, all Directors, State Geologist, Deputy Commissioners, Executive Magistrate and Police Officers have also been delected with powers under the act to make complaint in writing in the court of competent jurisdiction in respect on any offense punishable under the Mines & Minerals (Development & Regulation) Act, 1957.

Following Sub-Divisional Level Flying Squad has been constituted vide Notification No. Udyog (Chh) 7-3/90 dated 11-3-1993 and revised vide notification No. Udyog (Chh) 7-3/90 dated 20-11-1993.

- |    |                                                     |   |          |
|----|-----------------------------------------------------|---|----------|
| 1. | Sub Divisional Magistrate                           | - | Chairman |
| 2. | Assistant Conservator of Forests/Range Officer      | - | Member   |
| 3. | DSP or his representative having local jurisdiction | - | Member   |

The above committee is authorized to requisition the relevant record from the office of Mining Officer and the Services of Mining Officers and his staff for the purpose of carrying out such inspections.

**9.7.7 Illegal Mining:** -Under Sub Rule (I) of rule 53 of the H.P. Minor Minerals (Concession) Revised Rules, 1971, no person shall undertake any operations in any area, except under and in accordance with the terms and conditions of the mining lease, contract or permit granted under these rules.

Under Sub Rule (2) of rule 53, any contravention of sub-rule (1) shall be punishable with imprisonment for a term which may extend to one year or with fine which may extend to five thousand rupees, or with both and in case of a continuing contravention, with an additional fine

which may extended to five hundred rupees for every day during which the contravention continues after conviction for the first such contravention.

**9.7.8 Cognizance of Offences:** -Under Rule 54, no court shall take cognizance of any punishable under these rules except upon a complaint in writing made by the Director or any other officer authorized by him in this behalf within six months of the date on which said offence is alleged to have been committed.

**9.7.9 Restrictions on Transport of the Minerals Under Rule 57: -**

- i) The holder of a mining lease or mining permit or a person authorized by him in this behalf shall issue a pass in Form 'M' duly countersigned by the concerned Mining Officer/General Manager, District Industries centre or any officer authorized in this behalf to every person carrying a consignment of minor mineral by a vehicle, animal or any other mode of transport.
- ii) No person shall carry within Himachal Pradesh a minor mineral by a vehicle, animal or any other mode of transport, excepting railway, without carrying a pass in Form 'M' issued under sub-rule (1)
- iii) Every person carrying any minor mineral shall on demand by any officer of the State Government authorized in this behalf, show the said pass to such officer and allow him to verify the correctness of the particulars of the pass with reference to the quantity of the minor mineral.
- iv) The State Government may establish a check post for any area included in any mining lease or permit, and when a check post is so established, public notice shall be given of this fact, by publication in the Gazette and in such other manner as may be considered suitable by the State Government.
- v) No person shall transport a minor mineral to which these rules apply from such area without first presenting the mineral at the check post fixed for that area for purposes of verification of the weighment or measurement of the quantity of the mineral.
- vi) Any person found to have contravened any provision of sub-rule (2), (3) or (5) above shall, on conviction, be punishable with imprisonment of either description for a term which may extend upto six months or with fine which may extend to one thousand rupees or both.



Besides this the Himachal Pradesh Minerals (Prevention of illegal Mining Transportation & Storage) Rules, where stringent provision has been made in case of violation have been notified by the Govt. vide notification No. Ind. II (F) 11-3/2000 dated 11-8-2004. To curtail illegal mining, instructions have also been issued to all the Mining Officers that no case of illegal extraction of mineral shall be compounded for less than five thousand rupees. If the offence is repeated, the case shall not be compounded and shall be lodged in the court of law.

**9.7.10 Compounding of Offences Under the Mines & Minerals (Development & Regulation) Act, 1957: -**

Rule 23 A (1) any offence punishable under this Act or any rule made thereunder may, either before or after the institution of the prosecution be compounded by the person authorized under Section 22 to make a complaint to the court with respect to that offence, on payment to that person, for credit to the Government, of such sum as that person may specify:

Provided that in the case of an offence punishable with fine only, no such sum shall exceed the maximum amount of fine which may be imposed for that offence.

(2) Where an offence is compounded under sub Section (1) no proceeding or further proceeding, as the case may be, shall be taken against the offender in respect of the offence so compounded, and the offender, if in custody, shall be released forthwith.

**9.7.11 Rule 23 B Power of Search: -**

If any Gazetted officer of the Central or a State Government authorized by the Central Government or a State Government, as the case may be, in this behalf, by general or special order has reason to believe that any mineral has been raised in contravention of the provisions of this Act or rules made thereunder or any document or thing in relation to such mineral is secreted in any place or vehicle, he may search for such mineral, document or thing and the provisions of Section 100 of the Code of Criminal Procedure, 1973 shall apply to every such search.

Rule 23C (1) the State Government may, by notification in the Official Gazette, make rules for preventing illegal mining, transportation and storage of minerals and for the purposes connected therewith.

(2) In particular and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely: -

- a) Establishment of check-posts for checking of minerals under transit.
- b) Establishment of weigh-bridges to measure the quantity of mineral being transported.
- c) Regulation of mineral being transported from the area granted under a prospecting license or a mining lease or a quarrying license or a permit, in whatever name, the permission to excavate minerals, has been given.
- d) Inspection, checking and search of minerals at the place of excavation or storage or during transit.
- e) Maintenance of registers and forms for the purposed of these rules.
- f) the period within which and the authority to which applications for revision of any order passed by any authority be preferred under any rule made under this section and the fees to be paid therefore and powers of such authority for disposing of such applications.
- g) Any other matter which is required to be or may be prescribed for the purpose of prevention of illegal mining, transportation and storage of minerals.

(3) Notwithstanding anything contained in Section 30, the Central Government shall have no power to revise any order passed by a State Government or any of its authorized officers or any authority under the rules made under sub-Sections (1) and (2).

#### **9.7.12 Power of Entry and Inspection: -**

Rule 24 (1) for the purpose of ascertaining the position of the working, actual or prospective, of any mine or abandoned mine or for any other purpose connected with this Act or the rules made thereunder, any person authorized by the Central Government or a State Government in this behalf, by general order, may-

- a) Enter and inspect any mine.
- b) Survey and take measurements in any such mine.
- c) Weight, measure or take measurements of the stocks of minerals lying at any mine.
- d) Examine any document, book, register or record in the possession or power of any person having the control of, or connected with, any mine and place marks of identification thereon, and take extracts from or make copies of such document, book, register or record.

- e) Order the production of any such document, book, register, record, as is referred to in clause.
- f) Examine any person having the control of, or connected with, any mine.

(2) Every person authorized by the Central Government or a State Government under sub-Section (1) shall be deemed to be a public servant within the meaning of section 21 of the Indian Penal Code, and every person to whom an order or summons is issued by virtue of the power conferred by clause (c) or clause (f) of that sub-section shall be legally bound to comply with such order or summons, as the case may be.

#### **9.7.13 Penalties: -**

Rule 21 (1) Whoever contravenes the provisions of sub-Section (1) or sub-Section (IA) of Section 4 shall be punished with imprisonment for a term which may extend to two years, or with fine which may extend to twenty-five thousand rupees, or with both.

(2) Any rule made under any provision of this Act any provide that any contravention thereof shall be punishable with imprisonment for a term which may extend to one year or with fine which may extend to five thousand rupees, or with both and in the case of continuing contravention, with an additional fine which may extend to five hundred rupees for every day during which such contravention continues after conviction for the first such contravention.

(3) Where, any person, trespasses into any land in contravention of the provisions of sub-Section (1) of Section 4, such trespasser may be served with an order of eviction by the State Government or any authority authorized in this behalf, by that Government and the State Government or such authorized authority may, if necessary, obtain the help of the police to evict the trespasser from the land.

(4) Whenever, any person raises, transports or causes to be raised or transported, without any lawful authority, any mineral from any land, and for that purpose, uses any tool, equipment, vehicle or any other thing, such mineral, tool, equipment, vehicle or any other thing shall be liable to be seized by an officer or authority specially empowered in this behalf.

(4A) Any mineral, tool, equipment, vehicle or any other thing seized under sub-section (4) shall be liable to be confiscated by an order of the court competent to take cognizance of the offence under sub-section (1) and shall be disposed of in accordance with the directions of such court.

(5) Whenever, any person raises, without any lawful authority, any mineral from any land, the State Government may recover from such person the mineral so raised, or where such minerals

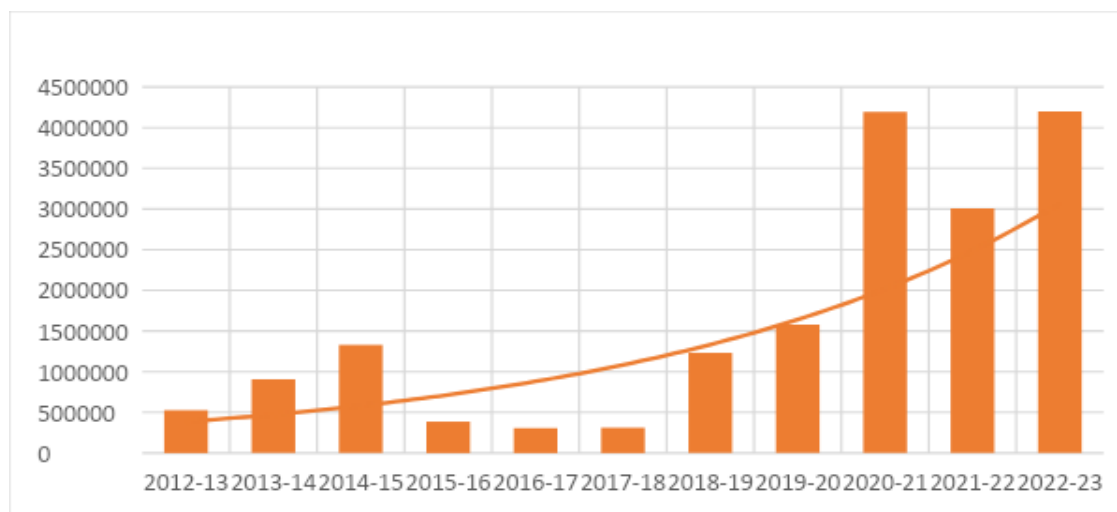
have already been disposed of the price thereof, and may also recover from such person, rent, royalty or tax, as the case may be, for the period during which the land was occupied by such person without any lawful authority.

(6) Notwithstanding, anything contained in the Code of Criminal Procedure, 1973, an offence under sub-section (1) shall be cognizable.

Paonta Sahib Forest Division, especially in the last four years with the special efforts of the DFO and field staff has led a major crackdown on compounding with respect to illegal mining cases. The details of cases detected and challans made are given in Table 9.7.13

**Table 9.7.13 Mining cases details**

| Sr. No. | Year    | Mining cases detected | Amount challaned (Rs.) |
|---------|---------|-----------------------|------------------------|
| 1       | 2012-13 | 46                    | 526600                 |
| 2       | 2013-14 | 120                   | 907600                 |
| 3       | 2014-15 | 113                   | 1329600                |
| 4       | 2015-16 | 52                    | 385948                 |
| 5       | 2016-17 | 54                    | 306438                 |
| 6       | 2017-18 | 35                    | 311577                 |
| 7       | 2018-19 | 106                   | 1234320                |
| 8       | 2019-20 | 117                   | 1575714                |
| 9       | 2020-21 | 271                   | 4196335                |
| 10      | 2021-22 | 162                   | 3007428                |
| 11      | 2022-23 | 200                   | 4201176                |



#### **9.7.14 Preventive/Remedial Measures: -**

Field functionaries are advised to act against the mining mafia or offenders under the Mines and Minerals (Development and Regulation) Act, 1957 read with Forest (Conservation) Act, 1980, so that illegal mining could be halted/checked on the forest land including Charagah Billa Darakhatan, Gair Mumkin Khad, Nallah, River Bed/Stream etc. in compliance of the Hon'ble Supreme Court order dated 12-12-1996.

All vehicle carrying stone, sand, bajri etc. are required to carry with them "M" Form duly signed by the Mining Officer or authorized officer. Action need to be taken against vehicle not accompanied by 'M' Form signed by authorized signatory, as it shall be presumed that the mineral has been brought from forest if the vehicle incharge or owner of the vehicle failed to proof the legal source of material with satisfaction of the forest officer, police officer or mining officer etc. under the provisions of the Mines & Minerals (Development & Regulation) Act, 1957. Similarly, Incharges at all check posts should also check all vehicle carrying minerals i.e. Sand, Bajri and Stone etc. for 'M' Form and a record of all such vehicle checked should be maintained at check post's register and fortnightly report may be submitted to Range Officer.

Additionally, following measures are must when it comes to mining control:

- A great degree of the forest area in the Division can be covered by vehicles. Hence provision of patrol vehicles will be highly useful. The same is imminently required for action on illicit mining and patrolling *Khair* areas.
- Collaboration with neighboring state forest department is also required urgently to combat illicit mining and boundary issues.
- Special discount needs to be given to staff of border division beats for procuring fire arms, as risk exposed is high during night time patrolling near mining sites.
- A task force at division level, equipped with vehicular mobility is required to combat illicit mining. Joint patrolling with police, mining and revenue officials also adds deterrence to the mining mafia.

#### **9.8 Grazing**

The geographical area of Paonta Sahib Forest Division is 45053 hectares while Forest area is 29568.16 hectare (it includes 431-hectare Shamlat land and 346-hectare Ceiling land, rest of area is Reserved Forest) thus 15485 hectares is in private land. Over grazing is harmful for the regeneration of forests and in Paonta Sahib Forest Division area available for grazing has

decreased over the time. Out of this forest area some area has been diverted under Forest Conservation Act, 1980 and Forest Rights Act, 2006. Beside this, in compliance to the Hon'ble Supreme Court of India order dated 16th February, 2018 (in the matter of Interlocutory Application No. 3840 of 2014 in W P (C) No. 202/1995 in T N Godavarman Thirumulapad vs Union of India and others, silviculture felling is allowed in approximately 293.21 ha of Paonta Sahib Forest Division on an experimental basis. The Hon'ble Supreme Court permitted silviculture felling of trees to a very limited extent to observe whether such silviculture felling actually helps in the regeneration of forests or not. It should also be ensured that these forest areas are kept free from grazing and are protected. In all these forests grazing shall not be allowed as these areas are being felled especially for regeneration of Sal forest, therefore neither grazing nor any other biotic pressure except Silvicultural operation prescribed for establishment of young regeneration of Sal be allowed.

The grazing is one of the major causes for degradation of forests as maximum damage is caused to the young seedlings by way of browsing as well as by trampling under the hoofs of domestic cattle. The National commission on Agriculture (1976) also mentioned about the need to reduce the numbers of goats in India. For formulation of grazing policy cardinal principle laid down in National Forest Policy includes; rotational grazing to prevent destruction of better strains of grasses, grazing incidents are to be kept at minimum and should be eliminated from regeneration of forest areas. It has also been emphasized in National Forest Policy that restriction be imposed on sheep grazing and total exclusion of goats from forests as damage to young plants caused by these animals is often un-repairable and their admission to the forest is incompatible with the aims and the objects of forest management. Keeping in view the above principles, Government of Himachal Pradesh vide notification no. 784-13/66(M) dated 29.2.1968 appointed a high-level Grazing Advisory Committee to review the entire grazing Policy of the Himachal Pradesh. During the meeting of State Grazing Advisory Committee held on 17.10.1989 it was decided that "the number of animals found grazing presently be frozen at the present level. Thus, number of animals grazing in the forests of Himachal Pradesh cannot be increased beyond the number of animals fixed in the year 1989 level. And further meeting of Gaddi Kalyan Board held on 16.02.2011 it was decided that the number of cattle shall not be increased.

Graziers in Paonta Sahib Forest Division can be divided into following four categories:

- Local Right Holders
- Nomadic Graziers

- Migratory Graziers
- Others

1. Local Right Holders- They are almost entirely agriculturists and have their bonafide livelihood rights in the forests of this division. They keep buffaloes and cows for milk and manure and are stall fed but graze goats in the forests throughout the year. Until recently, grazing permits were issued to such graziers by the department known as ‘Punchi Permits’, but as on today and there is no strict regulation on them.

2. Nomadic Graziers – Ban gujjars are a purely pastoral race owning large herds of buffaloes. They can be classified into two groups i.e, Jammuwal Gujjars and others, who have migrated from Uttarakhand. The Jammuwal Gujjars were issued temporary grazing permits but now they have developed permanent settlements in Jammukhala and Chhaluwala area of Paonta Sahib Forest Range and practice agriculture in forest land. Their population has increased considerably in last few years and there is large number of Jammuwal gujjars in this division who are grazing their buffaloes without permits. Some gujjars have migrated from Uttarakhand and are settled illegally in this Division.

3. Migratory graziers – They are nomadic pastoral people from Kinnaur and Rohru area of Shimla District. For generations they exercised rights of grazing during winter months in certain areas of Uttar Pradesh, particularly in the Dehradun District. But due to some interstate dispute, they were not allowed into Uttar Pradesh after 1977-78. In 1988 Government of Himachal Pradesh issued directions to temporarily issue permits for 8000 sheep and goats for winter grazing in Paonta Sahib Forest Division. They visit this division during winters and in practical they let more cattle than the permitted numbers into forests. However, there is no provisions to have any right and concessions to migratory graziers in Sirmour district as per Faisla-e –Janglat and under the provisions of Revenue settlement.

4. Others- They include people from the hill tracts of Trans- Giri area of Sirmour. They visit this division during winters and are issued grazing permits on a regular basis.

**List of Grazing Permits has been already attached in Appendix X.**

#### **9.8.1 Damage caused to the forest by grazing-**

1. It negatively affects regeneration as animals graze the seedlings of desired species along with grass, herbs etc. which can lead to the change in the composition of the

future crop. If an area is allowed to be overgrazed, the vegetation is repeatedly trampled thus making the germination and survival of native species difficult.

2. Indiscriminate and heavy grazing causes soil compaction which further decreases soil porosity and aeration due to which water absorption capacity of soil gets reduced. Hooves of animals break down soil aggregates which give crumbly structure to the soil and thus making it susceptible to erosion and accelerated run off.
3. Physiological disturbance to the preferred species is caused by overgrazing which is indicated by reduction in height growth, basal growth and reproductive activity.
4. The original vegetal cover gets replaced by species of lower stages of succession which have low fodder value and poor yield thus leading to retrogressive succession.
5. Invasive species which are indicative of conditions of heavy grazing such as, *Lantana camara*, *Opuntia sp.*, *Euphorbia sp.* and *Agave sisalana* become abundant in areas subjected to indiscriminate grazing.

### 9.8.3 Carrying capacity and optimum livestock level number

Carrying capacity is the maximum number of animals that can graze on a specific area over a given period of time without causing any adverse effects such as a decrease in the production of fodder, forage quality, soil erosion etc. Maintaining the number of live-stock on a grassland or forest at an optimum level is necessary as it keeps the grassland at an optimum level of fodder production and it ensures the well being of the livestock. Allowing animals for grazing beyond carrying capacity of the area will be detrimental to forest health and will be against the basic principle of conservation of natural resources in sustainable manner. As per the Report of the Grazing Advisory Committee on the Grazing Policy in Himachal Pradesh standard formula to calculate grazing incidence on the basis of weight and feeding habits of various animals has been devised as under: -

**Table 9.8.3 (a): Grazing incidence units**

| Sr. No. | Type of Animal | Number of units | Grazing Area required hector/unit |
|---------|----------------|-----------------|-----------------------------------|
| 1.      | Sheep          | 1               | 0.50 hac.                         |
| 2.      | Goat           | 1.5             | 0.50 hac.                         |
| 3.      | Buffalo        | 6.00            | 0.50 hac.                         |
| 4.      | Kine           | 4.00            | 0.50 hac.                         |



|    |        |      |           |
|----|--------|------|-----------|
| 5. | Horse  | 4.00 | 0.50 hac. |
| 6. | Mule   | 5.00 | 0.50 hac. |
| 7. | Donkey | 3.00 | 0.50 hac. |

So that the net grazing Area required by the grazers for grazing their sheep & Goats including buffaloes is as under: -

**Table 9.8 (b): Carrying Capacity of Paonta Sahib Forest Division**

| Total area of Paonta Sahib Forest Division | Closed area with plantation etc. | Area available for grazing | Name of cattles/ animals | No. of unit | No. of animals | Total No. of units | Carrying capacity required for cattle @ 0.25 ha per unit grazing incidence (in ha.) | Actual area affected by grazing (in ha.) |
|--------------------------------------------|----------------------------------|----------------------------|--------------------------|-------------|----------------|--------------------|-------------------------------------------------------------------------------------|------------------------------------------|
| 28791.69 ha.                               | 3843.47 ha.                      | 24948.22 ha.               | Goat                     | 1.5         | 16707          | 25060.50           | 6265.125                                                                            | 41417.125 ha                             |
|                                            |                                  |                            | Sheep                    | 1           | 10722          | 10722              | 2680.50                                                                             |                                          |
|                                            |                                  |                            | Buff.                    | 6           | 10051          | 58182              | 14545.5                                                                             |                                          |
|                                            |                                  |                            | Ox/ Cow                  | 4           | 19904          | 71704              | 17926                                                                               |                                          |
|                                            |                                  |                            | <b>Total</b>             |             | <b>57384</b>   | <b>165668.50</b>   | <b>41417.125</b>                                                                    |                                          |

Forest area of Paonta Sahib Forest Division is 29568.16 hectare but animals grazing presently in this division require an area of 41417.125 hectare. Thus, the animals presently grazing in Forests of Paonta Sahib Forest Division are far above the carrying capacity of the forest area. Thus, the areas of Paonta Sahib Forest Division are subject to overgrazing which is one of the major environmental degradation. Overgrazing happens when groups of animals which feed continuously and excessively an area without allowing the vegetation in the area to get rest to fully recover and regenerate. Recommendations of State Grazing Advisory Committee as well on the basis of proper grazing management and control, some measures are prescribed therefore.

#### **9.8.4 Grazing Management & Remedial Measures**

1. Illegal grazing -The field staff should ensure that the livestock of the graziers should not exceed the permissible limit, for ensuring regeneration no grazing should be allowed in areas under silvicultural operations. Illegal graziers in the division should be identified and they should be immediately prosecuted and should be dealt under the provisions of Section 26 and 70 of the Indian Forest Act, 1927.

2. Grazing Permits – Owing to the decision of the State Grazing Advisory Committee, no new grazing permit can be granted and the number of cattle cannot be increased. But it should be ensured that the areas permitted for grazing should be strictly according to the carrying capacity.
3. Control over graziers- The most important pre- requisite for the control of migratory and nomadic herds and flocks and management of pastures grazed by them is correct enumeration of these flocks and registration of their owners. Identity cards to the graziers should be issued and enumeration of the livestock should be conducted annually by the concerned staff.
4. Closures- In order to implement various soil conservations afforestation and pasture improvement programmes the areas can be closed every year. If it may not be possible to provide alternative grazing areas in exchange of those which are closed then not more than 1/3<sup>rd</sup> of the grazing area allotted to any particular grazier/graziers can ordinarily be closed, advance intimation should be given to the grazier/graziers concerned and every effort should be made to provide alternate grazing.
5. Vaccination-Wild animals do not have immunity against FMD and Anthrax so, vaccination of cattle entering forests, against these diseases should be ensured. In coordination with the Animal Husbandry department; the villagers should be advised to retain HYV cattle & to vaccinate their cattle. The cattle of the Gujjars should also be vaccinated periodically.
6. Gujjars should be rehabilitated outside forest areas. DFO should prepare proposal as per the existing guidelines. Since, rehabilitation process will take time; hence it is prescribed that Gujjars should be provided with alternate employment opportunity. They should be preferred as temporary labourers in forestry operations. Gujjar women may be trained to undertake silk worm rearing, bee keeping, composting & production of QPM in ‘Mahila Nurseries’. They may be trained in bamboo & lantana furniture making. With the help of dairy department, they should be linked with the nearest ‘Milk Route’.
7. Awareness campaign should be initiated to educate villagers/Gujjars about the grazing potential of the forest and advantages of control and systematic grazing as also of stall feeding.
8. Grazing should not be allowed in plantation and regeneration areas till the young plantation or regeneration is above the grazing damage.

## **9.9 BEAT LEVEL SUSCEPTIBILITY INDEX (BSLI) for Paonta Sahib Forest Division**

**Need:** To describe the actual ground realities of the Division on paper, an evidence-based, forest beat-level analysis basis susceptibility to various threats to the forest and foresters must be carried out based on the various threats that were discussed in the chapter. The main threats to the forests of Paonta Sahib summarily include illicit felling, illicit mining, encroachment, grazing, forest fires. An overall assessment of each of the beats on these parameters shall give the overall susceptibility level of the beats of the Division.

It is a Bottom-up approach rather than top-down, telling the actual picture and condition of vulnerabilities at the basic unit of a forest management area – Beat. If rightly scaled up, it will help in streamlining ground-level policy-making, targeted interventions, budgetary allocation and area-specific planning by higher-ups and field functionaries.

**Methodology to be used:** The model for Parvati Forest Division can be used for the assessment by the DFO in Paonta Sahib as well:

- Secondary Research: Last 5 years data analysis for various offences to be carried out. References must also be taken from complaints received, working plan prescriptions, forest-fire records etc.
- Historical & Primary Research: – From field staff, locals and retired officials & surveying for ground- truthing
- 4-tier scoring exercise – Forest Guard, Block Officer, Range Officer, Division level to ensure the scaling is in line with the common- understanding approach as well as evidential

### **Expected Impact of BSLI:**

- Scalability: At the state level, a streamlined database of all susceptible beats across various parameters can give a bird's eye view of field reality
- Data Mining: A lot more information can be interpreted from baseline raw data – eg. Seasonality of offences, tourism potential and regulatory interventions etc.
- Better planning: Budgetary allocation, Staffing, introducing technology etc. – all can be planned and targeted better from policy making level to executing functionaries
- Mapping: As done for Division, the same can be done across all Divisions (territorial and wildlife)
- Targeted Interventions: In susceptible and highly susceptible areas, targeted interventions can be made: eg. In case of illicit activities,
- Ensuring staffing is as per actual posts/rationalization of large beats boundaries
- Increased joint patrolling

- Drone usage as deterrence
- Ensuring no field staff position lying vacant
- Surprise night checks/nakas
- Tools required to be integrated with for proper monitoring – GIS, Drone Surveillance and Survey, Real time and periodic tracking/progress mechanism.

## CHAPTER 10

### WILDLIFE MANAGEMENT & BIODIVERSITY

#### CONSERVATION (OVERLAPPING) WORKING CIRCLE

##### **10.1 General Constitution of Working Circle:**

This Working Circle is constituted for emphasizing the necessity of conservation of wildlife and collection of information for better management of wildlife. The whole tract dealt under this Working Plan is ideally suited for a variety of wild animals and birds, since the forests are distributed from low-lying elevation to the hilly terrains. Therefore, this Working Circle overlaps all other Working Circles. In present scenario, wildlife includes faunal as well as floral life on the Earth. It is a biodiversity as a whole, which makes wildlife's worth. Wildlife conservation cannot be executed in isolation. Areas outside the protected area network are often vital ecological corridor links and must be protected with a view to ensuring the ecological and environment security of the State. Thus, conservation efforts in Paonta Sahib Forest Division by virtue of its proximity to Col. Sher Jung National Park at Simbalwara, Renukaji Wildlife Sanctuary, Rajaji National Park in neighboring state of Uttarakhand and Kalesar National Park in Haryana assume profuse significance. The trees and vegetation present in these areas along with the water sources and grasslands create a suitable habitat for wildlife especially for Himalayan Black Bear, Sambar, Leopard, Wild boars, monkeys. Owing to the proximity to Renukaji wetland as well as Asan Conservation Reserve in Uttarakhand (being a Ramsar wetland site as well as an 'Important Bird Area'), birds' richness is also found in abundance. The Wildlife (Protection) Act, 1972 was enforced in the state w.e.f. 01.04.1975 to save the environment and wildlife. The rules under this Act were also framed and notified Wildlife Divisions has been created to manage protected areas with its headquarter at Shimla to look after the protection of wildlife in this area. Besides, the Divisional Forest Officer (wildlife), the territorial D.F.O. and the subordinate staff is equally responsible for the protection and enforcement of wildlife (Protection) Act, 1972. Wildlife Working Circle has been created to look after the interests of wildlife and their habitat while managing the forests.

**10.2 Importance of Wildlife:** - Due to the spread of education and awareness, there is a growing concern for protection and preservation of wildlife and there is a steady opposition to their killing and to the destruction of their habitat. With the increased availability of

information on biodiversity, a wide spread and intelligent recognition of the immense value of the myriad species of plants and animals to the humankind has been established. Forests provide an excellent opportunity to a man to study living beings in their natural environment. In addition to this, there are material consideration as well, especially ecological. These animals and plants through the intricate food web maintain the delicate balance of nature and any breach in this chain can cause over-population of any one species, which may prove detrimental to human interests. Wildlife is a source of sport and enjoyment to people and fetches revenue to State as well. If the people are led to know the importance and worth of wildlife they will appreciate it as an asset and put in efforts to conserve them.

Faunal and Floral life (Biodiversity) play a significant role in maintaining the balance of nature. The value and importance of it from scientific, aesthetic, economic and recreational points of view is immense and is recognized the world over and therefore, adequate protection, and the scientific management of it is absolute necessity. In wider perspective, it is Biodiversity conservation and development and also its further research, which makes it more important.

This region, as a whole, has come under the enormous pressure from biotic interferences' both from the ongoing practice of traditional livelihoods, such as seasonal grazing, hunting and collection of medicinal plants as well as more recent developments such as: farming of temperate cash crops, commercial forestry, tourism, and hydroelectric power development.

**10.3 Objectives of Management:** The following are the special objectives of management:

1. To conserve and protect the existing biodiversity of the ecosystem as a whole
2. To improve the wildlife habitat in terms of living space, forage conditions, protective and breeding cover
3. To supplement the existing natural vegetation by planting fruit and fodder species with special emphasis on trees that provide shelter to wild animals and birds.
4. To prepare scientific data base for the maintenance and development of viable populations of fauna

**10.4 Character of Vegetation:** As already mentioned, the forests in the area comprise Northern Tropical Moist deciduous forests, Northern Tropical Dry deciduous forests and Himalayan Sub-

Tropical types with predominance of trees such as Sal, Rohini, Khair, Simul, Siris, Amaltas, and Kangu etc. The bamboo is not in abundance but the species found is *Dendrocalamus strictus*. A number of fruit and fodder trees for wildlife importance occur in the areas of which the following are important:

- Bel (*Aegle marmelos*)
- Amaltas (*Cassia fistula*)
- Mango (*Mangifera indica*)
- Guava (*Psidium guajava*)
- Jamun (*Syzigium cumini*)
- Dhak (*Butea monosperma*)
- Kinu (*Diospyros tomentosa*)
- Gular (*Ficus glomerata*)
- Pipal (*Ficus religiosa*)
- Kangu (*Flacourtia indica*)

The following palatable grasses are found: Bhabhar (*Eulaliopsis binata*), Khabbal (*Cynodon dactylon*), Panni (*Dicanthium annulatum*), Dholu (*Chrysopogon montanus*), Sariala (*Heteropogon contortus*), Sarkanda (*Saccharum munja*) etc.

Therefore, there is a variety of tree and grass forage found in these forests. However, there is a persistent scarcity of water in the dry and winter months as no perennial source other than Yamuna and Giri rivers.

### **10.5 Analysis and evaluation of wildlife and habitat**

Wildlife Institute of India in its bio-geographical classification has recognized Shiwalik region as one of the regions of biological significance. In this Shiwalik region, animals like Pangolin and Pythons are rare which are included in the International Red Data list of I.U.C.N. Sambar, barking deer and hog deer which are included in the schedule III of Wildlife (Protection) Act, 1972 are also found in these forests. Leopards are found in the area. Apart from above, the list of recorded animals in these forests is given in the following tables.

**TABLE 10.1 LIST OF FAUNA****MAMMALS OF PAONTA SAHIB**

| <b>Sr. No</b> | <b>Local Name</b> | <b>English Name</b>        | <b>Scientific Name</b>      |
|---------------|-------------------|----------------------------|-----------------------------|
| 1             | Bhaloo            | Himalayan Black Bear       | <i>Ursus thibetanus</i>     |
| 2             | Tendua            | Leopard                    | <i>Panthera pardus</i>      |
| 3             | En Koryal         | Flying Squirrel            | <i>Belomys pearsoni</i>     |
| 4             | Ghoral            | Himalayan Goat             | <i>Naemorhedus goral</i>    |
| 5             | Jungli Suar       | Wild Boar                  | <i>Sus scrofa</i>           |
| 6             | Kakar             | Barking deer               | <i>Muntiacus muntjak</i>    |
| 7             | Khargosh          | Common Hare                | <i>Lepus nigricollis</i>    |
| 8             | Lomri             | Red Fox                    | <i>Vulpes bengalensis</i>   |
| 9             | Sambar            | Sambar                     | <i>Cervus unicolor</i>      |
| 10            | Shail             | Porcupine                  | <i>Hystrix indica</i>       |
| 11            | Bandar            | Monkey (Rhesus Macaque)    | <i>Macaca mulatta</i>       |
| 12            | Gidar             | Jackal                     | <i>Canis aureus</i>         |
| 13            | Gilhari           | Five striped Palm squirrel | <i>Funambulus pennantii</i> |
| 14            | Jungli Billi      | Wild Cat                   | <i>Felis chans</i>          |
| 15            | Langoor           | Common Langoor             | <i>Presbytis entellus</i>   |
| 16            | Newla             | Mongoose                   | <i>Urva edwardsii</i>       |
| 17            | Bagh              | Royal Bengal Tiger         | <i>Panthera tigris</i>      |
| 18            | Hathi             | Asiatic Elephant           | <i>Elephas maximus</i>      |

In the recent past, elephant movement from the neighbouring state of Uttarakhand's Rajaji National Park has been on the rise, even though occasional movement has been existing since 1990s. Himachal Pradesh's first recorded evidence of **Royal Bengal tiger movement** was taken through camera trapping in the adjoining Col. Sher Jung National Park at Simbalwara in February 2023 (movement from forests of adjoining Rajaji National Park).



## BIRDS OF PAONTA SAHIB

A variety of birds are also found in the area of which are peacock, koel, pied-crested cuckoo, red jungle fowl, blue rock pigeon, doves, lapwings, babblers, hoopoe, bulbuls, jungle mynas, grey tit, golden backed wood pecker, king crow, shama, common grey hornbill and grey partridges are important occurring in numbers. The main bird species which are not seen in other parts of the state but found in this tract include Himalayan slaty headed parakeet, Blue headed Rock thrush, yellow backed sunbird and paradise flycatcher. The list of birds found in the tract are given below.

| Sr. No. | Local name   | English name               | Scientific Name                          |
|---------|--------------|----------------------------|------------------------------------------|
| 1       | Bater        | Common or Grey Quail       | <i>Coturnix coturnix</i>                 |
| 2       | Ghugi        | Spotted Dove               | <i>Streptopelia chinensis</i>            |
| 3       | Harial       | Yellow-footed green Pigeon | <i>Treron phoenicoptera</i>              |
| 4       | Jangli Murga | Red Jungle Fowl            | <i>Gallus gallus</i>                     |
| 5       | Kabutar      | Blue Rock Pigeon           | <i>Columba livia</i>                     |
| 6       | Kaleej       | Kalij pheasant             | <i>Lophura leucomelanos</i>              |
| 7       | Lowwa        | Jungle Bush Quail          | <i>Perdica asiatica</i>                  |
| 8       | Peora        | Hill Partridge             | <i>Arborophila torqueola</i>             |
| 9       | Kala Teetar  | Black Francolin            | <i>Francolinus francolinus</i>           |
| 10      | Bulbul       | Crested bulbul             | <i>Pycnonotus jocosus</i>                |
| 11      | Cuckoo       | Large hawk-Cuckoo          | <i>Hierococcyx sparveroides</i>          |
| 12      | Gidh         | Himalayan Griffin          | <i>Gyps himalayensis</i>                 |
| 13      | Kaua         | Crow                       | <i>Corvus splendens &amp; culminatus</i> |
| 14      | Kath phora   | Woodpecker                 | <i>Dendrocopos himalayensis</i>          |
| 15      | Goraiya      | House sparrow              | <i>Passer domesticus (indicus)</i>       |
| 16      | Tota         | Rose-ringed Parakeet       | <i>Psittacula krameri</i>                |

Further list has been depicted pictorially in IV List of Fauna of Part I.

### REPTILES OF PAONTA SAHIB

| Sr. No. | LOCAL NAME         | ENGLISH NAME        | SCIENTIFIC NAME                 |
|---------|--------------------|---------------------|---------------------------------|
| 1       | Biskhopra          | Monitor lizard      | <i>Varanus griseus (daudin)</i> |
| 2       | Gobilda            | Chameleon           | <i>Chameleon calcaratus</i>     |
| 3       | Kharpa             | Indian Cobra        | <i>Naja naja</i>                |
| 4       | Krait              | Common Indian Krait | <i>Bungarus caeruleus</i>       |
| 5       | Daboiya            | Russell Viper       | <i>Vipera russelli</i>          |
| 6       | Kukri Snake        | Common Kukri        | <i>Oligodon arnensis</i>        |
| 7       | Russel Kukri       | Russel's Kukri      | <i>Oligodon taeniolatus</i>     |
| 8       | Common wolf        | Common Wolf         | <i>Lycodon capucinus</i>        |
| 9       | Teliya/Andha snake | Brahminy Worm       | <i>Indotyphlops braminus</i>    |
| 10      | Retila snake       | Common Sand Boa     | <i>Eryx conicus</i>             |
| 11      | Dhodiya            | Checkered Keelback  | <i>Xenochrophis piscator</i>    |
| 12      | Hurhur Snake       | Striped Keelback    | <i>Xenochrophis vittatus</i>    |
| 13      | Common Trinket     | Common Trinket      | <i>Coelognathus helena</i>      |
| 14      | Bronzeback         | Bronzeback          | <i>Dendrelaphis tristis</i>     |
| 15      | Dhamman            | Indian Rat          | <i>Ptyas mucosa</i>             |
| 16      | Ajgar              | Indian Rock Python  | <i>Python molurus</i>           |
| 17      | Domuha             | Red Sand Boa        | <i>Eryx johnii</i>              |
| 18      | Harantal           | Common Vine         | <i>Ahaetulla nasuta</i>         |
| 19      | Cat snake          | Common Cat Snake    | <i>Boiga trigonata</i>          |
| 20      | King Cobra         | King Cobra          | <i>Ophiophagus hannah</i>       |

Paonta Sahib Forest Division has also recorded the first evidence of King Cobra in 2022, the northernmost limit of the species in India recorded so far. Additionally, Paonta is home to a variety of snake-species, both venomous and non-venomous.

### BUTTERFLIES OF PAONTA SAHIB

| Sr. No | ENGLISH NAME   | SCIENTIFIC NAME              |
|--------|----------------|------------------------------|
| 1      | Common Palmfly | <i>Elymnias hypermnestra</i> |
| 2      | Club Beak      | <i>Libythea myrrha</i>       |
| 3      | Indian jezebel | <i>Delias eucharis</i>       |
| 4      | Baronet        | <i>Symphaedra nais</i>       |
| 5      | Common Castor  | <i>Ariadne merione</i>       |

|    |                                |                              |
|----|--------------------------------|------------------------------|
| 6  | Psyche                         | <i>Leptosia nina</i>         |
| 7  | Orange Oakleaf                 | <i>Kallima inachus</i>       |
| 8  | Plain Tiger                    | <i>Danaus chrysippus</i>     |
| 9  | Glassy Tiger                   | <i>Parantica aglea</i>       |
| 10 | Himalayan Five-Ring            | <i>Ypthima sakra</i>         |
| 11 | Zebra Blue                     | <i>Leptotes plinius</i>      |
| 12 | Lemon Emigrant                 | <i>Catopsilia pomona</i>     |
| 13 | Indian Tortoiseshell           | <i>Aglaia caschmirensis</i>  |
| 14 | Glassy Bluebottle              | <i>Graphium cloanthus</i>    |
| 15 | Red Pierrot                    | <i>Talicauda nyseus</i>      |
| 16 | Grizzled Skipper               | <i>Spialia galba</i>         |
| 17 | Blue Tiger                     | <i>Tirumala limniace</i>     |
| 18 | Common Woodbrown               | <i>Lethe sidonis</i>         |
| 19 | Common Jester                  | <i>Symbrenthia lilaea</i>    |
| 20 | Common Leopard/ Spotted rustic | <i>Phalanta phalantha</i>    |
| 21 | Common Baron                   | <i>Euthalia aconthea</i>     |
| 22 | Common Peacock                 | <i>Papilio bianor</i>        |
| 23 | Lime Swallowtail               | <i>Papilio demoleus</i>      |
| 24 | Chocolate Pansy                | <i>Junonia iphita</i>        |
| 25 | Yellow Pansy                   | <i>Junonia hierta</i>        |
| 26 | Painted Lady                   | <i>Vanessa cardui</i>        |
| 27 | Sorrel Sapphire                | <i>Heliophorus sena</i>      |
| 28 | Grass Demon                    | <i>Udaspes folus</i>         |
| 29 | Cheshtnut Angle                | <i>Odontoptilum angulate</i> |
| 30 | Common Gull                    | <i>Cepora nerissa</i>        |

## FISHES

| Sr. No. | LOCAL NAME | SCIENTIFIC NAME          |
|---------|------------|--------------------------|
| 1       | Goonch     | <i>Bagarius yarrelli</i> |
| 2       | Lachi      | <i>Wallago attu</i>      |
| 3       | Mahseer    | <i>Tor putitora</i>      |
| 4       | Rohu       | <i>Labeo rohita</i>      |

### 10.6 Management Imperatives: -

**Human Wildlife Conflicts:** -Usually in winters and in the hot months of April- June when there is a scarcity of water and fodder inside the forests, the wild animals move out of the forests and raid adjoining fields as well as causing loss to livestock. Primarily, the conflict

cases pertain to leopards and bears, in addition, wild boars damage and snake-bites are also reported occasionally.

Monkey menace is also another ensuing issue in Himachal Pradesh under which monkey-sterilization program is being carried out annually by all the Divisions.

In the recent past, the issue of elephant movement from the neighboring state of Uttarakhand's Rajaji National Park has also arisen, leading to the death of 2 elephants in the last one year. Given below are the human-animal conflict cases in the last 11 years along with compensation disbursed:

**Figure 10.2: Compensation details since 2012-13 in Paonta Sahib Forest Division**

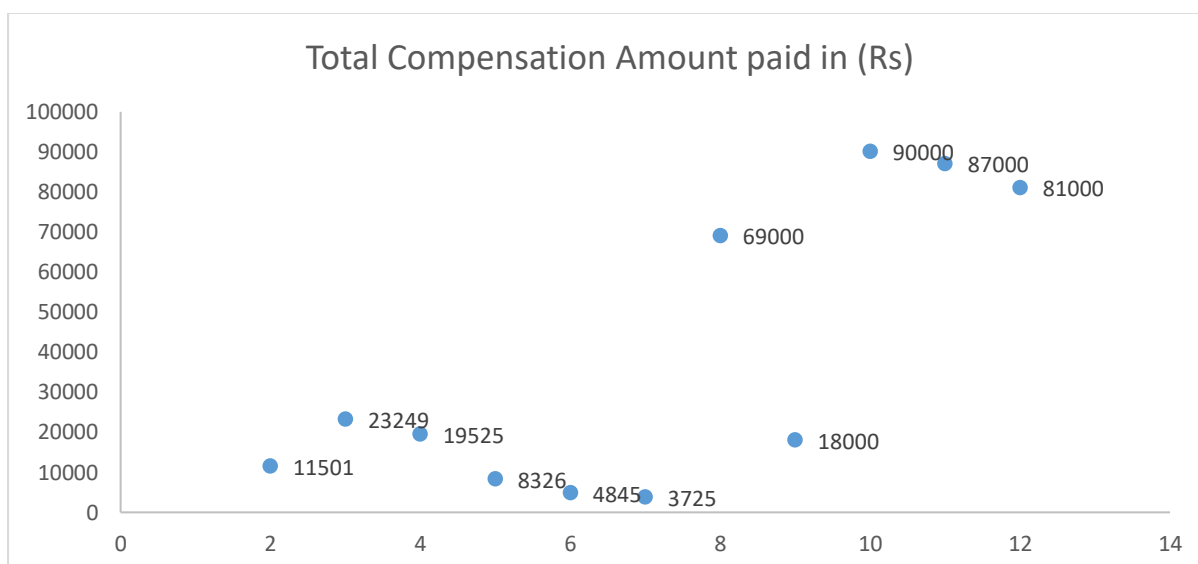


**TABLE 10.2: Compensation details since 2012-13 in Paonta Sahib Forest Division**

| Wild life Compensation Cases in respect of Paonta Sahib Forest Division |         |                         |                           |                                |                          |              |                               |
|-------------------------------------------------------------------------|---------|-------------------------|---------------------------|--------------------------------|--------------------------|--------------|-------------------------------|
| Sr. No                                                                  | Year    | No. of cases sanctioned | Livestock (deaths) (Nos.) | Human beings (injuries) (Nos.) | Compensation (in Rupees) |              | Total Amount paid in (Rupees) |
|                                                                         |         |                         |                           |                                | Livestock                | Human beings |                               |
| 1                                                                       | 2012-13 | 06                      | 05                        | 01                             | 8301                     | 3200         | 11501                         |
| 2                                                                       | 2013-14 | 15                      | 10                        | 05                             | 8700                     | 14549        | 23249                         |
| 3                                                                       | 2014-15 | 08                      | 05                        | 03                             | 4525                     | 15000        | 19525                         |
| 4                                                                       | 2015-16 | 04                      | 01                        | 03                             | 2500                     | 5826         | 8326                          |
| 5                                                                       | 2016-17 | 03                      | 02                        | 01                             | 2609                     | 2236         | 4845                          |
| 6                                                                       | 2017-18 | 03                      | 03                        | 0                              | 3725                     | 0            | 3725                          |
| 7                                                                       | 2018-19 | 04                      | 04                        | 0                              | 69000                    | 0            | 69000                         |
| 8                                                                       | 2019-20 | 03                      | 03                        | 0                              | 18000                    | 0            | 18000                         |
| 9                                                                       | 2020-21 | 06                      | 05                        | 01                             | 75000                    | 15000        | 90000                         |
| 10                                                                      | 2021-22 | 09                      | 08                        | 01                             | 72000                    | 15000        | 87000                         |
| 11                                                                      | 2022-23 | 02                      | 01                        | 01                             | 6000                     | 75000        | 81000                         |

Attached in Appendix IV

**Discussion on human-conflict situations is given below.**

i) Asiatic Black Bear (*Ursus thibetanus*):- Human conflicts are not a local, small phenomenon; but an issue that spans a diverse array of geographic and human demographic contexts. The increase in number of black bear-human conflict cases is due to competition for resources at different levels. Bear population, usually require large areas of land to survive. They typically compete directly with people for resources such as space, food, security and cover. Almost all bear species kill or injure livestock, damage agricultural or horticulture crops.

ii) Leopard (*Panthera pardus*):- Leopard is the most widely distributed large cat in India, but due to expansions of human influence and ever increasing pressure on natural resources has greatly intensified the issue of human leopard in a wide variety of situations. Human-leopard conflict is a complex issue influenced by political and social attitudes, the biology of the species, and management action. Effective management of conflict will have to strike a balance between minimizing serious conflict (attacks on people) and the long-term conservation of the leopard species. Although, the leopard is commoner and more resilient than other large cat species that occur in India, it is poached in the largest numbers to meet the demand of the illegal wildlife trade. The leopard is very adaptable, and can live close to human habitations. The presence of a species like the leopard in a human dominated landscape will invariably lead to some predation on domestic animals. Carnivore density is known to be dependent on prey density and leopard is no exception.

iii) Monkey (*Rhesus macaque*):- Monkey is widely distributed animal in the tract dealt with. However, the population has increased more in human habitations than forests. The main cause of increased population near human habitation is increasing availability of garbage with food discards. The population has increased manifold in the lower part of the division and there are a lot of complaints of crop depredation by them. All along the National highways, State Highways and even in the link roads and paths, the monkeys can be seen in herds and pose a threat to tourists, passersby and local inhabitants. The monkey also destroys the young seedlings of plants as they suck the roots of the seedlings and in this process, they uproot the seedlings. They have left the interiors of the forests and are seen near human habitation. However, the efforts of Forest Department are in progress to reduce number by way of sterilizing male ones. The details of sterilization carried out in Paonta Sahib Forest Division are tabulated below:

Monkey sterilization measures fulfilling annual targets in order to curb the monkey population.

**Figure 10.3: Monkey Sterilization details in Paonta Sahib Forest Division**

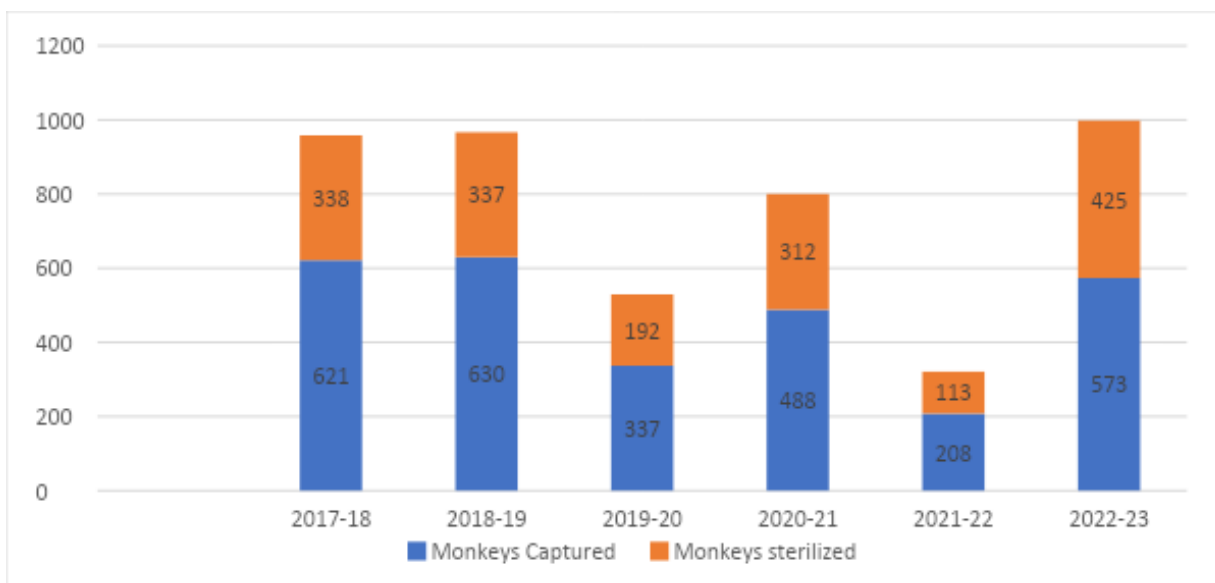


**Table 10.3: Monkey Sterilization details in Paonta Sahib Forest Division**

| Year    | Monkeys Captured | Monkey Sterilization |               |       |
|---------|------------------|----------------------|---------------|-------|
|         |                  | M<br>(Male)          | F<br>(Female) | Total |
| 2017-18 | 621              | 198                  | 140           | 338   |
| 2018-19 | 630              | 216                  | 121           | 337   |
| 2019-20 | 337              | 103                  | 89            | 192   |
| 2020-21 | 488              | 163                  | 149           | 312   |
| 2021-22 | 208              | 69                   | 44            | 113   |
| 2022-23 | 573              | 236                  | 189           | 425   |

(Out of the total monkeys captured, only those monkeys were non-sterilized due to reasons including captured monkeys being either pregnant, young in age and some were already sterilized before.)

#### **Leopard/Black Bear – Human Conflicts in Paonta Sahib Forest Division: -**

The human population of Himachal Pradesh has increased over the last 30 years. As a result of growing human population, changing land use practices and resultant anthropogenic pressures, forest cover had either decreased or declined in quality due to habitat degradation. Paonta Sahib Forest Division also faces a lot of fragmentation of land with respect to wildlife habitats. The movement of bears and leopards for food outside these forest areas in search of cultivated crops leads to close encounters of man and bear, and sometimes to conflict. The black bear/ leopard–human conflicts are in the form of crop damage, livestock predation,

human attacks and sometimes even death of humans. All these have led to strong backlash from people resulting in confrontation with the Forest Department or the Government authorities. Conflict scenarios include:

- a) **Livestock Killing:** - Killing of livestock (sheep, goat, and cow) by black bears is not uncommon and may become a serious problem. Black bear do occasionally kill livestock when there is no food available in wild for their animal protein requirements. There are instances, when grazing domestic animals are predated by bear in their habitats and some cases of livestock killing in night shelters.
- b) **Human Attacks and Killing by Black Bear/Leopards:** - Increased human population in and around forested areas, encroachment on forest land and increased dependence on forests by humans have led to increased frequency of human-animal encounters.

#### **10.7 Management Initiatives Required to Address Human-Wildlife Conflicts: -**

- **Database Development and Maintenance:** - The basic step towards understanding and developing mitigation strategies for reducing black bear-human conflicts in this Division and elsewhere, in the State would be the development and maintenance of a database. The patterns of human-animal conflicts in a large landscape both in spatial and temporal scales will be extremely important to understand underlying causes and preventing conflicts. It is extremely important for the Forest Department of Himachal Pradesh to develop and maintain a database on conflicts for its different regions using GIS. Changing land use patterns, development and use of habitats by humans are the causes, while un-natural behaviour, human habituation are the symptoms.
- **Creation of Conflict Management Team:-** A fully equipped, well trained and motivated 'Conflict Management Team'/ Rapid Response Teams comprising of wildlife staff, veterinarians, staff of related line departments or institutions, and wildlife NGOs has to be formed at the Division/Circle Level to respond to conflict situations, including animal rescue, treatment (if required), translocation and monitoring. Efficient and effective response to complaints is more feasible when rapid communication is possible from and to the conflict site and between the personnel of the Conflict Management Team and when duties are shared amongst the members of Team.
- **Awareness Creation:-** Knowledge on Black Bear/ Leopard behavior is essential for the villagers who live near bear/leopard habitats and suffer crop losses and are also vulnerable to bear attacks. Awareness creation through elected bodies at the village or block levels, religious or educational establishments, and other government or non-governmental agencies needs to be explored. Simple precautionary measures such as avoiding moving

singly during dawns and dusks in crop fields or orchards or forests during summer and autumn could greatly reduce bear attacks on humans. Another crucial factor that can reduce bear attacks is providing a safe passage or escape route for a stranded bear, particularly in the villages. These ‘dos’ and ‘don’ts’ should be widely circulated through posters in local language. T.V and print media should also used for awareness creation for villagers in conflict area.

- **Reducing Livestock Depredation by Black Bear/Leopard:-**As most of the livestock killings have taken place at the night shelters in the villages, it would be necessary to strengthen the doors, windows and other vulnerable portions of these night shelters to reduce loss by predation to black bear and common leopard. Supervised livestock grazing by at least 3-4 villagers will reduce livestock depredation by black bear and leopard. Villagers who were affected by livestock depredation by black bear and leopards should be advised to use iron doors and proper lighting at their cattle sheds or night shelters as both have been found to be very effective in reducing livestock loss.
- **Guarding of Crop from Damage:-** A Village level cooperative effort for guarding of crop fields and orchards on rotational basis could be tried as an option using the effective means of scaring bears such as noise by drumming empty tin/metal containers. Using guard dogs while patrolling and keeping them in villages would be of added advantage. Proper lighting in the corners or boundaries of crop fields particularly the vulnerable points lying close to forest fringes may be another option that may help to reduce crop depredation as observed in a few cases during the survey.
- **Monitoring of Conflict Areas:-** Use of passive and preventive actions is an important step in conflict management. There should be proper monitoring of black bear-human conflict areas where at least one of the employees is present at the problem site until the situation is resolved.
- **Translocation and Marking of Problem Animals:-** The problem animals that are captured and translocated from the conflict areas should be marked by radio collar, florescent collar or, by ear tags prior to their release back into the wild so that the movement and the ranging patterns of these animals could be studied. This will be very helpful in better understanding of problem bears and ultimately help in mitigating the problem.
- **Aversive Conditioning of Problem Animals:-** Aversive conditioning of problem animals (habituated to people or raiding crops) is very much essential so that the problem animal learns to associate ‘undesirable activities’ such as entering a village, crop field or orchard with ‘negative events’. Such problem animal could be subjected to one or more of the



following treatments prior to release back into the wild. The treatments include: being hit with pepper sprays or rubber bullets, loud noise by bursting of crackers, and barking and/or chased by specially trained dogs.

- **Strengthening of Local and Traditional Deterrent Methods:** - The traditional methods of burning red chillies mixed in cow dung can also be experimented in villages which were located in the periphery of forested areas in harvest seasons.
- **Compensation for Damages Caused by Wild Animals:** - The loss of cattle and human beings due to attack by wild animals are compensated by the forest department to victims vide notification No. FTS-(F)-6-7/82 Shimla-2, LOOSE dated 9-4-1996 and Fts. (F) 6-7/82-II dated 28th August, 2001 but still there is no provision for compensation to the loss of cultivated field crops due to damage by wild animals in the State of Himachal Pradesh which need attention of the State Government in this regard. Therefore, necessary step may be taken up with Govt. in this regard by the Divisional Forest Officer. This will be very helpful in better understanding of problems of wildlife and ultimately help in mitigating the problem of human-wildlife conflict.

The following are the current compensation rates and ex-gratia relief payable to the victims of predation/depredation by wild animals as under.

## **10.8 Management Prescriptions: -**

**10.8.1 Habitat Management:** - Reversing the process of degradation of forests as prescribed by itself improves the habitat of wild life. Cost effective check dams and water bodies prescribed in will be constructed in locations with access to wildlife or in known wildlife habitats. The water bodies so constructed will be, to the extent possible, under vegetation cover. Rather, the vegetation cover over the natural water bodies in the wilderness will be left undisturbed, as the water holes without vegetation cover do not attract wild life. Dead and dying trees will be retained as snags for smaller species of mammals and birds. In known wildlife habitats the biotic interference in the form of collection of forest produce also will be discouraged. The availability of food, water and shelter for wildlife has to be improved. Fire protection is one of the best accelerating steps towards better habitat. Augmenting the fodder resources of herbivores through artificial regeneration of fodder species such as grass, herbs and trees help in multiplication of prey species, which in turn, support predators and scavengers. As per the policy of the State Govt. that out of the total plantations to be done in an area, at least 10% plants are to be of fruit bearing species, the species to be planted in a particular area is to as per the requirement of the wild life

species specifically found in that areas. Protection of micro wildlife habitats from forest fire especially during breeding season is essential.

Habitat especially for the endangered species and the species in the schedule-I of the Wildlife (Protection) Act, 1972 requires to be protected by all means. The areas where schedule-I animals are found, needs to be specially protected and entry of domestic animals should be stopped so that wild animals get the required forage and shelter. Regular monitoring of their habitat should be done.

There should be no felling amounting to alteration of crop composition near the water holes and on the paths frequented by the wild animals. Gap planting with species such as Amla, Bahera, Jamun, Ber, Mallah, Bel, Kinu, Bauhinia and Dhak should be carried out in pockets.

**Weed treatment/habitat improvement:** Lantana weed is the biggest hazard for deterioration of wildlife habitat. Measures to control its further spread, and eradication and utilization of the existing lantana weed as suggested in the Plantation Working Circle should be vigorously adopted. Provisions have also been made in the various Working Circles to reserve the trees of wildlife importance near the water holes, baulis, near temples and shrines. Similarly, trees providing roosting and nesting for birds are to be left intact. One dead tree preferably of low commercial value per hectare should be retained for shelter and resting of wildlife. Unsound and hollow logs are to be left in the forest as shelter for wildlife provided they are not fire hazard.

**Fire Protection:** Fire is potentially a deadly enemy of both forests and wildlife. Rapid running forest fires particularly crown fires are very destructive to wildlife. If it occurs in the nesting season of birds, breeding stock may be destroyed. The wild animals are usually trapped in the thick lantana bushes in case of fire. The rodents and reptiles are usually the bigger casualties as they are holed up. Therefore, strict fire protection measures as prescribed in the Protection Working Circle should be followed. The fire watch towers should be used for detection of fire outbreaks.

**Rescue Equipment adequacy:** The Rapid Response Teams at Division and Circle levels should be well-equipped with all the rescue items including ropes, trap cages, transfer cages for large/small mammals, snake-handling hooks, torches, GPS sets, tranquilizing guns etc. as notified by Chief Wildlife Warden of Himachal Pradesh from time to time.

**Veterinary Care:-** Veterinary care in areas rich in wildlife may be ensured by:-

- i) Wildlife health monitoring through post-mortem examinations and direct and indirect observations
- ii) Free vaccination and preventive measures like de-worming to grazing domestic livestock and special Veterinary care campaign for foot and mouth disease in nomadic livestock.
- iii) Extension education to owners of domestic livestock.

**Training:** - For carrying out multidimensional activities, ranging from routine protection to social services, a new breed of staff with entirely different perceptions has to be made available. The available talent can be sharpened only through training. On the job training will be given to staff for capacity building. Trainings in weaponry, unarmed combat, participatory exercises, first aid, veterinary care, intelligence gathering, investigation, public relations, wildlife sciences etc. will be provided in various reputed institutions. A part from that staff should be well versed in investigation, adducing evidence and material, dealing with wildlife offences/offenders, compoundable and non-compoundable cases under the Wildlife (Protection) Act, 1972. Staff should be imparted training in matters like trapping of wild animals, rescue operation, snakes-handling, post-mortem of animals, collection of samples of vital organs for histo-pathological, viral and bacterial examination, their preservation and dispatch, sign and symptoms of common wild life diseases, external indicators of health etc.

**Research and Monitoring:-** Sudden outbreak of diseases, suitability of a given area for a particular species, carrying capacity of the forests, crop raids and methods to check the excessive breeding of a particular species are some of the problems that need research inputs. These problems can be addressed by appointing qualified persons for research and monitoring or by entrusting the same to specialized research organizations like HFRI, WII and local universities. It is essential to monitor the growth and development of wildlife in a given area to assess the impact of management practices, so as to make the needed corrections to suit the objective.

**Awareness Program and Peoples' Participation:** - Educating the local population about the importance of wildlife in the ecosystem and creating awareness about their conservation will go a long way in protecting our forests as well as reducing man-animal conflicts. Such awareness can be brought through nature camps, birding trails etc. for different target groups such as panchayats, students, fringe dwellers etc coupled with seminars, workshops and guest lectures.

**Mitigating Man Animal Conflicts:** - Some of the recommendations to mitigate the conflict at the man-animal interface are: -

- i) Augment sources of browse species, particularly grass and fodder species.
- ii) Encouraging stall-feeding among fringe dwellers may reduce the number of live-stock within forests
- iii) Timely action for compensating the loss due to crop raiding.
- iv) To ensure sufficient budgetary support to provide relief to victims. Wildlife compensation has been made part of Public Guarantee Act in Himachal Pradesh.
- v) To explore and promote alternate income generating source for forest dependent population.
- vi) To explore LPG connection on subsidies rates for forest dependent population so that dependence on forest pressure for fuelwood could be reduced.
- vii) **Coordination between Forests and Wildlife Teams:** Coordination between forests and wildlife wings is imperative in the interest of forests and wildlife. Forest is the habitat for wildlife and wildlife is the protector of forest growth. The survival of wildlife is dependent on the existence of forests. The role of each component is required to be understood and appreciated in their respective roles. It is therefore suggested that not only the level of existing position of divisional functionaries of wildlife improved but effective wildlife management should be created.

**Census of Wildlife:** - The Monkey census is being carried out in Himachal Pradesh. Proper documentation of the population trends i.e. pre-sterilization and post-sterilization of monkeys are needed for management. This will help in studying the impact of sterilization and making decision for further improvements in future. The Monkey census was carried out during 2015-16 in this division and the details are tabulated below.

**TABLE 10.4: Monkey Census in Paonta Sahib Forest Division (2015-16)**

| Sr. No | Name of Range | No. of Troop | Category |    |    |    |       |     |    |     |         |     |     |      |        |     |    |     |           |     |    |     | Total no. of Monkeys Total Column<br>(4+5+6+7+8) |      |     |      |
|--------|---------------|--------------|----------|----|----|----|-------|-----|----|-----|---------|-----|-----|------|--------|-----|----|-----|-----------|-----|----|-----|--------------------------------------------------|------|-----|------|
|        |               |              | Urban    |    |    |    | Rural |     |    |     | Forests |     |     |      | Temple |     |    |     | Road Side |     |    |     |                                                  |      |     |      |
| 1      | 2             | 3            | 4        |    |    |    | 5     |     |    |     | 6       |     |     |      | 7      |     |    |     | 8         |     |    |     | 9                                                |      |     |      |
|        |               |              | M        | F  | Y  | T  | M     | F   | Y  | T   | M       | F   | Y   | T    | M      | F   | Y  | T   | M         | F   | Y  | T   | M                                                | F    | Y   | T    |
| 1      | Paonta Sahib  | 42           | 20       | 19 | 14 | 53 | 38    | 65  | 34 | 137 | 176     | 282 | 123 | 581  | 36     | 49  | 27 | 109 | 23        | 36  | 13 | 72  | 293                                              | 451  | 208 | 952  |
| 2      | Majra         | 21           | 0        | 0  | 0  | 0  | 3     | 5   | 2  | 10  | 78      | 202 | 103 | 383  | 0      | 0   | 0  | 0   | 6         | 22  | 11 | 39  | 87                                               | 229  | 116 | 432  |
| 3      | Giri N.       | 30           | 0        | 0  | 0  | 0  | 3     | 7   | 4  | 14  | 74      | 171 | 104 | 349  | 41     | 92  | 47 | 180 | 18        | 43  | 19 | 80  | 136                                              | 313  | 174 | 623  |
| 4      | Bhagani       | 22           | 0        | 0  | 0  | 0  | 14    | 49  | 41 | 104 | 53      | 88  | 81  | 222  | 0      | 0   | 0  | 0   | 4         | 17  | 16 | 37  | 71                                               | 154  | 138 | 363  |
|        | Total         | 115          | 20       | 19 | 14 | 53 | 58    | 126 | 81 | 265 | 381     | 743 | 411 | 1535 | 77     | 141 | 71 | 289 | 51        | 118 | 59 | 228 | 587                                              | 1147 | 636 | 2370 |

**Langur Census**

| Sr. No | Name of Range | No. of Troop | Category |   |   |   |       |   |    |    |         |    |    |    |        |   |   |   |           |   |   |   | Total no. of Monkeys Total Column<br>(4+5+6+7+8) |    |    |    |
|--------|---------------|--------------|----------|---|---|---|-------|---|----|----|---------|----|----|----|--------|---|---|---|-----------|---|---|---|--------------------------------------------------|----|----|----|
|        |               |              | Urban    |   |   |   | Rural |   |    |    | Forests |    |    |    | Temple |   |   |   | Road Side |   |   |   |                                                  |    |    |    |
| 1      | 2             | 3            | 4        |   |   |   | 5     |   |    |    | 6       |    |    |    | 7      |   |   |   | 8         |   |   |   | 9                                                |    |    |    |
|        |               |              | M        | F | Y | T | M     | F | Y  | T  | M       | F  | Y  | T  | M      | F | Y | T | M         | F | Y | T | M                                                | F  | Y  | T  |
| 1      | Paonta Sahib  | 2            | 0        | 0 | 0 | 0 | 0     | 0 | 0  | 0  | 9       | 12 | 5  | 26 | 0      | 0 | 0 | 0 | 0         | 0 | 0 | 0 | 9                                                | 12 | 5  | 26 |
| 2      | Majra         | 0            | 0        | 0 | 0 | 0 | 0     | 0 | 0  | 0  | 0       | 0  | 0  | 0  | 0      | 0 | 0 | 0 | 0         | 0 | 0 | 0 | 0                                                | 0  | 0  | 0  |
| 3      | Giri N.       | 1            | 0        | 0 | 0 | 0 | 0     | 0 | 0  | 0  | 3       | 5  | 4  | 12 | 0      | 0 | 0 | 0 | 0         | 0 | 0 | 0 | 3                                                | 5  | 4  | 12 |
| 4      | Bhagani       | 4            | 0        | 0 | 0 | 0 | 0     | 6 | 14 | 20 | 9       | 10 | 14 | 33 | 0      | 0 | 0 | 0 | 0         | 0 | 0 | 0 | 9                                                | 16 | 28 | 53 |
|        |               | 7            | 0        | 0 | 0 | 0 | 0     | 6 | 14 | 20 | 21      | 27 | 23 | 71 | 0      | 0 | 0 | 0 | 0         | 0 | 0 | 0 | 21                                               | 33 | 37 | 91 |

The results of **Technical Report titled ‘Population status of rhesus macaque (*Macaca mulatta*) in Himachal Pradesh 2019-2020’** pertaining to **Paonta Sahib** following monkey census carried out across Himachal Pradesh are as follows:

| DIVISION                                      | PAONTA SAHIB |
|-----------------------------------------------|--------------|
| Density (Macaque groups per km <sup>2</sup> ) | 0.31         |
| Number of groups observed                     | 233          |
| Standard deviation                            | 0.31         |
| Average group size                            | 35           |
| Population in the estimated area              | 5135         |
| Urban Population                              | 835          |
| Total Population                              | 5970         |

| DIVISION     | Average Group Size | 2015 | 2019 |
|--------------|--------------------|------|------|
| Paonta Sahib | 35                 | 2546 | 5970 |

As can be observed, there has been a considerable increase of 134 % in monkey population from 2015 to 2019. This points to the increasing challenge of human-animal conflict with respect to monkeys in the Division. In addition to efforts of the Forest Department in sterilization and capturing, a broader solution has to be reached out by all stakeholders that includes the management of garbage disposal in the city which currently is in an abysmal condition. Similarly, further studies to keep track of the changes as well as behavior in rhesus macaques must be taken up for analyzing the issues confronting this challenge.

Some mitigation measures are mentioned for dealing with the conflict.

**1. Improving existing population control:** Himachal Pradesh Forest Department has established 9 sterilization centres where laser assisted tubectomy and vasectomy is performed on captured macaques. Since year 2006, total of 1,55,257 macaques have been sterilized. Monetary incentives are given to locals for capturing and re-releasing of the macaques. As macaques are captured from far away locations and brought to sterilization centres, reach of each centre is limited, and also further the random re-release of them probably has affected their social organisation and unexpected over crop raiding pattern. To avoid this, the proper release of them

at their original locations has to be ensured. However, the massive sterilisations drive has been effective in regulating population growth of macaques through prevention of subsequent births of progenies. A rough statistical model shows that for Himachal Pradesh, prevention of about 5-6 lakh new births which has a cumulative effect in overall population growth of the species in the last 14 years.

**2. Management of crop raiding:** Behavioural plasticity of rhesus macaque enables it to learn and overcome any obstacles. Due to this adaptability, many preventive measures are rendered ineffective if used for prolonged period. Also, strategies or pattern of crop raiding varies between different groups and different sites. Hence, a turnkey based hard intervention such repellent devices, high frequency sound emitters etc might not work equally at different places. One of the most effective methods found is physically driving macaques away or regular patrolling.

**3. Social programmes** for livelihood diversification of affected community and Awareness generation: Communities which are dependent on crops which are frequently raided by macaques should be provided with alternative source of livelihood. Having multiple sources of livelihood will ensure that crop loss due to macaques will not drastically affect the livelihood of the communities. This can be done through developing eco-tourism, cultivation of non-food crops and value addition to existing produce to maximize economic returns. Backward and forward market linkages should be assessed for such interventions. Further, management of perception of conflict is equally important. Public should be made aware of existing interventions being carried out. Further synergy between forest department and citizens can be established through regular dialogues at village, district and state level representatives.

Currently, forest department has been conducting awareness drives with local residents and tourists. As tourism is one of the key sectors in the state, it was essential to educate the tourists to stop deliberate provisioning of the macaques by not throwing/ offering eatables to monkeys. Further, state wide development in transport infrastructure has resulted in reduction of stoppage of tourists along the highways thus preventing provisioning. Awareness about social organization or documented unique behavior of the macaques can be used as tourist attraction.

**4. Solid waste (kitchen waste management):** In most of the Municipal corporation areas and other areas specifically having large number of human habitations, the door-to-door garbage collection and kitchen waste management has probably forced sizable macaque populations to migrate to the forests. More efforts are required in this direction so that the kitchen waste and the waste generated by various eateries is well managed.

**6. Habitat enrichment:** The effort of the department to increase the quality of the habitat of macaques through taking up plantation model comprising of plantation of mandatory 30% fruit trees (at least) has also probably lead to bringing down the rhesus macaque population. This effort has been further complemented by implementing plantation schemes such as ‘Habitat Enrichment Plantations’.

**Monkey-Human Interface:** - The monkeys have become a problematic for the last 20 years in Himachal. Whether, it is the townships or the rural areas now monkey menace is quite common as they move out of the forests in search of food and convenience. Not many efforts were made to address this problem in the past as this problem was never considered a public or administrative problem. The efforts made for last 10 years at Forest Department level are inadequate unless the larger issues including garbage dumping are resolved by all stakeholders. Trap cages have been installed in the Division but success ratio of trapping has been not very high due to the high level of adaptation by the species.

During the course of Monkey-conflict incidences estimation, a two-step strategy is suggested:

- Preliminary observations for Monkey estimation to determine hotspots based on complaints/experiences.
- Comprehensive monkey-estimation in the hot spots.

Census exercise was also initiated in 2022 with Wildlife Institute of India for black-bears and leopards, second phase of which is now due in June 2023. With the help of this data once the report is published, further clarity into their numbers, movement and habitat with remedial measures will be clear. Such census needs to be made a regular feature and in the present-day technologies the camera trap methodologies must be adopted for ground-truthing of traditional ‘Pug mark Method’. Necessary steps therefore may take up with the Government for camera traps and conducting proper survey to identify such key location for trapping and plan the forestry operation in such a way so as to cause least disturbance to wildlife and may minimize the man-wildlife conflict.

Other IEC ideas include:

- i) Create awareness among the students of schools and colleges in and around Paonta Sahib Forest Division about the importance of Wildlife conservation with particular emphasis on



endemic species of wild fauna. Celebration of environmentally important days, Wildlife Week etc. will further enhance sensitization.

ii) Making groups of students by forming nature clubs and linking with environment studies exposure visits to field. These students can then be trained making use of resource person in the respective fields.

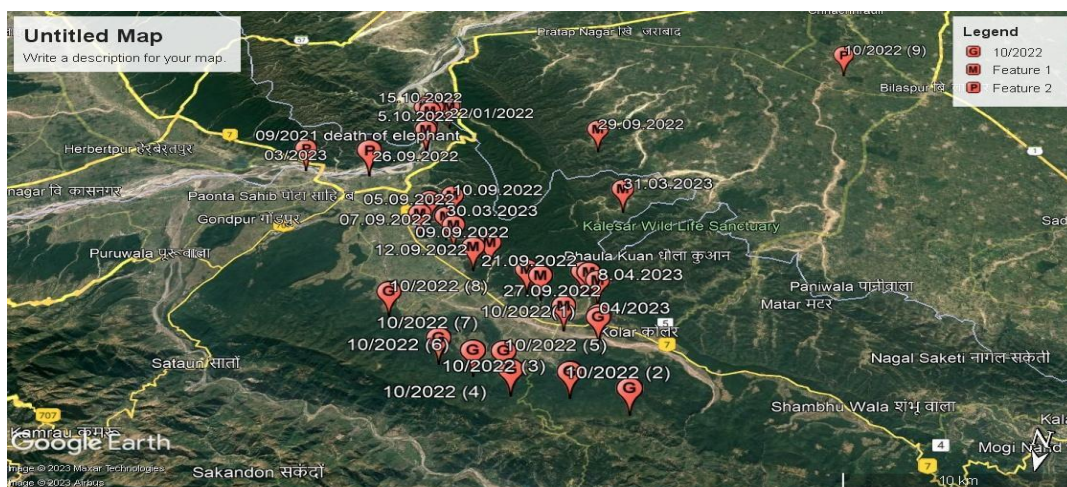
iii) There is a scheme for payment of cash rewards for providing intelligence about persons indulging in poaching and illegal trade in wildlife product in the state. It was framed in February, 1994. This should be tapped properly again with proper IEC. The information for which cash rewards would be made available should fall under either of the two categories: -

- a) Illegal held stocks of wild animals and wildlife products.
- b) Any activity related to poaching, illegal trade or transport, illegal export or import committed or to be committed.

## 10.9 Human-Elephant Conflict in Paonta Sahib Forest Division

In the recent past, the issue of elephant movement from the neighboring state of Uttarakhand's Rajaji National Park has also arisen. A brief discussion regarding the case of elephant movement in Paonta Sahib Forest Division over the years is given below.

### Elephant Movement map within Paonta Sahib Division (with dates)



1. There has been a sharp rise in cases pertaining to Human-Elephant conflict situations in Majra, Girinagar ranges as well as Paonta Sahib Range of this Division over the last 2-3

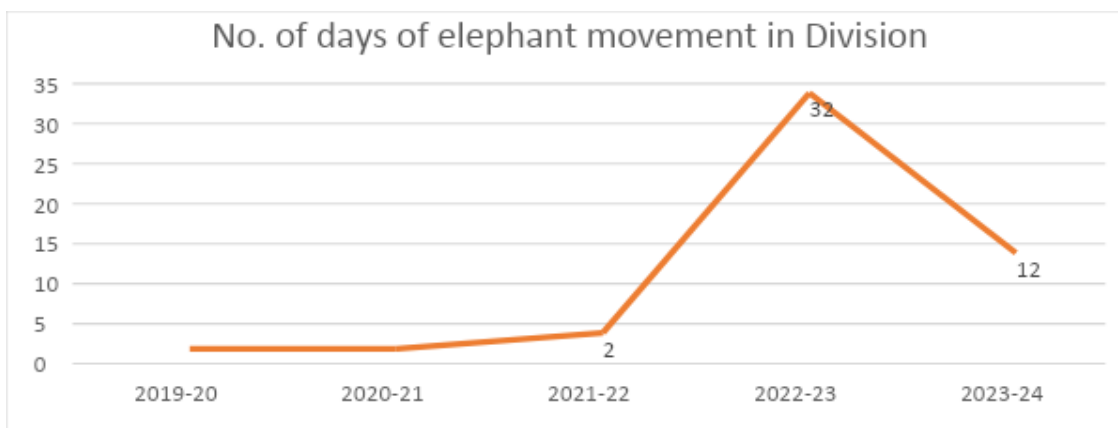
years. The human elephant conflict occurs in Paonta Sahib Division due to interstate movement of elephants from Uttarakhand and UP border to Himachal Pradesh and subsequent visitation into human habitation. The complete details of elephant tracking since 2019-20 has been provided below.

**TABLE 10.5: Elephant Tracking Movement details in Paonta Sahib Forest Division**

| Name of Year | Month/Date | Name of Area Block/Beat/RF Compartment/Private Area | No of Days of Movement | GPS Location                  |                  |
|--------------|------------|-----------------------------------------------------|------------------------|-------------------------------|------------------|
|              |            |                                                     |                        | Lat. (N)                      | Long.(E)         |
| 2019-20      | NIL        | NIL                                                 | 0                      | NIL                           | NIL              |
| 2020-21      | NIL        | NIL                                                 | 0                      | NIL                           | NIL              |
| 2021-22      | 22/01/2022 | RF Ambwali C6                                       | 1                      | 30° 23' 17.1492"              | 77° 34' 2.1936"  |
| -do-         | 09/2021    | RF Rampurbeli                                       | 1                      | 30° 25' 48.0144"              | 77° 35' 56.6556" |
| 2022-23      | 05/09/2022 | Majra, Johron, RF Banswali C-2 & 3                  | 1                      | Banswali C-2 30° 27' 52.0524" | 77° 33' 29.3256" |
|              |            |                                                     |                        | C-3 30° 27' 38.7504"          | 77° 33' 22.0464" |
| -do-         | 07/09/2022 | Majra, Johron, RF Banswali C-1 & RF Kiyarda C-1&2   | 1                      | Banswali C-1 30° 27' 47.1024" | 77° 33' 4.4136"  |
|              |            |                                                     |                        | Kiyarda C-1 30° 28' 21.7092"  | 77° 32' 5.8416"  |
|              |            |                                                     |                        | Kiyarda C-2 30° 28' 6.2184"   | 77° 32' 5.8416"  |
| -do-         | 09/09/2022 | Majra, Majra, RF Sukhimelion C-2                    | 1                      | 30° 28' 47''                  | 77° 31' 28''     |
| -do-         | 09/09/2022 | Majra, Batamandi, RF Ghutanpur C-13                 |                        | 30° 25' 33.5''                | 77° 33' 26.9''   |
| -do-         | 10/09/2022 | Majra, Surajpur, RF Katapathar C-2                  | 1                      | 30° 26' 59''                  | 77° 32' 43''     |
| -do-         | 12/09/2022 | Majra, Majra, RF Sukhimelion C-1                    | 1                      | 30° 28' 32''                  | 77° 31' 01''     |
| -do-         | 12/09/2022 | Majra, Sainwala, RF Sainwala C-3                    |                        | 30° 28' 55''                  | 77° 30' 01''     |
| -do-         | 12/09/2022 | Majra, Sainwala, RF Jamanwali C-1 & 2               |                        | 30° 28' 39''                  | 77° 29' 46''     |
| -do-         | 14/09/2022 | Majra, Sainwala, RF Tokyo C-6                       | 1                      | 30° 29' 16''                  | 77° 29' 38''     |
| -do-         | 14/09/2022 | Majra, Sainwala, Private Area                       |                        | 30° 29' 31''                  | 77° 29' 29''     |
| -do-         | 21/09/2022 | Majra, Behrewala, RF Naurangabad C-5                | 1                      | 30° 29' 24.18"                | 77° 29' 10.32"   |
| -do-         | 23/09/2022 | Majra, Dhaulakuan, RF Sudanwala C-1                 | 1                      | 30° 29' 2.094"                | 77° 27' 58.536"  |
| -do-         | 24/09/2022 | Majra, Dhaulakuan, RF Sudanwala C-2                 | 1                      | 30° 29' 0.3768"               | 77° 27' 58.1976" |
| -do-         | 25/09/2022 | Majra, Dhaulakuan, Private Land Bhelwali            | 1                      | 30° 29' 0.3336"               | 77° 27' 46.9836" |
| -do-         | 26/09/2022 | Majra, Dhaulakuan, RF Garhi C-2                     | 1                      | 30° 29' 0.4164"               | 77° 27' 42.5628" |
| -do-         | 26/09/2022 | Behral, Satiwala, UPF                               |                        | 30° 24' 26.3592"              | 77° 34' 28.65"   |
| -do-         | 05/10/2022 | UPF Satiwala                                        | 1                      | 30° 24' 26.3592"              | 77° 34' 28.65"   |
| -do-         | 06/10/2022 | RF Konch Beli C1                                    | 1                      | 30° 23' 29.256"               | 77° 34' 50.4876" |

|      |                     |                                                                                                                                                  |    |                  |                  |
|------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----|------------------|------------------|
| -do- | 08/10/2022          | UPF Satiwala                                                                                                                                     | 1  | 30° 24' 16.8768" | 77° 34' 50.4876" |
| -do- | 13/10/2022          | UPF Satiwala                                                                                                                                     | 1  | 30° 24' 14.0832" | 77° 34' 30.2088" |
| -do- | 14/10/2022          | RF Konch Beli C2                                                                                                                                 | 1  | 30° 23' 6.8568"  | 77° 34' 50.4876" |
|      | 15/10/2022          | Khararu beat of Girinagar block of Giri Nagar Range in RF Khararu C-9,                                                                           | 1  | 30° 30' 29.718"  | 77° 27' 8.3052"  |
|      | 15/10/2022          | Gullarwala beat of Kansar block of RF Gullarwala C-10&11                                                                                         |    | 30° 32' 38.6736" | 77° 25' 44.6376" |
| -do- | 16/10/2022          | RF Konch Beli C1                                                                                                                                 | 1  | 30° 23' 36.3696" | 77° 34' 35.4756" |
|      | 16/10/2022          | Ganyoni beat Girinagar block of RF Ganyoni C-9                                                                                                   |    | 30° 32' 26.1492" | 77° 27' 29.466"  |
|      | 17/10/2022          | Majri/Girinagar/RF Majri 5,6,7,8                                                                                                                 | 1  | 30° 32' 42.0108" | 77° 29' 7.6812"  |
|      | 17/10/2022          | Mehrar/Girinagar/RF Mehrar 4,5,6&7                                                                                                               |    | 30° 18' 36.972"  | 77° 29' 29.454"  |
| -do- | 18/10/2022          | RF Mast Ali C2                                                                                                                                   | 5  | 30° 24' 39.3588" | 77° 31' 55.6176" |
|      | 18/10/2022          | Parduni 1 <sup>st</sup> /Chandpur/RF Parduni C-2&3                                                                                               |    | 30° 19' 44.4"    | 77° 18' 0"       |
|      | 18/10/2022          | Parduni 2 <sup>nd</sup> /Chandpur/RF Parduni C-6                                                                                                 |    | 30° 19' 15.42"   | 77° 31.84.4"     |
|      | 18/10/2022          | Chandpur1st /Chandpur/RF Chandpur C-7                                                                                                            |    | 30° 18' 36.972"  | 077°.31.38.4     |
| -do- | 19/10/2022          | UPF Satiwala                                                                                                                                     |    | 30° 24' 20.3724" | 77° 34' 28.1676" |
|      | 18,19,20 of 10/2022 | Beas /Chandpur/RF Beas C-3,5&8                                                                                                                   |    | 30° 30' 51.408"  | 77° 33' 24.3"    |
| -do- | 20/10/2022          | RF Konch Beli C2                                                                                                                                 |    | 30° 23' 21.552"  | 77° 34' 51.1284" |
|      | 20,21,22 of 10/2022 | Khara Block, Jhara, Lai, Toka and Khara beat (RF Jhara C-11 to 14,17 &20, RF Lai C-26, 29, 27, 28, 24, 25, 6,3,5,7,11,10, RF Khara C-18,15 & 13. |    | 30° 18' 3.0708"  | 77° 21' 13.6512" |
| -do- | 23/10/2022          | UPF Satiwala                                                                                                                                     | 1  | 30° 24' 20.0124" | 77° 34' 29.712"  |
| -do- | 25/10/2022          | RF Konch Beli C1                                                                                                                                 | 1  | 30° 23' 25.206"  | 77° 34' 33.2904" |
| -do- | 28/10/2022          | RF Konch Beli C2                                                                                                                                 | 1  | 30° 23' 21.6456" | 77° 34' 48.0036" |
| -do- | 30/03/2023          | RF Banswali C1                                                                                                                                   | 1  | 30° 27'49''      | 77° 32'39"       |
| -do- | 30/03/2023          | RF Badighati C3                                                                                                                                  |    | 30° 27'30''      | 77° 31'14"       |
| -do- | 31/03/2023          | RF Sainwala C2                                                                                                                                   | 1  | 30° 29'12''      | 77° 30'29"       |
| -do- | 31/03/2023          | RF Garhi C2                                                                                                                                      |    | 30° 25'39''      | 77° 27'30"       |
| -do- | 08/04/2023          | RF Garhi C2                                                                                                                                      | 1  | 30° 29' 14.316"  | 77° 27' 27.504"  |
| -do- | 03/2023             | RF Rampurbeli                                                                                                                                    | 1  | 30° 26' 1.2336"  | 77° 38' 2.6988"  |
| -do- | 04/2023             | Khararu/Girinagar/RF KhararuC-9                                                                                                                  | 12 | 30° 30' 22.6224" | 77° 27' 8.118"   |

The key point to note here is the fact that from nil elephant movement in 2019-20 and 2020-21, to 2 days in 2021-22, to a whopping increase of 32 days of elephant movement in 2022-23 has been noted in at least one part of Paonta Sahib Division. For 2023-24 (till 1st month of April), already 12 days of elephant movement has been recorded.



A copy of the report prepared by the Division in May 2022 on Human Elephant Conflict has also been prepared in this regard regarding the conflict management, however the issue has got even more severe since then.

2. The beats such as Satiwala and Behral are situated on the banks of river Yamuna. In the past the visitation of elephants has been observed in these beats from Uttarakhand border.

3. The conflict between human and elephant arises in these border areas mainly because of the issue of habitat fragmentation- this can be said on the basis on presence of human habitation, plantation fields, agricultural lands, industrial units, roads etc along the RF stretch and absence of continuous forest area connecting RF Konchbeli (of Paonta Sahib Forest division) to Simbalbara National Park.

4. Based upon the data collected it has been observed that movement of elephants across border from Uttarakhand to Himachal Pradesh is directed towards reaching Simbalbara National Park through forest areas, but due to habitat fragmentation, after crossing Uttarakhand border and coming to Himachal Pradesh, elephants do not have any continuous forest area for the above movement.

5. This obstruction to their movement and absence of any continuous stretch of forest land leads to straying of elephants into human habitation and therefore negative interactions between human and elephant.

In this regard, the following issues are pertinent to note;

#### **I) Brief of human-elephant conflict in Paonta Sahib:**

1. The human-elephant conflict incidents occur largely in Satiwala, Behral, Batamandi beats of Majra Range, Khardu and Jalmusa beats of Girinagar Range and Rampur beat of Paonta Sahib

Range, where the elephants pass through human habitation areas. The beats of Majra and Paonta Sahib Ranges lie close to river Yamuna from where herds of elephants and tuskars enter from Uttarakhand. The elephants cross-over the river towards Batamandi area, and have now begun to move as far as RF area of Khardu beat in Girinagar via Kolar Range of Nahan Division (the episode of a herd of 9 elephants who had entered these forests and stayed for almost a month in March 2023 after crossing dense habitation areas, is the latest case in point of the extent of probable conflict scenario).

2. The elephants coming from Uttarakhand have been noted to visit Simbalwara in the past. However, over the last 2 years they have been increasingly taking detours & entering from agriculture fields adjacent to Yamuna, as well as habitation in the above said beats, posing risk of human-elephant conflicts.

3. There have been several incidents of elephants destroying crops, walls of the houses as well as cow sheds in the village as well as city area while they traverse in and around human habitation. The complaints from people regarding compensation have also summarily increased. Two elephant deaths have already taken place in Paonta Sahib (due to electrocution in one case and consuming insecticides in crop fields in another).

## **II) Action taken till now:**

1. Elephant Anti-Depredation teams have been created in Majra and Girinagar ranges, who have so far successfully prevented any major mishap of human-elephant conflicts in consonance with concerned Gram Pradhan and others locals living in fringe areas. But the risk looms large in the case of the staff being ill-equipped and not properly trained. These teams have been repeatedly visiting, night patrolling& repulsing the elephants as and when information is received or any sighting is done.

2. The teams take aid of creating loud sounds through banging of metal objects, locally made sound guns and have to occasionally resort to the use of fire crackers as the elephants get very close to populations at times.

3. Awareness related activities: Elephant-conflict awareness boards have been installed, meetings with local people and pamphlet distribution in villages, habitation and nearby schools for Do's and Don'ts for elephant conflict situations have been carried out constantly in the last two months and even in the past.

4. Correspondence has been taken up with various stakeholders in administration in line with June 3rd 2020 'MoEF&CC guidelines on handling human-wildlife conflict including damage to crops' to states:

- District Collector and Sub Divisional Magistrate Paonta Sahib for taking cognizance of crop damage caused by Elephant trespass in agriculture area as well as for solar fencing provisioning.
- Deputy Director, Agriculture for taking cognizance of the situation and aid the locals in putting Solar Fence around agriculture fields
- SP Sirmaur and DSP Paonta Sahib for deputing of Quick Response teams for crowd management in case of conflicts
- XEN Electricity, Paonta Sahib for repair of open wires to avoid elephant shocks and deaths especially along the routes taken by the animals
- Wildlife Team at Simbalwara for coordination and redirecting elephant movement into sanctuary area instead of habitation

### **III) Proposed future course of action:**

1. Based on the Centrally Sponsored Scheme "PROJECT ELEPHANT" Guidelines 2013 (Para 6: Items of Works Identified for Financial Support Under Project Elephant) with site-specific requirements in terms of minimizing human-elephant conflict, as well as guidance from Project Elephant Cell, MOEFCC, an APO of Rs 44.67 lakh has been proposed\*\* (**added below in Table 10.5**) for the year 2023-24 for Paonta Sahib Forest Division with Centre Share 60% and State share 40% as per the scheme (given below). As per Para 6, the focus for Paonta Sahib Division is mainly on Activity no. 3. i.e 'Eliciting public co-operation and mitigation of human elephant conflict' and Activity no 4. 'Improvement of support services including monitoring, research and training' and to an extent Activity no. 1 'Protection of elephants'. As regards Activity no. 2, 'Conservation and development of habitats and corridors', these largely pertain to Wildlife wing at Simbalwara National Park where the main focus regarding habitat improvement, eco-restoration of corridors by enrichment of palatable species and removal of invasive like lantana, creation of water bodies and salt-licks must be stressed upon, to facilitate the intended elephant corridor from Uttarakhand to Himachal Pradesh's wildlife protected areas which will further enhance the state's faunal diversity in future. In this regard, the matter may be taken up with higher-ups.

2. In line with June 3,2020 ‘MoEF&CC guidelines on handling human-wildlife conflict including damage to crops’, it is of extreme import for State Level and District Level Coordination committees to be notified for ensuring all stakeholders are engaged in managing elephant conflict scenarios. It is important that timely compensation for damages to crops are paid to people so as to allay public reactions wherein field staff and officers often face the brunt for lack of institutionalization of compensation damage regarding crops.

3. It is also suggested here that experts from Wild Life Institute of India be invited to visit the area & suggest further mitigation measures as per the site situations. Since radio collaring of elephants has been undertaken in Rajaji National Park in the past, discussion along the same lines may be taken up to work out the areas frequented by elephants and the route tracing exercise for further management decisions.

4. It is also strongly recommended that matter be taken up at higher levels for coordinating with the Wildlife wing of the neighboring state of Uttarakhand for joint collaboration in elephant-human conflict situations and information sharing.

#### 5. Elephant Corridors:

- As earlier mentioned, it has been observed that movement of elephants across border from Uttarakhand to Himachal Pradesh is directed towards reaching Simbalbara national Park through forest areas but due to habitat fragmentation after crossing Uttarakhand border and coming to Himachal, elephants do not have any continuous forest area for movement as it can be noted that human settlement, agricultural crop fields, plantation on private land and roads obstruct their movement.
- It should also be noted that at the end of Reserve Forest Konchbeli there is an area of approximately 300 to 500 m which meets with reserve forest area of Ambwali which can potentially be used as elephant corridor to divert elephant visitation from private area to forest area.)
- Therefore, it is recommended that with suitable physical barriers like EPT, Solar power fencing, Bio fencing and modifying the cropping patterns inside RF areas like avoiding tree species which are liked by the elephants etc, the elephants can be diverted from private areas to this above-mentioned stretch of forest land. It will further minimize the conflict.
- The focus here is to develop elephant corridor to divert elephants to Simbalbara NP.

- Habitat improvement in Simbalbara National Park and plantation of tree species like Bamboo, Shisham, Giloe, Bel preferred by elephants in continuous forest stretch identified as potential elephant corridor should be carried out.

Summarily, the following conclusions are drawn in context of human-elephant conflict management.

- Data collection should be initiated at the earliest for further analysis of dynamics of situation and potential opportunities that might be existing to deal with the issue.
- It is recommended that Anti-Depredation Squads (ADS) should be formed keeping in mind the local factors and resources available to serve as alert and aware Human Resource 24/7 and serve as first face to deal with emergency situations.
- Physical barrier as measures to avoid HEC should be adopted immediately. Viability and suitability of suggested physical barriers may be got checked from the experts from Rajaji Tiger Reserve as per the local context as recommended above. Funding provision should be explored. The possibility of government schemes in this aspect e.g. solar fencing in agricultural fields may be examined.
- Feasibility of elephant corridor as suggested above should be considered with consultation with all the stakeholders.
- Awareness generation and training to deal with emergency situations is a must for the local community. Thereby engagement with local bodies, civil administration, police, electricity board, fire department etc is necessary. **Anti-electrocution cells** on Whatsapp groups can also be created to ensure coordination with respect to naked wires and lines repairs immediately.
- Collaboration and coordination with inter-state bodies like the forest department of Uttarakhand, UP, Haryana, etc is also needed.
- Continuous study of situations based upon data collection and emerging situations should be carried out to re-evaluate the strategy to deal with the situation to increase effectiveness of measures.

Appropriate funds and planning as reported above, is essential to ably handle and reduce human-elephant conflicts in Paonta Sahib Forest Division as well as ensure smooth passage of elephant movement in Uttarakhand-HP protected areas corridors through proper scientific management and from an ecological point of view. The issue will otherwise get only more serious in the coming future.



**Table 10.6: Annual Plan of Operation under CSS - Project Elephant- for the Financial Year 2023-24**

| Sr. No. | Items of work                                                                                                                                                                                                                                                                                                         | Unit | Unit Cost (Lakh) | Location |          | Target       |            |                      |                   | Remarks                                                                                                                                                                                                                                                    |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------|----------|----------|--------------|------------|----------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                                                                                                                                                                                                                                                                       |      |                  | Lat (N)  | Long (E) | (Rs.in lakh) |            | Rs. (lakhs)          |                   |                                                                                                                                                                                                                                                            |
|         |                                                                                                                                                                                                                                                                                                                       |      |                  |          |          | Phy          | Fin (lakh) | Centra l share (60%) | State share (40%) |                                                                                                                                                                                                                                                            |
| 1       | Anti-depredation Squads (including vehicle): Range level elephant squad for Majra and Girinagar ranges (the two main conflict areas) to handle anti-depredation duties. Each squad will comprise 1 RO, 1 BO, 4 Forest Guards and 1 trained expert. Hired vehicle, anti-depredation equipments like spotlight torches, | No.  | 3.5              |          |          | 2            | 7          | 4.2                  | 2.8               | Paonta Sahib boundaries lies between plain and hills. Due to insufficient numbers of patrolling vehicles (only 1 in FY 2022-23, the effective monitoring and patrolling is difficult to carry with a number of entry points for wildlife to crossover from |

|   |                                                                                                                                                                                                |    |      |            |            |   |       |      |       |                                                                                                                                                                                                                                                                                                         |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|------|------------|------------|---|-------|------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | binoculars<br>crackers/sound gun,<br>siren. The same squad<br>can be of help if there<br>is any movement into<br>Paonta Sahib Range<br>(which has happened<br>in the past ,<br>intermittently) |    |      |            |            |   |       |      |       | the state of<br>Uttarakhand.<br>This area is<br>highly prone to<br>human animal<br>conflict. Anti-<br>depredation<br>teams can move<br>in Campers for<br>effectively<br>addressing<br>conflict. The<br>same vehicle can<br>be also used for<br>watering troughs<br>and fire-fighting<br>in dry seasons. |
| 2 | Infrastructure - Watch<br>tower installation (one<br>each in Majra and<br>Girinagar ranges)                                                                                                    | No | 5.21 | 30°30'23.3 | 77°27'09.2 | 2 | 10.42 | 6.52 | 4.168 | Erection<br>of Tower with<br>Solar panel,<br>battery etc.<br>@Rs.4.21 lac<br>each + Rs 1 lakh<br>each for<br>procurement of<br>VHF equipments                                                                                                                                                           |
|   |                                                                                                                                                                                                |    |      | 30°25'29.7 | 77°34'47.1 |   |       |      |       |                                                                                                                                                                                                                                                                                                         |

|                                                                         |                                                                                                                                             |     |       |  |  |    |      |      |     |                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|--|--|----|------|------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                         |                                                                                                                                             |     |       |  |  |    |      |      |     | and its accessories                                                                                                                                                                                                                                                                                                |
| Eliciting public co-operation and mitigation of human elephant conflict |                                                                                                                                             |     |       |  |  |    |      |      |     |                                                                                                                                                                                                                                                                                                                    |
| 3                                                                       | Engagement of 'gaj-mitras' volunteers (elephant watchers) Rs 12,500 per watcher (50 no.) to tackle man-elephant conflict during Crop Season | No. | 0.125 |  |  | 50 | 6.25 | 3.75 | 2.5 | The human wildlife conflict in two Ranges of Paonta Sahib Division are very high due to migrating elephants which causes depredation in village farm lands adjoining forest boundaries, the period typically varies from 30-40 days currently. Hence local youth can be engaged to drive back the animals into the |

|   |                                                                                           |  |     |  |  |  |   |   |   |                                                                                                                                                                                 |
|---|-------------------------------------------------------------------------------------------|--|-----|--|--|--|---|---|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                                                                                           |  |     |  |  |  |   |   |   | forest alongwith anti-depredation teams.                                                                                                                                        |
| 4 | Awareness and sensitisation<br>- Publicity & IEC for elephant conservation, pamphletsetc. |  | L/s |  |  |  | 5 | 3 | 2 | Awareness activities including celebration of elephant day, Gajutsav , hand outs on project elephant, steel awareness signboards on National Highway, statues at Van Vihar etc. |

|   |                                                                                             |    |     |            |            |   |     |     |     |                                                                                                                                                                                                                                                                                                              |
|---|---------------------------------------------------------------------------------------------|----|-----|------------|------------|---|-----|-----|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | Solar power fencing along Bata Mandi area (main entry point for elephants from Uttarakhand) | Km | 5.5 | 30°25'29.7 | 77°34'47.1 | 1 | 5.5 | 3.3 | 2.2 | The idea is to redirect the elephant movement towards Simbalwara Sanctuary that is in the vicinity of Bata Mandi (entry point). By creating solar fencing and trenches near habitation area from where the elephants currently enter Paonta Sahib the elephants movement can be directed towards Simbalwara. |
|---|---------------------------------------------------------------------------------------------|----|-----|------------|------------|---|-----|-----|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|   |                                                                              |     |     |                                                |                                                     |   |     |     |     |                                                                                                                                                                                                                                                                                                                                                                         |
|---|------------------------------------------------------------------------------|-----|-----|------------------------------------------------|-----------------------------------------------------|---|-----|-----|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | Elephant proof<br>Trenches<br>construction(EPT)                              | Km  | 5.5 | 30°25'30.7 30°25'58.8<br>30°26'15.2 30°25'05.5 | 77°33'30.2 77°33'2<br>8.3 77°33'25.2 77°<br>34'02.3 | 1 | 5.5 | 3.3 | 2.2 | The item is<br>essential to avert<br>Human-Elephant<br>conflict<br>situations rising<br>out of frequent<br>elephants<br>crossing over to<br>Human<br>Habitation in<br>Majra and<br>Girinagar ranges.<br>Crop raiding by<br>elephants is a<br>persistent<br>problem faced in<br>Paonta Sahib<br>Division and<br>hence the item is<br>proposed to<br>mitigate the<br>same |
| 7 | Bee keeping training<br>and apiculture in<br>fringe areas with<br>habitation | L/S |     |                                                |                                                     |   | 1   | 0.4 | 0.4 | As a livelihood<br>option as well as<br>deterrence for<br>elephant                                                                                                                                                                                                                                                                                                      |

|                                                                             |                                                                                                                     |     |      |  |  |   |   |     |     |                                                                                                                    |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----|------|--|--|---|---|-----|-----|--------------------------------------------------------------------------------------------------------------------|
|                                                                             |                                                                                                                     |     |      |  |  |   |   |     |     | movement inside<br>habitation areas<br>and crop fields                                                             |
| Improvement of support services including monitoring, research and training |                                                                                                                     |     |      |  |  |   |   |     |     |                                                                                                                    |
| 8                                                                           | Holding of workshops,<br>meetings, seminars etc<br>for stakeholders                                                 |     |      |  |  |   | 2 | 1.2 | 0.8 |                                                                                                                    |
| 9                                                                           | Mobile application<br>development for<br>tracking elephant<br>movement and<br>corridor mapping and<br>miscellaneous | 1   | 2    |  |  |   | 2 | 1.2 | 0.8 | Identification of<br>hotspots, SMS<br>based alerts to<br>staff as well as<br>citizens nearby                       |
| 10                                                                          | Camera traps/Night<br>vision devices for<br>monitoring                                                              | No. | 0.25 |  |  | 8 | 2 | 1.2 | 0.8 | For tracking of<br>wildlife<br>movement                                                                            |
| 11                                                                          | Training of officers,<br>field staff in elephant<br>management<br>techniques                                        |     |      |  |  |   | 2 | 1.2 | 0.8 | Expertise<br>gathering in<br>handling human-<br>elephant conflict<br>as well as<br>learning best<br>practices from |

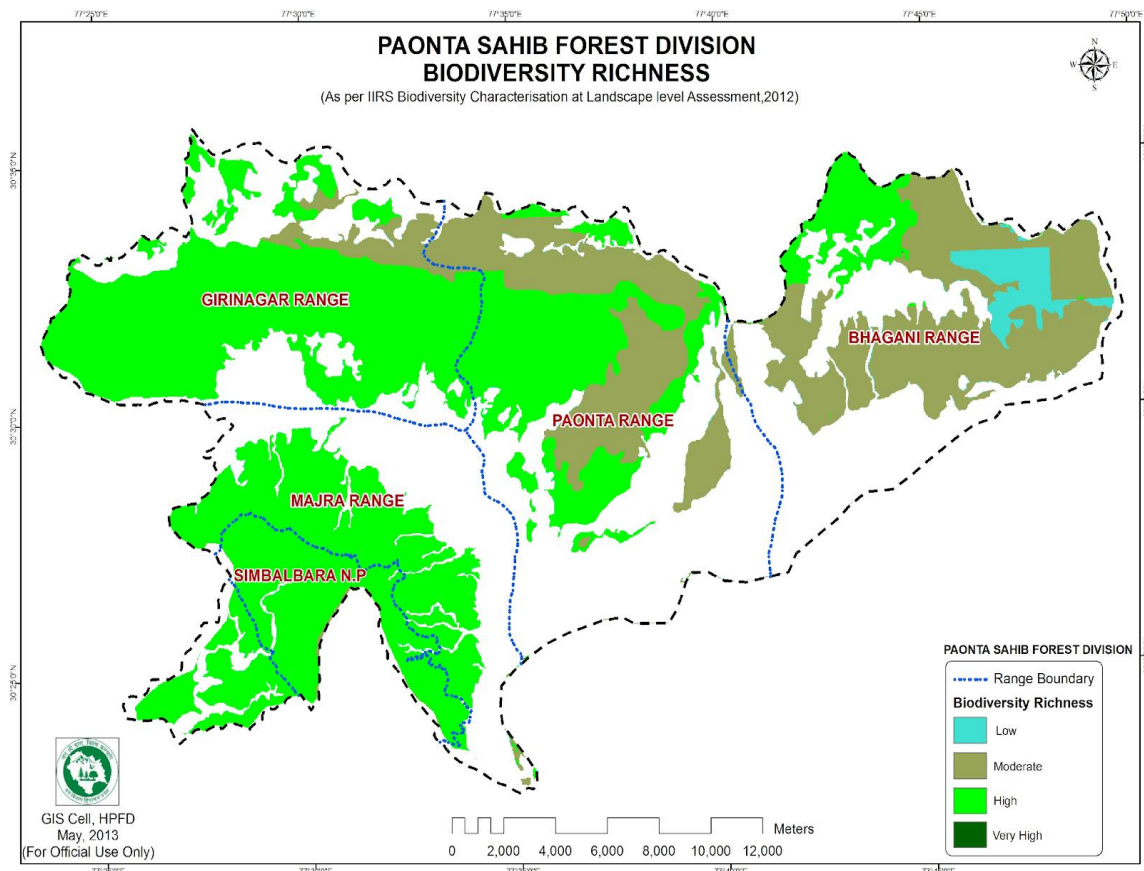
|  |              |  |  |  |  |  |              |             |             |                               |
|--|--------------|--|--|--|--|--|--------------|-------------|-------------|-------------------------------|
|  |              |  |  |  |  |  |              |             |             | elephant-<br>populated states |
|  | <b>Total</b> |  |  |  |  |  | <b>44.67</b> | <b>26.8</b> | <b>17.9</b> |                               |



## 10.10: Biodiversity Conservation

“Biodiversity is the variation among living organisms from different sources including terrestrial, marine and desert ecosystems, and the ecological complexes of which they are a part.” Biodiversity describes the richness and variety of life on earth. It is the most complex and important feature of our planet. Without biodiversity, life would not sustain. The term biodiversity was coined in 1985. It is important in natural as well as artificial ecosystems. It deals with nature’s variety, the biosphere. It refers to variabilities among plants, animals and microorganism species. Biodiversity includes the number of different organisms and their relative frequencies in an ecosystem. It also reflects the organization of organisms at different levels. Biodiversity holds ecological and economic significance. It provides us with nourishment, housing, fuel, clothing and several other resources. It also extracts monetary benefits through tourism. Therefore, it is very important to have a good knowledge of biodiversity for a sustainable livelihood. Paonta Sahib Forest Division’s Biodiversity richness is indicated through the map below:

**MAP No. 10.10**



**Importance of Biodiversity:** Biodiversity and its maintenance are very important for sustaining life on earth. A few of the reasons explaining the importance of biodiversity are:

**Ecological Stability:** Every species has a specific role in an ecosystem. They capture and store energy and also produce and decompose organic matter. The ecosystem supports the services without which humans cannot survive. A diverse ecosystem is more productive and can withstand environmental stress.

**Economic Importance:** Biodiversity is a reservoir of resources for the manufacture of food, cosmetic products and pharmaceuticals. Crops livestock, fishery, and forests are a rich source of food. Wood, fibres, perfumes, lubricants, rubber, resins, poison and cork are all derived from different plant species. Biodiversity provides people with basic ecosystem goods and services. it provides goods such as food, fibre and medicine, and services such as air and water purification, climate regulation, erosion control and nutrient cycling. Biodiversity also plays an important role in economic sectors that drive development, including agriculture, forestry, fisheries and tourism. More than three billion people rely on marine and coastal biodiversity, and 1.6 billion people rely on forests and non-timber forest products (e.g. the fruits from trees) for their livelihoods. Many people depend directly on the availability of usable land, water, plants and animals to support their families. In fact, ecosystems are the base of all economies.

**Ethical Importance:** All the species have a right to exist. Humans should not cause their voluntary extinction. Biodiversity preserves different cultures and spiritual heritage. Therefore, it is very important to conserve biodiversity.

#### **10.11 Strategies for biodiversity conservation:**

- Biodiversity use and conservation education.
- Integrated health care
- Afforestation
- Communities involvement in Biodiversity Conservation
- Traditional agro-ecosystems and biodiversity conservation

#### **1. Biodiversity use and conservation education:**

- People should be aware about the direct and indirect benefits from the forest and their change in attitude is needed.
- Initiation of educational programs that comprises teaching of conservation topics and its

- extension to adult literacy and schools will bring beneficial change in people's attitude.

## **2. Integrated health care:**

- Documentation of traditionally used plants, and selection of plants that are safe, effective and easily available or cultivated is to be done which plants may be integrated into modern health care system. The combination of traditional with modern system health care can be truly effective and affordable for low income groups.

## **3. Afforestation:**

- Multipurpose tree including legumes are marvellous, multipurpose resources that can protect and stabilize the soil, save water, symbiotically fix atmospheric nitrogen, produce valuable wood and fodder, and certain proteins and lipids for diet.
- In the most degraded areas where trees are difficult to grow, attention should be given to the shrubs which are highly palatable to cattle.

## **4. Communities involvement in Biodiversity Conservation:**

- Collection of fuel-wood for household cooking and fodder for animals undertaking mostly by women and children should be allowed with regulation.
- Promotion of the community-based resource management systems of indigenous people will help in accomplishing the conservation of indigenous knowledge for biodiversity conservation.

## **5. Traditional agro-ecosystem and biodiversity conservation:**

- Recent patterns of agricultural development are depleting soils, genetic diversity, species diversity both in managed fields and surrounding habitats. Further, due to introduction of imported seed of crops, fertilizers and pesticides, traditional agro-ecosystems are under threat. A decline in the crop yield has been gradually noticed in lack of sufficient chemicals which the country imports. To maintain the diversity and productivity of traditional genetic resources of agriculture, the government should promote and encourage the farmers to maintain traditional agro-ecosystems. Highly diverse plant species shall be maintained in the village area.

#### 10.12 Preservation plots for Biodiversity assessment

In order to carry out biodiversity analysis from conservation point of view, preservation plots must be identified by the DFO for the areas with rich biodiversity presence. The beats having ecotone areas should be preferred so as to study the biodiversity presence of two ecosystems and their cusps (indicated in Biodiversity Richness map above). **The list includes Majra, Johron, Sainwala, Behrewala, Majra Sukron (North) Gharatwali (North) of Majra Range.** This preservation plot shall not be less than 1 ha area and will be studied for ecological succession and biodiversity of the area. No grazing shall be allowed in this area nor any type of cultural operations will be done. Biannual studies on composition and structure of the forest will be done. In case of trees, girth at breast height shall be recorded. The biodiversity will be studied by laying out 3m×3m and 1m×1m quadrats as explained in the methodology of Resource Assessment Survey. The Research Wing of Himachal Pradesh Forest Department along with field biologists shall inspect the area annually along-with the Divisional Forest Officer of Paonta Sahib Forest Division to record their findings.

## **CHAPTER-11**

### **JOINT FOREST MANAGEMENT (OVERLAPPING) WORKING CIRCLE**

#### **11.1 GENERAL**

By definition Joint Management would mean involving people in the decision-making process in the management of forests. The participatory forest management started in 1972 in India from West Bengal. A predominantly rural & hilly areas, need for participatory forest management arose in Himachal, and the PFM started in H.P in 1985 through National Social Forestry (Umbrella) project.

In the 1980s, the World Bank supported Social Forestry project (1984-92) and the Indo-German Integrated Dhauladhar project (1982-92) were implemented in H.P. In these projects the drawbacks of Umbrella projects were well addressed. Therefore, in 1990s, World Bank funded IWDP Kandi project started in the Shivalik hills in which participatory approach was emphasized, later came the mid Himalayan watershed development project and at present IDP project, JICA Forestry project and KFW Project are ongoing where all three issues i.e. physical targets of Forest Department, social participation and equity are taken all together as per guidelines of World bank and respective funding agencies.

The framework for JFM in H.P is provided by the Govt. of H.P order of 12.5.1993, which followed the Govt. of India (JFM) circular of 1<sup>st</sup> June 1990 from the then Secretary (Environment and Forests), enabling the spread of JFM to the Village Forest Development Committees (VFDC's) for Joint Forest Management in the Villages of Himachal Pradesh.

This working circle will be overlapping working circle and includes both degraded forests as well as healthy forests, which needs treatment with the participation of local communities in form of forest protection, afforestation, soil and water conservation, water resource management, ecotourism management etc. Treatment plans and memorandum of understanding will be different for degraded and healthy forests.

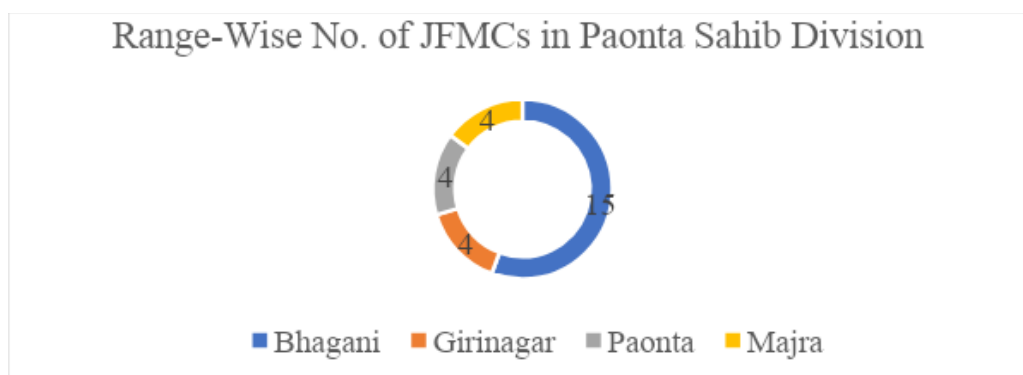
#### **11.2 OBJECTS OF MANAGEMENT:**

- a) To motivate and convince local people about role of Forest department to protect the forests and simultaneously to uplift socio-economic condition of the people and thereby ensure involvement of local people for protection, conservation and management of forests.

- b) To carry out socio-economic surveys in every JFMC/fringe village to accurately assess the dependency of people over forests in terms of timber, fuelwood etc.
- c) To empower village communities to play a crucial role in forest resource conservation and enable them to resolve their issues and problems. People shall be made aware about the benefits of conserving and improving the quality of their plantations against the backdrop of climate change negotiations, particularly, REDD+
- d) To reclaim the degraded forests by promoting natural and artificial regeneration (through plantation activity) with active participation of the villagers
- e) To document the indigenous traditional knowledge and incorporate the same in the micro plans of the JFMCs
- f) To associate the people of JFMCs with identification, documentation and implementation of ecotourism activities.
- g) To analyse the past working of JFMC and suggest suitable policy modifications required for more effective functioning of JFMCs.
- h) To win over people so that they become willing partners in protection of forests both within and outside the JFMC areas.
- i) People interested in taking up plantations that are commercially viable in their private lands would be given technical guidance as well as seedling support to raise such plantations

### 11.3 JFMCS IN PAONTA SAHIB FOREST DIVISION

Details for Paonta Sahib Forest Division as per latest available data are given below:



## JFMCs Status in Division



### JFMCs OF BHAGANI RANGE:

| Sno. | Name of JFMC                                      | Name of Range | Date of Registration of JFMC | Area       | Functionality |
|------|---------------------------------------------------|---------------|------------------------------|------------|---------------|
| 1    | Van Sarankshan Samiti, Ram Nagar                  | Bhagani       | 2008-09                      | Bhagani    | Active        |
| 2    | Mahila Van Evam Paryavaran Surksha Samiti, Amboya | Bhagani       | 2008-09                      | Amboya     | Active        |
| 3    | Van Vikas Evam Sarankshan Samiti, Khodowala.      | Bhagani       | 2008-09                      | Khodowala  | Active        |
| 4    | Sayed Peer Evam vikash Samiti, Gorkhuwala         | Bhagani       | 2008-09                      | Gorkhuwala | Active        |
| 5    | Van Samrat Vikash Samiti, Gorkhuwala.             | Bhagani       | 2008-09                      | Gorkhuwala | Active        |
| 6    | Baba Balanath Vikas Samiti Khodowala.             | Bhagani       | 2009-10                      | Khodowala  | Active        |
| 7    | Nagdevta Van Vikas Samiti                         | Bhagani       | 2009-10                      | Puruwala   | Active        |
| 8    | Jai Santoshi Maa Van Samiti, Pager Tuniwala       | Bhagani       | 2009-10                      | Puruwala   | In-active     |
| 9    | Guru Van Vikas Samiti, Khorowala                  | Bhagani       | 2009-10                      | Khoronwala | Active        |
| 10   | Gram Van Vikas Evam Sarankshan Samiti, Dandiwala  | Bhagani       | 2008-09                      | Dandiwala  | In-active     |

|    |                                                 |         |         |           |           |
|----|-------------------------------------------------|---------|---------|-----------|-----------|
| 11 | Van Vikas Samiti, Gojjar                        | Bhagani | 2008-09 | Gojjar    | In-active |
| 12 | Gramin Harit Vikas Samiti Killour.              | Bhagani | 2008-09 | Killour   | Active    |
| 13 | Van Vikas Samiti Dhigali.                       | Bhagani | 2008-09 | Dhigali   | Active    |
| 14 | Shri Radhe Krishan, Van Vikas Samiti, Ambiwala. | Bhagani | 2016-17 | Ambiwala  | Active    |
| 15 | Baba Balaknath Van Vikas Samiti, Danda          | Bhagani | 2008-09 | Khorowala | Active    |

#### **JFMCs OF GIRINAGAR RANGE**

| Sno. | Name of JFMC                             | Name of Range | Date of Registration of JFMC | Beat         | Functionality |
|------|------------------------------------------|---------------|------------------------------|--------------|---------------|
| 1    | Van Vikas Samiti Kansar                  | Girinagar     | 2009-10                      | Kansar       | Active        |
| 2    | Van Sangini Mahila Mandal Bharog Baneri. | Girinagar     | 2009-10                      | BharogBaneri | Active        |
| 3    | Van Vikas Samiti Purli                   | Girinagar     | 2009-10                      | Purli        | In-active     |
| 4    | Van Vikas Samiti, Kansar                 | Girinagar     | 2022-23                      | Kansar       | Active        |

#### **JFMCs OF PAONTA SAHIB RANGE:**

| Sno. | Name of JFMC                 | Name of Range | Date of Registration of JFMC | Beat       | Functionality |
|------|------------------------------|---------------|------------------------------|------------|---------------|
| 1    | Shiv Vikas Samiti Kumbhigarh | Paonta Sahib  | 2008-09                      | Kumbhigarh | In-active     |



|   |                                         |                 |         |              |           |
|---|-----------------------------------------|-----------------|---------|--------------|-----------|
| 2 | Van Vikas Samiti,<br>Malgi              | Paonta<br>Sahib | 2009-10 | Malgi        | Active    |
| 3 | Mahila Mandal Dadwa<br>Kailla           | Paonta<br>Sahib | 2009-10 | DedwaKailla  | In-active |
| 4 | Shiva Van Vikas Samiti<br>Sirimouri Tal | Paonta<br>Sahib | 2011-12 | Sirmouri Tal | Active    |

#### **JFMCs OF MAJRA RANGE:**

| Sno. | Name of JFMC                                | Name of Range | Date of Registration of JFMC | Beat       | Functionality |
|------|---------------------------------------------|---------------|------------------------------|------------|---------------|
| 1    | Paryavaran Suraksha<br>Pilhori              | Majra         | 2008-09                      | Pilhori    | Active        |
| 2    | Van Vikas Samiti Pilhori                    | Majra         | 2008-09                      | Pilhori    | Active        |
| 3    | Van Vikas Samiti Majra                      | Majra         | 2010-11                      | Majra      | In-active     |
| 4    | Forest Development<br>Committee, Dhoulakuan | Majra         | 2019-20                      | Dhoulakuan | Active        |

As can be seen, the presence of JFMCs is largely concentrated in Bhagani Range (15 total, 12 active) and limited to 4 each in the other three ranges. There is scope for engaging stakeholders and mobilizing communities through proper engagement and dialogue for new formation of JFMCs in other ranges as well. This will also be in line with India's commitments to Sustainable Development Goals and UNFCCC where people's participation in environment conservation and protection activities has been given prime importance.

#### **11.4 FUTURE SCOPE OF JFMCs IN PAONTA SAHIB FOREST DIVISION**

There is reasonable scope for the JFM activities in the division provided a 360-degree approach is ensured in engaging, consulting, working and monitoring with the stakeholders. The JFM/PFM committees can be the future agencies of forest development, conservation and expansion. The potential activities to be executed through JFMCs can be:

- ❖ Afforestation and plantation activities

- ❖ Soil & water conservation through treatment of micro watersheds in a catchment. The Success stories of Jalodari Project, Amboya and Ramnagar as has already been discussed can act as guiding models for future people-driven movements with Forest Department in the field of forest conservation, water conservation and livelihood generation.
- ❖ Water Resource management: Recharging of water bodies like baulis, ponds and groundwater (akin to the model in Chandpur Block, Girinagar Range)
- ❖ Minor construction work of road, paths and buildings
- ❖ Awareness programmes for forest protection, fire protection, propagation of medicinal herbs
- ❖ Livelihood options like bee keeping, mushroom cultivation, vermicomposting, cutting & pruning etc. through effective training
- ❖ Maintenance and management of ecotourism sites and potential ones (Yamuna Van Vihar, Eco Park, Sirmaur Van Vihar etc)
- ❖ Human-animal conflict mitigation
- ❖ Forest-fire control and briquette-making
- ❖ Forestry and conservation related awareness activities

JFMCs can decide for several income generation activities for alternative livelihood particularly low-income group of community. They can make Self Help Groups (SHGs) and the front-line staff of the forest department can assist them to form the groups.

In order to reduce dependence of these people on forest resources by ensuring them alternate livelihood, SHG groups are formed so that they can earn money to meet their daily requirements by pursuing some economic activity. SHGs also help them to inculcate habit of savings for bad days from own savings rather than incurring loan from money lender and being in a perennial debt trap. Self Help Groups (SHGs): The guidelines in “A Handbook on Forming Self Help Group, National Bank for Agriculture and Development” may be followed for formation and regulation of SHGs.

As mentioned previously, in order to expand the JFMC concept further in Paonta Sahib, Girinagar and Majra Ranges of the Division, it is of prime import to engage stakeholders and mobilize communities through proper communication and dialogue for new formation of JFMCs in other ranges as well. A brief outline has been given ahead in this chapter.

### **1. Selection of JFM Working Areas**

The following broad guidelines have been devised for selection of potential areas:

- ❖ Interest of local forest staff in involvement in joint forest planning and management;
- ❖ Interest of local people in involvement in joint forest planning and management;
- ❖ Existence of ongoing ‘successful’ collective land management systems;
- ❖ Resource poor areas where there are constraints on the forest and farming system in term of access to grazing and forest products;
- ❖ Relatively homogenous local communities.

The information will be gathered from village-level PRA studies; workshops held with range officers and forest guards, in conjunction with village visits and meetings to determine local people’s perception of problems and possible intervention.

## **2. Participatory Rural Appraisal (PRA):**

Participatory Rural Appraisal (PRA) will be used as a way to facilitate communication between users and the Forest Department and to determine problems and priorities. At this initial discussion stage, it is likely that only partial information will be obtained from the village, so it will be necessary to repeat the PRA exercise. Repeated PRAs would be used to continue the dialogue and build on the information base. PRA will be used to identify particular area needing more detailed socio-economic research.

### **Specifically, PRAs will be used to:**

- (i) Finalize village selection
- (ii) Build up baseline information
- (iii) Identify forest users and their priorities
- (iv) Provide the context for experimental learning for the staff and to create the basis for effective interaction between the department and forest users
- (v) Identify local option for institution building
- (vi) Draw up village level agreements.

### **The key objectives of this PRA would be:**

1. To identify local resource use system; access rules; differential control; legal and customary status of land of land; past and current tendril status of land.
2. To document existing land use practices and management as a basis of their development.
3. To document current interaction between forest, farm and pasture; type of usage; division of labor.

4. To build a detailed picture of the socio-economic context of villages; identify different categories of household (i.e. household profiles); to identify and assess effectiveness of village institutions and leaders; to identify different levels of decision making in resource use and their relative importance, i.e. village council. Men, women, rich, poor.
5. To identify user's priorities and means of reaching consensus.
6. To identify different users' constraints to participation, for example women's labor time, poorer people's lack of access to decision making.
7. To identify and assess effectiveness of existing village level institutions, cooperative action between villages as a means to build more effective village or user group organizations.

### **PRA Process**

The PRA process will be initiated to provide a growing dialogue between the department and forest users. Initially, information may be colored by misunderstanding and mistrust on both sides. It is only as familiarity and participation in the benefits of joint management become apparent to forest users that a relationship of understanding and trust will be built between the staff and communities.

### **PRA Technique**

The PRA technique to be used in joint forest planning and management will include review of secondary data and existing information

- a) Direct observation
- b) Semi-structured interviews
- c) Group interviews (casual, focused, village).
- d) Use of key information's, local experts.
- e) Use of local researchers
- f) Ranking: wealth ranking, pair-wise ranking, direct matrix ranking
- g) Livelihood analysis
- h) Seasonal diagramming (firewood, fodder, NTFPs, labour etc.)
- i) Transects (systematically walking through an area with a group of local people).
- j) Participatory mapping, modeling; people's mapping and modeling.
- k) Linkage chart (showing links between village organizations, between villages, and forest resources).
- l) Case studies and stories.
- m) Ethno-histories.

- n) Brainstorming (especially joint sessions with villagers)

### **Role of Front-Line Staff**

Forest Guards will coordinate all inputs to the village and will act as the interface between villager and the department. They will be conduit for the flow of information both up and down the system. They will establish links with other village-level organizations and government extension agents where appropriate. The departments most likely to be involved are Animal Husbandry, Agriculture and Rural Development.

Forest Guards will have the following responsibilities:

- a) To establish effective and representative Village Forest Development Committees;
- b) To maintain contact with joint forest management groups (VFDCs);
- c) To provide technical advice as required;
- d) To arbitrate between groups if conflict arises and requested;
- e) To collect information through PRAs;
- f) To provide feedback to the department;
- g) To facilitate the full participation of women and poorer people;
- h) To liaise between villagers and the department.

Although these activities are all additional to the current work of forest guard; the experience elsewhere indicates that as the JFPM process strengthens the more onerous protection workload of the guard will reduce.

### **Field level Training**

Field level training will be carried out through participatory workshops which encourage an experience-based learning approach. At outset these workshops may be facilitated by some JFPM Training specialist. Each person participating in the workshop should share his experience and knowledge with other participants including the facilitators. A series of workshops should be organized at different levels, such as:

- Circle-level workshops
- Divisional-level workshops
- Range-level workshops

### **Villagers Reorientation**

Reorientation is not essential for the staff only, villagers will also need to be reoriented in their approach to the management of local natural resources, and in their perception of the role of the

staff. The joint forest planning and management system forms a major part of this reorientation. Workshops should be organized for local leaders (local politicians, ehaviors leaders, teachers, other key persons); and VFDCs. This will provide a forum where VFDCs can share experiences, learn from each other, and develop combined strategies and approaches to JFPM.

### **Micro Plan Making**

Before a VFDC can manage a forest, it will be required to prepare a micro plan. The micro plan will be prepared jointly by Executive Body of the VFDC and the Range staff, and will be discussed with the General House. It will be finally approved by the concerned DFO. The information's gathered during the PRA exercise will be helpful in preparation of the micro plan. Locally drawn maps of the area may be useful to ensure that everyone understands what areas are to be managed. The micro plan should include:

- a) Detail which households and villages have access and right to the forest lands and forest products;
- b) Include detail on protection and decision-making mechanisms;
- c) Detail forest management prescription;
- d) Detail soil conservation measures if considered necessary by the VFDC
- e) Detail grassland management measures if considered necessary by the VFDC
- f) Demarcate the responsibilities of the department and the villagers (forest users);
- g) Detail unambiguous rights to the usufruct and harvesting of common plantation, grassland and forest area;
- h) Detail clear rules and mechanisms for the distribution of benefits: intermediate and the final harvest, among users.

### **Duties and Responsibilities of JFM Committees**

To make the JFMCs active and functional, each member of JFMC should shoulder certain duties and responsibilities.

- a) To persuade the villagers to give available areas for plantation.
- b) To assist the Forest Department in planning, protection, afforestation.
- c) To help the F.D. in judicious use, of all existing rights, eco-development of the area as per approved management plan.
- d) Just and fair distribution of the usufructs derived.

- e) Ensure its management as per prescribed norms.
- f) Settlement of all disputes between villagers

### **Power to JFMCs**

The committee should make its own bye-law with the concurrence DFO. The concerned DFO should carry out necessary procedure for granting powers of a forest officer as mentioned in HPPFM regulations, 2001.

- Power to register Damage report.
- Power to summon the accused to the general house of JFMC.
- Make recommendations to Range officer regarding compounding of damage in respect of offences committed on JFMC areas

### **MOU between Forest Department and JFMCs**

In the participatory mode, the scheme is being implemented by setting up Forest department agency (FDA) at Forest division level and JFMC at village level. As per the notified regulation titled HPPFM regulations, 2001 notified vide no. Fts. IIB/15-10/87 dated 23.8.2001, MOUs were signed between State Govt. represented by DFO of Forest Division in which FDA is being implemented and JFMC through its president during November 2009. Govt. of H.P has approved this MOU after getting vetted from the law Department. This MOU shall be valid for a period of five years from the date of signing as per terms and conditions detailed in the MOU for proper protection, maintenance, regeneration and management of plantation created under FDA and other forestry schemes within the jurisdiction of the JFMC.

In addition, MOU may also be signed between Forest Department and JFMCs for fire protection. No fire watcher is engaged in the area of JFMC. Further, a provision of honorarium/ assistance has been made to be paid to JFMCs for doing excellent works in fire fighting.

### **JFMC Role in Eco-Tourism**

There is need to develop specific sites for eco-tourism in JFM localities. Through various projects like stay home scheme, traditional food/ Ethnic food serving etc. through eco-tourism the villagers not only get employment but self-business will raise their income and it will become a source of livelihood. Some potential and established sites include Yamuna Van Vihar, Eco park, upcoming Sirmour Van Vihar etc. Stress should also be laid on making the sites self-

sustaining and to benefit local live hood generation and add to be tourism potential of the Division.

#### **Approach to Be Adopted in Implementing JFM Schemes**

- Educate people on the aim and objectives of the program/scheme before launching the program/ scheme
- Make extensive and intensive use of PRA techniques to formulate the plan and share the derived information with the people;
- Draw up a working scheme/ Micro plan with the active involvement of the local people, ensuring representation of the heterogeneity of the group;
- Execute works and use PRA techniques for monitoring as well;
- Exemplify spirit of participation by well defined, lucid usufruct sharing mechanisms and transparency in accounting the expenditure on the works.

#### **MONITORING AND EVALUATION**

The monitoring of the progress and performance of the activities taken under this working circle under different schemes should be done at the Divisional level. Evaluation of the schemes should be planned periodically through ‘Social auditing’.



## CHAPTER 12

### ECOTOURISM (OVERLAPPING) WORKING CIRCLE

#### 12.1 General constitution:

The working circle is looking into identification of various ecotourism destinations holding future potential for sustainable ecotourism development as well as creating livelihood generation opportunities for different stake holders in forest and natural resources management and conservation. The training, capacity building of identified stake holders in effective management of ecotourism assets is also to be ensured.

#### 12.2 Special objectives of management

1. To identify eco-tourism sites and methods to develop them into self-sustaining entities and to develop regional ecotourism circuits
2. To identify active JFMCs /VFDCs formed under different projects like FDA, NMPB etc.
3. To identify training needs of different stakeholders in the functioning and ensure capacity-building
4. To create public awareness (Information, education and communication) and nature education through the ecotourism assets and areas using tools of marketing, branding and destination-specific campaigns
5. To promote low-impact nature tourism which ensures ecological integrity of the ecotourism sites and its environment;
6. To promote biodiversity, traditional ecological knowledge and heritage values of Himachal Pradesh

#### 12.3.1 Guidelines on Sustainable Eco-Tourism in Forest and Wildlife Areas, 2021

In order to regulate and encourage planned development of areas in and around protected areas, the Ministry of Forest, Environment and Climate Change has notified “Guidelines on Sustainable Eco-Tourism in Forest and Wildlife Areas” in October 2021.

Considering the need for a participatory approach for conservation of wildlife and its habitats, the guidelines emphasizes the engagement of local communities in a manner that enriches local economies and encourage sustainable use of indigenous material through financially viable value chains to help local communities become independent and promotes partnership among

stakeholders in development of ecotourism as well as equitable sharing of benefits with local communities.

Creation of foundations/societies in protected areas and sharing of revenue with local communities has also been underscored in the guidelines. Besides, the guidelines provide for identification of ecotourism sites, zonation and making an ecotourism plan which shall be part of approved management plan/working plan for forest/protected area and tourism master plan in case of eco-sensitive zone. It also provides for monitoring mechanism at district level, state level and national level.

### **12.3.2 Eco-Tourism in Himachal Pradesh**

Himachal Pradesh is renowned worldwide for its rich natural heritage and landscapes, tourist places and striking scenic views. Also known as ‘Devbhoomi’, the state attracts on an average, close to 1.7 crore tourists annually, which is far greater than its own population. In wake of post Covid times, the state has begun to draw even more visitors who come seeking the beauty and tranquility of nature from the plains below. Ecotourism is basically sustainable, nature-based tourism, that is environmentally conservative while maintaining local culture and contributing to the well-being of the host community. Keeping this in view, the goal is to develop a list of best practices and recommendations for sustainable tourism and ecotourism that are specific to Himachal Pradesh, India.

Himachal Pradesh Forest Department formulated the Eco-tourism Policy during 2001 which was subsequently revised in 2005. A re-revised Draft Ecotourism Policy was also proposed in the year 2017. The central theme of the 2005 policy is to ‘decongest and disperse over flowing city tourist destinations and bring the tourists closer to nature and ensure adequate economic return to the State and livelihood opportunities to the local communities.

To fulfill this objective H.P. Ecotourism Society has been constituted with its Headquarters at Aranya Bhawan Talland Shimla (H.P.). It is a registered Society under the Societies Registration Act.

The Society’s apex decision making body is the Governing body headed by Hon’ble Chief Minister, Himachal Pradesh and Principal Secretary (Forests) as its Member Secretary. The affairs of the Society are administered by an Executive Committee headed by Principal Secretary (Forests) and CCF Eco-tourism as its Member Secretary.

### **12.4 Eco-Tourism sites in Paonta Sahib Forest Division**

The city of Paonta Sahib is popular among tourists across India for the famous Paonta Sahib Gurudwara. The town occupies a strategic location bordering with Uttarakhand, Uttar Pradesh and Haryana and is richly bestowed with Sal forests, riverine tracts of Yamuna, Giri, Bata and Tons and Shiwalik hills in the landscape. Simbalwara National Park, Renukaji wetland and sanctuary, Asan Bird Conservation Reserve are famous attractions of natural wealth in the vicinity. Serving as the gateway to Himachal Pradesh, Paonta Sahib holds a lot of potential for sustainably tapping ecotourism in the area. Eco-spiritual tourism can also be tapped with various spiritual centres located in and around the town.



Camping sites, nature parks, nature trails, nature interpretation centres are all various facets of ecotourism that can be tapped in the Division. In 2017-18, the Division's first Eco-Park was opened in Rampurbeli area of Paonta Sahib Range with nature trails, landscaping, nature-awareness boards spread across. The park has been gaining traction among youngsters of the town.



### **Eco-restoration case of Yamuna Van Van Vihar – Dumping yard to green zone**

In 2022, Yamuna Van Vihar along the banks of Yamuna, close to Paonta Sahib Gurudwara, was opened to public. The creation was the brainchild of then DFO, Kunal Angrish, who with the team of foresters of Paonta Sahib Forest Division and involvement of all stakeholders converted a dumping yard to a public park. The piece of land under the possession of forest department was lying vacant for 33 years owing to long-running ownership issues and consequent court cases. The land was not only getting increasingly used for dumping of all kinds but was becoming a favored haunt of rogues and miscreants who were suspected of using the place for drug abuse. However, in 2021, department decided to push the status quo. Multiple rounds of talks ensued and finally taking all the stake-holders on board, an understanding was reached where a part of land was cleared for development of a public park by the forest department. Funding mechanism was converged through funds from National Clean Air Programme and District Mineral Foundation Trust.

After clearing the land from all the dumped material accumulated over the years, the site was first of all closed for trespass by fencing through an interlink chain. This was followed by making trail and placing sitting benches, creatively made to look like log-benches, by local artists. Planting was done with various indigenous and flowering species. Swings and environment-consciousness signages were put to cater to the children & youth. Since the area was in vicinity of a mortuary, the same was hidden from the view by planting *Dendrocalamus strictus*. The civil society also took note of the effort and pitched in by providing an open gym. The work was completed within a year's time.

The park has become the cynosure of activities in Paonta Sahib town and is now frequently thronged by locals who throng it in the morning & evening and between the rounds of open gym and walks, taking in hues of sunrise and sunset by the banks of Yamuna. To make the park self-sustaining, revenue generation models are also underway through cafeteria serving local cuisine, ticketing etc. The park has been a win-win model of eco-restoration and sustainable ecotourism.



**Yamuna Van Vihar**



## 12.5 Ecotourism sites identified for future development in Paonta Sahib Forest Division



On the success model of Yamuna Van Vihar, riverside development along Yamuna Riverfront as part of eco-restoration of degraded areas is being undertaken, works for which began in 2022 with the initiation by then National Green Tribunal Chairman. Working on a similar model with convergence of schemes, the Riverfront will include walking trails, river-protection, green corridor planting of riverine species, canopy walks, landscape-zones, cycling space, recreation etc. Funding is proposed to be through convergence of schemes including Nagar Van Yojana, DMFT, NCAP, District funds, State Plan etc. A brief description of activities under this Riverfront and Green Corridor development is as follows.

Broadly, the activities fall under the 4 heads namely ecological, protection, recreational and supplementary.

### **a. Ecological:**

- i. Avenue plantation of groves: Groves will be developed of flagship species like Shisham, Papri, Khair, Kadam and ornamental ones like Bougainvillea, Willow, Golden shower, Jacaranda, fruiting species like Apricot, mulberry, pomegranate etc. Bamboo species and grassing including vetiver will be used. A combination of climbers, ornamentals and herbals will be used.
- ii. Themed forest patches/vatikas: Groves like in point i), alongwith beautiful indigenous grasses and hedges. Miniatures of arboretum/bambusetum, Arogya Van, Smriti Van, Sugandhit Van etc. will be developed inside closed fenced zones.

## **b. Protection**

- i. Barbed wire fencing with RCC Pole: Barbed wire fencing with RCC Pole would be erected along the river banks and surrounding plantation areas, along the trails.
- ii. Protection walls and measures: As the area is close to the river, it is essential to provide soil conservation and retaining wall structures as per site conditions in portions. Some already degraded areas due to mining shall be reclaimed in the form of river beach and soil conservation structures.

## **c. Recreational**

- i. Trail development: A beautiful network of trails is proposed to be developed with minimum impact on the surroundings. All the trails would be developed in such a way that these will pass through avenue plantations, grasslands or along riverfront. Raised paths, shoreline and selfie - points will be developed using these trails along The Yamuna River – catering to needs of young and old, women and men alike (With CCTV installations and lighting to ensure safety).
- ii. Gazebos/benches: As total area of the proposed Yamuna River Front complex is about 4 ha, development of forest/nature observance areas and proper resting points/viewpoints/gazebos/benches will be ensured.
- iii. Meditation points: For the youngsters and health-conscious adults, a part will be dedicated to yoga and meditation zones.
- iv. Yamuna River Front development: To be taken up as part of the Yamuna River Front development exercise like walking river-gazing, open gyms and beautiful site watching along the Yamuna River.
- v. Bird-watching trail along the walking track will be developed for visitors to enjoy the many avian species visiting the ecotone area of River Yamuna.

## **d. Supplementary**

- i. Entry gate/ticket counter-cum-kiosk/chowkidar quarter: At entry points, gates will be developed in local architectural style in an eco-friendly manner by local artisans with nature

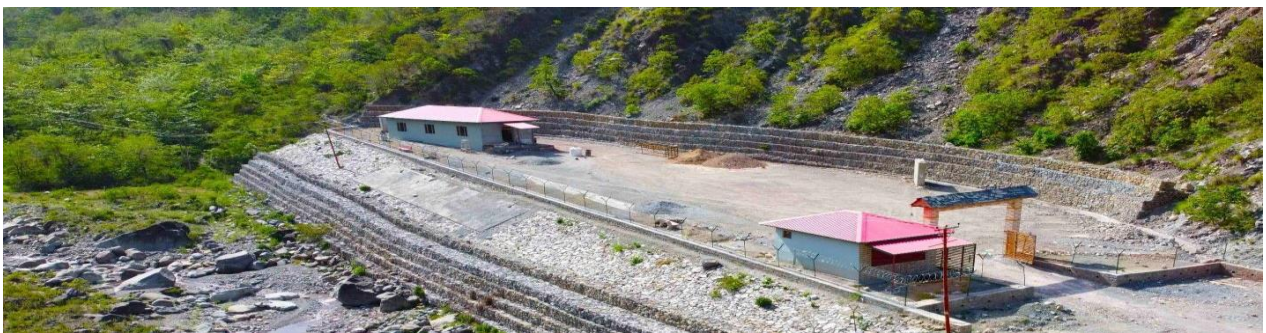
awareness themes. Also, a contiguous ticket counter-cum-souvenir shop and chowkidar quarter is proposed for the caretaker.

ii. Nature-specific landscaping showcasing local culture/nature themes: Focus will be on using local material, river stones, slates etc. to blend with the surroundings easily.

iii. Solar lighting/CCTVs: All along the trails to ensure safety of the visitors and keep any anti-social elements out of picture.

iv. Signages and nature-awareness inputs: Spread over 4 ha, the area will be well-equipped with signages, guidance maps/woodcrafts etc. to guide and educate the visitors. Driftwood will be utilized as part of up cycling.

Similarly, another project underway taking shape under the scheme ‘Nayi Rahein, Nayi Manzil’ as ‘**Sirmaur Van Vihar**’ in Chhacheti block of Paonta Sahib Range after slope-stabilization work was got carried out by Forest department near Sirmauri Taal village area, along Giri River. The place is proposed to be developed as a nature interpretation and recreational centre for locals and tourists. Owing to its vicinity to the village of Sirmauri Taal, the site is perfectly placed to be developed on the theme of showcasing the history culture and nature aspects of Sirmaur. The components to be developed at the site shall include a Interpretation Centre-cum-Museum showcasing the folk legends, history, culture, flora & fauna, ethano-botany and various aspects of the district. Adventure activities like zipline, ropeway as along with indigenous species-based grooves, landscaping are being planned alongside kiosk serving local cuisines. The development of the site will be an apt platform to showcase the Haati culture of Trans-Giri community. The inhabitants of the area have been demanding a schedule status from a long time. The development of the park showcasing the history and culture of the area may provide an endorsement to the pride and honor of the Trans-Giri community.





**12.6 Ecotourism sites identified for future development in Paonta Sahib Forest Division** The following eco-tourism sites have also been identified in Paonta Sahib Forest Division and hold potential to be sustainably managed in the future while people seek nature-getaways from the mundane pace of city-lives! They can be a part of a grand Paonta Sahib ecotourism circuit that can be explored by nature-enthusiasts as well as locals. Basic amenities in these areas to be included i.e seating, eco-friendly/pre-fabricated toilets, gazebos, fencing, protection etc. The brief description is as tabulated below.

| Sr. No. | Name of Site                                | Type (Trekking trail/camping site)                                                     | Range        | Beat            | GPS Coordinates                      | Elevation |
|---------|---------------------------------------------|----------------------------------------------------------------------------------------|--------------|-----------------|--------------------------------------|-----------|
| 1       | Dhoulidhang                                 | Camping                                                                                | Bhagani      | Rajpur          | 30°33'06.74"N<br>77°44'0.57"E        | 1350 m    |
| 2       | Bhadhana (Shirgul Temple)                   | Camping                                                                                | Bhagani      | Gojjar          | 30°29'37.04"N<br>77°35'46.10"E       | 400 m     |
| 3       | Kumbhigarh                                  | Camping                                                                                | Paonta Sahib | Gatu            | 30°32'41.70"N<br>77°34'10.02"E       | 1320 m    |
| 4       | FRH Khara                                   | Camping/Nature trail                                                                   | Paonta Sahib | Khara           | 30°29'37.04" N<br>77°35'46.10" E     | 400 m     |
| 5       | Gorakhpur to FRH Khara                      | Walking/trekking Trail                                                                 | Paonta Sahib | Kukron to Khara | 30°29'37.04" N<br>77°35'46.10" E     | 400 m     |
| 6       | Rajpur to Dhoulidhang                       | Walking/trekking Trail                                                                 | Bhagani      | Rajpur          | 30°33'06.74" N<br>77°44'0.57" E      | 1350 m    |
| 7       | Shirgul temple to Bhadhana                  | Walking/trekking Trail                                                                 | Bhagani      | Gojjar          | 30°29'37.04" N<br>77°35'46.10" E     | 400 m     |
| 8       | Gatu to Kando via Kumbhigarh Shirgul Temple | Walking/trekking Trail                                                                 | Paonta Sahib | Gatu            | 30°32'41.70" N<br>77°34'10.02" E     | 1320 m    |
| 9       | Bata bridge to Kundion                      | Walking/trekking Birding Trail/                                                        | Paonta Sahib | Rampurbeli      | 30°27'09.8" N<br>77°35'0.18" E       | 400 m     |
| 10      | Beas Mandir Area                            | Vatika/ Walking Trail                                                                  | Giri Nagar   | Beas            | 30°30'33" N<br>77°33'13" E           | 973 m     |
| 11      | Jamotwa (Arogra Van)                        | Birding trail, Medicinal (Arogya Van), walking trail, Spring Development, camping etc. | Paonta Sahib | Jamotwa         | 30°28'53.92" N<br>77°37'19.20" E     | 455 m     |
| 12      | Mantaruwala                                 | Nature trail, birding trail, Medicinal trail                                           | Paonta Sahib | Gondpur         | 30°27'19.43" N<br>77°36'34.79" E     | 445 m     |
| 13      | Sirmour Park                                | Nature Trail, Camping etc.                                                             | Paonta Sahib | Rajban          | 30° 32' 24.63" N<br>77° 39' 18.80" E | 623m      |

**Rest houses & Inspection Huts:** There is immediate need for major repair of the existing Rest Houses at Majra, Khara (Paonta Sahib), Bhagani and Inspection Hut at Rajpura (Bhagani). There is also scope for constructing inspection huts/view points at Bharog-Baneri and Kando-Baila (Girinagar) and Konchbeli (in Majra which falls at the border of 4 states namely Himachal, Haryana, Uttarakhand and Uttar Pradesh).

## 12.7 Administration of ecotourism sites

Since the ecotourism assets fall in the reserve forest area of Paonta Sahib Forest Division, the execution of the project as well as the subsequent administrative command shall rest with the forest department. The same shall be in consonance with the prescriptions of the Forest Conservation Act, 1980 and rules thereof. The governance of the site can be done in the society mode at the level of Conservator of Forests, Nahan Forest Circle. A pre-existing Eco-tourism Society at the level of Forest circle Nahan has the participation of the Divisional Forest Officers, representative of District Tourism Development Officer, district administration as well as civil society. The same may be inculcated with participation of representatives from local gram panchayat(s). The executive body of the site headed by the concerned Divisional Forest Officer (DFO) shall be responsible for day to day running as well as planning on the sites.

The forthcoming plans as well as annual site-running report (including cash-book maintenance, administrative actions etc.) of the shall be tabled for the ratification of the governing body. After the initial establishment capital, the long-term running of the site shall be done in society mode itself whereby the recurring cost to maintain the sites as well the wages of the personnel engaged at the sites shall be managed from the proceeds of the entry ticket and other chargeable (refreshment/adventure/stay activities) entities specific to the sites. Focus will be on engaging local people for livelihood generation as also envisaged in *Guidelines on Sustainable Eco-Tourism in Forest and Wildlife Areas, 2021*. The sites (or a part) may also be supported through Corporate Social Responsibility of the industrial and mining units in Paonta Sahib. All the points will add upto making the ecotourism sites self-sustaining in nature, as also develop an ecotourism circuit for Paonta Sahib that can be relished by both locals and tourists alike.

**Leveraging the Branding and Marketing Potential:** Many of the rest houses (for example the rest house at Khara) and ecotourism sites are not only located in pristine natural settings but also have a unique place in the forestry-history of country and are thus rich repositories of ‘mixed’ heritage. This provides a very fertile ground to suitably brand and market them. Branding and Marketing via robust online presence (on social media), documentation via coffee-table books and video-documentaries, attractive signages, roping in cultural ambassadors/influencers etc. will also open channels for tapping CSR streams which will in turn help to improve and maintain the infrastructure at these sites and also deepen the people-forests/people-nature connect to have an overall beneficial impact on conservation.

## CHAPTER 13

### GENERAL FINANCIAL FORECAST & FINANCIAL PLAN OF OPERATION

**13.1 General:** The costs and prices are influenced by market forces and depend on supply and demand. It further depends on the principles of management and pattern of exploitation adopted from time to time. Therefore, it is not possible to estimate with reasonable accuracy the expenditure and revenue during the period of this working plan. The estimates given below are based on the current prices of various items of forest produce and the cost involved in carrying out the prescriptions of the plan at current rates.

**13.2 Past Revenue and Expenditure:** The details of past revenue and expenditure have been given in the following table 13.1.

**Table 13.1: Past revenue & expenditure from 2013-14 to 2022-23 in Paonta Sahib Forest Division**

| Year             | Revenue (Rs.)   | Expenditure      | Deficit (Rs.)    |
|------------------|-----------------|------------------|------------------|
| 2013-14          | 2360521         | 75080120         | 72719599         |
| 2014-15          | 2635777         | 67119621         | 64483844         |
| 2015-16          | 1811001         | 62582667         | 60771666         |
| 2016-17          | 936671          | 78971221         | 78034550         |
| 2017-18          | 862193          | 89868457         | 89006264         |
| 2018-19          | 6156893         | 93337875         | 87180982         |
| 2019-20          | 1622089         | 100918200        | 99296111         |
| 2020-21          | 2212873         | 119108064        | 116895191        |
| 2021-22          | 3795596         | 110574123        | 106778527        |
| 2022-23          | 57190406        | 133178402        | 75987996         |
| <b>Gr. Total</b> | <b>79584020</b> | <b>930738750</b> | <b>851154730</b> |

\*\*\*\*The revenue amounting to **Rs. 33,83,70,177/-** has been recovered and deposited in account of HOD, HP Forest Dept. from HPSFDC on account of royalty of timber of salvage trees during last 10 years under the revenue head ‘101-02- other forest produce removed from forest by consumer & purchasers other than HPSFC’.

**13.2: Projected Revenue details for 2023-24 (excluding Working circles prescriptions): -**

| Sr. No. | Sources of revenue | Revenue projected for 2023-24 (Rs.) |
|---------|--------------------|-------------------------------------|
|---------|--------------------|-------------------------------------|

|    |                                                                                            |                    |
|----|--------------------------------------------------------------------------------------------|--------------------|
| 1  | 101-01-Timber and other produce removed from forest by the Govt. agency.                   | 10000              |
| 2  | 101-02- Other forest produce removed from forest by consumer & purchasers other than HPSFC | 28000              |
| 3  | 101-04-Other Forest Produce removed from Forests by Govt Contractors.                      | 30000              |
| 4  | 101-07-Receipt from Grazing and Grass.                                                     | 25000              |
| 5  | 102-01- Receipt from registration fees                                                     | 1000               |
| 6  | 102-02- Receipt from societies                                                             | 5000               |
| 7  | 800-01- Receipt from penalty damage bill other than HPSFC                                  | 70000              |
| 8  | 800-02-Receipt from sale of tree to Right Holder                                           | 35000              |
| 9  | 800-03-Comp U/s 68 of IFA,1927                                                             | 4100000            |
| 10 | 800-04-Receipt from rent of Govt. building Treasury/Deptt.                                 | 130000             |
| 11 | 800-05-Receipt from Registration fee                                                       | 60000              |
| 12 | 800-07-Receipt from Passing of Timber                                                      | 2000               |
| 13 | 800-09-Receipt from export permit fee                                                      | 2000               |
| 14 | 800-10- Receipt from seized timber                                                         | 200000             |
| 15 | 800-12-Receipt from other deptt/organization for CA plantation                             | 1200000            |
| 16 | 800-16-Receipt from penalties/damage bills from Forest Corporation.                        | 20000              |
| 17 | 800-17-Receipt from distribution of seedlings                                              | 70000              |
| 18 | 800-18-Other misc. receipts treasury/Deptt.                                                | 200000             |
|    | <b>Total:-</b>                                                                             | <b>Rs. 6188000</b> |

\*The approximate amount of timber royalty from Salvage trees is estimated at **Rs. 1,30,00,000/-**. This will be generated as revenue under revenue head '101-02- other forest

produce removed from forest by consumer & purchasers other than HPSFC' and shall be deposited in the account of HOD, HP Forest Department.

**13.3:** In this Working Plan there is harvesting prescription for Sal, Khair & Eucalyptus working circles.

**Table 13.3: Annual Revenue & Expenditure anticipated for FY 2023-24 for Working Circles**

| Working circle | Revenue (Rs.)         | Expenditure (Rs.)  | PROFIT (Rs.)          |
|----------------|-----------------------|--------------------|-----------------------|
| Sal working    | 1,07,75,26,100        | 15000000           | 1,06,25,26,100        |
| Khair          | 40,00,000             | 6,00,000           | 34,00,000             |
| Eucalyptus     | 35162750              | 15,00,000          | 3,36,62,750           |
| <b>Total</b>   | <b>1,11,66,88,850</b> | <b>1,71,00,000</b> | <b>1,09,95,88,850</b> |

**Expenditure details** include – Material & Supply (Barbed wire fencing, Paint), Manpower (Wages as per scheduled rates of Rs. 400 per day), Vehicle for works, SMC measures, Research & Miscellaneous.

**Revenue details:** Basis prescribed yield and auction thereof by HP Forest Corporation (Sal: Assuming Rs. 49,867/- market rate per cubic m for timber and 80% conversion excluding fuelwood, Khair: Assuming Rs. 1,39,145/- market rate per cubic m for timber and 70% conversion excluding fuelwood; Eucalyptus: Assuming Rs. 21612/- market rate per cubic m for timber and 90% conversion excluding fuelwood).

#### **13.4 Other Future Expenditure:**

Average expenditure basis APO projected for 2023-24.

**Table 13.4 Estimated expenditure**

| Item                            | Qty   | Rate (in Rs.) | Estimated expenditure projected for 2023-24 (Rs.) |
|---------------------------------|-------|---------------|---------------------------------------------------|
| <b>JFMC/Ecotourism</b>          |       |               |                                                   |
| Raising Plantation/Regeneration | 15 ha | 42500/-       | 637500.00                                         |
| Maintenance of plantation       | 45 ha | 3,200/-       | 144000.00                                         |

|                                                                           |                     |              |                            |
|---------------------------------------------------------------------------|---------------------|--------------|----------------------------|
| Lantana eradication                                                       | 45 ha               | 25500/-      | 1147500.00                 |
| JFMC Training                                                             | 2 no.               | 15000        | 30000.00                   |
| Promotion of ecotourism                                                   | 1                   | 5000000      | 5000000.00                 |
| <b>Plantation and regeneration</b>                                        |                     |              |                            |
| Plantation and regeneration                                               | 26.5 ha             | 99225/-      | 2629450.00                 |
| Maintenance of plantation                                                 | 550 ha              | 3900/-       | 2145000.00                 |
| Cost for maintenance of Nurseries                                         | 3 no.               | 14,00,000.00 | 4200000.00                 |
| <b>Forest Protection Working Circle</b>                                   |                     |              |                            |
| Cost for implementing the protection plan                                 |                     |              |                            |
| Roads and Bridges                                                         | 3                   | 17,00,000.00 | 5100000.00                 |
| Intensive protection measures including patrolling, staff mobilizing etc. | 4                   | 50000        | 200000.00                  |
| Maintenance of Boundary Pillars (large)                                   | 227                 | 6048         | 1372896.00                 |
| Soil & Water Conservation & other Engineering measures                    | L/S                 | L/S          | 2500000.00                 |
| <b>Wildlife &amp; Biodiversity Conservation WC</b>                        |                     |              |                            |
| Establishment of anti-wildlife depredation unit & patrolling vehicle      | 1                   |              | 494000.00                  |
| Elephant proof trenches                                                   | 2685 m <sup>3</sup> | 167.55/-     | 450000.00                  |
| Safe elephant corridors 4 nos.                                            | 4                   | 10000000     | 4450000.00                 |
| Sterilization of Monkeys                                                  | 500                 | 700          | 350000.00                  |
| 160 nos. wildlife awareness camps                                         |                     |              |                            |
| Construction of Camps, Watch Tower                                        | 1                   | 200000       | 200000.00                  |
| Construction & maintenance of Road                                        | 1                   | 200000       | 200000.00                  |
| Eco tourism activities                                                    | 1                   | 5000000      | 5000000.00                 |
| Scientific Studies, Monitoring                                            |                     |              |                            |
| Patrolling, monitoring etc.                                               | 4x2                 | 50,000/-     | 300000.00                  |
| Training of staff including exposure visit                                |                     |              | 10,00,000.00               |
| <b>Total estimated expenditure:</b>                                       |                     |              | <b>Rs.159,10,53,450.00</b> |

**Table 13.5 Salary Expenditure:**

| Rank        | Scale        | Average Pay | D.A.<br>(34%) | C.A. | No.        | Total annual Amount<br>(Rs.)                    |
|-------------|--------------|-------------|---------------|------|------------|-------------------------------------------------|
| DFO         | 67700-208700 | 71800       | 24412         | 200  | 1          | 1156944                                         |
| ACF         | 56100-165000 | 56100       | 19074         | 200  | 1          | 904488                                          |
| Supdt-II    | 43000-136000 | 52900       | 17986         | 200  | 1          | 853032                                          |
| FRO         | 38500-122700 | 66400       | 22576         | 210  | 5          | 5351160                                         |
| Sr. Asstt   | 43000-136000 | 48800       | 16592         | 200  | 3          | 2361312                                         |
| Jr.Asstt    | 28900-91600  | 31200       | 10608         | 200  | 6          | 3024576                                         |
| DR          | 38100-120400 | 44800       | 15232         | 212  | 21         | 15181488                                        |
| Fgd         | 21300-67700  | 33100       | 11190         | 213  | 70         | 37382520                                        |
| Peon        | 18400-58500  | 26000       | 9100          | 208  | 12         | 5084352                                         |
| FW          | 18400-58500  | 31400       | 10676         | 213  | 62         | 31463016                                        |
| Chowkidar   | 18400-58500  | 31400       | 10676         | 213  | 15         | 7612020                                         |
| Mali        | 18400-58500  | 26200       | 8908          | 213  | 12         | 5086224                                         |
| Dak Runner  | 18000-56900  | 19100       | 6494          | 200  | 2          | 619056                                          |
| Multi-cum-W | 18000-56900  | 19100       | 6494          | 200  | 1          | 309528                                          |
| Sweeper     | 18000-56900  | 19100       | 6494          | 200  | 2          | 619056                                          |
| Driver      | 21300-67700  | 30500       | 10370         | 200  | 1          | 492840                                          |
| Kanungo     | 43000-136000 | 48800       | 16592         | 200  | 1          | 787104                                          |
|             |              |             |               |      | <b>216</b> | <b>118288716</b><br><b>Or say Rs 1.19 Crore</b> |

**Table 13.6: TA:** - The expenditure is worked out on the basis of daily allowance and number of days an officer/official is expected to tour to discharge his duties. This is tabulated as under:

| Official             | Average Pay | Rate of Daily Allowance | No. of days in year | No. of Posts (sanction) | Amount Required/annum (Rs.) |
|----------------------|-------------|-------------------------|---------------------|-------------------------|-----------------------------|
| DFO                  | 71800       | 200                     | 180                 | 1                       | 36000                       |
| ACF                  | 56100       | 200                     | 120                 | 1                       | 24000                       |
| Superintendent-II    | 52900       | 160                     | 60                  | 1                       | 8000                        |
| Forest Range Officer | 66400       | 160                     | 100                 | 5                       | 80000                       |
| Sr. Asstt            | 48800       | 160                     | 60                  | 3                       | 28800                       |

|                      |       |     |              |            |                |
|----------------------|-------|-----|--------------|------------|----------------|
| Jr. Asstt            | 31200 | 140 | 60           | 6          | 50400          |
| Deputy Ranger        | 44800 | 160 | 100          | 21         | 336000         |
| Forest Guard         | 33100 | 140 | 30           | 70         | 294000         |
| Peon                 | 26000 | 130 | 80           | 12         | 124800         |
| FW                   | 31400 | 130 | 20           | 62         | 161200         |
| Chowkidar            | 31400 | 130 | 20           | 15         | 39000          |
| Mali                 | 26200 | 130 | 10           | 12         | 15600          |
| Dak Runner           | 19100 | 130 | 100          | 2          | 26000          |
| Multi-Purpose Worker | 19100 | 130 | 80           | 1          | 10400          |
| Sweeper              | 19100 | 130 | 10           | 2          | 2600           |
| Driver               | 30500 | 130 | 300          | 1          | 39000          |
| Kanungo              | 48800 | 160 | 200          | 1          | 32000          |
|                      |       |     | <b>Total</b> | <b>216</b> | <b>1307800</b> |

- ii. **Table 13.7 Medical, Uniform and Liveries:** - The expenditure on medical, uniform and liveries can best be worked out on the basis of last three years experiences as tabulated below: -

| Item    |                |                |                | Total (Rs.) | Average (Rs.) |
|---------|----------------|----------------|----------------|-------------|---------------|
|         | <b>2020-21</b> | <b>2021-22</b> | <b>2022-23</b> |             |               |
| Salary  | 81251139       | 80525546       | 99385363       | 261162048   | 8705403       |
| Medical | 166246         | 643435         | 514722         | 1324403     | 441468        |
| Livery  | 90000          | 150000         | 100000         | 340000      | 113333        |
| Uniform | 0              | 0              | 199686         | 199686      | 66562         |

**13.8: Cost of the Preparation of the Working Plan:** The actual expenditure incurred on the preparation of this Working Plan during 2020-21 to 2022-2023 is given in table 13.5.1

**Table 13.8.1: Showing the cost of preparation of the working plan**

| Details                                                                                                                                                                                                     | Expenditure incurred during financial year in Rs. |         |         |         |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|---------|---------|---------|--------|
|                                                                                                                                                                                                             |                                                   | 2021-22 | 2022-23 | 2023-24 | Total  |
| Other expenditure (Field data collection from sample points, plantation survey, boundary survey, socioeconomic survey, encroachment survey for the forest areas of 2000 ha and travel cost of forest staff) | -                                                 | 200000  | 310500  |         | 510500 |



|                                                                                                                                                                              |   |        |        |        |        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------|--------|--------|--------|
| <b>ONGOING:</b> Miscellaneous expenses for printing, stationary, binding, pending liability of vehicle used for final ground-truthing in silviculture areas for Working Plan |   |        |        | 400000 | 400000 |
| <b>Total</b>                                                                                                                                                                 | - | 200000 | 310500 | 400000 | 910500 |

**13.9 Possible Funding Agencies:** Normally the forestry activities are funded through various schemes under District, State & Central sector. In the state, the district & state sector schemes include:

**Table 13.10 showing the funding sources**

| Sn<br>o | Funding Agency                                        | Schemes involved                | Nature of works                                                                                                                                                                                                 |
|---------|-------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.      | Ministry of Forest & Environment, Government of India | Campa (NPV, CA) Schemes         | Miscellaneous (Plantation, Soil Conservation work, Wild life conservation, Raising of nursery, Lantana Eradication, infrastructure work in Forest area, development of degraded forest area, Biodiversity etc.) |
| 2       | Ministry of Forest & Environment, Government of India | CSS Scheme                      | a) Forest Fire Control and Management Scheme.<br>b) Human conflict with elephant project.                                                                                                                       |
| 3       | Government of Himachal Pradesh                        | Samudayik Van Samvardhan Yojana | Community based forestry works (Plantation, Soil Conservation work, lantana eradication etc.) in forest area.                                                                                                   |
| 4       | Government of Himachal Pradesh                        | Ek Buta Beti ke name Scheme     | Distribution of 5 plants with Kit to each newly born girl-child                                                                                                                                                 |
| 5       | Forest Department, Himachal Pradesh.                  | Forestry developmental work     | Buildings, Roads, Silvicultural operations, marking, etc.                                                                                                                                                       |
| 6.      | HP Tourism Department                                 | Nayi Rahein Nayi Manzilein      | Sirmaur Van Vihar creation                                                                                                                                                                                      |
| 7.      | HP Pollution Control Board                            | National Clean Air Programme    | Yamuna Van Vihar, Yamuna Riverfront (ongoing)                                                                                                                                                                   |

**13.10 Prioritization of works:** All the works prescribed in this plan are important for effective forest management. Hence, funds should be made available to carry out all the prescriptions prescribed for the sustainable management of the forest. However, scarcity of financial allocation is often felt while working plan prescriptions are followed in the division. Therefore, priority of works has been fixed to guide DFO while preparing annual budget & sending his demand. It is also suggested that DFO should carry out top priority works with the available budget:

**Table 13.12: Table showing the priority of works**

| <b>Priority</b> | <b>Nature of works to be carried out</b>                                                        |
|-----------------|-------------------------------------------------------------------------------------------------|
| <b>I</b>        | Forest Protection i.e. protection from forest fire, encroachment, illicit felling, etc.         |
| <b>II</b>       | Wildlife conflict management and under Project Elephant                                         |
| <b>III</b>      | Plantation and regeneration                                                                     |
| <b>IV</b>       | Silviculture operations                                                                         |
| <b>V</b>        | Soil & Water Conservation works                                                                 |
| <b>VI</b>       | Construction and Maintenance of buildings & other infrastructure (Nursery etc.) in the Division |
| <b>VII</b>      | Strengthening the knowledge of field staff by imparting training & exposure visits              |
| <b>VIII</b>     | Community based schemes, Samudayik Van Samvardhan Yojana etc.                                   |
| <b>IX</b>       | Development and green corridor of degraded forest area under Forest Department                  |

## CHAPTER 14

### MISCELLANEOUS REGULATIONS

#### 14.1 Petty felling

Felling of petty nature as detailed below may be carried out after the sanction of competent authority: -

. Trees to be removed as salvage only the completely dead / dry and uprooted trees can be classified as salvage trees All removals will be entered in controlled forms and will count towards the yield.

a. Trees required to meet the bonafide timber requirements of the local people in accordance with the provisions of Faisla -e-Janglat or trees granted in special cases as free grants by the competent authority.

b. Trees coming on road, transmission and canal alignments or any other development work or in ropeway spans including petty needs of contractors and persons employed/ residing in the forests. This should be done keeping in view the restrictions/provisions of Forest Conservation Act, 1980 & Forest Rights Act, 2006.

c. Trees required for departmental use and for supply to Other departments including trees to be given at Market rates. These fellings should be as minimum as possible and strictly according to the Silvicultural principles and as per instructions on the subject at the time of such fellings.

d. Green trees required for research and allied purposes like growth and yield data. All such fellings will count towards' the yield.

**14.2 Deviation:** All operations including plantations and fellings not covered by the provisions of the plan will constitute a deviation. Sanction for all deviations from the prescriptions of the plan shall be obtained from the Pr.CCF or the competent authority well in advance.

Any large and unusual operation, variation from yield and target for plantation/regeneration and other activities provided in control forms of the working plan constitutes a deviation. Deviation beyond 25 percent of target is considered to constitute a major deviation. All deviations, which permanently alter the basis of management laid down in a working plan, will require prior sanction of the PCCF. All deviations, which do not permanently alter the basis of management

and with the necessity of which he agrees, may be approved and sanctioned by the APCCF, Working Plan on behalf of the PCCF. Where there is difference of opinion between APCCF Working Plan and the territorial Conservator of Forests, the former will refer them to the PCCF for instructions. The PCCF, as the case may be, will counter sign the deviation statement. Minor deviations can be sanctioned at the level of CCF or PCCF as the case may be, but the PCCF before sanctioning the major deviations of following nature, will necessarily take prior approval of the Ministry of Environment and Forests:

- (i) Change in Silvicultural system
- (ii) Clear felling of natural forest
- (iii) Formation of new felling series; and
- (iv) Large scale felling due to natural calamities

### **14.3 Grazing, Lopping and Grazing Paraos**

Grazing lopping concessions as provided in the *Faisla-e-Janglat* are to be enjoyed by the villagers to the extent 'that their exercise does not further deteriorate the forests. However, the situation is entirely different in the field. There is practically no control over grazing, lopping. Excessive damage is being caused to the forest by unrestricted grazing and lopping by local people, gujars and nomadic grazers. Even Sal trees, which are not prescribed for lopping are being badly lopped. This has to be checked at all cost. As per the guidelines issued in 1971, no new paraos should be allowed to Gujjars and Gaddies and the number of grazing animals has been fixed to the limit in 1971. However, this rule has not been followed in the past. New paraos have been allowed in the name of temporary paraos. This is causing severe damage to the forests and there is continuous degradation and loss of forest cover. Therefore, guidelines given in Forest Protection (overlapping) Working circle to be ensured in context of grazing in the Division.

### **14.4 Road and Paths:**

The existing P.W.D and forest road/paths reaches most of the forest areas. However, it has been observed that the forest roads and paths have been badly neglected in the past. No attention has been paid to repair them and their condition has worsened. Rajban-Khara-Mehrar road, Jalmusa-Gullarwala road, need repair every year. Besides these all the bridle paths and inspection paths should be maintained every year depending upon availability depending upon the availability of funds. No new road is proposed to be constructed during this plan.

### **14.5 Buildings:**

A list of the existing buildings, both residential and office, and the rest houses is given in **Appendix VI**. There are several beats, and blocks in Paonta Sahib Forest Division, where the Guard hut or the B.O quarter does not exist. They have to be constructed in a phased manner. Special attention has to be given for site selection. In the past, many guard huts have been constructed in remote areas, far away from the habitation and even basic facilities like water supply and electricity connections could not be provided there. This has caused problems to the staff. In turn, such building remains unoccupied and abandoned and within few years become dilapidated. This has to be avoided. Site selection should be done keeping in view above facts, so that the building is well located. Many also urgently need repairs. Besides, the staff quarters at Paonta Sahib and residence for field staff, Check Post buildings should be constructed to house the staff Posted at various check posts including CCTV provisioning and washroom facilities.

#### **14.6 Settlement:**

The Government of Himachal Pradesh notification Fts (F/3-13) 83 loose dated 1987 constituted a State Level Committee to see and consider some issues relating to Forest Settlement Operation and submit its report to them.

The salient features of committee's recommendations as they apply to Paonta Sahib Division:

“3.4 – It is abundantly clear that variations in area figures need reconciliation in the department records. At the same time, it is essential that area shown under forest by Revenue Department and Forest Department should tally particularly in respect of reserved forests in demarcated forests.”

“5.2 Reserve Forests:- These forests are required to be entered in revenue record wherever in district where measurement are required to be carried out for these forests , necessary steps will help to be taken hereafter , when settlement operations are taken up hereafter . “

“5.4 Undemarcated Protected Forests :- The remaining forests under undemarcated forests are required to be surveyed , measured and demarcated after following the procedure prescribed in the Himachal Pradesh Forests ( Settlement Rules ) , 1965 and the Himachal Pradesh Forests (Settlement ) First Amendment Rules 1975 .”

“5.5- Other Categories of Forests :- The other categories of forest presently being reported are as under:

- I. Strips forest along road

- II. Un-classed forests
- III. areas under section 38 of the Indian Forests act
- IV. Forests managed under Land Preservation Act
- V. Forests notified under H.P. Private Forests Act.
- VI. Cantonment forests.
- VII. other forests.
- VIII. Forests areas vested in Government under the Himachal Pradesh Village Common Lands Vesting Utilization act, 1974 and Himachal Pradesh Ceiling and Land Holding act 1982.

#### **14.9 Nautors and Encroachments:**

Nautors were granted freely in late seventies and very early eighties. However, no nautor has been sanctioned in the recent past. However, the encroachments have increased manifold. Weak enforcement of law, delay in settling the Cases detected, no provision of Forest Kanungo to verify land status have all compounded the problem. There has been growing tendency to encroach forest land. This has to be checked efficiently and effectively.

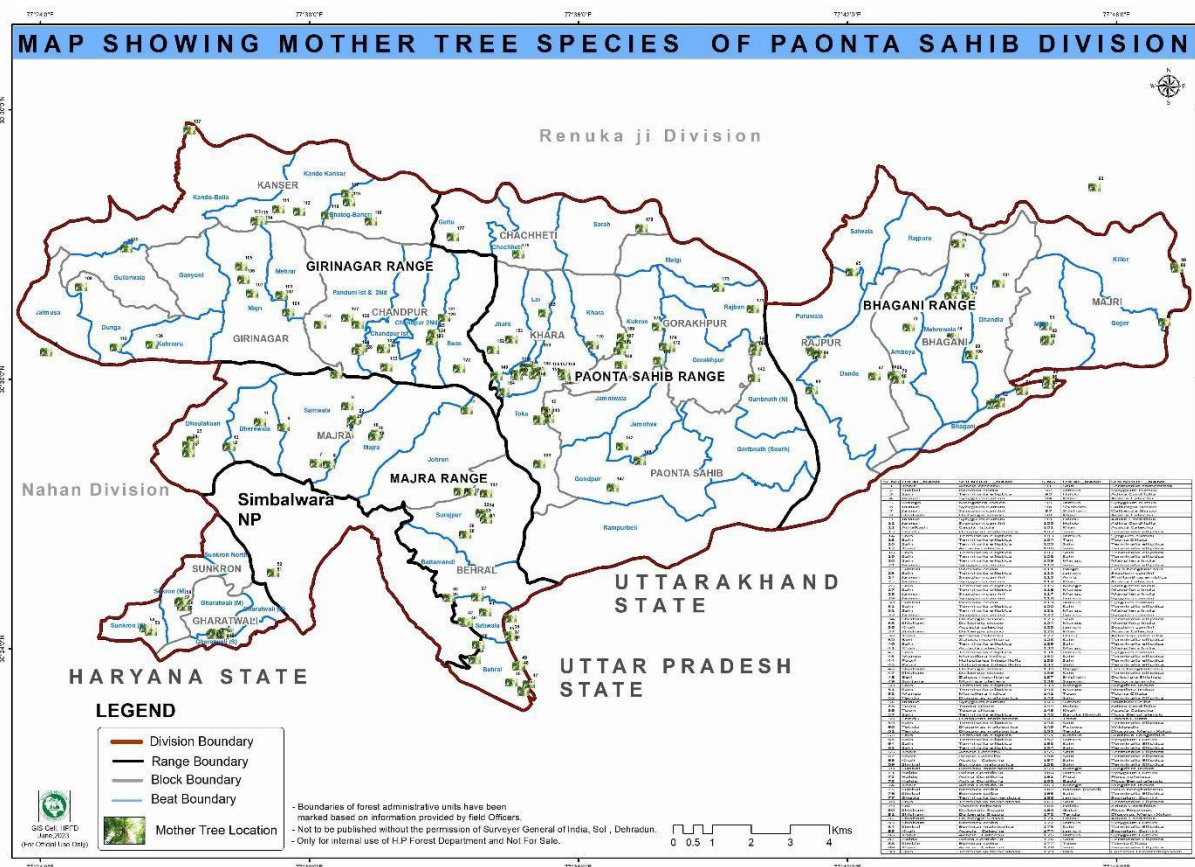
**14.8 Planting Plants of Religious, Medicinal, Food and Aesthetic:** These aspects are intimately connected with our lives but, adequate attention is not being paid them. Even the propagation techniques of many of them are yet to be standardised. **Nursery techniques for some of the relevant species have been given in Appendix XIII**

**14.9 Shooting and Fishing:** Shooting and hunting are not allowed in the area. Fishing permits are issued as per the regulations. The ban on hunting should continue for another couple of years. Strict vigil should be kept to avoid any illegal hunting and shooting.

**14.10 Temperature and Rainfall Statistics:** there is one rain gauge at Dhaula-kuan. Efforts should be done to get complete/correct rainfall data to be maintained by Forest Department. Effective maintenance of rain gauges is required.

**14.11 Mother Trees:** Plus, trees have been identified in the Division (with GPS coordinates) for nursery raising purpose as depicted below. Proper record of such trees should be updated in future as well.

# Map No. 14.11



## CHAPTER 15

### SCIENCE & RESEARCH

#### 15.1 Regeneration Plots

##### Observations and analysis for regeneration in Experimental Silviculture areas

The regeneration survey results of the experimental Silvicultural Felling Program (conducted in Paonta Sahib Range from 2018-19 to 2019-20) in the Sal forests in RF Kukron, RF Rajban and RF Lai of Paonta Sahib Forest range have been conducted since 2019 annually.

The compartments were found to have regeneration, albeit the same was in very early stage. A number of young saplings in two-leaved, four-leaved and six-leaved stage were seen. The data of regeneration survey undertaken in October of every year suggests that the regeneration score is following a slow but steady trend. It is seen that the regeneration percentage is more in the felled PB-1 area of Rajban than Kukron. In order to assist natural regeneration, fencing of the forests after silviculture fellings have been done and bush cutting of *Ardisia solanacea* in Sal forests is done on a yearly basis.

| Forest (PB I areas)        | Regeneration Percentage |                    |                    |                    |                    |
|----------------------------|-------------------------|--------------------|--------------------|--------------------|--------------------|
|                            | October<br>2019-20      | October<br>2020-21 | October<br>2021-22 | October<br>2022-23 | October<br>2023-24 |
| RF Kukron C14<br>(20 Ha)   | 17.6 %                  | 23.8 %             | 19.56 %            | 18.85%             | Ongoing            |
| RF Rajban* C10<br>(7.5 Ha) | 20.9 %                  | 28.5 %             | 24.7 %             | 29.3%              | 31.75%             |

Also, as a comparative study, regeneration survey was also carried out in adjacent compartment of RF Rajban C10 (with regeneration 29.3% in Oct 2022-23). In RF Rajban C9 (PB-I area), where silviculture operations were not carried out, regeneration survey was done using the same methodology of Line plot. The regeneration status owing to denser canopy and no cultural operations leading to heavy weed infestation for RF Rajban C9 was observed at only 13.71%. One can derive that the regeneration of Sal in silviculture areas has more than doubled, in line with expected results.



Due regard must be given to the phenomenon of dying back of Sal seedlings and the slow growth that the Sal saplings are known to have as a result of the dying back. The dying back phenomenon (as described by Troup in his seminal book ‘The Silviculture of Indian Trees’) involves dying of the stem and new shoots coming up in the following season. The new shoots may come from buds in the axils of the cotyledons or the axillary buds on the stem. Dying back with subsequent recovery takes place when the taproot has developed with sufficient vigour to withstand the adverse influences that may cause the death of the aerial portion of the root. The time-period between seedling to sapling stage (where the plants begin to produce rough bark) in natural conditions is long and variable and has been described to take at least ten years or more in many cases in North-western India. With this time-frame in context, any deduction on the establishment of seedlings at present shall be far-fetched. The Working Plan of the division also recommends carrying out regeneration survey for at least 12 years post felling. On these lines, it can only be recommended that the regeneration surveys are repeated till the twelfth year after felling and the results be analysed continuously.

### **Reasons for deficient natural regeneration in Sal forest under Experimental Silviculture Felling**

The seeding felling has been undertaken in years 2018 and 2019, the same has not been followed up by further opening of canopy, something which is being observed to be genuinely required presently in the experimental silviculture plots. The primary reasons include dense canopy owing to no secondary felling operations, delay in bush cutting of *Ardisia* and weeding operations, the die-back phenomenon and slow growing rate in Sal as discussed, and the last good seed year for Sal was in 2019-20, typically 3-5 years for Sal.

**Regeneration Survey Methodology** followed during Experimental Silviculture program as approved by Hon’ble Supreme Court in IA No. 3840 of 2014 in Writ Petition (Civil) no. 202 of 1995:

Natural regeneration (seed origin) method:

- Line plot system of cruising was followed
- The regeneration survey was carried out on the cruise lines
- The cruise lines followed should be recorded in the GPS

### **Natural Regeneration (seed origin) Methodology**

The cruise lines should be at least be 20 m apart, equally spaced and cover the entire compartment area

- On each of these cruise lines, 10 square plots of 2 m × 2 m size was laid out
- 5 plots on the left-hand side and the other 5 plots on the right hand -side
- A gap of at least 5 m will be maintained between the two sample -plots
- The sample plot must be perpendicular to the cruise lines
- No sample plot should lie on Nalas, fire-lines, forest roads etc.

#### Sampling Intensity and Number of Regeneration Plots

| Compartment Area<br>(Ha.) | No. of regeneration plots per Hectare<br>(Ha.) |
|---------------------------|------------------------------------------------|
| 0-10                      | 5                                              |
| 11-50                     | 3                                              |
| >50                       | 2                                              |

#### EVALUATION OF DATA

| Score | Category of Regeneration                                                            | Remarks                                                                                                      |
|-------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| 5     | Woody shoots of establishment height (2.5m and above) having d.b.h. of 10cm or less | At least one such plant is present in regeneration plot                                                      |
| 1.5   | Seedlings up to 2.5m                                                                | In the absence of above category, one or more plants of height less than 2.5m and are more than one year old |
| 0.1   | Current years seedlings or recruitment. Two-leaved                                  | Fresh seedlings that have erupted after last monsoon.                                                        |
| 0     | Blank                                                                               | All categories of regeneration are absent                                                                    |

**Regeneration status of the compartment-** The Regeneration score of all the plots will be summed up and the regeneration status will be determined as per the following formula:

$$\text{Natural Regeneration Percentage} = \frac{\text{sum of score in all plots}}{\text{total no. of plots}} \times 20$$

### **15.2 Biodiversity Plot (Other)**

It is proposed to preserve app. 1 ha area comprising of endemic species at eco-tones in the Division where edge effect and richness in biodiversity can be studied from a conservation point of view. In this regards, the beats' areas criss-crossing Bata, Giri & Yamuna riverine tracts transitioning into the forest areas should be considered including Majra, Johron, Sainwala, Behrewala, Bata Mandi etc. Artificial protection around this forest patch to be initiated. The boundary geo-coordinates should be recorded. Periodical measurement should be taken and recorded. Account of any silvicultural operation, maintenance measures and natural disasters should also be recorded.

### **15.3 Preservation Plot**

A preservation plot of 0.5 ha (30.455411°N 77.609651°E) is also proposed in RF Mantaruwala, C-5 of Gondpur beat, Paonta Range with respect to carrying out regeneration studies in Sal as well as for experimental studies on native medicinal herbs and shrubs.

## CHAPTER 16

### WEED MANAGEMENT

#### 16.1 Weeding operations

Weeding may be defined as “a tending operation done in the seedling stage in nursery or in a forest crop that involves the removal or cutting back of all weeds.” Any unwanted plant that interferes or tends to interfere with the growth of the individuals of favoured species is called a weed.

Importance of weeding operations

1. To reduce root competition and transpirational water loss-  
Inadequacy of soil moisture during the critical growth period is one of the limiting factor in the failure of Sal regeneration. Further, root competition and transpiration water loss appear to be the dominant factor to account for the poor growth or failure of sal natural regeneration in areas full of weed growth, thereby emphasizing the need for timely and complete elimination of certain types of weed to avoid competition for soil moisture and nutrients
2. To improve light conditions- Weeds adversely affected the growth of desired seedling by reducing light reaching the seedlings as necessary for chlorophyll formation and photosynthesis.
3. Weeding in Naturally regenerated areas-  
Weeding must be done before weeds have started suppressing the seedlings and the seedlings have stopped growing. When the growth period is over the seedlings require protection against frost and browsing afforded by weeds and so weeding should not be done.

In case of Sal, Rains weeding have as a rule been found most effective but since Sal has two periods of growth i.e., March- April and June July and the moisture reserves of the soil have also to be taken into consideration, another weeding just before the onset of summer or in very late winter is expected to be beneficial. This will cut out the large transpiration losses from the weeds at a critical period in the soil moisture cycle at a time when Sal itself needs it for its first flush of growth.

Cold weather weeding makes relatively little difference, since at this season the seedlings are not growing and they do not benefit from the extra light and reduced competition for moisture.

In Moist Sal regeneration, repeated shrub cutting of *Ardisia solanaceae*, *Mallotus philipensis*, *Clerodendrum viscosum*, *Flemengia chappar*, *Murraya koengii* etc is necessary as they have been found to suppress the establishment of *Shorea robusta*.

In Sal forests climber species like *Bauhinia vahlii* (Maljhan), *Millettia auriculata* (Gauj), *Combretum decandrum* (Roel) are common and they have to be kept under control always by cutting and uprooting in regeneration areas during marking and cultural operations. In case of heavy climbers, the most useful method is to cut them at two places one near the base and the other about a meter above it. This is not effective in case of thin climbers; they should generally be uprooted after tracing the tubers during the rainy season when the ground is soft.

#### 4. Weeding in artificially regenerated areas-

Within a week of the completion of the sown seed, weeding have to be started because, even though the weeds are all destroyed at the time of soil preparation, they appear again while the germination of the seeds is in progress, and sometimes, even before it. If weeding are not carried out immediately the weeds kill the seedlings by suppression. In the first year, the weeding have to be done in the plantations 2 to 3 times.

In the first weeding, which is started with in a week of the completion of the germination, the weeds are pulled out because they have not firmly established themselves of the soil. But while pulling out the weeds seedlings of the desired species should be held between two fingers of the left hand so that they may not get uprooted with weeds. This weeding should be got done under proper supervision of staff, well acquainted with the initial stages of the seedlings of desired species so that mazdoor may not make any mistakes. By the time first weeding is over, weeds appear again in that portion of the plantation from where first weeding is started. Therefore, second weeding has to be started within a month of completion of germination. In this weeding, the weeds have to be cut as they develop long and stout roots by then.

If tall grasses and weeds are present in the area, they should also be cut to a distance of half meter on either side of the line or strip or in a diameter of 1 meter round the planted pit. The cut grass and weeds should be spread in situ to act as mulch.

The weeding should be completed by the end of September, after which no weeding is necessary.

More weedings are required in wet areas than dry sites and in areas where growing season is short. Slower growth attributed to either site or species require more weedings spread over a number of years continuously.

5. Management of major weed species- Invasion of weed into the forest has become the major concern throughout the country. There are several weed species in the forest but *Lantanacamara*, *Parthenium hysterophorus*, *Ageratum conyzoides* and *Eupatorium adenophorum* have spread markedly in a short period of time and affecting the floral and faunal diversity of forest. In addition to there has been a widespread of *Ardisia solanaceae* in the Moist Sal forests which adversely affects the establishment of Sal.

There are several factors which favour their invasion. Control measures such as mechanical, chemical and biological measures are prescribed to control the further spread to save the rich floral diversity of the forest.

**16.2 *Lantana camara* (Phul lakdi, Fulnu buti, Lantana)**- This Tropical American species belongs to family Verbenaceae. It has occupied most of the forests and non-forests areas in the sub-tropical belt and badly affecting the native floral diversity and availability of grasses. It is a perennial shrub with fragrant evergreen foliage, dark green in colour. The flowers are pink, yellow and orange

#### 16.2.1 Interaction with animals –

The success of lantana may be attributed to presence of a range of pollinators, accounting for high percentage of fruit set. Pollinators are Lepidopteran species and thrips. The process of invasion is further augmented by nutrient additions, with animal droppings, canopy removal, soil disturbances creating good seed bed. Lantana itself benefits from the destructive foraging activities of vertebrates, such as pigs, cattle, goats, horses, sheep, and deer, through enhanced vegetative propagation.

#### 16.2.2 Geographical range-

The plant is tolerant to Drought, heat and wind. It can grow in sandy to clayey loam soil and prefers unshaded habitats but can tolerate some shade. It is intolerant to frequent and prolonged freezing. It can sustain in wide annual rainfall range i.e., between 1000-4000 mm. thus it has ability to consistently maintain its population over a range of environments. It can grow in slopes and exposed sites. It has wide range of phenotypic plasticity which makes it adaptable to broad range of environment.

#### 16.2.3 Vegetative reproduction-

Once established, the rapid vegetative growth of Lantana facilitates the formation of large, impenetrable clumps and high seed production.

The more common means of vegetative spread is through layering, where horizontal stems produce roots when they come in contact with soil in addition, suckering also can occur. Prostrate stems can root at the nodes if covered by moist soil, fallen leaves or other debris. Dumped Lantana stems can develop roots and grow into plants and eventually flower.

#### 16.2.4 Fire tolerance-

Although Lantana burns readily during hot dry conditions, even when green, moderate and low intensity fires can promote the persistence and spread of Lantana thickets, rather than reducing them. After a low intensity fire, the removal of competing neighborhood plant species and increases in soil nutrients following burning can increase its germination.

#### 16.2.5 Competitive ability-

Under conditions of high light, soil moisture and soil nutrients, the mortality rate of mature Lantana plants in its naturalized range is very low. Lantana infestations are very persistent and, in forest communities, have the potential to block succession and displace native species, resulting in a reduction in biodiversity.

At some sites, Lantana infestations have been so persistent that they impede the regeneration in forest. Lantana is a very effective competitor with native colonizers and is capable of interrupting the regeneration processes of other indigenous species by decreasing germination, reducing early growth rates, and increasing mortality. This results in marked changes in the structural and floristic composition of natural communities. Therefore, as the density of Lantana in forests increases, species richness decreases. Lantana does not invade intact forests, but is found on its margins

#### 16.2.6 Allelopathy-

The allelopathic effect of Lantana results in severe reductions in seedling recruitment of nearly all species under its cover. No growth or only stunted growth has been observed for other species growing close to Lantana due to allelopathic effects. Allelochemicals promote or inhibit the crop growth based on their concentration, and the concentration

increases from root, stem to leaf, making the leaf toxic to grazing animals. Lantadene A and lantadene B as more potent allelochemicals.

The presence of 100% infested areas in Paonta Sahib Division is given in the following table.

| Sr. No. | Name of Range                        | Block   | Beat      | Compartment        | Area (ha)  | Percentage (%) |
|---------|--------------------------------------|---------|-----------|--------------------|------------|----------------|
| 1       | Bhagani                              | Bhagani | Mehruwala | RF Mehruwala C-1   | 10         | 100%           |
| 2       | Bhagani                              | Bhagani | Amboya    | RF Amboya C-2      | 5          | 100%           |
| 3       | Bhagani                              | Rajpur  | Puruwala  | RF Kandela C-2     | 40         | 100%           |
| 4       | Bhagani                              | Majri   | Killour   | RF Badana C-1      | 20         | 100%           |
| 5       | Bhagani                              | Majri   | Gojjar    | RF Khojjar C-2     | 10         | 100%           |
| 6       | Bhagani                              | Rajpur  | Danda     | RF Danda C-14      | 25         | 100%           |
| 7       | Bhagani                              | Bhagani | Dhandla   | RF Dhandla C-2     | 25         | 100%           |
|         | <b>Total area Bhagani Range</b>      |         |           |                    | <b>135</b> |                |
| 8       | Paonta Sahib                         | Khara   | Lai       | RF Mankundion C-4  | 5          | 100%           |
|         | <b>Total area Paonta Sahib Range</b> |         |           |                    | <b>5</b>   |                |
| 9       | Majra                                | Majra   | Majra     | RF Badighati C-2   | 10         | 100%           |
| 10      | Majra                                | Majra   | Majra     | RF Sikhimelion C-4 | 10         | 100%           |
| 11      | Majra                                | Majra   | Johron    | RF Banswali C-1    | 10         | 100%           |
| 12      | Majra                                | Majra   | Johron    | RF Banswali C-3    | 10         | 100%           |
|         | <b>Total area Majra Range</b>        |         |           |                    | <b>40</b>  |                |
|         | <b>Gr. Total</b>                     |         |           |                    | <b>180</b> |                |

### 16.3 Physical Control Measures

The best time for removal of *Lantana* is just before rainy season, i.e. when the plants are not in flowering and fruiting. However, prescribed period for lantana removal in Himachal Pradesh is from 1<sup>st</sup> Nov to 31<sup>st</sup> Jan.

For restoration of lantana eradicated areas broadcast sowing of grass seed is done in January and February.



### **16.3.1 RECOMMENDATIONS for lantana removal**

1. Lantana removal has both ecological and socio-economic benefits. The need is to continue efforts at removal combined with regular training and increased monitoring.
2. Regular training of field staff in techniques of removal of Lantana viz. CRS Method, Calendar of activities and maintenance of documents.
3. Site selection should follow watershed approaches like ridge-to-valley, removing lantana from upper areas first. Larger patches of area need to be preferred. Highly infested areas need to be considered first.
4. Disposal of removed lantana needs to be strategized in an SOP for undulating and steep areas. Incentives to locals and firms need to be promoted.
5. Lantana infested areas could be mapped using satellite imagery and ground truthing by field staff. This will help in prioritising areas.
6. As Lantana removal would be an extensive activity, the need to have a portal like FONIS, to plan and monitor the lantana eradication work. It should have systems to upload kml boundaries, update registers and photographs from the site. The portal may also have a system that integrates manuals and site-specific recommendations using Artificial Intelligence.
7. During maintenance operations, weeds like Ageratum, Eupatorium need to be removed. The norms for removal of these should also be formulated.
8. For soil moisture conservation, trenches and other measures are recommended to prevent soil erosion and promote retention after removal of Lantana.
9. Rehabilitation - fast growing species to be marked specific to the site. The same needs to be raised in the nurseries. Planning at least 3 years into the future.
  - a. There is a need for a proper plan to link the sites systemically to be automatically taken up for plantation in next year.
  - b. Protection measures from fire, grazing, others need to be linked

c. There is a need to create a long-term plan for targetted areas where fast growing species are a part of nursery protocol. Further the species suggestions need to be provided based on forest types and local ecological conditions and needs of local people.

10. Non-Forest land surrounding Lantana removal sites need to be considered as part of treatment. Convergence with other schemes like MGNREGA and incentives to landowners as well as firms focussing on value addition of lantana needs to be promoted.

**16.4 *Parthenium hysterophorus*** (Carrot Weed, Congress Grass, Gajar ghas, Chatak Chandni) A member of family Asteraceae and a native of Tropical America, this herb is an aggressive colonizer of degraded areas with poor ground cover and exposed soil such as agricultural fallows, wastelands, roadsides, soil dumps, overgrazed pastures and degraded forests. The species, in addition to its adverse ecological impacts, has become a serious health hazard, causing allergic reactions in human beings. The weed was first revealed in India in 1955.

#### 16.4.1 Habitat

This weed is spotted on bare lands, industrial areas, developing residential colonies, railway tracks, roads, drainage and around the ditch etc. High temperature is favorable for the development of this noxious weed production. Low temperature represses the development of the plant and the seed productivity. It invaded sites mostly have sandy loam soil with pH ranging from 5.4 to 7.4 and water holding capacity 16.8 to 63%.

#### 16.4.2 Life cycle

It can flower at any time of the year, but commonly occur during raining season. After 24-48 days of germination flowering takes place. The best alternating temperature regime for its weed seed germination is 21/16°C (day/night). Further its seeds can live for between 4-6 years in the soil as seed bank.

#### 16.4.3 Causes of rapid spread

Seeds of *Parthenium* can survive under harsh conditions and remain viable for a long time period. These qualities of this weed help in its fast spreading. Seeds of *Parthenium* can germinate any time of the year, when suitable moisture is available.

**16.4.4 Fast growth rate:** It is vigorously growing annual herbaceous weed. Generally, *Parthenium* flowered when it is only 4-8-week-old and can flower for several months. Under unfavorable conditions like salt and drought stress, the weed can complete its life cycle within 4-5 weeks.

**16.4.5 Allelopathic potential:** This noxious weed suppresses the development of nearby plants by allelopathy. Leachate and extract of leaves and inflorescence prevent the germination and growth of associated economically important crops.

**16.4.6 Unpalatable to animals:** *Parthenium hysterophorus* is unpalatable to the animals. Generally, animals do not eat *Parthenium hysterophorus* because of its bitter taste and intense odour. Earlier investigations in India had revealed its serious health hazards to the livestock in *Parthenium hysterophorus* invaded areas.

#### **16.4.7 Control measures**

##### **a) Mechanical measures**

- i. Controlling overgrazing:** Overgrazing decreases the vigor and diversity of grassland that enable the spread of *Parthenium hysterophorus* weed luxuriously. Grazing during winter is generally safe since the period has low risk of *Parthenium* spread. However, *Parthenium* may grow and germinate in this time also.
- ii. Burning:** Mass vegetation of the weed can be destroyed by this practice. But it cannot be considered as safe control strategy for the weed since there is great risk to soil, air and existing plant and animal diversity.
- iii. Manual control:** Manually, *Parthenium* weed can be controlled by simple hand plucking. But this is not recommended since it might cause serious health hazard. Further, the seeds may drop off and increase the area of infestation.

#### **16.4 *Eupatorium adenophorum* (Crofton Weed)**

*Eupatorium adenophorum* is a member of family Asteraceae, this shrub is a native of Mexico. It forms dense thickets in fallow and wastelands, degraded forests and forest fringes out-spacing the indigenous species. The plant also causes allergic reactions and is a potential health hazard.

It is found upto 2200 meters above mean sea level, in ravine slopes and grassy localities. The plant inhabits moist conditions, extremely aggressive competitor, especially in shaded conditions although seeds do not germinate in dense shade. The plant increases its competitive advantage through allelopathic action and by altering the soil microbial activity. Flowering occurs in spring and summer around 10,000 to 100,000 seeds are produced per year when mature, mid to late spring with high Germination rates. It is reported to produce seed by means of apomixes. It is therefore likely that there is limited genetic variation within populations, especially in its introduced range, which in turn may make it easier to control.

#### **16.4.1 Causes for rapid spread**

It is perennial, fast growing and due to wide adaptability, it is able to colonize vast tracts in Himachal Pradesh. It is light demander and its seed remain dormant in the absence of direct sunlight, continuous slashing of stem give rise to affirly thick root stock

#### **16.4.2 Control measures**

#### **16.4.3 Mechanical measures**

Manual uprooting, Mowing, cutting with machete or burning of live plants. Furthermore, at the maturity stage, uprooting of plants results in dispersal of seeds to other areas.

### **16.5 *Ageratum conyzoides* (Goat Weed, Neel- phulnu)**

*Ageratum conyzoides* is a noxious herb, a member of family Asteraceae present in many tropical and subtropical environments. It thrives best in rich, moist, mineral soils with high humidity and tolerates shading. *It may* grow from sea level to at least 2400 meters in altitude. In Himachal Pradesh, India, the weed is established up to 1800 meters.

#### **16.5.1 Lifecycle Stages**

It can complete its life cycle (germination to flowering) in less than two months. The plant flowers almost throughout the year, precisely from June to March. The seeds germinate in response to light (photoblastic) and are often no longer viable within 12 months. *A. conyzoides* has the potential to produce many seeds (94,772 seeds per plant) and to shed seeds over extended times (5 to 8 months), as well as its extraordinary physiological plasticity, has enhanced its persistence in arable fields.

#### **16.5.2 Features imparting invasiveness**

Fast growth and rapid spread Wide ecological amplitude; High reproductive potential

Long flowering and fruiting periods; Absence of natural predators/enemies/ competitors; resistance to predators; Unpalatable due to high phytotoxin content; and resource competition along with novel weapons such as allelopathy.

### **16.5.3 Management**

#### **Physical methods**

These include manual uprooting, mowing, cutting with machete or burning of live plants. In general, these are of some use when the plant is at the vegetative stage. However, certain limitations are associated with these methods, for example the high cost of labour, ill-effects on workers' health, vegetative regeneration from stolons, etc. Furthermore, at the maturity stage, uprooting of plants results in dispersal of seeds to other areas.

In conclusion *lantana camera*, *Parthinium hetrophorus*, *Eupatorium adenophorum* and *Ageratum conyzoides* are highly invasive exotic weed in sub tropical and temperate forest of North Western Himalaya. Lantana is recorded most dominating shrub in the forest ecosystem. The main reasons of their invasion are fast growth and rapid spread, wide geographical range, high reproductive potential and allelopathic effect. Due to their allelopathic effect and gregarious habitat they affect the native biodiversity and also the regeneration process. Preventing the spread of these weed species is most cost-effective management tool. However, various control measures (mechanical) are being under taken throughout the world to reduce the further spread of these weeds. This would require the restriction of further importation to our country, sale and use of these weeds and strategically controlling infestations wherever it currently occurs.

### **16.6.Ardisia solanacea**

*Ardisia solanacea*, commonly known as Gurbheli in local dialect and belongs to Primulaceae family. It is a species of evergreen shrub or small tree native to Indian subcontinent. It grows in moist ravines and in the understorey of Moist Shivalik Sal, Moist dun Sal and to some extent in Dry Shivalik Sal forests, and in Himalayas up to 1200 m.

#### **Description**

It is a 1.5 to 4 m tall, evergreen shrub or small tree with smooth bark of brown colour. Flowers appears from March to August and Fruit bears June to September. As an evergreen, sheds old leaves and produce new leaves simultaneously, throughout the year.

### Silviculture

A strong shade demander when young, and can survive extreme low light levels. Grows well in alkaline soils and limestone substrates. Prefers moist forests with seedlings tolerating short period submergences. Prefers shelter from cold drying winds and winter frosts. Sensitive to wild fires and droughts.

*Ardisia solanacea* is a common understory shrub in the Sal (*Shorea robusta*) forests, a significant forest ecosystem in South Asia. This species establishes dense thickets, aggressively outcompeting native vegetation in this specific ecosystem, and could potentially be considered invasive and disruptive to the native biodiversity.

Also, this species suffers lower foliar herbivory rates vis-à-vis other species which further leads to its better growth in forests. Several herbivory experiments indicate even moderate levels of leaf area loss over an area might have significant impacts on growth and potential reproductive output, which may be the reason for its invasiveness. Population dynamics of this species varies spatially and temporarily over all of its native range. Further, **Various birds and rodents are fond of *Ardisia solanacea* fruits which leads to better and far-flung seed dispersal every year.** It has evolved specific adaptations that allow it to thrive in the unique conditions of Sal forests, such as soil type, moisture levels, and light availability. Hence, it might fulfil a unique niche within the Sal forest ecosystem, making it less prone to competition from other species. Also, it is relatively free from significant predation or disease pressure, allowing them to grow and reproduce without significant constraints.





### Effect on regeneration:

It is extensively present as undergrowth in moist Sal forests. It occupies the second layer which is above grasses and herbs. The wide spread occurrence of *Ardisia* in Sal forests hampers the regeneration of Sal as it provides competition for light to the emerging Sal seedlings. Sal is a light demander but its young seedlings require lateral shade for protection against frost. Its growth inhibits overhead light to the sal seedlings, thus negatively affecting the natural regeneration of Sal.



**Coppicing of *Ardisia* after bush cutting**

### Treatment methods:

#### Physical method

Uprooting of the plants during initial stages is effective to some extent. However, cutting of the plants from the base induces multiple shoots for the next year, thus aggravating the extent of its spread. Man-days calculation exercise carried out for removal of *Ardisia* in Paonta Sahib Division in experimental silviculture areas with the following results:

| Sr. No | Location                                        | Area | No. of man-days needed |
|--------|-------------------------------------------------|------|------------------------|
| 1      | Rajban Beat C-10, RF-Rajban, Paonta Sahib Range | 1 ha | 20                     |
| 2      | Kukron Beat C-14, RF Kukron, Paonta Sahib Range | 1 ha | 18                     |

|   |                                            |      |                   |
|---|--------------------------------------------|------|-------------------|
| 3 | Toka Beat C-28, RF Lai, Paonta Sahib Range | 1 ha | 18                |
|   | <b>Average</b>                             |      | <b>18.66 days</b> |

It was observed that previous norms did not consider the disposal of cut bushes in nearby nalas or depressions. The same has to be done so as to provide space to the plant regeneration coming up as well as to remove the fire risk material. It was observed that a mean number of **FOUR (4)** man-days were required to dispose the cut bushes. Hence, the total number of 4 man-days needed for cutting & disposal of bushes (*Ardisia solanaceae*) was found to be **18.66+4=22.66 Man-days**. It was also observed that the roots of the bush *Ardisia solanaceae* were highly fleshy with a high coppicing ability. (Pictures attached). The roots were found to be much sturdy in comparison to *Lantana camara*.



*Ardisia solanaceae* Roots

*Lantana camara* roots



## CHAPTER-17

### CLIMATE CHANGE

Climate change is the global phenomenon of climate transformation characterized by the change in the usual climate of the planet (regarding temperature, precipitation & wind) that are especially caused by human activities.

Climate Change has undoubtedly emerged as an issue of global concern. Climate Change has a potential to completely and adversely affect the balance of entire biodiversity. The terms 'global warming' and 'climate change' are often used interchangeably, but there is a difference. 'Global warming' is the gradual increase of the earth's average surface temperature due to greenhouse gases in the atmosphere, whereas the 'climate change' is a broader term. It refers to long-term changes in climate, including changes in average temperature and rainfall due to global warming. Climate change phenomenon which is much more complex is the result of activities that alters the composition of atmosphere, due to undesirable and unwanted over exploitation of our natural resources.

**Paris Agreement:** Paris agreement is a legally binding international treaty on climate change, it was adopted by 196 parties at COP-21 in Paris on 12.12.2015 entered into force on 4.11.2016. Its goal is to limit **global warming** well below 2°C, preferably to 1.5 °C compared to pre-industrial level. Climate change action needs to be massively increased to achieve the goal of Paris agreement years, giving into new concepts of carbon-based solutions and new market. Countries, region and cities are establishing carbon neutrality targets. Zero carbon solution is becoming competitive across economic sector representing 25% of emission. The strategy involves energy and climate policy including the 20/20/20 target namely reduction of CO<sub>2</sub> emission by 20%, increasing renewable energy market share to 20% and increase in 20% in energy efficiency. Paris deal is world's first comprehensive climate agreement.

**Paris Agreement:** What are India's climate commitments?

In 2015 ahead of UN significant climate conference in Paris, India announced three major voluntary commitments called the National Determined Contributions.

- Improving the emission intensity of its GDP by 30-35% by 2030 over 2005 level.
- Increase share of non-fossil fuels-based electricity to 40 % by 2030.
- **Enhancing forest cover, thereby absorbing 2.5 to 3 billion ton of CO<sub>2</sub>.**

India's progress in fulfilling its climate commitment:

- India has reduced emission intensity by 21% over 2005 level.
- Massive plantation activities across states YoY to increase forest cover and highlighting ToF (Trees Outside Forests).
- Solar capacity has grown from 2.63 GW in 2014 to 36GW in 2020.
- Renewable energy capacity is the 4<sup>th</sup> largest in the world and will reach 175 GW before 2022.
- India has set new target of 450 GW by 2030.
- Onward stage India has pioneered two major initiatives:  
ISA (International Solar Alliance)  
Coalition for disaster resilient infrastructures

### **General overview of climate of Paonta Sahib**

The Kiardun valley region is exceedingly hot during summer months and has a considerable rainfall in this valley. The rainy season usually begins in the middle of June and lasts till the middle of September. A shower or two are received in April and May. The April and May rains may also bring hailstorms

During monsoon, rains are more active in the month of July and August. About 80 per cent of the rainfall is received by the district during July and August months. The cold season starts from December to about middle of March. The hot season which follows lasts till the middle of June. Up to middle of September is monsoon season and October and November constitutes the post monsoon season. In cold, summer and post monsoon seasons, the air is dry particularly in the afternoon while during the monsoon season, the air is humid. Skies are generally clear or lightly clouded except during monsoon season when they are heavily clouded to overcast. In monsoon season, winds are from the directions between south-west to north-west, the westerly being more frequent. In post monsoon season they are predominately from the north-east or east. Easterlies and south easterlies are common in the cold season. By the end of March, westerlies and north westerlies appear and these predominate in summer.

|                                     | January              | February             | March                | April                | May                  | June                 | July                 | August               | September            | October              | November             | December             |
|-------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Avg. Temperature °C (°F)            | 11.3 °C<br>(52.4) °F | 14 °C<br>(57.2) °F   | 18.8 °C<br>(65.9) °F | 24.6 °C<br>(76.3) °F | 28.1 °C<br>(82.6) °F | 28.7 °C<br>(83.7) °F | 26.6 °C<br>(80) °F   | 26.1 °C<br>(78.9) °F | 24.8 °C<br>(76.6) °F | 21 °C<br>(69.9) °F   | 16.7 °C<br>(62) °F   | 12.7 °C<br>(54.8) °F |
| Min. Temperature °C (°F)            | 4.4 °C<br>(39.8) °F  | 6.6 °C<br>(44) °F    | 10.5 °C<br>(50.8) °F | 15.7 °C<br>(60.3) °F | 19.8 °C<br>(67.6) °F | 22.7 °C<br>(72.8) °F | 23.7 °C<br>(74.7) °F | 23.3 °C<br>(73.9) °F | 20.5 °C<br>(68.9) °F | 14.3 °C<br>(57.8) °F | 9.6 °C<br>(49.3) °F  | 5.6 °C<br>(42.1) °F  |
| Max. Temperature °C (°F)            | 17.8 °C<br>(64.1) °F | 20.8 °C<br>(69.5) °F | 26.3 °C<br>(79.3) °F | 32.4 °C<br>(90.3) °F | 35.1 °C<br>(95.2) °F | 33.9 °C<br>(93) °F   | 29.8 °C<br>(85.6) °F | 29.1 °C<br>(84.4) °F | 28.8 °C<br>(83.8) °F | 27.5 °C<br>(81.5) °F | 23.8 °C<br>(74.8) °F | 19.6 °C<br>(67.3) °F |
| Precipitation / Rainfall<br>mm (in) | 37<br>(1)            | 54<br>(2)            | 28<br>(1)            | 21<br>(0)            | 28<br>(1)            | 160<br>(6)           | 450<br>(17)          | 423<br>(16)          | 191<br>(7)           | 16<br>(0)            | 2<br>(0)             | 14<br>(0)            |
| Humidity(%)                         | 73%                  | 67%                  | 54%                  | 38%                  | 40%                  | 56%                  | 83%                  | 85%                  | 81%                  | 69%                  | 66%                  | 70%                  |
| Rainy days (d)                      | 3                    | 4                    | 3                    | 3                    | 5                    | 9                    | 19                   | 19                   | 12                   | 1                    | 0                    | 1                    |
| avg. Sun hours (hours)              | 8.8                  | 9.4                  | 10.6                 | 11.5                 | 11.9                 | 10.7                 | 8.2                  | 7.7                  | 8.8                  | 9.8                  | 9.4                  | 8.9                  |

Data: 1991 - 2021 Min. Temperature °C (°F), Max. Temperature °C (°F), Precipitation / Rainfall mm (in), Humidity, Rainy days. Data: 1999 - 2019: avg. Sun hours

**Evidence of Climate change:** - Following are the evidence which proves that climate change is the reality and needs to be considered for future policy and action.

- a) Increase in average annual temperatures and likelihood of extreme events like hailstorms
- b) Changes in hydrology and water supply; reduced snowpack and water availability in some basins; changes in water quality and timing of water availability
- c) Loss of water bodies, wetland ecosystems and services.
- d) Increase in water bodies temperatures, with potential for changes in water regime/chemistry and increased pollution loads.
- e) Increased incidence of drought
- f) Increased soil erosion and risk of inundation from increasing levels due to rain intensity and increasing storm intensity.
- g) Changes in the abundance and geographical distributions of plant species and habitats for aquatic and terrestrial wildlife.
- h) Increase in diseases, invasive species, and insect, animal and plant pests
- i) Increase in forests fire frequency and intensity
- j) Increased frequency of extreme precipitation events and incidence leading to flash floods
- k) Increased incidence of landslides
- l) Impact on soil fertility

### **Climate Change: Impact on Forests**

Forests in Himachal Pradesh are an important ecological and natural resource and have been aptly termed as "Green Pearl" in the Himalaya. About 26% of the State's geographical area is the

repository of 3,295 species out of which 95% are endemic to the state and 5% (150) species are exotic, most of the people in rural areas in the State depend directly or indirectly on forests for their livelihood and use significant quantity of forest goods and services like non-wood forest products, ecotourism, fodder, timber etc.

The immediate repercussions of climate change on the forests are visible in the form invasion of weeds in forests adversely affecting the regeneration of preferred species, further contributing to changes in the composition of forests. Changes in temperature are leading to modification of phenological patterns of vegetation.

## **1. Climate Change Induced Natural Hazards**

### **Climate Change: District Sirmour**

\*The data base for the period of 34 years (1979-2013) has been analysed for three developmental block i.e Sangrah, Pachhad, Paonta Sahib on daily basis and accordingly a monthly average is calculated. Further, a rate of change of temperature between 0.091 to 0.200degree centigrade per year was observed in southern region during kharif and rabi season.

\*Since 1979 winters are getting warmer, summer are getting either extremely hot or slight variation in expected weather condition and extreme hot days are getting hotter threatening moisture levels.

\*Temperature are likely to be raised by 1.5 to 4 degree Celsius across the Indian Himalayan region by 2050. Similarly, in the Northern parts of Yamuna Basin the rise in temperature is projected by '3 degrees centigrade by 2050. [Ref. Report Summary, '*Implication of climate change on Water, Agriculture, Horticulture sectors in the Yamuna river basin*' by Department of Environment, Science and Technology Govt. of Himachal Pradesh].

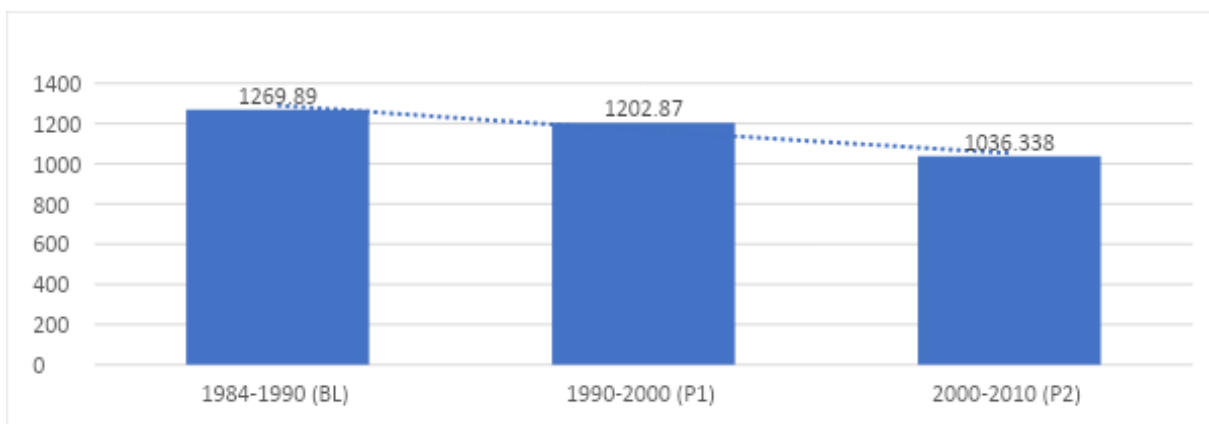
Mean annual and total annual rainfall were recorded and analysed for the similar period of time. Mean annual rainfall followed a declining trend and decreased by 67.02 mm in1991-2000, while by 233.55 mm in 2001-10 over the baseline. The total annual rainfall for 1991-2000 as well as 2001-10 increased by 3139.45 mm and 1474.18 mm respectively, over baseline period but total annual rainfall during P2 followed declining trend over P1.

| <b>Time Period</b> | <b>Mean Annual Rainfall (mm)</b> | <b>Total Annual Rainfall (mm)</b> |
|--------------------|----------------------------------|-----------------------------------|
| 1984-1990 (BL)     | 1269.89                          | 8889.20                           |
| 1990-2000 (P1)     | 1202.87                          | 12028.65                          |
| 2000-2010 (P2)     | 10363.38                         | 10363.38                          |

| Increase/decrease over baseline |        |         |
|---------------------------------|--------|---------|
| P1                              | 67.02  | 3139.45 |
| P2                              | 233.55 | 1474.1  |

\*BL – Base Line Period

[Ref. Research article, understanding the effect of climate change on temperature and precipitation in Sirmour district of Himachal Pradesh by Reena Joshi and K.S. Verma].



### **Climate Change Hazard Scenarios: District Sirmour**

Sirmour is the most south-eastern district of Himachal Pradesh. The region is fed by numerous perennial rivers which originate in the glaciers and supply water to the plains throughout the year. Having a mountainous topography, this area is also prone to the incidents of cloud burst and flash flood. As has been seen in other parts of the State, landslides can wipe out entire villages as well as lead to blocking and cutting off of settlements for days from the rest of the state. Due to loose and unconsolidated material any kind of shaking can also trigger landslides or rock falls which also pose a threat to the district.

**The main hazards of Sirmour contributed by Climate change are as under -:**

#### **1. CLOUD BURST & FLASH FLOODS**

- a. Most of the part of district Sirmour is hilly and it is prone to cloud burst and may lead to flash floods in local water channel during rainy season. The flash floods are events that are sudden, severe and short lived. It is a sudden and often destructive surge of water down a narrow channel or sloping ground, usually caused by heavy rainfall. Flash-floods are mostly the result of cloudbursts or blockage of river channel due to landslides. Paonta valley being a prominent inter mountain valley in the district is most affected by flash floods caused by torrential rains.



The major incidences of floods in Paonta Sahib were reported on July 2012, 16 June 2013 and July 2023 of Monsoon season.



## 2. LANDSLIDES

Due to the mountainous terrain, several parts of the districts are prone to landslides. As per the landslide zoning map of North India (Vulnerability Atlas, BMTPC 2007), almost the entire district has a moderate to severe risk of landslides. Only a minor portion at the southern edge of the district is in the 'Unlikely' risk zone. There is also the possibility of landslides triggered by severe earthquakes with the possible loss of life and also blockage of important roads. The district as per the Landslide atlas of India had witnessed a major landslide in the year 1955 October at Sirmouri Tal in Paonta Sahib. Landslides are generally caused by high intensity rains during monsoons and anthropogenic activities in Forest area makes the situation worse. Till date total 2742 Square Kilometre area has been affected by Landslide. The landslide prone areas in Paonta Sahib exist in Dhartidhar range & Trans Giri area. The major landslide was reported on 4th October 1955 in Sirmouri Taal, and in Kachidhang area during recent times. Further, during August 2023 a massive landslide occurred in this area taking lives of 5 people and causing huge loss to forests.

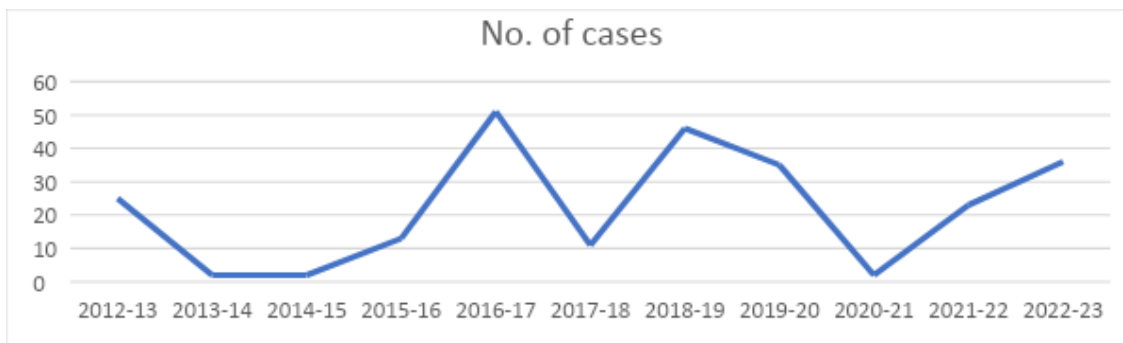


### 3. Drought

The district was affected by drought in the year 2002 and year 2009 when the government declared drought due to lack of rainfall which further affected the agriculture in the district. This is attributed by change in temperature and rainfall due to climate change, which can be easily identified by the rainfall data from the revenue department.

### 4. Forest fire

Forest fires are common in the summer season as the heat and the wind condition help spreading the fire rapidly. The increase in temperature due to climate change further makes the condition favourable for Forest fire. The detail of fire incidences in Paonta Sahib is mentioned in Chapter 10 of Part-II. The uneven trend in fire-incidences points to the unpredictable climate and rainfall patterns owing to climate change



phenomenon.

a.

### 5. High Winds

The South western parts of the district of Sirmour are also prone to the effects of very high winds as per the Vulnerability Atlas of India 2007. The remaining portions are in

the High damage risk zone. During summers, there are instances of thunderstorms accompanied by heavy winds, hail and lightning that can cause immense damage to the surrounding areas.

## **Sectoral Strategies:**

### **1 . Sectoral Vision and Commitment**

The overall sectoral vision and commitment will be to improve forest and biodiversity management practices through multiple strategies and initiatives in the state to minimize the impacts of climate change and for the overall well-being of the state and its people.

### **2 Strategies**

For improving the scientific knowledge and evidence base on climate change and its impacts, the following will be taken up for immediate research under the Forest Department:

1. Evaluation of total carbon stock and annual increment for Himachal Pradesh.
2. Monitoring the carbon fluxes of forests in various ecological and altitudinal zones.
3. RS-GIS analysis of the whole state to evaluate/monitor the carbon stock.
4. *Ex situ* conservation of the genetic diversity of both the flora and fauna.
5. Documentation and monitoring of the biodiversity of various ecosystems.
6. Development of appropriate silvicultural techniques with climate change considerations.
7. Research on the eradication of invasive alien species.
8. Management of forest fires.
9. Monitoring the population dynamics and movements of wildlife.
10. Documentation of traditional knowledge related to biodiversity.
11. There is a need to carry out studies to find out the impact of global change on the carbon mitigating capacity of the forests. There may be significant effects on the growth/decomposition rates, the area, type and intensity of natural disturbances, land-use patterns and ecological services. Since a large portion of the population of this area is dependent on forests for their basic needs such as fuel and fodder, any climate response strategy has to be developed with the community in mind. Comparing environmental and social co-benefits and costs with the carbon benefit will help promote sustainable development.
12. Extensive measures need to be taken by using both traditional as well as modern inputs to contain forest fires. With the increase in the temperature, the forests are likely to be more prone to fires. Hence, wildfire management needs to be taken up at a priority basis to combat an increased frequency and intensity of wildfires in the future.



**Proposed actions/programmes will include the following:**

1. Increasing the existing area under forests and trees and improving the quality and density of the degraded forests. The activities contemplated under this are the following:

**Management intervention in forests:**

1. Plantation of climate-resilient species beneficial also to local communities in third class forests.
2. Assisted natural regeneration in moderately dense forests.
3. Enhancing natural resources and livelihood options of the vulnerable sections
4. Identification of ways to manage ecosystems that will improve their resilience to changes in climate conditions. Preparation of inventory of Local / native species which are more adaptive to expected changes in environment

**The following are action points towards meeting these challenges:**

1. Mapping of all forest areas using remote sensing and geographical information systems (RS-GIS), followed by ground truthing.
2. Alternate livelihood options for communities such as non-timber forest produce (NTFP) collection, community based eco-tourism, biomass briquetting, establishment of decentralized nurseries and cultivation of medicinal herbs
3. Protection and management initiatives towards regulated grazing.

**Soil and water conservation:**

The observed warming (over several decades) has been linked to changes in the large-scale hydrological cycle, such as increasing atmospheric water vapour content; changing precipitation patterns, intensity and extremes and changes in soil moisture and runoff.

**The soil and water conservation activities will include the following:**

1. Identifying vulnerable areas with the help of experts.
2. Strategic and scientific planning for road cutting that results in minimal loss of soil and water resources.
3. Construction of large-scale rainwater harvesting structures to reduce the water stress in moisture-deficient areas.
4. Enhancement of soil and moisture conservation regime by introduction of multi-tier forest plantations.

5. Enhance water harvestings in micro watersheds and mapping of areas likely to experience floods, establishing hydraulic and hydrological models and developing comprehensive schemes for flood management.
6. Increase research on the impacts of changes in water temperature and regime/ chemistry river basin, micro watershed habitats and resources.
7. Inventory and map micro watersheds- irrigated lands that are at risk of soil erosion or inundation and develop long-term local adaptation strategies. Promotion of traditional system of water conservation.
8. High flooding zonation's and potential threat zoning. Inventory past flood conditions and define and map future flood conditions.

### **Fire management:**

With changes in the monsoon system, short-term, high-intensity precipitation accompanied by intervening drought-like conditions are the major possible threats. Main components of the strategy that will be adopted for effective fire management are as follows:

1. Quick response teams for firefighting.
2. Daily monitoring of fire threats with the help of satellite imagery and information technology.
3. Utilization of pine needles as an energy-efficient eco-friendly energy source for making pine needle check dams.
4. The Forest Department will undertake a detailed capacity needs assessment, especially the need for frontline field staff/personnel. Additionally, the assessment will also examine the scale and scope of capacity development that should be directed at local communities for sensitizing school children and college students. Appropriate action measures will be designed and taken up based on the capacity needs assessment results.
5. Restore fire-adapted ecosystems to withstand natural recurring forest fires. Develop short- and medium-term climate change adaptation strategies for forests and other fire-prone habitats, and improve development standards to reduce exposure to fire risk at the urban-forests land interface

**Carbon sequestration:** -It is the process capturing the waste CO<sub>2</sub> from large point sources. Planting tree and managing their development is proven way to reduce the no. of harmful particulate in air. If carbon is not emitted into atmosphere will ultimately reduce the GHG effect & lessen impact of climate change.

**Carbon sequestration:** Role of Paonta Sahib Division

The forest of Paonta Sahib Division play important role in carbon sequestration as 34004.09 tons of carbon dioxide is sequestered by the Forests of this division which is discussed in detailed of Chapter 6 of part -I. The division, as part of HP Forest Department is further focusing on increasing the plantation area along with the active participation of local people through various community participation schemes such as JICA programme, Vidyarthi Van Mitra, Ek buta beti ke Naam etc.

As climate change is unfolding, the science of climate change too is in the process of development. Nevertheless, adaptation and mitigation efforts are urgently needed corresponding to the existing level of scientific understanding;

## CHAPTER 18

### MONITORING, ASSESSMENT AND REPORTING

#### 18.1 Control and Records

The control forms required for control of deviation from prescriptions for the Working circles is provided in this chapter. The control forms shall be prepared and submitted annually to the **Conservator of Forests** with a copy to the **Working Plan Officer (i.e. DFO Paonta Sahib)** on the 1st of January for scrutiny and obtaining sanctions of deviations, if any. The following control forms will be used for monitoring all the important operations prescribed and suggested in this working plan:

##### 18.1.1 Silviculture Felling Control Form

For the felling operations and record-keeping, following control form will be used.

| Working circle-<br>periodic block |      | Felling series-<br>cutting section |                   | Localities prescribed<br>localities suggested<br>(with areas) |                |                  |                   | Coupe control form  |         |
|-----------------------------------|------|------------------------------------|-------------------|---------------------------------------------------------------|----------------|------------------|-------------------|---------------------|---------|
|                                   |      |                                    |                   |                                                               |                |                  |                   | Coupe No.           | Page    |
| Range<br>wise                     | Area | Species                            | Diameter<br>class | Trees<br>marked                                               | Unit<br>factor | Volume<br>marked | Trees<br>retained | % Trees<br>retained | Remarks |
| 1                                 | 2    | 3                                  | 4                 | 5                                                             | 6              | 7                | 8                 | 9                   | 10      |
|                                   |      |                                    |                   |                                                               |                |                  |                   |                     |         |
|                                   |      |                                    |                   |                                                               |                |                  |                   |                     |         |

##### 18.1.2 Silvicultural Control Form

For control of all other silvicultural operations such as subsidiary cultural operations, cleanings, burnings etc., following form will be used.

| Working circle-<br>periodic block- |           | Felling-<br>series<br>cutting<br>section | Localities prescribed<br>localities suggested |                  |      |        | Coupe control form       |        |                         |
|------------------------------------|-----------|------------------------------------------|-----------------------------------------------|------------------|------|--------|--------------------------|--------|-------------------------|
|                                    |           |                                          |                                               |                  |      |        | Coupe No.                |        | Page                    |
|                                    |           |                                          | As carried out                                |                  |      |        | Excess(+) or deficit (-) |        |                         |
| Prescription<br>in brief           | W.P. para | Year due                                 | Year                                          | Block/<br>Compt. | Area | Volume | Area                     | Volume | Remarks and<br>Sanction |
| 1                                  | 2         | 3                                        | 4                                             | 5                | 6    | 7      | 8                        | 9      | 10                      |
|                                    |           |                                          |                                               |                  |      |        |                          |        |                         |
|                                    |           |                                          |                                               |                  |      |        |                          |        |                         |
|                                    |           |                                          |                                               |                  |      |        |                          |        |                         |

#### 18.2 Compartment History

Compartment history will be furnished and any deviation for aligning compartments for the current context of sustainable management of forests adhering to watershed approach will be recorded. The DFO will direct the concerned Marking Officer to write the compartment description and maintained in the registrar. The compartment history along with a thematic map

will include the operations, silvicultural operations, and any other operations in the compartment as prescribed in the working circles.

### **18.3 Maintenance of Records**

A detailed record of each forestry activity shall be maintained in order to have a solid database for scientific monitoring, evaluation and future planning. The controlling officers should inspect the following documents during inspection and enter signed observations.

- i. Annual Plan of Operations (APO) & Annual Administration Report
- ii. Plantations Journals
- iii. Nursery Journal
- iv. Measurement Books
- v. Beat Manual

#### **18.3.1 Annual plan of operations**

An annual plan of operations should be prepared by the Divisional Forest Officer based on the prescriptions and operations to be carried out as per the provisions of the Working Plan. It should be approved by the Conservator of Forests.

**Annual Administration Report :** Yearly abstract of all kinds of works done in the Division including civil works, plantation works, all other forestry operations, land diversion details, revenue and expenditure details, existing strength of Division etc.

#### **18.3.2 Plantation forms and journals**

The existing system of filling plantation forms and compartment history will be furnished and any deviation for aligning compartments for the current context of sustainable management of forests adhering to watershed approach will be recorded. The DFO will direct the marking Officer to write the compartment description and maintained in the registrar. The compartment history along with a thematic map will include the operations, silvicultural operations, and any other operations in the compartment as prescribed in the working circles.

A complete record of plantation viz. year and month of plantation, area planted, Number of plants planted, species. All activities such as advance work, plantation, regeneration, maintenances, felling and enumeration, maintenance cost, weed cutting, constructing of fire-lines etc. should be recorded for a year. For each year, there will be one entry that should be signed by the Forest Range Officer. The inspection notes by the officers should be recorded in the journals. The Divisional Forest Officer should inspect the entries at the time of annual office inspection.

Details of expenditure incurred month-wise, compartment wise/and operation wise including maintenance cost for subsequent three years. At the end of each year observation regarding success of plantation, survival percentage and the reports on monitoring and evaluation should be given. Specific instructions given during the inspection by senior forest officers to be recorded. Instructions of the PCCF/APCCF on checking of plantations issued from time to time should also be followed.

### **18.3.3 Nursery journal**

For each nursery, separate registers need to be maintained. It shall have monthly detail of operations and expenditure incurred, plants raised, plants used departmentally, plants supplied to the public during the month etc. Detail of plants supplied free of cost to other Government Departments, public institutions, NGOs etc. shall also be recorded in the register. Plants destroyed as a result of natural calamities or otherwise destroyed shall be got written off from the competent authority. A copy of the nursery statement showing details of species wise nursery stock should be sent to the Divisional office monthly.

### **18.3.4 Deviation statement**

To exercise control over progress of various operations at the end of each financial year, the prescriptions of the working plan will be compared with the actual operation done in the field on felling, silvicultural operations and miscellaneous works and any excess or short fall shall be recorded giving reasons for deviation and sanction of the competent authority shall be obtained as per the details given in the Miscellaneous Regulations.

### **18.3.5 Beat Manuals**

Each beat guard will maintain a Beat-Book to be prepared and issued by the Divisional Office. The Beat-Manual shall contain the following information:

- a) Beat map
- b) Detail of forests in the beat
- c) Copy of boundary register of forests
- d) Duties of Forest Guard
- e) Legal status of the forest area with notifications
- f) Abstract copy of the relevant sections of the Indian Forest Act, 1927; Wildlife (Protection) Act, 1972; Forest (Conservation) Act, 1980 and vernacular translation thereof.
- g) List of buildings, roads, paths, fire-lines in the beat

- h) List of plantations raised during the past 10 years
- i) Record of water table at various places in the area

#### **18.3.6 Registers and Records**

The following updated (till last financial year) register and records will be maintained by the Division:

- i) Compartment histories
- ii) Fire records and registers
- iii) Register of Boundary Pillars
- iv) Register of Rights and Concessions
- v) Record of forest produce harvested
- vi) Free grants
- vii) Register of land transferred to other departments under FCA Act.
- viii) Register of soil and water conservation works
- ix) Register of wildlife management may include detailed record of human wildlife conflicts that includes data on human casualties and injuries, loss of domestic animals, and compensation paid etc.
- xii) Register of Government buildings that includes log of the repairs and addition (if any) undertaken in the building.
- xiii) Register of registered saw-mills & other industries in the Division

#### **18.4 Annual Inspection**

Annual inspection of DFO territorial office by CF/CCF and Range office by DFO territorial is mandatory within three months of completion of financial year to have checks on annual statements in control forms and deviation statements and maintenance of registers and records.

## CHAPTER 19

### SUMMARY OF PRESCRIPTIONS

| Working Circle | Heading                               | Prescription                                                                                                                                                                                                                                                                      | Para no.<br>(of Part II) |
|----------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Sal            | Silvicultural system and Regeneration | Indian Irregular Shelterwood System with assisted natural regeneration                                                                                                                                                                                                            | 2.6.2                    |
|                | Rotation and Regeneration Period      | 120 & 30 years respectively                                                                                                                                                                                                                                                       | 2.6.3                    |
|                | Exploitable Dia                       | 40 cm                                                                                                                                                                                                                                                                             | 2.6.4                    |
|                | Felling Cycle                         | 30 years                                                                                                                                                                                                                                                                          | 2.6.6                    |
|                | Division into Periodic Blocks         | Fixed; Three PBI, PB-Unallotted, PB IV                                                                                                                                                                                                                                            | 2.6.7                    |
|                | Prescribed Annual Yield               | By volume: 21670 m <sup>3</sup> for PB I, 5340 m <sup>3</sup> for PB IV, Total 27010 m <sup>3</sup>                                                                                                                                                                               | 2.6.8                    |
|                | Felling in PB I                       | Guidelines given basis CEC in IA 3840 of 2020; seeding felling prescribed with 40 trees per ha to be retained as seed bearers of preferably III & IIA                                                                                                                             | 2.6.10.1                 |
|                | Treatment of PB Unallotted            | Salvage and T.D. grants are prescribed. Small open patches to be taken up for plantation. Thinning recommended as per site-specificity.                                                                                                                                           | 2.6.10.2                 |
|                | Felling in PB IV                      | Over-wood is to be removed and thinning is to be carried out. Felling sequence laid down. This can be changed by CCF Working Plan and Settlement.                                                                                                                                 | 2.6.10.3                 |
|                | Subsidiary Silvicultural Operations   | Operations like bush/climber cutting/ <i>Ardisia</i> removal, removal of miscellaneous growth likely to be suppress regeneration, debris collection, removal and burning, closures, singling out of coppice shoots, cleanings and special treatment to some areas etc. laid down. | 2.6.11                   |
|                | Associated Regulations & Measures     | Regulation of closures, lopping, grazing, fire protection, right holders requirement, prevention against Sal borer, availability of funds, illicit felling control                                                                                                                | 2.6.13                   |



|                                      |                                                              |                                                                                                                                                                   |                   |
|--------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|                                      | Regeneration Assessment Survey                               | To be carried out every year till regeneration gets established                                                                                                   | 2.6.12            |
|                                      | Assessment of Regeneration Status                            | Discussed in Science & Research Chapter of Part II                                                                                                                | 2.6.12.2          |
| <b>Coppice</b>                       | Silvicultural system and Regeneration                        | Coppice with standards                                                                                                                                            | 3.6.2             |
|                                      | Rotation Period                                              | 30 years for coppice and 60 years for standards                                                                                                                   | 3.6.3             |
|                                      | Felling Cycle                                                | 10 years for 1 <sup>st</sup> year thinning                                                                                                                        | 3.6.6             |
|                                      | Regulation and calculation of Yield                          | By area, 210 ha annually                                                                                                                                          | 3.6.8             |
|                                      | Subsidiary Silvicultural Operations                          | Nursery raising, Artificial planting, slash disposal, singling out of coppice shoots, bush cutting, closures, weeding, natural regeneration protection laid down. | 3.6.11            |
|                                      | Associated Regulations & Measures                            | Regulation of closures, lopping, grazing, fire protection, right holders' requirement                                                                             | 3.6.13            |
| <b>Chil</b>                          | Silvicultural system                                         | Indian Irregular Shelterwood System                                                                                                                               | 4.6.2             |
|                                      | Rotation Period                                              | 100 years                                                                                                                                                         | 4.6.3             |
|                                      | Felling Cycle                                                | 25 years                                                                                                                                                          | 4.6.6             |
|                                      | Periodic Blocks                                              | Four PBs; Existing only PB II & PB III                                                                                                                            | 4.6.7             |
|                                      | Prescribed Annual Yield                                      | Salvage removals in PB III                                                                                                                                        | 4.6.8             |
|                                      | Subsidiary Silvicultural Operations & Associated Regulations | Lopping control, fire-protection, pine-needle collection, resin tapping, grazing, bush cutting, closures, weeding, natural regeneration protection laid down.     | 4.6.11,<br>4.6.13 |
| <b>Protection-cum-Rehabilitation</b> | Silvicultural System                                         | None                                                                                                                                                              | 5.7               |
|                                      | Salvage Removals                                             | Only dry and fallen trees come within the meaning of salvage and can be removed.                                                                                  | 5.8               |
|                                      | Yield, exploitable Dia, Rotation/Regeneration Period.        | Not required as the forests are not to be managed silviculturally. However, salvage removals will appear in control forms.                                        | 5.9               |
|                                      | Methods of Treatment                                         | Treatment of badly eroded areas, grassy blanks, riverine tracts and wooded areas given                                                                            | 5.10              |

|                                                                          |                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                            |                  |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
|                                                                          | Other Regulations                                                                                                                                                                                                                                                      | Regulations of closure, grazing, lopping, planting, fire protection and right holder's requirements laid down.                                                                                                             | 5.11             |
| <b>Eucalyptus Working Area</b>                                           | Management plan for restoration and rehabilitation of Eucalyptus plantation<br>Clear felling (only for eucalyptus) with artificial regeneration of native species in accordance with Hon'ble Supreme Court order in IA 3840 of 2020. Annual prescribed yield 1808 cu.m |                                                                                                                                                                                                                            | 6.6              |
|                                                                          |                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                            |                  |
| <b>Khair (Overlapping)</b>                                               | Silvicultural System                                                                                                                                                                                                                                                   | Coppice with Standards                                                                                                                                                                                                     | 7.6.2            |
|                                                                          | Harvestable Dia                                                                                                                                                                                                                                                        | 25 cm for Khair and 30 cm for standards                                                                                                                                                                                    | 7.6.4            |
|                                                                          | Rotation                                                                                                                                                                                                                                                               | 30 years for coppice and 40 for standards                                                                                                                                                                                  | 7.6.3            |
|                                                                          | Felling Cycle                                                                                                                                                                                                                                                          | 30 years                                                                                                                                                                                                                   | 7.6.6            |
|                                                                          | Annual Yield                                                                                                                                                                                                                                                           | 42.5 cum                                                                                                                                                                                                                   | 7.6.8            |
|                                                                          | Methods of Executing Felling                                                                                                                                                                                                                                           | As per guidelines in I.A No. 87648 of 2020 in Writ Petition (C) No. 202 of 1995                                                                                                                                            | 7.6.10           |
|                                                                          | Subsidiary Silvicultural Operations & associated regulations                                                                                                                                                                                                           | Slash disposal, bush/ lantana cutting, planting, weeding, singling out of coppice shoots, singling of coppice shoots, protection and tending of natural regeneration, Closures, fire protection regulations etc            | 7.6.11<br>7.6.13 |
|                                                                          | Regeneration                                                                                                                                                                                                                                                           | Guidelines given, tall planting of 50% Khair and 50% native species                                                                                                                                                        | 7.6.12           |
| <b>Water Resource Management &amp; Soil Conservation (Overlapping)</b>   | Treatment proposed                                                                                                                                                                                                                                                     | Spring-shed identification and treatment                                                                                                                                                                                   | 8.3              |
|                                                                          |                                                                                                                                                                                                                                                                        | Project Jalodari & Girinagar models to be followed: Including PRA exercises, participation of communities followed by technical inputs for making of recharge ponds, trenching, drainage line treatment, gabion structures | 8.4.1            |
|                                                                          | Future Scope                                                                                                                                                                                                                                                           | Treatment of Bata watershed                                                                                                                                                                                                | 8.5              |
| <b>Wildlife Management &amp; Biodiversity Conservation (Overlapping)</b> | Management initiative for human-wildlife conflicts                                                                                                                                                                                                                     | Prescriptions given including data base management, conflict management teams, awareness, crop guarding, monitoring conflict areas, translocation, compensation                                                            | 10.7             |
|                                                                          | Prescriptions                                                                                                                                                                                                                                                          | Habitat management, improvement, rescue-equipment adequacy, training, veterinary care, census                                                                                                                              | 10.8             |

|                                 |                                    |                                                                                                                                                                                                                                                                         |       |
|---------------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|                                 | Human-elephant conflict management | Anti-depredation teams, coordination, anti-electrocution cell, Infrastructure development-watchtowers, elephant-proof trenches, solar fencing, Gaj-mitras & awareness, procurement of camera traps & night-vision devices and equipments, bee-keeping etc as prescribed | 10.9  |
|                                 | Biodiversity conservation          | Afforestation, integrated health care, community involvement in conservation, preservation plots, documentation of ethano-botanical plants                                                                                                                              | 10.11 |
| <b>Ecotourism (Overlapping)</b> | Ecotourism sites management        | Perspective on ecotourism potential of the Division                                                                                                                                                                                                                     | 11.3  |
|                                 | Future scope                       | Specific site development activities including Sirmaur Van Vihar, Yamuna Riverfront, developing walking trails and camping sites with list of areas and ensuring self-sustainability of these ecotourism sites with livelihood generation for local communities         | 11.4  |
|                                 | Administration of sites            | Model given for a conservation led participation by local communities under relevant acts under Society model                                                                                                                                                           | 11.7  |

*Signature of Officers*