

HIMACHAL PRADESH GOVERNMENT
DEPARTMENT OF FORESTS

Working Plan
For the Forests of
RAJGARH FOREST DIVISION
DISTT. SIRMOUR H.P.

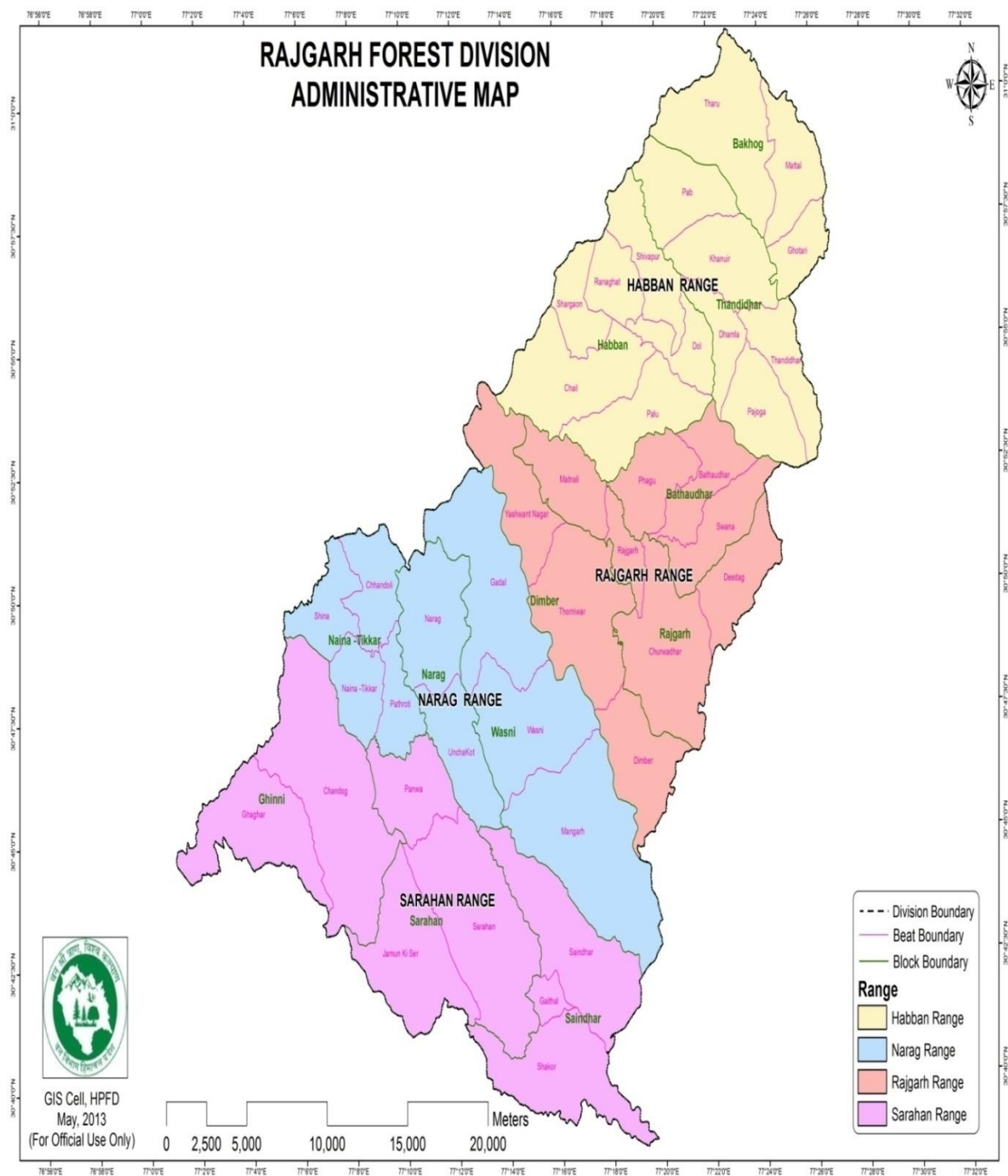
for the period
(2013-14 to 2027-28)

By
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Under the Guidance of

OP Solanki, I.F.S
OSD, Working Plan, Solan.

Volume -I



AWPO Working Plan
Rajgarh.

WPO Working Plan
Rajgarh.

**ADMINISTRATIVE MAP
OF
H.P. FOREST DEPARTMENT**

LEGEND

1. EXTERNAL BOUNDARY
2. STATE BOUNDARY
3. DIVISION BOUNDARY
4. RIVERS
5. DIVISION H.Q. □ KULLU

Inset Map: Shimla Forest Div., Theog Forest Division, Solan Forest Div., Rajgarh Forest Division, Chopal Forest Div., Renuka Ji Forest Division, Nahan Forest Division, Haryana.

WPO Working Plan
Rajgarh.

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INTRODUCTION

This working plan revises Dr. M.B. Shrivastava's plan and covers all the forest areas of the present Rajgarh Forest Division.

PWPR of Rajgarh Forest Division was prepared by Sh. Rajesh Shukla in assistance of Sh. R.K. Gupta, IFS, CF Nahan which was approved by the Govt. of India vide Addl. Pr.CCF (Central) Chandigarh letter No. 13-7(33)/2011-ROC/614 dated 18-1-2012. Sh. Rajesh Shukla was entrusted the revision of this working plan. The notification for preparation/writing of Working Plan was issued by the H.P. Govt. vide Addl. Chief Secretary (Forests) to the Govt. of H.P. Shimla No. FFE-B-F(15) 2/10 dated 5-7-2011 as DFO as WPO and ACF as AWPO. After the issue of notification the field work commenced immediately after he took over as Working Plan Officer in November 2011 and completed in March 2012. It stands to his credit and to that of the staff employed under him that with the limited resources and facilities available, the entire field work has been completed within short span of time. The total area covered by this plan is 25,986.72 ha: enumerations have been carried out over 5346.05 ha, largely in remote and difficult forests exhaustive stock maps have been prepared: and the forest have been inspected and described in full detail.

In his yield calculations, the Working Plan Officer has made it possible to ensure that the stock shall be built up and shall increase at the expiry of the working plan period. This is most satisfactory. The management of Deodar and Kail forests have been switched over to Irregular Shelter wood System with Float in Periodic Block. This will ensure the restocking of P.B.I. areas quickly sit was lagging behind the expectation in the past plan with fixed periodic blocks. Similarly, the Silver Fir and Spruce forests shall be managed under Selection System. In Plantation working circle, territorial and social forestry planting series have been constituted to stock the forest areas with commercial species and to cater needs of the rural people by planting fuel, fodder, fruit and other economic trees species. The prescriptions have been made strictly as per Growing Stock.

Thus the Working Plan prescription will help in improving the existing forests of Rajgarh Forest Division.

(Tejender Singh), IFS
Addl. Chief Conservator of Forests,
Working Plan & Settlement
Mandi, H.P.

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The task of this important work will remain incomplete without acknowledging the input of all concerned, particularly those whose contribution was beyond their normal duties.

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Sh. Arun Kumar Bhrigu S/O Sh. Mohan Raj Bhrigu R/O Vill Shamoga Tehsil Rajgarh deserve tremendous appreciation for putting in very hard work specially in overall typing work of plan.

All those who contributed various write up also deserve appreciation.

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Sh. O.P. Solanki, IFS, OSD, Working Plan Solan is specially thanked here. He took great pains and made personal efforts to ensure word to word checking of the

draft plan to remove shortcomings. He also provided very important technical input during the writing of the plan.

Sh, Tejender Singh, IFS, CCF, (Working Plan & Settlement) Mandi also deserve special thanks. He provided necessary guidance in preparation of the Working Plan.

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Working Plan Officer-cum-
Divisional Forest Officer,
Rajgarh Forest Division,
Rajgarh

GLOSSARY OF THE COMMON LOCAL TERMS

Common Local Terms	Definition /Explanation
1. Abadi	A village habitation.
2. Balli	A round pole having a diameter of 10 to 30 cm at butt end.
3. Banjar	Wasteland.
4. Banjar Jadid	A field which is lying fallow for less than four years.
5. Banjar Kadim	A field which is lying fallow for more than four years.
6. Baoli	A small water spring.
7. Bartan	Rights of users.
8. Bartandar	An individual who enjoys rights in forests.
9. Chak	Demarcated private land in the forest.
10. Charand	Grazing land.
11. Chauki	An out post generally residence of Forest Guard.
12. Chaukidar	Watchman.
13. Coolie	Labourer.
14. Chhang	Lopping.
15. Chhatan	Thinning
16. Dandasa	Bark of walnut.
17. Darwar	The Court of the Ruler.
18. Darat	Sickle used for lopping purposes.
19. Dastur-ul-Amal rates	Rates for the sale of various forest produce.
20. Dehat	Village.
21. Dhar	A ridge or spur.
22. Devta	A local diety.
23. Dimdima	Roughly axed odd size timber less than 180 cm in length
24. Dochi / Dogri	Temporary field residence.
25. Dhulan	Carriage.
26. Dhulanee	Labourer used for dhulan.
27. Faisla-e-Janglat	A Forest Settlement.
28. Gaddies	A professional shepherd
29. Ghair morusi	Non hereditary right.
30. Ghair mumkin	Land under buildings / roads / paths / streams etc.
31. Ghall	Timber floating in stream or river.
32. Ghallu	Labour engaged on ghall.
33. Gharat	A water flour mil.
34. Ghasnies	Grasslands.
35. Ghat	A saddle in a hill.
36. Godam	Ration Godown.
37. Gorkh Labour	A Nepalese labourer.
38. Gujjar	A professional nomadic buffalo grazier.
39. Hadbast Number	Serial number allotted to a village during Revenue settlement.

40. Hakries	Pieces of un-fashioned split wood.
41. Hooka	Smoking pipe.
42. Llaqua	Locality.
43. Jagir	An estate / grant.
44. Jagirdar	Owner of the estate / Grant.
45. Jamabandi	Land record maintained by Revenue Department.
46. Jugni / Jugthi	Torch wood.
47. Jungle Mehdooda	Demarcated Protected Forest.
48. Jangle Mehfuza	Reserve Forest.
49. Kanaitis	Rajputs.
50. Kanungo	A Revenue official superior to patwari.
51. Karam	Linear Measurement Unit equal to 146.05 cm
52. Kari	Scant or scantling.
53. Katha	Extract from Khair heart wood.
54. Khad	Manure
55. Khala	Water course.
56. Khasra	A field number given in village revenue record.
57. Khudd	A small stream.
58. Kilta	A conical basket generally used for carrying manure/ fruits etc.
59. Kokath	Miscellaneous inferior Broad leaved tree species.
60. Kuhl	A water Channel.
61. Lala	A shopkeeper.
62. Mahkma Janglat	Forest Department.
63. Makooja	Possession
64. Mali	Gardner.
65. Manu	Current year's shoot of bamboo.
66. Mandi	Market.
67. Mauza	A unit of Revenue administration.
68. Mazdoor	Labourer.
69. Mela	Local fair.
70. Misal Haquiyat	Revenue document containing information regarding customs, rights & concessions.
71. Mistri	Mason / carpenter/Mechanics.
72. Moawza	Compensation.
73. Morusi	Hereditary Rights.
74. Musterqua	Forest shared with people.
75. Nadi	River
76. Naquabil	Land not fit for cultivation.
77. Nala / Nullah	Water course/ small stream.
78. Nautor	Government wasteland granted to an individual for cultivation / habitation purposes.
79. Nazrana	A fee leviable on the fresh breaking up of land.

80. Panchayat	A village council.
81. Parao	Halting place of Gujjar.
82. Patti	A section of village.
83. Patwar	A group of villages forming a patwar circle.
84. Patwari	A revenue official at village level, in charge of patwar.
85. Rawana	Permit for exporting Forest produce.
86. Sahukar	Money lender.
87. Sehada	Trijunction pillar of three mauzas.
88. Shamlat	Village common land.
89. Shimla Mirch	Capsicum.
90. Tal	Lake / Pond.
91. Taraf	A sub division of a village.
92. Tehsil	A sub division of District.
93. Thach	Grassy blanks.
94. Tibba	Hillocks.
95. Tikka	A Village / hamlet.
96. Tora	Raised edge of a cultivated field.
97. Wajib-ul-arz	Regulation regarding land rights etc
98. Zamindar	One who owns the land assessed to land revenue.
99. Zamindari	Land assessed to land revenue of which owner is sole proprietor.

GLOSSARY OF VERNACULAR AND SCIENTIFIC NAMES OF FOREST FLORA & FAUNA FOUND IN RAJGARH FOREST DIVISION

A. TREES

BOTANICAL NAME	ENGLISH / LOCAL NAME
1. <i>Abies pindrow</i>	Tosh
2. <i>Acacia catechu</i>	Khair
3. <i>Acer oblongum</i>	Paran
4. <i>Aegle marmelos</i>	Bel
5. <i>Aesculus indica</i>	Khanor
6. <i>Albizzia chinensis</i>	Siris
7. <i>Albizzia lebbek</i>	Black Siris
8. <i>Albizzia odoratissima</i>	Safed Siris
9. <i>Albizzia procera</i>	----
10. <i>Alnus nepalensis</i>	Kunis
11. <i>Anogeissus latifolia</i>	Chhal
12. <i>Azadirachata indica</i>	Neem
13. <i>Bauhinia variegata</i>	Kachnar
14. <i>Benthamidia capitata</i>	Thamion
15. <i>Betula alnoides</i>	Bhuji patra
16. <i>Betula utilis</i>	Bhuj patra
17. <i>Bombax ceiba</i>	Semal
18. <i>Butea monosperma</i>	dhak
19. <i>Carpinus viminea</i>	Horn bean
20. <i>Casearia tomentosa</i>	Chilla
21. <i>Cassia fistula</i>	Amaltas
22. <i>Cedrela serrata</i>	Dauri
23. <i>Cedrela toona</i>	Toon
24. <i>Cedrus deodara</i>	Deodar
25. <i>Celitis australis</i>	Khirk
26. <i>Cinnamomum tamala</i>	Tomal pattar
27. <i>Cordia dichotoma</i>	Lasoora
28. <i>Cornus macrophylla</i>	Khaksha
29. <i>Corvus colurna</i>	Thangi
30. <i>Cupressus torulosa</i>	Saru or Devidiar
31. <i>Dalbergia sissoo</i>	Shisham
32. <i>Dendrocalamus strictus</i>	Bans
33. <i>Diospyros tomentosa</i>	Tendu
34. <i>Eretia laevis</i>	Chamror
35. <i>Eretia serrata</i>	Pandayan
36. <i>Emblica officinalis</i>	Amla
37. <i>Erythrina suberosa</i>	Dhaul
38. <i>Ficus bengalensis</i>	Bar / Bargad

39.	<i>Ficus glomerata</i>	Fagura
40.	<i>Ficus nemoralis</i>	Anjir
41.	<i>Ficus palmata</i>	Fagura
42.	<i>Ficus religiosa</i>	Pipal
43.	<i>Flacourtia indica</i>	Kanu or Kandai
44.	<i>Fraxinus floribunda</i>	Ash
45.	<i>Grewia oppositifolia</i>	Dhaman / beul
46.	<i>Holarrhena antidysenterica</i>	Maror phalli
47.	<i>Juglans reiga</i>	Akhrot
48.	<i>Juniperus macropoda</i>	Dhup
49.	<i>Juniperus recurva</i>	Guggal
50.	<i>Kydia calycina</i>	Pula
51.	<i>Lannea coromandllica</i>	Jhingam
52.	<i>Lyonia ovalifolia</i>	Ailan
53.	<i>Limonia acidissima</i>	Beli
54.	<i>Litsea glutinosa</i>	Chandna
55.	<i>Machilus duthii</i>	Kharamb
56.	<i>Mallots philippensis</i>	Kamal
57.	<i>Mangifera indica</i>	Aam
58.	<i>Melia azadirachta</i>	Drake
59.	<i>Mitragyna parvifolia</i>	Phaldu
60.	<i>Moringa oleifera</i>	Sanjna
61.	<i>Morus alba</i>	Toot
62.	<i>Myrica nagi</i>	Kaphal
63.	<i>Nictanthes arbortristis</i>	Harsingar
64.	<i>Olea cuspidate</i>	Kau
65.	<i>Ougeinia oojeinensis</i>	Sandan
66.	<i>Phoenix humiltis</i>	Khajur
67.	<i>Phoenix sylvestris</i>	Khaju
68.	<i>Picea smithiana</i>	Rai / Spruce
69.	<i>Pinus wallichiana</i>	Kail
70.	<i>Pinus roxburghii</i>	Chil
71.	<i>Pistacia integerrima</i>	Kakar
72.	<i>Populus ciliata</i>	Poplar
73.	<i>Prunus armeniaca</i>	Khumani /Apricot
74.	<i>Prunus communis</i>	Aloocha
75.	<i>Prunus cornuta</i>	Bird cherry
76.	<i>Prunus persica</i>	Aru / Peach
77.	<i>Prunica granatum</i>	Daru
78.	<i>Pyrus pashia</i>	Kainth
79.	<i>Quercus dilatata</i>	Moru oak
80.	<i>Quercus glauca</i>	Bani
81.	<i>Quercus incana</i>	Ban oak
82.	<i>Quercus semecarpifolia</i>	Kharsu oak

83.	<i>Rhododendron arboretum</i>	Brass
84.	<i>Rhus punjabensia</i>	Tittri
85.	<i>Robinia pseudoacacia</i>	Robinia
86.	<i>Salix alba</i>	Badha / willow
87.	<i>Salix tetrasperma</i>	Beuns
88.	<i>Sapindus mukorossi</i>	Ritha
89.	<i>Sapium insigne</i>	Khinni / khirni
90.	<i>Schleichera oleosa</i>	Kusum
91.	<i>Spondias pinnata</i>	Ambara
92.	<i>Sterculia villosa</i>	Godgudala
93.	<i>Syzygium cumini</i>	Jaman
94.	<i>Taxus baccata</i>	Barhmi
95.	<i>Terminalia belerica</i>	Behera
96.	<i>Terminalia chebula</i>	Harar
97.	<i>Terminalia tomentosa</i>	Sain
98.	<i>Trewia nudiflora</i>	Gamhar
99.	<i>Ulmus wallichiana</i>	Plauch
100.	<i>Wendlandia exserta</i>	Chili / ukan / pansara
101.	<i>Zizyphus jujba</i>	Kath ber

B. SHRUBS & HERBS.

	BOTANICAL NAME	ENGLISH / LOCAL NAME
1.	<i>Aconitum heterophyllum</i>	Patis
2.	<i>Acorus calamus</i>	
3.	<i>Achyranthes aspera</i>	Chirchitta
4.	<i>Adhatoda vasica</i>	Basuti
5.	<i>Adiantum lunulatum</i>	
6.	<i>Agave americana</i>	Ram ban
7.	<i>Agrimonia eupatorium</i>	
8.	<i>Ainsliaea aptera</i>	Aerons rod
9.	<i>Anemone obtusiloba</i>	Ageli
10.	<i>Artemisia vulgaris</i>	Charmar / Khardar
11.	<i>Arisaema wallichianum</i>	Cobra plant
12.	<i>Aristida cyanantha</i>	
13.	<i>Arundinaria falcate</i>	Nirgal
14.	<i>Asparagus racemosus</i>	Sataron
15.	<i>Atropa belladonna</i>	Belladonna
16.	<i>Bambusa arundinacea</i>	Kanta bans
17.	<i>Berberis aristata</i>	Kasmal
18.	<i>Berberis chitria</i>	Kasmal
19.	<i>Berberis lyceum</i>	Kasmal
20.	<i>Boenninghausenia albiflora</i>	Pissu mar

21.	<i>Callicarpa macrophylla</i>	Daia
22.	<i>Cannabis sativa</i>	Bhang
23.	<i>Carissa opaca</i>	Karaundha
24.	<i>Cassia tora</i>	Panwar
25.	<i>Chenopodium album</i>	Bathu
26.	<i>Colebrookia oppositifolia</i>	Binda
27.	<i>Coriaria nepalensis</i>	Gangeru
28.	<i>Cotoneaster bacillaris</i>	Reuns
29.	<i>Cotoneaster microphylla</i>	Bhedda
30.	<i>Crataegus crenulata</i>	
31.	<i>Crotalaria albida</i>	Saun
32.	<i>Daphne cannabina</i>	Niggs
33.	<i>Dactylis glomerata</i>	
34.	<i>Datura suaveolens</i>	Dhatura
35.	<i>Datura tatula</i>	Dhatura
36.	<i>Debregeasia hypoleuca</i>	Siaru
37.	<i>Dendrophthoe falcate</i>	Bahda
38.	<i>Delphinium denudatam</i>	Larkspur / Main
39.	<i>Desmodium tiliaefolium</i>	Safed kathi
40.	<i>Deutzia corymbosa</i>	Batti
41.	<i>Elaeagnus umbellate</i>	Geowain
42.	<i>Euphorbia royleana</i>	Thor
43.	<i>Elsholtzia polystachya</i>	Potha
44.	<i>Elophia campestris</i>	Salam panja
45.	<i>Ephedra geradiana</i>	Ain
46.	<i>Euonymus pendulus</i>	Bhambeli
47.	<i>Excoecaria acerifolia</i>	Dudhila
48.	<i>Ficus scandens</i>	Makhota
49.	<i>Flemingia chapper</i>	Saipan
50.	<i>Flemingia prostrate</i>	
51.	<i>Fragaria indica</i>	Stawberry
52.	<i>Galium acutum</i>	
53.	<i>Geranium wallichianum</i>	
54.	<i>Gerbera lanuginose</i>	Kuphera
55.	<i>Geradiana heterophylla</i>	Bichhu buti
56.	<i>Glycosmis pentaphylla</i>	Ban nimbu
57.	<i>Grewia sapida</i>	Bistu
58.	<i>Hamiltonia suaveolens</i>	Paderi
59.	<i>Hemiphraoms heterophyllum</i>	
60.	<i>Hydrocotyle javanica</i>	Brahmi
61.	<i>Hypericum cernuum</i>	Phiunli
62.	<i>Helicteres isora</i>	Maror phalli
63.	<i>Ilex dipyrena</i>	Kanderu
64.	<i>Indigofera gerardiana</i>	Kali kathi

65.	<i>Indigofera hirsute</i>	Kali kathi
66.	<i>Indigofera pulchella</i>	Kali kathi
67.	<i>Impatiens brachycentra</i>	
68.	<i>Iris nepalensis</i>	
69.	<i>Jasminum humile</i>	Ban chameli
70.	<i>Jasminum officinale</i>	Ban Chameli
71.	<i>Lantana camara</i>	Panjphuli
72.	<i>Laptodermis lanceolata</i>	Padera
73.	<i>Lonicera angustifolia</i>	Chalu
74.	<i>Lonicera hispida</i>	
75.	<i>Lonicera quinquelocularis</i>	Taknoi
76.	<i>Leucomeris spoctabilis</i>	Phusiari
77.	<i>Mentha arvensis</i>	Podina
78.	<i>Meriandra strobilifera</i>	
79.	<i>Mikosa himalayana</i>	Khinkari
80.	<i>Morina longifolia</i>	
81.	<i>Murraya koenigii</i>	Gandla/ curry patta / Gadhelu
82.	<i>Myriactis wallichii</i>	
83.	<i>Myriactis nepalensis</i>	
84.	<i>Myrsine Africana</i>	Banwan
85.	<i>Nardostachys jatamansi</i>	Jatamansi
86.	<i>Nerium indicum</i>	Kaner
87.	<i>Opuntia dillenii</i>	Nag phan
88.	<i>Orchis latifolia</i>	Salib mishri
89.	<i>Oxalis corniculata</i>	
90.	<i>Plectranthus rugosus</i>	Kathal
91.	<i>Plumbago zeylanica</i>	Chitrak
92.	<i>Podophyllum hexandrum</i>	Ban kakri
93.	<i>Paeonia emodi</i>	Chandra
94.	<i>Pennisetum orientale</i>	
95.	<i>Picrasma quassioides</i>	Karui
96.	<i>Poa annua</i>	
97.	<i>Progestemon plectranthoides</i>	
98.	<i>Polygonum capitatum</i>	
99.	<i>Polygonum verticillatum</i>	Salib mishri
100.	<i>Picrorhiza kurroa</i>	Kutaki
101.	<i>Potentilla nepalensis</i>	
102.	<i>Potentilla aroyrophylla</i>	
103.	<i>Prinsepia utilis</i>	Bhekhhal
104.	<i>Pteridium aquilinum</i>	Ferns
105.	<i>Pueraria tuberosa</i>	Sural
106.	<i>Randia dumetorum</i>	Maindel / madana
107.	<i>Randia tetrasperma</i>	Chhota ghingar
108.	<i>Ranunculus diffuses</i>	

109.	<i>Reinwardtia trigyna</i>	Phiunli
110.	<i>Rheum webbianum</i>	Atish
111.	<i>Rhododendron companulatum</i>	Sarnagar
112.	<i>Rhododendron hypenenthus</i>	
113.	<i>Rhamnus virgata</i>	Chhedula
114.	<i>Rhus cotinus</i>	Tung
115.	<i>Rhus parviflora</i>	Tungla
116.	<i>Ribes rubrum</i>	Karan
117.	<i>Rosa sericea</i>	Ban gulab
118.	<i>Rosa macrophylla</i>	
119.	<i>Rubia cordifolia</i>	Majit
120.	<i>Rubus ellipticus</i>	Achhu
121.	<i>Rubus niveus</i>	
122.	<i>Rumex nepalensis</i>	Jungli palak
123.	<i>Salvia glutinosa</i>	Makhia
124.	<i>Salvia moorcroftiana</i>	Thuth
125.	<i>Salix elegans</i>	Dwarf willow
126.	<i>Salinum wallichianum</i>	Bhutkesh
127.	<i>Sarcococcasaligna</i>	Diun
128.	<i>Saussurea lappa</i>	Kuth
129.	<i>Saxifraga lagulata</i>	Pathar tor
130.	<i>Senecio spp.</i>	
131.	<i>Siegesbeckia orientalis</i>	Lichakura
132.	<i>Skimmia laureola</i>	Gurl patta
133.	<i>Setaria glauca</i>	
134.	<i>Smilax vaginata</i>	
135.	<i>Sporobolus elongates</i>	
136.	<i>Solanum indicum</i>	Ban tambaku
137.	<i>Solanum verbascifolium</i>	Ban tambaku
138.	<i>Spiraea sorbifolia</i>	Lotka
139.	<i>Stahylea emodi</i>	Nagdadu
140.	<i>Strobilanthes alatum</i>	
141.	<i>Swertia chirata</i>	Chirata
142.	<i>Thalictrum foliolosum</i>	Machhar mar
143.	<i>Thamnocalamus spathiflorus</i>	Nirgal
144.	<i>Thymus serphyllum</i>	Jangli ajwain
145.	<i>Tylophora hirsute</i>	
146.	<i>Urtica dioica</i>	Bichhu buti
147.	<i>Valeriana wallichii</i>	Swak
148.	<i>Verbascum Thapsus</i>	Gidar tobacco
149.	<i>Viburnum cotinifolium</i>	Talanji
150.	<i>Viburnum foetens</i>	Talanj
151.	<i>Viburnum nervosum</i>	Talanj
152.	<i>Vitex negundo</i>	Banna

153.	<i>Viola canescens</i>	Banaksha
154.	<i>Viola serpens</i>	Banaksha
155.	<i>Wikstroemia canescens</i>	Chambai
156.	<i>Woodfordia fruticosa</i>	Dhau
157.	<i>Zanthoxylum alatum</i>	Timber
158.	<i>Zizyphus nummularia</i>	Beri
159.	<i>Zizyphus mauratiana</i>	Beri

C. CLIMBERS.

	BOTANICAL NAME	ENGLISH / LOCAL NAME
1.	<i>Abrus precatorius</i>	Ratti
2.	<i>Acacia pinnata</i>	Agla
3.	<i>Bauhinia vahlii</i>	Taur
4.	<i>Caesalpinia sepiaria</i>	Karanj or Alai
5.	<i>Clamatis buchananiana</i>	Garol
6.	<i>Clematis Montana</i>	Garol / Kaunie bali
7.	<i>Cryptolepis buchananani</i>	Singani
8.	<i>Combretum decandrum</i>	Ruel
9.	<i>Cissampelos pareira</i>	Mathiari
10.	<i>Cuscuta reflexa</i>	Saragbali
11.	<i>Dioscorea deltoids</i>	Kural / mithiari
12.	<i>Hedera helix</i>	Banbatkari
13.	<i>Hiptae madabtola</i>	Madhumalti
14.	<i>Ichnocarous frutescens</i>	Kali dudhi
15.	<i>Millettia auriculata</i>	Gauj
16.	<i>Mimosa rubicanlis</i>	
17.	<i>Porana piniculata</i>	Safed bel
18.	<i>Rosa moschata</i>	Van Gulab
19.	<i>Rubia cordifolia</i>	Malo
20.	<i>Rubus peniculatus</i>	Kathula
21.	<i>Schizandra grandiflora</i>	Anjeli
22.	<i>Smilax parvifolia</i>	Ushwa
23.	<i>Tinospora cordifolia</i>	Gilai
24.	<i>Vitis Himalayan</i>	Pani bel

D. Grasses

	BOTANICAL NAME	ENGLISH / LOCAL NAME
1.	<i>Andropoon spp.</i>	
2.	<i>Agropyron longearistatum</i>	

3.	<i>Arostis spp.</i>	
4.	<i>Arundinella nepalensis</i>	
5.	<i>Bothriocloa pertusa</i>	
6.	<i>Brachiaria villosa</i>	
7.	<i>Bromus spp.</i>	
8.	<i>Chrysopogon fulvus</i>	Dholu
9.	<i>Chrysopogon gryllus</i>	
10.	<i>Chrysopogon montanus</i>	
11.	<i>Cynodon dactylon</i>	Dub
12.	<i>Cymbopogon martini</i>	
13.	<i>Dicanthium annulatum</i>	
14.	<i>Eulaliopsis binata</i>	Bhabbar
15.	<i>Festuca pratense</i>	
16.	<i>Hemarthria compressa</i>	
17.	<i>Heteropogon contortus</i>	Lamb
18.	<i>Pennisetum orientale</i>	
19.	<i>Phalaris tuberosa</i>	
20.	<i>Poa pratensis</i>	
21.	<i>Saccharum spontaneum</i>	Kans
22.	<i>Schima notata</i>	
23.	<i>Themeda arudinacea</i>	
24.	<i>Themeda anathera</i>	

E. FOREST FAUNA

ZOOLOGICAL NAME
LOCAL NAME

ENGLISH / LOCAL NAME

GAME ANIMALS

A. CARNIVORES:

1.	<i>Hystrix indica</i>	Porcupine	Sail or sahi
2.	<i>Martes flavigula</i>	Himalayan Pine Martin	---
3.	<i>Panthera pardus</i>	Leopard or Panther	Bagh
4.	<i>Petaurista albiventer</i>	Large Red Flying Squirrel	Koryal
5.	<i>Selenarctos thibetanus</i>	Himalayan Black Bear	Kala Bhalu

B. HERBIVORES:

1.	<i>Nemorhaedus goral</i>	Himalayan Goat	Ghoral

2. <i>Cervus unicolor</i>	Shambar	Sambhar
3. <i>Moschus moschiferus</i>	Musk Deer	Kasturi Mrig
4. <i>Muntiacus muntjak</i>	Barkin Deer	Kakar
5. <i>Lepus nigricollis</i>	Common Indian Hare	Khargosh
6. <i>Susscrofa cristatus</i>	Indian Wild Boar	Jangli Suar

NON GAME ANIMALS

1. <i>Barbastella barbastellus</i>	Barbas Tello Bat	Chamgadar
2. <i>Canis aurs</i>	Jackal	Gidar
3. <i>Canis lupus</i>	Wolf	Bheria
4. <i>Felis bengalensis</i>	Leopard Cat	Chita Billi
5. <i>Felis chaus</i>	Wild Cat	Jungli Billi
6. <i>Funam bulus</i>	Five Stripped Squirrel	Gilhari
7. <i>Herpestes edwardsii</i>	Mongoose	Neola
8. <i>Lutra lutra</i>	Common Otter	Udbilao
9. <i>Macaca mulatta</i>	Monkey	Bandar
10. <i>Marmota baback</i>	Himalayan House Rat	Chuha
11. <i>Paradoxurus hermaphroditia</i>	Himalayan Palm Civit	House Cat
12. <i>Presbytis entellus</i>	Langoor	Langoor
13. <i>Scotophilus healthi</i>	Common Yellow Bat	Chamgadar
14. <i>Vulpes vulpes</i>	Red Fox	Lomari

F. FOREST AVIFAUNA

SCIENTIFIC NAME
LOCAL NAME

ENGLISH / LOCAL NAME

GAME BIRDS

PHEASANT & FOWL GROUP:

1. <i>Catreus wallichii</i>	Cheer Pheasant	Cheer/Cher
2. <i>Callus gallus</i>	Red Jungli Fowl	Jangli / Lal Murga
3. <i>Lophophors impejanus</i>	Monal	Monal
4. <i>Lophura lecomelana</i>	White Crested Kaleej	Kaleej
5. <i>Pucrasia macrolopha</i>	Kokalas	Kokalas

PARTRIDGE & QUAILS GROUP:

1. <i>Alectoris graeca</i>	Chakor Partridge	Chakor
2. <i>Arborophila farncolinus</i>	Hill Partridge	Peora
3. <i>Coturnix coromandelica</i>	Rain Quail	Bater
4. <i>Coturnix coturnix</i>	Grey Quail	Bater
5. <i>Francolinus francolinus</i>	Black Partridge	Kala Titar
6. <i>Francolinus pondicerianus</i>	Grey Partridge	Safed Titar
7. <i>Lerwa lerwa</i>	Snow Partridge	Koor Monal
8. <i>Perdica asiatica</i>	Jungle Bush Quail	Bater

PIGEONS & DOVE GROUP:

1. <i>Columba livia</i>	Blue Rock Pigeon	Kabutar
2. <i>Streptopelia spp</i>	Spotted Dove	Ghugi

OTHERS:

1. <i>Scolopax rusticola</i>	Wood Cock	Sham Kukra
2. <i>Treron sphenura</i>	Wedge Tailed Green Pigeon	Harial

NON GAME BIRDS

1. <i>Althana spp</i>	Common King Fisher	
2. <i>Aquila chrysetus</i>	Golden eagle	Girja
3. <i>Acridotheres spp</i>	Common Myna	Myna
4. <i>Corvus macrorhynchos</i>	Jungle crow	Junli Kaua
5. <i>Corvus splendens</i>	House Crow	Kaua
6. <i>Cuculus varius</i>	Cuckoo	Cuckoo
7. <i>Discrurus spp</i>	King Crow	--
8. <i>Falco peregrinus</i>	Shahin Falcon	Falcon
9. <i>Gyps himalayensis</i>	Himalayan Griffen Vulture	Gidh
10. <i>Picus squamatus</i>	Wood Packer	Kathphora
11. <i>Huhua neapensis</i>	Forest Eagle owl	Owl

12. <i>Ictinactus malayenges</i>	Black Eagle	
13. <i>Oriolus spp</i>	Golden Oriole	
14. <i>Passer domesticus</i>	House sparrow	Sparrow
15. <i>Thurdoides spp</i>	Jungle Babbler	
16. <i>Psittacula himalayana</i>	Parakeet	Tota
17. <i>Ploceus spp</i>	Common Baya	Baya
18. <i>Pycnonotus leucogenys</i>	White checked Bulbul	Bulbul
19. <i>Chloropsis spp</i>	Bulbul	Bulbuls
20. <i>Strixaluco nivicola</i>	Owl	Ullu
21. <i>Egretta spp</i>	Hérons Bagula	Bagula
22. <i>Gallinula spp.</i>	Indian Moorhens	Hans

G. REPTILES

SCIENTIFIC NAME

ENGLISH / LOCAL NAME

LOCAL NAME

SNAKES:

1. <i>Ancistrodon himalayanus</i>	Himalayan Pit Viper	Saap
2. <i>Bungarus caeruleus</i>	Common Indian Krait	Krait
3. <i>Naja naja</i>	Indian Cobra	Nag /Kharpa
4. <i>Ptyas moscosus</i>	Rat Snake	Dhaman

LIZARDS:

1. <i>Colotas vessicoloen</i>	Common Indian Lizard	Girgit
2. <i>Gecko hemidactylus</i>	House Lizard	Chhipkali
3. <i>Varanus monitor</i>	Common Indian Monitor Lizard	Gobilda

FISH:

1. <i>Allia coila</i>	Fish	Baranguli
2. <i>Barbus chilnadea</i>	Fish	Kali Machhi
3. <i>Barilius barile</i>	Fish	Bhareli
4. <i>Cirrhunia mrigala</i>	Fish	Marigal
5. <i>Labeo calbasu</i>	Fish	Kalbans
6. <i>Labeo dero</i>	Fish	Bhunga
7. <i>Labeo rohita</i>	Fish	Rohu
8. <i>Mystus seenghala</i>	Fish	Singhara
9. <i>Tor putitora</i>	Fish	Mahasheer

RAJGARH FOREST DIVISION

STATISTICS AT A GLANCE

1. Geographical area of the Division : 820.02 Km²
2. Total Forest Area : 259.867 Km²
3. Percentage of forest area to geographical area : 31.69%
4. Forest area by legal classification :

Forest Class	Area (ha)	% of Forest area	% to geographical area
Reserved Forests (R.F.)	12970.88	49.91	15.82
Protected Forests (P.F.)	2552.18	9.82	3.11
Unclassed Forests (U.F.)	3240.13	12.47	3.95
Mushterqua Forests (M.F.)	2650.05	10.20	3.23
Shamlat/Ceilingland Forests (S.F.)	4573.48	17.60	5.58
Total :	25986.72	100	31.69

5. Stocked area under various species :

Species	Area (Ha)
Chil	8555.02
Broadleaved (Scrub)	3389.17
Oaks	3295.29
Deodar	1803.87
Kail	1819.53
Mixed (Chil + Deodar+ Kail)	553.16
Spruce	448.78
Silver fir	319.55
Mixed (Spruce+fir)	977.03
Bamboos	50.00
Eucalyptus	15.80
Total Stocked area	21227.20

6. Unstocked area :

Categories	Area (Ha)
Culturable blanks	4178.17
Unculturable blanks	119.54
Included cultivations	461.81
Total unstocked area :	4759.52

7. Area by Working Circles :

Working circle	Area (Ha)	% to Total forest Area
The Chil	6143.11	23.64
The Deodar-Kail	4173.74	16.06
The Selection	2551.50	9.82
The Rehabilitation	4107.70	15.81
The Protection	2540.94	9.78
The Plantation	6469.73	24.89
The grazing overlapping	25986.72	100.00

8. People :

Total population	101650
Density (Person/Km ²)	195.47
Agricultural works	45.1% of population
Non-agricultural works	5.73 % of population

9. Live stock :

Population	0
Cattle	38597
Buffaloes	20449
Sheep and Goats	36989
Other	122517

10. Growing stock, increment and yield prescribed

Working circle	Species	Growing stock	C.A.I	Prescribed annual yield
		(m ³)	(m ³)	(m ³)
1. The Chil (387.77 m ³ /ha)	Chil	534477.9	14910.21	8000
2. The Deodar-Kail (541.75 m ³ /ha)	Deodar	1134237.12	17902.64	16100
	Kail	245692.81	5241.45	
	Chil	33196.62	867.01	595
	Fir/Spruce	26895.66	751.43	525
3. The Selection (735.2 m ³ /ha)	Spruce	247879.57	6467.45	6588
	Silver Fir	993370.06	23187.50	
	Deodar	26245.08	436.75	131
	Kail	33953.17	566.05	92
4. The Rehabilitation	Deodar + Kail (18.58 m ³ /ha)	76310.91	1713.34	300
	Chil (54.42 m ³ /ha)	223541.05	5461.44	2500
5. The Protection	Ban Oak	49715.66	--	---
6. The Plantation	Misc broadleaved (Scrub Forests) 15.33 m ³ /Ha	3629.47		

CHAPTER –I

THE TRACT DEALT WITH

1.1.1 NAME AND SITUATION: This Working Plan is a revision of Dr. M. B. Shrivastava's Plan. It covers the reserved, Protected, Un-classed, Mushterqua and Shamlat/ Ceiling Forests.

The Rajgarh Forest Division covers the Pachhad and Rajarh Tehsils of Civil district of Sirmour lying on either sides of River Giri between longitude 77°-1'-5" to 77°-26'-13" East and latitude 30°-38'-40" to 31°-1'-14" North. The area is bounded on the North and North West by Theog and Solan Forest Division; on the East by Chopal and Renuka Forest Division; on the South by Nahan forest Division and South-West by Ambala Civil District of Haryana State. The tract forms catchment of Giri and Ghaggar rivers. The length from North-East to South-West is approximately 47 Kms with a width of 31 Kms from North – West to South – East, however along the Giri River it is 20 Kms in width. Total geographical area of this division is 820.02 Sq. Kms divided into four territorial ranges- Habban, Rajgarh, Narag and Sarahan. The forest does not form a continuous compact belt but scattered throughout and forest coverage is 31.69% of geographical area. The divisional head quarter is situated at Rajgarh at an elevation of 1600 meters and connected with Solan, Habban and Nohra by metalled roads and with Bagthan, Braila and Tikri by fair weather roads. The Solan & Shimla cities are located 40 KM & 85 Km respectively from Rajgarh.

The entire Rajgarh Forest Division is covered on the **1:15000 Scales by survey sheets -53F/1/NE, 53F/1/SE, 53F/1/SW, 53F/2/NE & 2SE, 53F/2/NW, 53F/5/NE, 53F/5/NW, 53F/5/SE, 53F/5/SW, 53F/6/NW, 53E/8/SW & SE** and on the **1:50000 scale by 53E/8, 53F/1, 53F/2, 53F/5, 53F/6.**

1.1.2 CONFIGURATION OF THE GROUND: The tract is mountainous lying in outer and middle Himalayas with little South-West portion in Shiwaliks. It is cut up by deep and narrow valley separated by spurs and ridges. Giri flows almost in the middle and drains whole tract except the Ghinni valley draining into Ghaggar. The altitude ranges from 540 meters at Preet Nagar to 3402 meters at Chhogtali Dhar. The slopes are generally moderate to steep but precipitous along the ridges and in cut up areas.

1.1.3 THE MOUNTAIN SYSTEM: The tract is divided into two separate regions:

1. Trans-Giri Region-covering North –East half of the tract/Division.
2. Cis-Giri Region-covering South-Western half of the Division.

TRANS-GIRI REGION: The Chur peak situated at 3643 meters in Chopal Forest Division forms the nerve centre from which most of the important hill ranges in Trans Giri area emerge. There is a network of interlinked mountain ranges radiating from Chur peak, the main ridge running the West under the name Chur dhar bifurcate at a peak 3402 meters in to **Jadol dhar and Topi Dhar.**

Jadol dhar divides Rajgarh from Chopal Division and turns toward North-West from peak 2753 meters and known as **Kuftu ki dhar**. The Kuftu ki dhar further branches off at peak 2668 meters into **Painkufer dhar** ending in Giri River and **Jajyon dhar** which bifurcate into Lojla dhar endin in Basari river and Manal dhar which changes its name **Ghar dhar** near Baggar and furher branches of at peak 2026 meters above Majhgaon in to two dhars – Kunthial ki dhar and Kuru ki dhar terminating in Giri at junction of Basari Nadi and Khairi ka Khala respectively.

From Topi dhar at Julhasan Tibba, 3355 meters, Duni-thari dhar runs North-South and merges into Jalta ka Khala. Topi dhar further benches off, at distance of 750 meters from it, into Kheri ki dhar endin near Kalan in a tributary of Giri in the South-West. A number of dhars - Sen ki dhar, Cheon ki dhar, Gusan dhar, Basali dhar, Kuriya Karang dhar, Garol ki dhar etc. running parallel, originates from Kheri ki dhar and end in Nait ka Khala.

At Temple 2088 meters above Pab village Kheri ki dhar branches off into Churwa dhar, which runs through Rajgarh, Jagas and Dudhan merges into Giri near Yashwant Nagar with Sur dhar and Dudhan dhar as subsequent names.

Topi dhar at peak 2924 meters bifurcates into Ber ki dhar which ends in Bajhetu ka khala near Sarwa. Bathaudhar originates from Topi dhar peak 2738 meters and terminates in Pervi khad near Koti. Topi dhar at peak 2409 meters bifurcates into Jhimmi dhar endin at Bajhetu ka Khala and Naun dhar running till Haban. Beyond Haban, Naun dhar splits into Shivepur dhar, Deothi dhar and Haban dhar. Deothi dhar further branches off in to Kanog dhar, Ranaghat dhar and Dhaya-Pitli dhars and ends in Giri & Pervi.

CIS-GIRI REGION: The two important and independent ranges to the South-West of Giri River are - Sain dhar and Sarahan Dhartidhar. Sain dhar arises from confluence of Kawal and Giri rivers near Maryog and moves in South-Eastern direction, separating the Giri river from Mari ki ghat at North-Western end and from Jalal river at the South –Eastern end, before ending up at the confluence of Giri and Jalal near Dadahu in Renka Forest Division. Purra ki dhar originates from Sain dhar near Brahmani and merges in Jalal river whereas Sarera ki dhar originates at Barno and terminates in Giri. The Sarahan Dhartidhar enters Rajgarh Forest Division from Solan Forest Division near Prem Nagar and forms the watershed between the catchments of Giri on its North – East and that of Ghaggar river in its South-West. The Dhartidhar runs South-East wards from Prem Nagar to Naina Tikker and finally ends in Giri river.

Table 1.1.1: Important Peaks with Elevation (Meters) are given as under::

Sr. No.	PEAKS	ELEVATIONS (M)
1	JULHASAN TIBBA	3355
2	DONGA KANSAR	3158
3	SARANTI	3080
4	TOPI	2780
5	BANALI	2410
6	NAUN	2325
7	BATHAUDHAR	2297
8	KHERADHAR	2137
9	SURDHAR	2055
10	SAINDHAR	2046
11	SANGLAN KA TIBBA	2038
12	BARNO	2018
13	BHUR SINH DEVTA	1899

1.1.4 GEOLOGY, ROCK & SOIL: The rocks found in the area comprises of sand stone, shale, slate, lime stone and schist deposited during the period stretching from 1 to over 600 million years ago when it was all a vast sea, now called Tethys. The only life that might have existed during that time must have been soft bodied unicellular creation which nature could not preserve for such a long stretch of time. The fluctuation in depth and expanse of sea, the variation in the nature of sediments brought by feeder channels and physico-chemical conditions of the sea water led to deposition of various groups of sediments having a thickness of several Km, layer by layer often thinner than a millimeter. The sequence of deposition was seldom smooth and continuous. The large boulders in blaini formation indicate complete glaciations all over the area. The major disturbance was rise of Himalayas by the bulking of sediments in the Tethys due to collision of Northward floating Indian subcontinent with the Chinese main land and then followed a lull for many million years during which huge sediments were deposited in shallow depressions created by Himalayan uplift. The climatic conditions improved and so those that shallow waters were abode of giant size animals which continued to live till the next glaciations when it made impossible for animals of that size to survive. The second mountain building activity led to rise of low Siwalik ranges. The instability created by rise of Himalayas and Siwalik is still observed and the fact that Himalayas is still rising.

Geologically Rajgarh Forest Division is dividable in to thee zones:-

1. Sub Himalayan or Siwaliks zone.
2. Outer Himalayan zone.
3. Middle Himalayan zone.

(1) SUB HIMALAYAN OR SIWALIKS ZONE: It is confined to Ghinni valley / Ghaggar catchment and cosists of sediments of tertiary age. The elevation ranges up to 1500 meters. The rocks of this region are represented by Lower Siwaliks Formation which is composed chiefly of alternating beds of fine grained usually grey, rather friable sandstone and of clay usually bright red in colour which weathers in nodular manner. Large pockets of conglomerate, shale and veins of red marl are also present in this tract. All these are very friable and loose and are easily eroded by water. The soil varies in texture, depth and colour from place to place. Clay soils are predominant along spurs and sandy loam down bellow. The soils, all over this region is shallow in depth and poor in fertility, thus supporting only broad leaved scrub forests with few exceptions of chil forests.

(2) OUTER HIMALAYAN ZONE: This zone is confined to South-West of Giri and extends up to Siwaliks formation of the Ghinni valley, Saindhar and Dhartidhar falls under this zone and the elevation ranges up to 2046 meters. The strata are similar to sub Himalayas except upper layer which is of harder sandstone. The main rocks are sandstone, shale, pockets of lime stone, clay and conglomerates. Scattered out crops of micacios schist are also met with. Sandstone with a greenish tinge, with occasional pockets usually reddish coloured stones of comparatively loose texture predominates in this tract in general and on Dhartidhar I particular. The rock formation of the Trans-Giri .i.e. middle Himalayan zone consisting of shale, slate and iron ores emerges out, at places, to the South-West side of Giri river and overlaps with the outer Himalayan formation. It completely replaces the sandstone in a

narrow belt along the South-Western bank of Giri river and is found in mixture with the sand stone in patches, on the North-Eastern slope of Saindhar.

On the basis of nature and age, the rocks have been classified into formation as under:

Sr. No.	Formation	Age
(i)	Kasauli	Lower Miocene
(ii)	Dagshai	Lower Miocene
(iii)	Sabathu	Middle Eocene to upper Oligocene
(iv)	Karol	Permo Carboniferous
(v)	Infra-Karol	Permo Carboniferous

- (i) **Kasauli Formation:** Mainly comprises of sandstone with minor argillaceous bands. The shale is soft, gritty and weather into angular splintery chips, and are exposed in pockets in Sarahan and Narag Ranges. This bears clay loam to sandy loam soils supporting chil crops. Pockets of miscellaneous broad leaved species are found on poor soils on Southern slopes.
- (ii) **Dagshai Formation:** This formation covers major portion of Sarahan and Narag Ranges-South Jalal and Marighat ka Khala. The formation comprises of very hard grey and purplish sandstone, intercalated with seams of real clay. Soil is clay loam supports dense chil forests.
- (iii) **Sabathu Formation:** This formation is found in pockets along Jalal and consists of olive green and purple shale, green and white sandstone, unstained quartzite and shale limestone. Soil is clayey loam supports chil crops.
- (iv) **Karol Formation:** This formation is found in Bhaji, Saru, Mangarh, Bagh (Saindhar) and comprises of sandstone, red shale, massive limestone conglomerate, soil derived from this formation is shallow clayey loam. Most of the tract is devoid of vegetation except for a few pockets of chil.
- (v) **Infra Krol:** This formation is comprises of shaly slate with thin carbonaceous quartzite bands and exposed at Narag and Ajga. Soil formed is clayey loam with mainly chil.

The Northern-Eastern aspects of Outer Himalayan Zone, in general, have fairly deep soil with good admixture of sand & clay which support practically the whole bulk of chil forests of the division. The Southern aspect, however, have generally a poor and dry soil which support only broad leaved scrub forests with grassy blanks. Few patches of chil are also found at places along the upper reaches of Dhartidhar.

- (3) **MIDDLE HIMALAYAN ZONE:** The Trans-Giri area of the division fall in this zone, it is composed of crystalline and metamorphic rocks, such as granites, gneiss limestone, shale, slate, mica, schist, Quartzite with unfossiliferous deposits of ancient origin. The height ranges up to 3402 meters. Granite and gneissic rocks are generally confined to the higher regions of the tract.

The rocks of the zones have been classified groups, formations and series as under:

Sr. No.	Classes	Age
(i)	Jatog	Archean
(ii)	Chur granite	Archean to late palaeozoic
(iii)	Shimla Group	Lower palaeozoic
(iv)	Jaunsar Series	Carboniferous
(v)	Blaini	Upper Carboniferous

- (i) **Jatog Formation:** Exposed in the West, North-West and South-West of Churdhar in Rajgarh and Haban Ranges. Starting from Julhasan Tibba on Churdhar in the East, it extends to Pirag, Tikri, Rajgarh, Baila, Palu, Haban etc. The formation consists of carbonaceous slates, phyllitic schist with carbonaceous limestone. It supports deep, fertile, micacious clayey loam soils which carry dense oak, silver fir, spruce and deodar forests.
- (ii) **Chur Granite:** Exposed along Churdhar in Rajgarh & Haban Ranges and comprises of coarse grained prophyritic and ganetiferous granites and gneiss. Soil resulting from this formation is clayey loam, shallow to moderately deep and supports Oak, Silver fir, Spruce forests and Temperate Pastures.
- (iii) **Shimla Group :** Exposed in the North and North-West of the division along Giri and also in Dudhan. Soil is clay to clayey loam supporting Chil forests.
- (iv) **Jaunsar Series:** Exposed as a small outcrop in the North-West and extend to the East where these become broader, starting from Deothi-Majhgaon-Tharu to division boundary near Lojla and Ghar dhar. Lower most Mandhali formation consists of massive limestone, pale green or purpled slate and shale with leuticular limestone. The upper most Nagghat formation is characterized by quartzite, slate, conglomerates and sporadic boulder beds. Soil is clayey loam supporting deodar, Kail and Oak forests.
- (v) **Blaini Formation :** Exposed in pockets near Ranaghat, Dhaila, Tharu etc. and emerges in outer Himalayan zone near Narag. Occurs as thin lenticular outcrop and comprises of carbonaceous shale, slate, silt-stone, purpled dolomitic limestone and entra bedded red shale. Soil is clayey loam supporting deodar, Kail and Oak forests.

SOILS:

A very ferruginous red and black soil, with reddish deposit in the water springs is observed in many places. This indicates the presence of iron ores in the locality. In the lower regions mostly along the Giri River, yellow, blue and black argillaceous shale and white calcareous shales, change the colour of the soil at places. Outcrop of bluish black slates are also found in places. The high rides branching from Churdhar have pockets of shallow clayey loam soil, logged in outcrop of granitic and gneiss rocks near the top. Lower down though the slopes are quite steep, still deep clayey loam soil, quite rich in mums, is found under dense oak, silver fir and deodar forests. Else where, on the Northern and Eastern aspects wherever the slopes are moderate and are stocked with tree growth, a

fairly deep clayey loam soil occurs. All grassy blanks and specially those of Southern and Western aspects, have shallow clayey loam soil with low fertility. The alluvial terrace deposits are formed along the banks of river and streams throughout the division.

1.1.5 CLIMATE: Climate varies with altitude. The tract lies in the subtropical zone, areas above the 1500meters in elevation experience temperate climate condition and those above 3500 meters experience alpine winters. At lower elevation up to 1500 meter along Giri and Ghaggar, in their side valley and on Southern aspects the summers are hot when the temperature rises to 42°C and winters are cold, when the temperature comes down to below 0°C. Areas above 1500meters experience snowfall during winters which do not stay long below 2150 meters as its intensity is directly proportional to elevation. Frost is common from November to February in most of the areas.

Seasons are well marked- winter from end November to February, spring March to April, summer May to June, Rainy season July to September and autumn from October to November. The Changes over from winter to summer is gradual. The area receive bulk of annual precipitation from the South-East monsoon, starts by end of June and last till mid September. Draught occurs both in pre and post monsoon period. Winter rains occurs from December to February. March, April, May, October and Novembers are generally dry months. Occasional hail storms from April to June are common.

Climate exercise a powerful influence in the distribution and growth of species. Moisture and temperature are, by far, the most important site factors for plant growth. For better management of forests, knowledge of rainfall pattern and temperature variations are essential. Meteorological stations are meager in the division. Reliable climatic data is not available. Whatever available is either insufficient or incomplete.

1.1.6 RAINFALL: The average annual rainfall is about 1500mm out of which about 60% i.e. 900mm of precipitation is received during monsoon months. Monthly average Rainfall Data (mm) and Monthly Rainy days for the period 1991-2010 are given in the Table 1.2.2 & 1.2.3 respectively.

Table 1.1.2: Monthly average Rainfall Data (mm) for the period Jan 1991 to December 2010

Month	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Jan	8.4	142.8	117.6	43.6	77.0	96.6	54.0	15.1	195.0	64.7	25.8	26.4	39.6	112.4	67.8	68.0	Nil	44.1	21.3	11.5
Feb	84.6	71.3	66.4	106.2	92.7	110.6	15.0	87.1	17.3	121.5	5.0	101.8	101.6	9.4	142.4	4.4	228.0	31.0	29.3	97.0
Mar	85.4	52.4	107.8	4.6	60.7	88.4	58.6	125.5	15.6	5.8	56.4	119.4	57.6	0.0	56.9	106.7	174.0	0.0	43.2	1.0
Apr	67.6	10.0	5.2	85.8	38.8	4.6	129.2	46.6	0.0	59.4	55.0	89.4	43.4	35.0	5.0	24.6	6.2	38.4	26.5	2.7
May	51.0	39.2	49.0	23.8	4.0	26.6	60.4	63.0	196.3	119.0	68.2	26.6	33.0	64.8	11.4	78.8	19.6	95.9	30.2	48.2
Jun	80.3	148.8	130.0	121.6	95.4	176.2	94.2	185.1	133.4	392.5	320.2	92.6	102.6	91.8	27.0	103.4	86.0	261.5	37.3	168.8
Jul	182.2	158.1	305.8	246.4	350.1	85.2	69.5	206.4	462.2	587.9	155.6	118.4	318.2	87.2	368.6	243.9	111.1	120.2	183.1	484.6
Aug	272.4	315.8	45.0	210.2	465.4	353.2	422.0	100.8	148.2	109.3	210.8	302	192.4	339.6	58.2	252.2	342.6	243.3	67.5	171.4
Sep	114.4	172.7	183.4	57.6	235.2	198.2	43.2	199.7	149.4	9.9	1.0	230.6	131.0	88.8	157.6	47.8	59.8	348.9	408.0	346.6
Oct	13.0	0.0	0.0	57.6	0.0	36.8	45.6	264.0	0.0	0.0	0.0	15.0	0.0	95.8	0.0	9.4	52.8	13.5	2.2	41.7
Nov	0.0	24.6	9.3	3.4	4.6	0.0	59.2	0.0	0.0	0.0	0.0	0.0	4.8	4.0	0.0	14.2	0.0	5.4	14.7	21.8
Dec	97.2	0.0	0.0	19.1	8.8	3.4	85.2	0.0	3.0	0.0	12.4	0.4	37.0	6.0	11.4	16.0	10.0	8.7	0.0	70.2

(Source of data: Dr Y S Parmar University of Horticulture & Forestry Nauni, Solan)

Table 1.1.3: Monthly Rainy days for the period 1991-2010

year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Jan	4	7	10	4	6	7	4	5	10	7	3	3	4	5	9	4	0	4	4	2
Feb	7	5	7	6	9	6	5	7	3	6	1	6	6	1	9	2	10	6	1	5
Mar	9	6	10	2	7	8	9	7	3	5	3	6	5	0	8	10	8	0	5	1
April	4	2	2	8	7	4	12	5	0	3	5	4	4	5	2	2	1	5	4	1
May	4	3	6	4	1	5	9	5	13	8	6	2	3	3	2	7	4	12	6	3
June	9	9	12	7	7	4	11	8	11	11	13	9	6	11	5	11	10	20	4	10
July	13	20	14	16	23	8	14	15	17	16	13	7	16	10	20	19	10	13	11	22
Aug	18	8	7	18	23	17	18	14	13	9	9	6	9	14	7	19	13	18	8	23
Sep	5	9	11	7	7	10	7	10	7	5	0	10	7	3	10	7	6	6	10	16
Oct	1	0	0	1	0	3	9	3	0	0	0	2	0	6	0	3	0	3	1	2
Nov	0	3	1	0	1	0	5	0	0	0	0	0	1	2	0	2	0	1	3	2
Dec	5	0	0	4	1	1	5	0	1	0	1	0	2	1	1	5	3	2	0	2

(Source of data: Dr Y S Parmar University of Horticulture & Forestry Nauni, Solan)

Table 1.1.4: Monthly average maximum temperature (°C) for the period Jan 1991 to December 2010

Month	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Jan	16.0	16.0	15.7	17.9	15.5	16.4	17.4	17.6	17.9	18.7	19.8	18.2	19.9	20.6	21.6	17.2	21.0	19.8	17.9	18.0
Feb	17.5	16.8	20.6	17.4	17.2	18.8	18.1	18.7	22.5	17.0	22.6	19.5	19.6	21.1	18.8	20.0	30.6	19.9	22.4	17.9
Mar	21.6	20.8	20.2	24.9	21.9	22.8	22.8	20.8	25.6	22.6	24.5	24.4	23.5	23.9	23.9	27.2	24.9	26.8	28.6	24.0
Apr	25.1	26.6	27.5	24.7	26.1	27.5	24.5	28.3	32.3	30.8	27.8	29.0	29.2	29.2	30.9	29.1	28.8	31.8	30.9	28.5
May	31.3	29.7	32.8	32.4	32.2	31.2	29.2	32.3	31.7	32.3	31.7	33.3	31.8	32.1	33.2	30.0	30.8	32.5	33.1	31.9
Jun	30.6	30.9	31.5	32.3	33.8	30.0	29.5	31.5	30.4	28.6	28.4	31.4	33.0	31.4	32.5	27.5	33.3	39.3	30.5	34.9
Jul	30.9	28.0	27.5	27.5	27.8	28.2	29.5	29.4	28.2	27.3	28.5	30.6	28.7	29.0	30.4	28.8	29.0	27.7	20.4	29.0
Aug	27.2	27.5	29.1	27.0	26.1	27.2	27.0	28.3	28.3	28.7	28.4	27.9	28.8	29.0	29.0	27.9	28.4	27.7	27.9	29.0
Sep	27.8	27.7	26.5	27.3	27.3	27.2	27.5	27.2	27.9	28.5	29.8	26.6	28.1	29.6	28.1	27.6	27.1	26.9	31.0	29.1
Oct	25.8	26.5	26.5	26.0	26.5	26.1	22.7	26.4	27.4	28.2	28.1	26.4	27.8	28.1	28.4	27.0	26.2	27.1	25.3	27.1
Nov	21.2	22.1	23.9	22.7	23.2	23.3	20.6	24.4	24.7	23.3	24.5	23.9	23.6	24.2	25.0	25.2	22.2	24.4	23.8	24.6
Dec	17.8	20.5	21.0	18.8	18.5	20.9	17.1	23.0	21.8	22.0	21.0	20.7	20.6	21.7	22.3	24.0	19.2	19.9	22.5	21.8

(Source of data: Dr Y S Parmar University of Horticulture & Forestry Nauni, Solan)

Table 1.1.5 Monthly average minimum temperature (°C) for the period Jan 1991 to December 2010

Month	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Jan	1.7	3.8	2.2	3.8	1.6	1.9	1.0	2.4	2.5	3.7	1.8	2.3	3.4	1.2	2.4	2.3	1.5	1.8	2.7	2.7
Feb	4.8	3.2	5.8	3.3	3.9	4.7	2.7	4.8	5.2	2.4	4.3	4.5	7.8	4.8	4.0	3.0	3.7	5.0	4.7	4.7
Mar	8.2	8.2	6.2	9.5	7.3	9.2	8.3	5.8	8.0	7.7	8.0	8.8	8.2	7.5	8.9	8.4	9.3	8.4	10.1	8.5
Apr	11.1	11.8	11.3	10.4	10.2	12.3	10.9	11.2	13.5	13.1	13.0	12.9	12.2	13.3	12.5	16.6	13.8	12.4	14.1	11.2
May	16.3	15.1	16.3	15.7	16.7	15.7	13.9	15.6	16.9	17.8	17.2	17.0	17.3	16.7	15.1	15.9	16.3	15.4	16	15.3
Jun	18.3	17.8	19.5	19.1	20.0	18.4	17.3	18.5	18.0	18.4	18.6	19.1	17.9	19.1	18.7	18.5	18.3	19.7	17.8	19.0
Jul	20.2	19.4	19.9	20.5	20.2	20.0	20.5	20.4	20.0	20.0	20.7	20.2	20.9	20.0	20.2	19.5	20.5	20.5	19.6	20.3
Aug	19.9	19.9	19.5	20.2	24.2	19.7	19.4	94.1	19.2	19.7	20.2	19.9	19.8	20.0	19.7	18.8	20.2	20.1	19.2	19.4
Sep	17.3	16.7	17.3	16.6	16.3	17.0	16.9	17.9	17.9	16.0	15.2	15.4	16.6	17.7	15.8	15.6	17.3	18.3	16.6	17.8
Oct	9.7	10.4	9.2	9.9	11.1	9.7	9.6	12.6	10.3	10.8	11.2	10.0	11.3	9.2	10.9	9.7	10.5	9.5	10.4	10.4
Nov	5.2	6.6	6.2	6.1	5.8	5.0	6.4	6.3	5.6	7.2	6.6	6.1	6.7	5.1	5.9	5.0	6.1	4.9	5.9	5.0
Dec	3.5	2.9	3.0	3.8	3.8	1.3	2.9	2.2	2.6	2.7	3.6	3.5	3.5	2.3	4.0	1.9	1.2	3.5	4.1	1.4

(Source of data: Dr Y S Parmar University of Horticulture & Forestry Nauni, Solan)

Table 1.1.6: Monthly average Sunshine hour for the period 1991-2010

year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Jan	6.9	5.6	5.7	6.0	6.3	6.3	6.7	6.6	0	0	7.8	6.7	7.3	5.7	6.0	6.0	7.6	4.7	5.7	6.7
Feb	6.0	7.7	6.8	6.9	6.1	6.7	7.7	6.0	0	0	7.3	5.9	6.5	7.8	3.8	6.0	4.2	6.5	7.8	6.4
Mar	6.8	6.2	6.9	8.4	7.4	6.7	6.0	6.8	0	0	8.1	8.4	7.6	9.1	6.8	6.6	8.2	8.3	7.4	8.1
April	8.0	8.5	-	7.8	8.2	9.0	8.2	8.6	0	0	8.1	8.1	8.7	6.5	8.2	7.2	9.5	-	9.2	7.2
May	9.9	9.7	9.6	9.9	8.6	9.6	9.1	9.2	0	0	9.3	9.7	9.8	9.7	8.7	7.7	8.2	6.3	5.5	7.1
June	8.9	7.4	8.6	7.7	8.7	5.4	5.5	3.4	0	0	5.1	6.5	6.8	6.6	4.2	5.9	5.3	1.6	7.9	6.1
July	7.1	4.4	5.1	3.4	4.0	4.9	4.4	0	0	0	4.2	7.3	4.1	6.2	2.7	2.8	4.3	3.3	4.8	2.4
Aug	4.4	4.5	7.7	3.4	2.6	3.6	4.2	0	0	5.7	5.9	3.8	4.3	3.7	6.5	3.7	3.3	4.0	5.1	2.4
Sep	7.4	7.0	6.0	6.8	7.7	6.1	6.6	0	0	7.7	9.0	6.6	5.1	7.2	4.8	7.0	5.7	7.4	6.5	4.3
Oct	9.8	9.3	10.2	9.4	8.8	9.3	6.0	0	0	9.5	8.9	9.1	9.6	7.0	9.2	8.5	8.9	8.5	8.7	8.2
Nov	8.0	7.8	8.7	8.5	8.9	8.9	6.6	0	0	7.3	8.6	8.4	7.4	8.0	8.4	7.6	7.0	8.1	6.6	7.4
Dec	6.7	7.4	8.2	5.9	6.0	8.0	5.3	0	0	7.8	7.5	6.7	5.8	6.2	7.6	5.5	6.4	7.9	5.7	6.3

(Source of data: Dr Y S Parmar University of Horticulture & Forestry Nauni, Solan)

Table 1.1.7: Month wise temperature range for the period 1991-2010

Year	January		February		March		April		May		June		July		August		September		October		November		December	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1991	8.0-25.5	-2.0-9.0	9.0-24.5	0.0-9.0	14.0-28.5	3.0-13.5	18.0-31.0	6.5-15.0	27.0-33.5	11.5-21.0	27.0-34.5	15.0-21.5	26.0-35.0	15.5-22.5	23.0-30.0	18.0-21.5	26.0-29.0	12.5-20.5	19.5-28.0	7.5-13.5	14.0-24.5	2.0-8.5	5.5-24.0	0.0-8.0
1992	8.0-23.0	0.0-8.5	7.5-22.5	0.0-9.0	13.0-24.5	4.0-12.5	23.0-31.0	8.0-18.0	23.0-34.0	11.0-19.5	25.5-35.5	15.0-21.0	22.0-30.5	17.0-21.0	22.5-36.0	19.0-23.0	24.5-30.0	12.5-21.0	24.0-29.5	7.0-15.0	11.0-24.5	2.0-9.5	15.0-22.5	1.0-5.0
1993	6.5-22.0	-1.0-7.5	9.5-26.0	0.0-10.0	14.5-25.0	2.5-10.5	21.0-34.0	5.5-17.5	27.5-36.0	11.0-22.0	27.0-36.5	14.0-24.5	21.0-31.5	17.0-23.5	21.0-31.0	17.5-21.0	21.0-29.0	12.0-19.0	23.5-28.5	5.5-13.0	21.0-28.5	2.5-10.0	18.5-25.0	0.0-6.0
1994	8.0-23.0	0.0-10.5	8.5-22.0	0.5-8.0	21.0-29.0	4.5-14.0	18.5-29.5	7.0-13.0	25.0-39.0	12.5-21.0	24.5-36.5	15.0-23.5	21.5-32.0	19.0-22.5	22.0-29.5	18.5-21.0	23.5-30.0	11.5-20.5	24.0-28.0	6.5-17.0	20.5-25.5	4.0-8.5	14.0-23.0	0.5-9.0
1995	10.5-20.0	0.0-4.5	10.0-23.0	1.0-9.0	16.5-29.5	3.5-14.0	21.5-32.0	5.0-16.0	28.5-35.1	11.0-21.0	22.0-37.7	12.0-24.0	23.0-31.7	18.0-22.0	21.0-29.5	2.5-23.0	21.5-30.5	13.5-20.5	19.0-29.0	7.0-15.0	17.0-26.0	3.0-7.5	16.0-22.5	0.5-8.0
1996	9.5-21.0	0.0-6.0	10.0-24.0	2.0-8.5	15.5-27.0	6.0-14.0	21.5-31.0	6.0-17.0	27.0-35.0	11.0-19.0	24.0-34.5	11.0-21.5	23.5-31.0	16.0-23.5	21.0-29.5	16.0-21.5	22.5-29.0	12.0-22.0	22.0-28.5	6.5-14.5	19.5-26.0	1.5-10.5	18.0-24.0	-0.5-5.0
1997	10.0-21.0	-1.5-5.0	12.5-25.0	0.0-10.0	19.0-27.0	4.5-12.0	16.0-30.5	4.5-15.0	24.5-32.5	10.0-18.5	25.0-34.0	13.0-20.5	26.0-33.0	19.5-23.0	21.5-30.5	16.5-22.0	19.0-29.0	11.0-20.0	13.5-26.0	7.0-12.0	14.0-25.0	4.0-10.0	13.0-21.5	-1.0-7.0
1998	13.5-22.0	0.0-7.0	10.0-24.0	2.0-8.5	15.5-25.5	0.0-9.5	23.0-32.0	8.0-15.5	26.0-37.0	10.0-22.7	20.5-36.5	14.8-21.5	26.4-32.5	18.6-23.5	23.5-31.0	21.9-18.7	21.5-31.4	16.3-19.8	15.4-29.8	8.0-16.5	18.0-27.5	2.2-10.0	19.9-26.6	0.5-7.0
1999	8.5-22.5	0.0-9.0	13.0-28.5	0.5-9.0	21.9-32.5	3.2-13.4	29.4-35.8	9.2-17.4	25.5-37.0	13.4-22.0	24.2-33.8	12.5-22.0	22.0-30.5	17.5-22.5	21.5-31.5	16.0-21.5	19.8-29.8	15.0-19.7	25.8-29.0	7.8-16.0	20.0-27.5	3.0-9.2	17.2-32.0	0.5-5.2
2000	11.5-24.9	-3.0-11.0	8.8-23.5	-0.5-7.0	15.2-30.5	3.0-13.5	26.5-33.5	9.2-18.5	27.5-35.0	14.9-21.5	20.0-33.2	14.0-21.8	20.5-31.5	17.0-22.5	26.0-30.7	16.0-22.8	26.0-30.2	10.5-20.5	24.5-31.0	8.5-14.0	18.5-26.0	2.0-11.5	17.0-25.8	1.0-6.5
2001	9.5-27.0	-1.0-6.5	19.5-25.0	-1.0-10.5	16.5-29.0	2.5-16.5	19.5-34.0	7.0-18.5	23.5-37.0	13.0-21.5	24.5-31.5	15.5-22.5	25.5-30.7	19.5-22.0	24.0-30.8	17.0-21.5	28.5-32.0	11.5-19.0	26.0-30.0	8.5-18.0	20.0-30.2	4.0-11.0	11.0-25.5	0.0-7.5
2002	13.5-24.0	0.0-8.5	12.0-25.0	1.5-9.5	11.0-29.0	3.8-15.0	19.5-34.5	9.0-17.0	21.5-36.5	14.5-20.0	26.0-35.0	15.5-22.5	28.0-33.0	18.0-22.5	21.0-32.0	17.5-21.5	19.5-29.5	11.0-19.5	23.5-30.0	6.5-14.0	20.5-26.0	3.5-10.0	10.5-24.5	-0.5-8.0
2003	10.0-23.5	-1.5-6.0	13.5-24.5	1.0-9.0	16.0-28.0	1.0-13.0	23.5-33.5	10.0-15.5	26.0-36.2	10.5-22.0	27.5-37.8	16.0-25.0	24.5-32.0	18.5-22.5	23.5-31.0	18.0-21.5	24.5-30.5	11.0-22.0	25.5-29.5	7.5-12.0	15.0-27.5	1.5-9.0	14.0-24.0	-0.5-9.5
2004	7.5-26.5	-1.0-9.0	13.0-28.5	0.0-9.0	24.0-32.5	5.0-15.0	25.5-34.5	10.5-18.0	24.5-38.0	8.5-23.0	28.0-34.5	14.5-21.5	24.5-35.0	16.0-22.5	21.5-31.0	16.5-22.0	22.0-32.0	12.5-21.0	22.0-29.0	5.0-18.0	21.0-25.5	4.5-7.0	16.5-26.0	-1.0-12.5
2005	12.5-25.0	-1.0-9.5	12.5-23.5	1.5-7.0	19.0-27.5	5.5-12.5	23.5-32.0	6.5-18.0	24.5-35.5	11.0-20.5	31.5-39.0	15.5-22.5	26.0-31.5	18.0-22.5	26.0-32.0	15.0-22.5	26.0-32.0	14.0-20.5	25.0-29.5	6.5-15.5	21.0-27.7	2.4-9.0	18.0-24.7	0.2-4.5
2006	14.8-27.0	-1.0-8.5	23.2-29.2	4.5-11.0	18.2-27.2	3.8-13.2	24.5-34.0	6.0-17.4	27.4-35.4	12.8-19.6	26.7-36.0	16.5-21.0	24.0-32.4	18.8-26.5	25.4-32.0	17.8-22.4	25.5-32.0	12.0-20.0	23.0-31.5	8.0-15.0	19.8-27.6	1.2-10.4	15.5-27.0	0.0-9.0
2007	17.5-27.5	-3.4-7.0	10.0-24.5	1.4-8.5	16.0-31.7	2.2-13.0	28.0-34.2	9.0-16.0	28.5-34.5	12.0-20.0	26.0-39.0	16.0-24.2	27.0-32.2	18.0-21.5	21.0-32.0	18.0-22.2	24.5-31.5	11.0-21.4	26.0-31.0	5.2-16.0	17.0-27.7	3.0-8.5	12.0-27.0	-1.0-5.5
2008	10.5-25.0	-2.8-11.0	9.0-27.0	-2.8-11.0	20.2-30.0	6.5-12.5	16.5-35.5	8.0-16.5	27.0-36.5	12.8-24.2	23.5-30.5	17.0-22.0	24.5-31.0	18.0-21.5	24.0-30.4	17.0-21.6	19.0-29.5	11.5-18.5	23.2-28.6	7.0-18.2	22.5-28.5	3.4-10.0	18.5-26.6	1.0-7.0
2009	16.5-30.6	0.5-5.5	19.5-25.5	0.0-7.2	18.5-29.5	5.5-12.4	19.0-34.5	9.5-23.5	25.0-35.4	13.4-19.4	27.0-36.3	15.6-23.2	24.0-32.5	16.5-22.0	23.5-33.0	15.2-21.5	19.5-29.6	13.0-18.6	24.0-29.7	5.5-17.0	19.0-26.5	1.7-8.4	16.4-22.8	-1.0-6.7
2010	12.5-23.2	-1.0-6.2	14.5-25.2	0.0-8.4	21.5-31.4	4.7-13.5	28.5-35.5	9.2-18.4	23.0-36.5	11.0-21.4	17.1-35.7	13.0-26.0	21.0-31.0	18.5-24.0	24.0-29.5	17.8-20.8	21.5-30.0	11.8-21.5	24.0-29.5	5.8-14.6	20.0-26.7	1.8-10.0	10.5-23.5	-1.5-4.5

(Source of data: Dr Y S Parmar University of Horticulture & Forestry Nauni, Solan)

1.1.7 SNOWFALL: snowfall is heavy on higher reaches of Haban and Rajgarh ranges and descends down to 1500 meter but occasionally comes down to 1000 meters as evident from 1990-91 winter snowfall.

Snow above 2000 meters lasts long and the works in such areas are suspended during the winter months, however, no snowfall data is available.

1.1.8 TEMPERATURE: Temperature has wide range due to variability in altitude and physical land features. The Siwalik zone is intense hot during summer day and comparatively cooler during nights. Hot winds and dust storms are common during this period and produce a desiccating effect. In Ginni valley and Southern slopes of Saindhar and Dhartidhar, though the day temperature in summer may be as high as 42°C, the nights are rather cool and dewy. During winter the day temperature falls as low as 10°C. Nights are much cooler; temperature may fall down to zero or even less on severe cold nights. The Temperature in Himalayan zone is milder during summer but the winters are very cold. No Temperature data for the division is available. The data regarding Minimum & Maximum Temperature, Average Sunshine Hour and Month wise Temperature Range from the UHF campus Nauni (1240 m) adjoining to this division along the Kawal Khad is available from 1991-2010 which is depicted in **tables 1.1.4, 1.1.5, 1.1.6 & 1.1.7** respectively.

1.1.09 WATER SUPPLY: The major river of the tract is Giri and Ghaggar. The principal tributaries of Giri are- Gamber, Jalal, Kawal, Bajhethu, Pervi, Nait, Dabresh, Arkati, Baghni and Basari. The main tributaries of Ghaggar river are Gamolti, Dehi, Bara-chakli etc. Both the rivers are perennial and streams, though in summer the water flow diminishes considerably in the smaller courses.

Catchment of small streams in Trans-Giri region are generally well protected with vegetal cover and water flows in them and local springs is maintained throughout the year. In Trans –Giri zone the fields are irrigated by small kuhals taken from the streams.

Generally there is shortage of water from April to June In Cis-Giri region. People have to bring drinking water from long distances. Nurseries and young plantations suffers from drought and large scale mortality is common.

The water supply is precarious in Siwaliks (Ghinni valley). Small streams generally dry up in summer except in Bawaries-perennial water springs, which are the main source of drinking water. Water is being carted over considerable distances for labourers and workmen in this region during March to June. The depletion of vegetal cover, forest fires and heavy incidences of grazing are the main causes of water scarcity.

Recently lift and gravitational water supply schemes have been taken up in some areas. The tap water has been supplied in majority of the habitations with execution of such schemes. With the proper water management, the drinking water requirement of the tract can be fully met with.

1.1.10 DISTRIBUTION AND AREA: The gross geographical area of the division is 820.02 sq. km. Forest occupy an area of 259.867 sq. km which is 31.69% of the geographical area. The class wise details are given in table 1.1.8.

Table 1.1.8: Legal Classification and Area distribution of Forest.

S. No	Legal Classes of Forest	Area (Hac)	Area (Sq. Km)
1	Reserved Forests	12970.88	129.71
2	Protected Forests	2552.18	25.522
3	Un-classed Forests	3240.13	32.40
4	Mushterqua Forests	2650.05	26.50
5	Shamlat & Ceiling land Forests	4573.48	45.735
	TOTAL	25986.72	259.867

Source: As per office Record of DFO Rajgarh

Shamlat and Ceiling land Forests transferred to Forest Department for control and management. During 1985-87 part of the land vested in the Government under: -

1. The Himachal Pradesh Ceiling on land Holding Act, 1972
2. The Himachal Pradesh Common Land Vesting and Utilization Act, 1974.

(Herein called Shamlat and Ceiling land Forest) have been transferred from Revenue to Forest Department for management. The total area transferred 4771.49 hac out of which 4573.48 hac had been stock mapped and described under the expired plan. The Khasra number with small areas not forming compact blocks had been excluded by from the plan. The range wise details of the areas are given in the table 1.1.9.

Table 1.1.9: Range wise distribution of Shamlat / Ceiling land Forest (Hac).

Ranges	Total Area	Covered in the Working Plan
Haban	135.22	135.22
Rajgarh	145.70	145.70
Narag	1871.68	1740.40
Sarahan	2618.89	2552.16
Total	4771.49	4573.48

Source: As per office Record of DFO Rajgarh

The division is divided into four ranges for administrative purposes. The distribution of forest areas in ranges is given in Table 1.1.10.

The Forests names remained same as given in the notification of reserved, protected and un-classed forests. The old numbers have been retained with slight change in the system of designation. The (P) denoting Pachhad Tehsil has been dropped and 'F' denoting forests have been adopted as per the expired plan.

Table 1.1.10: Range and class-wise and Distribution (Hac).

S. No.	Forest Classes	Haban Range	Rajgarh Range	Narag Range	Sarahan Range	Total
1	Reserved Forests	7266.78	2890.73	1219.12	1594.25	12970.88
2	Protected Forests	832.48	784.20	21.20	914.30	2552.18
3	Un-classed Forests	-	-	937.84	2302.29	3240.13
4	Mushterqua Forests	863.80	610.22	927.21	248.82	2650.05
5	Shamlat Forests	135.22	145.70	1740.40	2552.16	4573.48
	Total	9098.28	4430.85	4845.77	7611.82	25986.72

Source: As per office Record of DFO Rajgarh

The forests have now been numbered and designated as RF 17 Dalmun suder, PF 3 Brail, UF 12 Chandog, MF 69 Bhuiru and SF 1 Dibbar Trali where RF stands for Reserve Forests, PF for Protected Forests, UF for Un-classed Forests, MF for Mushterqua Forests and SF for Shamlat/ Ceiling Land Forests.

The RFs, PFs, UFs & MFs have been marked on the scale 1:15000 Survey sheets by Survey of India except a few forests left over. The SFs are yet to be marked. The Chaks existing in the forests have been shown on the survey sheets. In the Reserved Forests like RF Sawana, RF Setambu etc. some chaks of considerable size exist, many villagers are willing to part with such Chaks if suitable lands are given to them in exchange elsewhere.

1.1.11: STATE OF BOUNDARIES: The demarcation of the reserved forests was initiated in the year 1953-54. All the reserved, protected, un-classed and Mushterqua forests were demarcated by the end of March, 1976 and rubble stone boundary pillars constructed. The compartments and sub compartments have not been provided with boundary pillars. The maintenance is lacking, as result, the boundary pillars are missing or dislocated and damaged, especially near habitations / cultivations. In some cases, the existing boundary pillars are inadequate and spaced too far as in MF 152 Palashon and MF 155 Tikri Pajerli Boundary pillars have not been numbered. Most of the MFs, UFs and SFs and some of the RFs and PFs of Haban Range are subject to encroachments. The Boundaries Registers are incomplete. The forward and backward bearings are inadequately recorded. Neither the exact location of boundary pillars nor the exact linear distances between the adjacent boundary pillars are shown. The checks and repair of the boundary pillars as prescribed in the plan have not been carried out. During inspection of boundary pillars were found missing and badly damaged in Ghaggar, chandog, Panwa, Shalogni and Dol beats. Generally beat Guards were unaware of forest boundaries of their beats. The plates indicating Forests, Compartments, working Cicle, PB areas were either missing or wrongly placed as in case of RF 31 Dol, RF 23 Oria and RF 22 Salogni.

The Shamlat / ceiling land forests (SF) were mapped from revenue record, Mauza / Patti wise maps were traced from lathas (sajra Akash) available usually on 1"=40 and 1"=50 karam scale and reduced to approximately 1:15000 scale by Pentagraph and divided into compartments for ease of management. Plotting of SFs on survey sheets is not possible at this stage. The demarcation

and construction of boundary pillars need to be done so that the survey of India can map these forests on 1:15000 scale survey sheets. Detail of expenditure incurred on the boundary pillars is tabulated 1.7.32 of Chapter-VII.

1.1.12: LEGAL POSITION: Prior to independence, Sirmour was princely state. All forests over which the state had full ownership were declared as protected forests under section 29 of Indian Forests Act VII of 1878 and all the provisions of Chapter IV of the said Act were made applicable to them from Magsar 1958. V. (1901 A.D), vide Sirmour Durbar Notification No 15 dated 1st Phagun 1957 (1900 A.D). The control over these forests was further consolidated by various notifications issued during 1949. V. to 1952. V (1892 AD to 1935 AD) by which most of the important protected forests were declared as reserved forests under section 19 of the Indian Forests Act. VII of 1878 and all the provisions of the chapter II of the said Act were made applicable to these forests vide Sirmour Durbar Notification No 1 of 2nd Poh 1949. V. (1892 AD), No 14 of 17th Sawan 1990 V. (1933 AD), No 2 of 23rd Chat 1991. V. (1934 AD) and No 38 of 27th Phagun 1992. V. (1935 AD). Rules for protected forests under section 32 of Indian Forests Act, XVI of 1927 were framed, all the trees were declared protected and provisions of sec 30(C) of Indian Forests Act was made applicable vide HP Govt. Notification Nos. 43-241-B/49-3, 29-241-BC/49 and 43-241-E/49-3 dated 25th February 1952 respectively.

1.1.13: The Jagir forests reverted back to the Government have been grouped under un-classed forests as have not been notified as protected or reserved forests. Ownership of such forests vests with government. Panwala and Narag Jagirs were granted to Sh Sujan Singh and Surat Singh respectively by Ruler of Sirmour State under an order dated 14.2.1873 and in the form of patta respectively with the condition that first generation of Jagirdar will enjoy the full Jagirs; in second generation 1/3rd of the Jagirs will be reverted back to the State; another 1/3rd of the Jagirs will be reverted back to the State in 3rd generation and remaining 1/3rd .i.e. entire Jagirs will be reverted back to the State in the 4th generation.

In the year 1957-58 at the death of Jagirdar, 1720.24 hac (4249 acres) of Panwala Jagir was reverted back to Government and transferred from Revenue to Forest Department which forms 13 Un-classed forests of Ghinni Block of Sarahan Range.

In the year of 1977, an area of 63 .18 hac of Narag Jagir was reverted back to Forest Department which forms 14 Mahlog and UF 15 Nauhra were formed.

Now the entire Panwala Jagir forests falling in the division (3167.95 hac) have been vested in the Government and the ownership has been transferred to Forest Department, vide Deputy Commissioner Sirmour No 8 SRN-9 (45) dated 9/4/1990, 1561 SK. DC/131 dated 31.7.1981 and No 396 SK DC/82 dated 26/2/1982 which is included in the un-classed forests. Till 1985, 72.18 hac of Narag Jagir have been reverted back to Forest Department forming UF Mahlog and UF 15 Nauhra.

1.1.14: Mushterqua forests were originally Zamidari forests brought under State control for proper conservation and protection vide Sirmour Durbar Notification dated 30th Magh 193. V. (1896 A.D). In view of the State control over the forests, the owners were absorbed from payments of assessed land revenue w.e.f. 1st Chait 1996. V (1939 A. D) and “Quwaid Janglat” Mushterqua Code regulating the exercise of rights in these forests was promulgated by Sirmour Durbar vide Notification No. 3 dated 26th Phagun 1995. V (1938 A.D). The ownership of the Mushterqua Forests was vests with the State Government and Private individuals singly or

collectively. The entries of ownership and possession in the revenue records are of two types as under:-

Sr. No	Ownership	Possession
1	Mushterqua Sarkar Himachal Pradesh wa Jamindara Shamlat Deh.	Makbooja Mahkma Janglat
2	Mushterqua Sarkar Himachal Pradesh wa Malik Khewat No.	1. Makbooja Mahkma Janglat 2. Makbooja Malik hissedar

Mushterqua Forests were declared as Protected Forests and Rules governing them were framed and issued vide HP Government Notification No Ft. 29-241/BB/49 and No. Ft. 29-241-B/49-1 dated 25/2/1952 respectively. But in view of the existing Quwaid Janglat Mushterqua Code, these notifications declared ultra vires by the Judicial Secretary to HP Government and become invalid. Thus the Mushterqua Forests were excluded from the purview of Protected Forests and the rules governing these forests were also withdrawn vide notification No Ft. 8-4/59 dated 27/8/1962 and No Ft. 8-4/58-II dated 27/8/1962 w.e.f. 20/8/1955. The code was good law till 20/8/1955 when it lost statutory force due to the enforcement of the HP Private Forest Act, 1954. In view of the entries in the revenue records the Forest Department contested the opinion of the Judicial Secretary. However, the forests are still governed by the provisions of Quwaid Janglat Mushterqua of Sirmour Durbar.

The Zamindari forests were defined as private forests in Quwaid Janglat Zamindari though recorded in the revenue papers as “Naqabil” or “Ghair Mumkin” and included even Naqabil Torah, Naqabil Ghasnies or Naqabil Charand. The Quwaid Janglat Zamindari defined these Forests, under para 2, in two categories on the basis of ownership as

1. Private Forests owned by an individual or several persons with defined shares.
2. Shamlat Deh or Shamlat Patti or Shamlat Taraf not the separate property of any individual Zamindar.

Para 3 of the Quwaid Janglat Zamindari defined the rights of Zamindars in both the category of forests. In the first category of forests, Zamindars have rights to obtain forest produce without payment and without obtaining a permit for the construction of residential houses or cattle sheds. In the second category of forests, no co-sharer has a right to fell any tree except for making ploughs or paths or other agricultural implements without the permission of collector. They could, however, collect other forest produce for meeting their reasonable requirements. In both categories, Zamindars had no right to fell trees for sale except when he paid the price of the trees to the Ruler at the time of purchase of the land. If the trees were surplus of the requirements of Zamindars and

were silviculturally available, Collector in consultation with Conservator of forests could permit the felling and sale of trees with the condition that half of the sale price was to be paid to the Zamindars and the half was to be deposited in treasury for improvement of such forests. The sale was to be made by the Conservator of forests. Any Zamindar found guilty of breach of any Rules was liable to such fine as the Collector deemed fit, to impose, depending upon the gravity of the offence but not exceeding twice the amount of value of the timber involved. The code was promulgated by the Ruler in exercise of his sovereign power and would continue to have the force of law till modified or replaced by a statute.

1.1.15: With enactment of i) The Himachal Pradesh Ceiling of Land Holding Act, 1972 and ii) The Himachal Pradesh Village Common Land Vesting and Utilization Act, 1974, the Shamlats and Ceiling lands constituting large areas vested with the Himachal Pradesh Government under the possession of Revenue Department. The Government decided to transfer the forest areas to Forest Department for better management. Forest Department issued some guidelines in connection with the handling and taking over of such areas vide their letter No. Fts. (F) 7-1/82 dated the 20th April, 1982. The Revenue Secretary vide letter No. Rev. 2F (1)-1/80 dated 20th July 1985 directed the complete handing over of forest areas with the change of revenue entries in favour of Forest Department by mutation wherever necessary with the assurance that areas so transferred is not encroached upon by private individuals. With the above directions Revenue Secretary, the Forest Department automatically became the owner of such transferred lands. The Forest Department have taken the possession of such lands and plantations are raised in some of the areas.

The legal position of Shamlat and ceiling land forests changed with the issue of letter No. Rev. 2F (1)-1/80 dated 29th July, 1986 from Revenue Secretary to HP Government which envisaged to follow the following procedures: -

1. Where the land .i.e. village common land vested in the Government under the village common land Vesting and Utilization Act, 1974 and the surplus areas vested in the Government under the HP Ceiling and Land Holding Act, 1972 has been recorded in the revenue record clearly as “Forest” (and not as “Van Sarkar” “Charand Jungle Dahati” or “Charand Drakhtan etc) such land shall be transferred with possession of Forest Department if not already done.
2. In respect of land under trees and recorded other wise, the transfer shall be confined to the tree alone. The control over the trees by the Forest Department shall be reflected in revenue record in the remarks column of the Jamabandi stating therein that the trees are under the control of Forest Department. Neither the ownership nor the possession of the land shall be

shown as that of this department. The Forest Department shall be told at that time of formal handover that land is non-forest areas and their control over it shall be confined to trees only.

3. The above procedure shall be meticulously observed since it is necessary to do so, so that in due course the land under these trees, is not claimed / alleged to be within the preview of the Forest (Conservation) Act, 1980.

The above instructions were applicable to all such cases where transfers had already been made in the past. If in any of these cases the Forest Department had entered in the column of possession, it was to be reviewed so that only the control of the trees over the areas involved found mentioned in the remarks column of Jamabandi. This transfer is strictly subjected to condition that whatever rights on the produce of the forests or the land containing trees accrued or were accruing to the local people in these lands, would continue as heretofore.

1.1.16: Rights and Concessions: The regular Forest Settlement is lacking for the area. Revenue settlement record viz. Wajub-Ul-Arz and Missal Haquyat provide only brief account of right and concessions allowed to the villagers in the Government forests but indicate the applicability of Faisla – e- Janglat in the absence of any regular forest settlement. Faisla – e- Janglat is a document prepared during revenue settlement operation of 1890 A.D. and revised subsequently in the year 1930-32. It provides the details of rights and concessions granted to the inhabitants of Sirmour State in state forests. The nature of rights and concessions enjoyed by the villagers in reserved and protected forests are more or less in the same all over the division, though they differ in extent from village to village.

The rights and concessions allowed in the reserved forests of Sirmour Durbar remained operative and exercised in the manner described in Faisla –e- Janglat vide HP Government Notification No. Ft. 43-241/B/49 5/3/1952. To regulate the exercise of concessions with respect of forest produce, Rules were made applicable vide HP Notification NO. Ft. 29-256 / 48-II dated 24th June, 1955. The salient points are as under: -

- i. The concession shall be exercised according to the provision of Faisla – e- Janglat subject to amendment made there to from time to time by the competent authority.
- ii. Faisla – e – Janglat will be considered as a record of concessions in pursuance of section 14 of Indian Forest Act, 1927.
- iii. No timber or other forest produce obtained in exercise of any concession as allowed in Faisla e Janglat shall be sold, bartered or alienated by any means except as provided in Faisla – e- Janglat or otherwise sanctioned by the competent authority.

Faisla – e- Janglat and amendments made there from time to time are being treated as forest settlement report for all purposes. The nature of rights and concessions enjoyed by the villagers in the reserved and protected forests are more or less the same all over the division, though they differ in extent from village to village as given in Faisla-e-Janglat. The rights and concession as allowed in the Government Forests in Faisla-e-Janglat are Mauza wise but the names of such forests are not necessarily Mauza wise. A forest may cover one or more Mauzas or vice versa. The boundary registers need to be prepared Mauza wise, to help verify as to the Mauza in which the forest lie and thus enabling in deciding whether the inhabitants of a particular village have rights in a particular forest or not.

Certain concessions and right are being exercised in the Reserved and Protected forests, as per the past practices though not provided in Faisla-e-Janglat. Status quo was ordered to be maintained vide C.C.F. HP Endorsement No Ft. 45-129/52 dated 10/07/1953 and No. Ft. 45-129/52-II dated 03/11/1953 till final decision by the Government.

The rights and concessions recorded in Faisla – e- Janglat are of the following types: -

Grazing:

The local Zamindars with recorded rights are allowed to graze their cattle maintained for domestic purposes, only on payment of grazing fee and all cattle kept for agricultural purpose free of cost, in specified forest area. It is also recorded in the Faisla-e-Janglat that grazing can be regulated in whole or in part of any forest for the betterment of that forest and as such closure to grazing to the desired extent is possible in the interest of forests conservancy.

Fodder:

The local villagers, with recorded rights, are permitted to top broadleaved kokhat trees and cut grass for use as fodder on payment of fixed dues, from specified forest areas.

Fuel wood:

1. Local Villagers are permitted to collect dry fallen fuel wood for domestic use from forest area either at half the scheduled rates or free of the cost depending upon the nature of rights in Faisla-e-Janglat.
2. Dry fallen wood for cremation is granted to villagers free of cost.

GRANT OF TIMBER:

Timber Distribution (T.D.) is a unique policy in the colonial history of forest management. It is a policy that provides every landowner with the right to harvest timber for the

construction and repair of their houses. This policy while providing for a basic need of the local population is also the single largest reason for timber harvest in the western Himalayan region. It results in the harvest of 100,000 cubic meters of prime timber till recently before Hon'ble High Court while disposing a PIL directed the State Govt. to rationalize the process as rates for T.D. were fixed at 20% of the market rates at the time of the initial forest settlements, for all species that had a market value at that time. Thus practically while the market rates had increased over 15,000 to even 88,000 times (in case of Fir), state used to charge the original rates till 2005. Since the timber was available at such dead cheap rates, most of it was also mis-used and was sold further at commercial rates.

The state has recently notified **H.P. Forest (Timber Distribution to Right Holders) Rules, 2010 vide Notification No. FFE-B-E-(3)-43/2006 (vol. I) dated 13-10-2009** for the rationalization of grant of timber. The Facts and Figures thereof are given below:

1. Introduction These rules cover the Timber Distribution (T.D.) Rights for construction and maintenance of residential house, cowshed that too for bonafide domestic use without affecting the other rights contained in the Forest Settlements in operation. Some doubts and misconceptions are uncalled for and are clarified as under.

- Forest centered based on the principle that if the forests will remain then only people will be able to exercise rights namely of Timber distribution (TD). Further these rights are People centered more so rural poor centered.
- The rights recorded in settlement other than Timber distribution (TD) like free grant for last rites of the dead, collection of medicinal herbs, grazing etc. have not been touched upon and would remain to be exercised as they were in the past.
- To have transparency involvement of people in Timber Distribution through their Gram Sabha has been ensured.

2. Rationalization Process Hon'ble High Court before deliberating and deciding the issue under consideration of PIL with them directed the State Govt. to rationalize the timber distribution process which took into account the following aspects

- As the TD is concerned with Land holding in rural areas that too for construction of house/cowshed for domestic purpose the TD in Urban areas has been done away with.
- If the Right Holders have land holding at more than one place then TD will be granted at only one place of the choice of land holder.
- TD will only be enjoyed by original Right Holder and not by those who have purchased land after taking permission under Section 118 of the HP Tenancy and Land Reforms Act, 1972 from now onwards.
- The ratio of TD rates of Chil, Deodar and Kail at the time of Forest Settlement when their rates of TD were initially fixed was 1:5 to 1:8, which has now gone to 1:8,8700 in case of Deodar, 1:30,000 in Kail, and 1:15,000 in Chil, thus requiring rationalization, which has been affected after about more than 100 years.
- The people would be given converted timber near to their place of residence at rate of 30% and 10% of average commercial rates at which timber is sold by HP Forest Development Corporation.

3. Legal position

The various settlement reports mention that *'if the exercise of rights as admitted in any forest, would endanger the existence of forest, the extent to which the rights will be exercisable can be re-*

determined and should the exercise of rights become detrimental to the exercise of the forests over which these are exercised, the extent to which the rights will be exercisable can be re-determined.

Yet this option has seldom been exercised in the past for conservation of forests. H.P. Forest Settlement Rules, 1965 have been framed under Section 76 of IFA, 1927. The guiding principle laid down for determining the rights and concessions under these rules are as under:

“All these rights and concessions are meant for the satisfaction of personal bonafide requirements and subject to condition that forests are to be maintained in perpetuity. The right of user of easement is always a limited one; it can never extend so as to destroy the servient estate. The right exists so long as the (servient) property is safe or continues to exist, because if the (servient) estate ceases to exist, the right ceases with it. So while dealing with the claims, the Forest Settlement Officer should see that the forests are not unduly burdened.

Keeping into consideration the powers delegated to the state Govt. under Section 32 of IFA, 1927, based on the guiding principles under HP Forest (Settlement) Rules, 1965 and the orders passed by Hon'ble HP High Court the HP Forest (Timber Distribution of Right Holders) 2010 have been formulated and notified.

These rules in brief contain the following:

4. Quantity.-(1) Timber Distribution shall be granted in converted form from the depots to be specified separately as per scale fixed below:-

For construction of new house = 3 cubic meters; and

For maintenance = 1 cubic meter.

(2) Timber Distribution shall be given from salvage (fallen, dry standing), silviculturally available green trees in the order of preference.

5. Periodicity. - The periodicity for grant of Timber Distribution to the Right Holders will be as under:-

(i) For new construction once in life time or 30 years whichever is later;

(ii) For additions/alterations – once in 15 years; and

(iii) sufferers of natural calamities/fire sufferers: as per actual requirement as recommended by the Sub Divisional Officer (Civil) and after personal verification by the ACF/DFO concerned subject to the grant not exceeding the maximum limit prescribed under rule-4.

6. Rates. - The rates to be charged from the different types of Right Holders for grant of Timber Distribution will be as under:-

(i) Right Holders above poverty line- 30% of the rates at which timber is sold by the Himachal Pradesh State Forest Development Corporation Ltd commercially;

(ii) Right Holders below poverty line- 10% of the rates at which timber is sold by the Himachal Pradesh State Forest Development Corporation Ltd. Commercially; and

(iii) Right Holders suffering from natural calamities- Free of cost.

7. Priority for grant of Timber Distribution - Priority for grant of Timber Distribution shall be given to the Right Holders belonging to Below Poverty Line and then Right Holders above poverty line shall be granted Timber Distribution on first come first served basis.

8. Procedure for grant of Timber Distribution-

i) Application for grant of Timber Distribution, on the form appended to these rules as 'Annexure-I' shall be submitted by Right Holder(s) to the Panchayat concerned after getting necessary remarks from the Patwari concerned.

ii) The Panchayat after ascertaining genuineness of the requirement of the Right Holders shall pass resolution in the Gram Sabha of the Panchayat indicating actual quantity of requirement of Timber Distribution of the individual(s) concerned.

iii) After resolution recommending grant of Timber Distribution is passed by the Gram Sabha of the concerned panchayat, right holders shall submit his Timber Distribution application to the Forest Guard (FG) of the area.

iv) FG shall enter the same in the register maintained for the purpose and issue receipt of the application to the Right Holder.

v) He shall send his recommendations to the Block Officer after ascertaining the genuineness of demand, who in turn shall submit his recommendations to the Range Officer.

vi) After receipt of Timber Distribution application from the Range Officer, the Divisional Forest Officer shall take action for sanction of the Timber Distribution after satisfying himself about the genuineness of the requirement and silvicultural availability of trees/timber in the concerned forest and intimate his decision/ Timber Distribution grant to the Right Holder concerned on the proforma appended to these rules as 'Annexure II'.

vi) A schedule for grant of Timber Distribution shall be framed and notified for publicity to all panchayats and other functionaries in the Forest Division by the Divisional Forest Officer.

9. Time schedule for grant of Timber Distribution: The right holders shall apply for grant of Timber Distribution through concerned Panchayat to the concerned forest guard by 31st March each year which has been extended to 30TH April this year. The application shall be processed and Timber Distribution shall be given to eligible right holders between September to December of the year as per procedure under rule 8 and no Timber Distribution shall be granted thereafter for that year.

10. Depot. - The depots from where Timber Distribution in converted form shall be supplied to the right holders shall be notified by the Divisional Forest Officer every year. Any change during the next year in the place of these depots shall also be notified. These notifications shall be widely circulated up to the Panchayat level by the Divisional Forest Officer. The rates in this respect for various species during 2009-10 were as under:

**Table 1.1.11 Rate of Timber under H.P. Forest (Timber Distribution to Right Holders)
Rules for the year 2011-12**

<i>Species</i>	<i>Average weighted sale (commercial) rate in ` of HPSFC Ltd.</i>	<i>Rate per Cum at 30% in `</i>	<i>Rate per Cum at 10% in `</i>	<i>Estimated cost per standard</i>	
				<i>For Right Holders above Poverty line</i>	<i>For Right Holders below Poverty line</i>
Deodar	23889	7167	2389	717	239
Kail	14951	4485	1495	449	150
Fir/Spruce	9924	2977	992	298	99
Chil	6674	2002	667	200	67

11. Merit of these rules over previous provisions of T.D. in various settlements

The advantage these rules have provision for grant of TD under various settlements are as under:-

1. These Rules of TD have been integrated and unified for whole of the state.
2. Timber will be available in converted form and near to the place of residence of the people helping them in saving precious time and money during this schedule.
3. The rules are forest centered as well as right holder centered based on the guiding principles of HP Forest Settlement Rules, 1965 as indicated in point 3 which will help in conservation of forests and so also catering to the demand of TD to the present and future generations.
4. The periodicity and quantity has been made based on optional requirement so that forest remains and TD continues to be given in perpetuity.
5. Priority has been given to poor and needy (BPL) followed by other people who need wood in TD.
6. A detailed procedure for grant is enshrined in the Rules itself which is time scheduled for the year.
7. People have been empowered as the application for needy will start from the Gram Sabha.
8. The right holder now has to simply give application duly authenticated by the Gram Sabha of the Panchyat to the FG which will pass through the various chanel of the Forest Deptt. and the applicants would get their converted TD at the earmarked depots between September to December.

The quantity of timber of various species granted to right holders under TD System and free grant timber of various species granted during the last 15 years is given in Table 1.1.12

Table 1.1.12: Statement Showing the Timber Granted to Right Holders and Free Grantees (Standing Volume in M³).

Year	Deodar	Kail	Chil	Fir/ Spruce	Misc. Broad leaved	Total	Volume in M ³	Market Value
1991-92	63	17	28	--	--	108	197.77	
1992-93	98	4	168	--	--	270	474.18	
1993-94	271	28	55	--	1	355	851.90	
1994-95	248	6	108	--	--	362	82536	
1995-96	195	10	128	--	5	378	736.23	
1996-97	194	11	94	2	1	302	687.42	
1997-98	199	16	136	6	1	358	800.78	
1998-99	188	5	158	--	3	354	789.39	
1999-2K	74	7	27	--	--	108	258.07	
2000-01	42	4	53	--	--	99	165.90	
2001-02	35	2	32	---	---	69	114.35	
2002-03	20	---	22	--	---	42	63.4496	
2003-04	23	3	23	-	--	49	93.7721	
2004-05	91	01	33	--	--	125	306.629	
2005-06	71	8	23	---	---	102	229.544	
2006-07	23	0	6	---	---	29	63.912	
2007-08	0	0	0	0	0	0	0	
2008-09	0	0	0	0	0	0	0	
2009-10	0	0	0	0	0	0	0	
2010-11	0	0	0	0	0	0	0	

2011-12	0	0	0	0	0	0	0	
2012-13	0	0	0	0	0	0	0	

Pine Needles:

Villagers are allowed to remove / collect dry fallen chil needles from the specified forest area, free of royalty.

Way of Water Courses:

Wherever water springs exists in forest area, the adjoining villagers generally have a definite recorded right of way to that water course.

The rights and concessions as mentioned above are allowed only in such portion of the forests as were deemed fit for these purposes by the Forest Department.

The rights and concessions in the Mushterqua Forests are regulated under Quwaid Janglat Mushterqua and written in Mauza wise Jamabandis. The villagers enjoy the rights of grazing cattle, collection of fuel wood, lopping of broad leaved trees, cutting of grasses for fodder and timber for domestic purposes.

In Shamlat / Ceiling Land Forests whatever rights accrued to the villagers / local people, would continue as heretofore. These Forests were governed by Quwaid Janglat Zamindari which provided Zamindar the rights to obtain forest produce for the construction of residential house or cattle sheds, making plough or other agricultural implements. The Zamindar has no rights to fell for sale.

No rights and concessions have clearly been defined in un- classed forests, though local people collects fuel wood, cut grasses and graze cattle. The rights and concessions allowed by the Jagirdars to the inhabitants needed to be ascertained and allowed. Since the Un-classed Forests are owned by the State Government like Reserve and Protected Forests .i.e. being State property, which are governed by Faisla-e-Janglat. So in order to decide rights and concession to local people in the un-classed Forests, it is most appropriate to bring un-classed forests within the purview of Faisla-e-Janglat.

The inhabitants of Ghinni village have no timber rights being all un-classed forests. Similarly no rights and concession exist for new settlers in the division. The admissibility of concession to such people needed to be referred to Government for policy decision so that the same can be provided in the Forest Settlement of Sirmour District in future.

1.1.17: The pressure of grazing is quite heavy and it is difficult to ensure closure for regeneration. The increase in cattle population has given the grazing problem an alarming shape. The uncontrolled and excessive grazing has resulted in failure of plantation and regeneration areas in many cases. As per state level Grazing Advisory Review Committee meeting held on 24-9-2011

vide H.P. Govt. Notification No. 38-6/75-SF-LX-L dated 21-1-2012 has issued directions for renewal of grazing permits for 3 years instead of annual after realizing permit fee for 3 years (entire period). The grazing permits for the year 2011-12 are being renewed for 3 years in favour of grazers. Migratory animals permitted for grazing during the year 2010-11 is given in Table 1.1.13.

Table 1.1.13 Number of animals permitted for grazing.

Sr. No.	Animal Category	Numbers
1	Cattle (Cow family)	13
2	Buffaloes	20
3	Goats and Sheep	4474
5	Others	0
	Total	4507

Source: As per office Record of DFO Rajgarh

There is some recognized summer and winter grazing grounds / pasture lands / Paraos which afford grazing of buffaloes, of Professional migratory graziers locally called Gujjar. The capacity of each Paraos is fixed and annual grazing permits for a fixed numbers of buffaloes are issued on payment of grazing fees. This concession is only allowed to those Gujjars who have long tradition of occupation of these Paraos. The incidence of grazing is heavy as the local people have also started taking their cattle to near by Paraos, thus resulting in destruction /degradation of forest areas on higher reaches. More so, Gujjars fells annually large number of trees to construct their sheds. This is neither checked nor controlled as the Paraos are in far flung areas and territorial staff hardly visits them. The detail of such Paraos is given in Appendix-X.

1.1.18: During winter, the Professional migratory shepherds, locally called Gaddies, from high hills come down with their sheep herds and graze in lower hills especially in Ghinni valley till springs. They have been allotted certain forests and routes for this purpose against payment of fees. The incidences of grazing / browsing by these Gaddies are heavy and as well as uncontrolled, thus resulting in depletion of miscellaneous broadleaved forests in Ghinni valley. The list of migratory shepherd is given in Appendix – XIII.

1.1.19: The current rates of standing trees and other forest produce including grazing rates applicable to right holders are given in “Dastur-UI-Amal” and reproduce in Appendix – XII. The rates remain unchanged since 1954 though these rates are subject to change from time to time. At the time Dastur-UI-Amal was framed, there was a relationship between the value of tree granted to the right holders and timber rates prevailing in the market. Now since the market price of the timber have increased in geometric progression, the concessional rates of trees and other forest produce need immediate upward revision. These needs to be increased at he time of next settlement as indicated clearly in he Anderson’s Settlement Report of Kangra.

CHAPTER-II
FLORA AND FAUNA
PART: A
FOREST FLORA

1.2.1: OCCURRENCE AND DISTRIBUTION OF SPECIES:

The forest does not form a continuous and compact belt but are scattered all over the division honey combed with agricultural fields, grass lands and orchards. The forests in the division stretch from banks of Ghaggar & Giri to the tops and slopes of 'ofter' ranges of the Himalayas which separate the Chopal and Renuka Forest Divisions. They present a large variety of different features and a great diversity of climate and vegetation and some of the most magnificent scenery to be seen anywhere. The altitudinal difference of 2,862 m between Preet Nagar(540 m) and Chur Ridge (3,402 m) coupled with aspect and biotic influence result in a diversified and rich forest flora starting with riverain species like **Shisham, Khair, Kamal** and ending with **Spruce, Silver fir** temperate pastures. The riverain species are replaced by dry mixed deciduous forests above the banks of streams and continue up to elevation of about 1,000 m where after the ground is taken over by **Chil**, which extends up to about 2,000 m beyond which there is continuous stretch of **Kail, Deodar, Ban** and **Mohru** providing ground to **Spruce-Silver Fir** and **Kharsu** with the rise in altitude and change of aspect. Oaks and Brass are found both as understory (in **Kail, Deodar, Spruce and Silver Fir Forests**) and pure crops in temperate zone. **Walnut, Horse Chestnut, Poplar Maple, Bird Cherry** etc. are found scattered in temperate zone and in glades in the depression. Broadly, the following forests occur in the division.

Bamboos Forest: It is restricted to small groups of clumps both in pure patches as well as mixed with miscellaneous broadleaved species along Ghaggar River and its tributaries in Ghinni valley.

Khair-Sissoo Forests: It occurs in small patches in Ghinni and Dimber Blocks along the Ghaggar and their tributaries.

Scrub Forests: It is confined to Sarahan, Narag and Rajgarh Ranges. Common species are Jhingan, Chhal, Amla, Harar, Bahera, Srin Poola, Siris Kaith and Kamal etc. Hardly some species grow to a size to yield useful timber.

Chil Forests: Found in all the ranges in pure as well as mixed with scrub species in lower elevations with oaks on higher altitude. It is important species producing resin, packing case, pulpwood, timber and charcoal.

Kail and deodar Forests: Confined to Rajgarh and Haban Ranges, forming main source of commercial timber occurring pure and in mixed crop.

Oak Forests: The Ban, Mohru and Kharsu species occurs from middle to higher throughout the division as pure and mixed crop. Most of the Kharsu and Mohru oak forests are virgin and unexploited. The Ban oak exploited for fuel wood and charcoal.

Rai & Tosh Forests: Occupying highest elevation, slopes and ridges in Haban and Rajgarh Ranges and are next to deodar, Kail and chil in the angle of commercial importance.

The range wise, class of forest, species wise area distribution is given in Table 1.2.1.

Table 1.2.1: Species and Area wise Distribution.

Range	Class	Chil	BL	Oaks	Deodar	Kail	Mixed-C+D+K	Spruce	Fir	Mixed- F+S	Bamboo	Eucalyptus	Total
Haban	RF	1072.42		1185	1314.5	976.4	401.5	399.06	304	659.73		4.3	6317.18
	PF			36.8	22.2	588.1	3.45	6.55					657.13
	UF												0
	MF	243.34		48.7	180.1	84.28	44.78						601.15
	SF			8.59	2.05	31.65	7.44						49.73
Total		1315.76	0	1279	1518.8	1680	457.17	405.61	304	659.73	0	4.3	7625.19
Rajgarh	RF	826.27	8.2	1179	184.75	48.95	64.79	41.8	15	317.3			2686.44
	PF	56.05	69.5	366	44.45	55.55	14.9					5	611
	UF												0
	MF	293.98	38.5	35.7	52.85	33.75	13.3						468.03
	SF	24.66	34	25.5	3		3	1.37					91.53
Total		1200.96	150	1606	285.05	138.3	95.99	43.17	15	317.3	0	5	3857
Narag	RF	1072.94	15.1	50.7									1138.69
	PF	21.2											21.2
	UF	796.24		57.4									853.59
	MF	612.13	36.3	156		0.85							804.81
	SF	241.57	281	75.6									598.56
Total		2744.08	333	339	0	0.85	0	0	0	0	0	0	3416.85
Sarahan	RF	1152.22	390	14.1									1555.95
	PF	738.95	130	9.2									878.55
	UF	731.16	1416								45		2191.85
	MF	210.85	3.15	19.1									233.07
	SF	461.04	967	28.8							5	6.5	1468.74
Total		3294.22	2906	71.2	0	0	0	0	0	0	50	6.5	6328.16
G Total		8555.02	3389	3295	1803.9	1820	553.16	448.78	320	977.03	50	15.8	21227.20

1.2.2: COMPOSITION OF FOREST AND CONDITION OF CROP: The vegetation of the tract is classified according to “A Revised Survey Types of India” by Champion and Seth, 1964 and described in detail as “Forest Types of Himachal Pradesh” by Magan Bihari, 1979. The types found in the division are listed as under:

II: DRY TROPICAL FORESTS:

GROUP 5- TROPICAL DRY DECIDUOUS FORESTS:

<i>Sub group</i>	5 B	:	Northern Tropical Dry Deciduous Forests.
	C 2	:	Northern Dry Mixed Deciduous Forests.
	D	:	Degradation stages of Tropical Dry Deciduous Forests.
	DS1	:	Dry Deciduous Scrub Forests.
	E	:	General Edaphic types of Dry Deciduous Forests.
	E 9	:	Dry Bamboo Brake.
	S	:	General Seral types of Dry Deciduous Forests.
	1 S 2	:	Khair - Sissoo Forests

III: MONTANE SUB TROPICAL FORESTS:

GROUP	9	:	SUB TROPICAL PINE FORESTS:
	C 1	:	Himalayan Subtropical Pine Forests.
	a	:	Lower or Siwalik Chil Pine Forests.
	b	:	Upper or Himalayan Chil Pine Forest.
	D S 1	:	Himalayan Subtropical Scrub.
	D S 2	:	Subtropical Euphorbia Scrub.

IV: MONTANE TEMPERATE FORESTS:

GROUP	12	:	Himalayan Moist Temperate Forests.
	C 1	:	Lower Western Himalayan Temperate Forests.
	a	:	Ban Oak Forests (Q. incana).
	b	:	Mohru Oak Forests (Q. dilatata).
	D S 1	:	Oak Scrub.
	c	:	Moist Deodar Forests.
	d	:	Western Mixed Coniferous Forests (Spruce, Kail, Fir)
	e	:	Moist Temperate Deciduous Forests.
	f	:	Low level Blue Pine Forest (P. wallichiana).
	D S 2	:	Himalayan Temperate Secondary Scrub:
	C2	:	Upper Western Himalayan Temperate.
	a	:	Kharsu oak Forest (Q. semicarpifolia).
	b	:	West Himalayan upper Oak / Fir Forests.
	D	:	Degradation Stages of Himalayan Moist Temperate Forest
	DS 3	:	Himalayan Temperate Pastures.
	S	:	General Seral Types of Himalayan Moist Temperate Forest.
	1	:	Primary Seral Type.
	1S 1	:	Alder Forest.
	2	:	Secondary Seral Type.
	2S 2	:	Lower level Blue Pine Forests.

1.2.3 Type 5B/C2: Northern Dry Mixed Deciduous Forests Description:

The upper canopy is light, irregular and often broken, formed entirely of deciduous trees which have short bole and poor form, height is rarely 15 meters and often much less. There is considerable intermixture of rather smaller trees which form part of the main canopy. The stocking is extremely variable and generally poor. The quality on the whole is very poor and the crop is of the little value except for fuel. There is usually thin shrubby undergrowth including some evergreen xerophytic species. A feature of the forest is the contrast between the hot weather condition when it is entirely leafless and the soil is fully exposed, and the monsoon condition when it takes an almost luxuriant appearance from the growth of ephemeral herbaceous vegetation coupled with the leafing out of the trees and shrubs. Grass is always present.

Anogeissus latifolia: From contiguous concentrations and often monopolies Southern aspects. In most localities tree canopy has been seriously broken by human activities, so that scattered trees and small groups are typical. In the climax state, upper canopy is thin but fairly complete, most trees having low spreading crowns. In drier localities, the canopy is broken. Many tracts are at present occupied almost exclusively by large shrubs and small trees, and it is now difficult to determine just how far their condition is due to maltreatment. Middle to mature age classes predominate.

Distribution: It is confined to the Siwaliks and Southern slopes of outer Himalayas up to an altitude of 1250 meters in Rajgarh, Narag and Sarahan ranges in areas rendered unsuitable for chit due to excessive heat and other unfavorable geological and climatic factors.

Locality Factors: Rainfall varies from 900MM to 1500MM. The mean relative humidity for the year is under 60 and for the March under 45. The soil is derived from Siwalik sand rock and conglomerates which is shallow in depth, sandy in texture and completely drained. Intensive drainage and a long dry season are characteristics.

FLORISTIC:

Top Canopy: *Anogeissus latifolia*, *Ehretia laevis*, *Kydia calycina*, *Mallotus philippensis*, *Terminalia chebula*, *T. belerica*, *T. tomentosa*, *Syzygium cumini*, *Cassia fistula*, *Ougeinia dalbergioides*, *Erythrina suberosa*, *Salmaalina malabarica*, *Cedrela toona*, *Albizzia spp*, *Bauhinia variegata*, *Embllica officinalis*, *Pistacia integerrima*, *Acacia catechu* etc.

Middle Canopy: *Flacourtia indica*, *Limonia acidissima*, *Aegle marmelos*, *Zizyphus jujube*, *Grewia oppositifolia*, *Nyctanthes arbor-tristis*, *Casuarina tomentosa*, *Pyrus pashia*, *Holarrhena antidysenterica*, *Euphorbia royleana* etc.

Undergrowth: *Carissa opaca*, *Woodfordia fruticosa*, *Adhatoda vasica*, *Colebrookia oppositifolia*, *Murraya koenigii*, *Lantana camara*, *Zizyphus nummularia*, *Hamiltonia suaveolens*.

Climbers: *Caesalpinia sepiaria*, *Bauhinia vahlii*, *Acacia pennata*, *Pueraria tuberosa*, *Combretum decandrum*, *Mimosa rubicaulis*, *Cryptotolepis buehnanani*, *Ichnocarpus frutescens*, *Milletia auriculata*.

Parasites: *Loranthus spp*, *Cuscuta reflexa*.

1.2.4 Type 5 / DSI: Dry Deciduous Scrub.

Description: Degraded dry deciduous forests with low broken soil cover of shrubby growth 3 to 6 meters high including some tree species **reduced to similar condition, usually may stemmed from the base. Many of the shrubs are distasteful to cattle** (Holarrhena) or thorny (Randia, Carissa). Thin grass occurs throughout.

Distribution: Throughout the dry deciduous zone with poor soil in Saharan, Narag and Rajgarh ranges.

Locality Factors: There may be localities in which the soil and climate are as such to permit the development of a dry deciduous low forest in which tree growth in the narrow sense is scarce, but all examples seems unquestionably to owe their stunted conditions to maltreatment, usually directly or indirectly connected with felling, lopping, grazing and frequent fires.

Floristic: The species mainly found are *Lannea coromandelica*, *Acacia catechu*, *Aegle marmelos*, *Nyctanthes arbor-tristis*, *Woodfordia fruticosa*, *Carissa opaca*, *Flacourtia indica*, *Cassia fistula*, *Butea monosperma*, *Randia dumetorum*, *Euphorbia royleana*, *Zizyphus* spp, *Phoenix sylvestris*, *Sapium insigne*, *Holarrhena antidysenterica*, *Adhatoda vasica*, *Lantana camara* etc.

Grass: *Heteropogon contortus*, *Eulaliopsis binata* and *Chrysopogon montanus*.

Regeneration: The regeneration of all the valuable species by seed is rare due to excessive grazing and seed sterility. Species found reproducing themselves successfully are *Acacia catechu*, *Erythrina suberosa*, *Embllica officinalis* and *Terminalia tomentosa*. Regeneration by coppice of both trees and brushwood is abundant and the growth is quite rapid for the first few years.

1.2.5 Type 5/E 9: Dry Bamboo Brakes

Description: *Dendrocalamus strictus* is the only species forming relatively low but dense brakes. When grazed, the bamboo grows in dense patches with grass and deciduous often thorny shrub.

Distribution: Confined to bara Chakli and Ghirar Sandrol UFs and Ghini valley situated on the left bank of Ghaggar river along the boundary of Solan Forest Division.

Locality Factors: Occurs mainly on the hill sides but also on alluvium with rainfall 900 mm and more. The soil is often shallow, stony and dry for most of the year.

Floristic: *Dendrocalamus strictus* with a sprinkling of the trees and shrub species found in deciduous forests like *Anogeissus latifolia*, *Lannea coromandelica* etc. forms dry bamboo brakes. The general condition of the bamboo forest is very deplorable. The distribution of healthy and Vigorously growing clumps of good size are rare, while open and over congested clumps are a regular feature. The chief associates are *Terminalia tomentosa*, *Kydia calycina*, *Ougeinia oojeinensis*, *Cassia fistula*, *Mallotus philippensis*, *Holarrhena antidysenterica*, *Embllica officinalis*, *Acacia catechu*, *Erythrina suberosa*. The undergrowth consists of *Adhatoda opaca*, *Murraya koenigii*, *Lantana camara*.

Regeneration: The natural regeneration of bamboo is not common. Some seed as a result of sporadic flowering falls, but does not germinate, if at all, some seedlings come out after the rains, are killed by draught or destroyed due to heavy grazing.

1.2.6 Type 5/1S2: **Khair Sissoo Forests:**

Description: A Deciduous forest in which *Dalbergia sissoo* predominates and canopy is light. The *sissoo* have one marked feature that they come early into leaf (March) and remain in full leaf throughout the hot weather, however, this specific feature is not shared by most of its associates. *Acacia catechu* is usually but not always present; it does not grow as tall as *Sissoo* and in the mixture is relatively inconspicuous, but sometime also occurs in pure. There is often dense deciduous shrubby undergrowth.

Distribution: This type found in small patches in Rajgarh and Sarahan ranges on newly sandy or gravelly alluvium along the banks of river Giri and Ghaggar.

Locality Factors: The upper soil which is almost devoid of humus, having ample water supply at moderate depth, is porous, hot & dry during the summer. The soil is unstable and prone to be washed away at any time. The Khair - Sissoo type is the first tree association to colonize these new deposits.

Floristic:

Tree Canopy: *Acacia catechu*, *Dalbergia sissoo*, *Zizyphus mauratiana*, *Ehretia laevis*, *Mallotus philippensis* etc.

Undergrowth: *Adhatoda vasica*, *Murraya koenigii*, *Cassia tora*, *Colebrookia oppositifolia* etc.

Regeneration: It is deficient as *sissoo* never generate under a parent crop and species is completely displaced in the second generation. *Acacia catechu* is more persistent and is generally present in the next stage.

1.2.7 Type 9/Ca: **Lower or Siwalik Chil Pine Forests:**

Description: The pine stands singly or in groups with scattered lower deciduous tree storey more numerous in depression and cooler aspects. There is usually a fairly continuous low scrub growth of xerophytic shrubs. The general quality of the crop is III and density is variable. The trees have twisted fibers / grains and the prevalent twist is left hand. The soil is poor rocky and areas are prone to frequent fires and as well as under heavy grazing pressure.

Distribution: This type found in Siwaliks and outer Himalayas in between 600 to 1200 meters. The major forests lie in Ghinni valley and lower reaches along Jalal, Gambar, Kawal Rivers and their tributaries in Sarahan and Narag ranges.

Locality Factors: On steep dry slopes below 1200 meters on the Siwalik conglomerates and sandstone, the quality is markedly affected by variation in elevation. At low elevations, it is confined to the cool, Northerly and sheltered aspects. The Western and Southern aspects carry scrub forests containing very few Chil trees. The soil is shallow, boulder and poor. The maximum summer temperature rise above 40°C and during winter the minimum temperature falls below 4°C and there may be ground frost. The climate is dry and hot resulting excessive evaporation and development of zonal soils. The incidences of fire and grazing are very high.

Floristic: Chil generally grows gregariously in pure crop with light to moderate undergrowth, but on lower elevations it is sometimes found fixed with scrub forests. Second canopy is almost absent and not much undergrowth occurs.

Top Canopy: *Pinus roxburghii*

Underwood: *Terminalia* spp, *Mallotus philippensis*, *Pyrus pashia*, *Emblica officinalis*, *Anogeissus latifolia*, *Lannea coromandelica*, *Syzygium cumini*, *Zizyphus mauritiana*, *Acacia catechu*, *Albizia chinensis*, *Cassia fistula*, *Ougeinia oojeinensis* etc.

Undergrowth: *Carissa opaca*, *Berberis lyceum*, *Rubus ellipticus*, *Myrsine africana*, *Colebrookia oppositifolia*, *Murraya koenigii*, *Adhatoda vasica*, *Woodfordia fruticosa*, *Flacourtia indica*, *Indigofera pulchella*, *Crataegus crenulata*, *Prinsepia utilis*, *Zanthoxylum alatum*, *Tylophora hirsute*, *Euphorbia royleana*, *Randia tetrasperma*.

Ground flora: *Chrysopogon fulvus*, *Cymbopogon* Spp., *Dichanthium annulatum*, *Heteropogon Contortus*, *Themeda anathera*.

Climbers: *Rosa moschata*, *bauhinia vahlii*.

In moister sites, *Quercus incana*, *Q. glauca*, *Pyrus* and *Rhododendron* spp are met.

Regeneration: in general, it is good but poor in forests subject to excessive grazing and frequent fires.

1.2.8 Type 9/c 1B: Upper or Himalayan Chir Pine Forest

Description : High forest attaining 20-30 m height forming mostly complete but light canopy. No other trees reach the top canopy. Only scattered trees represent a second storey in isolated cases. However, along the lower streams, *Syzygium*, *Lannea*, *Terminalia* etc. exist as fringe forests in damp places and along most of the damper nallas at higher altitudes, *Quercus* *Rhododendron*, *Lyonia* and *Myrica* are found. Along dry exposed nallas grassland and miscellaneous broadleaved forests occur. Near the upper limits and especially on moist and cold northern aspect, chil is found growing with deodar, chil occupying the exposed ridges and deodar in the sheltered nallas. The crop is predominantly middle aged with moderate density and quality II to III. Annual fires prevent the development of the shrubs. Sites escaping fires and open forests have shrubby undergrowth of variable density. During the monsoon a rich grass growth develops, which dries up and is flattened down in the winter and from then till the rains, the soil appears completely bare of vegetation and is covered with the fallen needles till they get burnt and a flush of new grass appears.

Distribution: It is found on outer and middle Himalayan Zone from 1200 to 1800 m elevation overlapping the tropical dry deciduous forests at the lower elevation and giving way to the temperate forests above. The absence of the type on exposed southern aspects of Saurdhar, Saindhar and Dhartidhar ranges is due to; (i) combined effect of excessive heat and high humidity in the monsoon period which is unfavorably for the establishment of seedling, and (ii) excessive rock outcrops, shallow soil depth, drier conditions and continuous scorching sun, unfavorable to tree growth.

Locality factors: The type occurs under a wide range of conditions with rainfall from about 900mm, up to over 2000mm and with temperature running very high during the dry summer months.

Snow falls most years in the upper parts of the pine forests but rarely lies for more than a few days. Fire is of the greatest significance and almost all the forests are burnt at frequent intervals and the distribution and composition of the type has been greatly influenced by this. Some of the forests have been subjected to clearance for cultivation and settlements. As a result large scale encroachments especially in unclassed forests exist. The forests are generally heavily grazed. The annual fires and heavy grazing prevent growth of shrubs in Chir forests.

FLORISTICS:

Top canopy: *Pinus roxburghii*; *P. wallichiana* and *Cedrus deodara*, (on higher reaches)

Underwood: *Quercus incana*, *rhododendron arboretum*, *Myrica sapdia*, *Pyrus pashia*, *Lyonia ovalifolia*, *Lannea coromandelica*, *Syzygium cuminii* *Terminalia* spp.

Undergrowth: *Plectranthus rugosus*, *Rhus parviflora*, *Flemingia prostrata*, *Carissa opaca*, *Colebrookia oppositifolia*, *Rubus ellipticus*, *R. niveus*, *Indigofera* spp. *Myrsine Africana*, *Meriandra strobilifera*, *Berberis lyceum* etc.

Ground flora: *Artemisia vulgaris*, *Gallium* spp, *Desmodium parvifolium*, *Heteropogon contortus*, *Sehima notata*, *Themeda anathera* etc.

Climbers: *Rosa moschata*.

Regeneration: It is not a problem if the area is protected against grazing. In most of the forests, it is coming up even without opening the canopy.

1.2.9 Type 9/C 1/DSI: Himalayan Subtropical Scrub: Over considerable area in chil zone, extending from Himalayan Chir forest to dry mixed deciduous forests down below, the over-wood has been destroyed or unable to develop owing to excessively dry and shallow soil and open shrub formations occupy the ground. The disappearances of over wood is also contributed to adverse biotic factors (fire, fellings and grazing) leaving residual scrub forests of *Sapium insigne*, *Euphorbia royleana*, *Rhus parviflora*, *Carissa opaca*, *Murraya Koenigii*, *Woodfordia fruticosa*, *Mallotus philippensis* etc. The dominant species vary a good deal and often one or two of them may so predominate as to give a characteristic appearance. Probably the residual scrub on degradation will show its origin but both edaphic and biotic factors are involved to determine what persists. Vast areas are found in Narag and Sarahan Ranges containing such degraded vegetation.

1.2.10 Type 9/C 1/DS 2: Subtropical Euphorbia Scrub

***Euphorbia royleana*:** Constitute the only conspicuous vegetation on the scorching arid slopes of Siwaliks and Himalayas is dry mixed deciduous and chil forests. It forms consociations sometimes of considerable extent. Their distribution is related to edaphic factors, notably dry rocky ridges, but under biotic pressure they extend and become denser and purer owing to the elimination of less resistant species.

1.2.11 Type 12/C 1 a: Ban Oak Forest (*Quercus incana*)

Description: On good sites, the trees form a closed canopy about 20 to 25 m high with density 0.8 to 0.9. More usually they form a somewhat open forest (density 0.5 to 0.6) of rather short-boled and low branchy trees though often of considerable girth and on southern aspects the cover may be decidedly incomplete (density 0.5). The crop is of irregular age; ever mature and hollow trees are common in some forests not felled in the past. Appreciable admixture of deciduous trees contributing to the main canopy are common in damper localities, whilst on hot dry slopes, these are entirely absent. Typical associate are *Rhododendron arboretum* and *Lyonia ovalifolia*, usually below the oak canopy. Well defined second story may be met within damper sites. A good deal of deciduous and evergreen shrubby under growth is present in the areas not heavily grazed. Climbers are common. Moss and lichens are noticed on the trees. During monsoon, epiphytes and even orchids are seen growing on trees. In dense forests, grass growth is little; it is thick when the cover is broken. Slopes are often full of flowers in monsoon. Bamboos are absent. Little *Arundinaria falcata* occur in shady places. Many of the forests have been coppiced in the past and so present a decidedly different appearance from the original undisturbed form.

Distribution: Occupies the lower portion of the temperate belt, particularly in the outer ranges and on southern aspects. It occurs most extensively in the central Himalayans and extends a long way downwards practically right through the subtropical zone on the moister sites. Best forests occur in Trans Giri areas predominantly in Rajgarh and Habban ranges. In Cis-Giri on Saindhar and Sarahan Dhartidhar, only a few pockets of ban oak forests are found.

Locality Factors: The type occurs in the altitudinal zone roughly between 1500 to 2500 m on southern slopes but lower by 150 to 300 m on northern aspects and depressions. In comparison with the moist temperate types, it occupies drier as well as warmer sites, and may be viewed as their least mesophytic form. A monsoon rainfall seems necessary and a height snowfall unfavorable. Geological formation has very little influence on the distribution of the ban oak forest which builds up a good soil rich in humus. The ground is mostly well drained and the oak occupies all but really wet soils where deciduous trees take its place.

It is exposed to damage through human agencies. Lopping near habitation has reduced the ban forests generally open and crooked. The forests suffer a good deal from fires spreading up from the pine zone below. Lopping combined with fuel demand has led to the complete disappearance of these Ban forests over large areas.

FLORISTICS:

Tree canopy: *Quercus incana*, *Q. glauca*, *Rhododendron arboretum*, *Lyonia ovalifolia*, *Litsaea umbrosa*, *Pyrus pashia*, *Machilus odoratissima*, *Myrica sapdia*, *Benthamidia capitata*.

Under growth : *Berberis spp.*, *Myrsine Africana*, *Indigofera geradiana*, *Rubs niveus*, *R. ellipticus*, *Desmodium tiliaefolium*, *Prinsepia utilis*, *Daphne cannabina*, *Viburnum continifolium*, *Lonicera quinquelocularis*, *Strobilanthes dalhousianus*, *Deutzia staminea*, *Leptodermis lanceolata* etc.

Ground flora: *Plectranthus strictus*, *Agrimonia eupatorium*, *Salvia glutinosa*: *Myriactis wallichii* and *M. nepalensis*, thin grasses and ferns.

Climbers: *Vitis himalayana*, *Rosa moschata*, *Hedera helix*, *Smilax parvifolia*.

Parasites: *Loranthus* spp.

Ecology: It is a climatic climax. All stages of degradation occur to thin oak scrub, the composition of the underwood being completely changed by overgrazing and fire. Intensive grazing and lopping may reduced the ban forest to an open grass-tree type with practically pure *Rhododendron*.

1.2.12 Type 12/C1b: Mohru Oak Forest (*Quercus dilatata*)

Description: With the damper site, warm summer and pronounced cold winter, this tree is definitely more luxuriant than the ban oak, and forms in fact some of the finest moist temperate broadleaved forests with density 0.7 to 0.8 the height is typically 20 to over 30 m with long clean boled trees. Secondary species mostly deciduous in nature, form greater admixture in the top storey. Second storey is well marked consisting of evergreen species like *Rhododendron*, *Lauracea*, *Ilex* etc. Shrubby undergrowth of deciduous and evergreen species is common. Epiphytic ferns and herbs are less pronounced than in the ban forests; mosses are less than in the high level oaks, but epiphytes are none the less conspicuous during the monsoon months, especially ferns and bryophytes.

Both the ban and Kharsu oaks extend freely into the *Quercus dilatata* zone. At the same time fairly extensive almost pure crop of *Q. dilatata* occur. Amongst the conifers *Picea* is perhaps the commonest associate.

Distribution: A relatively narrow belt above the ban oak extending from about 2000 to 2500 m elevation in the middle Himalayas, confined chiefly to Rajgarh & Habban Ranges. On its lower limit, this type overlaps with ban oak forests and on higher limits merges with kharsu and spruce forests. Drier aspects of this zone are occupied by ban oak forests.

Locality Factors: It is more mesophytic type than the ban oak which displaces it on dry ridges and hot southern aspect. It is thus adapted to temperatures averaging 4°C or 5°C cooler and a moister atmosphere and fairly high soil moisture also appears to be needed. The average rainfall varies between 1500 to 2000 mm. Snow falls every year and lies for several weeks.

Quercus dilatata: is the best leaf fodder. The accessible forests are heavily lopped. Mohru is less fire hardy than Ban but the forests are too damp to burn except when fires sweep up from below in exceptional years. Degraded forests are common in Gotari where scattered kail also appears.

FLORISTICS:

Top canopy: *Quercus dilatata*, *Q. incana*, *P. wallichiana*, *Picea smithiana*, *Q. semecarpifolia*, *Carpinus viminea*, *Machilus duthiei*, *Betula alnoides*, *Aesculus indica*, *Celtis australis* etc.

Under wood: *Ilex diphyrena*, *Litsaea umbrosa*, *Lyonia ovalifolia*, *Rhamnus purpurea*, *Rhododendron arboretum*, *Cedrela serrata*, *Fraxinus micrantha*, *Taxus baccata*, *Pyrus* spp., etc.

Under growth: *Rosa macrophylla*, *Rubus niveus*, *R. biflorus*, *Myrsine semiserrata*, *Viburnum* spp., *deutzia corymbosa*, *Indigofera geradiana*, *Daphne cannabina*, *Sarcococca Saligna*, *Desmodium* spp. Etc.

Ground flora: *Geranium*, *wallichianum*, *Galium aparine*, *Fragaria vesca*, *Thalictrum* spp and various ferns.

Climbers: *Clematis Montana*, *Hedera nepalensis*.

1.2.13 Type 12/C1 (a, b)/DS1: Oak Scrub

Description: This is actually a degenerated form of oaks high forest, which was subjected to biotic interferences over a long period. The oak and associated species are reduced to low stunted unsound trees, usually coppice whilst *Rhododendron arboreum* tends to be left as useless for villager's purposed usual associates are *Lyonia ovalifolia* and *Pyrus pashia*. The under growth consists of thorny bushes like *Berberis* spp. *Prinsepia utilis*, *Rubus*, *niveus*, *Plectranthus rugosus*, *Crataegus crenulata*, *Spiraea* spp. *Indigofera* spp. *Wikstroemia canescens*.

Ground flora is mostly short grasses; *Pteridium aquilinum* Regeneration is almost absent.

Distribution: Area adjoining or easily accessible to settlements extending from **Ban** up into Mohru type.

Locality factors: The type is subjected to and the result of intense lopping for fodder and litter combined with a continuous grazing and more of less fuel and pole fellings. The soil is usually badly eroded and often completely stripped.

If the areas are completely cleared of tree growth, the secondary temperate scrub (Type 12/C1/DS2) may come into existence.

1.2.14: Type 12/C1C: Moist Deodar Forest (*Cedrus*)

Description: The forest is nearly pure deodar but more or less blue pine and a little spruce are commonly present. Chil trees are also met with a transitional zone as observed in Sawana, Braila, Phagu and Dol forests. The canopy is complete but not very dense. The boles are cylindrical and straight. Trees are tall; a height of 30-40 m is usual. Crop is predominantly middle aged with moderate to fair density (06-0.8) and quality II. Understorey is almost absent except in khallas where it consist of *Quercus* spp. and *Rhododendron arboreum*. Undergrowth and ground flora is sparse to moderate depending upon the intensity of grazing. *Viburnum continifolium* and *Indigofera geradiana* are common. Regeneration is patchy, rather deficient in general.

Distribution: It is confined to Habban and Rajgarh ranges occurring between 1700 to 2500 m elevations. It extends appreciably lower on cool aspects and much higher on sunny ridges.

Locality factors: The rainfall is between 110 to 1800 mm, major portion falling in monsoon. Appreciable winter snowfall is necessary for the growth and distribution of deodar. High Humidity is unfavorable. The type occurs on all geological formations but avoids badly drained soils. On the exposed ridges and on shale, gneiss, it is found mostly in pure form. Fire does not usually originate in the deodar forests but is liable to sweep up from the Chir or blue pine forests and occasionally causes wholesale destruction particularly in young crops. Grazing is usually heavy throughout, but not excessive. It may even be helpful in reducing the herbaceous ground cover to facilitate regeneration.

FLORISTICS:

Top canopy: *Cedrus deodars*, *Pinus wallichiana*, *Pinus roxburghii* and *Picea smithiana* are rate on lower and upper limits.

Under wood: *Quercus incana*, *Q. dilatata*, *Rhododendron arboretum*, etc.

Under growth: *Berberis lyceum*, *Rosa macrophylla*, *Lonicera angustifolia*, *Strobilanthes wallichii*, *Deutzia staminea*, *Daphne cannabina*, *Indigofera pulchella*, *I. heterantha*, *Desmodium tiliacifolium*, *Oxalis corniculata*, *Rubus niveus*, *Prinsepia utilis*, *Viburnum continifolium* etc.

Ground flora: Ferns, grasses, *Adiantum lunulatum*, *Galium asperifolium*, *viola canescens*, *Fragaria vesca*, *F. indica*, *Anemone spp.*, *salvia glutinosa*, *Rumex nepalensis* etc.

Climbers: *Vitis himalayana*, *V. parvifolia*, *Hedera nepalensis*, *Clematis Montana*, *Jasminum officinale*, *Rosa moschata* etc.

1.2.15 Type 12/C1d: Western Mixed Coniferous Forest

Nomenclature: The type is commonly referred to as mixed coniferous or simply “fir” forest but it also includes pure spruce, spruce and silver fir and *Pinus Cedrus* formations.

Description : The most attractive forests in the Himalayas with very fine growth and varying mixture of spruce, silver fir, blue pine and deodar and a varying inter-mixture of evergreen and deciduous broadleaved trees and strips and patches of broadleaved forests. In the lower zone spruce predominates with sprinklings of kail and deodar at places. In the upper zone a mixed crop of fir and spruce with *Taxus baccata* and *Quercus semecarpifolia* as underwood occur. The tree canopy is moderate to dense and dark but broken by open grassy and flowery meadows created by regular use as grazing grounds. The trees have tall cylindrical boles and a height over 40 m is not uncommon. The type is true selection forests. In many areas young trees are markedly deficient and regeneration is a problem. Oaks form a dense under storey. A rich herbaceous vegetation is developed during the monsoon, a variety of ferns being among the first to develop in the spring after the snow melts, and the shoots of *Strobilanthes* often predominating later; this all dies off and is completely flattened down by the winter snow. There is a good deal of moss and lichen on the tree but climbers are infrequent.

Distribution: The type occurs on the highest slopes above deodar forests in Habban and Rajgarh Ranges.

Locality factors: The altitude varies between 2430 to 3000 m or more and the rainfall between 1000 to 13000 mm. Heavy snowfall is common covering the ground for several weeks. On cool, northern aspects, Silver fir predominates while open ridges are dominated by spruce. The forests occur on all types of rock. The soils have a well developed ‘A’ horizon with a thick un-decomposed humus inimical to regeneration. High level grazing grounds situated in this type exert a far reaching influence on the ground vegetation and regeneration of the tree species.

FLORISTICS:

The flora is practically identical with that of *Quercus dilatata* type, expect that the oak and all its associates are subordinated to a coniferous over wood to which some or all of spruce, deodar, blue pine and fir may contribute according to the altitude and other site factors.

Top canopy: *Picea smithiana*, *Abies pindrow*, *Cedrus deodara*, *Pinus wallichiana*.

Under wood: *Quercus dilatata*, *Q. incana*, *Q. semecarpifolia*, *Acer ‘B’ spp.*, *Taxus baccata*, *Betula alnoides*, *Rhododendron arboretum*, *Lyonia ovalifolia*, *Celtis australis*, *Ulmus wallichiana*, *Juglans regia*, *Corylus colurna*, *Thamnocalamus spp.*, *Arundinaria falcata* etc.

Under growth: *Viburnum nervosum*, *V. Continifolium*, *Skimmia laureola*, *Deutzia corymbosa*, *Ribes rubrum*, *Strobilanthes wallichii*, *Rosa macrophylla*, *Lonicera angustifolia*, *Rubus niveus*, *Spiraea* spp, etc.

Ground flora: *Viola serpens*, *fragaria vesica*, *valeriana hardwickia*, *Geranium wallichianum*, *Polygonum speciosum*, *Ainsliaea aptera*, *Galium acutum*, *Adiantum venustum*, ferns and grasses.

Climbers: *Hedera nepalensis*, *Vitis* spp., *Jasminum officinal*, *Clematis* spp.

1.2.16 Type 12/C1e: Moist Temperate Deciduous Forests

Description: A deciduous high forest, 20 to 30 m high, the trees running to large girth, usually branchy and the species occurring mixed singly or by groups of varying extent. The undergrowth is thin. Canopy is often broken to permit the growth of smaller trees and shrubs, also largely deciduous.

Distribution: On suitable sites throughout the moist temperate forests except the lowest parts. It occurs often in strips along the hill streams and also on many of the gentler slopes in Habban and Rajgarh ranges.

Locality factors: This type is commonly found between 1800 to 2750m elevation in moist hollows and depressions. It has suffered severely from proximity to settlements with the associated grazing, lopping and felling.

FLORISTICS:

Top canopy: *Aesculus indica*, *Acer* spp., *Celtis australis*, *Fraxinus micrantha*, *Ulmus* spp. *Prunus cornuta*, *Betula alnoides*, *Juglans regia*, *Quercus* spp.

Under wood: *Corylus colurna*, *Cornus capitata*, *Lyonia ovalifolia*, *Rhododendron arboretum* *Rhus* spp., *Taxus baccata*, *Crataegus* spp.

Under growth: *Viburnum foetens*, *Rubus* spp, *Berberis* spp., *Strobilanthes wallichii*, *Spiraea lindleyana*, *Cotoneaster* spp, *Sarcococca saligna*, *Daphne* spp, *Prinsepia* spp.

Ground flora: *Impatiens* spp., *Aconitum* spp., *Polygonatum* spp, *Spiraea* spp.,

Climbers: *Vitis semicordata*, *Hedera nepalensis*, *Clematis connata* etc.

1.2.17 Type 12/C1f: Low Level Blue Pine Forest (*P. Wallichiana*)

Kail forests are secondary to the destruction of pre-existing forest of various types from natural to biotic causes. *Pinus wallichiana* is the universal colonizer of vacant sites. Whilst under natural conditions it can maintain itself in the broadleaved and coniferous forests in chance gaps caused by wind, snow or landslips. Its occurrence over large areas is only made possible by human disturbance; its prolific and regular seeding is an important factor. Accordingly these Kail forests cannot be accorded climax status and are described under para 1.2.24 as secondary seral type.

1.2.18 Type 12/C1/DS1: Oak Scrub

Due to heavy grazing and severe loppings, the older trees in oak forests have usually succumbed but the smaller trees have reduced to coppice scrub, often practically pure oak as most associated species are more easily killed, but *Rhododendron arboreum* and *Lyonia ovalifolia* being both unpalatable to live-stock and poor fuels are generally left. At the lower elevations *Pyrus pashia* often survives owing to its

thorniness *Q. dilatata* tends to be lopped to the main stem and stands in columnar form till it is killed so that most of the scrub is *Q. incana* and locally *Q. semecarpifolia*.

1.2.19 Type 12/C1/DS2: HIMALAYAN TEMPERATE SECONDARY SCRUB

Description: An irregular but often dense and extensive scrub cover with a few species predominating, and sometime scattered residual trees of the original forest or pioneers of the secondary sere.

Distribution: Throughout the temperate forest on the site of abandoned cultivation, on burnt areas especially on southern aspects, on excessively grazed and lopped areas near villages and on other similar sites.

Locality factors: The secondary nature of these scrub communities is evident and ascribable to the cause mentioned. Their stability varies greatly with conditions, from those which can quickly revert to forest on removal of the retrogressive influences to other where progression is so slow as to be hardly apparent-this is particularly applicable to hot southern aspects at the middle and lower elevations.

FLORISTICS : *Plectranthus rugosus*, *Berberis spp.*, *Crataegus Crenulata*, *Spiraea canescens*, *Prinsepia Utilis*, *Indigofera gerardiana*, *Pyrus pashia*, *Rosa macrophylla*, *Cotoneaster bacillaris* etc.

1.2.20 Type 12/C2a: Kharsu Oak (*Quercus semecarpifolia*)

Description : The oak forms dense and pure crops of irregular age, about 15 to 20 m rarely 30m high with little admixture of other species. The trees are hung with dark green-brown moss. Second tree storey is often absent. Ground cover is mostly deciduous Shrubs with a varying amount of grass, ferns and herbaceous growth. Scattered silver fir, blue pine and spruce occur, and in sheltered sites the oak is displaced by the fir forests, at the top of the altitudinal range it merges into the sub-alpine forests of fir, *Rhododendron arboretum* and birch but it often abuts directly on the alpine pastures.

Distribution: In Habban and Rajgarh ranges between 2500 m and 3000m particularly on southern aspects and scarp slopes.

Locality factors: Heavy snowfall is usual. Summer is short and largely coincident with the monsoon rainfall. The oak only comes into new leaf late in May and forests occur at the end of September. Hail storms are common in April-May and often strip the old foliage. The trees around gujjar paraos and summer grazing grounds are subjected to heavy lopping.

FLORISTICS:

Top canopy: *Quercus semecarpifolia*, *Q. dilatata*, *Picea smithiana*, *Pinus wallichiana*, *Abies pindrow*, *Acer caesium*, *Pyrus lanata*, *Betula alnoides*.

Under wood: *Rhododendron arboretum*, *Ilex dipyrrena*, *Prunus padus*, *Betula utilis*, *Taxus baccata*, *Cotoneaster acuminata*, *Viburnum stellulatum*, *Meliosma dilleniaefolia*

Under growth: *Lonicera angustifolia*, *Skimmia laureola*, *Salix elegans*, *Rosa macrophylla*, *Sarcococca saligna*, *Cotoneaster bacillaris*, *Viburnum foetens*, *Strobilanthes wallichii*, *Rubus niveus*, *Smilax vaginata*, *Berberis spp.* etc.

Ground flora: *Fragaria vesca*, *Podophyllum hexandrum*, *Spiraea* spp. *Rumex nepalensis*, *Geranium wallichiana*, *Viola canescens*, *Anemone rivularis*, *Skimmia laureola*, ferns and grasses.

Climbers: *Clematis Montana*, *Vitis himalayana* etc.

1.2.21 Type 12/C2b: West Himalayan Upper Oak Fir Forests

Nomenclature: This type is known as the **Oak-fir** forest and includes **SURI's** *Abies-Betula-Quercus* type and **GORRIE's** **silver fir Kharsu Oak**.

Description: Typically a two storied high forest with the silver fir standing singly or in strips and groups over oak and other evergreen and deciduous trees, the two canopies together forming a fairly complete cover. There is always more or less shrub growth over the soil and a luxuriant herbaceous growth during the summer except where too dense and dark canopy is irregular. Climbers are relatively few, but the oaks carry a conspicuous mantle of mosses. Regeneration of fir is entirely absent.

Distribution: The type occurs above the mixed coniferous forests in narrow belts between 2603 to 3400m especially on northern aspects and sheltered sites in Habban and Rajgarh ranges.

Locality factors: The sites occupied are under snow for several months in the winter. The drier warmer sites between the zonal limits mentioned tend to be occupied by pure oak forest but the type persists into regions with a lower rainfall, melting snow ensuring the presence of adequate moisture supplies. Fire is of exceptional occurrence but far reaching in its effect, it checks the fir to the benefit of deodar and blue pine. Grassy meadows are typical and more extensive than in the lower zone and often join up with the true temperate pastures. A deep moist humus layer is usually present.

FLORISTICS:

Top canopy: *Abies pindrow*, *Picea Smithiana*.

Middle canopy: *Quercus semecarpifolia*, *Q. dilatata*, *Betula alnoides*, *Ilex diphyrena*, *Ulmus wallichiana*, *Acer* spp. *Corylus colurna*, *Taxus baccata*.

Under growth: *Viburnum foetens*, *Rhododendron campanulatum*, *Salix elegans*, *Rosa* spp., *Lonicera angustifolia*, *Strobilanthes* spp., *Skimmia laureola*, *Rubus niveus*, *Spiraea* spp., *Cotoneaster acuminata* etc.

Ground flora: *Fragaria vesca*, *Ainsliaea aptera*, *Valeriana wallichii*, *Galium asperifolium*, *Adiantum venustum*, *Polygonum speciosum*, *Rumex nepalensis*, *Viola odorata*, *Salvia moorcroftiana*, *Aconitum nepellus* etc.

Climbers: *Vitis semicordata*, *Schizandra grandiflora*.

1.2.22 Type 12/DS3: Himalayan temperate pastures:

The temperate pastures are sporadic, smaller in size, distributed along the main ridges mostly above and in mixed coniferous forests in Habban & Rajgarh Ranges, Where grazing has taken place in the temperate forests favorable sites on ridges and the greater slopes especially where moist or near water, have gradually been cleared passing through the parkland stage to open grass land. The grasses commonly found in

such pastures are *Festuca spp.*, *Arostis spp.*, *Calamagrostis spp.*, *Dactylis glomerata*, *Bromus spp.*, *Danthonia spp.*, and many others. Lower down in the deodar and ban oak forests, these grasses are mixed with tropical species, notably *Themeda*, *Heteropogon*, *Chrysopogon* etc.

The pastures lying longer under snow differ in floristic. These meadows are mostly composed of perennial mesophytic herbs with very little grass. Conspicuous among the flowering herbs are *Potentilla argrophylla*, *Rosa sericea*, *Primula*, *Anemone*, *Fritilaria*, *Iris*, *Gentiana* with many *Ranunculaceae* *Cruciferae* *Compositae* and *Caryophyllaceae*.

1.2.23: Type 12 1S1: Alder Forest (*Alnus*)

Description: Typically pure forest 20 to 30 m high as a strip or patch of varying width along stream sides, landslips and more or less deciduous. An underwood may or may not be present, its amount and composition depending on site conditions. Often undergrowth of inedible or thorny shrubs present.

Distribution: Along the banks of some streams and on landslips in Rajgarh and Habban Ranges.

Locality factors: Limited to sites with permanent water supply. It occurs on newly formed shingle beds along the streams, and on landslips and screeds where not too dry. Mycorrhiza are known to occur on the roots. The altitudinal range is a wide one extending from 1000 to 3000m.

FLORISTICS:

Top canopy: *Alnus nitida*, *Ulmus villosa*, *Celtis spp.* *Populus Ciliata*.

Under growth: *Crataegus crenulata*, *Sarcococca spp.*, *Spiraea spp.*, *Berberis spp.*, *Prinsepia spp.*, *Plectranthus spp.*

Ground flora: *Urtica dioica*, *Girardiana heterophylla*, *Rumex nepalensis*, *Polygonum spp.*, *Ranunculus diffuses* etc.

Climbers: *Vitis spp.*

Parasites: *Viscum spp.*

1.2.24 Type 12/2S1 Low Level Blue Pine Forest Description:

The forests are more or less even aged with blue pine tends to be pure with a closed canopy at all places except on southern slopes where it has been destroyed by fires. The quality is II. Some deodar is often intermixed where a seed source has been present; similarly spruce on cool moist sites. At lower elevations chil and kail are seen growing together as witnessed on Bathaudhar. The understorey is almost absent except for a few scattered trees of *Q. incana*, *Rhododendron arboretum*. Regeneration of kail is adequate. Undergrowth is very little, the ground being covered with a layer of needles through which more or less grass and herbaceous growth comes up in the summer. On southern slopes with open crop a good deal of growth of *Berberis*, *Indigofera* etc. persist in varying degree as the pine grows up and closes.

Distribution: The type occurs in Habban & Rajgarh Ranges at altitudes between 1500 and 2400m.

Locality factors: The forests occur at the lower edge of the residual forest adjoining or near to village cultivation. In some cases lands were cleared and at least partially cultivated in the past. On steeper ground, the forest covers were destroyed by fire and or grazing with associated lopping and fuel collection in the past. Most of these pure blue pine crops unquestionably owe their origin to the introduction of protection 80 to 100 years ago.

FLORISTICS:

Top canopy: *Pinus wallichiana*, *P. roxburghii*, *Cedrus deodara*, *Picea smithiana*.

Under wood: *Quercus incana*, *Q. dilatata*, *Rhododendron arboretum*.

Under growth: *Rubus niveus*, *Berberis lyceum*, *Desmodium tiliaefolium*, *Prinsepia utilis*, *Myrsine Africana*, *Rosa spp.*, *Indigofera gerardiana* etc.

Ground flora: *Viola Serpens*, *valerian spp.*, *Geranium spp.*, *Fragaria spp.*, *Adiantum spp.*, etc.

Climbers: *Clematis spp.*, *Hedera spp.*, *Rosa moschata* etc.

1.2.25 Eucalyptus:

Plantations raised in the past have met with failure except for a few patches in Ghinni Block near Tamani and Dimber block near Khairy. List of plantations raised in the past are tabulated in Appendix XIV.

1.2.26 General Description of the Growing stock:

The compartment history files contain the description of growing stock of individual compartment/sub compartments. By and large chil is the most economic conifer species followed by deodar, Kail, spruce and fir. In broadleaved species ban has edge over other species on account of charcoal marking followed by misc. scrub vegetation. Chil is of II/III quality. Deodar and kail are of quality II. The density varies from 0.1 to 0.8. Upper chil pine forests have better quality, density and regeneration in comparison to lower Chir pine forests. Lower chil forests are burnt frequently in open stocking and deficient regeneration. Chil forests are represented by all age classes and regeneration is satisfactory. Kail forests are mostly even aged with moderate to good stocking and younger to middle age groups predominate. Deodar forests are well stocked middle aged trees predominate and regeneration is deficient. Spruce and fir forests are moderately stocked with predominately middle aged to mature trees but lacking in regeneration. Fire protection and closure to grazing are essential for the successful chil regeneration. Control grazing and frequent removal of undergrowth is prerequisite for successful deodar regeneration while opening of canopy and exposed soil is essential to regenerate the spruce. When there is less accumulation of humus and bush growth is sparse, fir regenerates well. Oak forests are well stocked except near habitations and grazing and represented by all age classes. Regeneration is fair. Dry mixed deciduous scrub forests are of poor quality, open oak and miscellaneous broadleaved scrub forests are below normal stocking. The per hac growing stock of important species enumerated is given in table 1.2.2.

Table 1.2.2: Growing stock (m³/ha) of various forests.

Sr. No.	Forests	Growing stock (M ³ /ha)	Normal growing stock (M ³ /ha)
1.	Chil Forests	75.44	123.56
2.	Chil Forests (degraded).	42.37	123.56
3.	Deodar-Kail Forests	228.87	310.00
4.	Deodar-Kail Forests (degraded).	52.29	310.00
5.	Spruce and Fir Forests.	312.85	
6.	Ban Oak Forests.	281.94	
7.	Dry mixed deciduous Forests.	104.15	

1.2.27 Injuries to which crop is liable: The trees liable to injuries are due to following causes:

- a. Natural
- b. Man made
- c. Wild animals and insects
- d. Plants (fungi, climbers & weeds)

NATURAL CAUSES:

Drought: It is dreaded of all the unfavorable climatic factors. The pre and post monsoon droughts play an important role in the success of natural and artificial regeneration. Damage to chil and deodar seedlings are noticeable during severe droughts. The pre-monsoon drought leads to forest fires. In year of severe drought, groups of trees on thin soil, spurs and ridges have dried up. The severity is more in Siwaliks due to desiccation. The heavy incidences of grazing and grass cuttings aggravate bad effects of drought.

Frost: The frost is common causing severe damage to khair seedlings and limited damage to deodar plantations.

Snow: Snow damage is common in deodar and kail forests, but it also occurs in upper chil forests during severe winters. Congested poles and saplings are chiefly affected and sometimes quite large numbers are uprooted or broken. Snow slides occur in some high altitude nallas, preventing tree growth in them.

Wind: Wind storm causes considerable damage to the standing trees particularly deeply tapped chil trees which are snapped. Beside forests, road side trees are uprooted. The damage to chil trees has become regular features which are uprooted and broken. Individual trees are occasionally thrown down by wind.

Lightening: It is common in high mountains and spruce and fir trees are mostly struck by lightning, split, damaged and die.

Erosion: Sheet, rill and gully erosion is a common feature in Siwaliks. Landslides, slips and stream bank erosion are prevalent in high hills. At places the existing forests and damaged due to soil erosion.

MAN MADE CAUSES:

Fire: A great deal of damage is done in chil and kail forests. Deodar forests are practically immune to fire damage unless intentionally set on fire by villages. In Chil forests, fires wipes out completely the young regeneration and damage the standing trees which become susceptible to wind fall. During the past 20 years 15322.17Ha. of forests in extent burnt in this division (Table 1.2.3). This has resulted in depletion of chil stocking. Some of the forests have been reduced to degrade from like RF Dalmun Sudar. The fires have also caused serious damage to scrub forests where **Lantana camara**

is spreading. In majority of cases, the forest fires are the results of negligence of the people burning the ghasnis carelessly and smoking while passing through the forests.

Table 1.2.3: Forest fires and area burnt.

Year	Area burnt (ha)	Estimated Loss (Rs)
1991-92	109.00	60000
1992-93	837.20	268150
1993-94	335.05	708500
1994-95	523.45	280000
1995-96	5501.75	7369098
1996-97	2.50	0
1997-98	0	0
1998-99	127.00	72000
1999-2000	2334.00	656850
2000-01	4.00	2000
2001-02	43.06	20000
2002-03	408.32	253000
2003-04	495.75	323284
2004-05	368.02	205000
2005-06	554.67	1212000
2006-07	103.00	131000
2007-08	561.00	565360
2008-09	87.65	80250
2009-10	2812.75	1912850
2010-11	114.00	258000
2011-12	1534.90	778450
2012-13	1240.23	610300
Total	18097.3	15766092

Fire protection is neglected most often than not in the division. It is left unattended, by the passers, by graziers or even labourers working in the vicinity. Fires can be minimized by laying fire lines. There is a network of fire lines in the division. These are however, not maintained and have thus been rendered totally useless. The control burning of the chil forests during winter reduces the incidence of fires. Incidentally this practice has also been abandoned by the department.

Lopping: It is done by the local people for fuel, fodder, and animal beddings. This damage is mostly restricted close to habitation and Gujjar paraos. Lopping of oak is a recorded right causing serious damage to trees. Rules regulating the exercise of this right are adequate but enforcement generally lacks. Many high forests have been transformed to Oak scrubs. Lopping in mixed deciduous and scrub forest is very heavy during winter chiefly done by Gaddies. The species lopped most are *Anogeissus latifolia*, *Bauhinia spp.*, *Terminalia tomentosa*, *Ougeinia dalbergioides*, *Celtis australis*, *Grewia oppositifolia*, *Salmalia malabarica* etc many forests in Ghinni valley have reduced to scrubs.

Illicit lopping in Chil, Kail and Deodar is heavy and even spruce trees are lopped for staking tomatoes, peas and vegetable being cultivated in the valley. This has added new dimensions to the injury.

Felling: Illicit felling of conifers are reported from all over the division. Large scale spruce and fir trees are felled every year by the Gujjars for constructing their camps. In dry mixed deciduous forests in Ghinni valley, the illicit fellings are restricted to *Terminalia tomentosa*, *Syzygium cuminii*, *Cedrela* spp. etc. Crave for bigger houses and possession of large cattle herds by right holders put immense pressure on forests for concessional timber (T.D.) and consequent destruction of forests. Misuse of TD and illicit fellings to smuggle the timber is a common feature in the division. This has multiplied the right holders demand many times much beyond what forests are capable of enduring.

Breaking of land: It is prevalent throughout the division. For agricultural, non forestry and horticultural purposes large scale forest lands have illegally been encroached upon. Even the reserve forests have not been spared. This has caused set back to the forestry extension works.

Grass Cutting: It is extensive all over the division and does little harm compared to grazing. In regeneration areas and new plantations, it causes some damage as many a small seedlings and plants are undoubtedly, cut with the grasses.

Grazing: As per statistics of animals, local and migratory graziers graze about 92,139 cow units in this division with average grazing incidence of 2.54 units per ha. Unrestricted grazing by an excessive number of cattle, sheep and goats has changed the composition of natural vegetation to a great extent. In chil forests heavy incidence of grazing destroys the natural regeneration by way of browsing, trampling and compacting the soil. It does little harm to deodar and kail. It is definitely harmful to seedlings and coppice shoots in Oak forests. The 'thaches' grazed by gujjars become scarce of grasses. As a result the broadleaved trees in and around are heavily lopped and die out slowly.

Torchwood Extraction: Its extraction from the basal portion of kail, deodar and chil causes appreciable damage to the trees. The practice is however, dying out with the economic development.

Resin Tapping: Of late, illicit and defective tapping has done considerable damage to chil forests. The lower diameter trees are tapped illicitly and defectively. This renders the trees weak at the base which breaks during strong wind. Supplemented by fires, the damage has reduced the density and extent of chil forests.

Construction of roads, electric and water lines: Construction of roads, electric transmission and water supply lines not only increase the hazards of erosion and land loss but also effect the existing vegetation adversely. Details of forest area diverted from 1991-92 to 2011-12 under FCA 1980 for various purpose and spp wise trees felled is given in Appendix-XVII

WILD ANIMALS AND INSECTS:

Wild animals:

Black bears debark and griddle young kail and deodar trees to depth in the early spring. Bears also break the branches of oaks to obtain corns. **Porcupines** eat the roots of young plants of deodar, kail and chil and do considerable damage to young plantations. They also eat new bamboo shoots and griddle the base of Khair trees. **Monkey, Langoors and Flying Squirrels** eat up the seeds from the cones of conifers and acorns of oaks. Nurseries are more susceptible to the damage of **Monkeys, Porcupines, and Flying Squirrels**.

Birds: The **Himalayan nut cracker** does maximum damage to the cones of kail, spruce, fir and pines by eating the seeds. Pheasants namely Koklash, Monal, Kalij, sometimes eat up the seeds from nurseries and areas sown with deodar and chil.

Insects: Some deodar forests have been subjected to severe defoliator attack (*Atropis deodareae*). Oaks are also subject prone to similar damages. In lower hills, the area is infested with white ants. It causes severe damage in plantations. **Cock Chaffers** are great nuisance in nurseries and cut off young seedlings flush with the soil surface. Spruce is affected by spruce bud worm, *Eucosma hypidryas*. The *Phytogagus chalcid* forms galls on spruce needles. Fir is also affected by silver fir bud worm and *Eucosmid caterpillar*.

PLANTS:

Fungi: *Trametes pini* attacks the lopped kail trees *Fomes annosus* has also been found attacking the young deodar saplings. The *Peridomum cedri* is known for Witches, broom in deodar.

Climbers: *Bauhinia vahlii* is the only climber which causes appreciable damage in dry mixed broadleaved forests and occasionally in some chil forests. It has engulfed the standing crops in Ghinni valley. *Vitis spp.* *Clematis Montana*, *Hedera helix* and *Rosa moschata* do a little damage in deodar forests by suppressing young poles in moist and damp localities.

Weeds: *Lantana camara* has become a menace to forest growth both in dry mixed deciduous and chil forests in Sarahan and Narag ranges. It is spreading constantly and eliminating all other vegetation. The highly dense mat formed by *Strobilanthes*, *Impatiens*, *Polygonum* obstructs the regeneration of high level conifers by preventing the seeds from reaching the soil. In opened areas bushes like *Rosa moschata*, *Rubus ellipticus*, *Berberis spp.* cover the blanks and make regeneration efforts difficult. In plantation, such bushes smother the young plants and obstruct their proper growth.

(PART - B)

FOREST FAUNA

1.2.28: General Description : A wide range in altitude with varied tropical to temperate flora offers diverse type of wild animals and birds capable of thriving under different climatic conditions ranging from tropical to arctic climate and from densely wooded area to sparse tree growth. The undisturbed forest in the past gave safe harbourage to wild creatures and provided guarantee of their survival. With the advancement of civilization, there are hardly few forest left free from intrusion by man. This has a disastrous effect on the wild life. The increase in human population and breaking of forest lands for agriculture has also reduced the damain available to the wild life. The spruce, fir and kharsu forest were full of musk deer serrow panther tragopan and monal The lower areas were rich in black deer goral wild deer barking deer koklass kalij chakor partridge and red jungle fowl Their number has reduced to alarming low level with the passage of time The important wild life species as described below. Chapter Approved by Pr.CCF W.L. No. WL/WORKING PLAN. 7513 dated 31-03-2012. (SHIMLA) Annexed.

1.2.29 ANIMALS (MAMMALS)

A. GAME ANIMALS

1. CARNIVORA

Leopard or Panther (*Panthera pardus*) It is also known as Bagh. Its population has reduced considerably. It is found up to an elevation of 2,500 m and resides in isolated rocky hills. It is bolder than tiger. It is of rufous fawn color, has a fulvous or bright fulvous coat marked with dark spots grouped in rosettes. The tail is also more or less ringed. Average male is about 2 m long weighing about 57 kg. Panther breeds all the year round and probably one litter of 2 to 4 is given every year. It generally remains in the neighborhood of villages, carrying off sheep goat calf and dogs etc. at nights. It seldom attacks human without provocation. It has been ruthlessly killed for its ornamental skin and also for the safety of the goats and sheep in the forest. Although it has been declared protected animal it is subjected to heavy onslaught.

The Himalayan Black Bear (*Selenarctos thibetanus*) kala bhalu is a big animal found in high hills between 1,500 to 3,000 m and lives solitary in the caves deep in the forest except during mating season. The body is covered with thick coat of black hairs with V shaped mark on the chest. The males may measure slightly over two meters in length and weigh up to 200 kg. Females are a little smaller and lighter. Bears hibernate during winter. It descends down to lower elevations after snow fall. Though it prefers oak stands it inhabits coniferous forests also. Being omnivorous it lives on variety of food such as wild fruits berries, honey, insects, rodents, even birds and small mammals. During monsoon these animals come down to maize fields and do considerable harm. During spring and early summer back bears damage the saplings and poles of deodar and kail by peeling off the bark to lick the sap or resin exudes. It is very furious when provoke. Females are more dangerous than males. This animal though categorized as big game and its hunting is only under permit it is killed by poachers for its skin, gall bladder and fat.

Himalayan Pine Martin (*Martis flavigula*) : - It is commonly found in ban oak, chil or even open kail and deodar forest between 1, 200 to 2,500 m elevation. It is of larger size than domestic cat with long tail. The colour is deep brown black with yellow at the throat. The predator thrives on birds and their eggs, mice, squirrels, rodents and small mammals like young ones of the deer and goat antelope family chasing them over to long distances. It is hunted for the fur. It has been declared as a vermin.

Porcupine (*Hystrix indica*) :Locally known as seh, sehl or sail , it is robust, heavy and terrestrial. The whole of its back is covered with long and well developed quills which may be nearly 60 to 70 cm long. It feeds on vegetables, principally on roots and damages the young plants in nurseries and plantation, especially of walnut chil, deodar etc. The animal is found of gnawing bones and when alarmed it utters a grunting sound, erects its spines and inflicts injuries. It weighs about 10 to 15 kg and is locally very much valued for its meat.

1.2.33 The Large Red Flying Squirrel (*Pteruista albiventer*) : It is a nocturnal animal found up to 1,500 m heights and becomes active after sunset. It flies from tree to tree eating fruits and also insects hiding under the bark. The acorns of all the oaks are eaten by this animal. During autumn, the fruits of walnut ,hazelnut, horse chestnut and maple are also eaten. The damage done to forest is compensated as it eats injurious insects.

2. HERBIVORA

GOAT ANTELOPE GROUP

The Goral (*Nemprhaedus goral*): It is stocky goat like animal, smaller than domestic goat with stout limbs and coars hair. It is found from 1000 to 3000 m elevations. Gorals are found in groups with offspring's of different ages feeding on rugged grassy glades or rocky grounds in the midst of forests. It's ideal habitat is thick undisturbed forests with glades of open grassy lands which it prefers to graze at dawn and dusk. It spends most of the day time in secluded spots in dense forest. The mating season is from October to December and the young ones are dropped in April to June. The animal is often hunted for its meat in winter when forests are under snow and it descends down to the villages.

Deer Group.

Musk Deer (*Moschus moschiferus*) : A small animal found on steep hills above. 2500 m elevation known as Kastura. It was quite common in Sarh , Pajoga, Berjamoli, Setambu forests but large scale poaching have reduced the population to an alarming low level. These animals lead solitary and secretive life and generally inhabit steep and rocky slopes. This deer is very agile and runs fast and is not easy to shoot. Musk deer eats mostly grasses, shrub such as wild rose, lichens and herbs. The habit of using the same place for dropping make it an easy prey of the poachers. It is much sought after for its musk which is found in males only. The musk is produced by the secretion of the musk gland situated beneath the skin. It is generally snared by the poachers and killed for the musk pod which sold between Rs. 40,000 to 50,000 depending upon the size of the pod. It has been declared a protected animal and its shooting and capturing is prohibited throughout the year.

The barking Deer (*Muntiacus muntjak*) : It is known as Kakar found between 800 to 2500 m elevation. Its colour is deep chestnut becoming darker on the back and pale and dull below. Its height shoulder is about 50 to 57 cm. the horns rarely exceed 13 cm. Generally it utters a subdued chicking noise but when alarmed and in flight, the sound becomes a bark like cry from which the name barking deer is derived. The animal lives mostly in forests having very thick understorey and comes out to graze in the out skirt of forests in open clearing during night. It is a solitary animal and is rarely found in herds. The animal is diurnal in habit and its food is mainly grass, tender leaves of trees, shrubs and wild fruits. It is unmatched for flexibility and prowess of creeping through the tangled stands. The mating season is during winter months and young's are born in spring. During winter it descends down. Being small in height, it cannot run fast on snow and gets stuck up and gunned down easily. It is a sought after animal for its meat. The high incidence of poaching has reduced the population an alarming low position. The destruction of the habitat of this animal is also the reason for its reduced population.

The Sambhar (*Cervus unicolor*): This is the largest deer, carrying magnificent horns. Its coat is coarse and shaggy and the general colour is brown with yellow or greyish tinge. A full grown average male weighs about 230 to 240 kg. The horns are about 90 cm. This animal was quite common upto an elevation of 2,000 m. Due to complete coverage of habitat by the domestic animals, increase in the population, better mobility due to roads, more guns and the lust for cheap meat, this animal has been badly hunted in the past.

OTHERS

The Indian Wild Boar (*Susserofa cristatus*): Also known as Jungli Suar, it is a notorious and an omnivorous wild animal living in grassy, bushy and also thickly wooded area. It feeds on field crops, wild roots, tubers and even insects. It is greyish black, the skin being covered with a sparse growth of bristles which form a conspicuous mane. Wild boar is a prolific animal giving at least two litters every year, one in the beginning of rains and other the after the rains. A well grown male is about 80 to 90 cm. at shoulder and may weigh upto 80-100 kg. It is generally found in herds and causes a lot of damage to agricultural crops, forest nurseries and plantations.

COMMON INDIAN HARE (*Lepus nigricollis*) : Locally known as Khargosh , Serru or Kharha it is found everywhere but is more pronounced in lower regions in Sarahan and Narag ranges , It is a small size animal having about 40 to 50 cm length and about 2 kg. of weight. It feeds on grasses, seeds and fruits. It is hunted for its meat. It is harmful to nurseries and plantations.

B. NON GAME ANIMALS

WOLF: - (*Canis lupus*): An animal little larger than domestic dogs and earthy brown in colour, was common in the area but due to its alleged preying on the domestic animals, it has been made nearly extinct.

THE JACKAL (*Canis aurs*): - Known as Gidar, it is little smaller than the domestic dogs and grey in colour. Very conspicuous due to their howling during dusk or dawn near villages. Their number has increased due to lack of competition by other animals which have been hunted down by the man. They do considerable damage to the crops and also lift the domestic poultry. Killing of these animals also require permit under big game.

RED FOX: (*Vulpes vulpes*): - **Lomari** is an animal known for its cunning and agility. It is little smaller than jackal and richly red in colour. It lives mostly on small rodents, insects, marmots and even

flying squirrels. Fawns of a braking deer and rabbits are also sometimes hunted and devoured by foxes. It also preys on small birds and pheasants. It is found between 1,500 to 2,700 m but moves down to even lower heights during winter.

THE HIMALAYAN PAIM CIVIT (*Paradoxurus hermaphroditus*): - It is little larger than the common house cat and is blackish in colour. It feeds on small mammals and also fruits and leaves of forest trees.

THE WILD CAT (*Felis chaus*): It is known as Jangli billi, slightly bigger than the domestic cat and has long legs. It is distributed all over but avoids cold during winters. Its habitat is forests fringes, open grass lands and rocky outcrops. It preys on small mammals, birds and even on poultry near villages. Due to diminishing natural diet, its population has decreased.

THE LEOPARD CAT (*Felis bengalenis*): It is known as chita billi, about the size of domestic cat with rather longer legs. Its skin marking resembles of panther. It lives mostly on small birds and rodents.

MONGOOSE (*Herpestes edwardsii*): It is light grey to dusty brown small animal locally called Neola. It eats rats, snakes and small birds. It is found all over the division except snow bound areas.

THE COMMON OTTER (*Lutra lutra*): Locally known as Udbilao, it is quite active along the Giri Pervi, Ghaggar and various other perennial khads.

THE MONKEY (*Macaca mulatta*): The common species found are *Rhesu maigna-Bandar* which is in plenty all over due to protection afforded to it on religious grounds. Its population has also increased due to reduction of its natural predator namely panther. It avoids snow and moves down during winter. Monkeys do considerable damage to the agricultural crops, garden fruits and plantations. They live in groups in open areas to the dense forests and feed on tender leaves, wild fruits and tubers. Oak acorns are the favourite food.

THE LANGOOR (*Presbytis entellus*): Like monkey, Langoors are also found from Shiwaliks to high himalayas but move down during winter though on lesser scale. They live on leaves, buds, fruits and flowers of forest trees, shrubs and even herbs. The banana acorns, horse chestnut, maple, robinia, walnut and hazelnut seeds are the favourite dietary items. They live in large groups. These animals are shy and less troublesome, compared to monkeys. However, they do damage to the agricultural crop-fruit trees and forest plantations.

A: GAME BIRDS

1: TERRESTRIAL BIRDS

PHEASANTS AND FOWL GROUP

MONAL (*Lophophorus impejanus*): Monal is the prettiest of all the birds found in the tract. Its habitat lies above 2,500 m extending upto snow line in summer but descending to lower altitudes during winter. It is frequently found in Fir, Spruce Deodar, Kail and oak forest but occasionally makes appearance in the vicinity of grassy glades. It is of the size of large domestic fowl with a short broad and square out tail. This characterized by brilliant metallic green head the glistening purple upper part cinnamon coloured tail and velvety black breast and a crest of beautiful feathers. The female looks like a huge partridge, plain brown in colour. It is mottled and streaked dark and pale with a white throat and short crest of normal feathers. When flushed the female flies to the nearest trees and perches on a bough convenient to her and as such is easy to shot. In breeds in May and June. Monal eats tubers and seeds in temperate and alpine pastures. In autumn it feeds on grubs or maggots ,roots and young shoots of various shrubs and grasses ,corns and berries. In winter these birds migrate to lower elevations and sometimes feed in the wheat and barley fields where these are short indiscriminately. It is killed for its beautiful dark green plumes.

THE KOKLAS (*pucrasia macrolopha*): It is found mostly in deodar and sometimes in fir zone and prefers moist wooded forest with undergrowth. This pheasant is a nice table bird. The male has dark green head with fawn coloured central crest and a white spot on each side of the neck at the commencement of head. The front of the neck breast and belly are of chestnut colour. The rest of the body is streaked with black and grey. The tail feathers are black with Narrow white tips with central part reddish brown. The female is mottled with black and brown with buff streaks above, eyebrows are buff and throat white. The breeding season is from April to June. In autumn and winter they are found in small flocks.

THE CHEER PHEASNT (*Catreus wallichii*) : It is a big birds about 90 cm with long tail of about 60 cm. The head has long narrow crest with bare red skin around the eye in both the sexes. The colour is buffy white, barred with black above. The lower part is buff barred with steely black. It has got a special preference for bushy areas and open forest. In the recent past the bird has been nearly wiped off by the poachers in some of the localities. Its habitat is also heavily disturbed by grass cutting and cattle grazing. It has been declared as endangered species by I.U.C.N. (1979) Red data Book 'Aves'.

THE WHITE KALEEJ (*Lophura leucome lana*) It is known as **Kulsha** (male) and **Kaleshi** (female) . The male is black above glossed with steel blue and black tail. It has a white rump, long white crest ,scarlet patch around eyes and feathers being white tipped. Most of the under surface is dirty white the throat and belly being brown. The female is reddish brown. The male has a long narrow dropping crest of white hairy looking feathers. It is found in higher reaches in Rajgarh and Habban ranges and inhabits in thick bushes and shrubs. They nest from March to June and live in pairs or family flocks. Heavy poaching had reduced the number of birds to great extent.

THE RED JUNGLE FOWL (*Gallus gallus*): It is known as **Jungli Murga** or **Kukar** and is common upto 2,000 m altitude. It prefers lower scrub forest. It is a favourite bird of shikaris. It is believed to be the ancestor of all domestic fowls, found in pairs or parties. It is a very shy and cunning bird scuttles into cover on slightest disturbance or suspicion. The male is black below and orange and red above. The tail has long coverts with dark metallic green colour hanging along each side. The wings are mixture of glossy, red, dark metallic green, black and chestnut. The hens are plain streaked brown with rufous brown under parts. It roosts on thick crowned trees or bamboo clumps; feeds on grains, vegetable shoots, insects etc. Nesting season is generally from March to May.

PARTRIDGE AND QUAILS GROUP

THE BLACK PARTRIDGE (*Francolinus francolinus*) : Commonly known as **Kala Titar**, it is found upto 1800 m frequenting the grassy and scrub patches near cultivations. It is a small game bird, about half the size of a village hen generally black and spotted white. The hens are paler and speckled black and white. It feeds on grass seeds, grains white ants, termites 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.

THE CHAKOR (*Alectoris graeca*) : Chakor is a mountain partridge being one of the best table birds. It is a large, plump, pinkish, grey brown with rib like bars on flanks Bills and legs are crimson. Its colour on the upper part and upto breast is plain grey.

The lower parts below the breast are buff and the flanks are beautifully banded with grey, buff, black and chestnut. It is distinguished at once by the beautiful bearing of flanks. The male and female are alike and in size it is bigger than house Myna measuring 35 cm. The bird is very prominent due to its call in the evening and at times even during day. It prefers the barren rocky slopes with scattered bushed and grasses. It is a resident bird of Himalaya found between 1500 to 3000m in Habban and Rajgarh ranges. Generally it is seen in parties regularly visiting the cultivated fields for food. It feeds on seeds and grain insects and larvae. The breeding season is from April to August, early at low altitudes and late in the high hills. Seven to twelve eggs are laid at a time.

THE HILL PARTRIDGE: (*Arborophila francolinus*) : It is known as Peora, found beyond chil forests unto an elevation of 2000m living in small flocks and roost at night. It has got special preference to bushy areas, oak forests and dense coniferous stands.

THE GREY PARTRIDGE: (*Francolinus pondicerianus*) : Locally known as Safed or Dhaula teetar, It is less common than Kala teetar, occasionally found in dry scrub forests. It frequents bushy jungles and cultivated lands. Its hunting is common.

JUNGLE BUSH QUAIL: (*Predicula asiatica*) : It is known as Bater and is of the size of rain quail. The bird has 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 and dry scrub forests. It lives in convoys of 5 to 20 which rests together and rise suddenly when almost trodden, feeds on grass seeds, tender shoots and grains. Nesting season is not well defined; it ranges from August to April.

THE COMMON OR GREY QUAIL (*Coturnix coturnix*) : It is almost the tailless partridge like bird called Bater . It is buffish –brown in colour with pale reddish brown and black streaks. It is found in pairs or parties grass land and cultivation and hides very well in grass and bushes .It flies straight for a short distance .Their population swells during winter when they migrate from Central and Western Asia to this region. It feeds on grain grass seeds and insects etc. Nesting season is from March to May. **RAIN QUAIL (*Contrunix coromandelica*)** which migrates lower regions but rather very rare.

DOVES AND PIGEON GROUP

BLUE ROCK PIGEON: (*Columba livi*) : Commonly known as kabutar has a salty grey colour with glistening metallica green purple and magenta sheen on the neck and breast. It lives gregariously on rocky cliffs and precipices. It is found throughout the division in upper reaches Large flocks regularly visit cultivated fields in search of food. It also lives in semi domesticated conditions and favours old buildings and rock holes. It generally feeds on grass seeds cereals pulses etc. Nesting season is not well defined.

DOVE (*Streptopelia* spp): Commonly known as Ghugi it is a common dove found in pairs or small parties in open places and cultivated fields. It approaches houses and even varandah if not scared. Its flight is straight and swift. It feeds on grass seeds, grains and wild fruits. Its nesting season is also not well defined.

OTHERS

THE WOOD COCK (*Scolopax rusticola*) : Locally it is known as Sham Kukra. This bird is equal to Chakor in size. It is brownish with black and rufous markings. It is present silver fir and kharsu forests of Habban and Rajgarh ranges.

THE WEDGE TAILED GREEN PIGEON (*Treron sphenuraj*): Also known as Harial and founds mostly in ban oak forest in summer. It is essentially a fruit eating bird.

2. AQUATIC BIRDS

Ducks, teals Goose and cranes are known to visit perennial rivers and streams but rare.

B: NON GAME BIRDS

These are of two types viz. Raptors and non raptors. Raptors are the birds of prey such as Hawks, kestrels, falcons, vultures and owls. Other birds of common occurrence are house and jungle crows (*Corvus spp.*), the jungle babbler (*Turdoides* spp), bulbuls (*Chloropsis* and *pycnontus* spp.), king crow (*Dicrurus* spp.), golden oriole (*Oriolus* spp.), the common myna (*Acridotheres* spp.), common baya (*Dloceus* spp.), the wood pocker (*Dinopium* spp.), parakeets (*Pisttacula* spp.), common king fisher (*Althene* spp.), Indian moorhens (*Gallinua* spp.), a bagula (*Egr etta* spp.), etc . These birds too are equally important from aesthetic, forest cleanliness and health, farming bird watching and balance of nature, point of views. Some of the important raptors and non, raptors are described below:

THE HIMALAYAN GRIFFON VULTURE (*Gyps himalayensis*) : It is the largest bird with long and naked neck and unfeathered bald head. A large gathering on an old carcase of a domestic animal is the

common sight. The other varieties of vultures observed in the tract are the Indian griffon, long billed vultures and lammergeyer.

THE BLEACK EAGLE (*Ictinactus malayenges*): It is a grey coloured bird in size nearly equal to vulture. It lives mainly on alive smaller birds, their young ones, rodents and snakes.

THE GOLDEN EAGLE (*Aquila chrysetus*): Also known as Girja, is a very black looking large and powerful eagle with size of vulture seen above the tree level of rather fierce appearance with its flat head sharply hooked beak and feathered legs armed with sharp claws. Alongish tail and often light patches in the wing and tail quills assist recognition. Its colour is deep chocolate brown. It's also carries animals like fawns of barking deer goral musk deer foxes and martens. Frogs, lizards and snakes are readily devoured. It avoids heavy forests and camp sites.

THE SHAHIN FALOONS (*Falco peregrines*): It is larger than the house crow, salty blue above with black head, rusty red below. Its favourite habitat is vast steep blanks with rocky outcrops. It lives mainly on chakor, partridges and other small birds. Other falcons commonly met are holbby and kestreal.

THE FOREST EGLE OWL (*Huhua nepalensis*): It is of a vulture size and is dark brown in colour with two black horns like tuft above its head. Underparts are tawny white barred with blackish brown. This bird is of nocturnal habits and lives mainly on pheasants or large birds and small animals especially the young ones of barking deer etc. The other owl found in the area are scops owl, great horned owl and sculy's wood owl.

PARROT/PARAKEET (*Psittacula himalayana*) : This bird is found in the lower hills and is a menace as it eats away the seed of chil by extracting it from the cones with its very strong beak.

THE JUNGLE CROW (*Corvus macrorhyniches*) : It replaces the common house crow (*Corvus splendens*) as a scavenger although the house crow is also found during summers.

WOOD PECKER (*Picus squamatus*) : This is a little scaly bellied green wood pecker, distributed throughout. It is easily observed as it works its way up the trunk of a tree now stopping to dislodge a piece of bark and then hammering lustily with its chisel like beak at a piece of grub-infested wood. Occasionally it feeds on the ground searching there for ants and termites. The nest hole is excavated in the trunk or branch of a tree and consists of a passage running down from 50 to 75 cm into the next chamber. It is a medium sized greenish bird with pale under parts scaled with black which climbs up the trunks of trees in series of jerks, and moves from tree to with noisy undulating flight.

1.2.13 REPTILES

A: SNAKES

THE COMMON INDIAN KRAIT (*Bungarus caeruleus*) : It has highly polished scales. It inhabits more or less open country at low altitudes, seldom ascending above 1,500 m. A highly poisonous snake found in lower part of Rajgarh, Narag and Sarahan Ranges.

THE HIMALAYAN PIT VIPER (*Ancistrodon himalayanus*) Also known as Saap, it is found between 2,000to 3,000 m elevation in Habban and Rajgarh Ranges. Although nocturnal in habit, comes out at times to bask in the sun.

THE INDIAN COBRA (*Naja naja*) : Locally called Kharpa or Nag, it is highly poisonous snake found in warmer, lower hills. It is absent in snow bound areas. Being very fond of water, it is found near water sources in the hot dry weather before the break of monsoon.

THE RAT SNAKE (*Ptyas mocosus*) : It is widely distributed and usually frequents the open country in the vicinity of human habitations. It is the common snake in the warmer lower tracts, also called Dhaman.

B: LIZARDS

The Common Indian Monitor Lizard (*Varanus monitor*): It is found both in forest as well as outskirts of villages. Also called Gobilda.

Girgit (*Colotes vessicoloen*): This is bigger than house lizard and found outside of the houses but near habitations, fields and forests, associated with vegetation. It also changes colors as per environment where it lives.

The Common House Lizard: (*Gecko hemidactylus*) : It is found at all elevations and in almost all the buildings.

1.2.32 Fishes: The supply of fish in major rivers and perennial streams in the division is still fairly abundant. Though that of the larger species has perceptibly diminished owing to continuous netting with no close season poisoning and dynamiting. Carp variety of fish is reared in tanks at Minde Ki Ser (**Ghinni valley**) and other places in the division by the fisheries department. The important fishes found in the area are mentioned below.

Mahaseer (*Tor putitora*): The fish is usually greenish above, light pink at sides with a silvery white abdomen. It is a big fish and much valued for the table.

Rohu : (*Labeo rohita*) : Its dorsal profile is more convex than that of abdomen. Snout is depressed but projecting beyond jaws. Colour is bluish or brownish on back, becoming silvery on sides and beneath. It grows quite large in size and weight.

Singhara (*Mystas seenghala*): This fish has a chisel shaped mouth, grey colour and a sufficiently strong head shield. It is very good table fish and grows upto 10 kg in weight. Besides above, the following varieties of fishes are also found in the area.

i)	Baranguli	(<i>Allia coila</i>)
ii)	Kali Machhi	(<i>Barbus chilinadea</i>)
iii)	Kala banas	(<i>Labeo calbasu</i>)
iv)	Bhareli	(<i>Barilius barile</i>)
v)	Mrigal	(<i>Cirrhunis mrigala</i>)
vi)	Bhunga	(<i>Labeo dero</i>)

1.2.33 **Injuries to which Fauna is Liable:** The biggest and only injury to which our wild life is exposed is the man himself. The other threats to fauna are epidemics, atmospheric influences, animals and fire. A brief resume of the damages done to forests fauna are listed below.

Hunting /Poaching: The destruction of wild life at the hands of bonafide residents is common because a large section possess arms. Although most of the arms are for crop protection, yet these are commonly used in shooting game. The animals are killed much in excess than their reproduction for meat or other valuable products like fur, musk, medicines and trophies or only for sport. Carnivorous animals are killed because they are dangerous to people and farm animals. Other animals are killed to save agricultural crops and orchards. Number of species have either become extinct or the verge of being extinct. Panther, musk deer, monal, cheer pheasants are the endangered species likely to become extinct in the area. Poaching is also known to take place in this division by the local people as well as outsiders as the wild life organization is not functioning effectively. The poachers have ingenious ways of poaching of game animals. Opening up of the area by more motor roads and paths is resulting in increased poaching.

Dynamiting: There is a lot of dynamiting in rivers for killing fish. P.W.D. and military men get plenty of explosives which they use for killing fish in rivers and streams. This naturally depletes the stock of fish for future crop.

Poisoning: During the dry season poisoning is practiced in water pools for wholesale destruction of fishes. The ingredients used to prepare poison are lime juice of *Euphorbia royleana*, pounded seeds of *Zanthoxylum alatum* and *Casearia tomentosa*. These are mixed and thrown into pools and stirred up and made to mix with the water. After an hour or so the fish come to the surface stupefied or dead and are removed in quantities.

Fire: It plays havoc with forest fauna. The animals get trapped in fire and perished. The eggs and young ones are destroyed in nests, nest holes and hollows in the trees trunks and rocks and dead stumps. The entire food chain is destroyed and the pyramid structure of wild life is broken. The habitat is rather destroyed completely.

Epidemics: It is not common feature in wildlife but Sambhar and other members of deer family may suffer from infectious and contagious diseases like rinderpest through domestic cattle grazing in the forest. No cases of epidemics have been reported in the division.

Atmospheric influences: The adults are seldom affected by the climatic disturbances but the young ones suffer casualties mostly from frost. The bird hatching is adversely affected by heavy rains. It is reported that before last three decades female jungle fowls used to hatch twice a year but the hatching period has now been restricted only once during March/April. Drought causes the drying up of natural water holes.

Animals: The ecological balance maintained by the predator- prey relationships have been disturbed by man. Carnivore prey on herbivore, reptiles on birds and eggs and rodents, other destroys fishes reptiles and small birds etc. Indiscriminate shooting of particular animal species like Sambhar, Kakar and other deers has recoiled on depletion on depletion of food for carnivore like panthers and is one of case for the extinction.

CHAPER-III

Utilization of the produce

1.3.1 General History of the Forest : The lower areas and the warmer aspects are thickly populated, while the higher hills in the interior valleys have sparse population. The population has been steadily increasing and has almost double in the last 30 years (Table 1.3.1) Based on 1991 census, the populations density is 93 persons per KM². The workers constitute 45.10% of the population; majority of them are agricultural workers. Non agricultural workers are 12.7% of total workers and 5.73% of the total population.

1.3.2 Land Utilization : The land utilization in Pachhad and Rajgarh Tehsils are given in Table 1.3.2 (District Land Records, 1981-82). The net area sown is 11,303 Ha. which is 0.38 ha per agricultural worker. Cropping intensity is 17% and 70% of the total cropped area is under high yielding variety. The irrigated net area sown is 39.65% and 19% of the villages have scarcity of drinking water. The important crops sown are paddy, wheat, maize, barley, millets, pulses (gram, black gram), potatoes, sugarcane, ginger, chillies, rape and mustard, linseed, tomato, peas and tobacco.

Agriculture is the main occupation of the people. There is no commercial or industrial activity in the area. The food grain production is in deficit and large quantities are imported from plains. The people supplement their income by working on developmental works and the forest operations and depend very much on the forests and forest produce. Sowing, planting, logging, soil conservation and road construction etc. provide sufficient jobs to population. The other trades allied to agriculture also practiced and carpentry, masonry blacksmithy and trade meeting the local demands.

The local population depends largely on the forests for its existence, which provide timber for house construction and agricultural implements, fire wood, grass, leaf fodder, litter for cattle and manure, raw material for local industries and medicinal plants. Also minor forest produce like Nirgal for mats and basket making, slates for roofing and stone for house building are also met with from forests.

Table 1.3.1: Detail of population

Year	Tehsil	Name of Panchyat	General		Total	Scheduled Caste		Total	Total Gen+S.C	Total Male	Total Female
			Male	Female		Male	Female				
2010	Rajgarh	Bhanat	317	300	617	270	248	518	1135	587	548
		Bohal Talia	191	197	388	520	510	1030	1418	711	707
		Bhuria	506	503	1009	403	369	772	1781	909	872
		Chogtalli	507	487	994	341	323	664	1658	848	810
		Dimber	481	390	871	196	188	384	1255	677	578
		Dahan	612	619	1231	418	395	813	2044	1030	1014
		Deedag	397	370	767	448	415	863	1630	845	785
		Dibber	381	383	764	615	622	1237	2001	996	1005
		Deothi Majgaon	639	600	1239	693	619	1312	2551	1332	1219

Year	Tehsil	Name of Panchyat	General		Total	Scheduled Caste		Total	Total Gen+S.C	Total Male	Total Female
			Male	Female		Male	Female				
		Habban	608	600	1208	374	337	711	1919	982	937
		Jadol Taproli	601	573	1174	318	302	620	1794	919	875
		Kothia Jajjar	375	353	728	385	379	764	1492	760	732
		Kathli Bharan	381	355	736	297	258	555	1291	678	613
		Karganoo	564	462	1026	536	507	1043	2069	1100	969
		Kotla Bangi	517	482	999	338	337	675	1674	855	819
		Koti Padhog	428	460	888	369	363	732	1620	797	823
		Matal Bakhog	185	195	380	247	257	504	884	432	452
		Nehar Pab	500	475	975	382	345	727	1702	882	820
		Neri Kotli	428	420	848	310	330	640	1488	738	750
		Nai Neti	247	238	485	237	268	505	990	484	506
		Nehrthi Bhagot	532	499	1031	255	226	481	1512	787	725
		Ranaghat	394	370	764	303	320	623	1387	697	690
		Shalana	163	143	306	327	333	660	966	490	476
		Ser Jagas	466	446	912	615	571	1186	2098	1081	1017
		Shilanjji	450	455	905	511	494	1005	1910	961	949
		Shaya Sanora	583	567	1150	570	589	1159	2309	1153	1156
		Tikkar	495	499	994	225	239	464	1458	720	738
		Thor Niwar	248	234	482	340	289	629	1111	588	523
		Talli Bhujal	366	398	764	218	213	431	1195	584	611
		Thaina Basotri	256	239	495	309	331	640	1135	565	570
		Nagar Panchyat Rajgarh			0			0	3083	1620	1463
		Total:	12818	12312	25130	11370	10977	22347	50560	25808	24752
2010	Pachhad	Dinger Kinner	506	475	981	61	62	123	1104	567	537
		Sirmouri Mandir	401	411	812	321	268	589	1401	722	679
		Mangarh	500	477	977	441	412	853	1830	941	889
		Kotla Panjola	85	88	173	715	636	1351	1524	800	724
		Mahlog Lal Tikker	417	437	854	266	275	541	1395	683	712
		Lana Baka	411	474	885	463	454	917	1802	874	928
		Dilman	431	407	838	824	731	1555	2393	1255	1138
		Naina Tikker	929	913	1842	663	605	1268	3110	1592	1518
		Sadnaghat	121	120	241	517	469	986	1227	638	589
		Tikkeri Kuthar	555	528	1083	193	177	370	1453	748	705
		Bag Pashog	1012	885	1897	538	446	984	2881	1550	1331
		Surla Janot	369	339	708	325	282	607	1315	694	621
		Kathad	490	465	955	155	116	271	1226	645	581
		Bani Bakhoul	473	462	935	306	277	583	1518	779	739
		Bagthan	432	423	855	192	159	351	1206	624	582

Year	Tehsil	Name of Panchyat	General		Total	Scheduled Caste		Total	Total Gen+S.C	Total Male	Total Female
			Male	Female		Male	Female				
		Bajga	659	636	1295	253	244	497	1792	912	880
		Katli	376	354	730	487	442	929	1659	863	796
		Rajyon (Jaman ki Ser)	667	577	1244	61	60	121	1365	728	637
		Banah Dhinni	664	614	1278	322	311	633	1911	986	925
		Dhar Tikkeri	534	461	995	242	225	467	1462	776	686
		Jaiher	160	163	323	385	395	780	1103	545	558
		Lana Bhalta	343	367	710	379	386	765	1475	722	753
		Sarahan	1193	1165	2358	384	358	742	3100	1577	1523
		Neri Nawan	298	315	613	326	262	588	1201	624	577
		Daro Devria	334	315	649	412	374	786	1435	746	689
		Chamenji	300	276	576	529	534	1063	1639	829	810
		Drabli	644	574	1218	121	119	240	1458	765	693
		Wasni	612	626	1238	435	411	846	2084	1047	1037
		Sharia	366	329	695	288	252	540	1235	654	581
		Narag	805	805	1610	617	559	1176	2786	1422	1364
		Total	15087	14481	29568	11221	10301	21522	51090	26308	24782

Table 1.3.2: Land use in Rajgarh Forest Division.

Sr. No.	Land uses	Area (ha)	
		Pachhad Tehsil	Rajgarh Tehsil
1.	Total geographical area	40753	41249
2.	Forests	8205	15179
3.	Land not available for cultivation		
	(a) Barren and unculturable land	442	557
	(b) Land put to non-agricultural use	1454	1446
4.	Other uncultivated land excluding current fallows		
	(a) Culturable wastes	4457	2819
	(b) Permanent pastures and other grazing land	8990	7620
	(c) Land under misc. tree crops and groves not included in net area sown	10630	7906
5.	Fallow land		
	(a) Current fallows	573	449
	(b) Other fallows	179	93
6.	Net area sown	5823	5480
7.	Area sown more than once	4393	3606
8.	Total cropped area	10216	9086

The improvement in the economic conditions and the need for independent modern houses have pronounced effect on timber distribution at privileged rates. The raising of orchards and vegetable cultivation has further increased the demand of timber for packing cases.

1.3.3 Nautors : Large scale lands have been granted to landless people in the recent past, the forests of various kinds are yet to be denotified although **Nautors** in such forest had been granted by revenue department quite sometime ago. The erstwhile jagirs now forming the unclassified forests are full of **nautors** around Dilman.

1.3.4 Livestock: The people rear cattle and flocks of sheep and goats to supplement their meager agricultural income. The cattle are of poor quality and maintained mainly for manure. The milk production is poor. Stall feeding is uncommon. The villagers depend on forest grass and waste lands for grazing their animals throughout the year. The bullocks and dry cows are left in the forests for months together. The grazing grounds have been exhausted and the harmful effects of overgrazing are apparent. The pressure of grazing per unit area is beyond the carrying capacity of the forests. The problem is serious in lower regions and in the vicinity of habitations. In remote areas on the higher reaches, it is not so serious. The livestock population in the division is given in Table 1.3.4. Though it has an increase of only 5% in 15 years, the increase of 38.8% in goat population is alarming as goats are most damaging animal. Rearing of poultry is being popularized in the recent past.

Besides local cattle, gujjars also graze buffaloes in the high level forests in summers and in scrub forests during winter months. Generally, the number of buffaloes with every Gujjar is much more than the number officially permitted. Flocks of migratory sheep and goats numbering 15580 are also grazed in lower hills by the Gaddies when they come down in winters.

**Table 1.3.3 : Live stock population in Rajgarh Forest Division :
(17th All India Livestock Census 2003).**

Livestock	Total No's
Cattle	38597
Buffaloes	20449
Sheep	4838
Goats	32151
Horse/Ponies	669
Donkey	140
Mule	1153
Pigs	120555
Total	218552

1.3.5 Minor Forest Produce: The people also depend on minor forest produce for their domestic requirements such as building stones, roofing slates, medicinal herbs torch wood, Guchhies, pine charcoal for smithy, oak bark for tanning, pine needles for packing of fruits and vegetables and cattle bed and many other minor forest products.

1.3.6 Markets and Marketable Products: With the improvement in the economic condition of the people, local demands for timber are increasing around Rajgarh, Narag and Sarahan which are developing as

townships. Demand for timber is also increasing due to increased developmental activities in the tract and also as a result of splitting up and partitioning of families. Fruit orchards and tomato cultivations have become quite extensive which has increased the requirement of timber for packing cases. As a result the sawmill industry is flourishing in the region. The list of saw mills are provided in Appendix XV.

The main markets for timber are State Forest Corporation depots at Mantaruwala (Paonta Sahib) and Parwanoo, apart from the local townships of Solan, Nahan, Kalka, Chandigarh and other towns of Haryana and Punjab. Resin is being extracted by the State Forest Corporation only for their factories at Nahan and Bilaspur, for fuelwood, the markets are Shimla, Solan, Dharampur, Nahan, Chandi Mandir, Kalka, Yamuna Nagar and other adjoining areas of Solan district and Haryana State. Delhi and Kanpur are the main markets for Katha. Minor forest produce like harar and medicinal herbs have main markets in Hoshiarpur and Amritsar, The chief marketable products of the division are timber, resin, fuelwood and charcoal, bamboos, katha, medicinal herbs and myrobolans etc.

1.3.7 Timber : The Deodar, Kail, Spruce, Fir and chil timber are sold by open auction at State Forest Corporation depots Mantaruwala and Parwanoo and exported out of the State. Chil timber is in great demand for Railways sleepers, constructional purposes. Manufacturing of packing cases and pulpwood etc. The branch wood of chil down to 5 cm diameter is in demand for activated carbon. The demand for deodar and kail timber continues to be in the form of constructional timber. Broadleaved species and oaks are not being exploited presently. The timber removed commercially through HPSFDC Ltd from the period 1991-92 to 2010-11 is given in Table 4.1 of Chapter IV

1.3.8 Resin: About 15000-20000 number of blazes are tapped annually in the division. Since 1.4.1991 the tapping operations are being done by the HP State Forest Development Corporation (Govt. Notification No. 10-26/72 SF dated 30-5-1975. With the coming into force of H.P. Resin Products (Regulation of Trade) act, 1982 the Resin from private forests is purchased by Pvt. Resin Factories as well as H.P. Forest Development Corporation at the rates purposed by the advisory committee constituted under the Act and approved by the Government from time to time. After meeting the requirements of its factories, the rest of resin is distributed among private owned Resin and Turpentine Factories. Local labour for resin tapping is not available. The labourers are recruited from UP., Kangra, Hamirpur and Una through labour mates. The number of blazes tapped by HPSFDC Ltd from the period 1991-92 to 2010-11 are presented in Table 4.2. of Chapter IV.

1.3.9 Fuelwood and Charcoal: The dry mixed deciduous scrub and ban oak forests of Sarahan Narag, Rajgarh and Habban Ranges were managed for fuelwood and charcoal in the past which were also exported to the neighboring districts and States. Now the fuelwood and charcoal are limited to private areas only. All the offices in the district and adjoining division's purchases charcoal from open market. There is great scope of fuelwood and charcoal supply from Government forests.

1.3.10 Bamboo: A small area in Sarahan Range (Ghinni Block) is under bamboos. It can be extracted periodically at regular intervals and exported to plains of Haryana and Punjab where good market exist.

1.3.11 Nirgals : It is confined to Rajgarh and Habban ranges and used by local people to make mats, baskets, hooka pipes, thatchings etc.

1.3.12 Katha : It is extracted from Khair trees and is exported to Delhi and Kanpur markets. Only one Mechanized Unit M/S Bhandari Katha Udhog Jaman Ki Ser, Tehsil Pachhad Distt. Sirmour H.P. is functioning in this division and annual consumption of Khair wood is 13000 Quintals and production of Katha is 1300 Quintal.

1.3.13 Jhingan Gum: It was being extracted from dry mixed deciduous forests on small scale and exported to neighboring states. Now it is not practiced but scope is there in Ghinni valley.

1.3.14 Harar (Myrobalans) : Ghinni valley in Sarahan range is the chief producer of export quality myrobalan. The produce is used for medicine and tanning industries and exported to Pakistan and gulf countries. The main markets in India are Hoshiarur and Amritsar. The private firms earn huge amount annually. The scope of harar collection from government forests do exist and harar cultivation needs wide publicity and encouragement.

1.3.15 Stone, Sand and Bajri : These are sold to contractors and used chiefly in local construction works.

1.3.16 Mushroom (Morchella esculenta): Locally called guchhi is extracted from deodar forests during the months of March to May. The high price obtained in the market for this produce has made its collection very lucrative.

1.3.17 Medicinal Herbs: Herbs like *Viola serpens*, *V. Canescens*, *Berberis aristata*, *Cannabis sativa*, *Mentha sylvestris*, *Valeriana wallichii*, *podophyllum emodi*, *Dioscorea spp.*, *Acorus calamus* etc are collected by the right holders and sold to contractors who in turn collect and export the same under licence. Licence fee is charged for the collections of medicinal herbs from the forests. Export fee is charged when these medicinal herbs are exported out of the division. In the recent past, *Be beris* roots are in great demand for medicinal purposes and large scale extraction from private areas have started. A royalty of Rs. 15.00 per quintal is charged as per hP Govt. Notification No. Ft. 12-306/57-11 dated 3-9-62. The produce is exported mainly to Punjab under export permit, it is fetching good money in Haryana and Punjab markets.

1.3.18 Lines of Exports : With the nationalization of forests exploitation the extraction work is done by the State Forest Corporation Limited since 1981. Though the river Giri and its tributaries are fit for timber floating, it is hardly practiced these days. Floating in side streams is being practiced in some far flung pockets. The area has good network of all weather metalled and unmetalled fair weather roads. Therefore the transportation of timber is not a problem. Timber and other forest products are now exported by road From forest to road side, the produce is generally transported manually. In remote and high altitude forests of Habban and Rajgarh ranges, gravity ropeways are also installed to bring down the timber to road heads. Resin is carried to road side depots through coolies and mules. Thereafter it is carried to R & T Factories Nahan and Bilaspur by trucks. The main lines of export i.e. motorable roads in the division are listed in Table 1.3.4 and distances between important places are mentioned in Table 1.3.5.

Table 1.3.4 : Lines of export in Rajgarh Forest Division.

Sr. No	Name of Road	Length (km) in the division	Metalled/unmetalled

1	Solan Nohradhar	33	Metalled
2	Kumarhatii Nahan	31	-do-
3	Rajgarh Banethi	61	Partly metalled
4	Rajgarh Habban	29	Metalled
5	Halonipul-Baggar	10	Unmetalled
6	Sanoura-Pulbahal	65	Partially Mettalled
7	Pervipul-Deothi	17	Unmetalled.
8	Salech Kainchi-Painkuffer	15	-do-
9	Habban-Chandol	14	Mettaled
10	Rajgarh-Mandiaghat	5	-do-
11	RehriGussan- Bagoria	3	-do-
12	Khairi – Mangan	10	Unmetalled
13	Machher to Baru Sahib	4	Metalled.
14	Maryog Narag	17	-do-
15	Maryog-Gasar	6	Unmettalled.
16	Narag-Oachghat	14	Mettalled.
17	Narag-Bagthan	40	Unmettalled.
18	Narag-Sarahan	25	Partially Mettalled.
19	Dilaman –Sadhnaghat	8	Mettaled.
20	Oachghat-Nainatikker	20	-do-
21	Narag-Mangarh	24	Partially Mettalled.
22	Nainatikker-Malana	5	Unmettalled.
23	Bagthan-Dungaghat (Kanlog)	13	-do-
24	Lawas Chowki-Chandigarh	33	Partially Mettalled.

Table 1.3.5 : Distances (km) between important stations.

Sr. No	From	To	Distance
1	Rajgarh	Deedag	13
2	Rajgarh	Khairi	20
3	Rajgarh	Bagthan	60
4	Rajgarh	Banethi	82
5	Rajgarh	Habban	29
6	Rajgarh	Yashwant Nagar	18
7	Rajgarh	Narag	35
8	Rajgarh	Sarahan	60 (via Narag)
9	Rajgarh	Pulbahal	78
10	Rajgarh	Naina Tikker	52
11	Rajgarh	Nayagaon	100
12	Rajgarh	Mangarh	60
13	Rajgarh	Shillanji	25
14	Rajgarh	Chandol	43
15	Rajgarh	Baru Sahib	26

1.3.19 Methods of Exploitation and their cost : Methods of exploitation is conventional. Felling is done by the axe or the axe and saw. Logging and conversion is done in situ. The trees are cut into logs of

different lengths with the help of saws. The logs are further squared with the help of axe and then sawn into scantlings by using frame saw. Deodar and Kail timber is marketed in the shape of geltus and sleepers. After conversion the timber is carried on human backs or rolled down to road side depots or to suitable points in the forest from where it is brought to the road side depots by gravity ropeways. There after it is carried in trucks to Parwanoo and Mantaruwala depots.

1.3.20 Resin : Resin is also being extracted by the Divisional Manager H.P. State Forest Corporation Solan and Nahan by rill method. Setting of crops commences in February March and collection continues till 15th November every year.

1.3.21 Bamboos : Though the bamboo forests are meager but it is to be worked departmentally or through HP State Forest Corporation. No bamboos have been exploited by HPSFDC Ltd from the year 2001 onwards. Most of the bamboo areas having flowered which have been felled by HPSFDC Ltd. No prescription of bamboo felling is require for future.

1.3.22 Fuel/Pulpwood: One labour can billet about 5 qtls of fuel/pulpwood from lops/tops and small wood of trees fallen or from trees marked in scrub forests under clear felling/coppice system.

1.3.23 Past and Current Prices : There has been a marked rise in the prices of timber, pulpwood, katha, firewood, charcoal and resin during the recent years.

1.3.24 Timber: The past current prices of standing timber of various species is given in Table 1.3.6. The royalty on account of trees felled/exploited of various species are being paid by HPSFDC Ltd as per approved rates fixed by the Pricing committee from time to time. The detail of timber extracted by the HPSFDC Ltd from the period 1991-92 to 2010-11 is given in Table 4.1 of Chapter IV.

Table 1.3.6 : Market rates of green standing trees (Rs./m³)

Year	Deodar	Kail	Chil	Fir/Spruce
1991-92	6403	5676	2702	2407
1992-93	7890	7000	2875	3365
1993-94	8679	7700	3163	3702
1994-95	9547	8470	3470	4072
1995-96	10502	9317	3827	4479
1996-97	11562	10249	4200	4927
1997-98	12707	11274	4630	5419
1998-99	13978	12401	5093	5961
1999-2000	15375	13641	5603	6587
2000-01	16913	15905	6168	7212
2001-02	18608	18608	6779	7934
2002-03	20485	18156	7457	8728
2003-04	22511	19972	8203	9601
2004-05	24762	21969	9023	10561
2005-06	27238	24168	9925	11317
2006-07	29600	27600	10600	13200
2007-08	33389	32232	10600	13200

Year	Deodar	Kail	Chil	Fir/Spruce
2008-09	33389	32232	10600	13200
2009-10	44031	38044	15372	17271
2010-11	47624	38044	15372	17271
2011-12	47624	38044	15372	17271
2012-13	47624	38044	15372	17271

1.3.25 : TD. Rates : The privileged right holder's rates comparable to market prices of the time were fixed during 1955. With the passage of time, the market price of tree has increased many hundred folds while the right holder's rates remain unchanged. The right holder's rates are several times less than the market rates. This difference is further increasing every year. Therefore, the right holder's rates need upward revision comparable with the market rates. Rates of timber under H.P. Forst (Timber Distribution to Right Holders) Rules, 2010 is given in Table 1.3.7:

Table 1.3.7 : Rate of Timber under H.P. Forest (Timber Distribution to Right Holders) Rules, 2010

Species	Average weighted sale (commercial) rate in ` of HPSFC Ltd.	Rate per Cum at 30% in `	Rate per Cum at 10% in `	Estimated cost per standard size	
				For Right Holders above Poverty line	For Right Holders below Poverty line
Deodar	25614	7684	2561	768	256
Kail	15379	4614	1538	461	154
Fir/Spruce	7588	2276	759	228	76
Chil	5775	1733	578	173	58

1.3.26 Royalty Rates: The royalty rates of various species fixed by the Pricing Committee from the year 2005-06 to 2010-11 is given in Table 1.3.8

Table 1.3.17 : Royalty rates fixed per Rs/ M3

Year	Deodar	Kail	Fir/ Spruce	Chil	Eucalyp- tus	Shisham/ Tun	Sain	Sal	Khair (MG)	Kokath Other B/L
2005-06	4576	2833	880	568	547	2182	1057	626	659	147
2006-07	4146	2817	835	484	551	1618	1153	777	766	74
2007-08	4315	2388	677	431	685	1699	1229	935	779	297
2008-09	4315	2388	677	431	685	1699	1229	935	779	297
2009-10	5664	2944	836	626	1097	2555	1524	1025	1078	481
2010-11	5903	3098	790	572	925	2376	1484	1062	952	326
2011-12	5903	3098	1030	704	1099	2949	1976	1390	811	371
2012-13	5357	3096	1123	739	1416	2928	2006	1467	794	300

1.3.27 Grazing Fees : The grazing rates now in vogue in this division are given in Table 1.3.22. As per grazing policy adopted by the Government, the grazing fees for sheep and goats shall be charged from the migratory graziers throughout the Pradesh once in a year at the first check post.

Table 1.3.22 Grazing fees charged in Rajgarh Forest Division.

Animal categories	Grazing fees (Rs./animal) realized from graziers of			
	Sirmour	Other territories	Gaddies	Gujjars
Sheep	0.19	0.37	0.50	0.50
Goats	0.25	0.75	0.50	0.50
Horse and Mules	0.37	0.75	--	0.75
Donkey	0.25	0.50	--	--
Camel	0.25	0.25	--	--
Cow and bullock	0.12	0.25	--	--
Buffaloes	1.00	2.00	--	--
Elephants	12.00	24.00	--	--

1.3.33 Minor Forest Produce : No price is charged for extraction of medicinal herbs and guchhi. However, the export permits for various items are issued. The royalty of Rs. 15.00 per quintal is charged for the export of **Berberis** roots from the division.

CHAPTER IV

ACTIVITIES OF FOREST DEVELOPMENT CORPORATION

The exploitation works of the forests are executed through state owned H.P. State Forest Development Corporation Ltd. In respect of Rajgarh Forest Division, the exploitation of timber and extraction of resin are assigned to the forest corporation.

1.4.1 HARVESTING / EXPLOITATION OF TIMBER Only dry and fallen trees referred to as salvage are handed over to Divisional Manager, HPSFDC Ltd. Solan & Nahan who have jurisdiction over this division and volume extracted by HPSFDC Ltd by DM FWD Nahan and Solan are given in Table 1.4.1.

The HPSFDC Ltd in turn gets the exploitation work executed through contactors called Labour Supply Mates (LSMs). The employment to skilled, semi-skilled and general is provided almost throughout the year except in winter months. On an average 2.7 man days per cum of standing volume handed over to forest corporation are generated. If the total standing volume in a year varies from 3000 to 5000 cum then the total man days generated would be 8000 to 13500.

1.4.2 EXTRACTION OF RESIN: Rajgarh is one of the main resin extraction divisions. Extraction cost is to be calculated by the Govt. agency i.e. HPSFDC only. Number of blazes tapped by HPSFDC Ltd from the year 1991 to 2011 is given in Table 1.4.2.

Table 1.4.2 No. of blazes tapped by HPSFDC Ltd in Rajgarh Forest Division

YEAR	NO. OF BLAZES	YEAR	NO. OF BLAZES
1991	67889	2003	5728
1992	144005	2004	13103
1993	196026	2005	12105
1994	150585	2006	12105
1995	142210	2007	25779
1996	118784	2008	25336
1997	80534	2009	18937
1998	56560	2010	16745
1999	48049	2011	13428
2000	14315	2012	11199
2001	16680	2013	17341
2002	7715		

On an average 480 man days per annum are generated per section of resin tapping. In addition 700 to 1000 mule days are also generated for carriage of resin annually. Hence overall 1.5 to 1.75 lac man days are generated annually of which about 60% labour is local and rest sourced from outside.

1.4.3 MARKETING OF FOREST PRODUCE:

Timber extracted from this division is marketed through **Sale Depot Baddi**. The resin is processed and further sold through Resin & Turpentine Factory Nahan. The royalty of resin blazes as fixed by Pricing Committee for the relevant years are paid by HPSFDC Ltd accordingly.

Table 1.4.1 Actual removal under salvage marking in respect of Rajgarh Forest Division

Year	Nature of Marking	Deodar	Kail	Chil	Rai	Ban/ Brass	Shisham	Kokath	Khair	Total
1991-92	Salvage		359.1300	1039.0836	521.4000	0	0	0	0	1919.6136
1992-93	Salvage	12.4589	17.3632	3525.1656	1117.3100	0	0	0	0	4672.2977
1993-94	Salvage	279.9837	1527.1783	8664.1088	117.7930	0	0	0	0	10589.0638
1994-95	Salvage	6490.4670	3350.0516	11909.6598	1178.4400	0	0	0	0	22928.6184
1995-96	Salvage	406.4435	769.0264	4649.6714	2374.7980	180.6860	0	0	0	8380.6253
1996-97	Salvage	150.9900	870.4800	13050.8385	152.8640	23.8860	0	0	0	14249.0585
1997-98	Salvage	473.9760	1676.1230	16789.6689	1204.4470	80.7520	0	0	0	20224.9669
1998-99	Salvage	537.1670	1916.9820	6809.9817	1004.7220	0	0	0	0	10268.8527
1999-2000	Salvage	1.2030	65.1850	5861.2610	0	0	0	0	0	5927.649
2000-01	Salvage	334.2660	2132.8520	11343.3157	518.7000	0	0	0	0	14329.1337
2001-02	Salvage	26.3332	396.1409	9333.2448	7.4070	0	0	0	0	9763.1259
2002-03	Salvage	109.2280	936.6580	4245.8341	516.9340	0	0	0	0	5808.6541
2003-04	Salvage	211.8810	646.7300	3621.3519	618.8640	0	0	0	0	5098.8269
2004-05	Salvage	95.4330	1257.9510	2548.4740	57.7270	0	0	0	0	3959.585
2005-06	Salvage	148.7299	390.2748	1840.4435	670.7270	0	0	0	0	3050.1752
2006-07	Salvage	82.4000	176.9600	2762.7858	4.4000	2.4880	0	0	0	3029.0338
2007-08	Salvage	220.3559	146.0351	2091.5882	1199.8070	0	24.0610	0	0	3681.8472
2008-09	Salvage	290.9409	182.2795	3182.7511	1112.9600	40.0120	0	19.1960	2.7864	4830.9259
2009-10	Salvage	597.1889	760.7108	2905.1184	1337.3110	38.4090	0	0	0	5638.7381
2010-11	Salvage	304.874	2520.8980	3513.4100	44.2190	402.8530	0	0	0	6786.254
2011-12	Salvage	220.2227	358.1946	2461.7384	0	35.646	0	0	0	3075.8017
2012-13	Salvage	221.2684	533.5205	1961.2893	1.805	0	0	0	0	2717.8832
	Total	11215.811	20990.7247	124110.7845	13762.635	804.732	24.061	19.196	2.7864	170930.7306

CHAPTER V

FIVE YEAR PLANS

1.5.1 GENERAL: The forests of the division have been managed for getting sustainable yield. The silvicultural fellings were aimed at making the forest uniform and the regeneration achieved through natural means. Till the early seventies, the emphasis was on planting commercially important species such as deodar, kail, Chil, fir, spruce etc. Growing demand of forest produce in the state especially that of timber resulted in focus on large scale plantations of commercially important species. Although the plantation programme started from I Five Year Plan but it gained momentum from III Plan onwards. The Plan wise management of forests is depicted as under:

1.5.2 1st FIVE YEAR PLAN (1951-56):- After the merger of states in 1949, the forests were densely stocked and exploited commercially thereafter. Deodar and Chil working circles were constituted and worked. Fuel and fodder working circle to meet local demand and protection working circle to fulfill conservation objectives were created. There is nothing on record to show the silvicultural system which was adopted. The year-wise revenue and expenditure of the Rajgarh Forest Division is given in Table 1.5.1.

Table 1.5.1 Expenditure and Revenue of Rajgarh Forest Division during First Five Year Plan

Year	Revenue(Rs)	Expenditure(Rs)
1951-52	5,70,878	2,55,326
1952-53	4,78,886	2,62,524
1953-54	6,24,823	3,36,486
1954-55	5,19,211	3,49,143
1955-56	5,13,073	4,30,268

1.5.3 2nd FIVE YEAR PLAN (1956-61) during this period, the Deodar forests were exploited for revenue with emphasis on regeneration by mainly natural means. The artificial regeneration in the form of patch sowing and planting has been carried out in Chil and Deodar forests. The slow pace of regeneration was primarily due to fire, uncontrolled grazing and poor protection. The year-wise revenue and expenditure of the Rajgarh Forest Division is given in Table 1.5.2

Table 1.5.2 Expenditure and Revenue of Rajgarh Forest Division during 2nd Five Year Plan

Year	Revenue(Rs)	Expenditure(Rs)
1956-57	3,14,334	2,01,259
1957-58	12,35,246	4,00,168
1958-59	7,58,587	2,27,639
1959-60	9,54,380	2,42,241
1960-61	11,88,546	3,61,775

1.5.4 3rd FIVE YEAR PLAN (1961-66):- The year-wise revenue and expenditure of the Rajgarh Forest Division is given in Table 1.5.3

Table 1.5.3 Expenditure and Revenue of Rajgarh Forest Division during 3rd Five Year Plan

Year	Revenue (Rs.)	Expenditure (Rs.)
1961-62	9,37,882	3,73,727
1962-63	15,25,936	4,50,236
1963-64	13,34,896	5,32,513
1964-65	14,66,781	9,70,372
1965-66	13,29,576	12,04,008

1.5.5 4th FIVE YEAR PLAN (1969-74) The year-wise revenue and expenditure of the Rajgarh Forest Division is given in Table 1.5.4

Table 1.5.4 Expenditure and Revenue of Rajgarh Forest Division during 4th Five Year Plan

Year	Revenue(Rs)	Expenditure(Rs)
1969-70	9,98,004	7,40,634
1970-71	13,51,964	11,43,850
1971-72	5837670	24,02,479
1972-73	3165670	42,22,608
1973-74	6097920	42,16,378

1.5.6 5th FIVE YEAR PLAN (1974-78) The year-wise revenue and expenditure of the Rajgarh Forest Division is given in Table 1.5.5

Table 1.5.5 Expenditure and Revenue of Rajgarh Forest Division during 5th Five Year Plan

Year	Revenue(Rs)	Expenditure(Rs)
1974-75	4507071	38,02,900
1975-76	2705298	34,71,005
1976-77	82,95,595.11	33,44,438.26
1977-78	28,50,408.61	24,35,742.32
1978-79	47,06,248.61	29,15,102.99

1.5.7 6th FIVE YEAR PLAN (1980-85) With the launching of social forestry programme, the focus shifted towards raising of fuel, fodder, small timber and grasses to meet the domestic needs of rural communities. The year-wise revenue and expenditure of the Rajgarh Forest Division is given in Table 1.5.6

Table 1.5.6 Expenditure and Revenue of Rajgarh Forest Division during 6th Five Year Plan

Year	Revenue(Rs)	Expenditure(Rs)
1980-81	26,06,363.82	30,90,999.58
1981-82	62,39,855.20	30,21,224.11
1982-83	37,50,132.70	38,46,784.42
1983-84	8,22,582.92	41,12,719.71
1984-85	22,76,215.16	41,56,707.24

1.5.8 7th FIVE YEAR PLAN (1985-90) The social forestry works were in full swing, main emphasis being on raising fuel, fodder, small timber and grasses to meet the domestic needs of rural communities. The year-wise revenue and expenditure of the Rajgarh Forest Division is given in Table 1.5.7

Table 1.5.7 Expenditure and Revenue of Rajgarh Forest Division during 7th Five Year Plan

Year	Revenue(Rs)	Expenditure(Rs)
1985-86	13,64,167.70	61,67,575.73
1986-87	1,80,440.45	79,09,187.18
1987-88	1,38,395.65	91,30,731.46
1988-89	1,46,838.50	1,06,60,928.28
1989-90	1,82,838.50	99,18,133.40

1.5.9 8th FIVE YEAR PLAN (1990-95) The JFMC approach started in the division and the forestry activities were implemented under departmental schemes and under ODA project. As ban on green felling continued, the objective remained afforesting denuded/degraded forests. The constitution of forest development committees and their participation in planning and implementation was sought. The year-wise revenue and expenditure of the Rajgarh Forest Division is given in Table 1.5.8 and plantation raise during the five year plan is given in Table 1.5.9.

Table 1.5.8 Expenditure and Revenue of Rajgarh Forest Division during 8th Five Year Plan

Year	Revenue(Rs)	Expenditure(Rs)
1990-91	2,15,538.00	1,02,81,574.75
1991-92	2,08,729	86,73,199
1992-93	74,095	78,71,627
1993-94	66,577	86,17,083
1994-95	53,547	85,60,323

Table 1.5.9 Plantations Raised from 1990-91 to 1994-1995 in Rajgarh Forest Division

Year	Total No. of plants planted	Planted area in Ha.
1990-91		
1991-92	1479420	1605
1992-93	580100	730
1993-94	767350	1072
1994-95	794850	792

1.5.10 9th FIVE YEAR PLAN (1995-2000) The activities of ODA/DFID continued in the pilot phase and in the C & D phase. The works of afforestation, soil conservation, entry point activity started by the VFDCs and micro plan process learnt and executed. Sanjhi Van Yojna started on the principles of JFPM. The year-wise revenue and expenditure of the Rajgarh Forest Division is given in Table 1.5.10 and plantation raise during the five year plan is given in Table 1.5.11.

Table 1.5.10 Expenditure and Revenue of Rajgarh Forest Division during 9th Five Year Plan

Year	Revenue(Rs)	Expenditure(Rs)
1995-96	2,94,348	99,47,787
1996-97	9,26,198	1,01,52,245
1997-98	9,17,301	1,35,44,672
1998-99	4,17,913	1,87,65,241
1999-2000	6,83,062	1,97,79,360

Table 1.5.11 Plantations Raised from 1995-96 to 1999-2000 in Rajgarh Forest Division

Year	Total No. of plants planted	Planted area in Ha.
1995-96	896300	1321
1996-97	750650	808
1997-98	744500	1009
1998-99	655450	774
1999-2000	818550	1632.5

1.5.11 10th FIVE YEAR PLAN (2000-2005) DFID & SVY created mass awareness about forestry but the focus was again on raising plantations besides soil works and entry point activities. The contribution in works to the tune of 5 to 15 % was desired but could not be persued properly. The year-wise revenue and expenditure of the Rajgarh Forest Division is given in Table 1.5.12 and plantation raise during the five year plan is given in Table 1.5.13.

Table 1.5.12 Expenditure and Revenue of Rajgarh Forest Division during 10th Five Year Plan

Year	Revenue(Rs)	Expenditure(Rs)
2000-01	9,03,430	1,46,68,817
2001-02	4,43,726	1,90,32,744
2002-03	12,19,930	1,56,24,185
2003-04	16,03,070	1,85,99,980
2004-05	5,28,623	1,98,66,861

Table 1.5.13 Plantations Raised from 2000-01 to 2004-05 in Rajgarh Forest Division

Year	Total No. of plants planted	Planted area in Ha.
2000-01	508160	663
2001-02	333930	450.92
2002-03	25800	35
2003-04	100165	121.5
2004-05	121275	153

1.5.11 11th FIVE YEAR PLAN (2006-11): 78 JFMC Committees under FDA, 5 Committees under National Bamboo Mission and 4 No. Committees under National Medicinal Plant Board have worked for raising plantation etc. The year-wise revenue and expenditure of the Rajgarh

Forest Division is given in Table 1.5.14 and plantation raise during the five year plan is given in Table 1.5.15.

Table 1.5.14 Expenditure and Revenue of Rajgarh Forest Division during 11th Five Year Plan

Year	Revenue(Rs)	Expenditure(Rs)
2006-07	6,87,883	3,68,80,196
2007-08	12,79,945	3,73,42,877
2008-09	7,57,040	4,13,38,898
2009-10	38,06,536	4,62,42,769
2010-11	2,36,35,004	77,13,887

Table 1.5.15 Plantations Raised from 2006-07 to 2010-11 in Rajgarh Forest Division

Year	Total No. of plants planted	Planted area in Ha.
2006-07	470436	1047.67
2007-08	417017	1266.5
2008-09	326468	491
2009-10	768215	1278
2010-11	519705	564.3

CHAPER-VI

STAFF AND LABOUR SUPPLY

1.6.1 Staff : The strength of the staff is stood on 31-3-2011 is given in Table 1.6.1. The executive as well as ministerial staff is adequate. The devotion of staff to their duty is not upto the mark as democratization of all institutions has led them to seek shelter from politicians rather than to depend on their own performance. The cost of the staff including pay, travelling allowances and house rent etc. is 34.05% of the total expenditure of the division whereas the revenue is 1.97% of the total expenditure based on the average figures for the financial year 2009-10 and 2010-11.

1.6.2 Executive Charges : With the reorganization of the department vide H.P. Govt. Notification No. Fts. 1(B)I-11/85 (part) dated 16-11-1991, two existing social forestry ranges of this division are now under the control of Social Forestry Division, Paonta Sahib. There are 4 ranges, 12 blocks and 41 beats in the division as listed in Table 1.6.2. In addition to this, there are 3 Check Posts at Chandol, Yashwant Nagar & Mahal Preet Preet Nagar.

1.6.3 Labour supply: Adequate local labour is generally available for all forestry works all the year round except during the peak days of agricultural sowing and harvests, fruit and vegetable harvest in the springs and autumn, local fairs and festivals. Works like sowing, planting, weeding, cleaning, markings enumerations, repairs and construction of roads and buildings etc. are done mostly by local labourers. The Nepali Gorkha labour is also available for various jobs. Timber extraction (felling/sawing) is done by the labourers imported from Mandi, Kangra and Bilaspur, Carriage of timber is mostly done by the Gorkha and Garhwali labours. For Katha and charcoal making, labourers from U.P and Haryana are engaged by paying cash advances by the contractors. Food grain stocks are maintained in the forests to carry various operations and ration is issued to the labourers at concessional rates as part of their wages.

Table 1.6.1 : Staff position of Rajgarh forest Division (2010-11)

DESIGNATION	SANCTIONED	EXITING
EXECUTIVE STAFF		
DFO	1	1
ACF	1	1
F.R.	5	3
Dy. Rangers	16	17
Fgds.	53	46
MINISTERIAL STAFF		
Supdt	1	1
Sr. Asstt.	2	2
Jr. Asstt. & Clerk	6	2
Kanungo	1	1
Peons/Khalasi	16	16
Mali	16	16
Chowkidar	21	21
Dak Runner	2	2
Forest Workers	70	64
Driver	1	1
Plumber	1	1
Sweeper	1	0

Table 1.6.2 : Ranges, Blocks and beats with headquarters.

Sr. No.	Range	Block	Beat	Headquarter
1	Habban	Habban	Chail	Shillanji
			Shargaon	Pitli
			Shivapur	Habban
			Ranaghat	Ranaghat
		Thandidhar	Thandidhar	Thandidhar
			Pajoga	Serwa
			Mattal	Mattal Bakhog
			Pab	Pab
		Van Thana Habban	Dhamla	Van Thana Habban
			Tharu	-do-
			Khaneur	-do-
			Gotari	-do-
			Dol	-do-
			Palu	-do-
2.	Rajgarh	Bathaudhar	Bathaudhar	Bathaudhar
		at Phagu	Sawana	Sawana
			Phagu	Phagu
		Rajgarh	Churwa	Chichiriadhar
			Deedag	Deedag
			Rajgarh	Rajgarh
			Matnali	Matnali
		Dimber	Yashwant Nagar	Yashwant Nagar
			Thor	Larab
			Dimber	Dimber
3.	Narag	Wasni	Gandal	Gandal
			Wasni	Wasni
			Mangarh	Mangarh
		Narag	Narag	Narag
			Unchakot	Unchakot
		Nainatikker	Nainatikker	Nainatikker
			Chandoli	Dilman
			Shina	Shina
			Pathroti	Pathroti
4	Sarahan	Sarahan	Sarahan	Sarahan
			Panwa	(Panwa) Bag Pashog
			Jamun Ki Ser	Jaman Ki Ser
		Saindhar	Saindhar	Lana Banka (Bantighat)
			Gethal	Gethal
			Shakore	Bagthan
		Ghinni	Chandog	Chandog
			Ghagger	Naya Gaon

Resin tapping is done by the labourers imported from Mandi, Una, Hamirpur, Kangra and Uttar Pradesh and payments are made for the collection of resin per quintal basis.

1.6.4 Labour Rates : The labour rates have increased considerably during the past over one decade on account of heavy labour demand and rising price index of essential commodities. Comparison of past and current daily labour rates for various categories are given in Table 1.6.3.

Table 1.6.3 : Past and present labour rates.

Sr. No.	Labour categories	Rate per day (Rs.)				
		1990-91	1998-99	2001-02	2007-08	2010-11
1	Full grown labourer	22.00	51.00	55.00	75.00	120.00
2	Mason grade I	64.00	93.00	100.50	136.00	217.00
3	Mason grade II	40.00	65.00	70.50	95.50	192.00
4	Carpenter Grade I	64.00	93.00	100.50	136.00	217.00
5	Carpenter Grade II	40.00	82.00	88.50	102.00	192.00
6	Black Smith	32.00	65.00	70.50	95.50	153.00
7	Plumber Grade I & II	53.00	65.00	70.50	95.50	153.00
8	Electric fitter	40.00	65.00	70.50	95.50	153.00
9	Painter	40.00	69.50	70.50	95.50	153.00
10	Sawyer (Charani)	40.00	56.50	61.00	82.50	132.00
11	Jeep Driver	40.00	69.50	75.00	102.00	164.00
12	Truck Driver	43.00	69.50	75.00	102.00	164.00
13	Truck cleaner	24.00	51.00	55.00	75.00	120.00

CHAPER-VII

PAST SYTEM OF MANAGEMENT

1.7.1 General History of the Forest : The Rajgarh Forest Division was part of the erstwhile Sirmour State for a long time, even before and after the Gurkha wars. The early history of the forest is obscure. The tract was densely wooded in the past but gradually the forests were cleared indiscriminately for cultivation. From time to time some forests leased to contractors were exploited uncontrolled. The rule of Maharaja Sir Shamsheer Parkash (1956-98) was important from conservation and management point of view when Reserved and protected Forests were constituted in the Settlement and embodied in the **Faisala – e – Janglat**. A “Rawana” system was introduced in 1947. V. (1890 A. D.) which organized the Forest Department on British India Model later on. Under this System only deodar trees VI 1.8m. girth were allowed for felling. No efforts were made either to regenerate the felled areas or to check the number of trees felled. There was no control on grazing. Consequently the forest almost depleted of the mature trees. Fir and spruce forests remained virgin as no timber demand of such species existed. The forests were managed under the orders passed by rulers of Sirmour State.

1.7.2. Past System of Mangement and their Results: The first attempt to manage the forest on scientific lines was made in 1904 with the preparation of the first working plan for Pachhad Tehsil comprising Habban and Narag ranges. This was the beginning of the forest conservancy.

1.7.3 Working Plan by Jiva Ram (1924- 25) : Mr. Jiva Ram, the Divisional Forest Officer prepared this plan under the guidance of Mr. G. G. Minikin, Deputy Conservator of Forest. It was subsequently revised by Sh. Bishamber Dass, the officiating Dy. Conservator of Forests, Nahan. Following working Circles were constituted.

- (1) Dalmun Working Circle.
- (2) Rajgarh Woking Circle.
- (3) Narag Woking Circle.

These working circle were constituted for administrative convenience rather than silvicultural considerations and were named after ranges. These were distinguished by territorial limits and not by the system of management. The prescriptions for deodar and oak workings were the same for Dalmun and Rajgarh Working Circles. Exploitation of Chil in both the circles were not prescribed due to their remoteness. In Narag working circle chil were brought under management. The working circles were divided into compartments on the basis of the boundaries of the protected forests as per Notification No. 15 of 1957. V. The compartments were large with varied crop composition and prescriptions for different species were made applicable simultaneously in the same compartment.

1.7.4 Objects of Management:

- (a) To regenerate the heavily felled deodar areas by closure and restocking of blanks artificially.
- (b) To prevent excessive lopping of oaks and prohibit lopping seedlings, sapling and poles upto 60 cm girth.
- (c) To obtain sustained yield through scientific exploitation.

The compartments were grouped as ‘exploitable’ and ‘un-exploitable’ and mode of exploitation for individual compartment was prescribed. Complete enumerations of kail, deodar and chil were carried out in 45 cm girth classes for the trees ≥ 45 cm in girth. The

number of oak trees were estimated by sampling the compartments predominated by oaks. Stump analysis on 69 deodar and 24 Chil trees were done to determine the age and time taken to reach from one girth class to another. The results summarised in Table 1.7.1.

1.7.5 Deodar Forests (Dalmun and Rajgarh Working Circle) : The system adopted was called “ Commercial Exploitation Under A High Forest System”. Only trees > 1.65 m girth, over topping the young growth capable of taking their place, were prescribed for felling followed by closure of forest. A rotation of 100 years with 4 periods of 25 years each was prescribed. Out of 15.826 trees above 1.35 m girth. 12,500 trees were estimated to be available for felling during the first 25 years.

Table 1.7.1 Results of stump analysis.

Sr. No.	Particulars	Period (Years)	
		Deodar	Chil
1.	Age at 1.65 cm girth	91	66
2.	Age at 1.80 cm girth	100	74
3.	Timber taken by 45cm girth class to reach 90 cm girth class	23	16
4.	Time taken by 90cm girth class to reach 1.35 cm girth class	25	19
5.	Time taken by 1.35 m girth class to reach exploitable girth of 1.65 m	17	14
6.	Time taken by 1.35 m girth class to reach 1.80 m girth class	27	19
7.	Average of	69 readings	24 readings

Rest 3,336 trees being unexploitable due to their location on spurs, precipitous slopes and over blank areas. The annual yield prescribed was $12,500/25=500$ trees ≥ 1.35 m girth. Annual felling coupes for 20 years for Dalmun Working Circle only were laid down for selection felling on 10 years felling cycle. Guiding principles proposed for deodar were:

“Only those trees must be selected which surmount young capable of taking their place and in thick forests, with on reproduction underneath. Care must be taken to open it gradually to induce trees to fertilize and sow the ground. No growing trees under 1.65 m in girth must be touched, No trees on top of spurs cliffs must be touched. The existing blanks caused by the past fellings must not be enlarged.”

No definite proposals for exploiting Kail forest of Dalmun and Rajgarh Ranges were made in the plan. It was, however, prescribed that whenever required, Kail trees above 1.50 m in girth could be removed from Pajoga, Sharh, Gatoga and Dol forest of Dalmun working circle.

1.7.6. Closure: Jive Ram proposed the closure of all the deodar forests against grazing but Bishamber Dass modified it in view of the great demand for grazing by local zamindars. It prescribed the closure of only half of the deodar bearing areas in a compartment,

which generally formed only a small fraction of the gross area of the compartment. It further prescribed that the closure would take effect gradually and only after the area had been felled.

1.7.7. Subsidiary Silvicultural Regulations: Cleaning, thinning, sowing and planning were prescribed. After the area was worked and the produce was removed, cultural operations were to be carried out. Sowing and plantings were to be done in refractory areas and nurseries were to be established where ever necessary. Thinning were to be done in deodar thickets and cleaning in areas where inferior species interfered with deodar growth. Weeds were to be uprooted or cut back. Deodar saplings and poles were to be freed suppression to provide sufficient light. A ten years programme for cultural operations, sowing and planting was laid down; particular compartments were mentioned against each year of operation.

1.7.8. Results: The yield prescribed was on the higher side. The recruitments up to 1.35 m girth were not taken into consideration while calculating the yield. Though the selection size was fixed at 1.35m girth, the working plan prescribed the removal of all trees above 1.35m girth within 25 years. No emphasis was on silviculture aspect of marking and heavy selling's were carried out to get the prescribed result the deodar forest were further depleted of mature stock. The 10 years sowing and planting programme had not specified the amount of work to be done. Thus little efforts were made and sporadic patches were sown and planted with deodar. This did not keep place with the heavy fellings. The deodar areas, in general, suffered a setback during this plan.

1.7.9: Chil Forests (Narag Working Circle): Chil forests were to be worked under "Selection Fellings". The exploitable girth was fixed at 1.5. m which was expected to be attained in 80 years. Four periods of 20 years each proposed and the entire areas was proposed and the entire area to be gone over twice under selection fellings with in the first 20 years period.

Total enumeration of Chil > 45 cm girth classes were carried out in all the workable compartments and the results are consolidated in Table 1.7.2.

Table 1.7.2 Enumeration results

Girth Classes	No. of trees.
I. Class (≥ 180 cm)	1,993
II. Class (135 to 180)	10,329
III. Class (90 cm to 135)	47,423
IV. Class (45 cm to 90cm)	64,813
Total	1,24,558

1.7.10: Yield Calculation : The yield prescribed were arbitrarily calculated on some assumptions as presented in Table 1.7.3

Table 1.7.3 : Yield calculation.

Sr. No.	Particulars	Girth Class	No. of trees
.			

1	Number of trees to die in struggle.	IV others	30,000 14,000
2	Trees available for removal during rotation period of 80 years		$1,24,558 - (30,000 + 14,000)$ $= 80,558$ or say 80,000
3	Annual yield		$80,000/80 = 1,000$
4	No. of I and II class trees available in 1 st 20 years period		$10,329 + 1,993 = 12,322$ Or say $= 12,000$
5	Number of unexploitable trees being on cliffs etc.		2,000
6	Number of trees available for felling in 1 st 20 years		$12,000 - 2,000 = 10,000$
7	Number of trees to be removed annually in the first period 20 years.		$10,000/20 = 500$

1.7.11 Marking Rules: A 20 year felling programme was laid down. The guiding principles for executing the fellings were as under:-

1. The fellings were to be conducted under the method of selection fellings taking out malformed, unpromising and overmature trees.
2. No growing trees under 1.5 m girth was to be felled.
3. The trees on tops of cliffs. Spurs and in existing blanks were to be left untouched.
4. Care was to taken in not enlarging the existing openings.
5. After the completion of fellings, all the forests were to be closed to grazing for 20 years to regenerate naturally.

On account of great hardships experienced by the villagers, Pandit Bishamber Dass modified the felling method in a manner as to ensure natural regeneration without affecting the closure. These modifications were that:-

1. Only these exploitable trees should be removed which overtop established advance growth.
2. Dead and dying trees, trees injured or otherwise having no future and wind fallen trees should be removed.
3. The prescribed annual yield was also reduced from 500 trees to 200 trees.

1.7.12 Results: Fellings were, however, carried out in excess of the prescribed number. Most of the mature trees were removed from the forests without giving due attention to the pace of regeneration. As the forests were kept open to grazing, regeneration obtained were deficient and patchy. However, the drastic cut in the yield proposed by Pandit Bishamber Dass had beneficial effect on the forest. As a result chil forests had moderate to well stock middle aged crop. Younger and older age classes were deficient.

1.7.13 Oak Forest (Dalmun and Rajgarh Working Circle): Annual felling coupes of 100 acres with 1,000 oak trees of ≥ 1.20 m girth were prescribed for felling each of the two working circles. This worked out to be 10 trees per acre. Only hollow, decayed and over mature trees were prescribed for felling. No growing trees below 1.2 m girth was allowed for felling. Trees occurring on top of cliffs, spurs and heavily lopped trees adjoining villages were to be protected. Pandit Bishamber Dass revised the prescribed yield to half i.e. 5 trees per acre were to be removed. He was of the opinion that the small gaps created by fellings of 5

trees per acre could easily be filled up by natural regeneration even when grazing was allowed over the entire area.

1.7.14 Results: Due to remoteness, the oak forests could not be exploited and remained untouched except for meeting demands of the local zamindars. The oak forests were generally well stocked with trees of all age classes and also contained some trees of gigantic dimension. The forests near habitations were heavily lopped and reduced to very poor crops of malformed trees. The period of Jiva Ram's plans expired in the year 1980. V. (1923 A.D.) but fellings were continued by selection method in annual coupes till Sewal's Provisional Scheme came into force in 1993 A.D.

1.7.15 Sewal's Provisional Scheme (1933-34 to 1942-43) : Due to financial depression only a provisional scheme for working the forests of Rajgarh Forest Division was prepared. Deodar, Kail and Chil forests of Pachhad tehsil were grouped into (i) Deodar Working Circle and (ii) Chil Working Circle, for commercial exploitation on scientific lines.

1.7.16 Deodar Working Circle: Selection fellings with exploitable girth of ≥ 1.5 m were prescribed. Only 50% of the trees of ≥ 1.5 m girth were prescribed to be felled from a coupe to ensure sustained yield. Ten years felling programme was laid down. The crops below 1.5 m in girth were prescribed for thinning. An area of 120 acres (48 ha.) in Gatoga forest was to be marked heavily and regenerated completely within 10 years after effective closures.

1.7.17 Results : The condition of deodar and kail forests improved considerably and good amount of patch natural regeneration came up. The proposed heavy fellings in Gatoga forest, with subsequent closure for getting natural regeneration of the lines of shelterwood system were, however, not implemented.

1.7.18 chil Working circle : Biennial felling coupes for 10 years starting from 1933 were laid down. The mode of working and yield regulations were the same as prescribed for Deodar Working Circle. It was proposed to select an area of 150 acres (60 ha) for felling and closure under concentrated regeneration system. The mushterqua forests adjoining various annual coupes were also subjected to similar treatments as the Government forests.

1.7.19 Results : Chil being a light demander, did not respond to selection fellings. Lack of closure resulted in poor and patchy regeneration and most of the Chil areas were deficient in mature trees due to selection fellings. The concentrated regeneration fellings over 60 ha. were not carried out.

1.7.20 Period Between 1942 to 1962 : Sewal's scheme expired in 1942. In the absence of any other working plan, the provisions of Sewal's scheme were followed till 1961, when Mukerjee's Plan came into force. Fellings were carried out in accordance with the annual felling programme approved by the Chief Conservator of Forests, Himachal Pradesh.

1.7.21 Chil Forests : As per prescriptions of Sewal's scheme 10 ha. patches each in Phagu, Shina. Unchakot, Rister and Lawasa forests were marked for seeding felling during 1952-55. Regeneration had come up in Phagu, Lawasa and Rister, but unchakot and Shina forests remained deficient and patch. Resin tapping was extended to all the important chil forests with the increase in resin demand.

1.7.22 Deodar forests: Efforts to raise deodar artificially at suitable places did not generally give the expected results for want of proper and effective closure. However, persistent efforts resulted in some of the established plantations at places like **Surdhar, Shendhar** and **Khabar** etc.

1.7.23 Fir and Spruce Forests : On the lines of **deodar** forests, selection fellings in fir and spruce forests were prescribed in Sewal's Plan, whenever the demand for their timber arose. During second world war the fir and spruce timber was in great demand and the market price of these species increased considerably. Systematic exploitation of fir and spruce forests started in 1943. Since then selection fellings were carried out in annual coupes proposed by the Divisional Forest Officer. The fellings were generally light. The **fir** and **spruce** forests were well stocked with trees of all age classes. The openings created by the selection fellings offered favourable conditions for natural regeneration, which had come up in adequate quantity over most of the areas of these forests.

1.7.24 Special Works of improvement undertaken:

Buildings : During the period from 1904-47 only 10 forest Guard huts, one Range quarter and one Range rest room were constructed and Haripur fort buildings repaired at a total cost of Rs. 12072.00. After 1947 the residential buildings constructed were : 8 Forest Guard huts, 5 Forester's quarters, 3 Range quarters cum office, 1 residence of DFO, 1 Divisional Office, 7 Clerk quarters, 5 Peon quarters, 1 Stable, 1 Range rest Room and 2 Rest Houses. In addition to the new constructions, repairs to existing buildings were also carried out. The total expenditure for construction and repairs during the period amounted to Rs. 3,19,000.00 At Rajgarh a water supply scheme was executed at a cost of Rs. 6983.00 and all the buildings of Forest Colony were provided with tap water.

Road and Paths : Upto 1953-54 no new roads and paths were constructed. In 1953 roads being maintained by the district board were transferred to the Forest Department. Since then construction of new roads was also taken in hand and the roads and paths constructed thereafter are given in Table 1.7.4. Total amount spent on construction and maintenance upto 1959-60 as Rs. 1,99,534.00.

Table 1.7.4 : List of roads and paths.

Sr. No.	Roads/Paths	Width (m)	Length (m)
1	Bridle paths	1.83	64
2	Inspection paths	1.22	26
3	Jeepable roads	3.05	4

Demarcation works : Demarcation works started since 1953-54 and all the reserved forests of Habban and part of Narag ranges were demarcated and boundary pillars provided.

Fire Lines : 100 feet (30.5m) wide fire lines were provided in all the chil forests and Narag range in the year 1948. It covered a length of 96.75 Km and spread over an area of 15,389 ha.

1.7.25 Past Revenue and Expenditure : The summary of the revenue and expenditure from 1948 to 1961 is given in Table 1.7.5.

Table 1.7.5 Past revenue and expenditure

Year	Revenue (Rs.)	Expenditure (Rs.)
1948-49	2,54,951	94,290
1949-50	5,02,373	2,33,278
1950-51	5,03,033	2,52,640
1951-52	5,70,878	2,55,326
1952-53	4,78,886	2,62,524
1953-54	6,24,823	3,36,486
1954-55	5,19,211	3,49,143
1955-56	5,13,073	4,30,268
1956-57	3,14,334	2,01,259
1957-58	12,35,246	4,00,168
1958-59	7,58,587	2,27,639
1959-60	9,54,380	2,42,241
1960-61	11,88,546	3,61,775

1.7.26 Mukerjee's Plan (1961-62 to 1975-76) : This plan was for a period of 15 years and four working circles were constituted as under:

- a. The Deodar Working Circle (7,709.68 ha.)
- b. The Chil Working Circle (10,142.65 ha.)
- c. The Selection Working Circle (7,234.58 ha.)
- d. The Protection Working Circle (21,885.16 ha)

1.7.27 The Deodar Working Circle : It covered all deodar and kail forests, pure or mixed, with the exceptions of a few small patches which formed small pockets in crops of other species or are situated on precipitous grounds. Some ban oak forests fit for raising deodar plantations, besides chil and fir patches found in deodar forests, were also included in this working circle. Depending on the stocking, the situation of the forests and demands of right holders, the deodar, and kail forests were differentiated into three types as under : -

TYPE A (4,475.43 ha): Confined to Habban Range, the type contained all the better stocked forests of deodar and kail with adequate natural regeneration, available for commercial exploitation after meeting the local demands.

TYPE B (490.48 ha) : It contained small isolated patches of deodar and kail located far away from the main deodar bearing tract and were not meant for commercial fellings but to meet the local requirements.

TYPE C (2743.77 ha). It constituted some ban oak forests suitable for raising deodar plantations.

1.7.27 : The species wise stocking is given in Table 1.7.6.

Table 1.7.6 : Stocking under various species.

Sr. No.	Species	Area (ha.)
1	Deodar	1713.04
2	Kail	1372.70
3	Oak	3496.49
4	Fir	139.21
5	Chil	117.36
6	Mixed Deodar/kail	183.32
7	Blanks	687.56
	Total	7709.68

1.7.28 Objects of Management: It envisaged improvement of the growing stock, supplementing natural regeneration by sowing and planting, restocking of blanks and extension of deodar areas apart from ensuring sustained yield of timber for sale after meeting the local demands.

1.7.29 Silvicultural System: For type ‘A’ forests the system adopted was “Irregular shelter-wood Group System with Floating Periodic Blocks”. For type ‘B’ forests the improvement fellings and light thinning were prescribed. In type ‘C’ forests, deodar planting was prescribed. The rotation was fixed at 150 years with exploitable diameter of 60 cm d.b.h. and forests were grouped as PBI and PB unallotted. The area of PBI was 733.29 ha.

1.7.30 Yield Regulation: By excluding the advance growth (<40 cm d.b.h.) and adopting Von Mantel’s Formula, 1,528 M³ annual yield for deodar and Kail (≥ 40 cm d.b.h.) was fixed. A deviation of $\pm 15\%$ from the annual prescribed yield was allowed with a cumulative departure below 20%. An annual coupe of 40 ha was proposed for felling. Sequence of fellings was laid down for ‘A’ type forests only. Subject to attainment of prescribed annual yield, the markings were required to be purely guided by progress of regeneration. Trees standing over advance growth were prescribed for fellings. Seedlings fellings were to be done in a ring of two crown width of about 30 mm around the groups advance growth. The spacing of seed bearers in the ring was to be one crown width i.e. approximately 15 m. In the mature crop with deficient regeneration, openings of 2 to 3 crown width (30 to 35 m) scattered all over the crop were to be created. The distance between these openings was fixed at 100 to 300 m edge to edge. A thinning programme with an average annual area of 144.88 ha. was prescribed for P.B. unallotted.

1.7.31 Plantations: Total area prescribed for deodar plantation in ‘B’ and ‘C’ types were 30.35 ha and 273.16 ha respectively. Any deficit in one year was to be made up in subsequent years. In addition 60.70 ha of natural blanks in PBI areas of the ‘A’ type were also to be planted up. Weeding, cleaning and thinning as per requirements were to be done. Partial closure in PBI as per need of the area was suggested.

1.7.32 Critical Appraisal: Grouping of forests into ‘A’ ‘B’ and ‘C’ types did not bring any gainful results as envisaged. The size of compartments and sub compartments were still too big for precise description and management, particularly for PBI forests. Patches of chil, fir, oak etc. forests were neglected. The Irregular Group Shelter-wood System proved unsatisfactory as it induced more irregularity in the crop and natural regeneration remained deficient. Individual poles upto 40cm d.b.h. retained as part of the future crop worsened the position as in Oria, Dol and Manwa forests.

Regeneration: The regeneration assessment results is prescribed in Table 1.7.7.

Yield: PBI: The yield calculation in PBI (Type A) was not based on correct assumptions. Old enumeration data were used to calculate the yield. Individual trees retained as part of the future crop were ignored for yield calculations. Felling programme could not be adhered to as the yield obtained was much more than the prescribed one. No attempt was made to revised the yield during the plan. The yield removed was more than the prescribed yield, as evident from the data presented in Table 1.7.8.

Table 1.7.7 Regeneration Assessment

Sr. No.	Particulars	Area (ha.)
1	Area felled under PBI fellings	558.80
2	Area regenerated (Pole crop density> 0.75)	8.81
3	Moderately regenerated (pole crops> 0.75, saplings 0.75, seedlings 0.75, density)	34.03
4	In adequately regenerated (Regeneration present but not established so far)	42.56
5	Blanks (Culturable) to be regenerated.	327.43
6	Blanks (Unculturable)	14.34
7	Scrub (Plantable)	5.96
8	Advance growth	125.67

Table 1.7.8 Yield position in PBI (Type A)

Year	Prescribed yield (M ³)	Yield removed (M ³)	Deviation + (M ³)
1961-62	1,528.00	---	-1528.00
1962-63	1,528.00	4330.00	+1274.00
1963-64	1,528.00	---	-254.00
1964-65	1,528.00	3472.00	+1690.00
1965-66	1,528.00	---	+162.00
1966-67	1,528.00	4106.00	+2740.00
1967-68	1,528.00	---	+1212.00
1968-69	1,528.00	2554.00	+2238.00
1969-70	1,528.00	---	+710.00
1970-71	1,528.00	5753.00	+4935.00
1971-72	1,528.00	254.00	+3661.00
1972-73	1,528.00	116.00	+2449.00
1973-74	1,528.00	379.00	+1100.00
1974-75	1,528.00	4983.00	+4555.00
1975-76	1,528.00	---	+3027.00

PB Unalloted : No yield by volume or numbers was prescribed in PB Unalloted. Even than large sized trees were removed for one purpose or the other. As a result forests become more open and contained predominantly middle aged crops. Regeneration was absent mainly due to frequent fires. The area prescribed for light thinning and the area actually gone over is presented in Table 1.7.9

Table 1.7.9 Area prescribed and thinned (PB Unalloted)

Year	Area Prescribed (ha.)	Area removed (ha.)	Deviation + (ha.)

1961-62	141.00	141.00	--
1962-63	14.50	14.50	--
1963-64	57.20	57.20	--
1964-65	261.20	261.20	--
1965-66	184.00	---	-184.00
1966-67	66.40	250.40	--
1967-68	522.00	522.00	--
1968-69	44.00	44.00	--
1969-70	511.20	675.20	+164.00
1970-71	60.40	60.40	+164.00
1971-72	164.00	766.00	+766.00
1972-73	---	---	+766.00
1973-74	121.30	---	+644.80
1974-75	173.60	---	+471.00
1975-76	31.60	---	+439.60

Plantations : Against the prescribed area of 303.51 ha in 'B' and 'C' types and 60.70 ha in PBI 'A' type forests, 400.50 ha and 244.00 ha were taken up for planning respectively. In addition 112 ha were also planted up with deodar in PB unallotted. Deodar planted under heavily lopped Ban Oak forests had given remarkable results. Planting received serious attention since 1971.

1.7.26 The Chil Working Circle : Chil forests managed under selection system in the past consisted heterogeneous mixture of all age groups. The species wise stocking is presented in Table 1.7.10.

Table 1.7.10 : Species and stocking (ha)

Sr. No.	Species	Area (ha)
1	Chil	8945.19
2	Broadleaved	561.71
3	Oaks	151.35
4	Deodar	86.60
5	Kail	21.85
6.	Blanks	375.95
	Total	10142.65

1.7.27 Objects of Management : It aimed to obtain crops of uniforms age gradation by regenerating the PBI areas quickly and preparing rest of the area for concentrated regeneration systems; to tend and protect the natural regeneration; to restock the blanks in PBI areas by natural or artificial means; and to produce maximum resin yields while keeping the forests in healthy conditions.

Enumerations down to 30 cm dbh in 10 cm. diameter classes were carried out in most of the compartments in the year 1953-54 and stock maps for all the compartments were prepared. Density varied from 0.5 to 0.9 with average 0.7 and quality II/III.

1.7.28 Silvicultural System: The forests were managed under Punjab Sheterwood System. Uniform opening of canopy with retention of compact groups of young poles as part of future crop in P.B.I area were the salient features. Definite allotment were made to P.B.I and II and the rest of the forest were grouped as PB Unallotted. P.B.I forests were further classified into 'A' and 'B' types. 'A' type were the better stocked areas in which seeding fellings were required to be carried out to get bulk of the P.B.I yield. 'B' types supported open

scattered middle aged to mature crop of chil with blank patches and practically no regeneration. This type was to be closed for artificial regeneration without any fellings. In P.B.II and P.B. Unalloted, improvement fellings and light thinning in congested groups on a 15 years felling cycle were prescribed and definite felling programmed laid down. Rotation was fixed at 120 years with a regeneration period of 30 years. An area of 177.66 ha. was reserved to meet the demand of right holders. Area under various categories and allotments are given in Table 1.7.11.

Table 1.7.11 : Allotment and area distribution

Sr. No.	Allotment	Area (ha)	
1	P.B. I type 'A'	2077.66	} 2480.32
2	P.B. I type 'B'	402.66	
3	P.B.II	2337.47	
4	P.B. Unalloted	5147.20	
5	Reserved for right holders	177.66	
	Total	101423.65	

1.7.29 Yield Regulation : The yield was calculated by Von Mantel's formula. It was prescribed as 2462 M³ and consisted of trees ≥ 30 cm dbh. A deviation of $\pm 15\%$ was allowed in prescribed yield with a cumulative departure at + 20 % at any time. Annual coupe of 57.87 ha was prescribed for working but the entire compartments were to be worked ignoring some deviations. Seeding and final fellings were prescribed. On cooler aspects 15 to 20 and on warmer aspects 20-25 trees were to be retained as seed bearers. Groups of poles upto 30 cm dbh covering ≥ 0.40 ha area were to be retained as part of the future crop. Individual trees of 30 to 50 cm dbh were also be retained. Final fellings were contemplated only after the establishment of regeneration. All the seed bearers were to be removed in final fellings except those needed for unregenerated blanks exceeding 0.40 ha or where retention was essential for protection. In P.B. II and P.B Unalloted, the yield was prescribed by area. Removal of unfit and inferior trees suppressing chil regeneration along with slash disposal were prescribed in PBI areas, Patch sowing was prescribed in 192 ha. type 'A' and 398 ha in 'B' forests. Control burning once in three years was to be carried out. It was also prescribed in regeneration areas having plants over 1.5 m in height. All the P.B.I areas were to be closed for a period of 20 years.

1.7.30 Critical Appraisal : Sizeable areas containing species other than chil were allotted to this working circle but no specific treatment was prescribed for them.

REGENERATION ASSESSMENT :

P.B.I 'A' Type : total 858.45 ha forests were felled during the plan period. Most of the areas got burnt and the regeneration was wiped out. The regeneration position assessed is presented in Table 1.7.12 :

Table 1.7.12 : Summary of regeneration assessment

Sr. No.	Particulars	Area (ha)	%

1	Total area of P.B. I type 'A'	2077.66	---
2	Area under regeneration (Seeding felling carried out)	852.60	100
3	Fully regenerated (Pole crop density > 75 %)	61.90	7.26
4	Moderately regenerated (pole crops < 75%, saplings 75%, seedlings 75%,)	92.18	10.81
5	In adequately regenerated (Regeneration present but not established so far)	67.65	7.98
6	Blanks (Culturable)	278.87	32.71
	Blanks (Unculturable)	39.54	3.58
7	Scrub (Culturable)	16.05	1.88
	Scrub (Culturable)	74.55	8.75
8	Advance Growth	230.86	27.08

P.B.I "B" Type : Against an area of 402.31 ha prescribed for planting, 137 ha were planted with chil. Planting programme received serious attention only during the last few years.

YIELD

P.B.I : The assessment of growing stock for purposes of yield regulation was not correct as the enumeration figures of 1953 were applied in 1960. The removals were in excess to the prescription. The condition of P.B.I. forests was not satisfactory mainly due to the ravages of forest fires. The annual prescriptions had to be ignored during the last few years. Only salvage markings were carried out. The yield prescribed and removed from P.B.I during the plan period is given in Table 1.7.13.

Table 1.7.13 : Yield prescribed and removed

Year	Yield (M ³)		
	Prescribed	Removed	Deviation
1961-62	2,462	6,215	+3,753
1962-63	2,462	1,986	+3,277
1963-64	2,462	1,135	+1,950
1964-65	2,462	2,275	+1,763
1965-66	2,462	1,885	+1,186
1966-67	2,462	1,874	+598
1967-68	2,462	7,766	+5,902
1968-69	2,462	594	+4,034
1969-70	2,462	--	+1,572
1970-71	2,462	3,757	+2,867
1971-72	2,462	--	+405
1972-73	2,462	1,900	-157
1973-74	2,462	5,293	+2,674
1974-75	2,462	5,337	+5,549
1975-76	2,462	4,592	+7,679

P.B.II: The annual prescription for some of the concluding years not followed because of fires, and salvage makings only could be carried out to regularized the excess fellings. The area prescribed and felled are provided in Table 1.7.14

Table 1.7.14 Area prescribed and felled

Year	Area (ha.)		
	Prescribed	Felled	Deviation
1961-62	184.00	184.00	--
1962-63	---	--	---
1963-64	29.60	29.60	--
1964-65	217.60	217.60	--
1965-66	101.60	101.60	--
1966-67	308.00	308.00	--
1967-68	155.00	155.00	--
1968-69	232.00	232.00	--
1969-70	51.20	275.00	+223.80
1970-71	316.40	1,565.60	+1,473.00
1971-72	45.20	141.60	+1,569.40
1972-73	160.40	1,516.40	+2,925.40
1973-74	132.00	1,469.60	+4,263.00
1974-75	79.60	1,836.00	+6,019.40
1975-76	147.60	1,600.00	+7,471.80

P.B. Unalloted : The prescribed fellings were not followed because of extensive fires. To even out the excess fellings, only salvage marking were carried out during the last 6 years. The area prescribed and felled is given in Table 1.7.15

Table 1.7.15 Area prescribed and felled

Year	Area (ha.)		
	Prescribed	Felled	Deviation
1961-62	366.40	366.40	---
1962-63	131.20	131.20	---
1963-64	154.00	154.00	---
1964-65	128.00	128.00	---
1965-66	334.00	242.00	-91.60
1966-67	188.40	272.00	---
1967-68	564.00	564.00	---
1968-69	165.60	232.00	+67.00
1969-70	181.60	232.00	+117.40
1970-71	418.80	2,240.40	+1,939.00
1971-72	466.90	196.80	+1,668.90
1972-73	517.60	2,266.80	+3,418.10
1973-74	338.00	2,554.40	+5,634.50
1974-75	149.20	3,258.00	+8,743.30
1975-76	290.00	3,785.60	+12,338.90

Control burning: In the absence of any positive programme laid this important operation was completely neglected.

1.7.31 The Selection Working Circle : It included all the fir and spruce forests, pure or mixed, the adjoining oak, deodar, Kail (pure or mixed) and chil forests which could not be separated by formation of Sub-compartments. They were true selection forests with all age classes present. Good amount of fir and spruce regeneration was coming up in adjoining ban oak areas. Regeneration was said to be satisfactory. Oaks and Rhododendron formed fairly dense understorey. Dense understorey. Oak forests forming dense belts above

and below the fir forests were mostly virgin. Kharsu oaks were badly looped near Gujjar paraos. Species wise stocking is given in Table 1,7,16 .

Table 1.7.16 Species and area distribution (ha)

Sr. No.	Species	Area (ha)
1	Fir/Spruce	4139.94
2	Oaks	2605.77
3	Deodar	39.25
4	Kail	10.93
5	Mixed deodar and kail	12.95
6	Chil	43.71
7	Blanks	358.55

1.7.32 Objects of Management : It aimed at maintaining the existing compete forest cover to protect steep hills, tending the natural regeneration of spruce and fir and supplementing it by planting in gaps and finally exploiting the silviculturally available mature and over mature fir and spruce trees. Enumerations in 10 cm density classes down to 30 cm d.b.h. were carried out in 1953-54. The density varied from 0.6 to 0.8. Quality assessment was not made but stock maps were prepared.

1.7.33 Silvicultural system : The forests were managed under Selection system to get uneven aged forests to provide good soil cover. In blanks artificial regeneration was to be carried out. Exploitable diameter was fixed at 60 cm d. b. h. attained in 160 years. Felling cycle was fixed at 15 years and sequence of felling laid down. Annual yield prescribed was 5,235 m³ calculated by Smythie, s Safe Guarding Formula in terms of trees ≥ 50 cm d. b. h. One out of every three selection trees were to be marked in a coupe of 262 ha annually. Marking rules were laid down. To induce the regeneration. Openings of 1 to 2 crown width without causing the permanent gaps were prescribed. Light crown thinning was to be carried out in the congested groups of immature trees.

1.7.34 Artificial Regeneration : Out of estimated 358.55 ha blanks 151.76 ha were prescribed for planting spruce and fir. In addition, planting of valuable species like walnut, bird cherry, maple etc. Were also suggested. Cleaning in dense patches of natural regeneration was to be carried out. Weeding on small scale was prescribed in the areas where weed growth inhibited natural regeneration. Slash was to be dumped in nallas and depressions. No burning of debris was permitted. Area was to be kept open to grazing.

1.7.35 Results: The system did not produce the required results. Crop was deficient in mature any younger age classes and natural regeneration had made no progress at all. The yield obtained was less than the prescribed one as evident from the figures given in Table 1.7.17

Table 1.7.17 : Yield prescribed and removed (m³)

Year	Yield (M ³)		
	Prescribed	Removed	Deviation

1961-62	5,235.00	4,121.00	-1,114.00
1962-63	5,235.00	3,970.00	-2,379.00
1963-64	5,235.00	4,845.00	-2,769.00
1964-65	5,235.00	5,802.00	-2,202.00
1965-66	5,235.00	---	-7,437.00
1966-67	5,235.00	1,898.00	-10,774.00
1967-68	5,235.00	832.00	-15,177.00
1968-69	5,235.00	6,070.00	-14,342.00
1969-70	5,235.00	9,468.00	-10,109.00
1970-71	5,235.00	1,650.00	-13,694.00
1971-72	5,235.00	5,715.00	-13,214.00
1972-73	5,235.00	216.00	-18,233.00
1973-74	5,235.00	11,626.00	-11,852.00
1974-75	5,235.00	---	-17,087.00
1975-76	5,235.00	---	-22,322.00

1.7.36 The Protection Working Circle : Over exploited areas in the past, areas situated on precipitous slopes, localities required protection against denudation and soil erosion, and grasslands with scattered tree growth were included in this working circle. Profitable working was out of question in these forests. Species wise stocking and area distribution is given in Table 1.7.18.

Table 1.7.18 Species and area statement

Sr. No.	Species	Area (ha)
1	Oaks	6610.15
2	Broadleaved species	5911.25
3	Chil	483.60
4	Fir/Spruce	217.72
5	Deodar	19.02
6	Kail	26.71
7	Mixed deodar and kail	20.24
8	Blanks	8296.47
	Total :	21585.16

1.7.37 Object of Management : It aimed at protecting the hill sides against further denudation, to undertake active soil conservation measures and to preserve and improve existing trees growth by raising plantations. Enumeration was not carried out but stock maps were prepared. Neither site quality was assessed nor silvicultural system was prescribed. Area was grazed excessively. Regeneration was lacking. Fellings were permitted to meet the right holders demand only. Guiding principles were laid down to execute the fellings. An area 455.27 ha was prescribed for planting during the plan period. Cleanings and weedings atleast twice a year were required to be carried out in all the young plantations.

1.7.38 Results: The areas needing protection against soil erosion were not prescribed. Against the prescribed area of 455.27 ha, only 146.70 ha were planted up with **Eucalyptus** in lower zones below, 1500 m. The performance of Eucalyptus was below expectations; hence

this had to be abandoned. No perceptible improvement had come about in the forests allotted to this working circle.

1.7.39 Special Works of Improvement Undertaken: 324.3 km of bridle paths and 57.56 km jeepable roads were constructed. Narag – Maryog and Bagthan jeepable roads were subsequently transferred to H.P. Public Works Department. The repairs of many paths remained neglected. Very little efforts were made to fix the sign boards delimit the compartments and sub compartments with boundary pillars. No efforts were made to clear the fire lines. To minimize inordinate delay in the transmission of urgent and immediate information, the installation of departmental telephone lines were undertaken during 1963-64 at a capital cost of Rs.13,000.00 connecting Rajgarh with Bathaudar, Thandidhar and Haban on one side and Yashwant Nagar on side. These departmental telephone lines were out of order in early seventies and now disappeared completely.

1.7.40 : Past revenue and Expenditure : The revenue and expenditure during the plan period is summarized in Table 1.7.19.

Table 1.7.19 : Past revenue and expenditure

Year	Revenue (Rs.)	Expenditure (Rs.)	Surplus/Deficit (Rs.)
1961-62	9,37,882	3,73,727	+5,64,255
1962-63	15,25,936	4,50,236	+10,75,700
1963-64	13,34,896	5,32,513	+8,02,383
1964-65	14,66,781	9,70,372	+4,94,408
1965-66	13,29,576	12,04,008	+1,25,568
1966-67	13,64,883	7,67,937	+5,96,946
1967-68	11,77,613	9,21,478	+2,56,135
1968-69	15,09,221	8,38,089	+6,71,132
1969-70	9,98,004	7,40,634	+2,57,370
1970-71	13,51,964	11,43,850	+2,08,114
1971-72	5837670	24,02,479	+34,35,191
1972-73	3165670	42,22,608	-10,56,938
1973-74	6097920	42,16,378	+18,81,542
1974-75	4507071	38,02,900	+7,04,171
1975-76	2705298	34,71,005	-7,65,707

1.7.41 Sharma's Plan (1976-77 to 1990-91): It was for a period of 15 years and seven working circles were constituted as discussed below.

1.7.42 : The Chil Working Circle : It covered an area of 10053.72 ha of reserved, protected, unclassed and mushterqua forests and included moderately stocked chil forests of mostly pure crop with scattered patches of broadleaved species. The forests were under stocked with middle aged trees predominating.

1.7.43 Objects of Management : It envisaged the conversion of chil crop into more or less even aged fully stocked normal crop by restocking naturally or artificially and maximizing the yield of timber, pulpwood, resin and other forest produce on sustained basis.

1.7.44 Analysis and Valuation of the Crop : Total enumeration down to 10 cm dbh was carried out in 10 cm diameter classes for P.B.I area in the year 1975-76. Stratified partial enumerations over about 10% of the area were carried out in other P.Bs. Stock maps on 1:15000 and 1:25000 scales were prepared. The average site quality was II/III and density varied from 0.3 to 0.6. Total growing stock of chil was assessed as 4,04,805 M³ which was only 32% of the normal growing stock.

1.7.45 Silvicultural System : The forests were managed under Irregular Shelterwood System which allowed fellings according to the nature of ground and permitted some irregularity to avoid the sacrifice of immature pole crops included in P.B.I. Marking conform to selection principles on steep and cut areas. Definite allotments in various P.Bs were made.

P.B.I (2411.63 ha) : The area containing middle aged to mature crop of chil fit for harvesting and regeneration and P.B.I are felled in the past but not regenerated, were included in this P.B.

P.B.II (2557.70 ha) : Area with middle aged or older crops were allotted to this periodic block.

P.B.III (4686.31) : The irregular crop of predominantly young to middle age group were allotted to this periodic block.

P.B.IV (398.08 ha) : The area containing predominantly young crop were allotted to PB.IV.

Rotation was fixed at 120 years with a regeneration period of 30 years. No fellings in P.B.II and II were prescribed except the removal of dry and fallen trees. Also in P.B.IV no fellings or thinning were prescribed except the removal of uprooted, dry fallen trees or left over seed bearers interfering the regeneration. The seeding and final fellings were prescribed in PB.I.

1.7.46 Yield Regulation : The yield was restricted to PB.I areas only. Down to 10 cm dbh the entire growing stock was considered for the yield calculation excluding seed bearers and 50 % volume of pole crop upto 20 cm d.b.h. The annual yield prescribed was 3500 M³ with a variation of 10% and a cumulative deviation of 50% of annual yield prescribed. Removal was linked with the progress of regeneration. If regeneration was not keeping pace with fellings, it was to be curtailed accordingly. For this purpose regeneration assessment survey was to be carried out once in three years. Sequence and method of executing fellings were laid down.

1.7.47 : Subsidiary silvicultural operations like slash disposal weeding, bush cuttings and cleaning, fire protection and control burnings were prescribed. List of fire prone areas were also provided. The numbers of resin blazes were reduced to 290000 from 357806. Forests closed and excluded from resin tapping were also listed. Regeneration survey was prescribed to be carried out every year before 31st March and results of such survey were to be utilized for preparing APO for next years.

1.7.48 Results : The removal from P.B.I was too high in excess of prescribed yield though quite a lot of forests remained unfelled due to moratorium on green fellings. Felling was not linked with the pace or regeneration specially in Sakore, Chandoli, Matnali Dalmun Dudar and Salogni forests which were burnt during the plan period. Regeneration in general is satisfactory and encouraging. In majority of the cases final fellings were not carried out and other trees are still standing over the dense pole crop. In some cases the crop is too young to transfer to P.B.IV. The yield prescribed and removed is given Table 1.7.20 and the P.B.I forests remained unfelled are list in Table 1.7.21.

Table 1.7.20 : Yield prescribe and removed.

Year	Yield (M ³)		
	Prescribed	Removed	Deviation
1976-77	3,500	12,785.52	+9,285.52
1977-78	3,500	16,405.73	+22,191.25
1978-79	3,500	9,558.44	+28,249.69
1979-80	3,500	10657.53	+35,407.04
1980-81	3,500	5,945.28	+37,852.32
1981-82	3,500	20,208.72	+54,561.01
1982-83	3,500 +300 of Reh. W.C	5,603.72	+56,363.76+8,727.50 of Reh. W.C (65,092.26)
1983-84	3,800	4,438.38	+65730.64
1984-85	3,800	8,467.66	+70,498.30
1985-86	3,800	11,854.44	+78552.74
1986-87	3,800	15,397.28	+90,150.02
1987-88	3,800	8,408.12	+94,758.14
1988-89	3,800	5,790.90	+96,749.04
1989-90	3,800	5,477.65	+98,426.69
1990-91	3,800	5,481.99	+1,00,108.68

Table 1.7.21: List of PB.I areas left unfelled.

Year of felling prescribed	Range	FORESTS
1976-77	Sarahan	(P) P. 20 Motipur C2
1977-78	Habban	(P) R.F. 13 Dol C1d
	Rajgarh	(P) R.31 Sanyo Didag C1c
1978-79	Rajgarh	(P) R. 28 Bohal C1c
		---do----- C2a
		(P)M. 64 Kulath C2a
1979-80	Rajgarh	(P) P. 3 Braila C2
1980-81	Rajgarh	(P) R. 28 Bohal C2c
		(P) R. 36 Surdhar C2
1982-83	Habban	(P) R. 11 Gatoga C1b
		(P) M21 Sarwa whole
	Rajgarh	(P)R.35 Matnali C1
	Sarahan	(P) P. 13 baunta C3b
		(P) P. 14 Sewli C1a
1983-84	Rajgarh	(P)M. 75 Neri Ratoli C2
	Sarahan	(P)R. 45 Ghinni C6

Year of felling prescribed	Range	FORESTS
1984-85	Rajgarh	(P) R. 31 Sanyo Didag C1a
		----do----- C1b
		-----do----- C1d
	Sarahan	(P) M. 156 Panwa C2
1985-86	Rajgarh	(P) R. 34 Rajgarh C2
	Sarahan	(P) R. 47 Unchakot C1d
		(P) P. 13 Baunta C4c
		(P) M. 124 Bharanji whole
1986-87	Rajgarh	(P) R. 35 Matnali C2a
		(P)P. 20 Motipur C1
		(P)M. 104 Sohala whole
		(P)M 145 Argu whole
1987-88	Rajgarh	(P)R. 37 Bandon whole
1988-89	Habban	(P) M. 33 Kharmanji whole
	Sarahan	(P) R. 40 Palashon c3b
		(P)R. 49 Pathroti C2
1989-90	Rajgarh	(P)R. 28 Bohal C1d
1990-91	Habban	(P)M. 46 Dhaya Pitli whole
	Rajgarh	(P) P. 3 Braila C3b
		(P)M. 57 Dahan whole
	Sarahan	(P)P. 13 Baunta C3c

1.7.49 Regeneration : Some of the regeneration area got burnt. The net position as per regeneration survey conducted in 1990-91 is given in Table 1.7.22. The attempts to raise plantations were made half heartedly and the success is meager. The system as a whole worked satisfactorily.

1.7.22 Summary of regeneration survey.

Sr. No.	Particulars	Area (ha.)	%
1	Total area of P.B.I	2411.63	--
2	Area under regeneration (P.B.I felled area)	746.75	100
3	Area fully regenerated (density > 0.75)	354.49	47.47
4	Area moderately regenerated (density 0.5 to 0.75)	188.59	25.26
5	Area poorly regenerated (density < 0.5)	175.50	23.50
6	Blanks (a) Culturable	3.95	0.53
	(b) Unculturable	0.30	0.04
7	Included cultivation	15.09	2.02
8	Advance growth	8.83	1.18

1.7.50 Miscellaneous : Fire lines were not maintained properly and forest fires were not controlled seriously. Control burning was also neglected. On average 1,03,638 number of blazes were tapped from 1976-77 to 1990-91 against the prescribed 2,90,000 blazes. Since the taking over of resin tapping by the HP SFC, the condition have worsened. Neither territorial nor corporation staff are exercising any control. As a result illicit blazes are common and illegal export of resin is being done. Rules are not followed strictly and undersized trees

tapped heavily. Size and depth of channels are more than the prescribed specifications. This has caused severe wind break in chil forests.

1.7.51 The Deodar Kail Working Circle : It covered an area of 3928.77 ha comprising of reserved, protected and mushterqua forests of moderate stocking and consisted of mainly pure crop of deodar or kail or a mixture of both. Deodar had predominantly middle aged trees where as kail had middle to younger age classes. Along the upper limits, spruce was found mixed with deodar and kail and at places dense crops of ban oak, pure or mixed with Mohru oak was also found. Southern aspects had chil and ban patches at places. Natural regeneration of deodar and kail was deficient.

1.7.52 Objects of Management : It envisaged the conversion of deodar and kail crops into normal forests by regenerating them both by natural and artificial means and maximizing the sustained yield of timber after meeting the local demands.

1.7.53 Analysis and Valuation of the crop : Total enumerations done to 10 cm dbh in 10 cm diameter classes for P.B.I areas, and partial enumerations of 16.28% in P.B.II and 19.86% in P.B.III and IV were carried out. Stock maps were prepared on 1:15000 and 1:25000 scale for all the forests. The average density of crops was 0.54 and site quality II.

1.7.54 Silvicultural System : The forests were managed **under Irregular Shelterwood System** which allowed fellings according to the nature of ground and permitted some irregularity to avoid the sacrifice of pole crops. On steep slopes, fellings were to be done on selection principles. The forests were allotted to 4 periodic blocks as under:

P.B.I (850.72 ha) : Area that have undergone seeding felling during the previous plan and where the regeneration is not yet established besides areas where seeding felling were to be carried out, were included in this periodic block.

P.B.II (965.70 ha) : Area having predominantly middle aged to mature crops were allotted to P.B.II.

P.B.III (1726.57) : Areas having irregular crops, predominantly young to middle aged were allotted to this periodic block.

P.B.IV (398.08 ha) : The P.B.I areas of the previous plan having advance growth and young crops were allotted to P.B.IV. A rotation of 120 years was fixed with a regeneration period of 30 years. No felling was prescribed in P.B.II except the removal of dry and fallen trees. Thinning of dense crop was prescribed in P.B.III & IV areas alongwith salvage removals and sequence of thinning were laid down. In P.B.I areas seeding and final fellings were prescribed. Area was to be closed immediately after fellings and protected against fire and grazing. Grass cutting was allowed after the seedlings had attained the height of 30 cm.

1.7.55 Yield Regulation : The yield was restricted to PB.I areas only. The growing stock down to 10 cm dbh was considered for the yield calculation excluding seed bearers and 50 % volume of pole crop upto 30 cm d.b.h. The annual yield prescribed was 1700 M³ with a variation of 10%. Removal was linked with the progress of regeneration and was to be curtailed if regeneration did not keep pace with the fellings. . Regeneration assessment survey was to be carried out once in 5 years. Guiding principles and sequence of felling were laid down. Slash disposal, removal of dead, damaged, unfelled trees and less valuable species

interfering with the regeneration of deodar and kail alongwith the shrub cutting were also prescribed.

1.7.56 Results : The yield prescribed and removed from P.B.I area is given in Table 1.7.23.

A cumulative deviation of +24839.84 M³ in yield is too high and beyond the prescribed limit though several forests were not worked due to moratorium on green felling. Such forests are listed in Table 1.5.24. Except for a few forests like Taproli, Khabbar and Manwa of Thandidhar block, the forests failed to regenerate. Fellings have created inhospitable condition for natural regeneration. Plantations are also not successful as the ground is full of luxuriant bushy growth. Closures were also not effective. The position of regeneration as per regeneration survey of P.B.I areas is summarized in Table 1.5.25. The crops allotted to various P.Bs do not conform to text book pattern so far as age classes are concerned. Neither thinning in P.B.III and IV nor subsidiary silvicultural operations were carried out. The system failed to bring any fruitful results.

Table 1.7.23 Yield prescribed and removed.

Year	Yield (M ³)		
	Prescribed	Removed	Deviation
1976-77	1,700	959.78	-740.22
1977-78	1,700	2,933.07	+492.85
1978-79	1,700	3,144.25	+1,937.10
1979-80	1,700	930.63	+1,167.73
1980-81	1,700	339.41	-192.86
1981-82	1,700	6,308.88	+4,416.02
1982-83	1,700	528.01	+3,244.03
1983-84	1,700	8,577.66	+10,121.69
1984-85	1,700	1,669.51	+10,091.20
1985-86	1,700	1,595.39	+9,986.59
1986-87	1,700	6,119.04	+14,405.63
1987-88	1,700	13,993.12	+26,698.75
1988-89	1,700	1,757.95	+26,756.70
1989-90	1,700	1,131.44	+26,188.14
1990-91	1,700	351.70	+24,839.84

Table 1.7.24 List of P.B.I areas left unfelled.

Year of felling prescribed	Range	FORESTS
1997-78	Habban	(P) R. 13 Dol C3b
		----do----- C3c
		(P) M. 17 Jadol Taproli whole
		(P) M. 18 Pajerli Whole
1980-81	Habban	(P)R. 7 Khabbar C1
1982-83	Habban	(P)P. 1 Deothi Majhgaon C1a
1984-85	Habban	(P) R. 15 Dalmun Suder C1c
	Rajgarh	(P) P. 3 Braila C1a
1985-86	Habban	(P) R. 7 Khabar C5
		(P)R. 16 Dalmun Deo Ki Kalar C4
		(P)M. 29 Bagna C4
1987-88	Habban	(P) R. 7 Khabar C4

Year of felling prescribed	Range	FORESTS
1988-89	Habban	(P) R. 23 Oria C2e
1989-90	Habban	(P) R. 17 Dalmun C2b
		(P) M. 9 Pab whole

Table 1.7.25 Summary of regeneration survey of P.B.I areas

Sr. No.	Particulars	Area (ha.)	%
1	Area of P.B.I	850.72	---
	Are felled during the plan period	324.47	100
2	Area fully regenerated (> 75%)	17.05	5.25
4	Area moderately regenerated (50 to 75 %)	21.48	6.62
5	Area poorly regenerated (25-50%)	179.79	55.41
6	Area not regenerated	71.60	22.07
7	Culturable blanks	33.45	10.31
8	Unculturable blanks	1.10	0.34

1.7.57 The Fir Spruce Working Circle : It included all the fir and spruce forests, pure or mixed and those of oak forests and alpine pasture which could not be isolated by forming separate compartments. It covered an area of 5670.47 ha of reserved forests. Fir predominated in the higher reaches, depressions and on cool aspects while spruce in the lower limits, on spurs and in warm localities. Both the species had almost equal proportions. Middle aged trees predominated while mature and younger classes were deficient stocking was moderate. Oaks and brass were the chief associates. Former was subject to severe lopping near the habitations and Gujjar paraos. Regeneration of spruce and fir was deficient.

1.7.58 Objects of Management : It aimed at converting the irregular crops into normal, evened forests and obtaining maximum possible sustained yield.

1.7.59 Analysis and Valuation of the crop : Stock maps on 1:15000 and 1:25000 scale were prepared for all the forests. Total enumerations in P.B.I and partial (20.83%) elsewhere were carried out down to 10 cm dbh. Density of the crop varied from 0.4 to 0.6. No regeneration survey was carried out. Fir and Spruce were the main species for planting and where these species were not likely to succeed, **Walnut, Poplar, Birch, maple, bird Cherry and hornbeams** were recommended.

1.7.60 Silvicultural System : The forests were managed **under Irregular Shelterwood System** with artificial regeneration. A rotation and conversion period of 120 years with a regeneration period of 30 years was adopted. Though the crops were predominantly middle aged, the forests were grouped into 4 periodic blocks as under:

P.B.I (1430.61 ha) : It contained predominantly open, middle aged to mature crops whose harvesting and regeneration was indicated. Actual area under fir/Spruce was 941.98 ha.

P.B.II (1313.77 ha) : Area with irregular age crops were allotted to this P.B. Actual area under fir/Spruce was 949.93 ha.

P.B.III (2303.69 ha) : Area allotted to this periodic block contained young to middle aged crops. Actual area under fir/Spruce was 1488.36 ha.

P.B.IV (622.40 ha) : It contained mainly young crops of fir and spruce and covered 480.60 ha under fir and spruce.

Sequence of fellings for P.B.I areas were laid down. Subsidiary silvicultural operations after main felling in P.B.I are were prescribed. Artificial, regeneration was stressed. Two weedings each year in plantations were provided till the plants attained a height of 1.5 m. Nothing was to be done in other periodic blocks except the salvage removals. P.B.I are was to be closed immediately after felling and regeneration survey was to be carried out every year in felled areas.

1.7.61 Yield Regulation : The yield was restricted to PB.I areas only. The growing stock down to 10 cm dbh was considered for the yield calculation excluding seed bearers and 10 % volume of trees to be retained on broken precipices and 50% of volume of younger trees upto 30 cm dbh retained as a part of the future crop. The annual yield prescribed was 2800 M³ with a deviation of +10% for a year and a slab of 5 years. Removal was linked with the progress of regeneration and was to be curtailed if regeneration did not keep pace with the fellings. Reappraisal was to be made after every 5 years by conducting regeneration survey once in 5 years. Fellings were to be reduced in proportion to the area not regenerated.

1.7.62 Results : The yield prescribed and removed during the plan period is given in Table 1.7.26. Removals were in excess of prescription in the beginning of the plan, but in deficit of 11718.24 M³ at the end due to moratorium on green fellings. The forests not felled are listed in Table 1.7.27.

Regeneration is lagging all over. No efforts were made to raise plantations. No regeneration survey was ever carried out and the areas were also not closed effectively as prescribed.

Table 1.7.26 Yield prescribed and removed.

Year	Yield (M ³)		
	Prescribed	Removed	Deviation
1976-77	2,800	9,910.71	+7,110.71
1977-78	2,800	8.50	+4,319.21
1978-79	2,800	75.98	+1,595.19
1979-80	2,800	4,689.79	+3,484.98
1980-81	2,800	125.12	+810.10
1981-82	2,800	586.73	-1,403.17
1982-83	2,800	157.70	-4,045.57
1983-84	2,800	395.14	-6,450.33
1984-85	2,800	130.62	-9,119.71
1985-86	2,800	3,688.88	-8,230.83
1986-87	2,800	6,907.49	-4,223.34
1987-88	2,800	3,114.40	-3,808.94
1988-89	2,800	109.05	-6,499.89
1989-90	2,800	119.99	-9,179.90
1990-91	2,800	261.66	-11,718.24

Table 1.7.27 List of P.B.I areas left unfelled.

Year of felling prescribed	Range	FORESTS
1976-77	Habban	(P) R. 8 Ber Jamoli C1a
1977-78	Habban	-----do----- C1b
1981-82	Rajgarh	(P) R. 30 Chhog Tali C1b
1984-85	Habban	(P) R. 9 pajoga C4e
1989-90	Habban	(P) R. 9 Pajoga C3c
1990-91	Habban	(P) R. 7 Khabbar

1.7.63 The Rehabilitation Working Circle : It included all chil, deodar, kail, spruce and fir forests with deficient regeneration and density below 0.3. It covered an area of 2859.33 ha. Species wise stocking is given in Table 1.7.28. The chil area predominated. Density of the crops varied between < 0.1 to .3. Regeneration was absent or deficient.

Table 1.7.28 Species and area distribution

Sr. No.	Species	Area (ha)
1	Chil	1077.11
2	Deodar	136.12
3	Kail	227.97
4	Mixed deodar and kail	33.36
5	Fir/Spruce	80.63
6	Ban	132.46
7	Kharsu	44.06
8	Broadleaved	202.12
9	Blank and included cultivations	925.50
	Total :	2859.33

1.7.64 Objects of Management : It aimed to restock the degraded confer forests with suitable confirer species and to meet the requirement of timber for packing cases and bonafide domestic and agricultural requirements.

1.7.65 Analysis and Valuation of the crop : Stock maps on 1:15000 and 1:25000 scale were prepared and quality class was assessed. It was II/III for chil and II for deodar/Kail with average density 0.2. Partial enumerations (62.3% for chil and 36.82% for deodar and kail) down to 10 cm dbh in 10 cm dbh classes were carried out.

1.7.66 Silvicultural System : Irregular Shelterwood System was adopted to manage the forests. Regeneration period was 30 years with rotation of 120 years Establishment of Regeneration was considered successful when the plants attained the height of 4 to 5 m. Chil, Deodar, Kail, fir and spruce were the main species prescribed for planting. Seeding and final fellings were prescribed. Marking rules and sequence of fellings were laid down. Artificial regeneration was stressed upon and planting programme for 2750.97 ha was laid down.

1.7.67 Yield Regulation : The yield was based on the growing stock down to 10 cm dbh excluding the volume of mother trees and 50% volume of regeneration upto 20 cm dbh retained. The annual yield for all the species prescribed was 300 M³ which was not on sustained basis.

1.7.68 The other operations prescribed were slash disposal, preparation of treatment maps, raising of nurseries and plantation, weeding, cleaning, maintenance of fire lines beating up of failures and closures of areas.

1.7.69 Results : The removal was more than the prescribed yield. A deviation of + 8727.50M³ as indicated in Table 1.5.29 is too high. The chil areas have fairly regenerated and in some cases the forests have really been rehabilitated. The forests not effectively closed and planted remained still degraded. The condition of deodar and kail forests is not good. No treatment maps were prepared.

Table 1.7.29 Yield prescribed and removed.

Year	Yield (M ³)		
	Prescribed	Removed	Deviation
1976-77	300	190.74	-109.26
1977-78	300	5,194.91	+4,785.65
1978-79	300	618.23	+5,103.88
1979-80	300	726.26	+5,530.14
1980-81	300	189.39	+5,419.53
1981-82	300	3,607.97	+8,727.50

1.7.70 The Coppice Working Circle : It included oak forests with area of 14388.51 ha. The majority of forests comprised ban and Kharsu mixed with mohru on transitional lines. Alpine pastures were also included in this circle.

1.7.71 Objects of Management : It aimed at meeting the demands of fuel, fodder, grazing and wood for agricultural implements for local people and improving the stocking of the forests. The forests were grouped as exploitable (3616.82 ha) and unexploitable (8118.58 ha) oaks

1.7.72 Analysis and Valuation of the crop : Stock maps were prepared on 1:15000 and 1:25000 scale. Randomized partial enumeration (1.59%) was carried out. Species wise growing stock for different oaks and exploitable and unexploitable forests were calculated separately. Regeneration of the oaks were deficient all over.

1.7.73 Silvicultural System : The forests were managed under “**Coppice with Standard System**”. Standards were retained to serve as mother trees besides charcoal production. A rotation of 45 years was fixed for coppice crop and 90 years for standards. Marking rules and sequence of fellings were laid down.

1.7.74 Yield Regulation : The yield was regulated by area and annual coupe of 80 ha was prescribed. Annual yield of 2800 M³ was estimated on the assumption that 55% volumes from exploitable areas were available for removal after deducting the volumes of standards. Which was not on sustained basis?

1.7.75 Subsidiary Silvicultural Operations : It included the patch planting in blanks, closures, weeding, cleaning and thinning of coppice shoots and fire protection.

1.7.76 Results : The forests were not felled as per prescription as is evident from the deviation of 37990.76 M³ as shown in Table 1.7.30. This was due to moratorium on green fellings. No subsidiary silvicultural operations were carried out. Lopping was severe especially near habitations.

Table 1.7.30 Yield prescribed and removed.

Year	Yield (M ³)		
	Prescribed	Removed	Deviation
1976-77	2,800	1,330.43	1,469.57
1977-78	2,800	644.30	3,625.27
1978-79	2,800	239.94	6,185.33
1979-80	2,800	59.50	8,925.83
1980-81	2,800	202.18	11,523.65
1981-82	2,800	466.93	13,856.72
1982-83	2,800	11.66	16,645.06
1983-84	2,800	46.95	19,398.11
1984-85	2,800	---	22,198.11
1985-86	2,800	133.34	24,864.67
1986-87	2,800	0.37	27,664.40
1987-88	2,800	859.84	29,604.56
1988-89	2,800	---	32,404.56
1989-90	2,800	8.56	35,196.00
1990-91	2,800	5.24	37,990.76

1.7.77 The Afforestation Working Circle : It included an area of 15006.96 ha covering dry mixed deciduous forests, blank areas and old plantations. Forests were of low stocking and poor quality. Khair was found mixed with broadleaved species in lower zones. Bamboo forest was limited in UF Bara Chakli only. There were culturable and uncultivable blanks with patches of chil, deodar, kail and oaks too. Regeneration was absent in all the forests.

1.7.78 Objects of Management: It aimed to restock the blanks, to replace the useless species with valuable one and to meet the demands of fodder, fuel, grazing and wood for agricultural implements for local inhabitants.

1.7.79 Analysis and Valuation of the crop : Stock maps were prepared and all the forests were described. Randomized partial enumerations covering 3.26% of the areas under scrubs were carried out. The estimated growing stock was 107343 M³, out of which 52678 M³ and 54665 M³ were from exploitable and unexploitable areas respectively.

1.7.80 Silvicultural System : The forests were managed under “**The clear fellings System with “Reserve”** having a diameter upto 15 cm and preferably of seedling origin of valuable species like **Khair, sain, shisham, tun, simal, bamboos etc.** Choice of planting species depended on natural vegetation and altitudinal variations. Rotation of 45 years for coppice and 90 years for reserve was fixed. Areas brought under conifers were to be managed alongwith regular forests in future. Three years felling cycle was fixed for bamboos. Marking rules, felling and planting programmes were laid down.

1.7.81 Yield Regulation : The yield was regulated by area and annual coupe of 65 ha was fixed with estimated annual yield of 850M³. Complete compartment and sub-compartments were prescribed for felling for convenience sake ignoring the marginal annual deviation. However, the control of yield was exercised through a five year check so that excess fellings did not take place.

1.7.82 Other operations prescribed were the preparation of treatment maps , slash disposal, closures, raising of nurseries, sowing and planting, pruning, cleaning, thinning, weeding, grass cutting, beating up of failures, clearing of fire lines and carrying out of regeneration survey every year.

1.7.73 Results : The yields prescribed and removed is provided in Tagble 1.7.31 and the list of plantation raised in Appendix XIV. A negative deviation of 9648.37M³ in yield shows that the forests were not worked and the prescriptions were not followed. Bamboo forests were also not worked. Moratorium on green fellings is said to be the reason. Planting programmes have not been followed. Whatever piecemeal efforts were made, are failure in most of the cases. Neither fire lines were cleared nor regeneration surveys were carried out. Weedings in plantations were not carried out at all. Closures have also not been notified.

1.7.84 Grazing Working Circle : This working circle covered the entire division. Important fodder species consisting of grasses, herbs shrubs and trees listed. The object of management was to meet the legitimate requirements of the right holders and concession aires and to improve the productivity of the area to ensure continuous supply of forest produce. Out of 51907.26 ha of total forest area, 37906.14 ha was available for grazing. Besides this, 52013 ha of Shamlat lands were also available for grazing. Areas near habitation along the roads, paraos, paths and migratory routes were heavily grazed while areas at higher altitudes and in the interior of valleys were comparatively less burdened. Productivity near the villages had deteriorated. The grazing of buffaloes, goats, sheep and other animals maintained for domestic purposes was allowed on payment of grazing fees and the cattle kept for agricultural purpose free of cost.

Table 1.7.31 Yield prescribed and removed.

Year	Prescribed		Removed		Deviation	
	Area (ha)	M ³	Area (ha)	M ³	Area (ha)	M ³
1976-77	65	850	90.00	702.02	+25.00	-147.98
1977-78	65	850	617.63	1,151.69	+577.63	+153.71
1978-79	65	850	76.70	236.76	+589.83	-459.53
1979-80	65	850	426.75	864.58	+951.08	-444.95
1980-81	65	850	6.58	96.18	+892.66	-1,198.77
1981-82	65	850	--	34.56	+827.66	-2,014.21
1982-83	65	850	--	--	+762.66	-2,864.21

1983-84	65	850	--	--	+697.66	-3,714.21
1984-85	65	850	--	--	+632.66	-4,564.21
1985-86	65	850	--	--	+567.66	-5,414.21
1986-87	65	850	--	--	+502.66	-6,264.21
1987-88	65	850	--	15.84	+437.66	-7,098.37
1988-89	65	850	--	--	+372.66	-7,948.37
1989-90	65	850	--	--	+307.66	-8,798.37
1990-91	65	850	--	--	+242.66	-9,648.37

1.7.85 Objects of Management: It aimed to restock the blanks, to replace the useless species with valuable one and to meet the demands of fodder, fuel, grazing and wood for agricultural implements for local inhabitants.

1.7.79 Grazing Intensity and Improvement Works : The cattle population converted to cow units were 187381. Conversion factors and grazing potential was described. The grazing incidence was 0.48 ha per cow unit against 2 ha recommended by Grazing Advisory Committee. Recommendation was made to reduce drastically the cattle numbers. Paraos were listed with the recommendations not to allow any more cattle than already allowed and these were to be demarcated. Physical conditions and productivity of paraos were to be studied and carrying capacity fixed. Checking of migratory grazing and realization of fees was prescribed. Rotational grazing and effective closures were recommended to increase the production. Grazing fees of 20 paise per sheep and 40 paise per goat was to be charged from the migratory graziers once in a year at the first check post.

1.7.86 Results : The grazing by local and migratory cattle, sheep and goats increased considerably as no check was exercised. Even the closed plantations became the play grounds for local cattle and the regeneration areas failed miserably. The grazing potential did not improve and grass productions could not be increased due to ineffective closures. A sum of Rs. 29526.30 was realized from 1976-77 to 1990-91 as grazing fees. No efforts were made to enforce rotational fazing and to improve the grazing lands in general.

1.7.87 Special works of improvement undertaken : 103.5 Km of bridle paths and 62.705 km jeepable roads were constructed during the plan period. 150 numbers of sign boards indicating the compartment and sub-compartments, plantations, divisional boundaries, checkposts etc. have been provided with a total cost of Rs. 1,14,635.87 during the plan period. In order to check illegal smuggling of timber and other forest produce and to transmit urgent and immediate messages and information's, telephone connections at Yashwantnagar Checkpost and Sarahan Range office were provided in the year 1991 and 1992 respectively.

1.7.88 Maintenance of Boundaries and construction of Boundary Pillars: The details of the boundary pillars repaired wholly or partially alongwith the cost incurred is given in Table 1.7.32.

Table 1.7.32 : Maintenance of boundary pillars

Year	Boundary pillars fully repaired		Boundary pillars partially repaired	
	Numbers	Cost (Rs.)	Numbers	Cost (Rs.)
1976-77	80	942.50	147	268.50

1977-78	2444	27,340.50	68	392.50
1978-79	393	3,935.00	363	2,713.60
1979-80	129	1,526.00	728	4,150.00
1980-81	142	1,475.00	232	1,996.90
1981-82	104	1,025.00	247	1,044.50
1982-83	332	4,528.00	669	6,980.00
1983-84	107	6,725.00	413	2,903.00
1984-85	118	3,192.00	732	14,995.35
1985-86	---	---	---	---
1986-87	8	225.00	16	255.00
1987-88	95	7,505.00	1237	31,761.90
1988-89	18	932.90	432	9,978.40
1989-90	5	893.00	82	2,705.00
1990-91	69	5,495.00	67	2,308.60

1.7.89 Past Revenue and expenditure : The summary of the Revenue and Expenditure (Non Plan + Plan : 2406; Soil : 2402 and Capital Outlay : 4406) for the last 15 years is presented in Table 1.7.33.

Table 1.7.33 Past revenue and expenditure.

Year	Revenue (Rs.)	Expenditure (Rs.)	Surplus (Rs.)	Deficient (Rs.)
1976-77	82,95,595.11	33,44,438.26	49,51,156.85	---
1977-78	28,50,408.61	24,35,742.32	4,14,666.29	---
1978-79	47,06,248.61	29,15,102.99	17,91,145.62	---
1979-80	27,08,544.35	24,68,506.22	2,40,038.13	---
1980-81	26,06,363.82	30,90,999.58	---	4,84,635.76
1981-82	62,39,855.20	30,21,224.11	32,18,631.09	---
1982-83	37,50,132.70	38,46,784.42	---	86,651.72
1983-84	8,22,582.92	41,12,719.71	---	32,90,136.79
1984-85	22,76,215.16	41,56,707.24	---	18,80,492.08
1985-86	13,64,167.70	61,67,575.73	---	48,03,408.03
1986-87	1,80,440.45	79,09,187.18	---	77,28,746.73
1987-88	1,38,395.65	91,30,731.46	---	89,92,335.81
1988-89	1,46,838.50	1,06,60,928.28	---	1,05,14,089.78
1989-90	1,82,838.50	99,18,133.40	---	97,35,294.90
1990-91	2,15,538.00	1,02,81,574.75	---	1,00,66,036.75

1.7.90 Dr. M.B. Shrivastava's Plan (1991-92 to 2005-06): It was for a period of 15 years and seven working circles were constituted as discussed below:

1.7.91 : The Chil Working Circle : It covered gross area of 6,143.11 ha with 5609.57 ha area stocked under Chil Working circle including reserved, protected, unclassed, mushterqua and Shamlat/Ceilingland forests and included moderately stocked chil forests of mostly pure crop with scattered patches of broadleaved species.

1.7.92 Objects of Management : Main objects to convert the present crops into more or less even aged, fully stocked, normal forests, P.B.I areas by natural regeneration supplemented with planting, to meet bonafide demand of timber,

firewood, grass/grazing etc. of the local people. Protect forests from fire and to obtain maximum yield of resin.

1.7.93 Analysis and Valuation of the Crop : Total enumeration down to 10 cm dbh in 10 cm diameter classes were carried out. The average site quality was II/III and density varied from 0.3 to 0.6. The average growing stock is 75.44 M³ per ha which is 61.06% of the normal growing stock (123.56 M³/ha).

1.7.94 Silvicultural System: The forests allotted to this working circle were managed under Uniform with Indian Irregular Shelter wood with fixed four periodic Blocks as under: -

P.B.I (2022.26 ha) : The area containing middle aged to nature crop of chil fit for harvesting and regeneration and P.B.I are felled in the past but not regenerated, were included in this P.B.

P.B.II (1162.99 ha) : Area with middle aged or older crops were allotted to this periodic block.

P.B.III (1383.85) : The irregular crop of predominantly young to middle age group were allotted to this periodic block.

P.B.IV (972.82 ha) : The area containing predominantly young crop were allotted to PB.IV.

Rotation was fixed at 120 years with a regeneration period of 30 years. No fellings in P.B.II and III were prescribed except the removal of dry and fallen trees under salvage marking due to natural calamities. Chil trees of 30 cm d.b.h and over were taken for resin taping work.

1.7.95 Calculation of yield: The yields from Chil Working circle were consisting from P.B.I and P.B.IV areas. The dry, fallen, uprooted, dead and damaged trees from P.B.II and P.B.III area had been utilized from meeting the right holders demand and removed under salvage markings.

1.7.96 : Subsidiary silvicultural operations like slash disposal, removal of unfit and inferior trees , effective closure, artificial regeneration, choice of species, new nursery techniques, new methods of plantations, treatment of existing plantations, tending, grass cutting fire protection and control burnings were prescribed. List of fire prone areas were also provided. The numbers of resin blazes were reduced due to continuous resin tapping. Forests closed and excluded from resin tapping were also listed. Regeneration survey was prescribed to be carried out every year in PB. I areas before 31st March and results of such survey were to be utilized for preparing APO for next years.

1.7.97 Results : Due to complete ban on green felling from Govt. forests, the dead dry fallen trees had been removed from the forests under salvage marking. The prescribed yield fixed is not fully achieved and due to this aspect there is deviation in volume as per prescriptions. The yield prescribed and removed from the period 1991-92 to 2013 is given Table 1.7.34(i) and list of P.B.I areas left unfelled is presented in Table 1.7.34 (ii).

Table 1.7.34(i) : Yield prescribed and removed.

Year	Yield (M ³)		
	Prescribed	Removed	Deviation
1991-92	6700	1295.07	(-) 5404.93
1992-93	6700	3529.662	(-) 8575.268
1993-94	5100	7055.9449	(-) 3419.3131
1994-95	5100	8790.5908	(+) 271.27772
1995-96	5100	3666.3679	(-) 1211.3568
1996-97	5100	10365.0704	(+) 4162.7066
1997-98	5100	13665.261	(+) 12727.9676
1998-99	5100	5229.2971	(+) 12857.2598
1999-2000	5100	4671.7973	(+) 12429.0620
2000-01	5100	10966.4720	(+) 18295.5340
2001-02	5100	7242.6722	(+) 20438.2062
2002-03	5100	4025.8835	(+) 19364.0897
2003-04	5100	2867.5333	(+) 17131.6230
2004-05	5100	1618.6660	(+) 13650.2890
2005-06	5100	1658.4199	(+) 10208.7089
2006-07	5100	2186.5871	(+) 7295.296
2007-08	5100	1456.1041	(+) 3651.4001
2008-09	5100	2408.755	(+) 960.1551
2009-10	5100	2130.0495	(-)2009.7954
2010-11	5100	3607.4073	(-)3502.3881
2011-12	5100	1858.4617	(-)6743.9264
2012-13	5100	1559.701	(-)10284.2254

Table 1.7.34 (ii): List of PB.I areas left unfelled.

Year of felling prescribed	Range	FORESTS
1991-92	Habban	(P) R. 11 Katoga C1b
		(P) M21 Sarwa whole
	Rajgarh	(P)R.35 Matnali C1
		(P) P. 13 baunta C3b
		(P) P. 14 Sewli C1a
1992-93	Rajgarh	(P) R. 34 Rajgarh C2
		(P) R. 47 Unchakot C1d
	Sarahan	(P) P. 13 Baunta C4c
		(P) M. 124 Bharanji whole
1993-94	Rajgarh	(P)R. 28 Bohal C1d
1994-95	Sarahan	(P) P. 20 Motipur C2
1995-96	Rajgarh	(P) R. 31 Sanyo Didag C1a
		-----do----- C1b
		-----do----- C1d
	Sarahan	(P) M. 156 Panwa C2
1996-97	Habban	(P) R.F. 13 Dol C1d
	Rajgarh	(P) R.31 Sanyo Didag C1c
1997-98	Habban	(P) M. 33 Kharmanji whole

Year of felling prescribed	Range	FORESTS
	Sarahan	(P) R. 40 Palashon c3b
		(P)R. 49 Pathroti C2
1998-99	Habban	(P)M. 46 Dhaya Pitli whole
	Sarahan	(P)P. 13 Baunta C3c
1999-2000	Rajgarh	(P) P. 3 Braila C3b
		(P)M. 57 Dahan whole
2000-01	Rajgarh	(P)M. 75 Neri Ratoli C2
	Sarahan	(P)R. 45 Ghinni C6
2001-02	Rajgarh	(P) R. 35 Matnali C2a
		(P)P. 20 Motipur C1
		(P)M. 104 Sohala whole
		(P)M 145 Argu whole
2002-03	Rajgarh	(P) R. 28 Bohal C2c
		(P) R. 36 Surdhar C2
2003-04	Rajgarh	(P)R. 37 Banona whole
2004-05	Rajgarh	(P) R. 28 Bohal C1c
		---do----- C2a
		(P)M. 64 Kulath C2a
2005-06	Rajgarh	(P) P. 3 Braila C2

Note: No felling in PB-I area's was done w.e.f. 2006-07 to 2012-13 due to ban on green felling by the competent authority.

1.7.98 Miscellaneous: Old Fire lines were maintained to protect forests from fire from the control burning also. Total No. of 12,15,158 number of blazes were tapped from 1991-92 to 2012-13 by the HPSFDC Ltd. The instructions for resin tapping have been followed by HPSFDC Ltd.

1.7.99 The Deodar Kail Working Circle : It covered an area of 4173.74 ha with stocked area of 3169.12 ha under deodar/kail (75.93%) comprising of reserved, protected and mushterqua forests of moderate stocking and consisted of mainly pure crop of deodar or kail or a mixture of both. Deodar had predominantly middle aged trees where as kail had middle to younger age classes. Along the upper limits, spruce was found mixed with deodar and kail and at places dense crops of ban oak, pure or mixed with Mohru oak was also found. Southern aspects had chil and ban patches at places. Natural regeneration of deodar and kail was deficient.

1.7.100 Objects of Management : The main objects were as under :

- To convert the irregular and uneven aged crops into more or less uniform, normal, even aged crops.
- To restock the P.B.I areas as soon as possible by resorting to artificial regeneration.
- To obtain progressive yield in perpetuity after meeting the legitimate demands of the local people.
- To preserve and protect the forests to maintain the mountain ecosystem.

1.7.101 Analysis and Valuation of the crop : Total enumerations done to 10 cm dbh in 10 cm diameter classes for P.B.I areas was carried out. Stock maps were prepared on 1:15000 and 1:25000 scale for all the forests. The density varied from 0.4 to 0.8 with an average of 0.5 to 0.6.

1.7.102 Silvicultural System : The forests were managed under Indian Irregular Shelter wood system with Floating periodic Block Method. The forests were allotted to 2 periodic blocks as **P.B.I (1049.71 ha) and P.B. Unallotted (2119.41).**

1.7.103 Calculation of yield : The yields from this working circle were prescribed from P.B.I area only. No separate yield from P.B unallotted areas had been calculated as the forest were under stocked. The dry, dead, fallen and damaged trees from P.B unallotted forests under salvage marking had been removed.

1.7.104 Rotation period and exploitable diameter : The rotation period of deodar and kail was prescribed for 120 years and exploitable diameter was fixed for 55 cm d.b.h.

1.7.105 Results : The yield prescribed and removed from P.B.I area is given in Table 1.7.35(i) and list of P.B.I areas left unfelled is presented in Table 1.7.35 (ii).

Table 1.7.35 (i) Yield prescribed and removed.

Year	Yield (M ³)		
	Prescribed	Removed	Deviation
1991-92	11300	1192.79	(-) 10107.21
1992-93	11300	1435.274	(-)19971.936
1993-94	8800	4282.1325	(-)19489.8035
1994-95	8800	6091.2017	(-) 20198.6018
1995-96	8800	726.8388	(-)30271.7633
1996-97	8800	1117.9282	(-)37953.8340
1997-98	8800	1448.4582	(-)45305.4487
1998-99	8800	2075.1478	(-)52030.3009
1999-2000	8800	1460.8135	(-)59369.4874
2000-01	8800	1805.2786	(-)66364.2088
2001-02	8800	1335.6433	(-)73828.5655
2002-03	8800	1017.0910	(-)81611.4745
2003-04	8800	1568.6424	(-)88842.8221
2004-05	8800	516.2784	(-)97126.5437
2005-06	8800	563.1652	(-)105363.3785
2006-07	8800	2586.8954	(-)111576.4831
2007-08	8800	209.2703	(-)120167.2128
2008-09	8800	895.1937	(-)128072.0191
2009-10	8800	1461.1172	(-)135410.9019
2010-11	8800	2536.0678	(-)141674.8341
2011-12	8800	319.4281	(-)150155.406
2012-13	8800	730.8161	(-)158224.5899

Table 1.7.35 (i) List of P.B.I areas left unfelled.

Year of felling prescribed	Range	FORESTS
1992-93	Habban	(P)M. 29 Bagna C4

Year of felling prescribed	Range	FORESTS
1994-95	Habban	(P) R. 7 Khabar C4
1995-96	Habban	(P) R. 13 Dol C3b
1997-98	Habban	(P) R. 23 Oria C2e
1999-2000	Habban	(P)R. 7 Khabbar C1
2000-01	Habban	(P) R. 17 Dalmun C2b
		(P) M. 9 Pab whole
2002-03	Habban	(P) M. 17 Jadol Taproli whole
		(P) M. 18 Pajerli Whole
2003-04	Habban	(P) R. 7 Khabar C5
2005-06	Habban	(P)R. 16 Dalmun Deo Ki Kalar C4

Note: No felling in PB-I area's was done w.e.f. 2006-07 to 2012-13 due to ban on green felling by the competent authority.

1.7.106 The Fir Spruce Working Circle : It covered an area of 2551.50 ha of reserved forests pertaining to Habban and Rajgarh Ranges only. Fir predominated in the higher reaches, depressions and on cool aspects while spruce in the lower limits, on spurs and in warm localities. Both the species had almost equal proportions. Regeneration of spruce and fir was deficient.

1.7.107 Objects of Management : It aimed at converting the irregular crops into normal, evened forests and obtaining maximum possible sustained yield.

1.7.108 Analysis and Valuation of the crop : Stock maps on 1:15000 and 1:25000 scale were prepared for all the forests. Total enumerations in P.B.I and partial (20.83%) elsewhere were carried out down to 10 cm dbh. Density of the crop varied from 0.4 to 0.6. No regeneration survey was carried out. Fir and Spruce were the main species for planting and where these species were not likely to succeed, **Walnut, Poplar, Birch, maple, bird Cherry and hornbeams** were recommended.

1.7.109 Silvicultural System : Spruce and fir forests had been managed under "Selection System". This system aims at getting irregular / uneven aged forests which provides good soil cover. This system allows the conservative removal of trees subject to silvicultural availability and on the basis, that the trees of the next lower diameter class would reach the exploitable size and replace the trees removed. Exploitable diameter was fixed at 60 cm d.b.h. for all conifer species.

1.7.110 Yield Regulation : The yield had been regulated by the number of selection trees expressed in percentage. It was calculated by **Smithies Safeguarding Formula**, which defines the yield available during the felling cycle as the number of trees of the next lower diameter class (IIB: 50-60cm d.b.h.) that may be expected to survive and grow up to the exploitable size(≥ 60 cm d.b.h.) during the felling cycle.

1.7.111 Results : The yield prescribed and removed during the plan period is given in Table 1.7.35. Removals were in deficit of prescription of the plan

Table 1.7.35 Yield prescribed and removed.

Year	Yield (M ³)		
	Prescribed	Removed	Deviation
1991-92	1164 Nos.	0	1164 Nos.
1992-93	1164 Nos.	0	2388 Nos.
1993-94	954 Nos.	82 Nos .	2980 Nos.
1994-95	954 Nos.	41 Nos.	(-) 3893 Nos.
1995-96	954 Nos.	260 Nos.	(-) 4587 Nos.
1996-97	954 Nos.	200 Nos.	(-)5281 Nos.
1997-98	954 Nos.	791 Nos.	(-) 5504 Nos.
1998-99	954 Nos.	891 Nos.	(-) 5507 Nos.
1999-2000	954 Nos.	406 Nos.	(-) 6055 Nos.
2000-01	954 Nos.	688 Nos.	(-) 6321 Nos.
2001-02	954 Nos.	521Nos.	(-) 6754 Nos.
2002-03	954 Nos.	319 Nos.	(-) 7389 Nos.
2003-04	954 Nos.	176 Nos.	(-) 8167 Nos.
2004-05	954 Nos.	74 Nos.	(-) 9047 Nos.
2005-06	954 Nos.	626 Nos.	(-) 9375 Nos.
2006-07	954 Nos.	1134 Nos.	(-)9195 Nos.
2007-08	954 Nos.	559 Nos.	(-)9590 Nos.
2008-09	954 Nos.	835 Nos.	(-)9709 Nos.
2009-10	954 Nos.	146 Nos.	(-)10517 Nos.
2010-11	954 Nos.	425 Nos.	(-)11046 Nos.
2011-12	954 Nos.	0 Nos.	(-)12000 Nos.
2012-13	954 Nos.	0 Nos.	(-)12954 Nos.

1.7.112 The Rehabilitation Working Circle: It included all chil, deodar, kail, spruce and fir forests with deficient regeneration and density below 0.3. It covered an area of 4107.70 ha.

1.7.113 Objects of Management : Main objects were to restock the degraded chil, deodar and kail forests, assistance in regeneration and improvement of stocking of forests, grass protection, soil conservation and requirement of local people.

1.7.114 Analysis and Valuation of the crop : Stock maps on 1:15000 were prepared and posted in C.H. files. Most of the forests are very open with density 0.1 to 0.3 and in other forests the density is 0.4 to 0.5. Enumerations were carried out down to 10 cm dbh in 10 cm dbh classes.

1.7.115 Silvicultural system: The entire area of the working circle was treated in the plan period and stocked both by natural and artificial means to improve the stocking. As the crop was already under stocked and open to very open, no regular fellings was done. The dead/dry fallen trees due to natural calamities were removed under salvage marking and to meet with the requirement of local people.

1.7.116 Control of yield: All the removals down to 10 cm d.b.h. were counted towards yield of the working circle. The yield was not regular on sustained basis due to salvage marking.

1.7.117 The other operations prescribed were slash disposal, preparation of treatment maps, raising of nurseries and plantation, weeding, cleaning, maintenance of fire lines beating up of failures and closures of areas.

1.7.118 Results: The removal was not done as per prescribed yield and deviation in + is due to removal of dead and dry fallen trees due to natural calamities under salvage marking. Yield prescribed and removed during the plan period is given in table 1.7.36.

Table 1.7.36 Yield prescribed and removed.

Year	Yield (M ³)		
	Prescribed	Removed	Deviation(m ³)
1991-92	620 M3	83.89 M3	(-)536.11
1992-93	620 M3	0	(-)1156.11
1993-94	620 M3	801.6255	(-)974.4845
1994-95	620 M3	1939.0238	(+)344.5393
1995-96	620 M3	430.4126	(-) 304.5939
1996-97	620 M3	1662.2447	(+)746.6508
1997-98	620 M3	2612.8502	(+)2797.6156
1998-99	620 M3	1406.7145	(+)3584.3301
1999-2000	620 M3	1079.4479	(+)4043.7798
2000-01	620 M3	2466.6636	(+)5890.4434
2001-02	620 M3	1525.8987	(+)6796.3421
2002-03	620 M3	555.0174	(+)6731.3595
2003-04	620 M3	726.9016	(+)6838.2611
2004-05	620 M3	340.4362	(+)6558.6973
2005-06	620 M3	325.5950	(+)6264.2923
2006-07	620 M3	1109.7741	(+)6754.0664
2007-08	620 M3	409.4966	(+)6543.563
2008-09	620 M3	641.6905	(+)6565.2535
2009-10	620 M3	961.3891	(+)6906.6426
2010-11	620 M3	1849.3843	(+)8136.0269
2011-12	620 M3	682.7021	(+)8198.729
2012-13	620 M3	204.2118	(+)7782.9408

1.7.119The Protection working circle : The majority of forests allotted this working circle were covered with moderately to well Stocked oak crop (Density 0.5 to 0.7) of all age group with middle aged to mature trees predominate. It included the area of 2540.94 ha. Out of the total areas of 2540.94 ha, the areas occupied by oaks is 1,805.77 ha i.e. % and by other species is 406.57 ha i.e. 16%.

1.7.120 Objects of Management: Consistent with the general object of management, these were:

- To protect the hill sides against erosion and conserve the area to build up soil water regime.
- To preserve, protect, improve and maintain the oak forests cover to ensure the regular flow of water in the streams and rivers.
- To conserve the environment and stabilize the Himalayan Ecosystems.
- To preserve and improve the existing degraded forests and restock the blanks by raising the plantation of economic species.

- e) To meet the demand of fuel, fodder and grass to local inhabitants and to regulate the lopping of oaks.
- f) To undertake active soil conservation measures in eroded areas

1.7.121 Analysis and Valuation of the crop : Stock maps were prepared on 1:15000 scale and pasted in the concerned C.H. Files. The oak forests were having average density 0.5 to 0.7 and other forests were open to open having average density 1.0 to 0.2. Trees down to 10 cm d.b.h in 10 cm diameter classes were enumerated.

1.7.122 Silvicultural System: No silvicultural system was prescribed. Only removal of dead dying deceased trees were prescribed. No commercial exploitation was contemplated and as such no silvicultural system was prescribed. No rotation and yield were prescribed.

1.7.123 Calculation of yield: It was of no relevance in protection working circle.

1.7.124 Subsidiary Silvicultural Operations : It included the patch planting in blanks, closures, weeding, cleaning and thinning of coppice shoots and fire protection.

1.7.125 Results : Only dry dead diseased trees had been removed under salvage marking and no prescriptions had been prescribed. The yield removal from 1991-92 to 2010-11 is given in table 1.7.37.

Table 1.7.37 Yield prescribed and removed.

Year	Yield (M ³)		
	Prescribed	Removed	Deviation
1991-92	50.50 M3	41.467 M3	(-)9.04 M3
1992-93	50.50 M3	15.471M3	(-)44.069M3
1993-94	0	196.7050M3	(+)253.6430
1994-95	0	186.1762 M3	(+)439.8192
1995-96	0	79.2920 M3	(+)519.1112
1996-97	0	458.0065 M3	(+)977.1177
1997-98	Not prescribed	200.5031 M3	(+)1177.6208
1998-99	--do--	149.9665 M3	(+)1327.5873
1999-2000	--do--	239.5527 M3	(+)1567.1400
2000-01	--do--	561.1372 M3	(+)2128.2772
2001-02	--do--	98.4271 M3	(+)2226.7043
2002-03	--do--	109.2804 M3	(+)2335.9847
2003-04	0	88.506 M3	(+)2424.4907
2004-05	0	390.8417 M3	(+)2815.3324
2005-06	0	231.0552 M3	(+)3046.3876
2006-07	0	531.3668	(+)3577.7544
2007-08	0	17.0708	(+)3594.8252
2008-09	0	122.6123	(+)3717.4375
2009-10	0	464.1302	(+)4181.5677
2010-11	0	590.1066	(+)4771.6743
2011-12	0	146.8366	(+)4918.5109
2012-13	0	24.493	(+)4943.0039

1.7.126 The Plantation Working Circle: It includes an area of 6469.73ha having stocked area of 3428.45 ha out of which 2896.24 ha is under broad leaved species. This working circle includes all the reserved, protected unclassed, mushterqua and Shamlat/ceilingland forests bearing dry mixed deciduous forests, scrub vegetation, spare trees growth etc.

1.7.127 Objects of management: Objects of management were to restock the blanks and open degraded forests with economic species, to replace gradually the inferior scrub forests with more valuable commercial trees species, To raise compact plantations under social forestry to meet the local demands of fuel, fodder, grass, grazing and wood for agricultural implements, To protect and nurse the existing plantation and natural young growth under a systematic regime of cleanings and thinning, To reclothe the barren areas to preserve the soils in situ and conserve the moisture in the catchment.

1.7.128 Analysis and Valuation of the crop : Stock Maps: All the compartments and sub- compartments have been stock mapped on 1:15,000 scale maps which is posted in concerned C.H. Files. Prominent successful plantations raised in the past have also been shown.

1.7.129 Silvicultural System : The silvicultural system for exploitable scrub forests was Selection- cum –improvement felling with Artificial Regeneration. No fellings of chil, kail, deodar, oaks and other broadleaved species were carried out in chil, deodar and kail forests. Only the areas were cleared of bushed and unwanted growth to pave the way for artificial regeneration. For Bamboo forests it was selection system with thinning. Each clump was treated as an independent unit of working.

1.7.130 Control of yield: The yield of Bamboo was controlled by the net increment. The gross increment in a bamboo forest was the total number of new shoots (Manus) produced in a year. The net increment was the gross increment minus the loss through decay, malformation and all other agencies of destruction. The number of exploitable culms removed from a clump season i.e. approximately 4 times the number of “Manus” because the felling takes place on 4 years felling cycle and the increment of 4 successive growth seasons are removed cumulatively.

1.7.131 Other operations prescribed were the preparation of treatment maps , slash disposal, closures, raising of nurseries, sowing and planting, pruning, cleaning, thinning, weeding, grass cutting, beating up of failures, clearing of fire lines and carrying out of regeneration survey every year.

1.7.132 Results : The prescription of the yield was not followed due to complete ban on green felling and flowering bamboos had only been removed from the forests of Sarahan Range. The yields prescribed and removed is provided in Table 1.7.38 and the list of plantation raised in Appendix XIV.

Table 1.7.38 Yield prescribed and removed.

Year	Yield (M ³)		
	Prescribed	Removed	Deviation
1991-92	1350 mt.	--	(-) 1350 mt.
1992-93	1350 mt.	--	(-) 2700 M ³

1993-94	--	--	(-) 24.75 ha.
1994-95	---	--	(-) 24.75 ha.
1995-96	---	--	(-) 24.75 ha.
1996-97	---	24.75 ha.	---
1997-98	4300 M3	233.4212 M3	(-) 28340.0850 M ³
1998-99	4300 M3	216.9121 M3	(-)32423.1729 M ³
1999-2000	4300 M3	655.735 M3	(-)36067.4379 M ³
2000-01	4300 M3	1038.2720 M3	(-) 39329.1659 M ³
2001-02	4300 M3	849.2830 M3	(-)42779.8829 M ³
2002-03	4300 M3	399.1776 M3	(-)46680.7053 M ³
2003-04	4300 M3	228.1480 M3	(-) 50752.5573 M ³
2004-05	4300 M3	297.1610 M3	(-)54755.3963 M ³
2005-06	4300 M3	75.9317 M3	(-)58979.4646 M ³
2006-07	4300 M3	0	(-)63279.4646 M ³
2007-08	4300 M3	180.1006	(-)67399.364 M ³
2008-09	4300 M3	124.4012	(-)71574.9628 M ³
2009-10	4300 M3	581.7533	(-)75293.2095 M ³
2010-11	4300 M3	372.9091	(-)79220.3004 M ³
2011-12	4300 M3	682.7021	(-)82837.5983 M ³
2012-13	4300 M3	198.6613	(-)86938.937 M ³

1.7.133 The Grazing overlapping working Circle : The working circle overlaps all other working circles and covers an area of 25986.72 ha. Out of 25986.72 ha of total forest area, 13628.89 was closed to grazing in various working circle. The remaining 12357.83 ha was opened and available for grazing.

1.7.134 Objects of Management: It was to meet the legitimate grazing and fodder requirements of right holders/local people as laid down in Faisla-e-Janglat and to improve the productivity of areas so as to ensure the continuous supply of forest produce to the people.

1.7.135 Silvicultural system : Forest area was managed in accordance with the prescription of the concerned working circle to which allotted. This working circle was concerned with the management of grazing, grass cutting and lopping etc.

1.7.136 Grazing Intensity and Improvement Works : The cattle population converted to cow units were 92139. Conversion factors and grazing potential was described. The grazing incidence was 0.393 ha per cow unit against 2 ha recommended by Grazing Advisory Committee. Recommendation was made to reduce drastically the cattle numbers. Paraos were listed with the recommendations not to allow any more cattle than already allowed and these were to be demarcated. Physical conditions and productivity of paraos were to be studied and carrying capacity fixed. Checking of migratory grazing and realization of fees was prescribed. Rotational grazing and effective closures were recommended to increase the production. Grazing fees of 20 paise per sheep and 40 paise per goat was to be charged from the migratory graziers once in a year at the first check post.

1.7.137 Results : The grazing by local and migratory cattle, sheep and goats increased from day to day. The grazing potential did not improve and grass productions could not be increased due to ineffective closures.

1.7.138 Special works of improvement undertaken :

Buildings : Details of building constructed during 1991 to 2010 alongwith the cost incurred is given in Appendix VII.

1.7.139 Roads, Bridle and Inspection Paths : The roads, bridle paths constructed and repaired are listed in Appendix VIII alongwith their length and expenditure.

1.7.140 Survey and Demarcation: No forests were surveyed and demarcated during the plan period.

1.7.141 Maintenance of Boundaries and construction of Boundary Pillars: The details of the boundary pillars repaired wholly or partially alongwith the cost incurred are given in Table 1.7.32.

Table 1.7.32 : Maintenance of boundary pillars

Year	Numbers	Cost (Rs.)	Year	Numbers	Cost (Rs.)
1991-92	428	20800	2001-02	97	10230
1992-93	276	16805	2002-03	76	41000
1993-94	75	14200	2003-04 to 2006-07	--	--
1994-95	90	20600	2007-08	1000	100000
1995-96	259	20000	2008-09	750	75000
1996-97	259	34800	2009-10	3000	268000
1997-98	500	150000	2010-11	--	--
1998-99	70	34000	2011-12	20	100000
1999-2000	732	46500	2012-13	48	75000
2000-01	347	15000			

1.7.142 Telecommunication: In order to check illegal smuggling of timber and other forest produce and to transmit urgent and immediate messages and information's, telephone connections at each range level has been provided. In addition to this the wireless system was also operative prior to 2000 and presently mobile phones are available with field staff for communication.

1.7.143 Fire Lines: The fire lines existing in the division are given in Appendix VI. Neither maintenance of old fires lines nor construction of new fire lines were undertaken during the plan period.

1.7.144 Past Revenue and expenditure: The summary of the Revenue and Expenditure (Non Plan + Plan: 2406; Soil: 2402 and Capital Outlay: 4406) for the last 15 years is presented in Table 1.7.33.

Table 1.7.33 Past revenue and expenditure.

Year	Revenue (Rs.)	Expenditure (Rs.)	Surplus (Rs.)	Deficient (Rs.)
1991-92	2,08,729	86,73,199	---	84,64,470
1992-93	74,095	78,71,627	---	77,97,532
1993-94	66,577	86,17,083	---	85,50,506
1994-95	53,547	85,60,323	---	85,06,776
1995-96	2,94,348	99,47,787	---	96,53,439
1996-97	9,26,198	1,01,52,245	---	92,26,047
1997-98	9,17,301	1,35,44,672	---	1,26,27,371
1998-99	4,17,913	1,87,65,241	---	1,83,47,328

1999-2000	6,83,062	1,97,79,360	---	1,90,96,298
2000-01	9,03,430	1,46,68,817	---	1,37,65,387
2001-02	4,43,726	1,90,32,744	---	1,85,89,018
2002-03	12,19,930	1,56,24,185	---	1,44,04,255
2003-04	16,03,070	1,85,99,980	---	1,69,96,910
2004-05	5,28,623	1,98,66,861	---	1,93,38,238
2005-06	65,60,597	2,47,27,343	---	1,81,66,746
2006-07	6,87,883	3,68,80,196	---	3,61,92,313
2007-08	12,79,945	3,73,42,877	---	3,60,62,932
2008-09	7,57,040	4,13,38,898	---	4,05,81,858
2009-10	38,06,536	4,62,42,769	---	4,24,36,233
2010-11	2,36,35,004	77,13,887	1,59,21,117	
2011-12	16,47,858	5,55,65,200		5,39,17,342
2012-13	13,97,781	6,56,13,363		6,42,15,582

CHAPTER VIII

Statistics of growth and yield

1.8.1 General : The statistical data of the previous plan being not too old is used as recommended in the preliminary working plan report. The data from Chopal Working Plan by Sh. Joginder Singh being recent and exhaustive in nature, is adopted for spruce and fir forests.

1.8.2 References: The followings were consulted.

1.	Seth, S.K., S.N. Dabral and M.L. Lala	The yield and stand tables for chil Indian Forest Record, Vol.II, No. 8
2.	Seth, SK.,	Volume tables for Quercus incana. Forest Bulletin No. 26
3.	Champion and Mahendru :	Provisional Yield Table for Quercus incana. Forest Bulletin No. 83, 1934, FRI
4.	FRI Dehradun :	Growth and Yield Statistics of Common Indian Timber species. Vol. I (Himalayan Region) Vol.II (Plain Region)
5.	FRI Dehradun :	The tree and Crop Measurement Manual. Silvicultural Research Code Volume 3
6.	Bruce, D and F.X. Schumacher, 1950 :	Forest Mensuration Mc GRAW HILL BOOK COMPANY, INC
7.	Loetsch, F. and K.E. Haller, 1973 :	Forest Inventory, Volume I B.L.V. Verlagsgesellschaft mbh. Muenchen.
8.	Spurr, H.G.:	Forest Inventory
9.	Knuchel, H. :	Planning and Control in the Managed Forests

1.8.3 Chil (Pinus roxburghii) : In Total 219 trees were selected randomly and felled from the entire division and measurements recorded. The data was computed by correlation studies provide quadratic relations between volume (V) in M³ and diameter (D) in m expressed in the regression equation as under:

$$V = 0.191902 - 2.70696D + 11.7562278 D^2$$

The growth increments were studied by Pressler borer method. The current annual growth percent have been calculated in coordination with Preinvestment Survey of Forest Resources Organization, Dehradun. The CIA and MAI have also been compiled from FRI Yield Tables based on total stem timber for use and comparison. The results are presented in Table 1.8.1 to 1.8.6.

1.8.4 : Deodar (Cedrus deodara) : To determine the volume of stem timber, 95 deodar trees were felled and studies. Age for various diameter classes and recruitment period were determined by analysing 20 deodar stumps. The C.A.I and M.A.I for deodar and kail have been calculated from F.R.I Yield Table for use and to determine the rotation.

The results are presented in Table 1.8.7 to 1.8.10.

1.8.5 Kail (Pinus Wallichiana) : The kail forests are younger in age. Higher age/diameter classes are deficient. Moreover, it is found growing mixed with deodar and resembles to deodar in growth. As such the volume figures of deodar will be used for kail also.

1.8.6 Spruce and Fir (*Picea smithina* and *Abies pindrow*) : For the computation of age and diameter relationship, 110 spruce and 98 fir stumps were analysed. Mortality percentage (Z value) was worked out by taking a number of sample plots in the different diameter classes predominantly covered by a particular diameter class and by computing the total basal area for the sample plot and then working out the number of trees per ha for the middle age of the class diameter. The percentage decrease in number of trees from IIB and IA was worked by Smythies Safe Guarding formula. The percentage increment was determined by Pressler borer method.

The results are presented in Table 1.8.11 to 1.8.14.

Table 1.8.1 : Diameter class distribution of sample trees.

Diameter class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	>90	Total
Number of trees (n)	80	12	8	9	18	26	17	17	32	219

Table 1.8.2 : Relations between diameter, volume and age.

Diameter class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	>90
Average dbh (O.B.) cm	15	25	35	45	55	65	75	85	95
Volume (M ³)	0.0504	0.2499	0.6846	1.3544	2.2593	3.3994	4.7746	6.3849	8.2303
Age (Years)	27	44	63	82	102	130	---	---	---

Table 1.8.3 : Recruitment period from one d.b.h. class to the next .

Diameter class (cm)	V to IV	IV to III	III to IIA	IIA to IIB	IIB to IA
Recruitment period (Years)	17	19	19	20	28

Table 1.8.4 Age, height and diameter relationship

Age (Years)	Height (m)	d.b.h. (cm)
10	5.8	6.0
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	39.0
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	65.0

Table 1.8.5 : Current annual growth (C.A.I) percent

Diameter class (cm)	Last 10 Years	Previous 10 years
10-20	4.56	4.66
20-30	3.75	4.60
30-40	2.69	3.24
40-50	2.26	2.35
50-60	1.99	2.13
60-70	1.56	1.88
70-80	1.14	1.14
80-90	0.92	0.92
> 90	0.66	0.66

Table 1.8.6 : C.A. I and M.A. I of Chil (F.R.I. Yield Table).

Age /age class in (Years)	Quality II			Quality III			Quality II/III		
	CAI M ³ /ha	CAI %	MAI M ³ /ha	CAI M ³ /ha	CAI %	MAI M ³ /ha	CAI M ³ /ha	CAI %	MAI M ³ /ha
10-20 20	0	0	0	0	0	0	0	0	0
20-30 30	16.583	20	5.528	4.688	20	1.539	10636	20	3.534
30-40 40	13.645	5.83	7.557	13.015	11.64	4.408	13.33	7.71	5.983
40-50 50	12.735	3.48	8.607	7.977	3.68	5.108	10.356	3.556	6.858
50-60 60	10.356	2.15	8.886	8.467	2.836	5.668	9.412	2.413	7.277
60-70 70	9.376	1.62	8.956	7.837	2.063	6.018	8.607	1.793	7.487
70-80 80	9.796	1.45	9.096	6.367	1.412	6.018	8.082	1.435	7.557
80-90 90	9.306	1.21	9.096	7.137	1.377	6.158	8.222	1.275	7.627
90-100 100	8.327	0.97	9.026	7.137	1.211	6.228	7.732	1.068	7.627
100-110 110	6.857	0.73	8.816	5.388	0.826	6.158	6.123	0.772	7.487
110-120 120	4.618	0.47	8.467	3.849	0.551	5.948	4.234	0.501	7.208

Table 1.8.7 : The diameter classes, volume (local volume table) and age .

Diameter class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	>90
Class	V	IV	III	IIA	IIB	IA	IB	IC	ID
Average dbh (O.B.) cm	15	25	35	45	55	65	75	85	95
Volume (M ³)	0.0707	0.1416	0.7079	1.4158	2.5484	3.5395	4.8137	6.0879	7.0879
Age (Years)	30	53	76	100	125	153	183	---	---

Table 1.8.8 : Recruitment period from one d.b.h. class to the next .

Diameter class (cm)	V to IV	IV to III	III to IIA	IIA to IIB	IIB to IA	IA to IB
Recruitment period (Years)	23	23	24	25	28	30

1.8.9 C.A.I and M.A.I of deodar and kail (F.R.I Yeild Table)

Age /age class in (Years)	Deodar Quality II			Kail quality II		
	CAI M ³ /ha	CAI %	MAI M ³ /ha	CAI M ³ /ha	CAI %	MAI M ³ /ha
10-20 20	0.980	20.00	0.49	3.219	20.00	1.609
20-30 30	6.437	15.33	2.449	9.166	11.749	4.128
30-40 40	13.785	9.63	5.318	15.884	7.814	7.067
40-50 50	14.134	5.00	7.067	15.884	4.386	8.816
50-60 60	15.744	3.64	8.537	16.723	3.186	10.146
60-70 70	14.274	2.45	9.306	17.703	2.541	11.196
70-80 80	13.225	1.838	9.796	17.633	2.020	12.035
80-90 90	12.665	1.492	10.146	16.024	1.539	12.455
90-100 100	12.035	1.237	10.356	12.665	1.069	12.455
100-110 110	10.916	1.004	10.356	7.977	0.619	12.035
110-120 120	9.376	0.789	10.286	6.088	0.448	11.545
120-130 130	8.896	0.694	12.216	---	---	---
130-140 140	8.327	.0609	10.076	---	---	---

Table 1.8.10 : Comparison of C.A. I.% for Deodar (D) and Kail (K)

Diameter Classes (cm)	Based on FRI Yield Table					Based on the data of previous Plan			
	Corresponding age classes (Years)		Deodar	Kail	Average	Corresponding age classes	C.A.I % for		
							Deodar	Kail	Average
10-20	D K	30-50 25-40	6.55	7.81	7.18	30	15.33	11.75	13.54
20-30	D K	50-70 40-60	2.96	3.676	3.318	53	6.55	5.62	6.085
30-40	D K	70-110 60-80	1.346	2.25	1.798	76	2.49	2.485	2.488
40-50	D K	110-140 80-120	0.69	0.878	0.784	100	1.36	1.29	1.325
50-60	D K	> 140 > 120	0.609	0.448	0.5285	125	0.89	0.53	0.71
60-70	---		---	---	--do--	153	0.65	---	0.65
70-80	---		---	---	--do--	---	---	---	--do--
80-90	---		---	---	--do--	---	---	---	--do--
90	---		---	---	--do--	---	---	---	--do--

Table 1.8.11 : Relations between diameter, volume and age

Diameter class (cm)		10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	>90
Average dbh (cm)		15	25	35	45	55	65	75	85	95
Volume (M ³)		0.121	0.24	0.942	1.75	3.00	4.4	6.29	7.425	8.77
Age (Years)	Spruce	39	61	81	102	126	153	182	213	245
	Fir	44	70	94	119	146	174	204	236	269

Table 1.8.12 : Recruitment period from one d.b.h. class to the next .

Diameter class (cm)		V to IV	IV to III	III to IIA	IIA to IIB	IIB to IA	IA to IB	IB to IC	IC to ID
Recruitment period (Years)	Spruce	22	20	21	24	27	29	31	32
	Fir	26	24	25	27	28	30	32	33

Table 1.8.13 Annual volume increment percent

Diameter class (cm)	Spruce	Silver fir	Average
20-30	4.72	3.99	4.355
30-40	4.69	3.91	4.3
40-50	2.57	2.16	2.365
50-60	2.09	1.85	1.97
60-70	1.36	1.31	1.335
70-80	1.20	1.16	1.18
80-90	0.53	0.51	0.52
90-100	0.51	0.50	0.505

Table 1.8.14 Mortality percent (value of 'Z')

Species	Percentage mortality
Spruce	26
Silver fir	26
Deodar	22
Kail	30
Chil	23

1.8.7 Broadleaved Species : The volume factors for some commercial timber of dry mixed deciduous forests have been adopted from Arya's Plan of adjoining Nahan Forest Division and given in Table 1.8.15.

Table 1.8.15 Diameter class and volume (M³)

Diameter class (cm)	Volume in (M ³)	
	Sain	Shisham
10-20	0.127	0.176
20-30	0.368	0.467
30-40	0.835	0.977
40-50	1.77	1.523
50-60	3.03	2.265
60-70	4.557	---
> 70	6.385	---

1.8.8 Firewood and Charcoal : To determine the volume and conversion factors of firewood and charcoal for oaks and other broadleaved species of dry mixed deciduous forests, the data was collected from Ban Oak lots of Habban Range and fuelwood lots of Sarahan Range. In addition 11 sample trees of ban oak were felled for studies, as per diameter class distribution given in Table 1.8.16. The conversion factors between volume, weight of wood and charcoal is given in Table 1.8.17 and the diameter class wise volume and weight of firewood and charcoal is computed in Table 1.8.18.

1.8.9 Khair : To determine the standing volume, heartwood volume, weight of chips and quantity of katha, the data was collected in Nurpur Forest Division by sampling 10 trees of each diameter class by Nanak Chand for Nurpur Working Plan. It is recommended for use as given in Table 1.8.19.

Table 1.8.16 :Diameter class distribution of sampled oak trees

Diameter class	IV	III	IIA	IIB	IA	Total
Number of trees	4	2	2	2	1	11

Table 1.8.17 :Diameter class distribution of sampled oak trees

Species	Firewood		Charcoal	
	Weight (qtls)	Volume (M ³)	Weight (qtls)	Conversion %
Oaks	12	1	1.98	16.5
Kokat	6.7	1	0.687	10.25

Table 1.8.18 Diameter classes and firewood/charcoal production

Diameter Classes (cm)	Oaks			Kokat		
	Firewood		Charcoal (qtls)	Firewood		Charcoal (qtls)
	M ³	Qtls		M ³	Qtls	
10-20	0.054	0.65	0.107	0.06	0.40	0.041
20-30	0.25	3.00	0.495	0.112	0.75	0.077
30-40	0.558	6.70	1.105	0.336	2.25	0.231
40-50	0.958	11.50	1.897	0.672	4.50	0.461
50-60	1.5	18.00	2.970	1.00	6.70	0.687
60-70	1.867	22.40	3.696	1.284	8.60	0.881

Table 1.8.19 : Katha content and diameter classes of Khair

Diameter Classes (cm)	Height (m)	Standing Volume M ³	Heartwood volume M ³	Weight of chips (kg)	Weight of air dried katha (kg)
10-15	8.30	0.0257	0.0122	11.2	---
15-20	10.10	0.0686	0.031	31.6	2.5
20-25	11.80	0.1181	0.0576	50.6	5.0
25-30	12.90	0.1697	0.1096	78.7	8.0
30-35	13.40	0.2528	0.1757	128.3	14.0
35-40	13.40	0.331	0.2406	167.7	18.0
40-45	13.40	0.4337	0.3016	197.4	23.0
45-50	13.40	0.5468	0.3898	280.1	29.0

1.8.10 Bamboos : To determine the number of clumps per ha and number of culms per clump, partial enumeration was carried out. The bamboo area of the two compartments were taken as a whole. The average No. of clumps per ha based on the enumeration is given in Table 1.8.20. To ascertain the number of culms per clump, 20 clumps were counted randomly. The results alongwith the average culms per clump are given in Table 1.8.21. The existing commercial classification of bamboos are given in Table 1.8.22 and the weight of air dried 100 bamboos of different classes is adopted from Nurpur Working Plan by Nanak Chand, which is given in Table 1.8.23.

Table 1.8.20 : Number of bamboo clumps and areas

Sr. No.	No. and Name of Forest	Comptt.	Area (ha)	No. of clumps
1.	UF 7 Bara Chakli	C1	16.25	18,478
2.	UF 11 Girar Sandrol	C3	12.50	7,719
		Total	28.75	26,197
		Average per ha. = 911.20		

Table 1.8.21 : Number of clumps and culms :

No. of clumps	No. of culms			Total
	Manu (Current year)	Chal		
		(Previous Year)	Two years and older	
204	1246	1256	5208	7710

Average per clump	6.11	6.16	25.53	37.80

Table 1.8.22 : Commercial classification of bamboos

Sr. No.	Trade name	Specifications
1	Kalan :	Over 12.7 cm girth
2.	Khurd	9.5 cm to 12.7 cm girth
3	Sota :	Below 9.5 cm girth

1.8.11 Quality Classes : The all India Quality classes as given in F.R.I Yield Table for deodar, kail and chil have been adopted. Quality class for individual compartment has been assessed ocularly and recorded in C.W. Files. This has further been reassessed by height and diameter measurements of 5 number of dominant trees in P.B.I. areas.

1.8.12 Density : Ocular estimate of density of each compartment was assessed and recorded in C.H. Files.

1.8.13 Enumerations: Total enumeration in 10 cm diameter classes down to 10 cm dbh were carried out in chil, deodar, kail, spruce and fir forests. Spruce and fir, deodar, kail and chil, found in compact patches in oak forests, have also been enumerated. Partial enumerations upto the extent of 14.815% of the total area by taking random samples considering the compartment as a unit of enumeration have been carried out in dry mixed deciduous scrub forests and 28.82 in Ban Oak forests. In Bamboo forests from 57.5% of the areas, total number of clumps have been enumerated and from 204 randomly selected clumps, the number of culms have been counted. No enumerations have been done in the remote inaccessible Mohru and Kharsu forests. Pure patches of these species though found in spruce and fir forests have also not been enumerated but intimately mixed with spruce, fir, deodar, and kail as understory or underwood, have been enumerated alongwith the main species. In broadleaved forests, only important species have been enumerated individually and rest grouped together as Kokath.

CHAPTER IX

ESTIMATES OF CAPITAL VALUE OF THE FORESTS

1.9.1 Capital value of the land under forests: The estimated capital value of the forest lands based on Net Present Value for dense forests Eco class I and II at Rs. 9,39,000 fixed by the Govt. of India is given in Table 1.9.1.

Table 1.9.1 : Capital value of land

Sr. No .	Forests	Area (ha.)	Cost of land (Rs./ha)	Total cost of land (Rs.)
1	R.F	12,970.88	9,39,000	12,17,96,56,320
2	P.F	2,552.18	9,39,000	2,39,64,97,020
3	U.F	3,240.13	9,39,000	3,04,24,82,070
4	M.F	2,650.05	9,39,000	2,48,83,96,950
5	S.F	4,573.48	9,39,000	4,29,44,97,720
	Total	25,986.72	..	24,40,15,30,080

1.9.2 Capital Value of Growing Stock: Estimated capital value of the growing stock is given in Table 1.9.2

Table 1.9.2 : Capital value of the Growing Stock.

Sr. No .	Species	Growing Stock (M ³)	Royalty (Rs./ M ³)	Total Value (Rs.)
1	Chil	791216	572	452575552
2	Deodar	1198792	5903	7076469176
3	Kail	317646	3098	984067308
4	Fir/Spruce	1268145	790	1001834550
5	Misc. Broad leaved scrub	3629	326	1183054
6	Ban Oak	49716	326	16207416
				0

1.9.3 Capital Value of Minor Forest Produce : The annual income from minor forest produce in this division is given in Table 1.7.3.

Table 1.7.3 : Value of minor forest produce

Sr. No .	Produce	Amount (Rs.)
1	Resin	20109180
3	Grasses/Fodder	100000
4	Medicinal Herbs	50000
5	Nirgal	100000
6	Miscellaneous (Guchhies, Harar etc.)	4500000
	Total	0

1.7.4 : The total estimated capital value of the forest of this division (sum of the capital value of land, growing stock and minor forest produce) work out to be Rs.33,95,87,26,316/-

PART –II
Future Management Discussed
AND
Prescribed

CHAPTER-I

BASIS OF PROPOSALS

2.1.1 General Objects of Management : Keeping in view the provisions of the National Forest policy of India (1952), Himachal Pradesh State Forest Policy (1980), National emphasis on : environmental conservation and rehabilitation on eco systems, reclothing of naked and barren hill slopes, soil and water conservation and watershed management, Flood Control, Social prosperity of the people by way of adequate provisions of fuel, fodder, fruit, fibre and fertilizers through Farm, Agro and Social Forestry, environmental pollution control, moratorium on green fellings especially of oaks, establishment of rural and cottage industries, wild life conservation and management, improvement of grazing and grasslands, minor forest produce and medicinal herbs etc., and the facts discussed in part- I above, the objects of management are as under:-

1. To conserve and improve the existing forest cover and thereby prevent the denudation and erosion of hill slopes so as to ensure even flow of water in the streams and preserve the environment, natural eco-system including wildlife.
2. To provide for the bonafide domestic and agricultural requirements of the local populace for timber, fuel wood, fodder, grass, grazing and other minor forest produce subject to the capacity of the subservient forest estate.
3. To improve the stocking of the forest and to bring them gradually to a condition as near to the normal forests as possible by obtaining a more normal distribution of age classes with normal regeneration and optimum density.
4. To restock the blanks and barren lands with valuable species
5. To replace the scrub forest with more valuable species through plantations.
6. To rehabilitate the degraded chil, kail and deodar forest.
7. To delineate and earmark the areas close to habitations to raise social forestry Plantations to meet the grass, fodder, fuel wood and timber requirement of people.
8. To extend the area under important timber yielding species on suitable lands.
9. To regulate and control both the local and migratory grazing.
10. To produce the optimum yield of resin subject to the maintenance of the chil crops in a healthy condition.
11. To protect all forests in general and chil forests in particular from fire.
12. To manage the wild life in endeavour to check extinction and help increase population.
13. Consistent with the above, to obtain the maximum sustained yield of timber, pulpwood, resin, fuel wood, charcoal and other forest produce in perpetuity.

2.12 Method of Treatment to be Adopted: To secure the objects of management, the treatments required for various forests are as under:-

1. For the attainment of full productivity and establishment of regeneration to secure productivity in perpetuity, for the supply of raw materials for wood based industries, to

meet the silvicultural requirements of the species and the realisation of progressively increasing yield of timber and other forest produce:

- a. Chill forest will be managed under uniform with Indian Irregular Shelter wood System with fixed periodic blocks. The mode of regeneration will be both natural and artificial ensuring the completion of regeneration of the P.B.I. areas within currency of this plan, as far as possible.
 - b. Deodar and Kail forests are also to be managed under Uniform with Indian Irregular Shelter wood System with floating periodic Blocks I. Deodar will be regenerated artificially taking due advantage of the natural regeneration wherever possible. Kail regenerates naturally but sowing will be resorted to the refractory areas.
 - c. Spruce and Silver Fir forests being not capable of regeneration under concentrated fellings, will be managed under Selection System.
 - d. Dry mixed deciduous scrub forest will be managed under “Modified Clear Felling System with Artificial Regeneration”. Valuable species will be introduced to improve the forests.
 - e. Special attention shall be paid to manage the Bamboo forests scientifically. Cleaning and cutting will be done departmentally. The area of bamboos shall be extended by planting the blanks and suitable sites.
2. For the prevention of erosion and stabilization of the terrain, for reclothing the naked areas and culturable blanks and for the improvement and regulation of water supply;
- a. All the oak forests cut up and rugged terrain, very steep to precipitous mountain slopes, river beds and banks barren and eroded slopes , rocky blanks, and the areas requiring protection have been allotted to Protection Working Circle Mature, over mature and hollowed ban oak trees shall be removed selectively to meet the departmental requirements of charcoal. The blanks and suitable patches shall be taken up for afforestation with suitable species.
 - b. All the degraded, fire burnt, maltreated and mismanaged forests of chil, deodar and kail have been allotted to Rehabilitation Working Circle and shall be managed under Irregular Shelter wood System relying both on artificial and natural regeneration with effective closures.
 - c. The blanks are to be converted into tree bearing areas by suitable plantations. Species best suited to the localities are to be resorted.

2.1.3 Working Circles, their Area and Distribution, Reason for their Constitution:

To achieve the objects of management, the following working circle have been constituted.

1. The Chil Working Circle
2. The Deodar and Kail Working Circle
3. The Spruce-Fir Working Circle
4. The Rehabilitation Working Circle

5. The Protection Working Circle
6. The Plantation Working Circle
7. The Grazing Overlapping Working Circle

2.1.4 The Chil Working Circle : It included all the natural and manmade forests of chil with moderate density comprising of reserved, protected, unclassed, mushterqua and shamlat/ceilingland forests. Total area of this Working Circle is 6,143.11 ha. The majority of the forests contain practically pure chil but some compartments have certain amount of oak and broadleaved deciduous trees. The forests response well to the concentrated regeneration fellings. Being the home of chil, profuge regeneration comes up naturally. Resin tapping is common in the forest of this circle.

2.1.5 The Deodar-Kail Working Circle: All the reserved, protected, mushterqua and shamlat/ceiling land forests which contain pure or mixed crop of deodar and kail with density ≥ 0.3 have been allotted to this circle. Also some of the oak forests containing compact patches of deodar and kail, which could not be separated by formation of sub compartments, have been included in this working circle. The area of this Working Circle is 4,173.74 ha. At places there are admixture of spruce on higher reaches and cooler places and chil on warmer spurs and lower elevations. There are also patches of oaks and other broadleaved species along the nalas and in depressions. The crop is generally of uniform middle age class throughout. It is difficult to divide the forest in different periodic blocks. In P.B.I. areas of the past plan, the regeneration is lacking and the plantations raised are not successful.

2.1.6 The Spruce-Fir-Working circle: This working circle includes all the Spruce and Fir forests, pure or mixed and adjoining oak patches which could not be separated by formation of sub compartments. The area of this working circle is 2,551.50 ha. It is chiefly confined to Habban and some in Rajgarh Ranges. The terrain is difficult and prone to erosion, snow slides, etc. Regeneration under uniform system is difficult to obtain on account of thick raw humus and luxuriant undergrowth. The forests are irregular with predominance of middle aged to mature trees. Overmature and hollowed trees are also available. Damage to trees by lightening is also noticeable on ridges.

2.1.7 The Rehabilitation Working Circle : The forests allotted to this working circle support open to very open, uniform to patchy, pure or mixed crops of chil, deodar and kail of different age classes with density < 0.3 . The degraded, maltreated, fire burnt and mismanaged reserved, protected, unclassed, mushterqua and shamlat/ceilingland forests containing deodar, kail and chil crops constitute this working circle. The forests are capable of restocking by natural regeneration if closure is effective and permanent blanks are planted up. The area of this working circle is 4,107.70 ha.

2.1.8 : The Protection Working Circle : All the oak forests managed under coppice working circle in the previous plan have been allotted to this working circle for the conservation of moisture regime, for balancing the mountain eco-system, and to regulate the flow of water in the streams. The areas having tough terrain, unfit for other circles, prone to soil erosion, land degradation, requiring closures, planting and soil conservation measures, have also been included in this circle. Such areas fall in all the categories of forests viz, RF, PF, UF, MF and SF. The area of this working circle is 2,540.94 ha.

2.1.9 The Plantation Working Circle : This includes all the areas having dry mixed deciduous forests fit for plantations with valuable species, area devoid of regeneration, areas requiring immediate reclothing under soil conservation and social forestry, blank areas of reserved, protected, unclassed, mushterqua and shamlat/ceilingland forests, and all plantations of various species raised upto 31-3-2011 in such forests which have not yet been transferred to other circles. Total area of the working circle is 6,469.73 ha.

2.1.10 The Grazing Overlapping Working Circle : This working circle overlaps all the working circles and covers all the forests of the division with an area of 25,986.72 ha. in extent. It is created to check, control and regulate the local and migratory grazing, to meet the legitimate demands of right holders and to improve productivity of the grazing and grasslands, meadows etc.

2.1.11 The forest class-wise area of the Working Circles is given in Table 2.1.1

Table 2.1.1 : Working Circles and Area Statement :

Sr No	Working circle	Forest Classes (Area in ha.)					
		RF	PF	UF	MF	SF	Total
1	The Chil Working Circle	3,329.97	672.71	1,235.16	779.66	125.61	6,143.11
2	The Deodar-Kail Working Circle	3,166.64	595.63	---	379.08	32.39	4,173.74
3	The Spruce-Fir-Working circle	2,551.50	---	---	---	---	2,551.74
4	The Rehabilitation Working Circle	1,857.44	322.35	402.40	897.24	628.27	4,107.70
5	The Protection Working Circle	1,452.34	557.80	75.90	225.12	229.78	2,540.94
6	The Plantation Working Circle	612.99	403.69	1,526.67	368.95	3,557.43	6,469.73
7	The Grazing Overlapping Working Circle	12,970.88	2,552.18	3,240.13	2,650.05	4,573.48	25,986.72

2.1.12 The Table 2.1.2 shows total growing stock in different working circle along with the estimated growing stock of protection and plantation working circle. The forest wise detail of the growing stock and per hectare growing stock figure for different working circles and P.Bs by diameter classes are given in Appendix-III.

2.1.13 Blocks and Compartments : A few changes have been made in the boundaries of the forests and compartments keeping in view the forest classification, crop composition treatment required and management prescribed. Details of compartments and sub-compartments allotted to various working circles and Periodic Blocks are given in Appendix-I and II. As for the RF, PF, UF and MF are concerned, the compartments and sub-compartments have been marked on 1:15000 scale survey sheet. The SF forests have been traced from Revenue Sajra maps and reduced approximately to 1:15,000 scale. The plotting of SF forests on survey sheet is only possible when these are demarcated on the ground and surveyed by the Survey of India.

2.1.14 Period of the Plan : The period of the plan will be 15 years from 2013-14 to 2027-28.

2.1.15 Necessity for Intermediate Revision: No necessity of Intermediate Revision is anticipated unless there are important unforeseen causes like serious outbreak of incendiarism, some natural calamities on vast scale, radical change in the Government policy, development of new techniques of management, change in utilization patterns and other developing social factors, which may call for drastic change in the mode of working or the management of the forests.

Table 2.1.2 : Working Circles wise Growing Stock

Sr No	Working circle	Description	Species								
			Chil	Deodar	Kail	Spruce	Fir	Ban	Misc.	B.L	Bamboos
1	The Chil Working Circle	No.	13,59461	---	---	---	---	---	---	---	---
		Vol. (M ³)	4,18,087.4	---	---	---	---	---	---	---	---
	Per Hect.	No.	245.31	---	---	---	---	---	---	---	---
		Vol. (M ³)	75.44	---	---	---	---	---	---	---	---
2	The Deodar-Kail Working Circle	No.	54,152	4,54,675	5,95,222	48,868	596	---	---	---	---
		Vol. (M ³)	22,089.66	3,00,653.61	4,24,693.47	28,595.43	285.27	---	---	---	---
	Per Hect.	No.	17.09	143.47	187.82	15.42	0.19	---	---	---	---
		Vol. (M ³)	6.97	94.87	134.01	9.02	0.19	---	---	---	---
3	The Spruce-Fir-Working circle	No.	265	33,090	39,308	2,84,046	2,17,199	---	---	---	---
		Vol. (M ³)	58.5	21,289.8	16,729.9	2,99,601.5	2,41,830	---	---	---	---
	Per Hect.	No.	---	32.55	38.67	164.13	125.50	---	---	---	---
		Vol. (M ³)	---	20.94	16.46	173.12	139.73	---	---	---	---
4	The Rehabilitation Working Circle	No.	4,06,161	1,47,852		5,758	---	---	---	---	---
		Vol. (M ³)	1,32,683.75	60,635.47		2,518.58	---	---	---	---	---
	Per Hect.	No.	98.89	36.00		1.40	---	---	---	---	---
		Vol. (M ³)	32.31	14.76		0.60	---	---	---	---	---
5	The Protection Working Circle	No.	---	---	---	---	---	4,78,105	---	---	---
		Vol. (M ³)	---	---	---	---	---	2,11,638	---	---	---
	Per Hect.	No.	---	---	---	---	---	636.92	---	---	---
		Vol. (M ³)	---	---	---	---	---	281.94	---	45,560 (Clumps)	17,22,168 (culms)
6	The Plantation Working Circle	No.	---	---	---	---	---	---	---	---	---
		Vol. (M ³)	---	---	---	---	---	---	2,47,099	911.2 (clumps)	34.44 (Culms)
	Per Hect.	No.	---	---	---	---	---	---	---	---	---
		Vol. (M ³)	---	---	---	---	---	---	104.15	---	---

CHAPTER-II

THE CHIL WORKING CIRCLE

2.2.1 General constitution : The working circle included all the better stocked chil forests of the division consisting of RF, PF, UF, MF and SFs and extending over an area of 6,143.11 ha. as per details give in Table 2.2.1

Table 2.1.1 : Working Circles and Area Statement :

Sr No	Legal Classification of forests	Area (ha.)	
		Gross Area	Area stocked with (Chil + Deodar + Kail)
1	Reserved Forests (R.F.)	3,329.97	3,033.42
2	Protected Forests (P.F.)	672.71	649.11,
3	Unclassed Forests (U.F.)	1,235.16	102.661
4	Mushterqua Forests (M.F.)	779.66	702.98
5	Shamlat/Ceilingland Forests (S.F.)	125.61	122.00
	Total :	6,143.11	5,609.57

The details of the area statement by ranges, forests blocks and compartments/sub-compartments showing gross and stocked area under various species are given in Appendix II.

2.2.2 General Character of the Vegetation : The vegetation consists of almost pure chil but in certain forests some patches of ban oak and broadleaved deciduous trees are found. Though the crops can be distinguished in various age groups, a heterogeneous mixture of all age classes exist. The man made forests and well regenerated areas are almost homogeneous and so is the case with some of the well stocked middle aged forests. In general, the forests are under stocked with density between 0.3 to 0.6. Broadly speaking, middle aged trees predominate. Natural regeneration is adequate if the closure is effective and area is protected against fire. The Siwalik chil pine forests are ecologically comparatively unstable than Himalayan chil pine forests. Detailed description have been given in Chapter II of Part I of the plan. Over mature trees on the whole are not found. Normal distribution of age classes is lacking. The forests around Bagthan, Panwa, Dilaman, Phagu and Deedag are of better quality (II) whereas rests are of comparatively inferior quality (III). The overall quality of chil is II/III.

2.2.3 Blocks and Compartments : Keeping in view the crop composition and treatment required, some alterations have been made in certain compartments. Forest blocks of RF, PF, UF, and MF remain the same as in the previous Working Plan. Jagir forests, Shamlat and Ceilingland forests transferred to Forest Department have been splitted into a number of forest blocks, numbered and named after mauza and each block has further been divided into compartments and sub-compartments for ease of management. All the compartments and sub-compartments are distinguishable on the ground.

2.2.4 Felling Series : No separate felling series have been constituted.

2.2.5 Special objects of Management: Consistent with the general objects or management, these will be :

- i. To convert the present crops into more or less even aged, fully stocked, normal forests.
- ii. To fully stock the P.B.I areas by natural regeneration supplemented with planting.
- iii. To meet the bonafide demand of timber, firewood, grass/grazing and other forests produce of the local people both right and non right holders.
- iv. To tend the young regeneration and protect the forests from fires.
- v. To obtain maximum yield of resin on sustained basis, while keeping the forests in healthy conditions.
- vi. Consistent with above, to maximise yield of timber, pulpwood and other forest produce on sustained basis.

2.2.6 Area and allotment : The Gross area of this Working Circle is 6,143.11 ha with 5,541.92 ha under chil (90.2%). The detailed distribution of compartments and sub-compartments into periodic blocks by ranges is given in Appendix I and the summary thereof for reserved (RF), Protect (PF), unclassified (UF), mushterqua (MF) and Shamlat ceilingland (SF) forests stocked with chil, deodar and kail is given in Table 2.2.2.

2.2.7 Analysis and valuation of the Crop :

Stock Maps : Stock maps for all the compartments and sub-compartments on 1,15,000 scale have been prepared. The details of stockings for individual compartments and sub-compartments is given in Appendix II and abstract in Table 2.2.3.

Table 2.2.2 Statement of Area Allotment

Range	Area in Ha.											
	RF		PF		UF		MF		SF		Total	
	Gross	Stocked	Gross	Stocked	Gross	Stocked	Gross	Stocked	Gross	Stocked	Gross	Stocked
1	2	3	4	5	6	7	8	9	10	11	12	13
					P.B. I							
Habban	368.94	292.03	---	---	---	---	47.90	38.74	---	---	416.84	330.77
Rajgarh	129.26	137.01	25.65	25.65	---	---	112.13	94.26	---	---	277.04	256.92
Narag	407.53	393.76	10.25	10.25	97.90	95.80	56.69	56.69	---	---	572.37	556.50
Sarahan	474.64	448.02	280.71	264.26	147.20	134.80	43.95	41.45	10.99	10.19	957.49	899.52
Total	1390.37	1270.82	316.61	300.16	245.10	230.60	260.67	231.14	10.99	10.99	2223.74	2043.71
					PB. II							
Habban	143.58	123.28	---	---	---	---	2.00	1.10	---	---	145.58	124.38
Rajgarh	103.97	103.97	---	---	---	---	76.03	72.78	---	---	180.00	176.75
Narag	224.04	221.24	---	---	45.00	42.75	78.15	73.45	10.06	10.06	357.25	347.50
Sarahan	281.98	233.88	175.95	170.05	130.35	98.00	49.05	30.40	1.13	1.13	638.41	533.46
Total	753.57	682.37	175.95	174.05	175.35	140.75	205.23	177.73	11.19	11.19	1321.29	1172.09
					P.B. III							
Habban	195.70	173.68	---	---	---	---	8.70	7.90	---	---	204.40	181.58
Rajgarh	59.51	52.10	6.50	6.50	---	---	33.59	33.39	---	---	99.60	91.99
Narag	172.46	155.89	---	---	385.16	375.54	96.40	88.20	11.22	11.22	664.84	630.85
Sarahan	117.04	105.49	80.20	79.20	321.60	260.72	43.50	43.20	16.08	13.97	578.42	502.58
Total	544.71	487.16	86.70	85.70	706.76	636.25	182.19	172.69	27.30	25.19	1547.66	1407.00
					P.B. IV							
Habban	128.63	82.78	---	---	---	---	21.70	18.30	---	---	150.33	101.08
Rajgarh	381.47	379.67	---	---	---	---	36.60	35.80	12.32	12.32	430.39	427.79
Narag	33.75	33.75	2.25	2.25	82.15	68.65	9.22	9.22	27.35	27.35	154.72	141.22
Sarahan	97.47	96.87	91.20	90.95	25.80	25.80	64.05	58.10	36.46	34.96	314.98	306.68
Total	641.32	593.07	93.45	93.20	107.95	94.45	131.57	121.42	76.13	74.63	1050.42	976.77
G. Total	3329.97	3033.42	672.71	649.11	1235.16	1102.06	779.66	702.98	125.61	122.00	6143.11	5609.57

Table : 2.2.3 Area statement and stocking of chil working circle.

Stocking (Spp.)	Chil	Misc. Broad leaved spp.	Ban	Deodar	Kail	Mixed (Deo + Kail + Chil)	Blanks		Included cultivation	Total
							Culturable	Un- culturable		
Area (Ha)	5541.92	164.07	71.58	53.20	5.95	9.50	149.79	15.15	132.95	6143.11

Site Quality : It was determined by ocular estimates while stock mapping and describing the compartments and checked subsequently by measuring a few dominant trees during regeneration survey of P.B.I areas. It varied from II to III with average II/III (F.R.I)

Density : It was estimated ocularly and mentioned in compartment descriptions. It varied from 0.3 to 0.8, the average being 0.5.

Enumerations : total enumeration down to 10 cm d.b.h. in 10 cm diameter classes have been carried out and appended in Compartment History Files. The details are given in Appendix III. Summary of enumeration results and growing stock of chil is given in Table 2.2.4. The average growing stock is 387.77 M³ per ha. The tabular statement showing the comparison of stocking during the past and present plan is given in Table 2.2.5.

Regeneration : Natural regeneration of chil is not a problem provided fire protection and closure against grazing is effective. It is present in plenty throughout in seedling, sapling, pole and advance growth stages even without seedling fellings carried out in various compartments. In areas subjected to forest fires, the regeneration is either wiped out or destroyed partially. Areas with established regeneration have been allotted to P.B.IV. Over all position is satisfactory except in some cases where it is due to repeated fires and uncontrolled heavy grazing.

Table 2.2.4 : Summary of Enumeration results

P.B.	Parameters	Diameter Classes (cm)									
		10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	> 90	Total
I 2022.26 ha.	N	346373	184491	77068	27806	12821	5561	2164	324	61	656669
	V	17457.19	46104.3	52760.75	37660.44	28966.48	18904.06	10332.23	2068.70	502.04	214756.2
	N/Ha	171	91.23	38.11	13.75	6.34	2.75	1.07	0.16	0.03	324.72
	V/Ha	8.63	22.8	26.09	18.62	14.32	9.348	5.11	1.02	0.25	106.2
II 1162.99 ha.	N	98994	94260	51160	17236	6443	1942	616	349	93	271093
	V	4989.3	23555.57	35024.14	23344.44	14556.67	6601.63	2941.15	2228.33	765.42	114006.65
	N/Ha	85.12	81.05	43.99	14.82	5.54	1.67	0.53	0.3	0.08	233.1
	V/Ha	4.29	20.25	30.12	20.07	12.52	5.68	2.53	1.92	0.66	98.03
III 1383.85 ha.	N	178046	94129	44103	10171	3543	1232	401	111	14	331750
	V	8973.52	23522.84	30192.91	13775.6	8004.7	4188.06	1914.61	708.72	115.22	91396.2
	N/Ha	128.66	68.02	31.87	7.35	2.56	0.89	0.29	0.08	0.01	239.73
	V/Ha	6.48	17	21.82	9.95	5.78	3.03	1.38	0.51	0.08	66.04
IV 972.82 ha.	N	180662	160496	42512	12608	3998	1819	496	165	29	402785
	V	9105.36	40107.95	29103.72	17076.28	9032.68	6183.51	2368.2	1053.51	238.68	114269.88
	N/Ha	185.71	164.98	43.7	12.96	4.11	1.87	0.51	0.17	0.03	414.04
	V/Ha	9.36	41.23	29.92	17.55	9.29	6.36	2.43	1.08	0.25	117.46
Total 5541.92 ha.	N	804075	533376	214843	67821	26805	10554	3677	949	197	1662297
	V	40525.38	133290.66	147081.52	91856.76	60560.54	35877.27	17556.2	6059.27	1621.37	534428.97
	N/Ha	145.09	96.24	38.77	12.24	4.84	1.9	0.66	0.17	0.04	299.95
	V/Ha	7.31	24.05	26.54	16.57	10.93	6.47	3.17	1.09	0.29	96.43
	C.A.I (M ³)	1847.96	4998.4	3956.49	2075.96	1205.15	559.69	200.14	55.75	10.7	14910.24
Note :	N = Number		V = Volume M ³			C.A.I = Current annual increment (M ³)					

Table 2.2.5 : Stocking (Number and volume in M³) of Chil in past and present plan.

Parameters	Diameter Classes (cm)									
	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	> 90	Total
N (Past)	846059	276218	127767	61406	31631	11463	3879	929	109	1359461
N (Present)	804075	533376	214843	67821	26805	10554	3677	949	197	1662297
V (Past)	42641.37	69026.89	87469.29	83169.28	71463.93	38967.31	18520.66	5931.57	897.10	418087.40
V (Present)	40525.38	133290.66	147081.52	91856.76	60560.54	35877.27	17556.2	6059.27	1621.37	534428.97
N/ha (Past)	152.67	49.84	23.05	11.08	5.71	2.07	0.70	0.17	0.02	245.31
N/ha (present)	145.09	96.24	38.77	12.24	4.84	1.9	0.66	0.17	0.04	299.95
V/ha (Past)	7.69	12.46	15.78	15.01	12.90	7.03	3.34	1.07	0.16	75.44
V/ha (present)	7.31	24.05	26.54	16.57	10.93	6.47	3.17	1.09	0.29	96.43

The details of Regeneration stages and density thereof are given in Table 2.2.6.

Table 2.2.6 Extent of regeneration stages of the P.B.I area (ha)

Regeneration	Recruit	Seedling	Sapling	Pole	Mixed	Total
Fully stocked (Density > 0.75)	--	--	--	50.63	155.96	206.59
Moderately stocked (Density > 0.5)	8.80	10.95	8.11	122.38	448.75	598.99
Poorly stocked (Density < 0.5)	22.15	41.96	24.58	120.02	603.59	812.30
Total	30.95	52.91	32.69	293.03	1208.30	1617.88

2.2.8 Silvicultural System: The forests allotted to this working circle are to be managed under Uniform with Indian Irregular Shelter wood with fixed periodic Blocks. The system involves uniform opening in the canopy of P.B.I. areas with a view to obtain natural regeneration .It also permits certain amount of irregularity in the uniformity of the crop. To avoid the sacrifice of immature crops, advance growth is retained as part of the future crop. The system allows felling according to the nature of the ground. On very steep and precipitous slopes, cut up and erosion prone fellings conform to selection principles.

2.2.9 Regeneration Period: Chil regeneration is considered established when plants have attained height of 8 m and d.b.h. 10cm. This is possible in 20 years as per growth data (Table 1.6.4). Normally the seedlings appear within 3-4 years after the seeding felling. Keeping in view the period of recruitment and their establishment and the frequency of forest fires, regeneration period of 30 years is adopted.

2.2.10 Rotation and Conversion period: The management of chil forest envisages the utilization of chil crop for resin and timber. The statistical data indicate that chil of this division attains 62.3 cm d.b.h. in 120 years, which is an ideal size both for sawn and pulp timber. The size of 60 cm is acceptable to the market, because of proportionately larger out turn parentage. Furthermore, the current and the mean annual increments for stem timber intersect at 110 years for quality II and between 110 and 120 years for quality III crop. As such the adoption of 120 years rotation will also coincide more or less, with culmination of the mean annual increment. Thus, the rotation of chil is fixed at 120 years, Chil trees of 30 cm d.b.h. and over is taken for resin tapping. Chil is expected to attain this size at an age of 55 years. Thus resin tapping will be possible for about 35 years when the tree attains age of 90 and allotted to P.B.I. If rill method is adopted and line is continued for 5 years, it should be possible to continue resin tapping for all the 35 years. Keeping in view the work already done in the forest allotted to this working Circle, a period of 30 years of the first rotation is taken as elapsed. Here the rotation period of 120 years is equal to the conversion period.

2.2.11 Exploitable Diameter: The exploitable diameter of chil has been fixed as 60 cm d.b.h. which will be attained in a rotation period of 120 years.

2.2.12 Division into period and allotment to periodic Blocks: With a rotation of 120 years and regeneration period of 30 years, the forests of this working circle has been divided into 4 periodic blocks, to achieve the set objectives.

Periodic Block I: Crop conditions and state of natural regeneration are the chief criterions taken into account to allot the forests into P.B.I. As a general rule, only areas with patchy to abundant regeneration of chil from seeding to poles stage with open to moderate stocking, area moderately stocked with mature crop fit for exploitation and regeneration, areas already felled and under the process which have remained un – regeneration or partially regenerated during the last plan and the area with chil > 0.3 density suitable for raising chil, have been the first choice for allotment to P.B.I.

Not necessarily all the P.B.I. area of the plan under revision have been included in P.B.I. of this plan. The Shamlat and ceilingland during forests (SF) fit for felling and/ or regeneration have been included in this periodic block for the first time. Total area of this periodic block is 2,223.74, out of which 2,022.26 ha is under chil.

Periodic Block II : Areas with middle aged to older crops with moderate density have been allotted to this periodic block. The allotment to this P.B. is provisional as the forests are still under the process of conversion. The forests allotted to this P.B. are likely to be transferred to P.B.I. in the next revision of the plan if not destroyed by fires or epidemics. These cover a total area of 1,321.29 ha with 1,162.99 ha under chil. These are not necessarily the P.B.II areas of the old plan.

Periodic Block III : This periodic block is 1547.66 ha in extent out of which 1383.88 ha is under chil crop. It consists of reserved, protected, unclassed, mushterqua and Shamlat/ceiling-land forests. The crop is irregular with preponderance of young to middle aged trees with moderate to fair density. Resin tapping is maximum in this periodic block.

Periodic block IV : All the natural and manmade chil forests consisting of pole to young crop with fair to dense stocking constitute this periodic block. It is 1050.42 ha in extent. The fully regenerated area of P.B.I of the previous plan and the successful plantation of afforestation Working circle have been included in this periodic block. The area under chil crop is 972.82.

The allotment of forests to various periodic blocks by forests classes and ranges are given Table 2.2.9. The compartment/sub-compartment wise details are given in Appendix I.

Table 2.2.9 : Allotment of areas to Periodic Blocks

Range	Forest Class	Area in ha allotted to							
		P.B. I.		P.B.II		P.B.III		P.B.IV	
		Total	Under chil	Total	Under chil	Total	Under Chil	Total	Under Chil
Habban	RF	368.94	279.18	143.58	119.33	195.70	156.98	128.63	81.33
	PF	---	---	---	---	---	---	---	---
	UF	---	---	---	---	---	---	---	---
	MF	47.90	34.24	2.00	1.10	8.70	6.65	21.70	18.30
	SF	---	---	---	---	---	---	---	---
	Total	416.84	313.42	145.58	120.43	204.40	163.63	150.33	99.63
Rajgarh	RF	139.26	134.76	103.97	99.12	59.51	49.85	381.47	377.17
	PF	25.65	24.35	---	---	6.50	6.50	---	---
	UF	---	---	---	---	---	---	---	---
	MF	112.13	93.71	76.03	62.48	33.59	30.44	36.60	35.80
	SF	---	---	---	---	---	---	12.32	12.32
	Total	277.04	252.80	180.00	161.60	99.60	86.79	430.39	425.29
Narag	RF	407.53	393.76	224.04	221.24	172.46	155.89	33.75	33.75
	PF	10.25	10.25	---	---	---	---	2.25	2.25
	UF	97.90	95.80	45.00	42.75	385.16	375.54	82.15	68.65
	MF	56.69	56.69	78.15	73.45	96.40	88.20	9.22	9.22
	SF	---	---	10.06	10.06	11.22	11.22	27.32	27.32
	Total	572.37	556.50	357.25	347.50	665.24	630.85	154.72	141.22
Sarahan	RF	474.64	448.02	281.98	233.88	117.04	105.49	97.47	96.87
	PF	280.71	264.26	175.95	170.05	80.20	79.20	91.20	90.95
	UF	147.20	134.80	130.35	98.00	321.60	260.72	25.80	25.80
	MF	43.95	41.45	49.05	30.40	43.50	43.50	64.05	58.10
	SF	10.99	10.99	1.13	1.13	16.08	13.97	36.46	34.96
	Total	957.49	899.52	638.46	533.46	578.42	502.58	314.98	306.68
	G. Total	2223.74	2022.26	1321.29	1162.99	1547.66	1383.85	1050.42	972.82
	Total Gross	= 6143.11		Total Stocked		= 5541.92		Stocked	= 90.2%

2.2.13 As a general rule, sequential operations are involved in uniform system and the areas move from one periodic block to another but there are regressions instead of progression in some areas and some are thrown out into entirely different periodic blocks or working circles under different silvicultural systems.

2.2.14 Calculation of yield: As per expired working plan by Dr. M.B. Shrivastava is being followed for calculation of the yield. The yield from this Working circle will consist of yield from P.B.I and P.B.IV areas. The unfit trees have been excluded from enumerations and will not be counted against the prescribed yield. The dry, fallen, uprooted, dead and damaged trees from P.B.II and P.B.III area will be utilized from meeting the right holders demand and removed under salvage markings. Volume of these removals shall be counted against the yield of the working circle.

2.2.15 Yield from P.B.I : 84% of P.B.I areas have been enumerated down to 10 cm d.b.h. The abstract of enumerations is given in Table 2.2.10. The yield from P.B.I is based on the volume of trees of 20 cm d.b.h. and above. As a safe guard against over felling and calamities like fires, storms etc. and to improve the growing stock, the increment has not been taken into account. The species wise yield is worked out as under:

Table 2.2.10 Enumeration abstract of P.B.I

Species	Class (cm)									Total
	10-20.	20-30.	30-40,	40-50.	50-60.	60-70.	70-80.	80-90.	90 & >	
	V	IV	III	IIA	IIB	IA	IB	IC	ID	
Chil	346373	184491	77068	27806	12821	5561	2164	324	61	656669
	17457.2	46107.53	52760.76	37654.48	28938.54	18908.13	10353.97	2103.15	566.23	214849.99
Deo./Kail	8534	3822	2770	2366	1112	425	61	20	0	19110
	603.35	541.2	1960.88	3349.78	2833.82	1504.29	293.64	121.76	0	11208.72
Ban/Brass	32356	10111	4045	0	0	0	0	0	0	46512
	1747.22	2527.75	2257.11	0	0	0	0	0	0	6532.08
Fir Spruce,Rai	22	0	0	6	0	6	0	0	0	34
	2.66	0	0	10.5	0	26.4	0	0	0	39.56
Khair	689	243	493	5	0	0	0	0	0	1430
	17.71	16.67	58.22	0.85	0	0	0	0	0	93.45
B/L	50678	14102	4969	1003	169	6	0	0	0	70927
	3040.68	1579.42	1669.58	674.02	169.00	7.7	0	0	0	7140.41
Sain	3994	2112	643	145	1	0	0	0	0	6895
	507.24	777.22	536.91	256.65	3.03	0	0	0	0	2081.04
G. Total	442646	214881	89988	31331	14103	5998	2225	344	61	801577
Total Volume	23376.06	51549.79	59243.47	41946.28	31944.39	20446.52	10647.61	2224.91	566.23	241945.25

Deodar, Kail and Spruce : These species are present only in limited numbers in the transitional belt in pure patches or in mixtures. The retention of such species will increase their proportion in this working circle. No felling of such species is therefore contemplated and no yield is prescribed.

Chil : The volume of all the trees ≥ 20 cm d.b.h. has been taken into account for yield calculation. The trees below 20 cm d.b.h. shall be retained as part of the future crop. Twenty percent of trees from 20 to 40 cm d.b.h. (III and IV class) will also be retained as advance growth and the trees that may not be available due to their location on steep slopes, stream and nallah heads etc. In total 20 seed bearers per hectare comprising 2 of I Class, 8 of IIB and 10 of IIA classes shall be retained over an area of 2022.26 ha under chil crop. The felling will be completed in a period of 15 years i.e. during the plan period. The annual yield is calculated by the formula.

$$A.Y. = \frac{\sum GS - V(SB + TR + FC)}{PP}$$

Where A.Y = Annual Yield (m^3)

$\sum GS$ = Total growing stock (m^3) in P.B.I down to 10 cm d.b.h.

V = Volume (m^3)

SB = Seed bearers at the rate of 20 trees i.e. 38.41 (m^3) per ha over stocked area of P.B.I (2022.26 ha).

TR = Trees retained as advance growth etc. (20% volume of III and IVth class trees).

FC = Future crop i.e. Vth class trees (10-20 cm d.b.h.)

PP = Period of the plan i.e. 15 years.

$$= \frac{214849.99 - [(2022.26 \times 38.41) + 20\% \text{ of } 98868.29 + 17457.2]}{15}$$

$$\text{Annual yield} = \frac{214844.90 - (77675 + 19773.66 + 17457.2)}{15}$$

$$= \frac{214844.90 - 114905.86}{15}$$

$$= \frac{99939.04}{15}$$

$$= 6662.60 \text{ m}^3$$

In order to improve the growing stock, the yield is fixed at 5000(m^3)

2.2.16 Yield from P.B.IV : The yield from this periodic block will be of two types i.e. one from final fellings and the other from thinning. The trees ≥ 40 cm d.b.h. standing over the

young crop will count towards yields calculations from final fellings. Increment shall be ignored as a safety factor. The yield of deodar and Kail is negligible as they occur in very little proportion in transitional belt. They may be removed under salvage markings only. The enumeration abstract and growing stock of P.B.IV area is given in Table 2.2.11.

Table 2.2.11 Growing stock of P.B. IV areas.

Species	Class (cm)									Total
	10-20.	20-30.	30-40.	40-50.	50-60.	60-70.	70-80.	80-90.	90 & >	
	V	IV	III	IIA	IIB	IA	IB	IC	ID	
Chil	180662	160496	42512	12608	3998	1819	496	165	29	402785
	9105.36	40107.95	29103.72	17076.28	9032.68	6183.51	2368.2	1053.51	238.68	114269.88
Deo &	346	205	51	3	1	0	0	0	0	606
Kail	24.46	29.03	36.1	4.25	2.55	0	0	0	0	96.39

Yield from Final fellings : After giving due allowance for the trees standing on outer boundaries, steepy and rocky areas and in blanks, 10% of total volume of trees ≥ 40 cm d.b.h. available in P.B.IV areas, will be retained. This will also serve as fire insurance reserve. The annual yield will be calculated as under:

$$\begin{aligned}
 \text{Annual yield (m}^3\text{)} &= \frac{\text{Volume of trees } \geq 40 \text{ cm d.b.h. (I and II class)} \times 0.9}{\text{Plan Period}} \\
 &= \frac{35952.86 \times 0.9}{15} \\
 &= 2157.17 \text{ m}^3
 \end{aligned}$$

The yield is fixed at 1600 m³ to improve the growing stock.

Yield from thinning: Out of the total area of 1050.42 ha in P.B.IV an area of 972.82 ha is under chil. While thinning the young chil crop mechanically with 4 m fixed distance, the left over trees are 625 per ha. For the total area of 972.82 ha, 608013 trees shall be retained after thinning. The trees below 10 cm d.b.h have not been enumerated but their number is estimated to be 1.5 times of V class trees. Thus, the total number of young trees in P.B.IV forming various diameter classes is 654663 with an average diameter and volume of 10.91 cm and 0.0594 m³ respectively as given in Table 2.2.12.

Table 2.2.12 Diameter classes and number of trees in P.B.IV.

Diameter classes (cm)	Ave. diameter (cm)	Numbers
> 10	5	270993
10-20	15	180662
20-30	25	160496
30-40	35	42512
	Total	654663

The annual yield is calculated by the formula.

$$A.Y. = \frac{\sum N - \sum NR}{PP}$$

Where A.Y = Annual Yield (Number of trees)

N = Total number of trees.

NR = Total number of trees to be retained.

PP = Period of the plan i.e. 15 years.

$$\text{Annual yield} = \frac{654663 - 608013}{15}$$

$$= \frac{46650}{15}$$

$$= 3110 \text{ trees or say } 3100 \text{ trees.}$$

$$= 3100 \times 0.0504 = 156.24 \text{ m}^3$$

Since 35 to 40 % of the thinned timber is either uncommercial being small in diameter, broken, damaged, suppressed etc. or only of limited use like fuelwood or fence posts and unsaleable, the annual yield from thinning is fixed at 100 m³.

2.2.17 Yield from P.B.II and P.B.III : As the forests, in general, are understocked, there is hardly any scope for removal by way of thinning cum improvement felling. Therefore no green fellings are prescribed. Only dry, fallen, dying, uprooted and damaged trees will be removed under salvage markings. Volume of such trees will be counted against the yield of the Working circle. The yield from Deodar, Kail and Spruce being negligible is neither calculated nor prescribed

The summary of enumeration with growing stock of P.B.II and III is presented in Table 2.2.13.

Table 2.2.13 : Enumeration abstract and growing stock of P.B.II & III.

P.B.	Species	Diameter Classes (cm)									
		10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	> 90	Total
II 1162.99 ha.	Chil	98994	94260	51160	17236	6443	1942	616	349	93	271093
		4989.3	23555.57	35024.14	23344.44	14556.7	6601.635	2941.154	2228.33	765.42	114007
	Deo/Kail	4733	8932	7699	1047	302	93	23	0	0	22829
		334.62	1264.77	5450.12	1482.34	769.62	329.174	110.715	0	0	9741.36
	Ban/Brass	19329	10188	2128	1116	337	174	23	23	0	33318
		1043.8	2547	1187.42	1069.13	505.5	324.858	0	0	0	6677.68
											0
III 1383.85 ha.	Chil	178046	94129	44103	10171	3543	1232	401	111	14	331750
		8973.52	23522.84	30192.91	13775.6	8004.7	4188.061	1914.615	708.7239	115.22	91396.2
	Ban/Brass	3473	3708	3667	1217	55	13	0	0	0	12133
		187.54	927	2046.19	1165.89	82.5	24.271	0	0	0	4433.39

2.2.18 Prescribed Yield : The annual yield from the forests can be to the extent of current Annual Increment (C.A.I). The current annual increment of chil down to V class is 15000 m³ (Table 2.2.4) which may be removed annually without impairing the present status of growing stock. But the forests are generally understocked and prone to fire and grazing damages. It is, therefore, advisable to remove only 54% of the C.A.I. from this working circle. Thus the total annual yield prescribed is 8000 M³. The rest of the increment is allowed to add in the growing stock to bring it to normalcy in due course. The yield available from P.B.I and IV is 6700 m³ (5000 + 1700 M³). Therefore there remains a margin of 1300 M³ (8000-6700) to adjust the salvage marking from P.B.II and III. The prescribed annual yield is presented in Table 2.2.14.

Table 2.2.14 : Prescribed annual yield (M³) Chil Working Circle.

Species	P.B.I	P.B.II & III	P.B.IV	Total
Chil	5000	1300	1700	8000

The yield so prescribed is strictly subject to the silvicultural availability of the trees. The expected yield from each forest is given in the felling programme for the guidance of the marking officer. The markings should be done strictly on silvicultural principles. No attempts should be made to remove the total prescribed yield as it is to adjust the salvage removals, which generally occur, without affecting the required silvicultural removals from the P.B.I and P.B.IV.

2.2.19 Control of yield : All removals down to 10 cm d.b.h. will count towards the yield of the Working Circle. To ensure this, right holders shall be marked trees from the areas to be worked and extraction allowed before handing over the areas to Forest Corporation or other Agencies. Since the unit of working will be compartments and sub-compartments, some deviations are bound to occur. The yearly excess or deficit will not exceed 10 % and shall be carried forward in control forms and deviation statement adjusted at the end of every 5years when it should be within +-10% of the prescribed yield. No efforts should be made to obtain the prescribed yield, if it is not available silviculturally. Any excess yield removed should be adjusted in future fellings. Automatic reduction in prescribed yield has to be provided in case forests suffer damages due to epidemics, fires etc. All the trees so damaged will be removed immediately. As such when any forest is seriously damaged or burnt, it should be transferred to P.B.I for restocking by deferring the regeneration fellings in equivalent area of P.B.I. such deferred areas be relegated to PB.II. In case of heavy and large scale fires, the yield should be recalculated and necessary adjustment made.

2.2.20 Table of fellings : The order of fellings for 15 years is given in Tables 2.2.15 and 18. To ensure that the areas are not exhausted in advance, the annual fellings have been prescribed on the basis of enumeration data. This will be sort of area check on the yield and if the marking rules are properly followed, the annual fellings should give the prescribed annual yield. The forests excessively felled in the past and the forests with low stockings have been excluded from the fellings programme, though allotted to P.B.I. The fellings programme laid down for P.B.I and P.B.VI is based on the consideration of equitable distribution of work load to facilitate proper administrative and management control.

2.2.21 Method executing the fellings :

Periodic block I : Only two viz. Seedling and Final fellings will be carried out. Seeding fellings will be carried out in unfelled and in those forests which require openings for regeneration. Retouching will be done in the forests felled in the past, having irregular open

crop, needing uniform distribution of mother trees. The final fellings will be carried out in the forests with established regeneration but still needing effective closure. High degree of prudence is required to carry out markings for seeding and final felling which should be done by the experienced DFO and ACF. The guide lines to marking officer are laid as under:

- About 20 to 25 m apart uniformly distributed II and I class healthy, untwisted, vigorously growing, well formed, clean boled, tall seed bearers at the rate of 20 trees per ha shall be retained.
- Compact groups of young crop upto 30 cm d.b.h. and not less than 0.2 ha. In extent with a density of 0.7 and above shall be retained as part of future crop and shall be thinned alongwith the seedling felling wherever necessary. However, over wood would be completely removed from patches of the established advance growth.
- All the young saplings and poles up to V class and 20% of III and IV class trees i.e. 11 trees per ha, which can merge into general canopy of the crop, will be retained.
- Rests of the trees will be marked for felling.
- All dead, dying, diseased, damaged and fallen trees will be marked for removal.
- Final fellings will not be doen until the regeneration is well established.
- All the seed bearers shall be removed during the final felling expect for those needed to provide seed for un-regenerated gaps exceeding 0.25 ha or where their retention is still desirable over the patches of regeneration which are still too young.
- Trees likely to damage the regeneration/advance growth, should be lopped meticulously before felling.
- Markings should be conservative on stream banks, very steep and precipitous slopes and in refractory areas.
- All deodar, kail and spruce trees along the transitional belts will be retained. Only damaged, fallen and dry trees of such species shall be marked.

Table 2.2.15 : Felling programme (P.B.I)

Year of felling	Range	Number and Name of Forest	Comptt./ Sub Comptt.	Area (ha)	
				Gross	Under Chil
1	2	3	4	5	6
2006-07	Narag	RF 48 Rister	C2	36.23	36.23
	Sarahan	RF 41 Panwa	C3a	6.55	6.55
	Rajgarh	MF 64 Kulath	C1	6.95	5.53
2007-08	Rajgarh	RF 35 Matnali	C4c	13.65	11.40
	Habban	MF 47 Tikkeri Balara	Whole	10.50	3.60
	Narag	PF 20 Motipur	C2	1.55	1.55
2008-09	Sarahan	RF 40 Palashon	C1	20.25	20.25
	Rajgarh	MF 57 Dahan	Whole	2.70	1.05
	Narag	RF 48 Rister	C1	26.77	25.42
	Habban	MF 44 Shillanji	C1	8.00	8.00
2009-10	Rajgarh	PF 3 Braila	C2	9.45	8.80
	Habban	RF 19 Dalmun Kanog	C1b	21.37	21.37

Year of felling	Range	Number and Name of Forest	Comptt./ Sub Comptt.	Area (ha)	
				Gross	Under Chil
1	2	3	4	5	6
		do.....	C1c	20.25	20.25
	Sarahan	RF 40 Palashon	C4c	6.75	6.10
2010-11	Habban	RF 15 Dalmun Sudder	C2b	7.00	5.50
	Narag	RF 37 Bandona	Whole	5.80	4.50
		UF 20 Shogi	C1	27.00	24.90
2011-12	Sarahan	RF 45 Ghinni	C5	2.90	2.90
	Sarahan	RF 46 Lawasa	C2	43.87	42.30
		MF 154 Tikkeri Pajerli	C4a	9.90	9.90
2012-13	Sarahan	RF 41 Panwa	C2	9.90	9.90
		RF 42 Shakore	C2e	8.10	8.10
		RF 46 Lawas a	C2	43.87	42.30
	Habban	RF 19 Dalmu Kanog	C1b	21.37	21.37
		-do-	C1c	20.25	20.25
	Rajgarh	M.F. 57 Dahan	Whole	2.70.	1.05
		M.F. 64 Kulath	C1	6.95	5.53
	Narag	R.F. 48 Rister	C1	26.77	25.42
2013-14	Habban	RF 13 Dol	C4a	22.30	18.70
	Rajgarh	RF 28 Bohal	C1e	6.31	6.31
		RF 29 Phagu	C3b	19.15	19.15
	Sarahan	RF 44 Banar	C1	8.97	8.97
2014-15	Rajgarh	M.F. 56 Braila	C4	32.78	32.23
2015-16	Habban	RF 22 Shalogni	C3d	12.30	12.05
	Narag	RF50 Lakhot Malara	C2a	23.52	21.47
	Sarahan	RF 46 Lawasa	C4d	17.87	17.87
		RF 41 Panwas	C4a	39.40	39.40
2016-17	Habban	RF 15 Dalmu Suddar	C2	6.50	4.63
	Narag	MF 135 Rister	C2	22.50	22.50
	Sarahan	PF 17 Gaithal	C5	40.75	30.95
		PF 17 Gaithal	C7	21.35	21.10
2017-18	Habban	RF 22 Shalogni	C1b	23.10	21.90
	Narag	RF 51 Chhandoli	C1	38.35	38.35
2018-19	Sarahan	PF 17 Gaithal	C9	26.16	26.16
	Rajgarh	RF 31 Sanio Deedag	C2a	16.95	16.95
		M.F 84 Tikkeri	Whole	5.80	5.80
2019-20	Sarahan	RF 45 Ghinni	C4a	17.90	17.25
	Habban	MF 32 Thaina	Whole	14.70	14.70
	Narag	RF 52 Argushina	C1b	26.79	26.79
2020-21	Narag	RF 52 Argushina	C2b	30.65	28.29
	Sarahan	UF 2 Bani Bakholi	C3	22.10	20.55
2021-22	Habban	RF 13 Dol	C1c	45.00	21.05
	Rajgarh	RF 28 Bohal	C1a	37.38	37.38
	Sarahan	UF 16 Nali Gusan	C1	22.50	20.20
2022-23	Narag	MF 105 Thana Kawdi	Whole	22.69	22.69

Year of felling	Range	Number and Name of Forest	Comptt./ Sub Comptt.	Area (ha)	
				Gross	Under Chil
1	2	3	4	5	6
	Sarahan	PF 15 Mandi	C1	7.90	7.90
2023-24	Rajgarh	PF 3 Braila	C2	9.45	8.80
	Sarahan	PF 16 Kharana	C2a	7.65	7.65
2024-25	Habban	RF 14 Thaina	C2a(i)	16.25	16.00
	Narag	RF 51 Chhandoli	C3	36.15	36.15
	Sarahan	RF 42 Shakore	C3	33.30	33.30
		PF 13 Bounta	C1b	30.90	30.90
2025-26	Narag	PF 20 Motipur	C2	8.7	8.7
2026-27	Sarahan	RF 42 Shakore	C5	47.13	47.13
	Rajgarh	RF 36 Surdhar	C3	3.90	3.90
2027-28	Rajgarh	MF 60 Rug Bakhota	C2	45.50	30.70
	Sarahan	PF 12 Sanon	C1	12.95	10.05

Note : Felling will be done as per yield prescribed in Table 2.2.14.

Table 2.2.16 Prescribed sequence of felling from P.B.IV

Year of felling	Range	Number and Name of Forest	Comptt./Sub Comptt.	Area (ha)	
				Gross	Under Chil
2006-07	Habban	MF 46 Dhaya Pitli	Whole	4.70	4.70
	Narag	UF 20 Shogi	C2	19.15	19.15
	Sarahan	SF 138 Jaman ki Ser	C2	2.48	2.04
		SF 162 Manghori	C3	2.02	2.02
2007-08	Rajgarh	RF 32 Gadhol Pirag	C1b	32.50	32.50
		RF 28 Bohal	C1d	11.25	11.25
	Sarahan	PF 13 Baunta	C1c	0.80	0.80
		UF 13 Mano Ghasan	C7	5.00	5.00
2008-09	Rajgarh	RF 35 Matnali	C5b	14.85	14.85
	Rajgarh	MF 75 Neri Ratoli	C2	22.80	22.00
2009-10	Rajgarh	RF 35 Matnali	C4a Part	24.87	24.37
	Narag	RF 49 Pathroti	C2	33.75	33.75
2010-11	Rajgarh	RF 32 Gadhol Pirag	C2	12.60	12.60
	Habban	MF 44 Shillanji	C2	11.40	8.00
2011-12	Sarahan	PF 13 Baunta	C1a	20.25	20.00
	Narag	MF 104 Sohala	Whole	9.22	9.22
2012-13	Rajgarh	SF 13 Dhar Pajera	Whole	12.32	12.32
	Sarahan	RF 46 Lawasa	C4a	40.22	39.62
2013-14	Rajgarh	RF 31 Sanio Deedag	C1a	30.00	30.00
2014-15	Habban	MF 35 Dangra	Whole	2.70	2.70
	Rajgarh	RF 35 Matnali	C4a	24.87	24.37
	Narag	UF 14 Bhajiana	C1	27.00	20.25
2015-16	Habban	RF 18 Habban`	C1b	56.25	26.40
	Sarahan	RF 46 Lawasa	C4f	7.20	7.20
	Rajgarh	MF 81 Pataria	Whole	2.50	2.50
2016-17	Sarahan	SF 102 Banah Dhinni	Whole	9.82	9.82
	Habban	RF 19 Dalmu Kanog	C1e	11.45	11.45
	Rajgarh	RF 28 Bohal	C2c	12.50	12.50
2017-18	Rajgarh	RF 36 Surdhar	C2	14.73	14.18
	Sarahan	RF 43 Banona	C1b	32.50	32.50
2018-19	Sarahan	PF 14 Sewli	C1a	6.00	6.00
	Rajgarh	RF 28 Bohal	C1c	30.58	30.58
2019-20	Rajgarh	RF 32 Gadhol Pirag	C1d	25.75	25.75
	Habban	RF 14 Thaina	C2a (iii)	11.48	7.53

Year of felling	Range	Number and Name of Forest	Comptt./Sub Comptt.	Area (ha)	
				Gross	Under Chil
	Narag	SF 64 Kotla Pajola	C1	27.35	27.35
	Sarahan	PF 13 Bounta	C4c	18.00	18.00
2020-21	Rajgarh	MF 58 Phagu	Whole	8.00	8.00
	Sarahan	PF 13 Bounta	C3b	46.15	46.15
2021-22	Rajgarh	RF 34 Rajgarh	C2	20.70	20.70
	Habban	MF 36 Barar	Whole	2.90	2.90
	Sarahan	UF 4 Dharot Khalog	C1	20.80	20.80
2022-23	Rajgarh	RF 32 Gadhol Pirag	C1e	43.50	43.25
	Habban	RF 19 Dalmu Kanog	C1a	42.75	29.25
	Narag	PF 20 Motipur	C1	2.25	2.25
2023-24	Rajgarh	RF 31 Sanio Deedag	C1a	30.00	30.00
2024-25	Rajgarh	RF 28 Bohal	C2a	22.19	21.69
	Sarahan	RF 40 Palashon	C3b	17.55	17.55
		MF 156 Panwa	C5	5.75	5.75
2025-26	Rajgarh	RF 31 Sanio Deedag	C1a	24.67	24.67
	Sarahan	MF 156 Panwa	C4	13.15	11.35
	Sarahan	MF 152 Bag Pashog	C1	8.20	8.20
2026-27	Habban	RF 22 Shalogni	C3e	6.70	6.70
	Rajgarh	RF 29 Phagu	C1a	11.25	8.75
		RF 35 Matnali	C1	15.98	15.98
2027-28	Narag	UF 24 Bhajana	C1	27.00	20.25
		UF 15 Nohra	C3	9.00	9.00

Note : Felling will be done as per yield prescribed in Table 2.2.14

Periodic Block IV: Due to non execution of final felling in P.B.I. the young crop of this P.B. is suffering from suppression. The markings in this P. B. will entail the removal of over wood (IIA and above) suppressing the young crop. These fellings shall be carried out along with the thinning of young crop. The following marking rules are prescribed:

- All trees standing as over wood (Class II and above) over the established young crop is be marked for felling.
- In pole to middle aged crop. B/C grade thinning to be carried out retaining 625 trees per ha. at 4m apart on average.
- Dead, diseased, damaged and fallen trees will be marked for removal.
- Seed bearers likely to damage the young crop should invariably be lopped before felling.
- No broadleaved trees are to be marked. However, if such species are found suppressing the young crops, the same may be lopped or removed.
- After the main felling are over, the damaged poles will removed.

2.2.22 Subsidiary Silvicultural Operations:

Periodic Black I : These operations will be carried out in the same year following the main fellings and will consist of cultural operations and thinning as under :

(i) **Removal of Unfit and Inferior Trees:** The dead, fallen, damaged and also the marked trees not felled and trees of inferior species suppressing chil regeneration should be removed.

(ii) **Slash Disposal:** Any refuse left in the forest should be collected, dumped in depressions and burnt to ashes. In areas having advance growth and promising regeneration, the slash burning should be done carefully. Best season for slash burning is October and November.

(iii) **Effective Closure:** The slash disposal will be followed by effective closure against grazing for a period of 30 years to induce natural regeneration and its establishment. This may be done by barbed wire or stone wall fencing and repaired regularly.

(iv) **Artificial Regeneration :** If the natural regeneration does not keep pace and the area is lacking in adequate recruitments/ seedlings even after three years of closures, it should be resorted to artificial regeneration. The gaps and problematic areas should also be filled up artificially. Sturdy tube plants shall be used for planting 3m apart. The failures will be beaten up for 2-3 subsequent years to ensure the success of plantations. The area will be protected against fire. The forests with considerable blanks, fit for plantations, are listed in Table 2.2.17.

Table 2.2.17 : List of Forests fit for Artificial Regeneration.

Sr. No.	No. and Name of Forests	Compartment
1	RF 13 Dol	C4a
2	RF 18 Habban	C2d
3	-do-	C3b
4	RF 19 Dalmun Kanog	C1b
5	-do-	C2
6	RF 20 Dalmun Pitli	C1b
7	-do-	C1c
8	RF 29 Phagu	C1b

Sr. No.	No. and Name of Forests	Compartment
9	RF 31 Sanyo Deedag	C1b
10	RF 42 Shakore	C1b
11	RF 43 Banona	C2b
12	RF 45 Ghinni	C3a
13	-do-	C3b
14	-do-	C4a
15	-do-	C12
16	RF 46 Lawasa	C3b
17	RF 49 Pathroti	C1b
18	-do-	C3b
19	-do-	C5
20	RF 50 Lakhot Malhara	C2a
21	Rf 51 Chhandoli	C1
22	-do-	C3
23	RF 52 Argu Shina	C1b
24	RF 53 Jaintidhar	C1b
25	-do-	C2a
26	-do-	C2c
27	-do-	C3c
28	PF 9 Salana	C2
29	PF 15 Mandi	C1
30	-do-	C2b
31	PF 16 Kharana	C1a
32	PF 18 Kairi	C5
33	UF 2 Bani Bakholi	C3
34	UF 7 Bara Chakli	C4
35	UF 16 Nali Gussan	C1
36	UF 18 Gadshaya	C4
37	UF 21 Tikker	C2
38	MF 21 Sarwa	Whole
39	MF 39 Barot	Whole
40	MF 47 Tikkeri Balera	Whole
41	MF 135 Rister	C2
42	MF 145 Argu	Whole
43	MF 147 Kotla Pajola	Whole
44	MF 152 Bag Pashog	C2b
45	MF 154 Tikkeri Pajerli	C4b
46	MF 155 Anji	C2
47	SF 128 Banar	C1
48	SF 157 Chukhar Dhangiar	C5

v) **Choice of Species:** Chil will be the first choice. In lower hills especially in Ghinni block, Khair will be the supplementing species. No attempt should be made to introduce other species in this working circle. Chil seeds should be collected from tall, clean boled, well shaped, healthy trees, free from twist.

(vi) **Nursery Technique :** Temporary nurseries will be raised near the area where water is available so as to have atleast 15 cm high seedlings by the end of June. The work should be started in the beginning of the year and sowing in polythene tubes should be completed by the

end of winter. Nursery technique for chil and Khair have been standardised and need no elaboration.

(vii) New Plantations and Methods of Establishment: The area will be cleared of bushes and debris in winter and fenced. The pits 30cm x 30cm x 30cm should be dug 3m apart preferably along the contour and earth work completed by March /April. The planting should be started after couple of showers and completed by August. The failures will be beaten up in subsequent Years. Grass cutting may be allowed under strict supervision.

(viii) Treatment of Existing Plantations: The fencing of the existing plantations shall be repaired periodically to ensure effective closures against grazing. The casualties will be beaten up with well grown tube plants during rainy season. Weeding and bush cutting should be carried out atleast once in a year till the plants are high enough to escape suppression. Strict fire protection is to be ensured. Bushy chil saplings require pruning of the lower branches. Mechanical thinning in established Young regeneration is to be carried out where ever necessary.

(ix) Tending : It consists of weeding bush cutting and cleanings which are to be done as pre requirement of the area. In plantation, the weeding and bush cuttings are essential atleast once after the rainy season, for three consecutive years. Cleaning may be necessary in clustered regeneration to guard against the fire hazard and space them out uniformly to reduce competition and provide growing space. Mechanical thinning are to be carried out in saplings and poles keeping an average distance of 2.5 m from plant to plant.

(x) Grass Cuttings : Grass cuttings will not ordinarily be allowed except when the high growth of grass may interfere with the chil seedling or dry grass becomes a fire hazard to the plantations/ natural regeneration. It may be allowed when adequate numbers of seedlings have over topped the general grass level. It should be allowed in compartments as a whole when it is fully regenerated. Strict supervision is essential to avoid reckless cuttings of seedlings alongwith the grass. The best time for grass cutting is October.

Periodic Blocks II and III : No thinning is prescribed in these periodic blocks due to open nature of crop. Fellings will be carried out purely on hygienic considerations for the removal of dry uprooted, fallen and damaged stems only under salvage markings as

Periodic Blocks Iv : Like P.B. I areas, the slash disposal has to be carried out in PB IV areas in the same year and in the same manner after the final fellings is carried out and the young crop is thinned. The damaged and left over unfelled trees shall have to be removed. The dry uprooted and fallen trees shall be removed under salvage markings. B/C grade thinning has to be carried out spacing the trees 4m apart.

2.2.23 Fire Protection and Control Burning : The chil forest are susceptible to fire of accidental and incendiary types. Therefore the fire protections is of utmost importance and needs special attention. The fire protection measures as per recommendations of Khosla committee issued vide Memo No. A.34011/6/95 –FF Dated 11th July 1995 (Appendix XVII of Volume II) should be followed. The felled areas of P.B.I shall remain fire protected until the regeneration have attained the average height of 5m. The following measures are suggested for effective fire protection.

Fire line : There are quite a few fire lines existing in this division. The details are given in appendix VI. In addition to these fire lines, quite a few new fire lines are proposed which should be laid out at the earliest as per details given under para 1.12.16. All the existing and the proposed fire lines should be maintained by keeping them clear of bushes, needles and other inflammable material.

- (i) Control Burning :** Entire chil areas shall be control burnt departmentally once in three years as per programme given in Appendix VI except for the regeneration areas where the plants are less than 2.5 m in height. Annual control burning in P.B.I

areas with the regeneration of over 2.5 m height shall be carried out till the regeneration attains an average height of 5m grasses, resin shavings and other inflammable material upto a radius of 2.5 m at the time of setting of resin.

- (ii) Most of the fires generally spread from Ghasnies which are burnt almost every year. Also during spring every year, the farmers set fire to the stubble in the fields which spreads to the adjoining forests. It is therefore, imperative to protect the forests either by burning the ghasnies under proper supervision or isolating them from the forest zone by providing fire lines.
- (iii) **Removal of Pine Needles** : Local people should be allowed and encouraged to collect the pine needles for their domestic requirements and use as packing material for vegetables and fruits. This will reduce the fire hazard to a great extent.
- (iv) **Fire Watchers** : Adequate fire watchers should be appointed during the fire season with set of equipments for keeping fire lines, paths and roads clear of the inflammable material and watching the forests from strategic points with fire fighting equipments provided to them.
- (v) The right holders are required to render all possible help in detecting and extinguishing the forest fires. In case of negligence, their right should be suspended. Use of reward and punishment should be made to secure the cooperation of the local people.
- (vi) Proper education through extension and publicity media can go a long way in making people aware of damage due to fire, the intensity of which is usually clouded by their innocence.

2.2.24 Exercise of Rights and Concessions : There is tremendous pressure of Right Holder's demand on the forests at privileged rates. This can be met subject to the silvicultural availability of trees. Unless the timber distribution rates are linked with the market rates, it is not possible even to meet the forest management expenditure. The average annual timber supplied to the right holders in the division is 912 m³. Due to under stocking of forests, this is to be met with only from P.B.I and IV prescribed for felling. Also the dry and fallen trees should primarily be utilized to meet the Right Holder's demand. No green trees should be granted to right holders. The unrestricted grazing should be checked and stall feeding encouraged.

2.2.25 Grazing : The P.B.I areas will remain closed to grazing if the regeneration is established. It may be thrown open to controlled grazing if the regeneration so warrants. Specific blank spots in the P.B.I areas should be kept completely forbidden from grazing. In other periodic blocks, the controlled grazing is permitted.

2.2.26 Resin Tapping : Presently the resin tapping is being done by the H.P. State Forest Corporation Ltd. Due to defective and continuous resin tapping, the chil trees have become highly susceptible to the wind fall. Large scale wind fall has resulted in tremendous loss of growing stock and resin yield. To overcome this, it is essential to switch over to rill method from conventional channel method. Defective resin tapping combined with frequent fires have resulted in large scale drying of trees. At places, good number of trees have almost been girdled leaving no surface for tapping.

2.2.27 Regeneration Assessment : It is to be carried out every year for P.B.I areas by the territorial staff before the preparation of A. P. O. for next year. In case regeneration does not keep with fellings, corrective measures shall be taken by resorting to artificial regeneration to restock the area in prescribed time.

CHAPTER - III

THE DEODAR- KAIL WORKING CIRCLE

2.3.1 General Constitution : This working circle covers all the moderate to well stocked (density >0.3) reserved, protected, mushterqua and shamlat/ ceiling land forests bearing deodar and kail as the principal species pure or mixed and considered suitable for working under a system of concentrated regeneration fellings. This working circle covers an area of 4, 173.74 ha as per details given in table 2.3.1.

Table 2.3.1 : Area Statement of Deodar –Kail Working circle

Sr No	Legal Classification of forests	Area (ha.)		
		Gross Area	Stocked (Chil + Deodar + Kail + Spruce)	Stocked (Deodar + Kail)
1	Reserved Forests (R.F.)	3166.64	2461.43	2357.29
2	Protected Forests (P.F.)	595.63	535.33	528.78
3	Mushterqua Forests (M.F.)	379.08	296.28	258.03
4	Shamlat/Ceilingland Forests (S.F.)	32.39	27.39	25.02
	Total :	4173.74	3320.43	3169.12

The details of the area statement by Ranges, Forest Blocks and comptt/ Sub compartments showing gross and stocked area under various species are given in Appendix II.

2.3.2 General Character of Vegetation : The crop is mainly deodar and kail occurring either gregariously in pure patches or in mixture of varying proportions. Deodar is predominantly middle aged with slight to fair admixture of mature trees, whereas kail is of young to middle age group. Stocking in general is moderate to fairly dense. Natural regeneration of deodar is deficient and is found either in few pockets or in scattered form. Kail being pioneer species is coming up naturally in open places and along the fringes.

In the upper reaches spruce is found mixed with deodar and kail. Along the nallas and depressions and at places dense crops of ban oak pure or mixed with Mohru are also found. Along the lower limits deodar is confined to sheltered places only. Chil is met within the lower altitudinal zone and is mainly confined to spurs and warmer aspects.

2.3.3 The forests included in this working circle mainly conform to 12/C I C, 12/ C I F and 12/ 2SI of Champion and Seth s Types which have already been described in detail in Chapter –of part I of the plan.

2.3.4 Blocks and Compartments: No change has been made in the existing boundaries of forests and compartments except R F 29 Phage C3b which has been spitted into two separation the chil area from deodar. Also some compartments in Habana Range have been united together to from one comptt. Like RF1 Tharu C3c and C3d, RF 2 Kufar Backlog CIA and C2c and C2d. The Sham at forests have been brought for the first time under working plan and forests compartments have been formed keeping in view the area extent, natural boundaries and crop conditions. Such forests have been numbered and named after Mauza. All the compartments/ sub- compartments are distinguishable on the ground.

2.3.5 Felling Series: The area has not been divided into separate felling series.

2.3.6 Special objects of management : Without prejudice to the general objects of management, the special objects of management will:

- i) To convert the irregular and uneven aged crops into more or less uniform, normal, even aged crops.
- ii) To restock the P.B.I areas as soon as possible by resorting to artificial regeneration.
- iii) To obtain progressive yield in perpetuity after meeting the legitimate demands of the local people.
- iv) To preserve and protect the forests to maintain the mountain ecosystem.

2.3.7 Area and Allotment : The gross area of this working circle is 4,173.74 ha with 3,169.12 ha under deodar and kail (75.93 %) . The detailed distribution of comptt / sub comptt. Into periodic blocks by Ranges and legal classification of forests is given in Appendix I and the summary thereof is presented in Table 2.3.2.

2.3.8 Analysis and valuation of the crop:

2.3.9 Stock Maps: Stock maps for all the compartments / sub- comptts. Have been prepared on 1: 15,000 scale maps. For sham at forests, the revenue maps have been reduced nearest to the scale. The areas under different categories and species are given in Appendix II and abstract produced in Table 2.3.3.

2.3.10 Site quality and age classes: Each compartment / sub- comptts. Has been assigned an average quality class determined by ocular estimation of height and checked by actual measurement. The average quality for deodar and kail is [(F.R.I.). The crop is mostly of mixed age classes, the middle age classes predominating and the younger and mature deficient.

2.3.11 Density: The density of each compartment /sub – compartment was determined by ocular estimate and recorded in compartment history files Most of the reserved and protected forests are well stocked. The mushterqua and sham at forests are rather open. The density varied from 0.4 to 0.8 with an average of 0.5 to 0.6.

2.3.12 Enumerations : Total enumeration in 10 cm diameter classes down to 10 cm d.b.h. have been carried out in all the Deodar- kail bearing forests. The details have been given in Appendix III.

Table 2.3.2 : Statement of area and allotment.

Range	RF		PF		MF		SF		Total	
	Gross	Stocked (D+K)	Gross	Stocked (D+K)	Gross	Stocked (D+K)	Gross	Stocked (D+K)	Gross	Stocked (D+K)
Habban	1176.32	947.41	52.75	50.25	34.00	23.00	---	---	1263.07	1020.66
Rajgarh	40.55	29.05	---	---	---	---	---	---	40.55	29.05
Total	1216.87	976.46	52.75	50.25	34.00	23.00	---	----	1303.62	1049.71
Habban	1685.83	1182.39	491.28	435.93	244.43	158.98	19.02	19.02	2440.56	1796.32
Rajgarh	263.94	198.44	51.60	42.60	100.65	76.05	13.37	6.00	429.56	323.09
Total	1949.77	1380.83	542.88	478.53	345.08	235.03	32.39	25.02	2870.12	2119.41
G. Total	3166.64	2357.29	595.63	528.78	379.08	258.03	32.39	25.02	4173.74	3169.12

Table 2.3.3 : Species wise stocking of Deodar Kail Working circle and Area statement

Stocking spp.	Chil	Oaks	Deodar	Kail	Mixed Deodar + Kail + chil	Spruce	Culturable blank	Un culturable blank	Included cultivation	Stocked	Un stocked	Total
Area Ha.	89.39	475.09	1703.06	1437.82	379.64	10.52	214.50	14.80	148.92	3795.52	378.22	4173.74

Summary of enumeration results, growing stock and C.A.I. of important conifer species for all the forests allotted to this working circle is given in Table 2.3.4 while Table 2.3.5 summarises the detailed data of Deodar and Kail allotment – wise. The present growing stock is 228.87 m³ per ha which is 73.83% of the normal growing stock which should be 310m³ per ha. The table statement showing the comparison of stocking during past and present plan is given in Table 2.3.6. The vast difference of stocking due to non felling of several forests, inclusion of new forests and the partial enumeration carried out in the past plan which had a very high standard deviation the estimate of growing stock unreliable.

2.3.13 Regeneration : The regeneration in P.B.I areas is not satisfactory. It is lagging the expectations. Efforts of raising plantations have met with partial to scanty success. The luxuriant undergrowth after seeding felling seems to be the main cause of unsuccessful regeneration. It is smothered before the establishment. Thorough bush cuttings and rising of massive plantations with nursery grown seeding followed by frequent weeding and beating up of mortality is the only solution to regenerate the area fully.

The extent of regeneration in various stages is also computed and presented in Table 2.3.8.

Table 2.3.8 : Stages of regeneration and area extent of Deodar-Kail Working Circle.

Stages	Area (ha)			
	Fully regenerated (≥75%)	Moderately regenerated (50 to 75%)	Poorly regenerated (25- 50%)	Total
Seedling	5.75	---	---	5.75
Sapling	0.77	---	---	0.77
Pole	52.83	17.05	10.98	80.86
Mixed	575.08	168.36	15.15	758.59
Total	634.43	185.41	26.13	845.97

Table 2.3.4 Number and volume of conifer trees in Deodar Kail Working circle (Total area : 3320.43 ha)

Species	Parameters	Diameter classes in cm									Total
		10-20 V	20-30 IV	30-40 III	40-50 IIA	50-60 IIB	60-70 IA	70-80 IB	80-90 IC	> 90 ID	
Deodar	Number	395187	284652	242504	149553	99004	58479	26378	5189	9108	1270054
	Volume (m ³)	27939.72	40306.72	171668.58	211737.14	252301.79	206986.42	126975.78	31590.11	64556.59	1134062.86
	C.A.I. (m ³)	3783.04	2452.66	4271.11	2805.52	1791.34	1345.41	825.34	205.34	419.62	17899.38
Kail	Number	125014	107850	91252	46517	28375	4161	747	63	10	403989
	Volume (m ³)	8838.49	15271.56	64597.29	65858.77	72310.85	14727.86	3595.83	383.54	70.88	245655.07
	C.A.I. (m ³)	1196.73	929.27	1607.18	872.63	513.41	95.73	23.37	2.49	0.46	5241.28
Chil	Number	38606	25540	12722	4669	1890	1050	286	81	13	84857
	Volume (m ³)	1945.74	6382.45	8709.48	6323.69	4270.08	3569.37	1365.54	517.18	106.99	33190.52
	C.A.I. (m ³)	88.73	239.34	234.29	142.92	84.97	55.68	15.57	4.76	0.71	866.96
Fir/Spruce	Number	17571	10007	6572	2938	1609	763	359	72	18	39909
	Volume (m ³)	2126.09	2401.68	6190.82	5141.5	4827.00	3357.2	2258.11	534.6	157.86	26994.87
	C.A.I. (m ³)	92.59	103.27	146.41	101.29	64.44	39.61	11.74	2.7	0	562.06
Total	Number	576378	428049	353050	203677	130878	64453	27770	5405	9149	1798809
	Volume (m ³)	40850.04	64362.41	251166.18	289061.1	333709.72	228640.85	134195.26	33025.43	64892.33	1439903.31
Number of trees per Ha.		173.59	128.91	106.33	61.34	39.42	19.41	8.36	1.63	2.76	541.74
Volume (m ³) per ha.		12.3	19.38	75.64	87.06	100.5	68.86	40.42	9.95	19.54	433.65

Number and volume of Deodar Kail trees allotment-wise

P.B.	Species	Para meters	Diameter classes in cm									
			10-20 V	20-30 IV	30-40 III	40-50 IIA	50-60 IIB	60-70 IA	70-80 IB	80-90 IC	> 90 ID	Total
I (1049.71 ha)												
	Deodar	N	214550	141931	105569	66006	52716	35081	17688	1501	609	635651
		V	15168.69	20097.43	74732.3	93451.29	134341.45	124169.2	85144.73	9137.94	4316.53	560559.55
	Kail	N	41170	29665	23388	8198	3726	1554	556	63	10	108330
		V	2910.72	4200.56	16556.37	11606.73	9495.34	5500.38	2676.42	383.54	70.88	53400.93
	Total	N	255720	171596	128957	74204	56442	36635	18244	1564	619	743981
		V	18079.4	24297.99	91288.66	105058.02	143836.79	129669.58	87821.14	9521.48	4387.41	613960.48
		N/Ha	243.61	163.47	122.85	70.69	53.77	34.9	17.38	1.49	0.59	708.75
	V/Ha	17.22	23.15	86.97	100.08	137.03	123.53	83.66	9.07	4.18	584.89	
Un- allotted (2119.41 ha)	Deodar	N	180637	142721	136935	83547	46288	23398	8690	3688	8499	634403
		V	12771.04	20209.29	96936.29	118285.84	117960.34	82817.22	41831.05	22452.18	60240.06	573503.31
	Kail	N	83844	78185	67864	38319	24649	2607	191	0	0	295659
		V	5927.77	11070.99	48040.93	54252.04	62815.51	9227.48	919.42	0	0	192254.14
	Total	N	264481	220906	204799	121866	70937	26005	8881	3688	8499	930062
		V	18714.39	31282.49	144988.83	172541.17	180806.87	92045.97	42833.27	22444.55	60276.02	765933.56
		N/Ha	124.79	104.23	96.63	57.5	33.47	12.27	4.19	1.74	4.01	438.83
		V/Ha	8.83	14.76	68.41	81.41	85.31	43.43	20.21	10.59	28.44	361.39
(3169.12 ha)	Grand Total	N	520201	392502	333756	196070	127379	62640	27125	5252	9118	1674043
		V	36778.21	55578.28	236265.87	277595.91	324612.64	221714.28	130571.61	31973.65	64627.47	1379717.93
		N/Ha	164.147	123.852	105.315	61.8689	40.19381	19.7657	8.5592	1.6572	2.8771	528.2359
		V/Ha	11.6101	17.5381	74.5562	87.595	102.4397	69.9612	41.227	10.087	20.404	435.4187
	Total C.A.I. (m³)		4979.77	3381.94	5878.29	3678.15	2304.75	1441.14	848.72	207.83	420.08	23140.66
	N = Number of trees			V = Volume (M³)								

Table 2.3.6: Comparative stocking (Deodar + Kail) during past and present plan

	Diameter classes in cm									
	10-20 V	20-30 IV	30-40 III	40-50 IIA	50-60 IIB	60-70 IA	70-80 IB	80-90 IC	> 90 ID	Total
N (Past)	410743	241343	176050	110156	57705	29262	15650	8120	868	1049897
N (Present)	520201	392502	333756	196070	127379	62640	27125	5252	9118	1674043
V (Past)	29039.54	34174.17	124625.8	155958.86	147055.42	103572.86	75334.4	49433.75	6152.3	725347.1
V (Present)	36778.21	55578.28	236265.87	277595.91	324612.64	221714.28	130571.61	31973.65	64627.47	1379717.93
N/ha (Past)	129.61	76.15	55.55	34.7	18.21	9.23	4.94	2.56	0.27	331.22
N/ha (Present)	164.15	123.85	105.32	61.87	40.19	19.77	8.56	1.66	2.88	528.24
V/ha (Past)	9.16	10.78	39.33	49.21	46.4	32.68	23.77	15.6	1.94	228.87
V/ha (Present)	11.61	17.54	74.55	87.59	102.43	69.96	41.2	10.09	20.39	435.36

It is obvious the regeneration is inadequate.

2.3.14 Silvicultural System: All the deodar – Kail forest allotted to this working circle look alike in age. It is difficult to divide these forests in different age groups or periodic blocks. The natural regeneration in the areas felled in the past is unsatisfactory. As such this forest will be managed under with Indian Irregular Shelter wood system with Floating periodic Block Method. P.B.I has definitely been identified and shall be taken up for seeding felling followed by planting of deodar. In case of Kail, natural regeneration shall be assisted by sowing wherever necessary. The rests of the forests form unallotted P.B where salvage markings and improvement fellings shall be carried out. In next revision of the working plan, fully regenerated compartments / sub compmts. Shall be transferred to P.B IV and fresh areas fit for regeneration shall be added, making the total extent of P.B.I about 1/14th of total area. The system allows fellings according to the nature of the ground and permits certain amount of irregularity to avoid sacrifice of immature crops and advance growth. On steep and cut up slopes marking conform to selection principles.

2.3.15 Regeneration period : Young deodar and kail crop is considered established when it attains a height of over 5m and is thus reasonably safe from damage by grazing and fires. Deodar and Kail of quality II attain this height at age 18 and 16 years respectively. At the age 30 years Deodar and Kail attains an average diameter and height of 11 cm and 9.45 m and 13cm 12.5m respectively. Thus it is safe to adopt a regeneration period of 30 years. Keeping in view the fellings done in some forests during the period of the plan under revision, a period of 15 years is taken as already over. Thus the remaining operations of fellings and planting have to be completed during the plan period i.e. within 15 years.

2.3.16 Rotation and conversion period : The management of Deodar and Kail forests aims at the utilization of crop mainly for timber. The statistical data indicate that the Deodar and Kail of this division attain an average diameter of 55 cm (class IIB) in 125 years. The C.A.I and M.A. I curves for quality II deodar intersect at the age 105 years and for quality II kail, it culminate at 100 years. Giving an allowance of 10 years for recruitment period, the adoption of 120 years of rotation period will also coincide with the culmination of the mean annual increment. The rate growth of deodar and Kail indicates a diameter of 53 cm in 120 years which is an acceptable timber size suiting the market requirements. Forests allotted to this working circle are in the process of conversion and as such rotation is only of academic interest, until such time, the entire forests are converted. The working plan is more concerned with conversion period which has been fixed as 120 years which seems quite reasonable and justified. A period 15 years corresponding to the plan under revision may be taken as elapsed. Thus the forests are to be converted within a period of next 105 years.

2.3.17 Exploitable diameter: The exploitable diameter of kail and Deodar is fixed at 55 cm d.b.h.

2.3.18 Division into periods and allotment to periodic blocks: Definite allotments have been made to P.B.I while the rest of the forest has been grouped under P.B unallotted. About one third of the total area of this circle i. e. 1,303. 62 ha in extent is allotted to P.B.I and the rests 2,870.12 ha remains as P.B unallotted. The P.B.I includes : felled and unfilled areas of the past plan ; some of the old P.B.II and P.B.III areas suitable for felling and regeneration and the areas where the regeneration is progressing and needed at other places. The Range and Forest class wise allotment is given in Table 2.3.10 while the details of individual compartments and sub compartments is given in Appendix I.

Table 2.3.10 Range and forest Class wise area allotment

Range	Forest Class	P.B.I. (ha)		P.B. Unallotted (ha)	
		Gross	Stocked (Deo+kail)	Gross	Stocked (Deo+kail)
Habban	RF	1176.32	947.41	1685.83	1182.39
	PF	52.75	50.25	491.28	435.93
	MF	34.00	23.00	244.43	158.98
	SF	---	---	19.02	19.02
	Total	1263.07	1020.66	2440.56	1796.32
Rajgarh	RF	40.55	29.05	263.94	198.44
	PF	---	---	51.60	42.60
	MF	---	---	100.65	76.05
	SF	---	---	13.37	6.00
	Total	40.55	29.05	429.56	323.09
	G. Total	1303.62	1049.71	2870.12	2119.41

2.3.20 In uniform system with a floating P.B.I the sequential operations are involved, as the areas move from one periodic block to another. It is essential to keep a check on regeneration and other operations during the conversion period. Instead of progression, regression has taken place in some areas. As a result such areas have been allotted to quite different periodic blocks and working circles.

2.3.21 Calculation of yield : The yield from this working comprises the yield from P.B.I area only. No separate yield from P.B unallotted areas has been calculated as the forests are under stocked. However, salvage marking in such areas will be done. The dry, dead, fallen and damaged trees from P.B unallotted forests will be utilized chiefly to meet the right holders demand and any surplus if left over, will be extracted commercially. Volume of all such removals shall be counted against the yield of the working circle. The unfit trees have been excluded from the enumerations and will not be counted against the prescribed yield.

2.3.22 Yield from P.B.I: The entire forests have been enumerated down to 10 cm d.b. h. The details are given in Appendix III and the abstract in Table 2.3.12. The yield from P.B.I is based on the volume of Deodar and Kail trees > 20 cm d. b. h minus the volume of trees to be retained as seed bearers and advance growth. As a safeguard against over fellings and to improve the growing stock, the increment has not been taken into account. The species wise yield is calculated as under :

Table 2.3.12 : Enumeration abstract of P.B.I areas

Species	Para meters	Diameter classes in cm									Total
		10-20 V	20-30 IV	30-40 III	40-50 IIA	50-60 IIB	60-70 IA	70-80 IB	80-90 IC	> 90 ID	
Deodar	N	214550	141931	105569	66006	52716	35081	17688	1501	609	635651
	V	15168.69	20097.43	74732.3	93451.29	134341.5	124169.2	85144.73	9137.938	4316.531	560559.6
Kail	N	41170	29665	23388	8198	3726	1554	556	63	10	108330
	V	2910.719	4200.564	16556.37	11606.73	9495.338	5500.383	2676.417	383.5377	70.879	53400.93
Chil	N	18779	11904	4923	2404	1081	661	147	42	0	39941
	V	946.4616	2974.81	3370.286	3255.978	2442.303	2247.003	701.8662	268.1658	0	16206.87
Fir/Spruce	N	10959	6246	4094	1837	1008	472	220	42	10	24888
	V	1326.039	1499.04	3856.548	3214.75	3024	2076.8	1383.8	311.85	87.7	16780.53

2.3.23 Deodar and Kail: The volume of all the trees > 20cm d.b.h. has been taken into account for yield calculations. At the time of markings, all the younger trees up to V class shall be retained as a part of the future crop and will not count towards yield. Since compact group of poles shall be retained as advance growth or may not be available for fellings due to other reasons, only 2/3 of III and IV class trees shall be available for felling. About 10% of the class I and II trees will not be available on account of their locations on broken grounds, rocky cliffs, precipices and rugged terrain and as such, shall be retained. IN total 30 seed bearers comprising of 10 each of I, IIB and IIA classes shall be retained per ha over an areas af 1,049.71 ha under Deodar and Kail. The fellings will be completed in a period of 15 years i.e. during the plan period. The annual yield, thus calculated is as under :

$$\begin{aligned}
 \text{Annual yield} &= \frac{\text{Total growing stock in P.B.I done to 10 cm d.b.h. (Volume of seed bearers to be retained at the rate of 30 trees per ha over 1049.71 ha + 1/3rd volume of III and IV class trees + 10% of I & II class trees + Volume of V class trees)}}{\text{Period of the plan (15 years).}} \\
 &= \frac{613960.48 - (75.037 \text{ M}^3 \times 1049.71 + 1/3 \text{ of } 115586.65 + 10\% \text{ of } 480294.42 + 18079.4)}{15} \\
 &= \frac{613960.48 - (78767.09 + 38528.89 + 48029.44 + 18079.4)}{15} \\
 &= \frac{613960.48 - 183404.82}{15} \\
 &= \frac{430555.66}{15} \\
 &= 28703.71 \text{ M}^3
 \end{aligned}$$

The yield is fixed at 14300 M³ to improve the growing stock.

2.3.24 Chil: Chil is found in pure as well as in mixed patches in limited numbers. Out of total 21 compartments, only 10 compartments can be considered for chil exploitation. It will be of an academic interest only to fix the annual yield of chil in this working circle as the volume is meagre, trees are scattered and it is uneconomical to exploit chil trees separately. Thus the chil trees will be marked and felled alongwith the main crop of Deodar and kail in the year when such compartments find their place in felling programme. The growing stock of chil fit for exploitation is presented in Table 2.3.13. The calculations of available yield during the plan and the annual yield are given below :

Table 2.3.13 : Enumeration Abstract of exploitable Chil Crop in P.B.I areas of Deodar Kail Working circle.

Sr. No	Forest Comptt.	Area in Ha.	Diameter classes in cm									Total
			10-20 V	20-30 IV	30-40 III	40-50 IIA	50-60 IIB	60-70 IA	70-80 IB	80-90 IC	> 90 ID	
1	RF 7 Khabbar C1	4.90	840	490	240	376	8	1				1955
2	RF 9 Pajoga C4a	0.15	19	15	18	5	2				1	60
3	RF 13 Dol C2a	26.85	6834	5252	1584	447	263	126	8	8		14522
4	RF 13 Dol C 3b	7.00	1186	824	570	236	126	64				3006
5	RF 13 Dol C3c	1.76	42	211	223	214	131	93	27			941
6	RF 15 Dalmun Sudhar C1e	22.67	3437	2341	1155	478	157	80	34	14		7696
7	RF 17 Dalmun C2b	16.66	3348	1583	487	234	109	106	2			5869
8	RF 23 Oria C1b	7.85	1339	668	374	284	222	158	68	12		3125
10	R.F. 36 Surdhar C1b	5.26	1270	224	148	72	34	14	2	3	0	1767
	Total	93.1	18315	11608	4799	2346	1052	642	141	37	1	38941
	Volume in M ³		923.08	2900.84	3285.40	3177.42	2376.78	2182.41	673.22	236.24	8.23	15763.62

Table 2.3.14 : Enumeration results and growing stock of spruce and fir in P.B.I of Deodar Kail working circle.

Sr. No.	Forest Comptt.	Area in Ha.	Diameter classes in cm									Total
			10-20 V	20-30 IV	30-40 III	40-50 IIA	50-60 IIB	60-70 IA	70-80 IB	80-90 IC	> 90 ID	
1	RF 3 Gotari	C 2 a	631	273	29	14	9	3				959
2	RF 3 Gotari	C 5 c	1066	777	426	121	62	22				2474
3	RF 3 Gotari	C 5 g	925	762	509	127	31	3	1			2358
4	RF 4 Manwa	C 3	300	204	204	162	34	48	14			966
5	RF 4 Manwa	C 5	275	252	196	103						826
6	RF 7 Khabbar	C 1	202	126	66							394
7	RF 7 Khabbar	C 4	1229	814	570	350	360	287	180	40	11	3841
8	RF 8 Ber Jamoli	C 2 d	3472	2020	1738	832	456	101	24	4		8647
9	RF 9 Pajoga	C 3 a	1641	712	146	57	27					2583
10	RF 9 Pajoga	C 4 a	541	65	22	2						630
	Total		10282	6005	3906	1768	979	464	219	44	11	23678
	Volume in M ³		1244.12	1441.20	3679.45	3094.00	2937.00	2041.60	1377.51	326.70	96.47	16238.05

$$\begin{aligned}
\text{Available yield :} &= \text{Total growing stock in M}^3 - \text{Volume of 20 mother trees per ha over an area of 93.1 ha} - 40\% \text{ volume of III \& IV class trees} - \text{Volume of V Class trees.} \\
&= 15763.62 - (38.41 \times 93.1) - (40\% \text{ of } 6186.24) - 923.08 \\
&= 15763.62 - (3575.97 + 2474.49 + 923.08) \\
&= 15763.62 - 6973.54 \\
&= 8790.08 \text{ M}^3
\end{aligned}$$

Or say 8500 M³

$$\begin{aligned}
\text{Annual yield} &= \frac{8500}{15} \\
&= 566.67 \text{ M}^3
\end{aligned}$$

Or say 500 M³

2.3.25 Spruce and Fir: Spruce and fir trees are generally found growing mixed with deodar and kail sporadically on the higher reaches or along the main ridges in narrow strips or mixed with oaks on the higher altitudes. It is not possible to ascertain the extent of area under spruce and fir. The species fail to regenerate naturally under concentrated regeneration fellings. As such only selective marking of spruce and fir trees alongwith the main felling is prescribed. Half of the trees > 60 cm d.b.h. shall be retained and the remaining shall be marked for felling if available silviculturally. Out of 19 compartments having spruce and fir trees, only 10 compartments qualify for selective exploitation. The enumeration results of such compartments in respect of spruce and fir trees with volume are compiled in Table 2.3.14.

The available yield during the period and annual yield is calculated as under: -

$$\begin{aligned}
\text{Available yield (M}^3\text{)} &= \frac{\text{Volume of trees } \geq 60 \text{ cm d.b.h.}}{2} \\
&= \frac{3842.28}{2} \\
&= 1921.14 \text{ or say } 1900 \text{ M}^3 \\
\text{Annual Yield} &= \frac{1900}{15} \\
&= 126.67 \text{ M}^3 \\
&= 125 \text{ M}^3
\end{aligned}$$

2.3.26 Yield from P.B. Unallotted : The forest in general is under stocked as compared to normal growing stock indicated in yield table. Thus there is no scope for removal by way of

thinning cum improvement fellings. Therefore no green felling are prescribed. Fellings in such forests shall be confined to removal of dead, fallen, damaged and uprooted trees of Deodar, kail chil, Spruce and Fir under salvage markings. The demands of right holders are invariably to be met from such forests especially from salvage markings. In order to safeguard future yield, no major fellings are prescribed, and therefore, no yield has been calculated for this Periodic Block Unallotted but all the removals will count towards the yield of the working circle. The abstract of enumeration showing the growing stock of commercial conifer species of P.B. Unallotted is presents in Table 2.3.15.

2.3.27 Total prescribed yield: The annual yield from the forest can be to the extent of C.A.I. The C.A.I. of the growing stock down to 10 cm d.b.h. for Deodar, Kail, chil, Spruce and Fir has been working out by summing up of the volume increment put up in each diameter class and presented in Table 2.3.16.

Table 2.3.16 : Current Annual Increment (M³)

Species	C.A.I (M ³)
Deodar	17899.38
Kail	5241.28
Total (Deodar +Kail)	23140.66
Fir Spruce	562.06
Chil	866.96

The annual removals from this working circle may be to the extent of 23000 m³ for Deodar and kail, 750 M³ for Fir & Spruce and 850 m³ for chil without disturbing the existing status of stocking. But since the Forests are generally under –stocked, it is prescribed that the only 70 % of the C.A.I. be the limit of total removals from this working circle. Thus the total prescribed yield from the Deodar –kail Working Circle is fixed at 16100 m³ for Deodar and Kail and 525 M³ for Fir & Spruce and 595 m³ for Chil. As would be evident from para 2.3.23, above, the yield available from P.B.I are 14300 m³ from Deodar and Kail, 500 M³ from Chil and 125 M³ from Spruce and fir, Therefore, there's remains a margin of 1800 m3 (16100-14300) from Deodar and Kail , 400 m3 (525-125) from Spruce and Fir and 95 m3 (595-500-) from chil to adjust the salvage removals, without affecting the removals from P.B. I. areas. The annual prescribed yield from this working circle is tabulated below:-

Table 2.3.17 : Prescribed Annual yield (M³) from Deodar Kail Working Circle

Species	P.B.I	P.B. Unallotted	Total
Deodar +Kail	14300	1800	16100
Spruce+Fir	125	400	525
Chil	500	95	595

However, it is definitely clarified here that no attempts should ever be made to remove the total prescribed yield from the working circle, as it has been prescribed to adjust the salvage removals only, which generally occur, without affecting the required silvicultural removals from the P.B.I.

Table 2.3.15 : Enumeration abstract of P.B. Unallotted areas

Species	Para meters	Diameter classes in cm									Total
		10-20 V	20-30 IV	30-40 III	40-50 IIA	50-60 IIB	60-70 IA	70-80 IB	80-90 IC	> 90 ID	
Deodar	N	180637	142721	136935	83547	46288	23398	8690	3688	8499	634403
	V	12771.04	20209.29	96936.29	118285.84	117960.34	82817.22	41831.05	22452.18	60240.06	573503.31
Kail	N	83844	78185	67864	38319	24649	2607	191	0	0	295659
	V	5927.77	11070.99 6	48040.93	54252.04	62815.51	9227.48	919.42	0	0	192254.14
Chil	N	54342	39548	26620	5638	1568	466	360	127	64	128733
	V	2738.84	9883.05	18224.05	7636.11	3542.58	1584.12	1718.86	810.88	526.74	46665.22
Fir/Spruce	N	64	42	64	0	6	0	0	0	0	176
	V	7.74	10.08	60.29	0	18	0	0	0	0	96.11

2.3.28 Control of Yield: The removals of various species in a particular year will neither conform to nor equalise the prescribed yield for each species. In actual practice it is ruled out, As mentioned earlier, the chil and spruce/fir species will be felled in that year only when compartments containing such species are taken up for felling according to felling programme. It is, therefore, imperative that markings in the forests should be carried out strictly on silvicultural principles. However, yield will be shown by species in control forms and deviation statements. All removals down to V class trees will count towards the yield of the working circle. The yearly excess or deficit of each species will not exceed 10% and shall be carried forward in control forms and deviation statement adjusted at the end of every 5 years when it should be within $\pm 10\%$ of the prescribed yield. No efforts should be made to obtain the prescribed yield, if it is not available silviculturally. The markings should be done purely on silvicultural considerations, and any excess yield available should be adjusted in future fellings. If any forests from P.B. Unallotted is burnt seriously or damaged and destroyed due to one or the other reason, it should forthwith be transferred to P.B.I for purpose of restocking and instead an equivalent area of P.B.I. in which the regeneration fellings are still to be undertaken, should be relegated to the P.B. Unallotted. Similarly in case of snow or wind damage, for every 100 M³ of the volume marked, 1 ha of the area should be taken up for compensatory plantation. For large scale damage, an area of P.B.I having expected yield equivalent to the volume marked should also be relegated to P.B. Unallotted. The right holders be marked trees from area to be worked and extraction allowed before handing over the area for working by State Forest Corporation or other Agencies. The yield prescribed from P.b. Unallotted is not binding and will depend upon the sanitation conditions of the compartment. Felling in P.B.I areas will depend on the progress of regeneration.

2.3.29: It is, therefore, most essential that critical survey of felled P.B.I areas is carried out annually so as to assess the progress of regeneration. If it is revealed that regeneration is not keeping pace with the felling, further felling shall be discontinued or deferred till such time by which regeneration in the felled P.B.I. areas gains momentum. Regeneration will be considered inadequate if the mortality is more than 50%, 45%, 35% and 25% for one year, 2 year, 3 year and 4 year old plantations. Under such circumstances, the area under felling will be reduced in direct proportion to the area under inadequate regeneration. All such deviations will have to be got approved from the CCF through C.F. Working plan.

2.3.30 Table of Felling: The entire area of the P.B.I shall be gone over during the currency of this plan.

2.3.31 Method of executing the felling in P.B.I. : The object of felling in this block is to replace the existing crop by young and more uniform crop. The marking in P.B.I area shall be carried out by the D.F.O. or his Gazetted Assistant. The felling shall be completed in two stages i.e. seeding and final fellings. Detailed map on 1:3,750 scale shall be prepared in respect of each area, indicating the areas where advance growth has been retained where selection markings have been done. The following general principles are, however, laid down for the guidance of the marking officer.

Table 2.3.18 : Felling programme for P.B.I area.

Year	Block	Number and name of forest	Comptt/Sub comptt.	Area in ha.	
				Gross	Stocked
1	2	3	4	5	6
2006-07	Habban	RF 23 Uria	C2a	19.35	19.35
2007-08	Bakhog	RF 1 Tharu	C2a	37.38	37.38
2008-09	Thandidhar	RF 7 Khabbar	C4	43.60	31.10
2009-10	Thandidhar	RF 8 Ber Jamoli	C2d	66.20	29.00
2010-11		RF 1 Tharu	C2c	32.90	32.90
2011-12	Thandidar	RF 7 Khabar	C5	44.50	31.85
2012-13	Thandidhar	RF 7 Khabbar	C1	36.00	36.00
2013-14	Bakhog	RF 1 Tharu	C1c	12.00	11.00
2014-15	Habban	RF 17 Dalmu	C2a	27.50	25.20
	Thandidhar	RF 9 Pajoga	C4a	45.00	29.10
2015-16	Bakhog	RF 1 Tharu	C1c	11.00	10.85
2016-17	Habban	RF 17 Dalmu	C2b	22.75	13.75
	Thandidhar	RF 7 Khabar	C1	12.20	12.20

Year	Block	Number and name of forest	Comptt/Sub comptt.	Area in ha.	
				Gross	Stocked
1	2	3	4	5	6
2017-18	Thandidhar	RF 4 Manwa	C2	36.50	21.75
		RF 11 Katoga	C1d	23.60	23.60
2018-19	Thandidhar	RF 5 Nar	C1	33.50	22.80
	Bakhog	PF 1 Deothi Majgaon	C1a	26.40	25.15
2019-20	Habban	RF 21 Dalmu Deothi	C2a	43.75	41.25
2020-21	Habban	MF 29 Bagna	C1	14.10	12.10
	Bakhog	MF 9 Pab	Whole	1.60	1.60
2021-22	Thandidhar	RF 4 Manwa	C5	51.95	43.35
2022-23	Thandidhar	RF 11 Katoga	C1a	20.90	20.90
	Bakhog	RF 1 Tharu	C1c	12.00	11.00
2023-24	Bakhog	PF 1 Deothi Majgaon	C1a	26.35	25.10
	Habban	MF 28 Palu	C1	2.90	1.90
	Habban	MF 38 Habban Marechi	Whole	15.40	7.40
2024-25	Thandidhar	RF 6 Taproli	C2	20.00	20.00
		RF 4 Manwa	C3	16.45	16.45
2025-26	Bakhog	RF 3 Ghotari	C5c	56.00	34.05

Year	Block	Number and name of forest	Comptt/Sub comptt.	Area in ha.	
				Gross	Stocked
1	2	3	4	5	6
2026-27	Habban	RF 13 Dol	C3c	82.14	62.25
		RF 15 Dalmu Sudar	C1e	47.25	35.70
2027-28	Bakhog	RF 1 Tharu	C1c	12.00	11.00

Note : Felling will be done as per yield prescribed in Table 2.3.17

- 1) Well grown, healthy, tall, clean boled seed bearers with well developed crown, preferably of II to IA class, uniformly placed at an average distance of 18 and 22 meters numbering 30 and 20 per ha respectively for Deodar/Kail and chil should be retained.
- 2) In a mixed forest of deodar and kail, deodar should be preferred to kail as seed bearers.
- 3) Compact groups of vigorously growing pole crop upto 30 cm d.b.h. of density not less than 0.5 and atleast 0.2 ha in extent shall be retained as part of the future crop.
- 4) All the saplings, poles and younger trees upto V class in diameter shall be invariably.
- 5) On precipitous and broken ground, the markings should conform to selection principles.
- 6) Groups of pole crop retained as part of future crop shall be thinned wherever necessary.
- 7) Broadleaved trees not interfering with t nifer species or their regeneration, should not be cut unnecessarily.
- 8) Final felling will be carried out only if the regeneration is fully established.

2.3.32 Subsidiary Silvicultural operations in P.B.I : The following subsidiary operations will be carried out soon after the fellings in this periodic block : -

- a) Disposal of slash/fellings refuse to provide clear bed for regeneration.
- b) Removal of dead, damage felled marked trees, if any.
- c) Removed of inferior species of trees interfering with the young regeneration of deodar and kail, if any, left unfelled.
- d) Lopping of broad-leaved trees interfering with young regeneration.
- e) Thorough bush cuttings wherever needed for providing a clean seed bed.
- f) Cleaning in the existing regeneration patches and climber cuttings wherever necessary.
- g) Effective closure to grazing by fencing with barbed wire/stone wall around the area.

2.3.33 Artificial regeneration in P.B.I areas : Good seed year does not always coincide with the year of fellings. There is a danger of the area being invaded by weeds and bushes if only natural regeneration is relied upon. In view of these impediments and to restock the areas within the stipulated time, artificial regeneration i.e. sowing and planting will be taken up simultaneously after the fellings without waiting for the natural regeneration to come in. This will reduce the period of closure on one hand and restock the area expeditiously on the other hand. The more quickly an area is regenerated after seeding felling, lesser will be the overall expenditure and the area will be ready for being thrown open to grazing. Normally a compartment should be regenerated within 5 years of seeding felling. A particular P.B.I area will be planted up in rainy season following the year of exploitation after slash disposal. The P.B.I areas, which have already been worked and need no fellings, will also be planted with deodar. Thus the entire P.B.I areas will be planted during the plan period. The annual plantation area will, therefore, be more than the annual felled area for some years till the areas already worked are planted up.

2.3.34 Treatment of over felled/understocked PBI areas : On account of inadequate growing stock and negative yields, some forests have been excluded from the felling programme. All such area should be closed immediately and sowing/planting operations commenced to establish regeneration within the plan period, without waiting for natural regeneration or wasting further time. These forests will be treated during the first 5 years of the plan in addition to the P.B.I area felled annually.

2.3.35 Treatment of existing plantation: Periodical repairs of the fencing to be ensured to provide effective closures to such old plantations. The unfenced areas to be fenced effectively. The causalities to be replaced by beating up. Deodar should be planted up with nursery grown seeding and kail by patch sowings, after thorough bush cuttings. Weeding have to be done invariably twice a year till the plants have attained sufficient height and not smothered by bushes any more. The beating up and bush cutting operations are to be repeated successively for a couple

of years uninterrupted till the area is regenerated successfully. In established plantation, cleaning, pruning, thinning have to be carried out wherever necessary.

2.3.36 Choice of species: The species eminently suited to the locality will be favoured and shall get preference over all other species. In majority of forests, deodar and kail are found growing side by side in mixture as well as in pure groups of varying sizes. Deodar occurs pure in large proportions in Habban and Thandidhar Blocks where as kail in Bakhog Block except for Gotari beat. Kail is more susceptible to fire damage and is often base burnt. It is also lopped heavily and therefore attacked by fungus **Tremetes pinii**. As such all reasonable attempt must be made to increase the proportion of deodar, which is more valuable species. No attempt should, however, be made to raise deodar on sites where kail alone is expected to do well and must be aimed at. Similarly spruce and silver fir belts and pockets shall not be converted into deodar and kail except the transitional belts where the site conditions are favourable for deodar. Broad- leaved species like **Maple, Walnut, Chestnut Ash, and Birdcherry** etc. Should be introduced on suitable grounds along nalas and in moist locations, where these species grow naturally as well. In nut shell, each species should be raised on the ground best suited to it. However, in mixed forests of deodar, kail and spruce, deodar should have upper hand. This can be achieved by planting the area with deodar seeding and by retaining more deodar seed bearers in preference to kail of spruce. No attempt should be plant the ‘Thatches’ occurring naturally on the top of the high ridges. Money is not to be waste on planting trees in places where nature never intended them to grow. Therefore, a detailed suitability and treatment map should be prepared for the area and sowing/planting be carried out accordingly.

2.3.37 Plants like **Sarcococca, Viola, Ainslaes, Indigofera, Desmodus, Fragaria,** and **Maiden hair fern**, are the good indicators of deodar sites where, to some extent, reliance can be placed on natural regeneration also. **Iris, Spiraea sorbifolia, plectranthus strobilanthus** and **Balsam** are the bad indicators of deodar sites where only artificial regeneration shall have to be relied upon.

2.3.38 Nursery technique: The technique of artificial regeneration has already been standardized and well understood and need no elaboration. The temporary nurseries of deodar and broad- leaved species should be raised within or in the vicinity of the P.B.I. area well in advance of the year of fellings/planting schedule. Deodar should be raised in polythene bags.

2.3.39 New plantations methods of establishment etc.

- (i) **Fencing :** The P.B.I areas shall be notified for closure immediately after fellings are over. All the subsidiary operations shall be completed by 31st May of the year and the areas should be fenced with 4 strands barbed wire. If stone is available locally, stone wall fencing should be preferred. This reduces the future cost of fence post replacement and repair of barbed wire fencing.
- (ii) **Soil Working:** After through bush cuttings in the entire areas or in strips and their disposal by way of burning or dumping in nallas, 30cm x 30cm x 30cm pits should be dug in advance along the contours at an average distance of 2mx 2m and soil working should be completed latest by June of the year in which planting has to be done.
- (iii) **Sowing and planting:** Each of the felled area will be planted up in the rainy season preferably in July following the year of exploitation. Deodar seedlings to years old with > 25cm height will be planted up. Patch or line sowing of deodar may also be resorted

to in ideal areas only.

This can be taken up even during the year of fellings. Kail shall be regenerated by patch/line sowing along contours. This will be done on dry and exposed sites where deodar is not expected to do well. Kail almost seeds every year and as such it will be regenerated naturally or by line/patch sowing along the contours 3m apart. Entire transplanting of broad leaved species shall have to be done in very moist locations near Khallas.

- (iv) **Weeding:** All the regeneration areas should be weeded properly in the infancy. Normally two weeding-one in June/July and another in August/September are considered sufficient for young plantations. It should be done judiciously and carefully and young plants should be freed from over shade and smothering of leading shoots. Removal of weaker plants from the patches where patch sowing is done, should be done continuously alongwith the weeding operations.
- (v) **Cleaning:** This operation should be carried out in the early stages both in congested natural regenerations and plantations and should be continued till the area is suitable for thinning. Best and vigorously growing stems should be retained. All forked, crooked sickly and damaged stems should be removed in cleanings so as to provide growing space to better stems. Nothing more than what is absolutely necessary should be cut in cleaning. In deodar plantations, kail found coming up naturally in plenty, must be cut at the initial stage to avoid suppression of deodar. For cleaning operations, vigour and health of the young plants is much more important to make the young crop fire resistant within reasonable time and also not to permit the side branches to persist unnecessarily.
- (vi) **Thinning:** Early and frequent thinning after the saplings have attained 10cm diameter at base should be carried out. All the materials removed in cleanings and thinning should be removed outside the regeneration area to avoid any fire hazards.

2.3.40 Closures: Effective closure is most essential for success of a plantation/regeneration area. It is thus imperative that the P.B.I. areas are closed immediately before the actual planting / sowing takes place. The area will have to be closed for cattle grazing till the regeneration establishes itself. Normally this period is 30 years. Government notifications for such closures should be got issued well in time to avoid litigations.

2.3.41 Grazing: The P.B.I areas planted up shall be closed to grazing till those areas which are not under regeneration is established. Grazing rights of the holders as admitted in the Faisla-e- Janglat and contained in Wazib-ul-Araz will not be interfered within the areas other than those closed for regeneration.

2.3.42 Grass Cutting: There will be no restrictions on grass cutting in those areas which are not under regeneration. Grass cutting in closed areas shall be allowed to the right holders when the seedling has attained a height of 50cm provided no plants are cut along the grasses.

2.3.43 Lopping: Kail and spruce and lopped for litter and Oaks for fodder. Deodar and Kail trees are being lopped for staking of tomato, peas and other vegetable crops being grown recently in the area. This should be stopped completely as it makes deodar, kail and spruce trees susceptible to diseases and retards growth. Indiscriminate lopping of Oaks should also be prohibited.

2.3.44 Requirement of Right Holders: The demand of right holders should be from P.B. Unallotted forests. T.D. trees should be marked strictly in accordance with the silvicultural principles and not according to the convenience of the local people. More often than not silviculture has been sacrificed for the convenience and caprice of the right holders. As a result permanent gaps have been created in some forests. No trees shall be marked from P.B.I. areas, after the markings for seeding fellings have been done till the regeneration is fully established. From P.B. unallotted areas, only those trees should be marked in T.D. which are required to be removed in thinning and improvement fellings. All the trees marked to the right-holders shall count towards the prescribed yield.

2.3.45 Fire protection: Forests will be protected from fires though the frequency of forest fires in deodar forests is negligible. Young deodar plantations and regeneration areas require special care and complete protection from fire. Special precautions are necessary in the areas adjoining chil forests. Forest floors are to be kept clean of the debris and other combustible material. The firelines, inspection and bridle paths should be kept clean of needles especially during summer. Fire watchers should be posted during fire season along with the fire fighting equipments. Above all, public co-operating is very necessary to keep fire out of the area.

2.3.46 Regeneration Survey : The regeneration survey of the felled P.B.I. areas should be carried out as per para 48 of the Code of Working plan procedure for H.P. every year on 1:3,750 scale map to assess the progress of regeneration and to plan operations for the next year. Reasons for failure should be sorted out and corrective measures taken forthwith. If however, regeneration is not keeping pace with fellings, further fellings should be deferred.

CHAPTER IV

THE SPRUCE-FIR WORKING CIRCLE

2.4.1 General Constitution: All the commercially exploitable Spruce and Silver fir forests either pure or mixed, growing in compact blocks or in patches, are included in this working circle. It includes all the forests of Fir- Spruce working circle, some forests of coppice working circle and one forests of Rehabilitation working circle of the previous plan, bearing considerable stocking of Spruce and Silver fir. It also includes those oak forests and alpine pastures which could not be separated by formation of sub-compartments. This working circle covers 2,551.50 ha of reserved spread over Habban and Rajgarh Ranges only.

2.4.2 General character of vegetation: The forests included in this working circle conform to Champion and Seth's Type 12/C 1d (Western Himalayan moist temperate mixed coniferous forests), and Type 12/2d (West Himalayan Upper Oak / fir forests) with Type 12/C1e (Moist temperate deciduous forests) found on moist localities in depressions, and along alas, the details of which are already given in Chapter II of Part I. Silver fir and Spruce are the main species of this circle. Silver fir predominates in upper parts and Spruce down below. Silver fir descends below in cooler localities whereas Spruce ascends higher along the warm spurs. Majority of the forests are the mixture of Fir and Spruce with narrow belt of Kharsu oak at the higher limits and broad belt of **Ban** and **Mohru** oaks along the lower limit. Proportion of spruce is higher than Fir. At places, small patches of Kail and Deodar are found pure or mixed with Spruce. Fir and Spruce forests are typical selection forests consisting of irregular crop of all age and diameter classes mixed together. Stocking is moderate. Regeneration of Fir and Spruce is lacking. However, patches containing young crops in the form of saplings and poles and found in the gaps. A fairly dense under storey of Oaks and Brass is present. The Oaks are mostly virgin forests but badly lopped in areas close to Gujar parasol. The ground is generally covered with dense bush and luxuriant weed growth.

2.4.3 Blocks and Compartments: The boundaries of the forests and compartment remain the same as given in the plan under revision, except for RF10 Sarh C1c which has been splitted in to 2 by separating the deodar –kail areas by creating a new compartment C1f.

2.4.4 Felling series: The areas have not been divided into separate felling series.

2.4.5 Special Objects of management: Without prejudice to the general objects of management, the special objects of management are:

- a) To preserve and maintain the existing forests of spruce and fir to conserve the environment and ecology, to protect the mountains from erosion and landslides and to conserve the moisture regime of the locality.
- b) To tend the regeneration of spruce and fir and restock blanks with spruce, fir, deodar, kail and valuable broad-leaved species artificially.
- c) To obtain the maximum possible sustained yield of timber by exploiting the silviculturally available mature and over mature fir and spruce trees.
- d) To preserver and nurse up all trees below the exploitable diameter, which is expected to reach that diameter under the best possible conditions of growth.

2.4.6 Area and Allotment: The details of the forests allotted to this working circle are given in Appendix I. The abstract showing the area distribution by Ranges is given in Table 2.4.1. Out of the total area of 2,551 50 ha, only 1,730.64 ha i.e. 67.83% is under spruce and fir.

Table 2.4.1 : range wise area in selection working circle

Range	Reserved Forests (ha)	
	Total area	Area under Spruce & Fir
Habban	1823.40	1357.34
Rajgarh	728.10	373.30
Total :	2551.50	1730.64

2.4.7 Analysis and Valuation of the Crop:

2.4.8 Stock Maps: All the forests allotted to this working circle have been stock mapped on 1:15,000 scale maps and posted in the C.H. files. Forest wise detail area occupied by each species is given in Appendix II and abstract showing distribution of species is given Table 2.4.2.

2.4.9 Site Quality: No standard quality classes have been fixed for silver fir and spruce so far. In the absence of Multiple Yield Table, the spruce and fir crops could not be assigned a definite quality class. However, the height of spruce and fir is over 30 meters. Deodar and Kail are of average quality II according to F.R.I tables.

2.4.10 Density: Density has been assessed ocularly while stock mapping and describing the forests and recorded in the concerned compartment history files. It varies from 0.4to 0.7, the average being 055.

Table 2.3.3 : Species wise stocking of Deodar Kail Working circle and Area statement

Stocking spp.	Oaks	Deodar	Kail	Mixed Deodar + Kail + Spruce +S. Fir	Spruce	Silver fir	Culturable blank	Un culturable blank	Included cultivation	Stock-ed Area	Un stock-ed Area	Total
Area Ha.	664.11	13.80	25.75	977.03	434.06	319.55	80.70	24.40	12.10	2434.30	117.20	2551.50

2.4.11 Age Classes: The Spruce and fir forests are irregular with all the age classes present younger age classes predominate. This is the case with deodar and Kail too. Thus the forests are selection forests in true sense. The distribution of age classes for individual forests has been given in C.H. files. The percentage of each diameter class for silver fir, spruce, kail and deodar has been worked out given in Table 2.4.3.

Table 2.4.3 : Diameter distribution of conifer species.

Diameter Classes (Cm)	Spruce		Silver fir		Kail		Deodar	
	Stem No.	%	Stem No.	%	Stem No.	%	Stem No.	%
10-20	17151	9.97	48804	7.44	3995	10.42	3935	13.30
20-30	33194	19.29	86705	13.22	10141	26.44	7304	24.69
30-40	49462	28.74	202952	30.95	11104	28.95	9547	32.28
40-50	40116	23.31	172631	26.33	8327	21.71	4710	15.93
50-60	20266	11.77	122512	18.68	4486	11.70	3176	10.74
60-70	8376	4.87	17826	2.72	250	0.65	749	2.53
70-80	2579	1.50	3790	0.58	39	0.10	158	0.53
80-90	900	0.52	450	0.07	13	0.03	0	0
>90	52	0.03	35	0.01	0	0	0	0
Total :	172096	100.00	655705	100.00	38355	100.00	29579	100

2.4.12 Regeneration: Regeneration on the whole is deficient. However, some saplings and poles in groups as well as in isolated form are noticed in the gaps.

2.4.13 Enumeration: Total enumeration in 10cm diameter classes down to 10cm d.b.h. has been carried out in all the spruce-fir bearing forests. In oak forests, the enumeration operation was confined to spruce and belts and patches only. Due to paucity of funds only conifer species of present economic importance were enumerated. The detailed enumeration is given in Appendix III. Summary of enumeration result and growing stock of spruce, fir, deodar and chil for the entire areas is given in Table 2.4.4.

2.4.14 The proportion of various species (%) by number and volume present in this working circle alongwith the species wise growing stock per ha is given in Table 2.4.5.

Species	Percentage		Per Hec		
	By Number	By Vol.	Trees(Numbers)	Volume (M ³)	C.A.I (M ³)
Spruce	19.21	19.04	97.22	140.02	3.65
Silver-Fir	73.21	76.33	370.42	561.17	13.10
Kail	4.28	2.61	21.68	19.18	0.32
Deodar	3.30	2.02	16.71	14.83	0.25
Total	100.00	100.00+	506.03	735.2	17.32

2.4.15 The tabular statement showing the comparison of spruce and fir growing stock during the past and present plan is given Table 2.4.6.

Table 2.4.6 : Comparison of stocking during past and present plan

Growing stock of Spruce + fir	Diameter classes in cm									Total
	10-20 V	20-30 IV	30-40 III	40-50 IIA	50-60 IIB	60-70 IA	70-80 IB	80-90 IC	> 90 ID	
Number of trees/ha										
Past	123.63	51.55	40.19	30.83	19.45	12.14	6.76	3.80	1.28	289.63
Present	38.11	69.28	145.85	122.93	82.50	15.14	3.68	0.78	0.05	478.32
Volume (M³)/ha										
Past	14.96	12.37	37.86	53.97	58.35	53.41	42.51	28.18	11.24	312.85
Present	4.61	16.62	137.39	215.12	247.50	66.62	23.12	5.76	0.48	717.22

The stocking per ha in the present plan shows the improvement over the stocking of the previous plan. This may partly be due to non felling of most of the forests and thereby increase in growing stock and partly due to the partial enumeration (20.83%) carried out in the previous plan which had a very high standard deviation and standard error over the mean volume (m³)ha i.e. with 36.79% coefficient of variation, rendering the growing stock estimate of the previous plan unreliable.

Table 2.4.4 Summary of enumeration results

Species	Parameters.	Diameter classes (cm) and number of trees.									
		10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	>90	Total
		V	IV	III	IIA	IIB	IA	IB	IC	ID	
1	2	3	4	5	6	7	8	9	10	11	12
Spruce	Number	17151	33194	49462	40116	20266	8376	2579	900	52	172096
	Vol. (M ³)	2075.27	7966.56	46593.20	70203.00	60798.00	36854.40	16221.91	6682.50	456.04	247850.89
	C.A.I. (M ³)	97.95	376.02	2185.22	1804.22	1270.68	501.22	194.66	35.42	2.326	6467.72
S. Fir	Number	48804	86705	202952	172631	122512	17826	3790	450	35	655705
	Vol. (M ³)	5905.28	20809.20	191180.78	302104.25	367536.00	78434.40	23839.10	3341.25	306.95	993457.22
	C.A.I. (M ³)	235.62	830.29	7475.17	6525.45	6799.42	1027.49	276.53	17.04	1.53	23188.54
Spruce + Fir	Number	65955	119899	252414	212747	142778	26202	6369	1350	87	827801
(1730.64 ha)	Vol. (M ³)	7980.56	28775.76	237773.99	372307.25	428334.00	115288.80	40061.01	10023.75	762.99	1241308.1
	C.A.I. (M ³)	333.57	1206.31	9660.39	8329.67	8070.09	1528.71	471.2	52.46	3.86	29656.26
Deodar	Number	3935	7304	9547	4710	3176	749	158	0	0	29579
	Vol. (M ³)	278.2	1034.25	6758.32	6668.42	8093.72	2651.09	760.56	0	0	26244.56
	C.A.I. (M ³)	37.67	62.93	168.15	88.36	57.47	17.23	4.94	0	0	436.75
Kail	Number	3995	10141	11104	8327	4486	250	39	13	0	38355
	Vol. (M ³)	282.45	1435.97	7860.52	11789.37	11432.12	884.88	187.73	79.14	0	33952.17
	C.A.I. (M ³)	38.24	87.38	195.57	156.21	81.17	5.75	1.22	0.51	0	566.06
Total	Number	73885	137344	273065	225784	150440	27201	6566	1363	87	895735
(1770.19 ha)	Vol. (M³)	8541.21	31245.97	252392.83	390765.03	447859.84	118824.76	41009.31	10102.89	762.99	1301504.84
	C.A.I. (M³)	409.49	1356.62	10024.11	8574.23	8208.73	1551.69	477.36	52.97	3.86	30659.06
Per ha.	Number	41.74	77.59	154.26	127.55	84.99	15.37	3.71	0.77	0.05	506.01
	Vol. (M³)	4.83	17.65	142.58	220.75	253.00	67.13	23.17	5.707	0.43	735.23
	C.A.I. (M³)	0.23	0.77	5.66	4.84	4.64	0.88	0.27	0.03	0	17.32

2.4.16 Silvicultural System: The terrain in general is difficult and prone to erosion and snow slides wherever spruce-fir forests occur. In the past plan, the areas worked under concentrated regeneration felling and allotted to P.B.I could not be regenerated satisfactorily. The fir and spruce forests are typically selection forests with all age classes represented well. Moreover, both the species are shade tolerant and younger regeneration thrive well under the canopy of older trees. As such spruce and fir forests shall be managed under “**Selection System**”. This system aims at getting irregular / uneven aged forests which provides good soil cover. This system allows the conservative removal of trees subject to silvicultural availability and on the basis, that the trees of the next lower diameter class would reach the exploitable size and replace the trees removed. Young trees and natural regeneration are expected to cover the gaps created by the selective fellings. The areas are far away from the habitations and there is little biotic interference. As such natural regeneration will not be problem. Thinning and improvement fellings are to be carried out in congested groups of young to middle aged age crops. In mixed forests, transitional belts and patches suited to deodar and kail, fellings will be done in favour of deodar and kail by keeping them as seed bearers, to facilitate the natural regeneration of these species in the area. Although natural reproduction is aimed in selection system and every effort will be made to induce and encourage it, the blanks and areas with deficient natural regeneration will be taken up for artificial regeneration of spruce, silver fir, deodar, kail and suitable broadleaved species like walnut, ash, maple, birdcherry, horse chestnut etc. after providing proper closures.

2.4.17 Exploitable Diameter: The exploitable diameter is fixed at 60cm d.b.h. for all the conifer species, which is commercially economical size for round, pulpwood and sawn timber. As per growth statistics, this diameter is attained in 160years for fir, 140 years for spruce, deodar and kail and in 116 years for chil. Trees of all species >60cm d.b.h. will hereafter be referred to as selection trees.

2.4.18 Felling Cycle: The felling cycle is fixed at year’s corresponding to the plan period. All the forests will be gone over once during this period.

2.4.19 Yield Regulation : The yield will be regulated by the number of selection trees expressed in percentage. It will be calculated by **Smithies Safeguarding Formula**, which defines the yield available during the felling cycle as the number of trees of the next lower diameter class (IIB: 50-60cm d.b.h.) that may be expected to survive and grow up to the exploitable size(≥ 60 cm d.b.h.) during the felling cycle, as under :

$$X = f \frac{(1-Z_2) II}{t_2}$$

Where X = Number of 50-60 cm diameter class trees (IIB) which survive and pass into ≥ 60 cm d.b.h class and over during the felling cycle.

F = Felling cycle i.e. 15 years.

t_2 = Number of years required by IIB class trees to pass into Ist class .

Z_2 = Fraction of II B class trees that die or do not pass up to t_2 years.

This yield X can by expressed as % (P) of the number of selection trees (N) present at the time of marking as :

$$P = \frac{X}{N} \times 100$$

At the beginning of the felling cycle only class I trees represent the number of selection trees (N). It adds X number at the end of the felling cycle. Thus the average number of selection trees during the felling cycle will be :

$$N = \text{Ist class trees} + \frac{X}{2}$$

Thus the total yield available during the felling cycle will be calculated by substituting the value of N in the above formula as under:

$$P = \frac{X}{1 + \frac{x}{2}}$$

Where P = Available yield expressed in percentage of total number of selection during the felling cycle.

X = Number of class II trees passing in class I (selection trees) during the felling cycle period.

I = The number of existing selection trees (I class trees) : a known figure as enumerated.

In addition to basic yield worked out as above, it is reasonable to remove 50 % of the existing excess stock of over mature trees (IC and ID) of spruce and fir that would otherwise die or decay. Also the removal of class I trees i.e, selection trees depends on silvicultural availability and the extent to which regeneration is present to permit the removal of mature trees. The above formula has therefore been modified by introducing an arbitrary factor $\pm A$ to cover all the factors influencing the yield so that eventually the formula becomes:

$$P = \left[\frac{X}{1 + \frac{x}{2}} \times 100 \right] \pm A$$

2.4.20 Calculation of yield : The yield will be calculated separately for each species. Spruce and silver fir will be grouped together for yield calculation. The unfit trees have been excluded from the enumeration and therefore, shall not be considered for yield calculations. The growing stock of approach class and selection trees of various species in the circle is reproduced in Table 2.4.7 and the value of t and z in Table 2.48 for further computation of yield. Deodar, Kail and Chil are not found uniformly in each compartments. As such their yield cannot be available regularly. It will be only of an academic interest of to fix the annual yield of Deodar, Kail and Chil. Such species will be marked and felled alongwith the main crop of spruce and fir in the year when such compartments find place in felling programme. The species wise yield is calculated as under:

Table 2.4.7 : Growing stock of selection trees and next lower diameter classes in numbers.

Species	Diameter class 40-50 cm IIA	Diameter class 50-60 cm IIB	Diameter ≥ 60cm I
Deodar	4710	3176	907
Kail	8327	4486	302
Spruce	40116	20266	11907
Fir	172631	122512	22101
Spruce & Fir	212747	142778	34008

Table 2.4.8 Value of 't' and 'z' for various species.

Species	't' in years (IIB to IA)	'z' % (% decrease in number from IIB to IA)
Deodar	30 years	22
Kail	30 years	30
Spruce	30 years	26
Silver Fir	30 years	26

Deodar :

$$\begin{aligned}
 \text{(i) Basic yield } X &= \frac{15}{30} \times (1-0.22) \times 3176 \\
 &= \frac{1}{2} \times 0.78 \times 3176 \\
 &= \frac{1}{2} \times 2477.28 \\
 &= 1238.64
 \end{aligned}$$

Or say 1239 Selection trees during felling cycle i.e. in 15 years.
Or 83 Selection trees per year.

(ii) Yield from removal of excess stock of over mature trees= None, because deodar over mature trees are scarce.

(iii) Expressed as percentage of selection trees present at the time of marking, the yield (P) will be :

$$\begin{aligned}
 P &= \frac{1239}{907 + \frac{1239}{2}} \times 100 \pm A \\
 &= \frac{1239}{1526.5} \times 100 \pm A \\
 &= 81.16 \pm A
 \end{aligned}$$

- (iv) In order to favour the deodar trees and on account of non availability of mature trees being on difficult terrain and to be on conservative side, the 'A' is being given a negative value of 46.16. Therefore, the % of exploitable selection trees will be 35.
- (v) The number of exploitable selection trees for felling annually is calculated by the formula :

Average number of selection trees x yield % x $\frac{1}{\text{Felling cycle}}$
during the felling cycle.

$$\begin{aligned}
 &= 1 + \frac{X}{2} \times P \times \frac{1}{15} \\
 &= 907 + \frac{1239}{2} \times \frac{35}{100} \times \frac{1}{15} \\
 &= 907 + 619.5 \times \frac{35}{100} \times \frac{1}{15} \\
 &= 1526.5 \times \frac{35}{100} \times \frac{1}{15} \\
 &= 35.61 \text{ Selection trees}
 \end{aligned}$$

Or Say 36 Selection trees per year.

Kail :

$$\begin{aligned}
 \text{(i) Basic yield X} &= \frac{15}{30} \times (1-0.3) \times 4486 \\
 &= \frac{1}{2} \times 0.7 \times 4486 \\
 &= \frac{1}{2} \times 4140.2 \\
 &= 1570.1
 \end{aligned}$$

Or say 1570 Selection trees during felling cycle i.e. in 15 years.

Or 105 Selection trees per year.

- (ii) Yield from removal of excess stock of over mature trees = None, as kail over mature trees are scarce.

- (iii) Expressed as percentage of selection trees present at the time of marking, the yield (P) will be :

$$\begin{aligned}
 P &= \frac{1570}{302 + \frac{1570}{2}} \times 100 \pm A \\
 &= \frac{1570}{1087} \times 100 \pm A \\
 &= 144.43 \pm A
 \end{aligned}$$

- iv) Based on silvicultural availability of mature and over mature trees and meagre number of I class trees A has been given negative value of 109.43. Therefore the % of explicable selection trees will be 35.
- v) The number of exploitable selection trees to be felled annually will be :

$$\begin{aligned}
 &= \left(302 + \frac{1570}{2} \right) \times \frac{35}{100} \times \frac{1}{15} \\
 &= 1087 \times \frac{35}{100} \times \frac{1}{15} \\
 &= 25.36 \text{ selection trees}
 \end{aligned}$$

Or say 25 selection trees per year.

Chil : Chil is found only in limited number in patches or mixed together in lower reaches on hotter place. No felling of chil has to be carried out in working circle. As such no yield has been calculated and prescribed.

Spruce and Silver Fir :

$$\begin{aligned}
 \text{(i) Basic yield X} &= \frac{15}{30} \times (1-0.26) \times 142778 \\
 &= \frac{1}{2} \times 0.74 \times 142778 \\
 &= \frac{1}{2} \times 105655.72 \\
 &= 52827.86
 \end{aligned}$$

Or say 52828 Selection trees during felling cycle i.e. in 15 years.
Or 3522 Selection trees per year.

A perusal of growing stock reveals that there is preponderance of over mature trees, which are putting on practically no increment at present. These over mature trees will decay, if left in the forest. In order to liquidate such tree, removal of 50% of IC and ID are prescribed.

- (ii) Yield from removal of excess stock of over mature trees i.e. removal of 50% of all selection trees ≥ 80 cm d.b.h. (IC and ID trees) in 15 years.

$$= (1350 + 87) \times 50\%$$

$$= (1437 \times 50/100)$$

$$= 718 \text{ selection trees}$$

Or say 48 selection trees annually.

- (iii) Total annual yield = $3522 + 48 = 3570$ selection trees.

- (iv) Expressed as percentage of selection trees present at the time of marking, the yield (P) will be :

$$\begin{aligned} P &= \frac{52828 + 718}{34008 + 52828} \times 100 \pm A \\ &= \frac{53546}{60422} \times 100 \pm A \\ &= 88.62 \pm A \end{aligned}$$

In order to be on conservative side, 'A' has been assigned a negative value of 53.62. Therefore the % of exploitable selection trees will be 35.

- (v) The number of selection trees to be marked annually shall be :

$$\begin{aligned} &= 60422 \times \frac{35}{100} \times \frac{1}{15} \\ &= 1409.84 \text{ selection trees} \end{aligned}$$

Or say 1100 selection trees per year only to improve the Growing Stock

2.4.21 Prescribed Yield: The prescribed annual yield from the forests of selection working circle is presented in Table 2.4.9.

Table 2.4.9 : Annual prescribed yield (Number of selection trees) from selection Working circle

Species	Number of selection trees.
Deodar	36
Kail	25
Spruce and Fir	1100

2.4.22 The yield expressed in terms of volume for various species is given in Table 2.4.10. It is just to indicate the expected out turn. The yield will be primarily regulated by the percentage control and silvicultural availability.

2.4.23 Increment and Yield Check: The annual increment put by various conifer species is calculated by summing up the total volume increment put up by each diameter class. The C.A.I. (m³) is further converted into number of selection trees equivalent to IB and IC diameter classes. The removal percentage i.e. prescribed yield expressed as % of C.A.I. in terms of number of selection trees of IB or IC diameter classes and Volume (m³) have been working out and presented in Table 2.4.11. This clearly indicate that the removals in respect of all the species is less than the admissible i.e. increments. This low removal is bound to add the increments to the growing stock which will improve further with the passage of time.

Species	Parameters	Diameter classes.					
		IA recruited (X/2)	IA	IB	IC	ID	Total
Deodar	Number	619.5	749	158	0	0	1526.5
	Vol (M ³)	2192.72	2651.84	759.25	0	0	5603.81
	Yield (M ³) during felling cycle 3		35 %				1961
	Annual (M ³)yield						131
Kail	Number	785	250	39	13	0	1087
	Vol (M ³)	2778.51	883.74	189.8	80.01	0	3932.06
	Yield (M ³) during felling cycle		35 %				1376
	Annual (M ³)yield						92
Spruce & Silver Fir	Number	26414	26202	6369	1350	87	60422
	Vol (M ³)	116221.6	115295.2	40012.4	9968.49	830.31	282328.00
	Yield (M ³) during felling cycle		35 %				98815
	Annual (M ³)yield						6588

Table 2.4.11 : Current annual increments and prescribed yield.

Species	Current annual increments			Prescribed yield		Removal %		
	Volume (m ³)	Equivalent to number of selection trees of		Number of selection trees	Equivalent Volume (m ³)	Expressed in terms of		
		IB	IC			Volume (m ³)	Selection trees	
							IB	IC
Deodar	436.75	91	72	36	131	30	39.56	50.00
Kail	566.05	118	93	25	92	16.25	21.18	26.88
Spruce + Silver Fir	29654.89	4715	3994	1100	6588	22.22	23.32	27.54

2.4.24. Control of Yield: All the trees ≥ 60 cm d.b.h. felled in this circle for and purpose including grants to right holders and other petty felling etc. shall count against the prescribed yield. An estimate of expected yield each compartment /sub- compartment given in Table of Felling, will serve as additional guide to marking officer. No effort should be made to obtain the prescribed yield, if it is not available silviculturally. The marking should be done purely on

silvicultural considerations, and any excess / deficit yield should be adjusted in future fellings. If any area is burnt or damaged seriously, it should immediately be taken up for planting after timber extraction and some areas having yield equivalent to such removals be relegated from future fellings. Owing to uneven distribution of deodar and kail, it is not possible to stick to the prescribed yield of such species in any one year. Transfer of yield between deodar and kail, is therefore permitted. The deodar and kail species will be felled in that year only, when compartment containing such of species are taken for felling according to felling programme. The yearly excess or deficit of each species will not exceed 10% and shall be carried forward in control form and deviation statement adjusted at the end of every 5 years when it should be within $\pm 10\%$ of the prescribed yield.

2.4.25. Table Felling: Tabular statement of felling for the period 2012-13 to 2027-28 has been prepared and given in Table 2.4.12. An estimate of species wise yield for each forest compartment/ sub- compartment is give as a guide to the marking officer. Based on enumeration data, the annual felling have been prescribed to ensure that areas are not exhausted in advance. This will be an area check on yield. The forest felled in the past or having no exploitable selection trees, has been excluded from the felling programme. The majority of the forests are confined to Thandidhar Block of Haban Range with little in Bakhog block. The forests found in Rajgarh range are confined to Bathaudhar Block only. In order to reduce the cost exploitation and to exercise the proper administration and management control, concentrated felling has been aimed in the felling programme.

2.4.26 Method of Executing Felling: The markings should be carried out on principles of selection system. Following guide lines are prescribed for the marking officer.

1. Marking should commence from the top of forest and its ridges, working downhill and marking each forests completely before proceeding to the next forest or compartment.
2. All dead, dying, diseased, damaged and uprooted trees will be marked.
3. Trees over 60 cm dbh standing over and interfering with the growth of younger trees and regeneration will be removed.
4. In all selection markings, silvicultural availability will have overriding priority
A tree of exploitable diameter will be considered, silviculturally available when:
 - a. It is dead, dying, diseased, malformed, deteriorating or putting on negative increments;
 - b. Its removal does not create a permanent gap in the canopy and there are other equally valuable trees to take its place;
 - c. Its removal tends to improve the remaining crop and helps the growth of group trees down to the sapling stage o f any of the valuable species.
 - d. There is some undergrowth underneath to take its place and the ground is not opened unnecessarily by its removal.

Table 2.4.12 : Felling programme

Year	Range	Block	Number & Name of Forests	Comptt./ Sub-Comptt.	Area in ha.	
					Gross	Stocked
1	2	3	4	5	6	7
2006-07	Habban	Thandidhar	RF 8 Ber Jamoli	C1a	45.75	41.25
			RF 9 Pajoga	C4f part	48.00	42.00
2007-08	Rajgarh	Bathaudhar	RF 26 Sawana	C1b	42.75	6.75
			do.....	C1c	66.50	66.50
2008-09	Habban	Thandidhar	RF 8 Ber Jamoli	C3b	39.50	34.50
	Rajgarh	Bathaudhar	RF 26 Sawana	C1f	67.50	40.50
2009-10	Rajgarh	Bathaudhar	RF 24 Sanohat	C1a	32.50	32.50
			RF 27 Shilli	C1d	40.70	6.40
2010-11	Rajgarh	Bathaudhar	RF 26 Sawana	C1e	70.60	13.50
	Habban	Thandidhar	RF 8 Ber Jamoli	C3a	34.80	28.45
2011-12	Habban	Thandidhar	RF 8 Ber Jamoli	C2a	42.50	39.50
2012-13	Habban	Thandidhar	RF 8 Ber Jamoli	C2c	12.80	12.80
				C2b	74.50	65.50
				C3c	37.50	37.50
2013-14	Habban	Thandidhar	RF 9 Pajoga	C4c	70.80	49.55
				C3d	58.00	50.75
2014-15	Habban	Bakhog	RF 3 Ghotari	C1b	53.78	42.68
		Thandidhar	RF 5 Narh	C3	44.55	10.00
				C5	83.90	14.55
		Thandidhar	RF 8 Ber Jamoli	C1c	74.10	49.35

Year	Range	Block	Number & Name of Forests	Comptt./ Sub-Comptt.	Area in ha.	
					Gross	Stocked
1	2	3	4	5	6	7
2015-16	Habban	Thandidhar	RF 9 Pajoga	C4e	50.50	48.60
2016-17	Rajgarh	Bathaudhar	RF 27 Shilli	C1c	42.95	15.95
				C1a	15.75	7.75
				C1b	65.15	65.15
	Habban	Thandidhar	RF 7 Khabar	C2	29.30	23.35
2017-18	Habban	Thandidhar	RF 9 Pajoga	C4d	36.50	19.75
				C4f	15.20	13.25
2018-19	Rajgarh	Bathaudhar	RF 24 Sanohat	C2a	18.80	18.80
			RF 25 Satambu	C4	95.43	48.75
				C2	71.87	31.50
2019-20	Habban	Thandidhar	RF 9 Pajoga	C1a	45.00	38.10
			RF 10 Shar	C2f	52.30	47.45
2020-21	Rajgarh	Bathaudhar	RF 25 Satambu	C5	97.60	32.00
	Habban	Thandidhar	RF 8 Ber Jamoli	C1b	60.16	57.46
2021-22	Habban	Thandidhar	RF 9 Pajoga	C2c	38.00	35.80
				C3b	61.20	37.00
			RF 10 Shar	C2c	25.60	12.10
				C2g	33.00	28.00
2022-23	Habban	Thandidhar	RF 8 Ber Jamoli	C1d	85.00	56.00
2023-24	Habban	Thandidhar	RF 9 Pajoga	C1b	195.00	176.00

Year	Range	Block	Number & Name of Forests	Comptt./ Sub-Comptt.	Area in ha.	
					Gross	Stocked
1	2	3	4	5	6	7
2024-25	Habban	Thandidhar	RF 10 Shar	C2d	42.50	42.50
2025-26	Habban	Thandidhar	RF 9 Pajoga	C3c	28.50	28.50
			RF 10 Shar	C1e	47.50	42.50
			RF 10 Shar	C1d	45.25	13.25
2026-27	Habban	Thandidhar	RF 9 Pajoga	C1a	72.00	62.00
2027-28	Habban	Thandidhar	RF 8 Ber Jamoli	C1d	50.00	32.50

Note : Felling will be done as per yield prescribed and selection trees given in Table 2.4.9.

5. The older selection trees will always be marked in preference to the younger exploitable trees which are likely to improve the growing stock by putting more increments. Old, hollowed and unfit trees will always be preferred for removal to the younger exploitable trees wherever there is a choice in the matter.
6. Thinning are an inseparable part of selection fellings and must in no case be neglected. It is to be done in congested group's alongwith the main fellings.
7. To safeguard the future yield, trees below 60 cm dbh shall not be marked unless unfit or actively suppressing the group of younger crops.
8. All marking are to be carried out in favour of the valuable and promising species – deodar being preferred to kail and healthy kail to spruce and silver fir. In mixed forests in areas suitable for deodar and kail, spruce and fir should be opened up heavily.
9. In areas where mature and over mature trees are in plenty but regeneration younger crop is deficient, cautions opening should be made in the canopy by removal of older trees. The opening should be large enough to allow sufficient light to induce fresh regeneration but not too large to encourage weed growth.
10. Marking should always be done in favour of the best grown and most vigorous trees in the main canopy, irrespective of age or size.
11. Trees liable to damage the younger crops, should be lopped before fellings.
12. Beyond the slope of 40%, the uneven aged character of the crop should be maintained as a permanent feature.
13. In localities subject to damage by avalanches and snow slides a protection belt should be maintained along the banks of streams and nalas.
14. Trees standing in blank area, on the precipitous slopes, eroding locations, edges of an opening, inaccessible ground, lower portion of roads, rocky cliffs, along the boundary lines and water courses must not be felled.
15. Climber cutting will be done during the markings.
16. The broadleaved trees should be left as such till the market is available for them.
17. In fir areas, marking should be done in such a way that at least 25% mixture of broadleaved associates of the conifers is retained.

2.4.27 Subsidiary Silvicultural operations : Immediately after the fellings are over, the subsidiary silvicultural operations will be carried out in the same year or in the next year. The marked trees not felled by the contractor or other felling agencies shall be felled and removed. Bush cuttings and lopping of inferior broadleaved species interfering with the growth of the healthy young crop and regeneration of valuable species shall be carried out. The area shall be gone over under cleanings and unsalable thinning in dense patches of saplings and poles. The fellings refuse shall be allowed to be taken by the local people wherever possible. The left over slash should be collected in small heaps away from the standing trees and burnt or dumped in the nalas. While burning the slash, great care be exercised as deodar, kail, spruce and fir are very susceptible to fire and die from the excessive blast or hot air from the burning heaps. The damaged and unserviceable tree of saleable size should preferably be salvaged simultaneously and handed over to the contractors or felling agencies as supplementary makings. Weeding operations should be carried out on small scale in limited areas where dense weed growth is positively inhibiting the natural regeneration and cleaning done in patches where regeneration is very dense. All the

climbers and liane should be cut alongwith weeding, bush cutting and lopping. In fir and spruce areas raking of humus in alterative strips 3 to 5 meter wide should be carried out to expose the mineral soils to expose the mineral soils to help the germination of spruce and fir seeds.

2.4.28 Artificial Regeneration : Natural regeneration of kail and deodar is inadequate. It is scanty or deficient in case of spruce and silver fir. There are culturable and uncultivable blanks in the forests allotted to this working circle. It is suggested that sowing and planting of suitable species should immediately be undertaken to stocks the blanks and very open areas.

2.4.29 Choice of species: Deodar and kail will be the main choice in lower elevations and warmer slopes below 2,700 m, whereas spruce and silver fir will be planted on higher elevations. Nature distribution of spruce and silver fir indicates that spruce grows in the lower parts and silver fir occupies the upper belt. Silver fir prefers cooler, moist and shady locations in spruce zone, whereas spruce occupies the raised ground and exposed spurs in the silver fir zone. Broadleaved species fill up the depressions. These factors should be taken into considerations while taking the sites for sowing and planting. Broadleaved species have a good market. They are also very useful to neutralize the acid reaction of soil and help the decomposition of conifer needles as the foliage of broadleaved species are rich in alkali salts. They are also easy to grow. Therefore, mixture of broadleaved species should be introduced while raising spruce and silver fir plantations. In fact any mixture with silver fir helps to reduce accumulation of humus layer and a mixture is automatically ensured if silver fir is not planted on sites suitable for spruce and kail and in too moist depressions which are suitable for broad-leaved species like Walnut, maple, Chestnut, Bird Cherry, Ash etc. A detailed treatment map should therefore be prepared before taking up actual planting, indicating the areas to be planted with different species.

2.4.30 Nursery Technique : Nursery techniques for deodar, spruce and fir is well established and need no elaboration. Seeds will be sown in polythene bags. Bags are to be filled with properly mixed and manured soil from fir zone. Raising of plants in tubes enhances the success percentage and cost of weeding, bush cuttings and beating up of failure as compared to naked root planting. Tube planting also reduces the nursery period. The broadleaved species are sown in beds and it is planted in the field with ball of earth. The plants of spruce and fir and deodar attain the plantable height of 25 to 30 cm in 2½, 4½ and 1½ to 2 ½ year respectively. Broadleaved species attain the height of 45 cm to 60 cm in 1½ to 2½ years when they become plantable.

2.3.31 Sowing and planting : All the blank areas of one ha and above in extent and the other areas to be taken up for sowing and planting will be closed to grazing and fenced with atleast three stands of barbed wire or stone wall if stones are available locally. Kail is to be regenerated by patch or line sowing along the contour 3 m apart. Healthy plants of deodar, spruce and silver fir not less than 25 cm to 30 cm in height should be planted in the field. Under normal conditions size of pits shall be 30cm× 30cm×30cm and the distance of planting 2.5x2.5 meters. In rocky pockets with little soil, size of pits may be increased to 45x45x45 cm. planting shall be done in July after 2-3 good showers and must be planted in such a manner so as to complete by the end of 1st week of August each year. Entire transplanting of broad-leaved species shall be done in moist locations in winter (December) when the plants are dormant. Beating up of failures shall be continued till the overall success is 75% or more. Normally beating up to 2 years following the main planting should suffice provided systematic efforts are made and work is carried out efficiently.

2.4.32 The culturable blanks existing in the circle is 80.70 ha in extent. Also there are other areas occupied by very open to scattered crops of various species requiring immediate attention. All such areas are to be sown and planted in the next fifteen years. The sowing and planting

programme shall be framed by the D.F.O. and concerned range officer depending on the availability of nursery stock, priority of the area and felling programme. On average 8 to 10 ha shall have to be planted annually. The details of areas to be sown and planted are given in table 2.4.13.

Table 2.4.13 Statement showing the areas to be sown and planted during the plan period.

No. and Name of Forests	Comptt/ Sub-comptt	Area in ha to be sown/planted		Species to be raised.
		Culturable blanks	Deodar+Kail or Spruce/Fir	
RF 3 Ghotari	C1b	1.00	--	Deodar, Kail, Spruce, Fir & B/L Species
RF 5 Narh	C3	--	5.00	-do-
-do-	C5	56.60	4.75	-do-
RF 8 Ber Jamoli	C2a	1.50	--	Deodar, Kail, Spruce & Fir
-do-	C3a	2.85	--	-do-
-do-	C3b	5.00	--	-do-
RF 9 Pajoga	C1a	2.10	--	-do-
-do-	C2c	1.00	--	-do-
-do-	C3b	1.70	--	-do-
-do-	C3d	6.50	--	-do-
-do-	C4c	1.00	--	-do-
-do-	C4d	1.45	--	-do-
-do-	C4e	--	--	-do-
RF 10 Shar	C2g	--	--	-do-
RF 26 Sawana	C1c	--	4.00	Spruce, Deodar & Kail
-do-	C1e	--	8.5	-do-
RF 27 Shilli	C1d	--	--	-do-
	Total	80.70	22.25	

2.4.33 Weeding: for the healthy growth of plants and establishment of regeneration, timely weeding is of immense importance. The growing season of fir is limited from April to September month and plants must be kept free of weeds during this period. Thorough weeding of young plantations of all species is essential. Two weeding every year i.e. pre and post monsoon weeding will be carried out till the plants attain a height of 1.5 m. Weeds and bushes at no stage should be allowed to smother the young plants. Similarly, cleanings and early thinning will also be carried out wherever necessary.

2.4.34 Closures : All the areas taken up for sowing and planting will be closed to grazing for a period of 15 years in the same manner as for P.B.I. areas of other working circles. It should be ensured that adequate areas are closed for regeneration every year. The fence must always be kept in good condition.

2.4.35 Grazing: Grazing in fir and spruce forests is generally of moderate intensity and does little harm to forests. It helps in keeping the weeds down, prevents formation of deep humus layers and exposes fresh soil for seed germination. As such the entire areas will be kept open to grazing. Some of the areas are being over-grazed by the migratory graziers and Gujjars when they pass and halt while moving to alpine pastures. Blanks are created at halting places which are widened up gradually by the girdling of surrounding trees. Strict measures should be taken to stop this practice. Severe lopping of trees is practised around the villages and Gujjar practice. Control over such lopping should strictly be exercised and defaulters be dealt with severely. The grazing by migratory graziers and Gujjars should be regulated by a check on the number of cattle. The over-grazed areas should be closed to grazing under a rotational closure.

2.4.36 Fire protection: Generally the entire working circle lies beyond the fire zone, but as the coniferous species growing in the area susceptible to fire, all the precautionary measure must be taken to protect the forests from fire. Extra care should be taken in areas being for felling.

2.4.37 Right Holder's Requirements: The requirements of right holders will continue to be met with from the forests as heretofore, except that no grass cutting will be allowed in the freshly sown patches till the seeding are 60 cm high. The timber requirement is generally nominal, and should, as far as possible, be met from the dead, dying, uprooted and snow damaged trees or those available in thinning, improvement fellings and salvage markings. Marking of unexploitable size is forbidden. No green trees are felled for meeting the local demands, unless it is strictly silviculturally available. All exploitable sized trees granted to right holders will, count the yield.

CHAPTER-V

THE REHABILITATION WORKING CIRCLE

2.5.1 General Constitution : This working circle covers all the poorly stocked, very open, degraded, maltreated and fire burnt chil, kail and deodar forest pure or mixed, interspersed with blank and patches of oaks and miscellaneous broadleaved species. The density of the crop is below 0.3 and the regeneration is deficient. It includes reserved, protected, unclassified, mushterqua and Shamlat/ceiling land forests extending over an area of 4,107.70 ha as per details given below :

Table 2.5.1 Area statement of Rehabilitation working circle.

Sr. No	Legal classification of forests	Symbols	Area (ha)		
			Gross	Stocked with	
				Conifers	B.L. Spp.
1.	Reserved Forests	R.F.	1857.44	1340.88	248.06
2.	Protected Forests	P.F.	322.35	253.75	4.25
3	Unclassed Forests	U.F.	402.40	323.50	56.10
4	Mushterqua Forests	M.F.	897.24	699.36	28.45
5	Shamlat/ Ceiling land Forests	S.F.	628.27	544.13	11.20
		Total :	4107.70	3161.62	348.06

The details of the area statement by Ranges, Forest blocks and comptt./ sub - comptts. Showing gross and stocked area under various species are given in Appendix II.

2.5.2 General character of vegetation: The forests are of low stocking and poor growth, supporting open to very open and patchy crops of chil, deodar and kail, pure or in mixture with varying proportions of different age classes. The chil areas predominate. In chil zone considerable patches of dry mixed deciduous broad- leaved species consisting of *Lannea grandis*, *Terminalia tomentosa*, *T. Billerica*, *Bauhinia* spp, *Sapium insigne*, *Euphorbia royleana* etc. exists. This is mainly due to retrogression caused by biotic influences. Ban patches are also seen in depressions. Underwood consists of Ban, Ailan, jhingan and associated species. The regeneration of chil is moderate to fair and the area can be restocked fully if closed effectively. The quality of chil is II/ III and density 0.1. to 0.3 . The undergrowth is sparse to moderate consisting of *Carissa opaca*, *Flacourtia* spp. *Lantana camara*, *Murraya koenigii*, *Rubus* spp. etc. Deodar and kail forests have Ban and Mohru species occurring as underwood and in pure patches, mainly confined to sheltered places and along the nallas. The Deodar and kail crops are irregular containing all age classes which are open to very with patches moderately stocked at places. The quality is II and regeneration, though coming up fairly, is deficient due to biotic inferences. In transitional belts and cooler aspects. Spruce and silver fir is intimately mixed with kail and deodar on higher reaches and chil in lower zones. On account of irregular fellings in the past coupled with fires, grazing and loppings, large blanks exist in the forests. Density of the crop is generally low (0.1to 0.3) except for a few small patches where it is even upto 0.5. Undergrowth is patchy to moderate consisting of *Berberis*, *Rumex*, *Myrsine*, *Plectranthus*, *Urtica*, *Zirardiiana* etc.

2.5.3 The forest included in this working circle conform to sub- group 9/cia, 9/clb, 12/clc, 12/clf and 12/ SI of Champion and Seth S forest types which have already been described in detail in Chapter II of Part I.

2.5.4 Blocks and compartments: No change has been made in the existing boundaries of the forests and compartments. Some of the left over areas of RF and MF have been included by forming the separate compartments/ sub compartments. Jagir forests transferred to the forests department have been splitted into a number of forest blocks and suitable compartments and sub-compartments and named after Mauza. For the first time, the Shamlat forests have been brought under working plan and compartments have been formed on the basis of natural boundaries and crop conditions. These forests have been numbered serially and named after Mauza. All the compartments / sub compartments are distinguishable on the ground.

2.5.5 Felling Series: No separate felling series have been constituted.

2.5.6 Special objects of Management: Consistent with the general objects of management, these will be:

- i) To restock the degraded chil, deodar and kail forests and bring them back to normal condition.
- ii) To assist the natural regeneration by artificial means and restock the blanks with chil, deodar and kail sowings/ plantings.
- iii) To improve the stocking of forests through check on fellings and resin tapping to attain the normalcy.
- iv) To improve the grass production and soil cover by closing the area and thus improve the general environment of degraded forests.
- v) To meet the domestic demands of local people.

2.5.7 Area and allotment: The gross area of this Working Circle is 4,107.70 ha with 3,161.62 ha under chil, kail deodar spruce and fir (76.97%). The distribution by Ranges, compartments and sub compartments is given in Appendix I&II. The distribution of gross and stocked (conifer spp) area over different ranges by different legal classes of forests is given in Table 2.5.2.

2.5.8 Analysis and Valuation of the crop:

2.5.9 Stock maps: All the compartments and sub compartments have been stock mapped on 1:15,000 scale maps and the same is pasted in respective compartments History Files. As regards the Shamlat and ceiling land forests, the revenue maps have been reduced nearest to the scale. The detailed stocking of individual forests and compartments /sub compartments are given in Appendix II and abstract produced in Table 2.5.3.

Table 2.5.2 : Statement of Ares allotment.

Range	Area (ha)											
	R.F		P.F .		U.F.		M.F.		S.F.		Total	
	Gross	Stocked	Gross	Stocked	Gross	Stocked	Gross	Stocked	Gross	Stocked	Gross	Stocked
Habban	1150.62	760.75	171.00	111.65	--	--	375.91	268.93	27.33	19.53	1724.86	1160.86
Rajgarh	120.99	98.09	19.10	19.10	--	--	87.80	60.55	--	--	227.89	177.74
Narag	273.07	246.93	8.70	8.70	258.75	231.95	390.78	335.43	196.79	178.49	1128.09	973.85
Sarahan	312.76	235.11	123.55	114.30	143.65	91.55	42.75	34.45	404.15	346.11	1026.86	849.17
Total :	1857.44	1340.88	322.35	253.75	402.40	323.50	897.24	699.36	628.27	544.13	4107.70	3161.62

Table 2.5.3 : Stocking and area statement

Stoking (spp)	Chil	Deodar	Kail	Mixed conifers	Ban	Misc. broad-leaved	Blanks			Stocked area	Un Stocked area	Total
							Culturable	Unculturable				
Area (ha)	2499.32	247.96	264.12	150.22	197.87	150.19	519.02	3.45	75.55	3509.68	598.02	4107.70

2.5.10 Site quality and age classes: Each of the species occurring in the compartments and sub- compartments has been assigned an average quality class determined by ocular estimate of height and checked casually by height measurements. The site quality of chil varied from III to II, average being II/ III, the average quality of deodar and kail is II. The crop is irregular, mostly of mixed classes with younger and middle aged classes predominating.

2.5.11 Density: The density in each compartments and sub-compartments was ocularly determined and recorded in the C.H. Files. Majority of the forests are very open with density 0.1 to 0.3. In some forests the density is 0.4to 0.5 in patches but mjr portions are blank. On average it is below 0.3.

2.5.12 Regeneration: Regeneration is not a problem in chil and kail areas if the closure is effective and the forests are protected against biotic interferences. Due to severe fires, excessive grazing and over fellings in the past, the regeneration is either absent or deficient. Whatever natural regeneration comes, it is destroyed due to uncontrolled grazing, frequent fires and reckless cuttings before its establishment. The existing poles, saplings and seedlings are maltreated as a result of which they are stunted, malformed and of poor quality.

2.5.13 Enumeration and Results: The forests of this working circle were divided in two groups' viz. chil forests and deodar / kail forests. The forests falling in Deodar- kail group are listed in Table 2.5.4. Out of total area of this working circle, 19 compartments/sub-compartments with 330.06 ha in extent were enumerated.

Partial enumerations were done down to 10 cm d.b.h. in 10 cm diameter classes. The unit of enumeration sampling was compartments and sub-compartments.

Table 2.5.4 : List of compartment/sub-compartments groups under Deodar-Kail forests.

Sr. No.	No. and Name of forest	Comptt./Sub-comptt.	Area (ha)
1	RF 1 Tharu	C3a	81.23
2	RF 5 Narh	C2	24.55
3	-do-	C4	27.50
4	RF 8 Ber Jamoli	C3d	28.20
5	RF 10 Sarh	C1b	25.30
6	RF 11 Katoga	C2a	71.83
7	RF 12 Dhamla	C2c	54.00
8	RF 13 Dol	C2b	56.00
9	-do-	C2c	59.22
10	-do-	C2d	55.12
11	-do-	C2e	22.56
12	RF 20 Dalmu Pitli	C2a	25.62
13	-do-	C2e	7.90
14	RF 21Dalmun Deothi	C1b	38.70
15	-do-	C2b	40.35
16	-do-	C2d	21.35
17	PF 2 Churel Ka Nal	C2	56.25
18	-do-	C4	65.25
19	-do-	C10	49.50
20	MF 3 Tharu	C2	10.50
21	MF 4 Majhgaon	C1	16.40

Sr. No.	No. and Name of forest	Comptt./Sub-comptt.	Area (ha)
22	MF 6 Kuffer Mond	C2	42.00
23	MF 7 Tali	Whole	4.23
24	MF 10 Pain Kuffer	C3	23.15
25	MF 17 Jadol Taproli	Whole	3.58
26	MF 18 Pajerli	Whole	3.50
27	MF 22 Ulakh	C2	14.25
28	MF 25 Darena	Whole	17.90
29	MF 26 Thanoh	Whole	16.45
30	MF 30 Korab	C1	3.20
31	MF 43 Arwan	Whole	17.60
32	MF 59 Sawana	C1	14.50
33	SF 3 Kuru Lawana	Whole	7.44
34	SF 4 Dibber Tarli	Whole	17.84
35	SF 7 Arwan Sangrah	Whole	2.05
		Total	1025.02

2.5.14 The estimated growing stock of chil, deodar, Kail, spruce and fir for the working circle alongwith the current annual increment is given in table 2.5.10.

2.5.15 Silvicultural system: The entire area of the working circle shall be treated in the plan period and stocked both by natural and artificial means to improve the stocking. As the crop is already under stocked and open to very open, no regular fellings will be done. The area will only be cleared of bush growth wherever necessary. However, hygienic and salvage removals will be carried out, wherever required. If opening is required in exceptional cases in some patches, it is to be carried out alongwith the hygienic and salvage removals and tress so marked will be only to meet the requirement of Right Holders. In case of malformed trees only those trees shall be removed, the felling of which will result in improvement of the remaining crop or in clearing overhead shade of regeneration.

Table 2.5.10 Estimated growing stock and increment of Deodar-Kail & Chil species in Rehabilitation Working circle (4107.70 ha)

Species	Parameters	Diameter classes in cm									Total
		10-20 V	20-30 IV	30-40 III	40-50 IIA	50-60 IIB	60-70 IA	70-80 IB	80-90 IC	> 90 ID	
Chil	N	196595	161515	63012	28672	16759	7846	4149	986	82	479616
	V (m ³)	9908.39	40362.6	43138.02	38833.36	37863.61	26671.69	19809.82	6295.51	674.88	223557.87
	C.A.I (m ³)	451.82	1513.6	1160.41	877.63	753.49	416.08	225.83	57.92	4.45	5461.24
	N/Ha.	47.86	39.32	15.34	6.98	4.08	1.91	1.01	0.24	0.02	116.76
	V/Ha.	2.41	9.83	10.5	9.45	9.22	6.49	4.82	1.53	0.16	54.42
Deodar/Kail	N	68225	28052	20249	11163	6235	3385	971	460	286	139026
	V (m ³)	4823.51	3972.16	14334.27	15804.58	15889.27	11981.21	4674.1	2800.43	2027.14	76306.67
	C.A.I (m ³)	653.1	241.71	356.64	209.41	112.81	77.88	30.38	18.2	13.18	1713.31
	N/Ha.	16.61	6.83	4.93	2.72	1.52	0.82	0.24	0.11	0.07	33.85
	V/Ha.	1.17	0.97	3.49	3.85	3.87	2.92	1.14	0.68	0.49	18.58

2.5.16 Rotation and exploitable diameter: It is of little significance in the management of forests under the Rehabilitation Working Circle.

2.5.17 Choice of species: Chil will be preferred in the chil forests and on warmer aspect/ridges, and lower reaches of deodar –kail forests. Deodar and kail shall be the choice in deodar-kail forests and in depressions and cooler areas of chil forests. The possibility of introduction of broad-leaved species of economic importance like Walnut, Chestnut Ash Maple and Bird Cherry in depression and moist locations is not ruled out.

2.5.18 Calculation of yield: Since the areas are too open and under stocked, commercial exploitation is ruled out. As the mother trees to be retained are not available in adequate numbers at uniform spacing's, the calculation of yield will be of an academic exercise only. Also the annual yield shall not be sustained as the main aim of creating this circle is restock the under stocked and degraded coniferous forests at the earliest with intensive care and management. The yield from hygienic removals and salvage markings will be the only yield. The unfit trees have been excluded from enumerations and shall not be counted against the prescribed yield. The dry, fallen, uprooted, dead and damaged trees will meet right holders demand and shall be counted against the yield of the working circle.

For the sake of calculations, the yield is based on the volume of trees of 20cm d.b.h. and above. To improve the stocking and as a safeguard against fire and calamities the increment has not been taken into account. The species wise yield is worked out as under:

Chil: The annual yield of chil is calculated as per procedure described in para 2.2.15 as under:

$$\begin{aligned}
 \text{Annual yield (m}^3\text{)} &= \frac{\text{Total growing stock volume-(Volume of mother trees over an area of 2499.32 ha + 20 \% Volume of III and IV classes + Volume of V class trees.)}}{\text{Regeneration period}} \\
 &= \frac{223557.87 - (38.41 \times 2499.32 + 20 \% \text{ of } 83500.62 + 9808.39)}{30} \\
 &= \frac{223557.87 - (95998.88 + 16700.12 + 9808.39)}{30} \\
 &= \frac{223557.87 - 122507.39}{30} \\
 &= \frac{101050.48}{30} \\
 &= 3368.34 \\
 &\text{Or Say } 2500 \text{ M}^3
 \end{aligned}$$

Deodar and kail: The annual yield of deodar/ kail is calculated as per formula described under para 2.3.23 as under:

$$\begin{aligned}
 \text{Annual yield (m}^3\text{)} &= \frac{\text{Total growing stock -(Volume of seed bearers over an area of 662.3 ha + 1/3 volume of III and IV classes trees + 10\% Volume of I and II class trees + Volume of V class trees)}}{\text{Regeneration period}} \\
 &= \frac{76306.67 - (75.037 \times 662.3 + 1/3 \text{rd of } 18306.43 + 10\% \text{ of } 53176.73 + 4823.51)}{30} \\
 &= \frac{76306.67 - (49697.00 + 6102.14 + 5317.67 + 4823.51)}{30} \\
 &= \frac{76306.67 - 65940.32}{30} \\
 &= \frac{10366.35}{30} \\
 &= 345.54 \\
 &\text{Or Say } 300 \text{ M}^3
 \end{aligned}$$

Spruce and Silver Fir: These species are present only in limited numbers in the transitional belt growing sporadically mixed with deodar, kail and oak species. The retention of such species is essential to restock the area and increase their proportion. As such neither the felling of these species is contemplated nor is the yield to be prescribed. Hence the annual yield is not being calculated.

2.5.19 The prescribed yield: No commercial fellings are prescribed for this working circle. The hygienic and salvage removals have to be accounted for. The forests are under stocked and subject to frequent fires. There is thus necessity to build up the growing stock. The prescribed yield of Chil is 2500 M³ m as calculated in proceeding paras. This is equal to 45.77% of the C.A. I (5461.44 m³). Thus 54.23 % balance of C.A.I will be added annually to improve the present stocking. Likewise prescribed yield of Deodar & Kail is calculated as 300 M³ and this is equal to 17.51% of the C.A.I (1713.34) and remaining 82.49 will be added annual to improve the present stocking. The yield thus prescribed is presented in Table 2.5.11.

Table 2.5.11 Prescribed annual yield

Species	Chil	Doedar + Kail
Prescribed yield (m ³)	2500	300

However, it is clarified here that no attempt should ever be made to remove the prescribed yield from this working circle, as it has been prescribed to adjust the salvage removals only which generally occur, in chil and deodar / kail forests annually or periodically.

2.5.20 Control of yield: All the removals down to 10 cm d.b.h. will count towards yield of the working circle. The yield will not be regular on sustained basis as it is subject to salvage marking. Right holders be marked the trees from the areas, required to be removed before the closure and planting.

2.5.21 Table of fellings /planting programmes: No commercial fellings are to be carried out in this working circle. Only restocking of the area through effective closure and regeneration is contemplated. However, salvage marking of dry and uprooted trees may be carried out as and when necessary. Alongwith the salvage removals, light markings may be carried out for uniform distribution of seed bearers under hygienic cum improvement fellings wherever felt absolutely essential. All the areas of the working circle shall be closed during the plan period and regenerated. Natural regeneration shall be assisted by sowing and planting of kail, deodar and chil species. The areas suggested as per expired working plan by M.B. Shrivastava, 270 ha area of forests shall be closed and planted up annually in working plan period as per availability of forests prescribed in expired working plan.

2.5.22 Method of executing the felling: Practically no felling will be done and the area will be cleared of scrub and bushes only. However where necessary, the fellings may be done keeping in view the terrain and stage of natural regeneration. The over mature trees standing over 5 m high regeneration may be removed to open the canopy. As far as possible, felling of green trees should be avoided. Alongwith the salvage removals, light retouching may be carried out to place uniformly as far as possible 20 chil trees and 30 deodar /kail trees preferably of II and I classes per ha as seed bearers. Broad leaved scrub species except oaks shall be removed, except on uncultivable sites. Patches of healthy young regeneration shall be retained. Over wood shall be removed only when the regeneration is established with an average height of 4to5cm. All seed bearers shall be removed except those required to provide seed for unregenerate portions exceeding 0.5 ha or where their retention is still otherwise desirable. All the removals should be done after lopping and roping to avoid damage to regeneration and young plants.

2.5.23 Treatment of the areas: In order to regeneration all the areas allotted to this working circle within the regeneration period, the emphasis shall be on the artificial method of regeneration. Most of the areas are degraded and refractory. Therefore planting of sturdy, well grown and healthy seedlings of ehil and deodar over 20 cm in height shall be done. In kail dominated areas, patch sowing with good quality kail seeds will be carried out. The areas shall be fenced, cleared of bushes and timber extraction if any pits to be dug and patches to be prepared for sowing and planting in july.

2.5.24 Subsidiary Silvicultural operations: The subsidiary silvicultural operations to be carried out are prescribed as under:

Clearance of sites: The area will be cleared off the bush growth and felling refuse, if any. The mater al will be burnt in depressions and blanks or dumped in nallas. Site clearance should be completed by the end of March positively.

Treatment Maps: For the areas taken up in a particular year, treatment maps on 1:3,750 scale shall be prepared showing soil type, depth, drainage, slope, planted area and species raised and pasted in Comptt. History files.

Site preparation and earth works: Sowing will be done in 1 m² patches laid along the contours at distance of 3m. The planting will also be done at a spacing of 2mx2m in pits of 30cm

x 30cm x 30cm size. The area shall be closed simultaneously either with 4 strand barbed wire or stone wall fencing. The earth work and fencing should be completed by the end of May every year.

Temporary nurseries: The nurseries should be located at central place near the water source. The requirement of plants should be worked out on the basis of net area to be planted. Sowings in the nurseries should be done at an appropriate time. Chil and deodar should be raised in polythene bags. Species wise sowing time and age of plants required at the time of planting is given in Table 2.5.13

Table 2.5.13 Species, time of sowing and time required to grow plantable seedlings.

Species	Sowing time	Period required to attain plantable size
Chil	February/March	6 months
Deodar	December/January	1 ½ to 2 years

Sowing and planting: Patch sowing should be done with the first shower of monsoon by broadcasting sufficient kail seeds. Planting of tube seedlings should be completed latest by 10th on August positively so that the plants get a month's period of rains to establish well to withstand the post monsoon drought.

The failures will be beaten up till the area have fully stoked. The broadcast sowing will be stopped with the progress of regeneration.

Weeding: Weeding shall be carried out till the plants are above the weed height and not smothered any more. Atleast one weeding is essential during the growth period i. e. in August/ September for 3 consecutive years for chil plantations. Normally two weeding one in June/ July and another in August/September are considered sufficient for deodar and kail.

Cleanings: Cleanings should be carried out in denser patches of young regeneration comprising mainly of saplings. All material should be burnt as a fire protection measure.

Mechanical thinning: When the crop attains young pole stage, it is subjected to stick thinning.

2.5.25 Fire protection and control burning: Internal fire lines 5m wide dividing the entire plantation area into blocks of not more than 20ha should be cleared and maintained, in addition to external fire line given in Appendix VI. Chil crops will be control burnt departmentally when the regeneration has attained an average height of over 2.5 m. This will be done annually till the regeneration /attains an average height of 5m. The boundaries of plantation / regeneration areas will also be clear of the inflammable material during the fire season.

2.5.26 Grazing: The area to be closed for regeneration and planted up shall not be allowed to grazing. However, if the regeneration and planted up shall not be allowed to grazing. However, if the regeneration is established and the plants are out of danger, controlled grazing can be permitted. Grazing will be allowed in the areas not taken up for closures.

2.5.27 Closures: The closure shall be got notified in advance. In the instance the closure shall be for a period of 30 years. This can, however, be extended depending upon the progress of regeneration. The closed area shall normally be thrown open to grazing as soon as the plants are beyond damage by grazing.

2.5.28 Exercise of rights and concessions: The timber requirement of right holders shall be met from salvage removals. No green felling shall be permitted from the forests allotted to this working circle, especially when these are closed and planted up. The unrestricted grazing shall have to be checked and shall feeding of domestic animals has to be encouraged.

2.5.29 Resin Tapping: The Resin tapping is to be banned completely in all the forests allotted to this Working Circle atleast for the period of the plan.

CHAPTER VI

THE PROTECTION WORKING CIRCLE

2.6.1 General Constitution: All oak forests including the forests of coppice Working Circle of the previous plan not included in other working Circles, tough terrain, inaccessible and remote areas, rock and blank areas prone to erosion, slips and landslides and areas situated on precept slopes or other such localities which require complete protection against denudation and soil erosion are included in this working circle. Commercial working in these forests is not prescribed as the forests are either inaccessible and remote or their preservation is desirable from ecological consideration. For the part they are of the high lying type and contain large areas of kharsu oak, scattered fir or birch as well as rock with numerous thatches or grasslands. Their chief value lies in being most important from the point of view of protection in preventing denudation conserving the environment and moisture regime, balancing the mountain ecosystem and maintaining equably the flow of water in the streams and rivers which have their sources in these hills. The potential value of the forests is great in addition to their protective value though they would not be worked commercially but protected and maintained as such. Total area of the Working Circle is 2,540.94 ha. It includes all types of forests, the detail of which are given in Table 2.6.1

Table 2.6.1-Area Statement and Legal Classification.

S. No.	Legal Classes	Symbols	Area (ha)		
			Total	Stocked	Unstocked
1	Reserved Forests	RF.	1452.34	1302.55	149.99
2	Protected Forests	PF.	557.80	489.85	67.95
3	Unclassed Forests	UF.	75.90	75.90	---
4	Mushterqua Forests	MF.	225.12	196.67	28.45
5	Shamlat/ceiling land Forests	SF.	229.78	147.57	82.21
		Total	2540.94	2212.34	328.60

2.6.2 General Character of Vegetation: The majority of forests allotted this working circle are covered with moderately to well Stocked oak crop (Density 0.5 to 0.7) of all age group with middle aged to mature trees predominate. **Quercus incana** predominates as pure crop in lower elevation whereas **Q. semicarpifolia** in the upper reaches. **Q. dilatata** pure of mixed with **Q. incana** is also found in Rajgarh and Habban ranges. Deodar, Kail, spruce and silver fir in isolated as well as in pure and mixed patches are also found growing in oak forest on higher reaches whereas chil is found in lower reaches and on warmer aspects, and on warmer aspects, ridges and spurs. The extreme top ridges have alpine pastures and grasslands devoid of trees growth. Some of the areas are covered with oaks and conifers on precipitous slopes in the temperate zone. Rests of the forests are scrubs or blank and degraded areas with thin and isolated as well as crops patchy of chil, miscellaneous broadleaved species or scrub vegetation of poor quality. Along the river Giri and Nait ka khala in Dimber Block there are some Khair and Shish am trees growing mixed with misc. broadleaved species and also in pure patches. The forests included in this working circle conform to sub-groups 5B/C 2, 5B/DSI, 5B/IS2, 9/DSI, 9/DS2, 12/C1a, 12/C1b, 12C1/DSI, 12C1/DS2, 12/C2a, and 12/ C2b of Champion and Seth s Forests Types which have already been described in Chapters II of Part I.

2.6.3 Blocks and Compartments: No change been made in the existing boundaries of the compartments and sub compartments except RF 18 Habban C2c which has been carved by separation the rocky precipitous hill areas from the old compartment. Jagir forests and Shamlat/ Ceilingland forests transferred department have been divided into a number of forests blocks and suitable compartments and named after Mauza. The basis of division has been the natural boundaries and crop conditions.

2.6.4 Felling Series: No felling series are made as it is not contemplated to work these forests commercially. Only removal of salvage trees will be done. Right holders demands will, also be met from these forests, if trees are available silviculturally.

2.6.5 Special Objects of Management: Consistent with the general object of management, these are:

- a) To protect the hill sides against erosion and conserve the area to build up soil water regime.
- b) To preserve, protect, improve and maintain the oak forests cover to ensure the regular flow of water in the streams and rivers.
- c) To conserve the environment and stabilize the Himalayan Ecosystems.
- d) To preserve and improve the existing degraded forests and restock the blanks by raising the plantation of economic species.
- e) To meet the demand of fuel, fodder and grass to local inhabitants and to regulate the lopping of oaks.
- f) To undertake active soil conservation measures in eroded areas.

2.6.6 Area and Allotment: The details of the forests allotted to this working circle are given in Appendix I and II. The abstract showing the area distribution by ranges and legal categories are given in Table 2.6.2. Out of the total areas of 2540.94 ha, the areas occupied by oaks is 1,805.77 ha i.e. 71% and by other species is 735.17 ha i.e. 29%.

Table 2.6.2 : Statement of area allotment.

Ranges	Area (ha)											
	R.F.		P.F.		U.F.		M.F.		S.F.		Total	
	Gross	Stocked	Gross	Stocked	Gross	Stocked	Gross	Stocked	Gross	Stocked	Gross	Stocked
Habban	416.41	361.61	20.70	20.70	---	---	13.90	13.90	---	---	451.01	396.21
Rajgarh	893.86	800.12	529.26	461.30	---	---	35.50	24.50	47.54	21.53	1506.15	1307.45
Narag	46.95	45.50	---	---	56.35	56.35	175.30	157.85	130.32	119.85	408.92	379.55
Sarahan	95.12	95.12	7.85	7.85	19.55	19.55	0.42	0.42	51.92	6.19	174.86	129.13
Total :	1452.34	1302.35	557.80	489.85	75.90	75.90	225.12	196.67	229.78	147.57	2540.94	2212.34

2.6.7 The entire areas have further been divided into following two categories as under.

- i) **Oak forests:** All the oak forests come under this category. They will be preserved, protected and maintained as such from environmental point of view. Considerable blanks existing in the forests will be planted up.
- ii) **Degraded Forests:** Forests with blanks and the areas prone to erosion, requiring closure, planting and soil conservation measures come under this category. The range wise areas of such categories are given in Table 2.6.3 and details of list of all such forest categories are given in Appendix V.

Table 2.6.3: Detail of oak and Degraded Forests.

Range	Area (ha)					
	Oak Forests		Degraded Forests		Total Forests	
	Gross	Stocked	Gross	Stocked	Gross	Stocked
Habban	417.58	393.06	33.43	3.15	451.01	396.21
Rajgarh	1255.37	1176.10	250.78	131.35	1506.15	1307.45
Narag	197.34	188.74	211.58	190.81	408.92	379.55
Sarahan	31.92	31.92	142.94	97.21	174.86	129.13
Total	1902.21	1789.82	638.73	422.52	2540.94	2212.34

2.6.8 Analysis and Valuation of the Crop.

2.6.9 Stock Maps: Stock maps on 1:15,000 scales have been prepared for all the compartments allotted to this working circle and pasted in the concerned Comptt. History files. The maps of Shamlat and ceiling-land forests have been reduced from revenue maps close to scale. The detailed stocking of individual forests and comptt/sup –comptts. Are given in Appendix II and abstract produced in Table 2.6.4.

Table 2.6.4 Stocking and Area Statement.

Stocked with spp.)	Chil	Deodar	Kail	Spruce	Mixed conifers	Oaks	Mixed B.L	Blanks		Included cultivation	Stock -ed	Un-stocked	Total
								Culturable	Un-culturable				
Area (ha)	94.40	48.20	67.30	4.20	13.80	1805.77	178.67	258.11	39.24	31.25	2212.34	128.60	2540.94

2.6.10 Site Quality and age Classes: No standard quality classes have been fixed for oaks. As such the crop has not been assigned and quality class. However, in general, the oak forests away from biotic disturbances are of good quality and growing luxuriantly. All the age classes are present in descending order from lower diameter classes to upper one giving a true picture of selection forests. Regarding other non oak areas, even casual observations reveal that the forests are of a very poor quality.

2.6.11 Density: The oak forests, in general are fairly stocked with average density of 0.5 to 0.7. Other forests are open and even blanks with patchy growth where the average density may be 1.0 to 0.2. It was estimated ocularly and recorded in the comptt. History Files of individual compartments.

2.6.12 Regeneration: Regeneration of oaks are inadequate in patchy and isolated form. In other areas, no regeneration of valuable species is coming up, except in a few scattered and sheltered patches. This is due to the overburdened grazing rights in the areas.

2.6.13 Enumeration and their Results: Randomized partial enumeration was carried out in Ban oak forests. The unit of enumeration sampling was compartment and sub- compartments. Trees down to 10 cm d.b.h. in 10 cm diameter classes were enumerated.

2.6.14 The diameter class wise estimated number of trees with volume (m³) per ha has also been computed and presented in Table 2.6.5. The higher number of trees in lower classes and lesser number higher classes indicate the selection nature of these oak forests.

2.6.15 Growing stock of Ban/Brass in Ban oak forests is calculated and provided in Table 2.6.6.

2.6.16 Silvicultural System: No silvicultural system is prescribed. Only removal of dead dying deceased trees is prescribed. No commercial exploitation is contemplated and as such no silvicultural system is prescribed. The blanks of plan table size in oak forests shall be closed and restocked by planting conifers like Deodar, Kail, Rai, Rosh and B.L. species like Walnut, Chestnut. Poplars, Ash, Maple and Bird Cherry. The degraded forests shall be closed effectively and suitable plan table patches shall be planted up with chil and other broadleaved species without disturbing the original vegetation.

Table 2.6.5 Growing stock per ha (Number and volume) of Ban oak trees for different diameter classes. (155.17 ha)

Growing stock	Diameter classes (cm)									Total
	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	>90	
Number (N)	186.67	171.56	158.06	79.84	40.64	15.98	5.55	0.64	0.21	659.14
Vol (M ³)	10.08	42.89	88.20	76.48	60.96	29.83	10.36	1.20	0.40	320.39

Table 2.6.6 Growing stock of Ban oak in exploitable oak forests (155.17 ha)

Growing stock	Diameter classes (cm)									Total
	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	>90	
Number (N)	28965	26621	24526	12388	6306	2479	861	100	33	102279
Vol (M ³)	1564.11	6655.25	13685.51	11867.7	9459	4628.29	1607.49	186.7	61.61	49715.66

2.6.17 Rotation and exploitable diameter: Rotation is of little or no significance for the protection forests.

2.6.18 Regeneration period: Regeneration period is of no significance in this working circle.

2.6.19 Choice of species: In blanks and degraded forests chil, Khair, Bamboos and other species of local importance shall be the main choice. In oak forests deodar, Kail, Rai, Tosh, Walnut, Horse Chestnut, Ash, Maple Bird Cherry, Oaks, Poplars etc. shall be preferred.

2.6.20 Felling Cycle: It will be 15 years.

2.6.21 Calculation of yield: It is of no relevance in prospection working circle.

2.6.22 The Prescribed yield: In protection circle no yield is prescribed. Only dead, dying, deceased trees will be removed.

2.6.23 Control of yield: Not required.

2.6.24 Treatment of Areas: Blanks of considerable size shall be closed and planted up with suitable conifer and broadleaved species as mentioned in para 2.6.20. Lopping in such forests shall be controlled as per lopping rules. The degraded forests shall be protected against denudation and soil erosion by effective closure and planting of suitable species. All possible soil conservation measures are to adopted in these areas. Most of such forests are incapable of providing any more grazing and require complete closure. If the closure in totality is not possible, atleast part of the compartment having good soil and fit for planting, should invariable be closed and planted up. The soil conservation measures will consist of contour trenching, gully plugging, check damming etc. In total 258.11 ha of culturable blanks are to be planted up during the plan period of 15 years and the total areas of 638.73 ha degraded forests shall be closed effectively. The details of such closures and plantable areas of each range of this division given in Table 2.6.7.

Table 2.6.7 : Statement of Closures and Plantable Areas.

Ranges	Plantable area (ha)	Closures of Degraded forests (ha)
Habban	24.65	33.43
Rajgarh	187.10	250.78
Narag	22.77	211.58
Sarahan	23.59	142.94
Total	258.11	638.73

2.6.25 Closure and planting programmes: The total areas to be closed are 719.87 ha whereas the plantable areas are .258.11 ha. On average this gives annual closures and planting of 48 ha and 17.21 ha respectively. A statement showing the closure and planting programme is gives in Table 2.6.08.

Table 2.9.08 : Closure and Planting Programme .

Year	Range	No. and Name of Forests	Comptt.	Total area (ha)	Area (ha)	
					Plantable	Closures
2012-13	Rajgarh	SF 38 Hiun	C1	34.60	16.50	34.60
	Sarahan	SF 115 Dinger Kinger	C4	10.21	5.11	10.21
2013-14	Habban	RF 10 Shar	C2b	24.00	0.70	0.70
		RF 9 Pajoga	C2b	30.35	1.50	1.50
	Narag	RF 39 Mahlana	C1	21.53	1.45	21.53
2014-15	Rajgarh	RF 32 Gadhhol Pirag	C1f	55.67	2.27	25.67
		PF 6 Bharan	Whole	65.50	8.00	10.50
2015-16	Rajgarh	RF 38 Hiun	C3	6.90	2.65	6.90
	Sarahan	SF 101 Sirat Sewli	C2	6.19	--	6.19
2016-17	Rajgarh	RF 31 Sanio Deedag	C3b	57.37	16.27	16.27
	Narag	MF 94 Sandrol	Whole	22.60	--	20.60
	Sarahan	SF 41 Katli	C2	1.32	1.32	--
2017-18	Rajgarh	SF 17 Kathli Bharan	C2	30.11	13.00	15.00
	Narag	SF 29 Kajar Sanglah	C2	37.50	-	37.50

Year	Range	No. and Name of Forests	Comptt.	Total area (ha)	Area (ha)	
					Plantable	Closures
2018-19	Rajgarh	PF 6 Bharan	Whole	65.50	15.00	15.00
		MF 71 Shalan	Whole	5.50	1.90	5.50
2019-20	Narag	MF 98 Drabli	Whole	14.90	2.25	14.90
	Sarahan	UF 6 Tikkri Kathar	C4b	19.55	--	19.55
2020-21	Narag	SF 43 Bongli Bayalag	Whole	48.35	--	24.00
	Rajgarh	SF 17 Kathli Bharan	C2	30.11	13.01	15.11
2021-22	Habban	RF 18 Habban	C2c	3.15	-	3.15
	Narag	MF 91 Sarol	Whole	22.60	8.60	8.60
	Rajgarh	RF 32 Gadhool Pirag	C1g	54.70	9.00	9.00
2022-23	Narag	MF 108 Khaledi Ki Ber	C3	3.11	--	3.11
	Sarahan	RF 45 Ghinni	C8a	10.50	-	10.50
2023-24	Rajgarh	MF 86 Lana Chamroga	Whole	9.10	--	9.10
		MF 88 Katalia	Whole	11.10	--	11.10
	Narag	SF 43 Bongil Bayalag	Whole	48.35	--	24.35
2024-25	Narag	RF 47 Unchakot	C7	23.62	-	23.62
	Sarahan	SF 117 Chanalag	C4	2.76	-	2.76
		SF 137 Achhla Chander	Whole	3.92	-	3.92
2025-26	Rajgarh	M.F 87 Kanech	Whole	9.10	9.10	9.10
	Narag	SF 56 Pajerli Madench	C2	18.47	10.47	18.47
	Sarahan	RF 44 Banar	C3a	34.22	--	34.22
2026-27	Rajgarh	RF 32 Gadhool Pirag	C1f	55.67	-	30.00
2027-28	Rajgarh	RF 24 Sanohat	C1d	74.41	0.90	0.90
		PF 7 Beas	Whole	22.50	-	22.50
		PF 6 Bharan	Whole	65.50	8.00	10.00

2.6.26 Subsidiary silvicultural operations: These will consist of the site clearance and fencing of areas, rising of nurseries, earth work and plantings and tending operations including weeding, cleaning thinning as discussed below.

Treatment maps: For the areas to be taken up a particular year for closure and planting, treatment maps on 1:3,750 scale should be prepared as per details mentions in para 2.5.33.

Fencing, site clearance and earth works: The areas to be taken up for closure and planting shall be fenced just after the rains i.e. in winter in chil and scrub zones and in spring /summer in temperate zones Stone wall fencing should be preferred in the areas where stones are readily available. Elsewhere 4 strands barbed wire fencing is suggested. The areas should be cleared of bushes and undergrowth and staggered pits of 30 cmx 30 cmx 30 cm should be dug along the contours at a distance of 2mx 2m. Where moisture conservation is necessary, contour trenches are preferred. These operations should be completed by the end of May positively.

Temporary nurseries: These should be centrally located near the water sources. Requirements of plants should be worked out on the basis of net areas to be planted. Both tube and bed plants be raised depending on the species to be planted. Sowing in the nurseries should be done at an appropriate time so that the plants are ready for monsoon / winter plantings. For fuel and fodder scarcity areas Dhaman, Siris, Pula, Shahtoot, Sain, Chhal, Toon, Gamhar, Bamboos, Ban, Khirk , Fagura, Jhingan etc. should be raised. In broadleaved and scrub areas, depending on the suitability of the site, the species recommended are Semal, Willow, Poplar, Shisham, Khair, Neem, Amaltas, Mango, Walnut, Deodar, Chil, Kail, Harar, Bahera, Amla etc. In nalas, depressions and moist localities in subtropical zones, Bamboos should invariably be raised.

Soil Conservation measures: Mechanical soil conservation measures like check dams, gully plugging, diversion channels, spurs and other masonry structures should be constructed and completed before the closure and actual plantings. The slips and eroded areas may be treated with vegetative measures like wattlings and planting of vegetatively propagated cuttings during the rainy season alongwith the main plantings.

Plantings: It should be started just after the break of regular monsoons and completed by the middle of August. The temperate zone broadleaved species are to be planted during winter rains before the heavy snowfall. The failures will be beaten up for 2-3 years till the area are stocked.

Cleaning and weeding: For the first 2-3 years 1 to 2 weeding and cleanings will be carried out in all the young plantations till the young crop outgrows the chances of suppression by weeds.

2.6.27 Grazing and Grass cutting: All the plantations and degraded forests should be fenced and completely closed to grazing. The rests of the areas i.e. oak forests will remain open for grazing. In plantations, if site conditions permit, the grass cuttings may be allowed to the right holders from the second year onward under strict spot supervision of the beat guard to avoid intentional/ unintentional damage to plants.

2.6.28 Loppings: Oaks are being severely lopped near habitations, along the cultivations, near Gujjar and Gaddi paragon. The practice has damaged the trees and reduced the forests to degradation stage in a number of cases. To avoid the harmful effects of indiscriminate and uncontrolled loppings, the following lopping rules are formulated for strict compliance and to maintain the forests in good conditions.

1. Trees should be lopped on rotation in 3 years lopping cycle.
2. The use of axes and other heavy sharp instruments for lopped should not be allowed. Only light sickles with blades not longer than 25 cm generally used for cutting grass should be allowed.
3. The lopping of any trees less than 30cm d.b.h. should be restricted.
4. The lopping of upper 1/3rd of the crown of trees should be prohibited and the leading branch left on each branch should not be cut.
5. The cutting of branches over 2.5 cm in diameter or 7.5 cm in girth should be prohibited.
6. If there is any climber on the tree, it must be cut back at the base by loppers. It has been found that loppers commonly lop a tree and leave the climbers on the tree.
7. Lopping should be prohibited except during the lopping season from 1st November to 31st March.
8. Walnut, maple and birdcherry should not be lopped.

2.6.29 Closure notification: The areas shall be protected against fire. Period 30 years and got notified well in advance.

2.6.30 Fire protection: The areas shall be protected against fire. Plantations need special care especially during summers when it is susceptible to fire. The recommendations of the Khosla committee constituted for fire protection will be followed. (Annexed as APPENDIX XVII)

2.6.31 Exercise of rights and concessions: As far as possible rights and concessions in degraded forests, eroded areas and in erosion prone forests should be suspended till the forests are restocked. The requirement of right holders will be met from oak forests only in accordance with silvicultural principles. Indiscriminate cutting of oaks and other broad leaved species should be stopped.

CHAPTER-VII THE PLANTION WORKING CIRCLE

2.7.1 General Constitution: This working circle includes all the reserved, protected unclassed, mushterqua and Shamlat/ ceilingland forests bearing dry mixed deciduous forests, scrub vegetation, spare trees growth in isolated as well as in patch forms interspersed with blanks or totally blank areas extending from temperate to tropical zones and also the plantation of various species raised in the past in such forests. Total area of the working circle is 6,469.73 ha as per details given in Table 2.7.1.

Table 2.7.1: Legal classification and area statement.

S. No.	Legal Classes	Symbols	Area (ha)	
			Total	Stocked
1	Reserved Forests	RF.	612.99	373.07
2	Protected Forests	PF.	403.69	199.79
3	Unclassed Forests	UF.	1526.67	1390.70
4	Mushterqua Forests	MF.	368.95	118.02
5	Shamlat/ceiling land Forests	SF.	3557.43	1346.87
		Total	6469.73	3428.45

The details of the area statement by Ranges, Forest Blocks, compartment and sub compartment showing gross and stocked areas lot various species are given in Appendix II.

2.7.2 General Character of vegetation: The type “Northern dry mixed deciduous” forests in general constitute the main crop of stocked forests allotted to this working circle. The type is found in all the ranges except Habban range. The forests are of low stocking and poor in growth with density ranging from 0.2 to 0.5. The important tree species constituting the main canopy are Terminalia tomentosa, T. belerica, T.chebula, Anogeissus latifolia, phyllanthes emblica, Lannea coromandalica, Bauhinia Spp; Nyctanthes arbortrisitis , Acacia catechu, Sapium insigne etc. Bamboos are found in 50hain U.F. 7 Bara Chakli C1, C2, UF 11 Ghirar Sandrol C3 and C4 and SF 170 Tikri Kathar C10 in Ghinni areas along the Ghaggar river in patches. Bamboos clumps are congested and poorly grown. The undergrowth is moderate to thick in such forests and elsewhere thin and patch consisting of Carissa, Flacourtia, Murraya, Lantana, Flemingia, Berberis, Rubus, Colebrookia, Hamiltonia, Indigofera, Urtica, Zirardiana, Prinsepia, Woodfordia, Zanthoxylum, etc. Besides deciduous scrub, there are culturable and unalterable and blanks with patch and scattered trees of chil, deodar, kail, oaks and other broadleaved species. The plantations included in this working circle contain seeding, Sapling and poles of various species. The forests conform to sub-groups 5B/C2, 5B/DSI, 5B/E9, 5B/IS2, 9/DSI 9/DS2, 12/DSI, 12/DS2 of Champion and Seth’s Forest Types described in chapter II of part I.

2.7.3 Blocks and compartments: No changes have been made in the boundaries of forests as given under previous plan. The Forests have however, been divided into compartments and sub-compartments Jagir forests and Shamlat/ Ceilinglands transferred to Forests Department have been divided into a number of forests block and suitable compartments and sub-compartments on the basis of natural boundaries and crop composition and named after Mauza.

2.7.4 Planting series: Territorial planting series have been prescribed in this division. The areas falling in the former planting series shall be planted by the territorial ranges whereas the latter planting series by the social forestry ranges. The areas nearer to habitations, needed for raising the fuel, fodder, fruit, fibre, and fertilizer species have been included in social forestry planting series.

2.7.5 Special objects of management: These will be as under:-

- 1) To restock the blanks and open degraded forests with economic species.
- 2) To replace gradually the inferior scrub forests with more valuable commercial trees species.
- 3) To raise compact plantations under social forestry to meet the local demands of fuel, fodder, grass, grazing and wood for agricultural implements.
- 4) To protect and nurse the existing plantation and natural young growth under a systematic regime of cleanings and thinning.
- 5) To reclothe the barren areas to preserve the soils in situ and conserve the moisture in the catchment.

2.7.6 Area and allotment: The gross area of this working circle is 6,469.73 ha with 2,796.24 ha under misc. broadleaved species (44.77%). The detailed distribution of individual forest by ranges, compartment and sub-compartment is given in Appendix I and the abstract is produced in Table 2.7.2.

2.7.7 The Range wise allotment of area into different planting series is given in Table 2.7.3.

Planting Series	Forest Classes	Range wise area in (ha)				
		Habban	Rajgarh	Narag	Sarahan	Total
Territorial	RF	114.50	93.10	42.85	205.04	455.49
	PF	42.75	152.10	---	137.70	322.55
	UF	---	---	12.53	1368.07	1380.60
	MF	23.90	94.77	40.22	---	158.89
	SF	---	26.26	686.31	752.30	1464.87
	Total	181.15	366.23	781.91	2463.11	3792.40
Social	RF	62.85	65.98	18.47	10.20	157.50
Forestry	PF	54.00	---	---	17.14	71.14
	UF	---	---	---	146.07	146.07
	MF	91.36	33.15	80.45	5.10	210.06
	SF	88.87	46.21	683.45	1274.03	2092.56
	Total	297.08	145.34	782.37	1452.54	2677.33
	G. Total	478.23	511.57	1564.28	3915.65	6496.73

Table 2.7.2 : Range wise area allotment.

Ranges	Area (ha)											
	R.F.		P.F.		U.F.		M.F.		S.F.		Total	
	Gross	Stocked	Gross	Stocked	Gross	Stocked	Gross	Stocked	Gross	Stocked	Gross	Stocked
Habban	177.35	76.20	96.75	14.00	---	---	115.26	22.85	88.87	3.38	478.23	116.43
Rajgarh	159.08	60.58	152.10	47.25	---	---	127.92	29.30	72.47	44.31	511.57	184.64
Narag	61.32	21.85	---	---	12.53	7.70	120.67	62.62	1369.76	254.89	1564.28	347.06
Sarahan	215.24	214.44	154.84	138.34	1514.14	1383.00	5.10	3.25	2026.33	1045.98	3915.65	2785.01
Total :	612.99	373.07	403.69	199.79	1526.67	1390.70	368.95	118.02	3557.43	1348.56	6469.73	3430.14

Table 2.7.5 Stocking and Area Statement.

Stocked with spp.)	Chil	Deodar	Kail	Oaks	Misc, B.L. Spp	Bamboos	Eucalyptus	Blanks		Blanks	Stocked	Un-stocked	Total
								Culturable	Un-Culturable				
Area (ha)	329.99	38.65	18.59	80.87	2896.24	50.00	15.80	2956.05	22.50	61.04	3430.14	3039.59	6469.73

Table 2.7.7 : Estimated Growing stock of Scrub forests

Species	Area	Para meters	Diameter classes in cm									
			10-20 V	20-30 IV	30-40 III	40-50 IIA	50-60 IIB	60-70 IA	70-80 IB	80-90 IC	> 90 ID	Total
Kokath	346.20	N	21425	6368	2639	734	213	62	12	1	190	31644
		V (m³)	1285.5	713.22	886.7	493.25	213.00	79.61	15.41	1.28	243.96	3931.93
		N/ha	61.89	18.39	7.62	2.12	0.62	0.18	0.03	0.003	0.55	91.4
		V/Ha.	3.713	2.06	2.56	1.425	0.62	0.23	0.04	0.004	0.7	11.36
Exploitable & unexploitable area	Total area = 2372.53	N	146836	43631	18079	5030	1471	427	71	7	1305	216849
		V (m³)	8810.16	4886.67	6074.54	3380.16	1471.00	548.27	91.16	8.99	1675.62	26946.58

2.7.8 The dry mixed deciduous forests and scrub area of Territorial planting series have further been divided in two categories as under:

- (a) Exploitable Areas:** The dry mixed deciduous forests and scrub vegetation of moderate density fit for exploitation and planting is included in this category. The commercial exploitation is economically feasible in such areas which are also opened up by road. The bamboo forests are also included in this category.
- (b) Unexploitable areas:** The areas other than exploitable fall in this category. The tabular statement showing the distribution of exploitable and unexploitable scrub forests are as follows:-

Table 2.7.4 Range wise distribution of exploitable and unexploitable scrub forests (ha)

Range	Exploitable area		Unexploitable Area		Total	
	Gross	Under scrub	Gross	Under scrub	Gross	Under scrub
Habban	---	---	---	---	---	---
Rajgarh	21.70	18.20	---	---	21.70	18.20
Narag	201.44	201.44	24.58	24.58	226.02	226.02
Sarahan	1070.22	1016.21	1251.89	1112.10	2322.11	2128.31
Total	1293.36	1235.85	1276.47	1136.68	2569.83	2372.53

2.7.9 Analysis and valuation of the crop:

2.7.10 Stock Maps: All the compartments and sub- compartments have been stock mapped on 1:15,000 scale maps which is posted in concerned C.H. Files. Prominent successful plantations raised in the past have also been shown. The stocking of individual forests have been given in Appendix II and the abstract of entire working circle in Table 2.7.5.

2.7.11 Site quality and age classes: In miscellaneous broadleaved and scrub forests. The trees of various species of all age groups are found mixed with each other. The site quality is poor and tree growth is restricted. The bamboo clumps are congested, poorly grown but of moderate density. Eucalyptus plantations are of uniform age group i.e. young to mature but quality is poor. Rests of the species are irregular in age class and poor in quality.

2.7.12 Density: The density was ocularly estimated and recorded in individual C.H. files. Except for the miscellaneous broadleaved and scrub forests which have an average density between 0.3 to 0.5, the rests of the forests are either blank or have density below 0.1.

2.7.13 Regeneration: Regeneration is absent almost in all forests allotted to this working circle. In Bamboo forests about 10% of the clumps have neither Manus (Current year's clumps) nor Chal (leading exterior shoots i.e. of preceding years Culm). Rests have regeneration every year. The clumps are choked with dead, dry and mature culms. Productivity can be increased and regeneration accelerated if useless culms are removed.

2.7.14 Enumeration and results : Randomised partial enumerations were carried out in scrub forests .Enumeration of chil and deodar/ kail were also carried out where patches of such species occur here and there. The trees were measured in 10cm diameter classes down to 10 d.b.h. The unit of enumeration sampling was stocked areas of compartments / sub

compartment. All the broadleaved tree species have been recorded as Kokat. Out of 2,372.53 ha are under scrub forests, an area of 346.20 ha was enumerated (enumeration intensity 14.59%).

2.7.15 The total growing stock scrub forests of this working circle is estimated to be **28280.56** m³. The estimated stocking of exploitable and unexploitable scrub forests is given in Table 2.7.7.

2.7.16 Silvicultural System : The silvicultural system for exploitable scrub forests will be Selection- cum –improvement felling with Artificial Regeneration. About 25 to 40 trees per ha well distributed over the area, having a diameter of ≥ 15 cm preferably of seeding origin of valuable species like Chil, Khair, Sain, Shisham, Toon, Semal, Chhal, Harar, Bahera, Amla, Bamboos etc. Shall be retained for seed, shade, protection of the site and to meet right holders demand for timber, fuel and fruit etc. The rest of the areas will however, not be clear felled for planting and whatever trees growth of some economic importance exist, should be retained for the purpose mentioned above. No fellings of chil, kail, deodar, oaks and other broadleaved species shall be carried out in chil, deodar and kail forests. Only the areas are to be cleared of bushed and unwanted growth to pave the way for artificial regeneration. For Bamboo forests it will be selection system with thinning. Each clump will be treated as an independent unit of working. Cleanings will receive due attention during fellings. Retention of the culms in the clump during its early life is essential for the proper development of rhizome system.

2.7.17 Choice of species: The less valuable scrub species shall be replaced by more valuable species like Khair, Bamboo, Semal, Chil etc. Sal and teak may also be tried on experimental basis in Ghinni block of Sarahan range as is being done in adjoining areas of Haryana State. On higher elevations < 900 m chil should be preferred and down below Khair will be planted. Bamboo planting shall be confined to fertile pockets in lower elevations along the nallas and rivers. On higher elevations in temperate zones, Deodar, Kail, Poplar, Walnut, Chestnut, Males, etc. Shall be preferred. Choice of species for a particular areas will be decided by the existing natural vegetation, site factors, silviculture of species, market and local demands and of course the policy of the Government The National Mission on Wasteland Development, New Delhi vide their letter No. NMWD: 11-1/92-MM – IV dated 5.7.90 has emphasised planting of fruit trees to the extent of atleast 20% under Social Forestry programme inlisting various fruit trees species for various regions. This has also been taken into account. The species recommended for planning in different areas are broadly indicated in Table 2.7.8.

Table 2.7.8 Altitudinal zones and species recommended for planting.

Altitudinal Zones	Species Recommended.
Upto 750 m i.e. Lower Regions	Khair(<i>Acacia catechu</i>), Babool(<i>Vachellia nilotica</i>), Siris(<i>Albizzia lebbek</i>), Kachnar(<i>Bauhinia variegata</i>), Semal(<i>Bombax ceiba</i>), Bamboo(<i>Dendrocalamus spp</i>), shisham(<i>Dalbergia sissoo</i>), Safeda(<i>Eucalyptus spp</i>), Beul(<i>Grewia optiva</i>), Sal(<i>Shorea rubusta</i>), Sagwan, Shahtoot(<i>Morus alba</i>), Sandhan, Sain(<i>Terminalia tomentosa</i>), Harar(<i>Terminalia chebula</i>), Bahera(<i>Terminalia belerica</i>), Toon(<i>Cerdrela toona</i>), ritha(<i>Sapindus mukorossi</i>) etc.

750-1600 m i.e. Middle Regions	Chil(<i>Pinus roxburghii</i>), Ohi(<i>Metrosi deros polymorpha</i>), Bamboo(<i>Dendrocalamus spp</i>), Semal(<i>Bombax ceiba</i>), Khirak(<i>Celtis australis</i>), Beul(<i>Grewia optiva</i>), Poplars(<i>Populus ciliata</i>), Toon(<i>Cedrela toona</i>), Robinia(<i>Robinia pseudocacia</i>), Kachnar(<i>Bauhinia variegata</i>), Bakain(<i>Melia azedarach</i>) etc.
1600-2500 m i.e. Higher Regions	Deodar(<i>Cedrus deodara</i>), Kail(<i>Pinus wallichiana</i>), Poplars(<i>Populus ciliata</i>), Walnut(<i>Juglans regia</i>), Maple(<i>Acer pseudoplatanus</i>), Robinia(<i>Robinia pseudocacia</i>), Chestnut(<i>Castanea sativa</i>), Bircherry etc.

Table 2.7.9 provides the list of various species recommended to be raised under Social Forestry for various purposes.

Table 2.7.9 : Species recommended for Social Forestry plantations.

Utility	Regions	Species.
Fuel wood trees	Lower	Khair(<i>Acacia catechu</i>), Shisham(<i>Dalbergia sissoo</i>), Beul(<i>Grewia optiva</i>), Karail(<i>Bauhinia variegata</i>), Maggar Bans(<i>Dendrocalamus spp</i>), Mangoes(<i>Mangifera indica</i>), Ohi(<i>Metrosi deros polymorpha</i>), Siris(<i>Albizia lebbek</i>), Katha Bans(<i>Dendrocalamus strictus</i>), Semal(<i>Bombax ceiba</i>). Shahtoot(<i>Morus alba</i>), Kainth(<i>Pyrus pashia</i>), Jamun(<i>Syzygium cumini</i>), Beuns(<i>Salix tetrasperma</i>), Khirak(<i>Celtis australis</i>), Phegura(<i>Ficus palmata</i>), Toon(<i>Cedrela toona</i>), Harar(<i>Terminalia chebula</i>), Sain(<i>Terminalia tomentosa</i>), Arjun(<i>Terminalia arjuna</i>), Aonja, Draik(<i>Melia azadirachta</i>), Neem(<i>Azadirachta indica</i>), Dheu(<i>Artocarpus lakoocha</i>), safeda(<i>Eucalyptus spp</i>), Silver Oak(<i>Grewellia robusta</i>), Tej Patra(<i>Cinnamum tamala</i>), Subabool(<i>Vachellia nilotica</i>), Chil(<i>Pinus roxburghii</i>) etc.
	Middle	Dhaman, Kachnar(<i>Bauhinia variegata</i>), Poplars(<i>Populus ciliata</i>), Robinia(<i>Robinia pseudoacacia</i>), Ohi(<i>Metrosi deros polymorpha</i>), Siris(<i>Albizia lebbek</i>), Toot(<i>Morus alba</i>), Baihmi/Aru(<i>Prunus persica</i>), Chulli/Shahra(<i>Prunus armeniaca</i>), Daru(<i>Prunus granatum</i>), Ban(<i>Quercus incana</i>), Mohru(<i>Quercus dilatata</i>), Kainth(<i>Pyrus pashia</i>), Kathaman, Badah/Willow(<i>Salix alba</i>), Akhrot(<i>Juglans regia</i>), Khirak(<i>Celtis australis</i>), Harar(<i>Terminalia chebula</i>), Sain(<i>Terminalia tomentosa</i>), Arjun(<i>Terminalia arjuna</i>), Aonla(<i>Emblica officinalis</i>), Draik(<i>Melia azadirachta</i>), Neem(<i>Azadirachta indica</i>), Kosh, Silver Oak(<i>Grewellia robusta</i>), Tejpatra(<i>Cinnamum tamala</i>), Chirindi, Chil(<i>Pinus roxburghii</i>) etc.
	Upper	Poplars(<i>Populus ciliate</i>), Robinia(<i>Robinia pseudoacacia</i>), Chimu(<i>Morus alba</i>), Aru(<i>Prunus persica</i>), Khurmani(<i>Prunus armeniaca</i>), Ban(<i>Quercus incana</i>), Mohru(<i>Quercus dilatata</i>), Akhrot(<i>Juglans regia</i>), Khanor(<i>Aesculus indica</i>), Dauri(<i>Cedrela serrata</i>), Marinu, Kosh/Pyak, Deodar(<i>Cedrus deodara</i>), Kail(<i>Pinus wallichiana</i>), Rai(<i>Picea smithiana</i>), Tosh(<i>Abies pindrow</i>) etc.
Fodder trees	Lower	Khair(<i>Acacia catechu</i>), Beul(<i>Grewia optiva</i>), Karal(<i>Bauhinia variegata</i>), Maggar Bans(<i>Dendrocalamus spp</i>), Ohi/Gauj(<i>Metrosi deros polymorpha</i>), Bel(<i>Aegle marmelos</i>), Lasora(<i>Cordia dichotoma</i>),

Utility	Regions	Species.
		Jaman(<i>Syzygium cumini</i>), Siris(<i>Albizzia lebbek</i>), Katha Bans(<i>Dendrocalamus strictus</i>), Toot(<i>Morus alba</i>), Badah(<i>Salix alba</i>), Khirak(<i>Celtis australis</i>), Sandhan, Jhingan(<i>Lannea grandis</i>), Pipal(<i>Ficus religiosa</i>), Suhanjana(<i>Moringa oleifera</i>), Phegura/Dagla(<i>Ficus palmata</i>), Toon(<i>Cerdrela toona</i>) Behera(<i>Terminalia belerica</i>), Sain(<i>Terminalia tomentosa</i>), Poola, Semal(<i>Bombax ceiba</i>), Arjun(<i>Terminalia arjuna</i>), Dheu(<i>Artocarpus lakoocha</i>), Subabool(<i>Vachellia nilotica</i>), Mahua(<i>Madhuca indica</i>), Beri(<i>Zizyphus mauritiana</i>) etc.
	Middle	Sandhan, Jhingan, Poola, Kathaman, Dhaman, Kachnar(<i>Bauhinia variegata</i>), Robinia(<i>Robinia pseudoacacia</i>), Siris(<i>Albizzia lebbek</i>), Gauj(<i>Metrosi deros polymorpha</i>), Bel(<i>Aegle marmelos</i>), Toot/Chimu(<i>Morus alba</i>), Paja(<i>Pyrus paddus</i>), Banni(<i>Quercus glauca</i>), Ban(<i>Quercus incana</i>), Mohru(<i>Quercus dilatata</i>), Willow(<i>Salix alba</i>), Khirak(<i>Celtis australis</i>), Behera(<i>Terminalia belerica</i>), Sain(<i>Terminalia tomentosa</i>), Arjun(<i>Terminalia arjuna</i>), Marinu, Kosh.
	Upper	Robinia(<i>Robinia pseudoacacia</i>), Chimu(<i>Morus alba</i>), Paja(<i>Pyrus paddus</i>), Ban(<i>Quercus incana</i>), Mohru(<i>Quercus dilatata</i>), Dauri(<i>Cedrela serrata</i>), Marinu, Kosh/Pyak etc.
Wood/Timber trees	Lower	Khair(<i>Acacia catechu</i>), Shisham(<i>Dalbergia sissoo</i>), Beul(<i>Grewia optiva</i>), Kachnar(<i>Bauhinia variegata</i>), Maggar bans(<i>Dendrocalamus spp</i>), Aam(<i>Mangifera indica</i>), Ritha(<i>Sapindus mukorossi</i>), Ohi(<i>Metrosi deros polymorpha</i>), Siris(<i>Albizzia lebbek</i>), Katha Bans(<i>Dendrocalamus strictus</i>), Semal(<i>Bombax ceiba</i>), Toot(<i>Morus alba</i>), Kainth(<i>Pyrus pashia</i>), Jamun(<i>Syzygium cumini</i>), willow(<i>Salix alba</i>), Khirak(<i>Celtis australis</i>), Phegura(<i>Ficus palmata</i>), Toon(<i>Cerdrela toona</i>), Bahera(<i>Terminalia belerica</i>), Harar(<i>Terminalia chebula</i>), Sain(<i>Terminalia tomentosa</i>), Arjun(<i>Terminalia arjuna</i>), Draik(<i>Melia azadirachta</i>), Neem(<i>Azadirachta indica</i>), Dheu, Safeda(<i>Eucalyptus spp</i>), silver oak(<i>Grewelia robusta</i>), Tajpatra, chil(<i>Pinus roxburghii</i>), Mahua(<i>Madhuca indica</i>), Beri(<i>Zizyphus mauritiana</i>) Etc.
	Middle	Dhaman, Kachnar(<i>Bauhinia variegata</i>), Poplars(<i>Populus ciliata</i>), Ritha(<i>Sapindus mukorossi</i>), Robinia(<i>Robinia pseudoacacia</i>), Siris(<i>Albizzia lebbek</i>), Ohi(<i>Metrosi deros polymorpha</i>), Toot(<i>Morus alba</i>), Chimu(<i>Morus alba</i>), Aru(<i>Prunus persica</i>), Chulli/khurmani(<i>Prunus armeniaca</i>), Paja(<i>Pyrus paddus</i>), Ban(<i>Quercus incana</i>), Mohru(<i>Quercus dilatata</i>), Kainth(<i>Pyrus pashia</i>), Kathman, Beunsh(<i>Salix tetrasperma</i>), Khirak(<i>Celtis australis</i>), Behera(<i>Terminalia belerica</i>), Harar(<i>Terminalia chebula</i>), Sain(<i>Terminalia tomentosa</i>), Arjun(<i>Terminalia arjuna</i>), Draik(<i>Melia azadirachta</i>), Neem(<i>Azadirachta indica</i>), Kosh, silver Oak(<i>Grewelia robusta</i>), Tejpatra(<i>Cinnamum tamala</i>), Chirindi, Chil(<i>Pinus roxburghii</i>) etc.
	Upper	Poplars(<i>Populus ciliata</i>), Robinia(<i>Robinia pseudoacacia</i>), Chimu(<i>Morus alba</i>), Aru(<i>Prunus persica</i>), Khurmani(<i>Prunus armeniaca</i>), Paja(<i>Pyrus paddus</i>), Akhrot(<i>Juglans regia</i>), Khanor, Ban(<i>Quercus incana</i>), Mohru(<i>Quercus dilatata</i>), Dauri(<i>Cedrela serrata</i>), Marinu, Kosh/Pyak, Deodar(<i>Cedrus deodara</i>), Kail(<i>Pinus wallichiana</i>), Rai(<i>Picea smithiana</i>), Tosh(<i>Abies pindrow</i>)etc.
Fruits, Vegetable	Lower	Bel(<i>Aegle marmelos</i>), Karondha(<i>Carissa carandas</i>), Aonla(<i>Emblica</i>

Utility	Regions	Species.
dry and & Food trees		<i>officinalis</i>), Imli(<i>Tamarindus indica</i>), Ber(<i>Zizyphus jujuba</i>), Karal(<i>Bauhinia variegata</i>), Aam(<i>Mangifera indica</i>), Semal(<i>Bombax ceiba</i>), Jamun(<i>Syzygium cumini</i>), Phegru(<i>Ficus palmata</i>), Bahera(<i>Terminalia belerica</i>), Harar(<i>Terminalia chebula</i>), Dheu(<i>Artocarpus lakoocha</i>), Tejpatra(<i>Cinnamum tamala</i>), Mahua(<i>Madhuca indica</i>), Nibu(<i>Citrus limon</i>), Lasora(<i>Cordia dichotoma</i>), Anar(<i>Prunica granatum</i>), Daru (<i>Prunica granatum</i>), Papita(<i>Carica papaya</i>), Suhanjana(<i>Moringa oleifera</i>), Shahtoot(<i>Morus alba</i>), Kathal(<i>Artocarpus heterophyllus</i>), Kela(<i>Musa paradisiaca</i>), Amrood(<i>Psidium guaiava</i>), Litchi(<i>Litchi chinensis</i>) etc.
	Middle	Kachnar(<i>Bauhinia variegata</i>), Toot/Chimu(<i>Morus alba</i>), Aru(<i>Prunus persica</i>), Khurmani(<i>Prunus armeniaca</i>), Daru(<i>Prunica granatum</i>), Anar(<i>Prunica granatum</i>), Nashpati(<i>Pyrus pyrifolia</i>), Kafal(<i>Myrica nagi</i>), Galgal(<i>Citrus pseudolimon</i>) etc.
	Upper	Chimu(<i>Morus alba</i>), Aru(<i>Prunus persica</i>), Chulli(<i>Prunus armeniaca</i>), Khurmani(<i>Prunus armeniaca</i>), Akhrot(<i>Juglans regia</i>), Kafal(<i>Myrica nagi</i>), Cherry(<i>Prunus avium</i>), Seb(<i>Malus pumila</i>), Nashpati(<i>Pyrus pyrifolia</i>), Nibu(<i>Citrus lemon</i>) species etc.

2.7.18 Regeneration period : A regeneration period of 30 years is sufficient for deodar, Kail, chil and other high level broadleaved spp. and conifers. For broadleaved and social forestry species in lower regions 10 to 15 years period will suffice. This may be taken as 15 years equal to the period of the plan.

2.7.19 Rotation and exploitable diameter: Since the plantations raised under this working circle are not likely to mature during the currency of the working plan, no rotation and exploitable diameter is prescribed at this stage. In Bamboos, rotation has reference to the individual culm and not the clum. The clump attains its entire height and thickness during the first year of its growth and deterioration starts in about the fifth year. The life of culm on average is about 6 years old bamboos are marketable but not much liked. Four to five years old bamboos find good market. Older Bamboos are not liked as they are not easy to work due to hardening of wall no account of silica deposition. Old and dry bamboos are fit for fuel only. In view of this, the culms 4 to 5 years old should be felled.

2.7.20 Felling cycle: Since Bamboo shows signs of deterioration after 5 years as such a fellings cycle of 4 years is prescribed. This will also allow adequate time for the new manus to establish and develop.

2.7.21 Calculation of yield: The yield in exploitable broadleaved scrub forests shall be regulated by area. It is proposed to work 1,235.85 ha of exploitable broadleaved forests in 15 years. Thus the annual coupe to be worked will be $1,235.85/15 = 82.39$ ha or say 80 ha. After deducting the volume of trees retained, which will be about 50% of the total growing stock of exploitable areas, the rough estimate of annual yield will be $(14731.33/15) \times 0.50 = 491.04$ or say 490 m³.

2.7.22 Methods to be followed for assessing some bamboo growth-parameters.
(Source : Forest survey of India) :

1. **Bamboo density** : - The density of Bamboo clumps of all speices will be depicted using following criteria : -

Density		Number of clumps per ha.
i)	Pure bamboo	200 or more
ii)	Very dense	150-200
iii)	Dense	100-150
iv)	Moderately dense	50-100
v)	Scattered	25-50
vi)	Sparse	1-25

Note : Bamboo clump means an aggregate of culms issuing from the same rhizome system. (A clump wood normally have more than one culm). A clump will be distinguished as an independent clump where its periphery is easily discernible from adjacent clumps irrespective of its distance from other. However, when such distinction is not possible. Two clumps with in half meter distance will be recorded as one.

2. **Bamboo site quality class** : -

Bamboo S.Q class	Description
I	Average culm height 6 meters or more from <i>Dendrocalamus strictus</i> and 14 meters or more from <i>Bambusa arundinacea</i> .
II	Average culm height 4 meters or more but less than 6 meters for <i>Dendrocalamus strictus</i> and 10 meter or more but less than 14 meter for <i>Bambusa arundinacea</i> .
III	Average culm height 2 meters or more but less than 4 meters for <i>Dendrocalamus strictus</i> and 2 meters or more but less than 10 meters for <i>Bambusa arundinacea</i> .

Note : The quality of other species of bamboo will be decided on the lines of *Dendrocalamus strictus*.

3. Clump size class :

Clump size class	Description
Small	All clumps with less than 1 meter average diameter
Medium	Clumps of average diameter between 1 meter and 2 meters.
Large	Clumps of average diameter 2 meter and above.

2.7.23 The Prescribed yield: The yield will be controlled by area, both for scrub and Bamboo forests. The annual coupe of exploitable scrub forest will be roughly 80 ha where as the total area under Bamboo Forests is 50 ha. only, out of most of the areas has been flowered and as such no removal/yield is prescribed. By volume the yield of scrub forests will be approximately 630m³/year .

2.7.24 Control of yield: For the purpose of convenience a complete compartment /sub compartment has been prescribed for felling except for bigger compartments to be worked in 2 to 5 years. A deviation of $\pm 10\%$ in the prescribed area is allowed. A five year check should, however, be applied so that excess/deficit fellings do not take place. Fellings will follow the successful plantations If regeneration does not keep pace, fellings will be stopped.

2.7.25 Prescribed felling : 1235.85 ha. area under scrub forests (exploitable) is prescribed for felling in this circle and no fellings are prescribed in other area of this circle except to meet the legitimate demand of right holders. The felling programmes shall only be adhered when the sufficient funds are available to plant the area and the nurseries are raised in advance otherwise no fellings of any sort will be carried out.

2.7.26 Method of executing the fellings:

Exploitable Scrub forests : The following marking rules are laid down for the guidance of the marking officer:

- i) About 40 to 50 trees per ha well distributed over the area will be retained and the rests of the Vegetation will be clear felled. A record of standards shall be maintained in Comptt. History files.
- ii) The trees retained shall comprise the species like Chil, Khair, Shisham, Sain, Toon, Semal, Chhal, Aonla, Harar, Behera etc. with d.b.h ≥ 30 cm.
- iii) Chil and Khair will not be felled except diseased, rotten, hollowed, dry and fallen trees.
- iv) On refractory, erosion prone and precipitous areas no fellings shall be carried out.
- v) The height of the stumps should be 10 cm above ground level.
- vi) Bamboo clumps if any found in the coupe, shall be thinned and not clear felled.

Bamboo Forests : The exploitation of Bamboos through contractors has followed more in breach of rules rather than in observance. As per practice, the H.P. State Forest Corporation Ltd. is also not expected to be better. The cutting operations of Bamboos in highly

silvicultural. Therefore the working should be done departmentally. The following rules must be carefully observed in carrying out the fellings.

- i) Fellings will commence in the middle of October and shall be completed latest by the end of February to avoid the borer attacks.
- ii) Cleanings will be done alongwith the main fellings under the constant supervision of the forest official capable of deciding the silvicultural limit of exploitation.
- iii) Fellings shall be restricted to denser and bigger clumps. Open clumps shall not be touched except for removal of old, mature and dry culms.
- iv) All culms will be cut as low as possible within 15 cm of the ground level. The cut should be slanting and immediately above the node to avoid collection of water in the hollow portion of internode. It should be cut using sharp tools to avoid splitting. In case support is needed for the adjoining “manus”, the cut may be higher.
- v) No “Manu” (Current years culm) or “Chal” (culms of preceding seasons on the periphery of clump or leading exterior shoots) is to be cut. For binding the bamboo bundles, twigs of hardwood trees and climbers should be used.
- vi) The maximum number of culms to be cut in a clump shall not exceed the total production of culms during the previous three years.
- vii) Culms left standing should be uniformly distributed over the root stock but in no case it should be less than 6 in numbers.
- viii) Cut portion of Bamboo shall not be left hanging on the clumps.
- ix) Flowered clumps must be clear felled after seed collection. In partially flowered clump, the actually flowered culms shall only be cut.
- x) Broadleaved species suppressing bamboo clumps will invariably be removed.
- xi) Digging of rhizomes, shall be prohibited.
- xii) In congested clumps, a horse shoe cut in the middle of it is to be given retaining the culms on the prephery.

2.7.27 Plantation Programme: The planting programme for scrub forest will be strictly in accordance with the felling programme. The areas taken up for felling in summer and autumn should be ready for planting by July next. Besides, the blank areas allotted to this working circle shall also be taken up for planting. The total area of the compartment/sub-compartments for planting in Territorial planting series is 2,515.93 ha, out of which 86.57 ha to be felled in 2027-28 shall be planted in 2028-29 i.e. after the expiry of the plan. The gross planting area during the plan will be thus 2429.36 ha. The actual planting area shall be less due to the exclusion of unculturable blanks, included cultivation, previous plantations and existing stockings. However, the blanks existing in such forests may be closed and planted if funds are available. The selection of such area rests with the territorial DFO. On average annual planting targets of this division will be 100-125 ha per year. Planting programme from the period 2006-07 to 2027-28 is given in Table 2.7.12

Table 2.7.12 : Planting programmes from the period 2006-07 to 2027-28

Year	Range	Number and name of forests	Comptt	Area in ha.	Total for the year (ha)
2006-07	Rajgarh	PF Jubbal		4	
		RF Gadhol Pirag		10	
		RF Sanio Deedag		10	
		Dudham Shmt.		3	
		RF Matnali		5	
		RF Rajgarh		3	
		RF Chhingtali		3	
		SF Jubbal Chandesh		2	
		MF Braila		4	
		Ger Khajel		7	
		RF Sanio Deedag		5	
		RF Sawana	C2	2	
	Narag	RF Pathroti	C2	4	
		RF Argu Shina		6	
		SF Bhouri		9	
		RF Jyantidhar	C1a	5	
		RF Argu Shina	C1a	3	
		UF Bhajyana	C4	8	
		MF Bhajji Banar		6	
		RF Pathroti	C2	4	
		MF Jehar		2	
		RF Unchakot	C1d	4	
		Mohar Shmt.		5	
		RF Jayantidhar		5	
		MF Jehar		4	
		UF Bhajyana	C3	1	
		UF Majgaon Shamlati		6	
		SF Meunta		10	
		SF Khech		10	
		SF Meu		10	
		SF Dhar		10	
		SF Madharia		20	
		Lana Machher		10	
		SF Rawan		5	
		SF Khal		10	
		SF Chujni		15	
		SF Rawarla		15	
		SF Bhalta		10	
		SF Chamraid		5	

Year	Range	Number and name of forests	Comptt	Area in ha.	Total for the year (ha)
		SF Chunji		10	
		SF Rawarla		10	
	Habban	RF Narh		4	
		RF Dalmun Deothi	C2	5	
		RF Dhamla	C2	5	
		PF Churel ka Nala		5	
		RF Shalogni	C3	5	
		RF Ghotari		3	
		RF Thaina	C2a	5	
		PF Deothi Majhgaon		5	
		RF Khabbar		3	
		RF Kuffer Bakhog		4	
		RF Habban	C1	6	
		RF Oria	C3	5	
		SF Pvt. Dharoti		15	
		SF Jalag Drabla		40	
		RF Shalogni	C3	10	
		RF Narh	C3	30	
		RF Manwa		20	
		RF Manwa	C4	10	
		SF Khaneur		20	
		RF Narh	C1	20	
		PF Churel ka Nala		10	
		SF Daonga		5	
	Sarahan	MF Plashon	C1	4	
		UF Chakli Banlog		8	
		RF Panwa	C4b	8	
		PF Bonta	C2b	6	
		RF Lawasa	C4a	8	
		RF Shakore	C1c	3	
		PF Kairy	C5	10	
		PF Gaithal	C9	5	
		UF Koti Jurab	C4	4.17	
		UF Koti Jurab		6	
		RF Shakore	C1c	6	
		UF Mano Gussan		6	
			Total=	589.17	
2007-08	Rajgarh	RF Sawana	C1a	5	
		RF Matnali	C4b	5	
		RF Sanio	C2b	5	
		PF Braila		3	
		RF Chhogtali	C3	5	
		G.C.L. Khajel		5	
		MF Badgla		5	

Year	Range	Number and name of forests	Comptt	Area in ha.	Total for the year (ha)
		RF Hiun		3	
		RF Rajgarh	C1	2.5	
	Habban	RF Habban		7	
		RF Ghotari	C5	10	
		RF Ghotari	C5	3	
		RF Tharu	C4	2	
		RF Dhamla	C2	3	
		UF Dharot Khalog		2	
		RF Pajoga		3	
		RF Shalogni	C3	10	
		RF Narh		15	
		RF Narh		10	
		PF Churel ka Nala		10	
		RF Manwa		15	
		MF Khaneur		7	
		MF Khaneur		3	
		RF Manwa		10	
		MF Kaloha		5	
		RF Manwa		15	
		RF Narh		30	
		PF Churel ka Nala		5	
	Sarahan	MF Tikkerli Pajreli	C4b	4	
		UF Dhillon Brahan	C3	2	
		RF Ghinni	C8d	5	
		PF Gaithal		5	
	Narag	Shina	C1c	4	
		UF Tikkar	C6	3	
		RF Jyantidhar	C5	4	
		Lakhot Malara		5	
		PF Madesh		5	
		RF Mahalana		5	
		PF Gaithal	C9	5	
		SF Bhauri		3	
		PF Kairy	C2	4	
		RF Uncha kot	C1c	2	
		PF Kairy	C2	2	
		SF Dhar Meu		15	
		SF Bongli		20	
		SF Kanch ka Khala		20	
		SF Paprana		10	
		SF Khech		10	
		SF Paprana		10	
		SF Meunta		10	
		SF Banita		20	
		SF Dawan/Rawarla		10	

Year	Range	Number and name of forests	Comptt	Area in ha.	Total for the year (ha)
		SF Dawan Machher		20	
		SF Chunji Rawata		20	
		SF Lana Machher		20	
		SF Rawarla		15	
			Total=	461.5	
2008-09	Narag	MF Jehar		2	
		RF Uncha kot	C3	3	
		SF Bhor		5	
		MF Basu		5	
		MF Jehar		3	
		RF Jyantidhar	C6	10	
		RF Panwa	C4c	5	
		RF Hiun	C1	4	
		RF Unchakot		5	
		RF Mahalana		12	
		RF Lakhot Malara	C3b	5	
		PF Gaithal	C9	5	
		UF Dhillon Barahan	C1	7	
		MF Pab		7	
		Chakla Deed Shmt.		4	
		RF Lakhot Malara	C2	4	
		MF Pab		2.5	
		SF Drabli		5	
		RF Jyantidhar		5	
		Chakla Deed Shmt.		3	
		SF Paprana Meunta		20	
		SF Rawarla Chamraid		15	
		SF Rawarla Chamraid		10	
	Sarahan	PF Kairy	C1	4	
		PF Kairy	C1	2	
		RF Ghinni	C4	5	
		PF Kharana	C1b	5	
		RF Shakore	C2b	5	
		RF Plashon	C2	4	
		UF Bara Chakli	C1	5	
		UF Chukhar Dhangyar	C7	3	
		UF Dhillon Barahan	C1	5	
		PF Kairy	C7	2	
		PF Kairy	C7	1	
		RF Plashon	C3	1	
		RF Plashon	C3	2.5	
		RF Plashon	C2	1	
	Rajgarh	RF Sanio Deedag	C1b	10	
		PF Braila		9	

Year	Range	Number and name of forests	Comptt	Area in ha.	Total for the year (ha)
		RF Sawana	C1e	5	
		RF Matnali	C5	5	
		PF Bharan		4	
		RF Rajgarh	C2	3	
		PF Bharan		6	
		RF Sanio	C2b	3	
		RF Rajgarh Pab	C3	5	
		RF Rajgarh	C2	2	
		RF Sawana	C2e	6	
		RF Sawana	C1c	3	
		Shmt. Sanio Deedag		2	
		Shmt. Sanio Deedag		1	
	Habban	SF Dibber		5	
		RF Dhamla	C2	5	
		RF Oria	C1	5	
		RF Habban	C1c	5	
		RF Dalmu Sudder	C2	4	
		RF Shar		4	
		PF Churel ka Nala		5	
		RF Habban	C2d	10	
		RF Shalogni	C1b	5	
		SF Dhaila Deothi		4	
		RF Habban	C1c	2	
		RF Shalogni	C3	10	
		RF Narh	C1&C2	15	
		PF Churel ka Nala		25	
			Total=	360	
2009-10	Narag	RF Lakhota Malara	C2a	5	
		UF Tikker	C5	7	
		RF Lakhota Malara	C3b	3	
		RF Unchakot	C1d	8	
		RF Lakhota Malara	C3b	5	
		RF Jyantiidhar	C2b	5	
		MF Bharoot	C1	2	
		SF Drabli		8	
		MF Basu		7	
		MF Wasni	C1	5	
		SF Khech Bongli		10	
		SF Sharia		15	
		SF Bhoori		15	
	Sarahan	UF Nali Gussan	C1	5	
		UF Nali Gussan	C1c	5	
		RF Shakore		5	
		PF Kharana	C1b	5	

Year	Range	Number and name of forests	Comptt	Area in ha.	Total for the year (ha)
		MF Bag Pashog	C1	5	
		PF Kairy		10	
		UF Nali Gussan	C2	5	
		UF Tikkari Kuthar	C2	5	
		RF Ghinni	C10a	5	
		RF Banona	C1c	4	
		RF Banona	C1	6	
	Rajgarh	RF Gadhol Pirag		3	
		RF Hiun		5	
		RF Hiun		5	
		MF Hiun		7	
		PF Churwa		5	
		MF Knech		5	
		PF Mangan		5	
		MF Shaya Chhabron		5	
		MF Shaya Chhabron		5	
	Habban	RF Ghotari	C5	5	
		RF Pajoga		5	
		Dhaila Deothi Smt.		5	
		Deothi Majhgaon Smt.		5	
		RF Dalmu Deothi	C3	5	
		PF Churel ka Nala		5	
		RF Shalogni		9	
		MF Manwa		7	
		PF Churel ka Nala	C4	8	
		PF Churel ka Nala/Smt.Manwa		9	
		RF Oria	C3	5	
			Total=	268	
2010-11	Rajgarh	PF Churwa		1	
		GCL Thor		9	
	Narag	MF Thari		3	
		SF Charnda		5	
		SF Kajar		5	
	Sarahan	PF Kairy	C4	4	
		RF Panwa	C3b	5	
		UF Chandog	C3a	10	
	Habban	RF Kuffer Bakhog		5	
		RF Narh	C2	5	
		RF Thaina C2a(i)		5	
		SF Kuru Shauit		3	
		MF Chabeul		2.8	
		RF Pajoga		5	
			Total=	67.8	

Year	Range	Number and name of forests	Comptt	Area in ha.	Total for the year (ha)
2011-12	Sarahan	UF Bara Chakli		5	
		UF Bara Chakli	C5	5.5	
		UF Mano Gusan	C3	20	
	Habban	RF Dalmun Sudder		5	
		RF Dalmun Pitli		1	
		RF Kuffar Bakhog		5	
		RF Dalmun Deothi		5	
		RF Dhamla	C1a	5	
		RF Deothi Majhgaon		4	
		RF Katoga	C2	4	
		RF Shalogni	C1	5	
		RF Oria	C2	4	
		MF Kaloha		4	
		RF Ber Jamoli		4	
		RF Dalmun Deothi	C1b	7	
		RF Dalmun Pitli		2.5	
		RF Dalmun Sudder	C1e	6	
		RF Dalmun Sudder	C1c	3	
	Narag	RF Mahalana		5	
		SF Charanda		5	
		MF Basu		6	
		SF Kajar		5	
		MF Thari		10	
		RF 53 Jyantidhar	C3a	14	
		RF 53 Jyantidhar	C3b	6	
		MF Bengi	C2	5	
		MF Pab	C3a	5	
	Rajgarh	PF Jubbal		5	
		RF Bohal		10	
		Kanech Smt.		5	
		PF Khairy		5	
			Total=	181	
2012-13	Habban	RF 3 Ghotari	C-4a	5	
		RF 4 Manwa	C4	10	
		RF 12 Dhamla	C-2c	7	
	Narag	RF 52 Argu Shina		25	
		PF 20 Motipur		10	
	Rajgarh	RF Phagu	C-1	20	
		PF Jubbal	C-1	15	
		PF Khairy		5	
	Sarahan	RF 43 Banona	C-2c	5.4	
		SF 164 Dhillon Barahan	C-3	19.01	
			Total:	121.41	121.40

Year	Range	Number and name of forests	Comptt	Area in ha.	Total for the year (ha)
2013-14	Habban	RF 18 Habban	C-1c	8	
		RF 21 Dalmu Deothi	C-1c	10	
		RF 22 Shalogni	C-1d	7	
	Narag	RF 47 Unchakot		25	
		MF 137 Mehog		10	
	Rajgarh	RF Bohal	C-2	15	
		RF Sawana	C-1c	15	
		Shalamu	C-2c	10	
	Sarahan	RF 44 Banar	C-3e	13.5	
		RF 45 Ghinni	C-9	5.9	
		SF 146 Surla Janot	C-2	1.44	
		SF 125 Galal Shakore	C-2	12.78	
			Total:	133.62	133.62
2014-15	Habban	PF 1 Deothi Majgaon	C1f	5	
		PF 2 Chural Ka Nala	C-8	10	
		MF 5 Deothi Majgaon		3	
		MF 8 Ghotari		2	
	Narag	MF 94 Sandral Talara		10	
		MF Basu		14	
		RF 50 Lakhota Malara		10	
	Rajgarh	PF Mangan		10	
		Bohal	C-2c	5	
		RF Sanio	C-3b	5	
	Sarahan	RF 42 Shakore	C-2a	45.62	
		UF 17 Killa Kalanch	C-2	8.77	
			Total:	128.39	128.39
2015-16	Habban	MF 12 Manwa		10	
		MF 14 Pabech		5	
		MF 15 Kuffar		5	
		MF 41 Panchar		3	
	Narag	RF 52 Argushina	C-2	10	
		MF 120 Mehog C-2		11.75	
	Rajgarh	RF Bohal	C-1a	10	
		PF Bharan		10	
		Gadol Pirag	C-1	5	
	Sarahan	RF 45 Ghinni	C-11 (part)	25	
		UF 12 Chandog	C-3a	25.75	
			Total:	120.5	120.5
2016-17	Habban	MF 53 Ritab	C-2	10	
		MF 45 Dhaila Deothi	C-1a	10	
		MF 15 Kuffar		4	
	Narag	RF 50 Lakhota Malara	C-2	7	

Year	Range	Number and name of forests	Comptt	Area in ha.	Total for the year (ha)
		RF 50 Lakhota Malara	C-1	10	
		RF Chhandoli		10	
	Rajgarh	RF Stambhu	C-3	5	
		Matnali	C-4a	10	
		MF Katalitya		5	
	Sarahan	UF 8 Chukhar Dhangyar	C-5	24.1	
		SF 170 Tikkari Kuthar	C-7	14.97	
			Total:	110.07	110.07
2017-18	Habban	MF 52 Pab	C-1	4	
		MF 53 Ritab	C-1	5	
		MF 45 Dhaila Deothi	C-1b	3	
		MF 10 Pain Kuffer	C-4	10	
	Narag	PF 19 Ajga		8	
		MF 91 Sarol		15	
		RF 39 Mahalana		10	
	Rajgarh	MF Neri	C-1a	10	
		RF Hiun	C-2c	15	
		Phagu	C-43	10	
	Sarahan	UF 13 Mano Gusan	C-5	27.3	
		SF 154 Ser	C-1	2.13	
			Total:	119.43	119.43
2018-19	Habban	PF 2 Chural Ka Nala	C-7	10	
		PF 1 Deothi Majghaon	C-1f	10	
		PF 22 Shalogni	C-3f	8	
	Narag	RF Tutab Bhajana		16.64	
		MF117 Basech		11.58	
	Rajgarh	RF Chogtali	C-3	15	
		Hiun	C-3	5	
		RF Satambu	C-2	10	
	Sarahan	PF 17 Gaithal	C-2	23.65	
		SF 120 Nar Chayali	Whole	11.58	
			Total:	121.45	121.45
2019-20	Habban	PF 2 Churel Ka Nale	C-8	10	
		MF 10 Pain Kuffer	C-4	4	
		RF 3 Ghotari	C-5 b	5	
	Narag	MF 114 Nohra		15	
		RF Narab Khojar		20	
	Rajgarh	RF Chogtali	C-1a	10	
		MF Chabriya		5	
		RF Satambu	C-2a	5	
	Narag	SF 160 Kathar	C-4	23.64	
		UF -2 Bani Bakholi	C-1a	14.5	
		UF 5 Mahal Preet Nagar	C-1a	14.6	
			Total:	126.74	126.74
2020-21	Habban	PF 2 Churel Ka Nala	C-8	10	

Year	Range	Number and name of forests	Comptt	Area in ha.	Total for the year (ha)
		RF 3 Ghotari	C-4a	10	
		MF41 Pancher	C-2	2	
	Narag	RF 49 Pathroti		12	
		RF 49 Pathroti		3.9	
		MF 108 Thaleri Ki Ber		5	
	Rajgarh	Pirag	C-1c	5	
		PF Khairy	C-2	5	
		Stambhu	C-1d	5	
	Sarahan	UF 10 Dhillon Barahan	C-3(Part)	28.95	
		SF 133 Galana Belgi	C-1	1.04	
			Total:	87.89	87.89
2021-22	Habban	RF4 Manwa	C-4	9	
		RF 12 Dhamla	C-2c	10	
		RF 14 Thaina	C-2c	7	
	Narag	MF 137 Mehlog		13	
		RF 53 Jaintidhar		15	
	Rajgarh	Hiun	C-2c	5	
		RF Sanohat	C-1d	5	
	Sarahan	UF 7 Bara Chakli	C-1	42.75	
		UF 5 Mahal Preet Nagar	C-5(part)	20	
			Total:	126.75	126.75
2022-23	Habban	RF 18 Habban	C-1c	7	
		RF 21 Dalmu Deothi	C-1a	10	
		RF 22 Shalogni	C-1d	7	
	Narag	MF 106 Motipur		5	
		MF 108 Thaleri Ki Ber		9	
		RF 47 Unchakot	C-1a	12	
	Narag	RF Sanohat	C-2b	5	
		Sawana	C-1c	5	
	Sarahan	SF 151 Saro Manla	C-1	1.35	
		SF 151 Saro Manla	C-2	3.04	
		UF 5 Mahal Preet Nagar	C-5	17.7	
			Total:	82.09	82.09
2023-24	Habban	RF 21 Dalmu Deothi	C-1a	10	
		PF 2 Chural Ka Nala	C-8	10	
	Narag	RF 49 Pathroti	C-3	10	
		MF 109 Kawkhi		10	
		MF 136 Rister		10	
	Rajgarh	RF Bohal	C-1	5	
		Hiun	C-1	5	
	Sarahan	SF 158 Kanarari	Whole	20.67	
		SF 138 Jaman Ki Ser	C-1	2.5	
			Total:	83.17	83.17
2024-25	Habban	RF 14 Thaina	C-2c	5	
		RF 21 Dalmu Deothi	C-1c	10	

Year	Range	Number and name of forests	Comptt	Area in ha.	Total for the year (ha)
		PF 1 Deothi Majgaon	C1f	5	
	Narag	MF 91 Sarol		5	
		MF 114 Nohra		4.23	
		RF 52 Argushina		10.77	
		RF 47 Unchakot	C-1d	5	
	Rajgarh	Phagu	C-4c	10	
		RF Chogtali	C-3	5	
	Sarahan	SF 151 Saro Manla	C-3	21.13	
		UF 7 Bara Chakli	C-5	25.5	
			Total:	106.63	106.63
2025-26	Habban	PF 2 Chural Ka Nala	C-8	10	
		MF 12 Manwa		10	
		RF 3 Ghotari	C-3b	5	
	Narag	RF Argu Shina		10	
		RF 53 Jaintidhar		10	
	Rajgarh	RF Stambhu	C-1a	5	
		Pirag	C-1b	5	
	Sarahan	SF 169 Dharot Khalog	C-2	12.81	
		UF 7 Bara Chakli	C-6	19.25	
			Total:	87.06	87.6
2026-27	Habban	RF 3 Ghotari	C-5b	4	
		RF 4 Manwa	C-4	9	
		RF 21 Dalmu Deothi	C-1a	10	
	Narag	RF 53 Jaintidhar		15	
		UF 21 Tikkar		20	
	Sarahan	UF -6 Tikkar Kuthar	C-2	25	
		UF 7 Bara Chakli	C-5	25.5	
			Total:	108.5	108.5

2.7.28 Subsidiary Silvicultural operations : The following subsidiary silvicultural operations are prescribed :

Treatment Map : Treatment on 1:3,750 Scale shall be prepared for each plantation area showing the plantable/unplantable locations, soil type, soil depth, drainage, slope and the species to be planted. This map shall be maintained in the comptt. History file.

Clearance of sites: In the exploitable areas, trees will be felled either through purchases or departmentally. In other areas bushes are to be cut and planting sites cleared. The felling and extraction of tree, bush cutting and burning shall be completed latest by 31st March every year.

Fencing and Earth work: After the sites are cleared, the fencing and pit digging operations shall be done simultaneously. The area will be fenced by stone wall or 4 strands barbed wire depending upon the availability of stones and fence posts. Planting will be done at a distance of 3m X 3 m along the contour in pits of 30 cm X 30 cm X 30 cm dimensions. The earth work must be completed before 31st May of every years positively but the fencing before

the actual planting takes place. Advance work of fencing and earth work is prescribed to be done.

Temporary Nurseries : Site for the temporary nurseries should be selected within or nearer to be plantation areas and the source of water. The plant requirements should be worked and entire operations be planned in advance. The nursery should be raised well before the actual planting, depending upon the time required to get seedlings of plantable size. Methods of nursery raising and time required to get plantable seedlings in respect of some common species is given in Table 2.7.13.

Table 2.7.13: Species, methods of nursery raising and the time required in respect of some common species.

Species	Method of raising	Time required
Chil	Sowing in Polythene bags	5 to 6 months
Khair	-do-	5 months
Bamboo	-do-	1 to 1 ½ years
Kachnar	Sowing in Nursery beds	1 Year
Beul	-do-	1 Year
Semal	-do-	1 to 2 Years
Deodar	Sowing in polythene bags	2 ½ years
Poplars	Cuttings in nursery beds	1 year
Walnut	Sowing in nursery beds	2 to 2 ½ years

Sowing and planting : Reliance will be placed on planting in most of the areas. However, sowings of Kail in temperate zones and Sal in the Mahal Preet Nagar areas shall be attempted in the first few year on experimental basis. If it succeeds, it must be attempted on large scale. The techniques of raising Sal in bordering area of Haryana should be followed and their experience should be shared for our advantage.

Weeding : In exploitable areas, the stools of felled trees are likely to coppice. Bushed are likely to appear after the area has been planted. Repeated cutting back of coppice shoots, bush cuttings together with the weeding has to be done intensively depending upon the need of the each are atleast for three years. Two weedings in the first year and one weeding during rains in following years is considered essential. It should be made an inseparable part of planting operations.

Beating Up : Beating up of failures will be carried out for 2 to 3 years after the planting if the plant survival is less than 80%. Where the success is more than 80 % no beating up is to be done unless the failures are in compact block of 0.2 ha or more in extent.

Prunning, cleaning and thinning : These operations will be carried out in old plantations. Prunnings will be done upto 1/3rd height of the4 chil plants when the crops has a mean height of 3 m like in SF 18 Ser Jagas. Cleanings and thinning should be done when the height of plants is 5 m. One cleaning shall be enough .

2.7.29 Grass Cuttings: Grass cuttings in closed areas may be permitted when the plants have attained sufficient height and there is not chance of their being damaged by sickle. The

permission of grass cuttings rests at the discretion of D.F. O. The grass should be suitable distributed amongst all the right holders. It is better if Panchayats are associated for the purpose.

2.7.30 Closures: Closures shall be got notified in advance of actual planting. Old plantations may be thrown open if these are beyond grazing damages. Effective closure is a must in order to reduce the total closure period of each plantation.

2.7.31 Fire Protection: Internal fire lines of 5 m in width dividing the entire plantation area into suitable blocks may be provided by clearing the bushes and other vegetation. Such fire lines should be shown on the treatment maps.

2.7.32 Regeneration Survey : Regeneration survey on 1:3,750 scale map shall be carried out every year till the plantation is established. Reasons of the failure, if any, should invariably be recorded in the Survey report and pasted in Compartment History Files.

CHAPTER-VIII

THE GRAZING OVERLAPPING WORKING CIRCLE

2.8.1 General Constitution : The working circle overloaps all other working circles and covers an area of 25986.72 ha.

2.8.2 General Character of Vegetation : The general character of vegetation has been discussed in detail under respective working circles and Chapter-II of Part-I. From grazing and forage point of view, the entire areas can be divided in three zone viz; Higher, Middle and Lower Zones.

2.8.3. Higher Zone: It extends from 2000 upwards and confined to Habban and Rajgarh Range. The principal species of fodder value are *Quercus spp.*, *Acer spp.*, *Prunus spp.*, *Pyrus pashia*, *Arundinaria falcate*, *Celtis australis*, *Corylus colurna*, *Morus serrata*, *Olea cuspidata*, *Robinia pseudoacacia* etc. The shrubs, herbs and climbers being the important source of fodder are *Indigofera spp.*, *Berberis spp.*, *Trifolium spp.*, *Ranunculus spp.*, *Polygonum spp.*, *Viola spp.*, *Fragria spp.*, and *Clematis spp.*, during the period of acute shortage, less palatable species like *Pistacia integerrima*, *Cedrella spp.*, *Salix flabellaris* etc. are also lopped. Goats do browse even *Rubus niveus*, *Jasminum officinale* and *Spiraea lindleyana* and *Cotoneaster spp.* The important grasses are *Agropyron spp.*, *Bromus spp.*, *Chrysopogon martini*, *Themeda spp.*, *Brachiara villosa*, *Dicanthium annulatum*, *Dactylis glomerata*, *Festuca spp.*, *Ischaemum spp.*, *Milium effusum*, *Pennisetum orientale*, *Poa spp.* Etc.

2.8.4 Middle Zone : It extends from 1,200 m to 2,000m. The common species for fodder and grazing are *Quercus incana*, *Pyrus pashia*, *Morus serrata*, *Rhus spp.*, *Ficus spp.*, *Salix spp.*, *Sapium insigne*, *Albizzia spp.*, *Prunus spp.*, *Bauhinia spp.*, *Ougeinia spp.*, *Carissa spp.*, *Cotoneaster spp.*, *Desmodium spp.* and a large number of ferns, grasses such as *Chrysopogon fulvus*, *Heteropogon contortus*, *Themeda anathera*, etc. *Bauhinia Climbers* are also used as fodder.

2.8.5 Lower Zone : It lies below 1,200m and contains a large number of fodder trees and shrubs, but provide poor grazing and fodder due to the influx of large number of migratory goats and sheep in winters. The principal tree species are *Acacia catechu*, *Morus alba*, *Anogeissus, latifolia*, *Albizzia spp.*, *Ougeinia ooffenensis*, *Salmalia malabarica* *Kydia calycina*, *Melia azadirach*, *Bauhinia spp.*, *Celtis australis*, *Grewia oppositifolia*, *Terminalia spp.*, *Zizyphus spp.* The bushes are *Carissa*, *Flacourtia*, *Berberis*, *Jasminum* etc. In periods of scarcity, species such as *Syzygium cuminii*, *Mangifera indica* *Ficus spp.*, *Butea spp.*, *Dalbergia sissoo* and *Cedrella toona* are also lopped. The species avoided by cattle if form the chief composition of the stand, indicate the excessive grazing and browsing of the area. These are *Butea monosperma*, *Caseaia tomentsa*, *Lagerstroemia spp.*, *Woodfordia fruticosa*, *Mallotus philipinensis*, *Adhatoda vasica* and *Euphorbias*. Armed species like *Carissa opaca* and *Zizyphus spp.* Over run heavily grazed areas. The leaves of *Bauhinia vahlii* and *Dendrocalamus spp.* are prized fodder. The principal fodder grasses of the zone are *Saccharum spp.*, *Heteropogon contortus*, *Bothriochloa pertusa*, *Themeda anathera* and *Chrysopogon spp.*

2.8.6 Blocks and Compartments : These remain the same as coverend under various working circles already dealt with.

2.8.7 Special objects of management : These are :

- i) To meet the legitimate grazing and fodder requirements of right holders/local people as laid down in Faisla-e-Janglat.
- ii) To improve the productivity of areas so as to ensure the continuous supply of forest produce to the people.

2.8.8 Area Statement: The total area of this overlapping working circle is 25,986.72 ha out of which 13,628.89 ha shall be closed to grazing in various working circles. The remaining 12,357.83 ha shall be open and available to grazing. From the closed area of 13,628.89 ha, quite a few forests shall be available to grazing till the closures are effective in such areas as per sequence of fellings and planting programmes given in various working circles. Later on these areas will provide adequate grass during closure. The details of the areas per legal classification and working circle are given in Table 2.8.1.

2.8.9 Silvicultural System: Forests area will be managed in accordance with the prescriptions of the concerned working circle to which allotted. This working circle is concerned with management of grazing, grass cutting and lopping etc.

2.8.10 Grazing: The incidence of grazing is not uniform all over the tract. Area near habitations, along the road, Paraos, Paths and migratory routes are heavily grazed. Areas at higher altitudes and in the interior valleys are comparatively less grazed. As per Faisla-e-Janglat the local Zamindars are allowed to graze their buffaloes, goats, sheep and other animals maintained for domestic purposes only on payment of grazing fees and all cattle kept for agricultural purposes free of cost in specified forest area as a concession. All the reserved, protect, unclassified, mushterqua and Shamlat/ceilingland forests cater to the grazing requirements of domestic as well as migratory graziers as discussed below.

2.8.11 Domestic grazing : it is practised in the villages. In this case, the local people keeping all categories of animals for agricultural and domestic requirements, can graze them in the adjoining Government forests all the time without any limit as provided in Faisla-e-Janglat.

2.8.12 Nomadic and migratory grazing : In this case, the local people who own more cattle than can be accommodated in the adjoining grazing grounds all the year round or others who keep large number of buffaloes, sheep and goats for commercial purposes, can graze their herds in Alpine pastures/temperate meadows and high level forests during summer and in sub-tropical forests at lower altitudes, during winter. This category includes migratory Gujjars and Gaddies besides local people. Grazing in these areas is permitted on payment of fees for each category of animals.

Table 2.8.1 : Area statement of Grazing Working Circle

Working circle	Forest Classification and Area (Ha)											
	R.F.		P.F.		U.F.		M.F.		S.F.		Total	
	Gross	Closed	Gross	Closed	Gross	Closed	Gross	Closed	Gross	Closed	Gross	Closed
1	2	3	4	5	6	7	8	9	10	11	12	13
Chil	3329.97	1390.37	672.71	316.61	1235.16	245.10	779.66	260.67	125.61	10.99	6143.11	2223.74
Deodar-Kail	3166.64	1216.87	595.63	52.75	--	--	379.08	34.00	32.39	--	4173.74	1303.62
Fir-spruce	2551.50	80.70	--	--	--	--	--	--	--	--	2551.50	80.70
Rehabilitation	1857.44	1857.44	322.35	322.35	402.40	402.40	897.24	897.24	628.27	628.27	4107.70	4107.70
Protection	1452.34	321.56	557.80	88.00	75.90	19.55	225.12	84.71	229.78	206.05	2540.94	719.87
Plantation	612.99	591.49	403.69	314.39	1526.67	771.26	368.95	368.95	3557.43	3147.17	6469.73	5193.26
Total	12970.88	5458.18	2552.18	1094.10	3240.13	1438.31	2650.05	1645.57	4573.48	3992.48	25986.72	13628.89

2.8.13 Grazinglands : Grazinglands, Rangelands and pastures are used loosely to symbolise the grazing grounds. In literary sense, the grazing grounds of Rajgarh Forest Division hardly meet the requirement of such nomenclatures which are defined below (Shrivastava et al. 1988)

Grazinglands : Natural land surface predominantly covered with “Grass”, the wild member of the family ‘Gramineae’.

Rangelands : Natural grasslands.

Pastures : Grassland area artificially established to tame forage plants.

Besides forests mentioned under parar 2.8.8, there are other categories of lands available for grazing in the division as mentioned in Table 2.8.2.

Table 2.8.2: Grazing land distribution in Rajgarh Forest Division.

Sr. No.	Land category available for grazing/grass production	Area (Ha)
1.	Forest lands	12357.83
2.	Culturable Wastes	7276.00
3.	Permanent pastures and other grazing lands	16610.00
	Total	36243.83

The forests available for grazing have already been described. The lands other than forsts used for grazing are described below in succeeding paras.

2.8.14 Present status of grazinglands: Village grazinglands are overgrazed by the ever increasing livestock population which reduces their regeneration capacity and keep them at a level of low productivity. Soil is deficient in mineral and organic matter content. For most of the year, these lands give the appearance of play grounds for cattle. Forest lands confined to fringes are excessively grazed. Trees are heavily lopped. Vegetal cover has been removed and the soil is exposed to accelerated erosion. Trees have gradually been replaced by shrubby growth. Fires have further deteriorated the whole ecosystem and non palatable species dominate. The forests are reduced to open thorn scrub type especially from Shamlat/Village Commonlands.

2.8.15 Ecological status : With the incidence of heavy grazing, the forests have disappeared and the areas have been converted to grasslands and bushy scrub growth. Such grass/grazinglands are bio-edaphic and can be regarded as sub-climax vegetation. Most of the grazing lands and degraded forests are thrown back to succession through several stages of regressive deterioration. Thus grasslands are maintained under the influence of fire and grazing of varying intensities and combinations.

2.8.16 Causes of deterioration : As described by Shrivastava et al 1988, the main cases of deterioration are as under: -

- Grazinglands :**
- Over grazing.
 - Premature grazing.
 - Continuous grazing.
 - Trampling.
 - Selective feeding.
 - Bad distribution of cattle.
- Forestlands :**
- Heavy and indiscriminate fellings.
 - Heavy grazing.
 - Fire.
 - Illegal encroachments/unauthorized Nautors.
 - Illicit fellings and forest theft.
 - Mismanagement.
 - Technical mistakes in forest management.
 -

2.8.17 Fodder production : Most of the farmers depend on forests, grasslands, crop residues and tree leaves as source of fodder for their livestock. Natural grasslands include common grazinglands, forest plantation and protected areas for hay harvesting. Growth starts with the on set of firest monsoon, reaching peak in September and mature by the end of October and for the rest of the year remain dormant. During this period the animals have mostly dry fodder. Hay cutting starts in October after most of the grass is mature.

2.8.18 Grass production : Due to lack of improvement and proper management, the productivity of grass (dry matter) per ha is low i.e. on average approximately 3t/ha. It is subject to altitudinal difference as is evident from the study undertaken by H.P. Agricultural University Palampur in Sub-tropical zone, the results of which are tabulated below : -

Table 2.8.3 : Forage yield from grasslands at different elevations (Singh et al 1975)

Altitude (m)	Forage yield (t/ha)	
	Fresh	Dry
675	12.70	5.04
100	12.45	4.78
1354	11.32	4.72
1675	14.80	4.90

2.8.19 Nutritive value of grass fodder : It depends on botanical composition, stage of maturity , soil fertility etc. Legumes are almost absent in grasslands. The dominant

species of grasses is the poor quality **Heteropogon contortus** Table 2.8.4 shows the relative composition of different grass and associated species in natural grasslands at various altitudes in sub-tropical zones, whereas Table 2.8.5 shows the chemical composition of H. contortus relative to other native grasses from the region. Chemical composition is very much affected by stage of maturity (Table 2.8.6). During winter and summer the protein and minerals fall below 2% which is inadequate for livestock maintenance.

Table 2.8.4 : Average percentage of tillers of different grasses in samples from natural grasslands of different altitudes (Source : H.P. Agriculture University Palampur) singh et al. 1975)

Grasses	Altitudes (m)			
	675	1000	1345	1675
<i>Cymbopogon martinni</i>	6.0	12.4	1.3	--
<i>Bothriochloa pertusa A. camus</i>	18.8	5.5	17.1	8.1
<i>Hemarthria compressa L.</i>	3.2	10.4	8.0	3.8
<i>Saccharum spontaneum L.</i>	5.9	1.2	1.2	1.3
<i>Chrysopogon gryllus Trin.</i>	1.4	16.2	6.6	16.5
<i>C. montanus Trin.</i>	4.5	2.0	9.5	5.6
<i>Arundinella nepalensis Trin.</i>	11.0	2.6	13.4	28.8
<i>Pennisetum orientale Rich.</i>	--	--	0.3	0.8
<i>Heteropogon contortus Beauv.</i>	42.8	47.1	39.0	25.8
<i>Themeda anathera Hack.</i>	--	--	2.4	3.0
Others	6.4	2.6	1.2	6.3
Total	100.00	100.00	100.00	100.00

Table 2.8.5 : Chemical composition of some important grasses (% on dry matter basis) Singh et al; 1975)

Grasses	Dry matter	Crude protein	Ether extract	Crude Fibre	N. free extract	Total ash	Ca	P
<i>Chrysopogon gryllus</i>	34.7	9.51	2.23	32.53	46.57	9.16	0.51	0.10
<i>C. montanus</i>	39.4	8.56	1.75	32.53	44.74	12.40	0.47	0.16
<i>Arundinella nepalensis</i>	35.6	9.30	1.27	35.41	47.77	8.25	0.41	0.10
<i>Themeda anathera</i>	37.8	7.26	1.87	34.45	45.74	10.68	0.48	0.10
<i>Bothriochloa intermedia</i>	32.7	7.07	1.85	33.96	49.43	7.69	0.42	0.13
<i>Heteropogon contortus</i>	41.8	6.43	1.86	36.92	46.79	8.00	0.42	0.11

Table 2.8.6 Mean values of important constituents of grasses during various stages of growth (% on dry matter basis)

Constituents	May/June	July/August	Sept/October
Crude Protein	9.08	8.17	5.01
Crude Fibre	31.48	35.30	37.09
Calcium	0.58	0.43	0.37
Phosphorus	0.15	0.10	0.08

2.8.20 Crop residues as fodder : In the division, the main Kharif and Rabi crops are Maize and wheat and barley respectively. The cropping intensity of the cultivated area (11303 ha) is 171%. Irrigated paddy is also grown. The average grain yields and grain to straw ratios for each of these crops are shown in Table 2.8.7.

Table 2.8.7 : Average grain yield and grain/straw ratios of common crops

Crops	Grain yield (Kg/ha)	Grain/Straw raio
Paddy	1500	1 : 2
Maize	2000	1 : 3.5
Wheat	1500	1 : 2.5
Barley	1000	1 : 2.5

Assuming a moisture content of 12%, the estimates of fodder production (on dry matter basis) from crop residues are given in Table 2.8.8.

Table 2.8.8 : Estimates of Fodder Production (on dry matter basis) from crop residues.

Crops	Dry matter production (t/ha/year)	Area cropped (ha)	Total dry matter (t)
Maize	6.16	8037	49508
Paddy	2.64	993	2622
Wheat	3.3	5216	17213
Barley	2.2	1104	2429
		Total :	71772

2.8.21 Fodder crops : Normally fodder crops are not grown in the area. Scope for interrow planting of existing crops with fodder crop do exist. Some farmers sow maize at high seeding rates to feed the thinning to their cattle but production as a whole is negligible and can not be counted for.

2.8.22 Fodder Trees : Leaf fodder helps to supplement the poor quality grass and crop residues. It is also useful during drought and famine. It is lopped throughout the year but more common between October to April when the grasses are deficient. The trees, shrubs and climbers lopped most frequently are *Grewia oppositifolia*, *Bauhinia spp.*, *Quercus incana*, *Albizzia spp.*, *Ougeinia dalbergioides*, *Celtis australis*, *Bamboos*, *Morus spp.*, *Zizyphus spp.*, *Kydia calycina*, *Robinia pseudoacacia* etc. The tree leaves in general have adequate crude protein and maintain their nutrients at a fairly uniform level throughout the year. To satisfy the annual protein requirements, 1000 to 3000 kg of fresh leaves per cow would be needed. Table 2.8.9 provides the nutritive value of some of the common fodder leaves.

2.8.23 Livestock : The livestock population of the division kept by the local people are given in Table 2.8.10.

2.8.10 Livestock Population of Rajgarh Forest Division.

Sr. No.	Livestock	Total
1	Cattle	38597
2	Buffaloes	20449
3	Goats	32151
4	Sheep	4838
5	Horses/Ponies/Donkeys/Mules	1962
	Total	97997

2.8.24 Cattle : Most of the village cattle are non descript. Bullocks are used for draught and cows for milk which also produce draught animals. The performance of the local non descript cattle is very poor. Bullocks are small with average weight of 220 kg and the cows 180 kg. The mortality rate of young calves is 30% and for older stock it is 5 to 8%. Cows normally do not calve until 4 years of age, with subsequent calving intervals of approximately 2 years.

2.8.25 Buffaloes : Over 50 % of buffaloes are non descript. At lower elevation there are some Murrah breed. The buffaloes are mostly kept for milk production, Mortality rate of male calves is as high as 80%.

2.8.26 Milk production : Milk production from local cows for one lactation of 150 to 200 days is 150 to 300 litres. The buffalo is a much better milk producer than the local cattle and can produce 1500-2000 litres per lactation.

2.8.27 Draught animals : Bullocks are used for ploughing, can crushing and threshing of harvests. Horses, ponies, donkeys and mules are used as draught animals for carriage and transport of goods, timber, firewood, charcoal and other materials of daily needs apart from house construction material like cements, concrete, sand, bricks, stones etc.

Table 2.8.9 Nutritive value of some common fodder leaves.

Sr. No.	Species	Crude Protein%	Digestible Protein %	Fibre %	Calcium%	Phosphorus %	Total digestible nutrients %	Fodder Stage
1	2	3	4	5	6	7	8	9
1	<i>Albizzia lebbek</i>	12.84	11.6	29.54	2.71	0.12	49.3	--
2	<i>Albizzia stipulate</i>	20.99	--	33.74	1.03	0.14	--	--
3	<i>Acacia catechu</i>	12.72	2.9	21.22	2.46	0.14	44.3	Green, mature
4	<i>Aegle marmelos</i>	14.33	10.8	21.14	4.79	0.14	56.8	Green, mature
5	<i>Anogeissus latifolia</i>	--	0.6	--	--	--	47.8	Green, mature
6	<i>Azadirachta indica</i>	--	8.4 (May)	--	--	--	53.3 (May)	
			9.3 (Sept)				42.8 (Sept)	--
7	<i>Bauhinia variegata</i>	15.91	9.2	27.04	1.76	0.22	55.5	Green, tender
8	<i>Cedrella toona</i>	14.90	--	20.61	2.57	0.20	--	--
9	<i>Celtis australis</i>	15.33	--	21.45	3.47	0.12	55.00	--
10	<i>Cordia oblique</i>	--	5.1	--	--	--	26.9	Green, mature
11	<i>Dalbergia sissoo</i>	--	9.1	--	--	--	52.2	--
12	<i>Dendrocalamus strictus</i>	14.19	9.3	27.64	1.12	0.26	58.9	--
13	<i>Ficus bengalensis</i>	--	4.1	--	--	--	51.1	Green, mature
14	<i>F. glomerata</i>	--	6.7	--	--	--	53.8	Green, tender
15	<i>F. palmate</i>	20.79	--	15.10	3.82	0.23	--	Green, mature
16	<i>F. religiosa</i>	--	5.5	--	--	--	39.2	Green, tender
17	<i>Grewia oppositifolia</i>	18.05	--	22.12	3.27	0.20	72.0	--
18	<i>Helicteres isora</i>	--	9.7	--	--	--	58.4	Green, tender
19	<i>Kydia calycina</i>	--	7.9	--	--	--	54.4	--
20	<i>Lagerstroemia parviflora</i>	--	0.9	--	--	--	55.1	Green, mature
21	<i>Lannea grandis</i>	--	4.9	--	--	--	55.2	--
22	<i>Laucaena leucocephala</i>	15.22	--	15.02	2.99	0.19	70.22	--
23	<i>Milletia auriculate</i>	--	15.5	--	--	--	44.9	Green, tender

Sr. No.	Species	Crude Protein%	Digestible Protein %	Fibre %	Calcium%	Phosphorus %	Total digestible nutrients %	Fodder Stage
1	2	3	4	5	6	7	8	9
24	<i>Morus alba</i>	16.64	10.7	14.32	3.62	0.23	59.6	Green, mature
25	<i>Moringa oleifera</i>	--	11.1	--	--	--	61.5	--
26	<i>Ougeinia dalbergioides</i>	--	3.7	--	--	--	45.6	--
27	<i>Pueraria thumbergiana</i>	--	11.7	--	--	--	44.0	Dry Vines
28	<i>Quercus dilatata</i>	--	4.2	--	--	--	43.2	Green, mature
29	<i>Quercus glauca</i>	--	4.6	--	--	--	39.8	Green, mature
30	<i>Quercus incana</i>	--	5.7	--	--	--	43.1	--
31	<i>Robinia pseudoacacia</i>	20.45	--	17.46	1.14	0.15	--	--
32	<i>Salamalia malabarica</i>	12.57	--	22.33	2.70	0.19	--	Green, tender
33	<i>Syzygium cuminii</i>	10.76	7.57	20.07	1.79	0.11	47.1	Green, mature
34	<i>Terminalia belerica</i>	--	0.9	--	--	--	54.3	--
35	<i>T. tomentosa</i>	--	--	--	--	--	34.9	Green, mature
36	<i>Zizyphus nummularia</i>	--	5.5	--	--	--	57.1	--

2.8.28 Animal manure : The animals are the chief source of manure. It is estimated that one stall fed buffalo, two grazing bullocks and two grazing cows provide sufficient recoverable dung to fertilize 1 ha of rainfed farmland growing Kharif and Rabi crops.

2.8.29 Goats : The landless families keep 20 to 30 sheep and goats in mixed flocks. The migratory graziers keep bigger flocks. The goat is the principal source of meat and milk. It is a prolific breeder and less demanding as they browse on trees and shrubs. They are destructive animals causing serious damage to forest vegetation.

2.8.30 Sheep : Sheeps are chiefly reared for wool production. The mild and meat is also used. Migratory graziers keep big flocks of sheep mixed with goats.

FODDER RESOURCES AND THE GRAZING PROBLEMS :

2.8.31 Animal units : The animal unit is the conversion of grazing animals to obtain a single measure for the pasture requirements of the herd for comparison with the carrying capacity of the land. The cow is taken as standard i.e. 1 Animal Unit. The conversion factors for various livestock are given in Table 2.8.11.

Table 2.8.11 Conversion factors of Animals Units.

Livestock	Details	Animal Units	Remarks
1	2	3	4
Cattle	Cow	1.0	Average for the cattle of all types is equivalent to 1.0 Animal Unit
	Breeding Bull/work Oxen	1.2	
	Cattle above 3 years	1.0	
	Young cattle below 3 years	0.6	
Buffaloes	An adjustment based on body weight is made to the above conversion factor.		
	Cow	1.5	Average for the Buffaloes of all types is equivalent to 1.5 Animal Unit.
	Bull	1.8	
	Buffalo above 3 years	1.5	
	Buffalo below 3 years.	0.8	
Others	Horse	1.0	Average for this category of animals is equivalent to 1.0 Animal Unit.
	Ponies	1.0	
	Mules	1.25	
	Donkeys	0.75	
Sheep and Goats	Sheep	0.25	The number of animal units on a cattle basis are calculated by multiplying the live weight of the sheep or goat by 1.5 and dividing by the life weight of the reference cow (180 kg), i.e. (30 kg x 1.5)/180 kg = 0.25 Animal Unit
	Goats	0.25	

2.8.33 Stocking Rate : Using the conversion factors, the total number of animal units for the division is 80481 as given in Table 2.8.12

Table 2.8.12 Total number of animal units in Rajgarh Forest Division

Livestock	Numbers	Animal Units.
Cattle	38597	38597
Buffaloes	20449	30674
Goats	32151	8038
Sheep	4838	1210
Others	1962	1962
Total	97997	80481

2.8.34 Grazing incidence : For 80481 Animal Units, the total available forests and non forests grazing lands is 36243.83 ha (Table 2.8.2). It gives an average grazing incidence of 2.22 A.U per ha i.e. per animal unit the available grazing land is only 0.450 ha.

2.8.35 Carrying capacity of grazinglands : Though no data are available on the carrying capacity of grazinglands of this division, it is taken as half Animal Unit (Cow Unit) per ha as recommended by the Grazing Advisory Committee. Thus for optimum grazing an area of 2 ha pr cow unit i.e. Animal Unit will be bare minimum. Thus the total requirement of land comes 160962 ha against available area of 36243.83 ha. This is approximately 4.5 times less than the required area and unfortunately it is on the increase. This suggests the need for drastic reduction in number of livestock and improvement of forests, grass and grazinglands.

2.8.36 Fodder Resources: The production of hay, grasses and fodder from grasslands (ghasnies) and closed forest area is assessed as 3 tonnes equivalent to 2.64 t dry matter per ha per year after an effective closures (Shrivastava et al 1988). In open areas the production is assessed to be 50% of the production of closed areas i.e. 1.32 t per ha per year. The fodder resources of the division have been estimated at 1,77,518 t dry matter of which 1,05,746 t is from forests and grasslands and 71,772 t from crop residues as presented in Table 2.8.13.

Table 2.8.13 Estimate of fodder resources.

Fodder Sources	Dry matter production (t/ha)	Area (ha)	Total dry matter production (t)
1	2	3	4
A. Forestlands			
i) Closed to grazing	2.64	13628.89	35980
ii) Open to grazing	1.32	12357.83	16312
B. Grazing and Grasslands			
i) Culturable Wastes	1.32	7276	9604
ii) Permanent pastures & other grazinglands	2.64	16610	43850
C. Kharif Crop residues (Maize)	6.16	8037	49508
D. Rabi Crop residues			
i) Wheat	3.3	5216	17213
ii) Barley	2.2	1104	2429
E. Paddy residues	2.64	993	2622
		Total	177518

2.8.37 Fodder Requirement: It is 1,89,130 t dry matter for the division. There is a deficit of 11612 t dry matter for which the people are dependent on the leaves of forest vegetation. The forest loppings thus contribute the fodder to the tune of 0.144 t dry matter per Animal Unit per year. Table 2.8.14 present the estimates of fodder requirements for the area.

Table 2.8.14 Estimate of fodder requirements (Shrivastava et al 1988)

Dry matter consumption per AU/Day	= 2.5% of body weight
Live weight of one village cow	= 180 kg
Per day dry matter consumption /AU	= $2.5 \times 180/100 = 4.5$ Kg
Annual consumption /AU	= $4.5 \times 365 = 1643$ Kg
Utilization factor	= 70 %
Requirement of each AU/Year	= $1643 \times 10/70 \times 1/1000 = 2.35$ t
Fodder requirement for 80481 AU/Year	= $2.35 \times 80481 = 1,89,130$ t

The serious shortage of fodder, the high livestock number and current grazing practices have increased the grazing pressure on the forests and communal grazinglands to the point where vegetation cover is being destroyed and erosion is taking place. Grazing pressure and livestock number need to be reduced, if the areas are to be rehabilitated.

2.8.38 Problems in management of grazinglands: The problems arising in the management of grazinglands are protection, high cost, people's participation, proper grazing system and poor site conditions. Protection against intensive grazing is essential as these results in the disappearance of perennial grasses giving place to tough obnoxious weeds. After protection, shrubs and weeds invade the area quickly. Weed control is costly and uneconomic. Deferred grazing is the urgent need to improve the grasslands with desired species. Suspension in grazing rights including reduction in it is essential. This can be achieved through active participation of people as reduction in cattle population is a social and politico-religious problem. Tree leaves are extensively lopped. Forest lands are frequently visited by migratory graziers. The leguminous component is confined to low quality annuals. Stall feeding is lacking. Indiscriminate cuttings of trees and lopping destroy the normal forests. These lands require silvi-pastoral management for fuel and fodder species. The fire causes desiccation of soils, kills the micro flora and hamper ecological succession, making the sites poorer.

2.8.39 Improvement and management of grazinglands : The objective is to obtain the maximum production of livestock without decreasing the productivity of the grasslands. The improvement programme consists of :

- i) Livestock management.
- ii) Grazing management.
- iii) Management of grazinglands.

2.8.40 Livestock Management :

- i) **Reduction in the number of cattle** : The cattle should be distinguished into essentials. The cattle population should be controlled by encouraging the breeding of only better breeds. Livestock number may be reduced by stall-fed upgraded cattle and buffalo which reduce the grazing pressure and increase the animal mature and milk production. It can be done from Govt. level by encouraging exchange of two surplus bullocks and/or useless low grade cows for one upgraded jersey. Heavy grazing fees should be charged for non essentials while essentials can be allowed to graze free. Unwanted breeding should be prevented by herding the cows and bulls separately. Limits of cattle should be fixed on the basis of the land possessed by a family.
- ii) **Improvement of cattle** : This can be done by (i) Replacement of nondescript local cows with jersey cross breeds, (ii) Painless castration of the scrub bulls, (iii) Introduction and use of better breeds of cow and buffalo bulls. Like Jersey, Sahiwal, Haryana, Murrah(Natural service) to improve the local cows and buffaloes,(iv) Use of artificial insemination on local cows and buffaloes to upgrade the milking herd of farmers. This programme requires adequate incentives and government aids for
 - a planned breeding programme,
 - improved AI facilities including purchase of jersey bulls,
 - supplementary feeding of concentrates to upgraded cows,
 - additional Murrah bulls for natural service of local buffaloes and
 - castration of young bulls retained for draught purposes.

2.8.41 Grazing management : In the planned grazing management two important principles are followed :

- i) Utilizing grass at a time when the growth and reproduction is least interfered with.
 - ii) Utilizing the grass when it is most palatable and nutritious. Grazing should be planned in such a way that the cattle benefit themselves of the early nutritious growth of the grass without impairing their growth, vigour and regaining power. This can be achieved by safeguarding the divergent needs of the cattle, grass, plant and the man, as discussed below.
- 1) **Grazing load** : Strict Control over the number of animals is the first essential principle. In fixing the number of animals, carrying capacity is taken into consideration. This is determined on the basis of botanical composition, plant cover density, plant vigour and the quality of available palatable forage in an average season. It varies from 2.5 to 8 cattle per ha in poor to moderately good grasslands. Grazing load suitable during average rainfall year is too heavy during drought.
 - 2) **Kind of cattle** : Mixed grazing results in the most uniform utilization of the forage. Selective grazing adversely affects the quality of pasture. One of the rules for maintaining a uniform grass-legume mixture is to graze it all down close atleast once a year. Better herding methods can minimize the goat damage. Thus various kinds of cattle should be balance with proportional mixture to maintain the grazing grounds properly.
 - 3) **Grazing distribution** : Animals should be distributed properly to avoid localized over and undergrazing. Good distribution of stock watering places is an effective means of spreading the grazing load over all parts of a pasture. Enough fences in the right places will also aid in proper distribution of livestock. Placing salt in remote corners will bring about better distribution. Occasional shifting of cattle and frequent moving of bed grounds are also desirable to secure better distribution.

- 4) **Time grazing** : Grazing should be light during the initial growth stage and right time to graze depends on the kind of range and its condition. In submontane Himalayas the grasses should be grazed before seed shed.

Grazing Methods : Continuous grazing has to be deferred. This is not possible in the entire area at the same time. The deferment in a part of the area and grazing in the rest has evolved the following methods:

- i) **Deferred grazing** : It is applicable to areas predominant in perennial grasses. The area is divided into 3 parts. One part is closed while two other parts are allowed to graze alternatively. The animals are shifted to closed one portion before the grasses become over ripe. Coarse and less palatable. This helps dissemination of seeds for germination. Each year one compartment gets rest and enables the plants to recoupe vigour.
- ii) **Rotational grazing** : it involves systematic transfer of animals at suitable intervals from one portion to other. The aim is to give each part a chance of regeneration itself. Diagrammatic rotational closures and grazing schemes for various types of grazing lands have been provided by Gorrie (1941).
- iii) **Deferred and rotational grazing** : it is applicable to areas dominated by annuals and where occasional seeding of perennials is essential to maintain the cover density. The area is divided into three compartments. Rotational grazing is carried out in such a way that each compartment is grazed for half of the grazing season and protected subsequently till the maturity of seeds.

2.8.42 Management of grazinglands : This will improve the conditions of grazing lands. Suggested techniques are: -

- (i) **Closure**: It leads to progressive succession and increased yields. In Poona the experiments with closure and rotational grazing showed better growth of vegetation, availability of young and nutritious grasses continuously, gradual disappearance of coarse and inferior grasses, reduction in soil erosion and better cattle conditions. Experiments conducted at Bhatta indicated the increased grass production from 2.1t/ha to 8.7 t/ha simply by 2-3 years closure (Gupta 1980). A significant increase in biomass production from 0.4 to 0.7 t/ha to 2.2 to 2.4 t/ha was observed in first two years which tended to stabilize at 3.5 t/ha after 5 years of fencing in natural grasslands in Almora district (Kochhar and Tandon 1982).
- (ii) **Soil and water conservation measure** : Studies conducted at CAZRI, Jodhpur revealed that contour furrows (25cm deep, 60 cm wide) spread at 8-10 m apart resulted in 638.7% increase in forage production (Singh 1977). Contour trenching (23-15cm) at 8 m interval with vegetative bunds of hybrid napier recorded a maximum yield of 11.9 t/ha of natural grass and 4.2 t/ha napier (Gupta 1980).
- (iii) **Weed control** : The weeds compete the forage crops in nutrient uptake and smother them. As a result the forage production is reduced considerable. Bush free grasslands produced 3520 kg/ha of grass against 850kg/ha from grasslands with brush (Shankarnarayan 1974). Two weedings increased 106 to 270% forage production of various grasses (Chakraborty 1968).
- (iv) **Reseeding** : The choice of grass species for different regions have been given by Singh et al (1975), Singh, (1979) and Gorria (1946). Indigenous grasses are relatively low yielders as compared to exotics. **Setaria sphacelata** gave 91% higher yield than **Pennisetum orientale**, the highest yielders amount the native grasses (Singh et al., 1975). For various altitudinal zones in Himalayas, improved grasses,

legumes and tree species have been recommended by Gupta (1980), Singh (1979) and Kochhar and Tandon (1982). *Digitaria decumbans* and *Chrysopogon fulvus* are important local grasses and fit for reseeding as the former is a good seed producer and the latter has more protein content in all stages of growth (Gupta and Puri 1979).

- (v) **Burning** : It may be desirable in humids but it is harmful in arid and semi arid regions. Its use has to be judicious. Unless proved to be definitely beneficial, burning should be avoided.
- (vi) **Legume introduction** : It should be ensured that heldover feed after the monsoon grazing contain necessary legumes to make it acceptable to cattle during winter and summers. If a range contains half legume during autumn, it will provide feed of best quality readily acceptable to cattle. Protein content of grasslands could be raised from 2% in pure grass cover to 6% in herbage mixed with legume (Shakarnarayan 1974) Introduction of **siratro** and **kulthi** legumes raised the protein content of mixed hay cut at ripe stage over 6% compared to about 2% of the pure hay (Dabadghao 1972), Some of the legumes recommended for introduction are *Stylosanthes humilis*, *S. hamata*, *S. scabra*, *S. viscose*, *Glycine javanica*, *Dolichos axillaris*, *Centrosema pubescens*, *Desmodium spp.* *Medicago*, *Melilotus*, *Alysicarpus*, *Lespedeza*, *Clitoria ternatea* and *Pueraria spp.*
- (vii) **Liming, fertilization and manuring** : Addition of manures, fertilizers and lime not only maintains the fertility of the soil but also increases the yields of grasses and legumes. Application of 15 kg nitrogen and 20 kg super phosphate increased 44% yield over the control plot at experimental station Paighar (Bambay). Dabadghao et al (1965) reported increase of 24 t o 47% in forage yield of different grasses by application of 22.4 kg/ha of nitrogen and phosphorus. Application of 60 kg N/ha increases the yield of Sehima Heteropogon grasslands of 7.9t/ha compared to 3.97 t/ha as control (Rai et al. 1973). The application of same dose in *Chrysopogon fulvus* increased about 95% forage yield (Kanodia et al. 1974). For acidic soil addition of 3-5t/ha of lime is recommended by Gupta 1980).
- (viii) **Introduction of top feed** : in low rainfall area livestock depend on crop residues, stored grasses, fodder and top feed of trees and shrubs for over 6 months. The leaf fodder remains the only alternative under famine conditions. Growing of fodder trees in association with grasses and legumes on such grazinglands becomes imperative. Leaves of fodder trees contain crude protein from 12 to 24 % on dry matter basis(Bihari and Prasad 1966). A moderate sized *Prosopis cineraria* tree yields about 15 kg of dry leaf fodder and one ha *Zizyphus nummularia* shrub yields about 125 kg of dry top feed per season (CAZRI 1976). The tree species for top feed should be such which provide substantial feed from leaves and pods and should not interfere with the growth of perennial grasses. Important top feed species are *Acacias*, *Albizias*, *Bauhinias*, *Morus*, *Prosopis*, *Melias*, *Zizyphus*, *Leucaena*, *Grewia*, *Celtis*, *Populus*, *Quercus*, *Robinia*, *Ulmus* etc. One third of space in a grazingland may be covered by trees and shrubs without detriment to grass cover.

2.8.43 Management of forest grazinglands : Promiscuous breeding of uneconomic scrub cattle encouraged by free grazing has resulted in the depletion of forest fringes. The measures to improve the conditions of forest grazinglands are as under: -

- (i) **Organization of cattle camps inside the forest** : Arrangements should be made to keep the cattle in the interior areas where grass is abundant. Rotational grazing would have to be planned in these areas.

- (ii) **Introduction of rotational grazing:** It provides time to recoups the vegetation, provides young and nutritious grasses and prolongs grazing season.
- (iii) **Encouraging grass cutting :** It reduces fire hazards and does not have the injurious effects of grazing. It should be popularized by allowing it free.
- (iv) **Departmental harvesting of grasses :** Forest Department should get the grass harvested from the interior areas and export to places of usual fodder scarcity.
- (v) **Burning :** Rotational burning as a measure of grassland improvement gives a new stimulus to growth of grass early in the season. Burning should not be followed by grazing otherwise the palatable grasses will become weaker and die out subsequently giving place to rough and undeserved grasses.
- (vi) **Introduction of exotic and indigenous fodder grasses :** This will solve the problem of poor grass composition in forest grazinglands.
- (vii) **Separate working circle for forest grazinglands :** Carrying capacity of the area, and measures of improvement and rotational grazing should be considered thoroughly and a separate working circle for grazinglands be provided in every working plans based on scientific lines.
- (viii) **Lopping :** Continuous loppings leave the trees unfit for survival. As a result the area becomes open and devoid of tree growth. While more fodder trees should be planted, attempts should be made to bring loppings on scientific lines. The rotational lopping on a three year cycle provides rest to lopped trees for two years before they are lopped again.
- (ix) **National Forest Policy :** Para 21 and 22 of the National Forest Policy of India 1952 ensures sustained supplies of grass fodder. The grazing should be regulated as regards the time and place as also the number of cattle permitted.
- (x) **Grazing Policy :** Continuous grazing should be discouraged and rotational grazing should be introduced. Cheap, free and indiscriminate forest grazing must be combated. Reasonable fee should be instituted for the privilege of grazing. It should not be allowed in regeneration areas and young plantations.
- (xi) **Sheep and goats :** Experience advocates the imposition of restrictions on sheep grazing in forest and total exclusion of goats there from. Damage caused by browsing to young plants is irreparable. Creation of special fodder reserves under strict rotational controls is the only remedy. The rotational grazing should be introduced to regulate the sheep and goat grazing in time and space. Migratory graziers should be discouraged and finally stopped. Rights and concessions on forest lands should be made stricter.

2.8.44 Research needs : Research is required on the followings :

- (i) Initial screening of introduced pasture species with special emphasis on pasture legumes.
- (ii) Evaluation of pasture species under grazing and harvesting conditions.
- (iii) Fertilizer requirements of legume based pastures with special emphasis on phosphorus and trace elements.
- (iv) Seed inoculation requirement of legume species.
- (v) Methods of pasture establishment including over sowing techniques.
- (vi) Cropping systems involving fodder crop and interrow planting of legumes.

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CHAPTER-IX

RESIN EXTRACTION

2.9.1 General : Resin is a metabolic exude being tapped from *Pinus roxburghii* commonly known as Chil. Resin produced from the tract dealt in this working plan accounts for a major portion of the revenue of this division. In fact, it is the most important source of income to the Government and also the local people owning chil trees. The large number of local people find employment in its extraction and carriage. Resin tapping was done departmentally till 1975, when it was taken over by the H.P. State Forest Corporation and the natural exude i.e. Resin is supplied to the Corporation Factories at Nahan and Bilaspur. The material is marketed as resin 70% and turpentine 18 %.

2.9.2 Constitution of Resin tapping Section : All the reserved, protected, Unclassed, Mushterqua and Shamlat/ceiling land forests bearing chil crops shall be taken up for resin tapping. The chil trees above 30 cm d.b.h are considered capable of resin tapping. Such trees are enumerated, punch marked and grouped into sections of 100 blazes each after every five years. This work is done during winter. Trees upto 60 cm d.b.h. are tapped with one blazes whereas trees < 60 cm d.b.h are tapped with two blazes. Trees below III class are not prescribed for resin tapping. One section is worked by a Mazdoor who refreshes each blaze once in six days or so.

2.9.3 Area extent and resin blazes : As described under 2.2.48 all the P.B.I and IV areas of chil working circle are kept out of the purview of resin tapping. Only P.B.II (1162.99) ha and III (1383.82 ha) areas of chil working circles are prescribed for resin tapping. The chil trees found in the other working circles are banned for resin extraction on account of poor growth, open density and limited extent. Only III class and above trees are allowed for resin tapping. The number of trees are taken from the table 2.2.13 of Part A of this working plan. After making a total reduction of approximately 45% for the trees not available for tapping due to their exclusion or otherwise.

The number of chil trees available for tapping totals to 142172 from which 78195 no. of resin blazes are expected. This will provide 78 sections in the entire division for the plan period.

2.9.4 Resin tapping season: The resin season is from 15th March to 15th November. There is period of another 15 days upto 30th November for scraping and collection. A long dry and hot weather produces high yield of resin. The yields are usually highest for the month of May and June.

2.9.5 Methods of tapping :

The French Cup and Lip Method : This is the method being employed from the early days of resin tapping in the State. This method has proved faulty in the sense it renders biological interference to injure the cambium and thereby the vital growth of the trees. This stems from the contractual system of resin tapping where by the labour engaged, are tempted to give deeper blazes just with a wrong notion that deeper incisions may yield more exude. This biological ignorance injures the water conducting system and eventually may kill the tree. Such

heavily blazed trees cannot withstand high velocity wind storms resulting in large scale stem break and uprooting of the trees. Furthermore, the instruments employed in this method does not render any check on the depth of the blaze which may extend as deep as the central core of the tree.

To overcome the disadvantage of this method, German Rill Method was tested in our conditions. It showed an edge over the French Cup and Lip Method. The details of this method are described below ;

German Rill Method : The injury to the stem is negligible, as this method invades only 2-3mm of sapwood. A set of instrument sare needed to set the crop for resin tapping (Fig. 2.9.1). Bark of the tree is removed atleast a month before tapping operation is taken up. A blaze of 35 cm X 20 cm is given superficially by a marker. A Central groove 4mm deep and 10-13 mm wide is made with the help of a Central Groove Cutter. Rills of 2-3 mm depth at an angle of 40° are made on both sides of the Central groove. The resin flow from the arms of rill and is collected in a pot through the central groove (Fig. 2.9.2). acid mixtures ($\text{HNO}_3 + \text{H}_2\text{SO}_4$) is also sprayed at the time of cutting of rill to increase the flow of the exude. The central groove cutter and knife used for cutting of rill are so designed that the cut does not extend than the required dimensions. The operations involved are briefly narrated as under : -

- (a) **Shaving the bark :** With the help of bark remover the loose bark over a surface area of about 45 cm x 30 cm is removed leaving a space of about 15 cm from ground level. The bark left should not be more than 2 mm in thickness to facilitate freshening. To save the cost, it is better to remove the bark over the surface area to be covered in two years.
- (b) **Marking of Blaze and Groove :** Blaze frame is put in vertical position on the stem so that the lowest point is 15 cm from the ground level. Position of blaze and the central groove are marked on the stem.
- (c) **Central Groove cutting :** Central groove is cut by drawing the Central groove cutter from above downwards.
- (d) **Fixing the Lip :** The lip is fixed with two horse shoe nails with fits snugly against the tree. A 5 cm log wire nail is driven into the trees about 2 cm below the mid point of the lip for hanging the collection pot on it. The nail is driven at an angle so that the pot hangs snugly against the tree.
- (e) **Freshening :** The second and subsequent freshening are repeated at weekly intervals just above the previous rills. The rill is made parallel to each other with an uncut bark of 5 mm in between the two successive rills. Average width of the rill is 6 to 7 mm. The length of rills neither exceed the blaze limit nor fall short of it.
- (f) **Spraying of stimulants :** After making a freshening on both arms of the blaze, the stimulant (Acid mixture) is sprayed on the freshly cut rill with the help of plastic bottle moving its nozzle in a steady motion along the rill. For obtaining good spray the plastic bottle should be held at 45° angle to the tree and its nozzle 3 to 5 cm away from it. The acid should be discharged from the bottle in the form of a spray. The pot should be hanged on the nail only after the extra acid has run down the lip,
- (g) **Collection of resin and cleaning of groove :** Resin is collected into collection Can by removing the pot from the tree. The resin adhering to the pot is removed with the

help of scraper. Central groove is also cleaned after each collection with groove cleaner to avoid accumulation of resin in it.

- (h) **Cleaning of lips and pots** : At the end of the tapping season, the nails should be pulled out and lips removed. The lips and pots should be washed with warm water containing washing soda.
- (i) **Installation in subsequent years** : In second year, the position of the blaze is marked above the top of the first year blaze and other operations of the first year remain the same and repeated.

2.9.6 The Forestry Department of the H.P. Agricultural University had conducted the research on resin yield of two tapping methods by laying the experiments at Mallan (Kangra) and Shilli (Solan) forests.

Table : Resin yield by French and German Tapping methods

Year	Yield in kg per blaze	
	French (Cup and Lip) Method	German (Rill) Method
1980	1.80	2.10
1981	1.90	2.15

From the experiment it is concluded that the rill method has advantages over Cup and Lip Method as under:-

- i) Resin yield is slightly higher.
- ii) Cambium layer is not injured due to superficial incision.
- iii) Tree Trunk is protected from deep channels. Thus the quality and quantity of timber is saved from wastage.
- iv) Healing of wound is faster.
- v) Wind/storm throw and uprooting of trees are reduced. In order to sustain dual benefits of timber and resin, it is recommended to switch over to Rill Method of resin tapping from conventional Cup and Lip method in the entire division.

2.9.7 Resin Depots : The resin collected from the forests is brought to resin depots at road sides close to the tapped areas usually located at a distance of 5 km. A number of sections are attached to each depot under the charge of a Resin Watcher, who maintains the accounts of the depot and supervises the works of labourers in the forest. From the road side depots, the resin is transported by trucks to the Resin and turpentine Factories at Nahan and Bilaspur.

2.9.8 Calculation of yield : The yield of resin expected from the division is based on the number of blazes i.e number of sections and average yield per blaze vis-à-vis per section per year. The resin extraction of the division is being carried out by H.P. State Forest Corporation Divisions Solan and Nahan. The number of blazes, sections and yield of resin realised by two Forest Working Divisions for the last 23 years are summarised in Table 2.9.1. On average the chil forests of this division yield 36.83 quintals of resin per section per year.

The annual yield of resin expected from the division calculated as under:

Resin yield = No. of section x Average resin yield per section (in quintals)

Quintals/year = 78 X 36.64

= 2857.92 Quintals

Or say 285.792 tonnes/year.

Table 2.9.1 Number of blazes & resin yield

Year	No. of blazes.	Average yield per section	Resin yield (quintals)
1991	67889	41.13	2792.27
1992	144005	36.97	5323.86
1993	196026	32.34	6339.48
1994	150585	41.23	6208.62
1995	142210	33.54	4769.72
1996	118784	36.37	4320.17
1997	80534	30.95	2492.53
1998	56560	37.01	2093.29
1999	48049	40.28	1935.41
2000	14315	38.40	549.70
2001	16680	36.72	612.49
2002	7715	34.60	266.94
2003	5728	35.03	200.65
2004	13103	38.54	504.99
2005	12105	39.61	479.48
2006	12105	35.02	423.92
2007	25779	41.72	1075.50
2008	25336	38.85	984.30
2009	18937	36.69	694.80
2010	16745	33.87	567.15
2011	13428	34.57	464.21
2012	11199	34.22	383.22
2013	17341	35.28	611.79
	Average	36.64	

2.9.9 Resin from Private Forests : With the nationalization of resin trade under “The Resin and Resin Products (Trade) Act, 1981,” the resin from the private ownership is also purchased by the H.P. State Forest Development corporation. This will help a great deal in checking illicit and defective tapping in private ownership and pilferage of resin from Government forests. The owners and their agents engaged for tapping are questioned for unreasonably high yield.

2.9.10 Fire Protection : All needles and other refuse within 1 m of the tree tapped for resin should be removed and individual trees freed from fire risks. It is better if bushes within 2 m of these trees are cut. Areas being tapped for resin are very susceptible to fire and need intensive fire protection. Fire fighting equipments should be provided in all resin depots to meet an emergency.

CHAPTER-X

MEDICINAL PLANTS AND FUNGI

2.10.1 General : Rajgarh Forest Division represent a wide range a wide range of altitudinal and climatic variations. Under such climatic conditions, it is natural to have a wide range of medicinal plants growing from tropical to sub-alpine regions. No work has been done on the survey, distribution, availability, extraction, production and usefulness of medicinal plants found in the division. Detailed studies and investigations are needed to ascertain quantitatively the potentiality of the tract in medicinal plants.

2.10.2 Zonations and medicinal plants: The entire tract can be divided into 3 major Regions on the basis of physiography, geology, altitudes and climate. The medicinal plants growing in such regions are listed broadly in Table 2.10.1.

Table 2.10.1 Regions and medicinal plants.

Regions	Altitudes	Important medicinal plants
1	2	3
Shiwalik Region	450 to 1800 M	Trifla (Harar, Bahra, Amla), Dash Mool (Shalparni, Prishniparni, Chhoti and Bari Ketkari, Goksharu, Bilv, Shyonak, Agnimanth, Gambhari, Padhal), Brahmi, Shankh-pushpi, Chitrak, Basuti, Ashwagandha, Sarpagandha, Kakar Singhi, Marorphali, Shatawar, Kalihari, Barahi Kand, Bidari Kand, Shiv Lingi, Apamarg, Tejpatra, Kamila, Patol, Indrayan, Varun, Arjun, Asan, Erand, Karanj, Ratti (Gunja), Kutaj (Kura), Giloy, Sariw, Palash, Khair, Kikar, Babul, Neem etc.
Middle Region	1800-3000 M	Daru haldi (Kashmal, Rasont), Ban Kakri, Chora, Chirayata, Atis, Vatsanabh (Mohra), Ganj (Singli-mingli), Salam panja, Salam mishri, Ashta varga (Jivak, Rishbhak, Meda, Mahameda, Ridhi, Bridhi, Kakoli, Kahir Kakoli), Mamiri, Karpur Kachari, Pakhan-Bhed, Sugandhvala (Tagar, Nihari), Talish-Patra, Guchhi, Bach, Ghurbach, Kooth, Noorcha (Sainski), Sobh, Pushkar Mool, Bhut Keshi(Mathosal), Muramansi, Van-ajwain and Lodhra etc.
Higher Region	Above 3000 M	Dhup, Karu, Kutki, Atish, Salampanja, Ratnajot, Sata mansi, Revandchini (Chukri, Archa), Mithapatish, Bhootjara, Nesar, Brahm Kamal, Ghugghi Badshah, Jogi Badshah, Talishpatra, Bhojpatra, Hauber (Bithar, Theledu), Masrin etc.

2.10.3 Ethno-botanical study of medicinal plants: In Eighties, the H.P. University of Horticulture and Forestry (Department of Forestry) carried out Ethno-Botanical studies of Trans –Giri Area of Sirmour District by conducting field trips and information collected from the local inhabitants, local drug collectors, shephards and local medical practitioners (Vaid). The important medicinal plants found in the division are listed in Table 2.10.2 based on this study. The list is not exhaustive. Further studies in due course of time may add many more plants to the list. The chemical screening and clinical trials are needed to ascertain the authenticity and efficacy of the claims of the informants.

2.10.4. Past yield : No proper records has been maintained in the divisional office as a result of which data on the past yield of medicinal plants, their extraction, quantity exported and money realized, are not available. Berberis roots have gained immense importance in the recent past on account of its use in medicines. Ghinni Block is the home of Harar and the produce is exported even to foreign countries. Both the products fetch handsome revenue to the locals engaged in their trade.

2.10.5 Management : Due to the ever increasing population pressure and indiscriminate felling of forests, many of the useful plants are being eliminated from the area. Unsystematic extraction of the medicinal plants is likely to reduce the yield and quality of the plants and may even lead to disappearance of the species. No data or information is available for laying down methods of extraction or fixing any rotation for obtaining maximum sustained yield without damage to its multiplication. Research in this direction is needed to be carried out by DFO Silva and University of Horticulture and Forestry. Special efforts have to be made to identify, conserve and preserve the germ plasm of the natural herbal wealth of the region. To increase the production and stop the excessive extraction, the medicinal plants need to be

- i) Extracted on rotation basis and
- ii) propagated artificially.

2.10.6 Rotational extraction : To avoid the excessive extraction and depletion of medicinal plants, it is necessary to give rest to the area atleast for a year or two. It is, therefore, prescribed that after the extraction is over, the area be given rest and plants be extracted on rotational basis of 5 years till the research is carried out and rotation is fixed on the basis of scientific data.

Table 2.10.2 : List of medicinal plants.

Sr. No.	Botanical name of species	Local/Sanskrit/Vernacular name	Distribution (m)	Usefulness	
				Parts used	Diseases/ailment cured
1	2	3	4	5	6
1	<i>Achyranthes bidentata</i>	Apamarga, Berailkanda, Puth kanda	1500-2500	Leaves and roots	Snake bite, skin eruptions.
2	<i>Aconitum heterophyllum</i>	Patish, Atish, Ativisa	3000 and above	Leaves and roots extracts	Malarial fever.
3	<i>Acorus calamus</i>	Bacha, Broach, Bare	1000-3000	Rhizomes	Chest pain due to cold (both for human and cattle) : antihistamine.
4	<i>Adhatoda vasica</i>	Adush, Basuti, Banshti	Upto 1330	Leaves and root extract	Cough, Chronic bronchitis, Asthma
				Leaves applied with butter	To cure the mumps
5	<i>Ajuga parviflora</i>	Nil Kanthi	2500-3000	Leaves powder	Bleeding piles
				Roots	Malarial fever
6	<i>Argemone Mexicana</i>	Satyanashi, Kandiyari, Swaran Kshiri	Upto 1666	Roots	Dryness of skin and chronic skin eruptions.
7	<i>Artemisia vulgaris</i>	Damnak, Chhamer	1200-3000	Leaves paste	Bleeding from the wounds or cuts.
8	<i>Asparagus adscendens</i>	Satjata, Shatavari	2000-2500	Roots	Snake bite, Scorpion sting, anti contraceptive.
9	<i>Bauhinia variegata</i>	Kachnar, Karyali	Upto 1000	Bark powder	Skin disease
10	<i>Berberis aristata</i>	Kashmal, Daruhaldi	Upto 3000	Root extract "Rasaunt"	Eye diseases, malarial fever
				Fruits	Digestion improvement
				Seeds	Piles
11	<i>Betula utilis</i>	Bhoj, Bhooj, Bhojpatra	3000 and above.	Bark	Antiseptic, Blood ear; decoction in Jaundice
12	<i>Boenninghansenia albiflora</i>	Pissumarbuti, Pishoidi	Above 2100	Shoots	Insect repellent especially for fleas.
13	<i>Cannabis sativa</i>	Bhang, Vijaya	1000-3000	Leaves-juice	Honey bee sting, swellings

Sr. No.	Botanical name of species	Local/Sanskrit/Vernacular name	Distribution (m)	Usefulness	
				Parts used	Diseases/ailment cured
1	2	3	4	5	6
14	<i>Cassia occidentalis</i>	Kasoundi, Kashmard	Upto 1300	Seed powder	Constipation.
15	<i>Cedrus deodara</i>	Devdaru, Kailon	About 2000	Cedar Oil	Insect repellent, Fleas killer, Foul ulcers and wounds of the cattle.
16	<i>Centella asiatica</i>	Manduk parni, Brahmi Buti	Upto1500	Plants	Brain tonic, nervous disorders, blood purification.
17	<i>Clematis gouriana</i>	Kaunibel, Tata-Dab	Upto 2000	Root paste	Pimples, antiseptic and healing agents
18	<i>Cynodon dactylon</i>	Dub, Joob, Doorba	Throughout the division	Roots infusion	Bleeding piles.
19	<i>Dioscorea deltoidea</i>	Shingli Mingli, Yam	Upto 2500	Rhizomes	Fish poison, lice killer, hair wash.
20	<i>Emblica officinalis</i>	Aonla, Amla	Upto 1300	Fruits	Tonics, Myrobalans and Ayurvedic medicines.
21	<i>Fagopyrum esculantum</i>	Ogla, Buck-weat	2500-3000	Seeds	Antidairrhoal both for human and cattle.
22	<i>Mentha longifolia</i>	Pudina, Podina	1000-2500	Leaves juice	Vomitting, headache, Cholera, indigestion.
23	<i>Myrica esculenta</i>	Katphal, Kaiphal, Kafal	1000-2100	Bark juice	Fever, Asthma, Cough
24	<i>Origanum vulgare</i>	Sathra, Wild Marjorum,	Above 2000	Plant	Insect repellent.
25	<i>Plantaga lanceolata</i>	Jangli Isabgol, Musal Minai	1000-2500	Leaves paste and juice	Healing of wounds, sores, inflamed skin, earache.
26	<i>Prinsepia utilis</i>	Bhekhla, Bhekhla	1500-2500	Seed oil	Rheumatism,
27	<i>Rhododendron arboreum</i>	Bras, Buras, Kurwak	1333-2500	Flower juice	Dysentery and diarrhoea.
28	<i>R. companulatum</i>	Kashmiri Patcha, K.Potha	Above 3000	Leaves and flowers	Rheumatism, Dysentery Scabies.
29	<i>Ricinus communis</i>	Castor, Erand, Arund	Upto 1500	Crushed leaves	Headache
				Seeds	Antidote in Scorpion sting.
30	<i>Swertia pupurascens</i>	Charata, Napali Chiryata	2500-3000	Leaves extract	Malarial fever.

Sr. No.	Botanical name of species	Local/Sanskrit/Vernacular name	Distribution (m)	Usefulness	
				Parts used	Diseases/ailment cured
1	2	3	4	5	6
31	<i>Terminalia balerica</i>	Bahera	Upto 1300	Fruits	Trifla and various Ayurvedic medicines.
32	<i>T. chebula</i>	Harr, Harar	Upto 1300	Fruits	Trifla and various Ayurvedic medicines and myrobolans.
33	<i>T. tomentosa</i>	Sain, Asan, Rasain	Upto 1300	Bark extract	Internal injuries, fractured bones.
34	<i>Thalictrum foliolosum</i>	Mamiri, Pilijari, Sarpharh	1500-2500	Roots-Dilute water extract and paste	Tonic, eye lotion and boils.
35	<i>Thymus serpyllum</i>	Banjvani, Jangli Ajwain	Above 1600	Floral heads and leaves.	Stomach ache and indigestion
36	<i>Uritica dioica</i>	Bichchhubuti, Bhabar	1000 to 3000	Crushed leaves	Bleeding from wounds.
37	<i>Valeriana jatamansi</i>	Mushkbala, Tagar, Gandhla	Above 2500	Plant juice	Poisonous sting of honey bees and scorpion.
38	<i>Viola canescens</i>	Banaksha, Banafasha	2000-3000	Flowers	Cough, cold, blood purification
39	<i>Vitex negundo</i>	Nirgundi, Shimalu	Upto 1500	Fresh leaves	Wormifuse.
				Dried leaves	Smoked for headache relief.
40	<i>Woodfordia fruticosa</i>	Dhai, Dhataki	Upto 1500	Flowers	Internal body heat and liver disorders in children.
41	<i>Zanthoxylum alatum</i>	Tirmiri, Timbru, Tejbai	Upto 1500	Seeds and bark	Fever, Cholera and tooth ache.

2.10.7 Artificial propagation: Although from the point of view of economic importance and the frequent demand of the medicinal herbs it may appear desirable to cultivate the naturally occurring medicinal plants in suitable localities which, in the course of time, may develop into established farms, but it is not considered feasible due to the following reasons and is, therefore, not prescribed: -

- A. The area where the medicinal plants can be raised artificially are subject to heavy grazing so much so that closure of any area for artificial propagation shall not be practicable.
- B. The cost of extraction and transport will be very high.
- C. There is acute shortage of labour in these remote areas and there is little possibility of arranging enough labour for work.
- D. Past attempts in cultivation of medicinal plants have not yielded encouraging results.
- E. The demands of these medicinal plants are picking up. With the setting up of drug manufacturing industries in the State, artificial propagation of economically important herbs will be more profitable. The following species of medicinal plants are suggested for artificial propagation and territorial staff may use its discretion about the species and area to be planted.

Table 2.10.3 : Medicinal plants for artificial propagation.

Species	Suitable altitude (m)
<i>Artimesia nilagirica</i>	Above 2,200
<i>Atropa belladonna</i>	Above 2,200
<i>Digitalis lanata</i>	Above 1,700
<i>Hyoscyamus niger</i>	Above 2,200
<i>Mentha piperita</i>	800-1,500
<i>Plantago orate</i>	Above 1,700
<i>Podophyllum hexandrum</i>	Above 2,200
<i>Saussurea lappa</i>	Above 2,200

2.10.8 Technique of propagation: The technique of propagation and harvesting of some important plants is described below. Necessary modifications in it may be made by the territorial staff based on experience from time to time.

***Artimesia nilagirica*:** The seeds are minute. The sowing is done in February/march. Seedlings are transplanted in June/July in pits at a spacing of 0.5mX 0.5 m. The crop is harvested when the plants flower in October. The flowers are used in extraction of a drug used as wormicide.

***Atropa belladonna*:** The species is propagated by sowing as well as planting. The nursery beds with light soil should be prepared by the end of October and seed is sown in November. Transplanting can be done in next rains in 0.3 m deep pits at a spacing of 0.5 to 1m. If direct sowing is decided upon, then the soil is worked upto a depth of 15 cm in patches which may be spaced 0.5 m to 1 m apart. Two crops of leaves can be harvested during the

first year and two to four crops in the second year. The roots are collected in the third year. The roots and dried leaves are used in extracting alkaloids hyoscyamine and pyridine.

Digitalis lanata: It is best propagated by transplants. It requires well drained soil. The soil in the nursery is thoroughly worked and the beds are prepared by the end of October. Sowing is done in the nursery beds in November. The seedlings are transplanted in rows 0.7 m apart when they are 5 to 8 cm high. Leaves are harvested during September in the first year and during May, July and September in the second year. Similar collections can be done in the third year also. The seeds are collected in the second and third year. The leaves and buds are used in extraction of glycosides and digitoxin alkaloids.

Hyoscyamus niger : The species can be propagated both by sowing and transplants as in the case of *Atropa belladonna*. The seeds germinate in February and the plants flower in April and fruit in May. The crop is harvested in July. The leaves and flowering tops are used in extraction of several alkaloids especially hyoscyamine and atropine.

Mentha piperita (Peppermint) : Peppermint (*Mentha piperita* Linn.) is a perennial glabrous, strongly scented herb for its essential oil which is used in flavouring, perfumery and Pharmaceutical industries. The crop can be successfully raised under irrigated conditions. The recommendations on the cultivation of this cash crop are based on a number of experiments conducted by the H.P. University of Horticulture and Forestry at University Campus Oachghat (Solan).

Variety : M.Piperita E.C. 41911, an exotic collection is recommended for cultivation for menthol. This strain on an average has 0.47 percent oil content and 80% of menthol. It yields 90-95 kg of oil per hectare in two harvests.

Climate and Soil: Peppermint prefers a temperate climate and sunny situations between the altitudes ranging from 800-1500m. A well distributed rainfall of 1800 to 2250mm and a good sunshine support luxuriant growth of the crop. It can be grown in well drained sandy loam to loamy soils. It requires high contents of humus and the soil should be normal in reaction and free from salts.

Seed Rate and Method of Planting : The plant is propagated by suckers. Freshly dug out suckers at the rate of 4.50 quintals/hectare are planted. Before planting, these are washed and dipped in 0.3% brassicol w.p. solution for 5 minutes. The planting is done in the furrows at a spacing of 45 cm and about 5 cm deep. The suckers about 8 to 10 cm in length are laid end to end and then covered with light planking. Light irrigation after planting is essential to obtain good sprouting.

Time of Planting : Usual planting time extends from mid February to March however, the best time for planting the suckers, under Himachal conditions is second fortnight of February.

Manures and Fertilizers: It responds well to organic manuring, therefore, a basal dressing of FYM or compost at the rate of 25-30 tonnes per hectare should be applied to soil. This may be followed by supplementary dressing of inorganic fertilizers. Significantly higher

herbage and oil yield is obtained, when nitrogen is applied @ 120 kg/ha in three equal splits. One third nitrogen in the form of Calcium Ammonium Nitrate (CAN) and all phosphorus and potash @ 50 kg/ha respectively should be applied at the time of planting. Second dose of N may be given after one month of planting as broadcast and third dose applied immediately after harvest.

Hoeing and Weeding: The success of the crop depends upon the weed control either chemically, mechanically or by manual labour. Terbacil @ 1.5kg/ha as pre-emergence weedicide proved most effective to check the weeds for the first harvest. The weeding at 40 days intervals is more appropriate with regard to herbage and oil yield. The crop should be free from weeds at the time of harvest to obtain good quality of oil.

Harvesting : The stage of harvest affects the herbage and the quality of essential oil. The crop should be harvested 5-6cm above ground level at the initiation of flowering. The first cutting is ready in first week of October, when planted in first fortnight of March.

Diseases : The following diseases have been observed on peppermint:

1. **Stolon rot or stolon decay (*Rhizoctonia bataticola*):** The initial symptoms of the disease are yellowing of leaves, stunted growth of plants. In advanced stages there is wilting of the entire plant followed by death of the above ground portion. Treatment of stolon before planting is with 0.5% Dithane Z-78 or Dithane M-45 and with 0.3% suspension of Brassicol WP 75% for 5 minutes.
2. **Leaf blight (*Alternaria spp*):** The main symptoms of the disease are the appearance of round to oval or slightly irregular dark brown spots on the upper surface of the leaves with concentric zones surrounded by pale yellow margin. Later, these patches coalesce and enlarge occupying the entire leaf which leads to the falling of the leaves. Spraying and copper fungicide is recommended.

Preventive measures :

1. Selection of planting material from disease free area.
2. The infested plants should be uprooted and destroyed.
3. Peppermint crop should not be grown repeatedly in the same field.

Processing : The harvested crop should be kept under shade for drying for some time. This enables the quick distillation, thereby saving the time and fuel. It is then subjected to simple steam distillation. In case of small individual holdings, it is advisable to distill on cooperative basis, which is more profitable.

Plantago orate: The species is propagated by transplanting. The seed is sown in drills 15 cm apart in the nursery beds during the month of April. The seedlings pricked out and replanted 25 cm apart in lines during July. The flowers appear in June and seeds are produced

from July to August when they are collected. They are used in the preparation of various drugs.

***Podophyllum hexandrum* (Bankakri):** The usual method is to plant rhizomes in 15 cm deep pits, 1m apart. In the zone of its natural occurrence the seeds germinate in about 3 years but if sowing is done in bores at low altitudes (nearly 500m), it can germinate in six months. Then the seedlings can be carried to the sub-alpine region and transplanted. The rhizomes of fully developed plants are collected. There is no information available about the optimum age of plants when the rhizomes should be collected.

***Saussurea lappa* (Kuth) :** The species is easily propagated by seed, transplants or root cuttings. Root cuttings 2.5 cm to 4.0 cm long should be planted in 0.3 m deep pits at a distance of 1m X 1m. Planting can be done before snowfall or in early spring. Sowings are done in October/November. The seed starts germinating when the snow melts in spring. The plants when 4 years old are transplanted in 0.3 m deep pits at 0.5 x 0.5 m spacing. The leaves should be nipped before transplanting. Direct sowing may be done in patches which are worked 15 cm deep and are spaced 0.3 m apart. In the 4th or 5th year the roots should be dug, washed and dried. Each plant produces several tubers. One tuber may be left behind for reproduction. Digging of roots should be done in late August or in early September.

2.10.9 Fungi : The Trans-Giri area especially temperate and sub-alpine zones of Habbani and Rajgarh ranges have a variety of both edible and non-edible Fungi. The non edible fungi have complex organic chemical compounds of great medicinal value. Common fungi found in the region are listed in Table 2.10.4. From economic point of view Morels and Dhingri are important fungi, which are collected, dried and exported. The present market rate of Guchhi is over Rs. 2000 per kg.

2.10.10 Morels (Guchhi): the common morel species of the tract are ;

1. Common Morel (*Morchella deliciosa*)
2. Half free Morel (*M. semilibere*)
3. Black Morel (*M. conica*)

Guchhies are delicacies, delicious in taste and have considerable food and economic values. The common morel is exploited maximum which grows in deodar zone. Black morel overlap deodar and spruce forests while half free morel grows in Spruce and Silver fir forests. The Morels grow naturally in forests from April to June depending upon locality factors like altitude, exposure and climate. It prefers moderately dense forests where nutrients from decaying wood is available for its growth. It is an important source of revenue to rural people. Visiting traders collect it from local people at the rate of approx. Rs. 1,500 per kg. The estimated annual production from the area ranges between 1500 to 2000 kg.

2.10.11 Dhingri : It is known as Oyster mushroom (*Pleurotus* spp.) Its production is quite substantive but its collection on commercial scale has not picked up so far. Scope of

collection is there provided market is assured. A thorough survey for the proper use and development of fungi is required to make full utilization of the available potential of the area.

2.10.12 Management : To get the maximum sustained yield, the prescribed management practices are as under :

- 1) Over exploitation near the villages should be stopped. Minimum number of Guchhies required for seeds should be left in the area. To this effect people have to be educated.
- 2) Some fully matured morels should be crushed on the ground to spread the seeds for propagation.
- 3) Spawn should artificially be developed and the areas be seeded.
- 4) Productive capacity of the soil be studied and the exploitation should be restricted accordingly.
- 5) Local inhabitants should be persuaded to collect the morels uniformly i.e. from far flung area also and not only in the vicinity of habitations. This will reduce the over exploitation.
- 6) Preservation plots should be laid and study should be conducted to ascertain the effect of ban i.e. non collection on the production of Guchhies.

2.10.13 Survey, Study and Research : There is urgent need to survey the entire tract to ascertain the available resource of the division. Study on the propagation, growth and utilization aspects of medicinal plants should be taken by the D.F.O Silva and Forestry departments of the University. Planned research on medicinal plants should be taken covering all aspects from origin to end products for better management and sustained yield in perpetuity. Special attention should be focussed on Harar cultivation, their propagation and plantations and the technique of Berberis exploitation without impairing the site and soil.

Table 2.10.4 List of common Fungi found in Rajgarh Forest Division.

Sub-Division	Class	Order	Family	Botonic Name	English Name	Usefulness
1	2	3	4	5	6	7
Asoomycotina	Discomycetes	Pezizales	Morchellaceae	1. <i>Morchella esculanta</i>	Yellow Morel	Edible
				2. <i>Morchella deliciosa</i>	Common Morel	-do-
				3. <i>Morchella conica</i>	Black Morel	-do-
				4. <i>Morchella semilibere</i>	Half free Morel	-do-
				5. <i>Verpa spp</i>	Wrinkled Themble cap	-do-
			Helvellcoae	1. <i>Gyromitra gigas</i>	Snowbank False Morel	-do-
				2. <i>Helvella crispa</i>	Saddle fungus	-do-
Basidiomycotina	Hymenomycetes	Dacrymy-cetales	Dacrymycetaceae	1. <i>Calocera viscosa</i>	Yellow tuning fork	Not edible
				2. <i>Dacrymyces palmatus</i>	Orange Jelly	Edible
		Tremellates	Tremellaceae	1. <i>Phlogiot'd spp.</i>	Apricot Jelly	-do-
				2. <i>Trenellodendron spp.</i>	Jellied False cord	Edible
		Aphyllaphorales	Cantharellaceae	1. <i>Creterellus spp.</i>	Fragrnat Creterlms	---
			Clavariaceae	1. <i>Clavicorni pyxidata</i>	Crown tipped coral	Edible
				2. <i>Claviclina cristata</i>	Crested coral	-do-
				3. <i>Ramaria stricta</i>	Straight Branch Coral	Not Edible
				4. <i>Ramariopsis spp.</i>	White coral	Edible
		Aphyllaphorales	Coniophoraceae	1. <i>Coniophora spp.</i>	Wet rot	Not edible
				2. <i>Serpula spp.</i>	Dry rot	-do-
			Hymenochaetaceae	1. <i>Hymenochaete spp.</i>	Reddish brown crust	---
			Polyporaceae	1. <i>Albatrellus spp.</i>	Sheep polypore	Not edible
				2. <i>Fomitopsis spp.</i>	Red belted poly pore	-do-
				3. <i>Fomitopsis spp.</i>	Larch Polypore	Not edible

Sub-Division	Class	Order	Family	Botonic Name	English Name	Usefulness
1	2	3	4	5	6	7
				4. <i>Fomer spp.</i>	Tinder polypore	-do-
				5. <i>Ganoderma spp.</i>	Ling chil	-do-
				6. <i>Ganoderma spp.</i>	Hemlock varnish	-do-
				7. <i>Heterobasidron spp.</i>	Conifer-base polypore	Not edible
				8. <i>Inonolus spp.</i>	Warted Oak Polypore	-do-
				9. <i>Piptoporus spp.</i>	Birch Polypore	-do-
				10. <i>Spongiporus spp.</i>	White spongi polypore	-do-
				11. <i>Trametes spp.</i>	Turkey tail	-do-
				12. <i>Trametes pini</i>	Pine polypore	-do-
				13. <i>Polyporus umbellatus</i>	Umbrella polypore	Edible
			Stereaceae	1. <i>Stereum spp.</i>	False Turkey tail	Not Edible
		Agaricales	Agaricaceae	1. <i>Agaricus spp.</i>	Felt ringed agaricus	Poisonous
				2. <i>Lapiota spp.</i>	Parasol	-do-
				3. <i>Lapiota spp</i>	Deadly lepiota	-do-
				4. <i>Lapiota spp</i>	Smooth Lepiota	-do-
			Amanitaceae	1. <i>Amanita spp.</i>	Cleft foot Amanita	-do-
				2. <i>Amanita spp.</i>	Powder Cap Amanita	-do-
				3. <i>Amanita spp.</i>	Death cap	-do-
			Bolbitiaceae	1. <i>Agrocybe spp.</i>	Maple Agrocybe	Edible
				2. <i>Boletus spp.</i>	King Bolete	-do-
				3. <i>Gyroporus Spp.</i>	Chestnut bolete	-do-
				4. <i>Tylophitus spp.</i>	Lilac Brown Bolete	-do-
			Coprinaceae	1. <i>Corpinus spp.</i>	Alcohol Inky	Edible
				2. <i>Coprinus comatus</i>	Shaggy mane	-do-
				3. <i>Psathyrella</i>	Clustered psathyrella	Not edible

Sub-Division	Class	Order	Family	Botonic Name	English Name	Usefulness
1	2	3	4	5	6	7
				<i>hydrophile</i>		
			Gomphidiaceae	1. <i>Gomphidius spp.</i>	Slimy Gomphidus	Not edible
			Hydrophoraceae	1. <i>Hygrophorus spp.</i>	Scarlet Waxy cap	---
			Plutaeaceae	1. <i>Volvariella spp.</i>	Smooth volvariella	---
				2. <i>Pleurotus spp.</i>	Oyster mushroom (Dhingri)	Edible
			Russulaceae	1. <i>Russuea emetic</i>	Emetic Russula	Poisonous
			Strophariaceae	1. <i>Stropharia spp.</i>	Wine cap strophoria	Edible
			Tricholomataceae	1. <i>Clitocybe spp.</i>	Wood elitocybe	---
				2. <i>Catathelasma spp.</i>	Swollen stalked cat	Edible
				3. <i>Collybia spp.</i>	Family collybia	-do-
				4. <i>Collybia dryophilla</i>	Oak loving collybia	-do-
				5. <i>Hypsizygus spp.</i>	Elmoyster	-do-
				6. <i>Mycena spp.</i>	Orange mycena or Walnut mycena	---
	Gastromycetes	Hymenogastralles	Lycoperdaceae	1. <i>Calvatia spp.</i>	Giant puffbals	---
				2. <i>Scleroderma spp.</i>	Pigskin puffballs	---

CHAPTER-XI

PROTECTION AND MANAGEMENT OF WILD LIFE

2.11.1 General : Wild life is an inseparable part of Forest eco-system. Their preservation and protection has gained prime importance on National and International level. High lighting the necessity of their conservation has become a part of Govt. policy. Study of wild life and collection of data is the need of the day for the better understanding and management of wild life.

2.11.2 Distribution: The distribution of wild life has been described in detail in Chapter II of Part I of the Plan.

2.11.3 Objects of Management: The objects of management are :

- 1) To identify problems of wildlife management in the division and to formulate guidelines for its development consistent with the requirements of forestry and environment.
- 2) To ensure collection of scientific data for maintenance and development of viable population of fauna for scientific, aesthetic, cultural, ecological and economic purposes.
- 3) To regulate game hunting.

2.11.4. Management and Organization : A separate Wild life wing has been created in the Department of Forest Farming and Conservation, Shimla for effective and better management of Wild life. Rajgarh Forest Division falls under the jurisdiction of DCF Wild Life Division, Shimla. The staff to the level of village and forests are meagre. As a result the management is not effective. Similarly the Fisheries Department of H.P. is looking after and regulating the fish trade but the control and management is ineffective for want of more staff.

2.11.5 Acts and Rules: The Wild life (Protection) Act, 1972 (53 of 1972) promulgated by the Indian Government came into force in Himachal Pradesh on 2.4.1973 vide Notification No. G.S.R 190 (E), dated 2-4-1973, Gazette of India, Extraordinary, Part II, section 3 (i), page 517. H.P. Wild Life (Protection) Rule, 1975 providing shooting and Hunting Rules have been framed and applied to all the Reserved and Demarcated Forests in the State, vide Notification No. 6-9/73-SF dated 24-2-1975 under. "The Wild Life (Protection) Act, 1972 of India." More vigilance, effective and strict enforcement of these hunting rules is, however, called for as the wild life staff are inadequate and ineffective in their duties.

2.11.6 Wild life problems: In the past, tract was rich in the fauna. The position has gradually deteriorated inspite of strict rules provided to control illegal hunting or poaching. In the absence of adequate wild life protection staff and complete neglect and at times even indulgence of local staff in illegal hunting has further made the conditions worst for the survival of wild life. In order to preserve and propagate the wild life of the tract, the area around Chhotali has been declared as Wild Life Sanctuary and an area of 947.18 ha

comprising the Forest. Comptts. Cla, b,c,d,e,f,g,h, i ; C 2a b,c,d,e,f, and C 3a, b of RF 30 Chhogtali has been transferred from Rajgarh Forest Division to Wild Life Division.

2.11.7 Wild Life Sanctuary “Churdhar”: Rajgarh Forest Division is a major link between the wild flora and fauna of lower region adjoining Siwaliks and higher hills adjoining Shimla District. The vegetation varies from tropical to temperate and sub alpine zone, which provides habitat for a variety of birds and animals. On account of the richness and diversity of flora and fauna, geomorphologic, natural and zoological point of view by the Himachal Pradesh Government. This resulted in the creation of “Chur Dhār ” sanctuary vide H.P. Govt. Notification No 6-24/73-SF dated 18.11.85 (AppendXII)for the purpose of protecting, propagating or developing wild life or its environment. The details of the sanctuary is given below : -

Area	Districts covered	Situation and Boundaries	
5615.92 ha	Sirmour and Shimla	North :	Baidhar
		East :	Uncchan Dhar-Kakaralani Dhar
		South :	Khur Dhar till it meets the Nohra-Haripurdhār Road near village Choras and then along Haripur Dhar Rajgarh Road up to Chhog village.
		West :	Chhog village all aong the Dhar forming catchment of Marka-Ka-Khala-Dhar till it meets the Bai Dhar near Bhaila village.

An area of 4,424.57 ha of sanctuary falls in Rajgarh and Renuka divisions and 1191.35 ha in Chopal Forest Division. This is an ideal sanctuary to study temperate flora and fauna which lies nearest to the plains and is conveniently approachable from U.P., Haryana, Punjab and different part of H.P. This sanctuary is known for animals like **Musk Deer, Leopard, Black Bear, Martens, Barking Deer, Gorals** and birds like **Monal, Kaklas, Kaleej, Chakor, Partidges** etc.

2.11.8 Game licences and fees : The licences of various types issued to various categories of persons alongwith the fees charged are given in Table 2.11.1. An additional fee of Rs. 1 and Rs. 2 per licence tag is charged from Indian Nationals and Foreigners respectively.

Table 2.11.2: Game licences and fees

Name of licence	Category of persons	Fee per licence
A. Special game hunting licence	1. Indian Nationals	Rs. 50/- per week
	2. Foreigners	Rs. 100/- per week.
B. Big game hunting licence.	1. Indian Nationals	Rs. 30/- per week
	2. Foreigners	Rs. 60/- per week.
3. Small game licence	1. Indian Nationals	Rs. 15/- per week
	2. Foreigners	Rs. 30/- per week.

Due to completed bane on hunting and shooting rate has not revised in the state so far. However following rate for film shooting has been

approved by the Govt of Himachal Pradesh (Append.XII) to do the shooting in the forest area of Himachal Pradesh as per detail given below:-

Name of Film	Category of Agency	Rate
i) Feature film	Any agency	5000/-Per day
ii) Documentary film	Any agency	3000/- Per day
iii) Feature film	Any agency	25,000/-Weekly
iv) Documentary film	Any agency	15,000/-Weekly

2.11.09 Protected species : The species protected as per Wild Life Protection Act, 1972 (53 of 1972) schedule I and II are as under. This should invariably be enforced.

Table 2.11.2: List of Protected species

Schedule	Part	English Name	Zoological Name
I	I	1. Leopard cat	<i>Felis bengalensis</i>
		2. Marbled cat	<i>Felis marmorate</i>
		3. Musk deer	<i>Moschus moschiferus</i>
		4. Ovis ammon	<i>Ovis ammon hodgsoni</i>
		5. Snow Leopard	<i>Panthera uncial</i>
		6. Urial	<i>Ovis viegnei</i>
	II	1. Cheel pheasant	<i>Catreus willichii</i>
		2. Mountain quail	<i>Ophrysia superciliosa</i>
		3. Peo fowl	<i>Pavo cristantus</i>
		4. Sclater's monal	<i>Lophophorus sclater</i>
		5. Trag pheasant	<i>Tragopan melanocephalus</i>
II		1. Leopard or Panther	<i>Panthera pardus</i>

2.11.10 Preservation and Protection of Wild Life : Several modes of catching game are practised by nets, poisoning, dynamiting, and nooses being freely used as well as the less destructive hawks and most destructive “muzzle loaded” guns commonly used by the local people under the garb of “Plant Protection Licences”. Wholesale driving is also resorted to in winter when snow is on the ground. By these and other devices, the number of the more valuable game animals, game birds and fish have been considerable diminished. To preserve the existing wild life as also to facilitate their growth and multiplication, poaching need to be totally eliminated. In addition, the following measures should be adopted for the preservation and protection of wild life.

- An adequate wild life staff should be posted particularly in winter to check poaching when the animals and birds migrate to lower elevations.
- Genuine demands for crop protection while met, must eliminate the “bogus” crop protector who enjoy free shikar at the expense of the State. For this a detailed list of the holders of crop protection licences should invariably be supplied by Dy.

Commissioner to the concerned D.F.O. The size of the barrel of these guns should not exceed 45 cm.

- (c) Intensive publicity, explaining the local people the importance of preserving wild life, should be carried out and the local people be made to respect the game laws.
- (d) A list of habitual poachers should be maintained so that close watch is kept on their activities. Who do not stop poaching; their gum licences should be cancelled once for all.
- (e) Provision for rewards to informers and subordinates engaged on Wild Life Protection should be made to encourage them to take due interest in this work.
- (f) The prohibition to sue dynamites and poison and regulating the size of meshes of nets should strictly be observed, and the defaulter be severely dealt with.
- (g) Elimination or control of grazing to provide enough food for the wild life to live on and prevent the spread of disease in the areas through grazing animals.
- (h) Predators should be kept under control to maintain natural balances.
- (i) Periodic inoculation of domestic animals of the surrounding area should be done to prevent cattle borne diseases being carried to wild life.
- (j) Protection from forest fires should be ensured by creating fire lines, construction of fire watch towers at strategic places and posting of fire watchers during fire season. Field posts should be connected with the Central Office with wireless set to provide immediate help for combating the fire in the area.
- (k) The included cultivation should be alienated by erecting barbed wire fence so as to minimise the disturbance to the wild life. The isolated included cultivations should as far as possible be acquired or exchanged from other areas to make the forests compact.
- (l) Wild life barriers should be established at important points on the motor road so as to apprehend the offenders.
- (m) Some hollow and dry trees may, however, be left at places to provide shelter for the birds.
- (n) Shrubs producing food for wild animals and birds should not be indiscriminately cut but should encouraged at places to provide food for the wild life. The bushes and plants which bear foliage when the majority of forest species are leafless, deserve special attention.
- (o) Most of the wild life found in our forests depend upon broadleaved species for their food. Adequate broadleaved species such as Walnut, Horse Chestnut, Maple, Bird Cherry etc. should be maintained.
- (p) In water scarcity area especially in summers, adequate arrangements for water may be provided through water retention dams, farm ponds, etc.
- (q) A narrow strip of trees should be preserved along the streams to provide shelter to wild life and shade to fish.
- (r) Commercial felling of green trees should completely be stopped in sanctuary areas.
- (s) Suitable agricultural crops may be sown to supplement forest food supplies in scarcity areas in the sanctuary.
- (t) Salt licks should be provided at suitable places in the sanctuary.
- (u) Dry mounds should be provided in the sanctuary as dusting place for birds.
- (v) Any staff member indulging into poaching should be punished severely.

2.11.11 : Management of Wild Life : The wild life management of scientific lines is based on the biological characteristics of a species. Economic, political, social, humanitarian and sentimental considerations are equally important. Wild life management must take into account all the considerations. The primary requirements of animal life are food, shelter and satiation of instinctive needs which should be met with. Animals and birds are selective in their food habits. Unless they found suitable conditions for themselves, they will not stay in unfavourable areas. Favourable conditions need to be created. Unwise and uncontrolled destruction of snakes should be stopped forthwith as it results in many fold increase in the rat population and the resulting damage to the crops. Wild life abounds the forests. The forests in turn are benefitted by Wild Life. Birds keep down the insect population in the forests and thereby increase hygienic conditions for the forest trees. Birds and animals help in pollination of flowers and dispersal of seed. Management of wild life entails preservation and control of individual species that abound a particular locality.

2.11.12 Study and Data Collection :

Biology of Wild Life : Biological study of wild life is essential so as to acquaint with the problems of wild life and its scientific management. The factors affecting the population in animal life depend upon the interaction of two important forces i.e. **breeding potential** and **environmental resistance**. For proper wild life management, it is essential to study the breeding habits, population density, life span, feeding habits, cruising radius and tolerance to environment.

Ecology of wild life : Animal ecology is the study of animals in relation to their environment. Its study involving the knowledge of inter dependence of plants and animals, population fluctuations, food chains, propagation and succession, is very necessary for proper management of Wild Life. No information is available on this aspect for this tract. This type of study on wild life ecology is needed for the tract as will be of immense help in planning proper management of wild life in the division.

Survey and data collection : To identify the various parameters to base future management, the survey and data collection on following lines are prescribed to be carried out by the Wild Life Division.

- (i) **Musk Deer** : The census on musk deer and their feeding behaviour should be studied and information collected. The information will help to evolve steps for their protection and multiplication.
- (ii) **Panthers** : The existing number of each predator species alongwith their prey population should be assessed. Damage cases of pet animals should be listed. Prey-Predator ratios of these animals should be assessed periodically. All the necessary steps should be taken to keep this ratio to the optimum level.
- (iii) **Migration** : Most of the animals and birds move to lower elevations in winter. Seasonal migrations and movement of such animals and birds should be studied and record maintained.
- (iv) **Breeding** : Breeding season of animals and birds should be studied. Hatching period of pheasants should be observed and record maintained.

2.11.13 : **Scientific study and research** : Studies and research on population and game management are the recent trends in wild life management. Population has to be studies on the basis of the peculiar habits of animals and the birds and the extent of habitat available for the particular animal/bird. Habitat should be studied first. Sampling techniques should be devised habitat wise to assess the population. For pheasants particular time of calling, season of the year and sex ratios should be studies. The data may then be computed to ascertain the population in the available habitat of pheasants. Similarly, the animal population can also be computed by scientific study of their habitats. The study on the occurrence of diseases in Wild animals and birds population should also be made. This will help in planning the future management of the wild life.

CHAPTER-XII

MISCELLANEOUS REGULATIONS

2.12.1 Petty Fellings : Petty fellings may be defined as fellings, the produce of which does not exceed Rs. 2,500 in value and that can be sanctioned by the Divisional Forest Officer as per provisions of the Settlement and in accordance with the Government orders. The petty fellings of following nature may be carried out in the forests of this division.

- (i) Trees required to meet the demand of right holders.
- (ii) Dry trees occurring here and there.
- (iii) Dry or green trees required for ordinary small departmental works like construction of bridges, manufacture of charcoal etc. or to be given to other Government Department.
- (iv) Green trees required for special tests at F.R.I or elsewhere or for the study of growth and statistical data by the working plan officer, D.F.O Silva and other research organizations etc.
- (v) Dry or green trees required to meet special free grants i.e. for the construction of houses destroyed by the natural calamities, repair and maintenance of religious and public utility places like temples, schools, sarais etc.
- (vi) Dry or green trees for the construction of huts, their repairs, ropeway spans and other petty needs of contractors, persons and labourers employed on departmental works and residing in the forests.
- (vii) Tree coming in the alignments of new roads, bridle paths, widening of existing roads, erection of electrical transmission lines, water channels and other works of public utility.

All such fellings shall be shown in the C.H. Files and control forms and shall count against the prescribed yield. Divisional Forest Officer shall, however, exercise strict control over such fellings so that excessive fellings are not carried out under the garb of petty fellings.

2.12.2 Deviations : Any excess or deficit fellings not prescribed in the working plan will constitute a deviation. These may be of following nature.

- (i) Extensive fellings of wind fallen and dry trees killed by fires, fungi and insect attacks or other causes.
- (ii) Fellings of unusual size and extent for special departmental works or removals along main electric lines or road alignments etc.
- (iii) Special fellings to meet a sudden new demand of a particular or local Wood Based Industries or for defence purposes.
- (iv) Stopping or curtailing clear fellings for plantations because of shortage of labour, funds or material for the plantation works.

Applications for sanction of deviations which can be foreseen, must invariably be submitted sufficiently in advance through the territorial Conservator, so that sanction may be received before the deviation occurs. For unforeseen deviations, sanction should be applied for as soon as it is known without fail, before the annual list of deviations is submitted alongwith the control forms. No distinction shall be made between controlled and uncontrolled classes. All fellings for whatsoever purpose made shall be properly accounted for in the control forms. Deviations for one year, for a period of five years and for the entire period of the plan shall not be more than 10% of the prescribed yield. A close watch shall be kept on the pace of regeneration and felling shall be continued only if regeneration in areas felled is upto the mark. In case of fires, the allotment may have to be changed. If any fire burnt area is considered fit for regeneration fellings, corresponding areas already allotted to P.B.I must be taken out and allotted to other P.Bs. with approval of CCF.

2.12.3 Timber distribution (T.D) : The T.D is granted at nominal rates to the right holders. No proper record is available/maintained at divisional or range or block level per right holder wise. The state has recently notified H.P. Forest (Timber Distribution to Right Holders) Rules, 2010 vide Notification No. FFE-B-E-(3)-43/2006 (vol. I) dated 13-10-2009 for the rationalization of grant of timber. The Facts and Figures thereof are given in Para 1.1.15 of Chapter I.

2.12.4 Roads, Paths and Bridges : The construction of a network of roads has already been in progress by the PWD in the division. These will suitably open the forests. Further construction of roads will affect the forests adversely. A number of bridle and inspection paths covering the important forests and connecting the inspection huts, Forest Guard Huts and Rest Houses have been constructed in the past. However, these are not in good shape and need immediate repair and maintenance. The Deedag-Bathaudhar bridle path is an important link between the East and West part of the Rajgarh Range. It connects almost all the important forests of the Rajgarh and Bathaudhar Blocks. This is in unserviceable condition. It is, therefore, prescribed that all the exist bridle and inspection paths alongwith this one should be maintained and all the bridges coming in the way and destroyed in the past be repaired or reconstructed to facilitate the inspection and also other forest works.

In addition, all the P.B.I and other regeneration/Plantation areas should be provided with 1 m wide regeneration path along contour for proper inspection and execution of regeneration operations. A list of existing roads and bridle paths is given in Appendix-VIII. Their maintenance is essential. The jeepable roads should be repaired annually and bridle paths in alternate years, except in the case of abnormal damage, which should be rectified without delay.

2.12.5 Buildings : The list of existing buildings has been given in Appendix –VII. Most the buildings (except the new constructions) are poorly maintained and some are in dilapidated conditions. All such buildings need repair and maintenance regularly. The DFO Office and residence at Rajgarh is quite spacious. Some additions and alteration may be made in these buildings alongwith the periodic repairs to meet the store, staff and present requirements. There is a double storied building just in front of DFO office which is vacant. This is quite big and spacious building. Special attention should be paid to modify this

building after alteration which may be used as residences for two families. The stores and other material dumped in it may be distributed to concerned ranges.

2.12.6 At proper Rajgarh, the department has adequate buildings. No new buildings are required to be constructed.

2.12.7 The following new buildings are prescribed to be constructed during the plan period in the interest of better inspection, management and protection of forests :

Table 2.12.2 New buildings proposed.

Range	Type of Buildings	No.	Location
Rajgarh	Forest Guard Hut	4	1. Sawana
			2. Thor
			3. Dimber
			4. Bathaudhar
Habban	Forest Guard	3	1. Shargaon
			2. Chail
			3. Palu

2.12.9 Water supply: Water supply is deficient at Divisional Headquarters Rajgarh. This should be ensured by constructing a spacious overhead tank which may supply water to office and Forest colony apart from Rest House. Similarly the water supply need to be strengthened at all the Range Headquarters and Rest Houses/Inspection huts. Some of buildings under this division have no water supply. This should be provided at the earliest. All the buildings should be provided with required sanitary fittings. While selecting the sites for new buildings and nurseries particularly of permanent nature, availability of sufficient clean water should be given top priority.

2.12.10 Fire Protection : All the Rest Houses/Inspection huts, Divisional and Ranges Offices should be provided with latest fire fighting equipments and the staff should be given demonstration and training for their use..

The tract has a network of roads which serve as fire lines. Also there are adequate fire lines provided in the division but are not maintained for the last over one decade. As a result their traces are not noticed in some cases. The list of fire lines are provided in Appendix-VI. All such fire lines alongwith the roads and paths passing through chil forests should be maintained regularly and properly to serve as fire lines against forest fires. The Thandidhar

and Bakhog blocks of Habban Range have not adequate road systems. Also the area is lacking in fire lines. The following new fire lines are to be provided in these areas.

1. Kufar Dhar to Kuftu Dhar : 1600 m
2. Jajyon Dhar (Kuftu-Kalab) : 2500 m
3. Sharogut-Pabech Dhar : 2200 m
4. Sharogtu Kalab Dhar : 1700 m

The detailed fire protection measures have already been described in respective working circles. Biological measures of the fire protection should be adopted by creating the mixtures of broadleaved species with chil. The continuity of compartments should be broken by bringing over green vegetation especially in Chil Zones. In new plantations a green belt of mixed broadleaved species at suitable intervals can be maintained. Besides this the recommendation of Khosla Committee constituted by the Govt. of India regarding fire control in forest areas will be followed/adopted during the fire season.(Annexed as Appendix-XVII).

2.12.11 Drought mortality: as soon as abnormal drought is noticed, report for affected compartments should be collected and verified by the Range Officer and Gazetted officers. Marking programmes for the utilization of such trees should be drawn up in time. The trees expected to survive should not be marked. The records should be maintained in the C.H. Files showing the marked trees: species and diameter class-wise and the area affected should be marked on 1:15000 scale maps. The affected portions should be coloured. Patches of 4 ha and above should be depicted on the map as per following legends:

Drought Intensity (%)	Colour to be used
Upto 10	Light Yellow
10-25	Deep Yellow
25-50	Orange
50-75	Light vermillion
Over 75	Deep Crimson

The drought percentage is calculated on the basis of number of trees affected by drought to the total trees in the compartment of part compartment. These figures should be ascertained from the marking records and enumeration figures. On the coloured portion of the map total number of trees per ha and total number trees per ha killed by drought should be superimposed in the form of a fraction (e.g. 30/5 indicating total trees 30 per ha and drought affected trees 5 per ha). The names of the principal species affected by drought, in order of drought susceptibility should also be shown on the map and the information should be entered in the C.H. Files.

2.12.12 Maintenance of Boundaries : All the reserved, protected, unclassed and mushterqua forests are demarcated forests delineated on the ground as well as on maps and provided with

boundary pillars. The Shamlat/Ceilingland forests have no boundary pillars for want of their demarcations. During inspection, it was found that most of the boundary pillars along the private lands, habitations, orchards and encroachments are missing. In other cases quite a sufficient numbers are broken or in dilapidated conditions. It is therefore necessary and prescribed that the boundary lines of all such forests are checked, pillars repaired or reconstructed. The boundary pillars are without numbers. It is prescribed that all the boundary pillars are numbered serially by engraving on stones or written by paints. The compartment/sub-compartment boundaries have been clearly shown on the stock maps. Wherever necessary, small pillars should be constructed to delineate/demarcate the altered compartments/sub compartments. Sign boards indicating the names of the compartments/sub compartments should be put properly as soon as possible. In Habban Range, some of the sign board of the compartments are misplaced. Necessary rectification should be made by fixing them at proper place. Efforts should be made to replace the dry stone pillars by cemented pillars.

2.12.13 Periodic check of Boundaries : The forest boundaries are to be checked at regular intervals of 5 years for proper maintenance and repairs.

2.12.14 Boundary Registers : The boundary register do exist in the divisional office but it is neither complete nor correctly maintained. It is prescribed that all categories of forest should properly be demarcated and proper boundary register should be maintained showing the distance between consecutive pillars. Forward and backward bearings to the succeeding and preceding pillars should invariably be measured and recorded.

2.12.15 Survey and Maps : All the forests except the Shamlat and Ceilinglands recently transferred to the department, have been surveyed by the Survey of India and shown on 1:15000 toposheets. The survey sheet maps are available in plenty in the offices of DFO, CF Nahan and CCF (HP). Two sets of stock maps containing 11 Survey sheets of 1:15000 scale covering the entire division have been placed at the disposal of DFO for the use and reference. One set each is provided to concerned ranges. The Shamlat and Ceiling land Forests need to be surveyed and demarcated and brought on the Toposheets during the plan period. Consolidated management and stock maps on 1:50000 scale showing all the reserved, protected, unclassified and mushterqua forests with compartment wise stockings and their respective working circles have been prepared on tracing cloth and printed copies have been supplied to CF Working Plan and direction office Shimla. Additional copies have also been prepared and provided to Divisional and Range offices. The Shamlat/Ceilingland forests could not be shown in management maps for want of their survey and demarcation on the ground as well as on Toposheets. Each Block Officer and Forest Guard should be provided with a block and beat map on 1:15000 scale showing name and boundaries of the forests, position of boundary pillars, included cultivations, inspection, contour and bridle paths and buildings etc. These should be kept updated and checked by the DFO during field inspections.

2.12.16 Revenue maps and demarcation records : These documents prepared at the time of demarcation of forests shall be maintained by the Patwari of the Division Mauza/Tika/Patti and forest-wise. In case of dispute of boundary of any forest, the revenue record shall be

considered as final. A Van Sarkar register should also be prepared and maintained by the Patwari for the whole division. The Shamlat and ceilingland forests should be categorised as forest and non forest lands and proper records maintained as per jamabandi entries in the Van Sarkar register to establish the possession of land and control over the trees only.

2.12.17 Nautors included cultivation and encroachments : Nautors have been granted in various forests freely and indiscriminately. The ex-Jagir forests now forming the U.Fs in Narag and Sarahan ranges are examples where nautors have honey combed the forests with hutments and agricultural fields. Well wooded and even steep slopes have not been spared in some cases. Opinion of the Forest Department was not obtained before sanction of such Nautors in many cases particularly in case of grants to landless and other Antyodaya families. In future nautor should not be granted in wooded areas and steeper slopes. There should be a close co-ordination between the Forest and Revenue staff at all levels and no nautor should normally be granted without consulting the Forest Department. Nautors being given are not in consonance with the Forest Conservation Act, 1980. Due to Nautors, some chaks (included cultivations) have been created in the forests. Efforts should be made to eliminate the chaks by paying compensations or to exchange them with other areas preferably devoid of tree growth and situated on the outer skirts of forests.

Encroachments are common throughout the division. All categories of forests are affected with this menace. Boundary pillars have been displaced and the forests have been converted into orchards and agricultural fields. Even reserved forests have not been spared. The encroachments detected during the stock mapping and inspections have been mentioned in compartment descriptions individually. It is necessary to detect and check encroachments. The affected areas need to be demarcated and encroachments ejected. At the time of checking of boundaries, encroachments should be detected and penal action taken against the encroachers. As per remarks given in C.H. Files by the WPO and AWPO in respect of encroachments, the legal action should be initiated and forest lands should be liberated from unauthorized possession.

2.12.18 Research plots/Preserved trees/seed trees :

- (i) DFO Silva and Forestry University Nauni should lay out some sample, research and preservation plots in various forest types for growth and ecological studies. Local volume tables for important species should also be prepared. Thinning studies in conifers should also be conducted by laying out the plots.
- (ii) It is of utmost importance that seed for artificial regeneration is collected from genetically superior trees. All such trees should be marked with white paints and protected. A list of such trees of various species should be maintained in a separate register in the Range Office. Such plots will be excluded from all working plan operations.
- (iii) Trees of extra ordinary dimensions and monumental trees of various species shall be selected, preserved and proper record thereof shall be maintained on standard F.R.O Forms.

- (iv) Temple groves are to be preserved in settlements. Only dead, dry and uprooted trees may be removed from temple groves. Record of all the temple groves shall be prepared and maintained both at the Range and Divisional level.

2.12.19 Meteorological Data : Data on precipitation, temperature etc are meagre in the division. It is suggested that rain and snow gauges, maximum and minimum thermometer and hygrometers should be installed at all the Range Headquarters and some other suitable places like Thandidhar, Dhangiar, Mangarh, Bathan and Khairi or at Rest Houses and Inspection huts where readings can be taken without interruptions throughout the year, so that a reliable data is available about snow, rain, temperature. Some incentives may also be provided to the official taking readings. The data should be compiled in the divisional office every month and properly evaluated.

2.12.20 Miscellaneous :

- (i) Extraction of gum from **Lannea grandis** may be encouraged and continued, as was being done in the past.
- (ii) Cultivation of medicinal plants should be encouraged and undertaken in suitable sites. Planting technology of Harar be standardised.
- (iii) Collection of minor forest produce like medicinal herbs, plants, Harar, Guchhies etc should be continued as per prevalent practice without impairing the ecological and environment of the tract.

CHAPTER-XIII

ESTABLISHMENT AND LABOUR

2.13.1 Establishment : The staff position as it stood on 31-3-2011 is given in Table 1.6.1 in Chapter VI of Part I of this plan. Executive and ministerial staff are sufficient as per sanctioned strength except the deficit of one clerk in ministerial staff which should be provided. Some of the existing blocks and beats are extensive and unmanageable. As a result the effective protection of forests, control and management of various operations are not possible.

2.13.2 Re-organization: The total area of Rajgarh Forest Division is 25986.72 ha out of which area of Habban Range is 9098.28 Ha and which is almost double of area allotted to other ranges of this division. This range is very sensitive range and main crop of trees is Deodar and Kail. Maximum illicit felling cases involves in this range. Due to sensitive range this Range needs some bifurcation and creation of new beats for effective control and management. The following changes are suggested in this respect.

Table 2.13.1 Reorganization of Blocks/Beats.

Bakhog Block		Thandidhar Block		Habban Block	Proposed Block and Beat	
					Habban Block	Shargaon Block
Present Beats	Proposed Beats	Present Beats	Proposed Beats	Present Beats	Present Beats	Proposed Beats
Ghotari	Ghotari	Pab	Pab	Shargaon	Shivapur	Shargaon
Bakhog	Bakhog	Khaniur	Khaniur	Chail	Palu	Chail
Tharu	Deothi	Thandidhar	Thandidhar	Ranaghat	Dol	Ranaghat
	Tharu	Sarwa	Sarwa	Shivapur	Thaina	
		Dhamla	Dhamla	Dol	Basotri	

2.13.3 Field staff : Most the Forest Guards and Dy. Rangers holding the charge of beats and blocks are untrained raw hands. Just after selection they were posted as beat guards/block officers. They have no basic knowledge of forestry and allied subjects. They are no more than literate labourers. They are not in a position to manage and protect their beats and blocks for want of proper training and education. It is, therefore, prescribed that only trained guards/Dy. Rangers be posted in beats and blocks. All the untrained filed staff should be sent to training without further delay.

2.13.5 Labour : The position of labour supply in general is satisfactory except skilled labourers for specialized jobs. Which are being arranged/imported by the H.P. State Forest Development corporation Ltd. Due to transfer of timber exploitation and resin extraction works to them some shortage of labour is, however, felt during harvesting of fruits, vegetables and agricultural crops but it does not have much adverse impact on forestry operations.

CHAPTER-XIV

CONTROL AND RECORDS

2.14.1 System of control : The system of control and maintenance of records as adopted in the State, Shall be followed. Control is an integral part of the plan and record of all operations has to be maintained properly. To ensure the proper carrying out of prescriptions of the plan, the following records shall be maintained.

2.14.2 Compartment History Files : The maintenance of C.H. Files both at divisional and range levels are quite unsatisfactory. All the forms A to C are almost blank and in some cases haphazardly filled. Inspection notes are lacking in old C.H. Files. Most of the C.H. Files are not in duplicate. Either divisional or range copy is missing. Their upkeep and storage in the range and divisional offices have been neglected more often than not. The C.H. Files have been prepared in duplicate for all the reserved, protected, un-classed, mushterqua and Shamlat/ceilingland forest afresh. Stock maps on 1:15000 scale have been prepared on tracing cloth and pasted in C.H. Files. The new descriptions, enumeration results, allotments, prescriptions, tracing of maps, regeneration surveys etc have all been filed in divisional as well as the range copies of C.H. Files. Old C.H. Files have also been filed alongwith the new ones after weeding out unwanted pages, for reference and record. It is prescribed that all the C.H. Files will be properly maintained and posted uptodate in April every year. Important notes on silvicultural operations, markings, progress of regeneration and other cultural and subsidiary operations will be recorded in these files by the inspecting officers from time to time. During field tours and also at the office inspection, the Divisional Forest Officer will ensure that compartment history files are properly maintained and kept uptodate. The divisional Forest Officer is required to submit a certificate together with the control forms that all the C.H. Files have been brought uptodate.

2.14.3 Control Forms : To exercise proper check and control on the prescriptions of the working plan, the Divisional Forest Officer will prepare the annual control forms showing the prescriptions and suggestions of sanctioned working plan and fellings and other exploitation actually made or the works actually carried out against them. Two control forms will be maintained :

- (i) Control Form Nos. 2, 2A and 2B which control fellings and other exploitation and out-turn.
- (ii) Control Forms Nos. 4 and C which control works of improvement and reproduction.

2.14.4 Annual Control Form Nos. 2, 2A and 2B : The specified objects are :

- (i) To compare the actual fellings or other exploitation of the year with the working plan prescriptions, and to enable the controlling authority to see how far the provisions of a sanctioned plan as regards fellings have been carried out and where they have been departed from .

- (ii) To enable the Divisional Forest Officer to ascertain at the beginning of each year what arrears of fellings or other matters have to be adjusted in the current year.

The following guidelines apply to the preparation of control forms :

1. Separate control forms will be prepared for the main regeneration, selection, etc. and subsidiary (Thinning and improvements) fellings, felling series/working circle-wise.
2. Control Forms No's 2, 2A and 2B will be prepared by working circles, using separate sheets for each working circle.
3. All entries in control Form Nos 2, 2A and 2B will be made under the following three main heads :
 - (i) Prescriptions of the working plan.
 - (ii) Suggestions of the working plan.
 - (iii) Neither prescribed nor suggested in the working plan.

2.14.5 Control Forms No. 4 and C : Annual Control Forms 4 and C deal with a record of all works carried out in connection with the construction and repairs of communications and buildings, demarcation, fire protection and cultural operations such as ; debris burning, planting, sowing, fencing, seeding, cleanings and improvement fellings. It must, however, be emphasised that this form is not an account for, but a form designed merely to control works of maintenance, reproduction, improvement and protection prescribed or suggested in a working plan and actually carried out. Details, therefore, are not wanted in control form No. 4, but only an abstract of work done with expenditure incurred. Form 'C' will be prepared by Working Circle, i.e. Separate sheets will be issued for each working circle, form 4 for all other works will be prepared for the working plan area. Form 4 will be divided into the following three main heads :

- I. Prescriptions of the Working Plan.
- II. Suggestions of the Working Plan.
- III. Neither prescribed nor suggested in the Working Plan.

The entries will be made by budget sub-heads as under, so as to facilitate totalling of each sub-head. The nature of the work and the working plan paragraphs authorising the operation will be the main headings :

- (i) Construction of new buildings (paragraph).
- (ii) Repairs to buildings (paragraphs).
- (iii) Construction and repairs of boundary pillars and clearance of boundary lines.

The perimeter of boundaries:

- (a) Checked and (b) repaired, with total expenditure (no details), to be shown against the total perimeter of boundaries in the working plan area. Where

however, quinquennial boundary check is prescribed by Forests, the names of the forests to be checked and actually checked should be entered.

- (iv) The total area burnt departmentally against the working plan prescriptions with costs, separately for (i) P.B.I and (ii) other P.B's or plantations, and total length of line cleared against the total length of line and fire traces with costs (no details).
- (v) Construction of new Roads/paths/Bridges to be shown separately against the working plan programme of roads and paths with cost of each project but no details.
- (vi) Repairs to roads/paths/bridges separately, the total length of roads/paths/bridges separately, the total length of roads/paths repaired with total cost and average cost per kilometre.

2.14.6 Deviation Statement : A consolidated statement of deviations from the prescription of the working plan will be prepared and submitted by the Divisional Forest Officer alongwith this annual control forms in triplicate to accord sanction by the Principal Chief Conservator of Forests. One copy will be retained in the direction office and other two returned alongwith the control forms. One such copy will be used in the circle office and the other in the divisional office.

2.14.7 All the control forms shall be prepared for the financial year and submitted to the Conservator of Forests latest by 15 the may every year together with (i) a deviation statement in triplicate, (ii) a certificate to the effect that all compartment history files are fully and accurately posted to date and the annual control forms for the year agree with the entries in the compartment histories, (iii) a note on the progress of operations prescribed in the working plan, and (iv) explanatory notes.

2.14.8 Nursery Journals : These will be maintained for all the nurseries and should have a complete record about the origin of seed, date of sowing, germination percentage, and operation-wise costs etc. At the end of the season, cost per plants should be worked out both for bed and tube plants.

2.14.9 Plantation Journals : These shall be maintained separately for all the plantation areas having no Compartment History Files. For areas having compartment History files, the details should be incorporated in such Compartment History Files. It should contain the following information :

- (i) Map of the area on 1:15000 scale showing prominent natural features.
- (ii) Location, Legal status, boundaries, configuration, altitude, aspect, slope, geology, rock, soil type, depth, stoniness, drainage, fertility status and other site factors.
- (iii) Soil suitability and treatment maps on 1:3750 scale showing the un plantable blanks, scrubs, species to be raised and other treatments prescribed.

- (iv) Regeneration survey map on 1:3700 scale showing regeneration/stocking position.
- (v) A statement showing area planted and cost of planting item wise for each year.
- (vi) A critical note on success or failure of plantations alongwith the reasons for failure and corrective measures required for the success of plantations.

2.14.10 Fire Records : A complete record of fires will be maintained in Range and Divisional Offices. Maps of the Forests, showing fire burnt areas will be filed in the concerned compartment history files and plantation journals alongwith relevant data such as the origin and nature of fire, extent of area burnt, damage assessment and how was it brought under control.

2.14.11 Register of Books and Maps : Register of books and maps will be maintained at the Range and Divisional level and should be kept upto date. All roads, bridge paths, inspection paths and buildings constructed during the year should be shown in the maps in April, every year.

2.14.12 Register of Forests : The register of RF, PF, UF, MF and SF will be properly maintained in the divisional office by the patwari and all changes in area or boundaries recorded every year giving reference of Government orders and notifications.

2.14.13 Register of Roads and Buildings : This will be maintained both in the Range and Divisional Offices and kept upto date. All roads and buildings constructed during the year shall be entered in April, every year alongwith the cost of construction. The year of construction with cost incurred should invariably be recorded.

2.14.14 T. D. Register : It is to be maintained both at Divisional & Range levels. The entries of all the sanctioned T.D's should be made regularly in the Range and Divisional registers maintained for the purpose.

2.14.15 Forest Beat Book : No Forests Guards have beat books. It should be prepared afresh by each forest guard containing the following information :

1. A beat map on 1:15000 scale.
2. List of forests with area and their allotment etc.
3. Forest maps showing the compartments/sub-compartments, boundary pillars, paths etc. traced from the Compartment History Files.
4. Records of rights and concessions allowed to the local people.
5. Duties and powers of the beat guard.
6. List of roads, paths and buildings of the beat.
7. Zamindari rates of trees and forest produce.
8. Standing instructions of Range Officer and Divisional Forest Officer.
9. List of Shamlat/ceilingland forests with their Khasra Nos.
10. Class wise Volume and market rates of tree species of the region/division.
11. Sowing, planting and other silvicultural operations.

12. List of mother trees and standards.
13. List of plantations and areas closed for regeneration etc.

The Range Officer should check these books once every month. The Divisional Forest Officer will check it during field tours and ensure that these are maintained properly and updated regularly.

2.14.16. Forest Block Book : Like beat book, a block book should also be prepared by every block officer. It should contain all the information's of the block. The map of the block should contain all the individual beats of it. This should be checked by the Range Forest Officer and Conservators when they are on tours.

2.14.17 Divisional Note Book : Divisional Forest Officer will maintain it for recording important activities, information's and results, mainly for his use. It will contain the information like :

1. Auctions results :
2. Lease rates for the various categories of Forests and resin blazes.
3. Out turn of resin sections, tree lots coppice coupes etc.
4. Results of experiments carried out, if any.
5. Results, of species/exotics tried and success achieved in different plantations.
6. Record of seed years of various species.
7. Survival and mortality rates in plantations.
8. Injuries to Forest Crops or any other interesting information like forest fires etc. concerning Forests.
9. Any other important, information regarding divisional working.

No such record is maintained at present. It should be started now. This will provide a bird eye view of the divisional working and may prove helpful at the time of revision of the Working Plan.

CHAPTER-XV

FINANCIAL AND FORECAST

2.15.1 Past Yield : The yield of resin is given in Table 2.15.1

Table 2.15.1 Number of blazes & resin yield

Year	No. of blazes.	Average yield per section	Resin yield (quintals)
1991	67889	41.13	2792.27
1992	144005	36.97	5323.86
1993	196026	32.34	6339.48
1994	150585	41.23	6208.62
1995	142210	33.54	4769.72
1996	118784	36.37	4320.17
1997	80534	30.95	2492.53
1998	56560	37.01	2093.29
1999	48049	40.28	1935.41
2000	14315	38.40	549.70
2001	16680	36.72	612.49
2002	7715	34.60	266.94
2003	5728	35.03	200.65
2004	13103	38.54	504.99
2005	12105	39.61	479.48
2006	12105	35.02	423.92
2007	25779	41.72	1075.50
2008	25336	38.85	984.30
2009	18937	36.69	694.80
2010	16745	33.87	567.15
2011	13428	34.57	464.21
2012	11199	34.22	383.22
2013	17341	35.28	611.79
	Average	36.64	

2.15.2 Future yield : The annual expected yield of different species in each working circle is given in Table 2.15.3.

2.15.3 Past Revenue and Expenditure: The details regarding past Revenue and expenditure is given in Table 2.15.2.

Table 2.15.2 Past revenue and expenditure.

Year	Revenue (Rs.)	Expenditure (Rs.)
1991-92	2,08,729	86,73,199
1992-93	74,095	78,71,627
1993-94	66,577	86,17,083
1994-95	53,547	85,60,323
1995-96	2,94,348	99,47,787
1996-97	9,26,198	1,01,52,245
1997-98	9,17,301	1,35,44,672
1998-99	4,17,913	1,87,65,241
1999-2000	6,83,062	1,97,79,360
2000-01	9,03,430	1,46,68,817
2001-02	4,43,726	1,90,32,744
2002-03	12,19,930	1,56,24,185
2003-04	16,03,070	1,85,99,980
2004-05	5,28,623	1,98,66,861
2005-06	65,60,597	2,47,27,343
2006-07	6,87,883	3,68,80,196
2007-08	12,79,945	3,73,42,877
2008-09	7,57,040	4,13,38,898
2009-10	38,06,536	4,62,42,769
2010-11	2,36,35,004	77,13,887
2011-12	16,47,858	5,55,65,200
2012-13	13,97,781	6,56,13,363

2.15.4 Future Revenue and Expenditure :

(A) Revenue : Based on current market prices, the anticipated annual revenue of the division is provided in Table 2.15.4.

(B) Expenditure: The estimates of annual expenditure are given in Table 2.15.5

Table 2.15.3 Working Circle Wise expected Annual Yield.

Working Circle	Expected annual yield (Timber in M ³ , Resin in Tonnes, Bamboos in number and tonnes.)			
	Species			
	Chil	Deodar/Kail	Silver Fir and Spruce	Misc Broadleaved
The Chil Working Circle	8000	--	--	--
Resin	287	--	--	--
The Deodar Working Circle	595	16100	525	--
The Fir-Spruce Working Circle	0	51	1100	--
The Rehabilitation Working Circle	2500	300	--	--
The Protection Working Circle	0	0	---	---
The Plantation Working Circle	0	0	--	490
Total Timber	11095	16451	1100	490
Resin	287			

Table 2.15.4 : Anticipated annual revenue of Rajgarh Forest Division.

Source of Revenue Timber	Quantity	Royalty Rate (Rs.)	Amount (Rs.)
Chil	11095	572	6346340
Deodar & Kail	16451	5903	97110253
Spruce and Fir	1100	790	869000
Fuel wood :			0
Ban	8400 Qtls	326	2738400
Resin	2872.74 Qtls	7000	20109180
Grasses, Grazing and timber distribution			100000
Penalty and Fines			200000
Compensation			200000
Rent of Buildings			50000
Registration and export fees			300000
Forfeiture etc.			100000
Misc.			100000
		Grand Total	12,82,23,173

Table 2.15.5 : Estimated future annual expenditure

Sr. No.	Item of Expenditure	Amount (Rs.)
1.	Marking of trees	50000
2	Maintenance of Boundaries	400000
3	Control Burning.	375000
4	Construction and repair of Roads, Buildings etc.	750000
5	Raising of Plantations 110.92 ha	2772000
6	Maintenance of Plantations. 110.92 ha.	830000
7	Fire Protection-Construction and maintenance of fire lines etc	30000
8	Establishment Charges	25000000
9	Office Expenses and misc. Charges etc.	1000000
	Grand Total :	3,12,07,000

2.15.6 Summary of Financial Forecast :

Revenue (Rs.)	Expenditure (Rs.)	Surplus/Deficit (Rs.)
12,82,23,173	3,12,07,000	+ 97016173

CHAPTER-XVI

SUMMARY OF PRESCRIPTIONS

2.16.1 : The important prescriptions and suggestions of the working plan are as under:

Heading	Prescription	Paragraph of the plan.
1	2	3
THE CHIL WORKING CIRCLE		
Silvicultural system	Uniform with Indian Irregular shelterwood system with fixed periodic blocks	2.2.8
Regeneration period	30 years	2.2.9
Rotation and conversion period	120 years.	2.2.10
Exploitable diameter	60 cms d.b.h.	2.2.11
Division into periodic blocks	Four periodic blocks of 30 years each	2.2.12
Calculation of yield from P.B.I	5000 M ³	2.2.15
Calculation of yield from P.B.IV	Final felling = 1600 M ³ Thinning = 100 M ³	2.2.16
Prescribed annual yield	P.B.I = 5000 M ³ P.B.II & III = 1300 M ³ P.B.IV = 1700 M ³	2.2.18
Control of yield	(±) 10% Deviation of prescribed yield allowed and removals will depend on the progress of regeneration.	2.2.19
Table of fellings	Laid down for P.B.I and P.B.IV for 15 years	2.2.20
Method of executing fellings	Principles for seeding and final fellings in P.B.I and P.B. IV with thinning laid down	2.2.21
Subsidiary silvicultural operations	Prescribed for different periodic blocks	2.2.22
Fire protection and control burning	Preventive and control measures prescribed.	2.2.23
Exercise of Rights and concessions	Prescribed for grazing, grass cutting and timber distribution.	2.2.24 & 2.2.25
Resin Tapping	Rill method prescribed and list of Forests to be excluded for tapping given.	2.2.26
Regeneration assessment	Prescribed to carry out annually in P.B.I areas.	2.2.27
THE DEODAR-KAIL WORKING CIRCLE		
Silvicultural system	Uniform with Indian Irregular Shelterwood system with Floating periodic block.	2.3.14
Regeneration period	30 years	2.3.15
Rotation and conversion period	120 years	2.3.16

Heading	Prescription				Paragraph of the plan.
1	2				3
Exploitable diameter	55 cm d.b.h.				2.3.17
Division into periodic blocks	P.B.I and P.B. Unalloted				2.3.18
Calculation of yield from P.B.I	Deodar and Kail = 14300 M ³				2.3.23
	Chil = 500 M ³				2.3.24
	Spruce and Silver Fir = 125 M ³				2.3.25
Yield from P.B. Unalloted	No green felling allowed. Only salvage removal prescribed.				2.3.26
Prescribed annual yield	Spp.	P.B.I	P.B. Unalloted	Total	2.3.27
	Deodar & Kail	14300	1800	16100	
	Spruce & Silver Fir	125	400	525	
	Chil	500	95	595	
Control of yield	± 10% of prescribed yield allowed as deviation and checked after every three year.				2.3.28
	Felling shall follow the progress of regeneration.				2.3.29
Table of fellings	Laid down in Table 2.3.18				2.3.30
Method of executing fellings in P.B.I.	Laid down				2.3.31
Subsidiary silvicultural operations in P.B.I areas	Slash disposal, removal of unfelled, dead, damaged, inferior trees spp., lopping of broadleaved trees, bush cuttings, cleanings of dense regeneration patches and effective closures.				2.3.32
Artificial regeneration in P.B.I areas	Prescribed				2.3.33
Treatment of overfelled/unstocked P.B.I areas	Effective closure followed by sowing/planting without waiting for natural regeneration.				2.3.34
Treatment of existing plantations.	Repair of fencing, beating up of casualties, thorough bush cuttings, weedings, cleaning, prunnings and thinning.				2.3.35
Choice of species	Kail, Deodar, Maple, Walnut, Chestnut, Ash, Bird Cherry.				2.3.36
	Plant indicators and site selection.				2.3.37
Nursery techniques	Prescribed				2.3.38
Ne plantations, methods of establishment	Prescribed				2.3.39
Closures	P.B.I areas to be closed effectively and notification issued				2.3.40

Heading	Prescription	Paragraph of the plan.
1	2	3
Grazing	P.B.I area to be closed till the regeneration is established	2.3.41
Grass cuttings	No restriction in non regeneration areas	2.3.42
Loppings	Loping of conifers banned.	2.3.43
Requirement of Right Holders	To be met from thinning cum improvement fellings in P.B. Unallotted.	2.3.44
Fire Protection	Measures suggested	2.3.45
Regeneration Survey	To be carried out every year on 1:3750 scale map	2.3.46
THE SPRUCE-FIR WORKING CIRCLE		
Silvicultural system	Selection System	2.4.16
Exploitable diameter	60 cms d.b.h.	
Felling Cycle	15 years	2.1.18
Yield regulation	Smythies safeguarding Formula	2.1.19
Yield Calculation	Deodar = 36 Trees, Kail = 25 trees Spruce and Fir = 1100 trees	2.4.20
Prescribed annual yield	-do-	2.4.21
Control of yield	± 10 % deviation from prescribed yield is allowed	2.4.24
Table of fellings	Laid down for 15 years	2.4.25
Method of executing fellings	Laid down	2.4.26
Subsidiary silvicultural operations	Prescribed	2.4.27
Artificial regeneration	Prescribed	2.4.28
Choice of species	Deodar, Kail, Spruce, Silver, Fir, Walnut, Maple, Chestnut, Bird Cherry, Ash.	2.4.29
Nursery techniques	Prescribed	2.4.30
Sowing and Planting	Prescribe	2.4.31
List of areas to be sown and planted.	Table 2.4.13	2.4.32
Weeding	Prescribed	2.4.33
Closures	Prescribed	2.4.34
Grazing	Allowed all over, migratory grazing to be regulated; lopping to be controlled and overgrazed areas to be closed rotationally.	2.4.35
Right holders requirement	Prescribed	2.4.37
THE REHABILITATION WORKING CIRCLE		
Silvicultural system	Uniform with Indian Irregular Shelterwood System	2.5.15
Rotation and Exploitable diameter	120 Year, Chil = 60 cms Deodar/Kail = 53 cms	2.5.16

Heading	Prescription	Paragraph of the plan.
1	2	3
Choice of species	Prescribed	2.5.17
Calculation of yield	Calculated for different species	2.5.18
Prescribed annual yield	Chil = 2500 M ³ Deodar & Kail = 300 M ³	2.5.19
Control of yield	± 10 % deviation of commulative yield checked after every 5 years allowed.	2.5.20
Table of fellings and planting programme	Laid down in table 2.5.12	2.5.21
Method of executing fellings	Prescribed	2.5.22
Subsidiary silvicultural operations	Prescribed	2.5.24
Fire Protection	Prescribed	2.5.25
Grazing	Regeneration areas closed and elsewhere controlled grazing allowed	2.5.26
Closures	To be notified in advance for a period of 30 years	2.5.27
Exercise of Rights and concessions	Green felling to be banned and unrestricted grazing to be checked/controlled	2.5.28
Resin Tapping	Banned for the plan period	2.5.29
THE PROTECTION WORKING CIRCLE		
Silvicultural system	Selection System in exploitable Ban Forests	2.6.16
Rotation and Exploitable diameter	≥ 60 cms d.b.h.	2.6.17
Regeneration Period	30 years	2.6.18
Choice of species	Prescribed for various zones	2.6.19
Felling Cycle	15 years.	2.6.20
Calculation of yield	27 Ban Trees ≥ 60 cms d.b.h. or 50.50 M ³ per year.	2.6.21
Prescribed annual yield	100qtls. Per year	2.6.22
Control of yield	Only to meet Charcoal demand of the Division i.e. 100qtls. Per year	2.6.23
Table of closure and planting	Laid down	2.6.25
Subsidiary silvicultural operations	Prescribed	2.6.26
Grazing and grass cuttings.	Prescribed	2.6.27
Loppings	Rules framed.	2.6.28
THE PLANTATION WORKING CIRCLE		
Silvicultural system	Selection cum improvement fellings with Artificial Regeneration ; Bamboos to be	2.7.16

Heading	Prescription	Paragraph of the plan.
1	2	3
	Thinnings.	
Choice of species	Prescribed	2.7.17
Regeneration Period	30 years for Conifers and high level broadleaved species ; 15 years for Social Forestry species in lower zones.	2.7.18
Felling Cycle	4 years for Bamboos	2.2.20
Calculation of yield	80 ha per year for broadleaved Scrub forests	2.2.21
Prescribed annual yield	630 M ³ for Fuelwood	2.7.23
Control of yield	(±) 10% deviation in prescribed area is allowed	2.7.24
Prescribed felling :	1235.85 ha. area under scrub forests (exploitable)	2.7.25
Methods of executing the fellings	Prescribed	2.7.26
Planting programme	Laid down	2.7.27
Subsidiary silvicultural operations	Prescribed	2.7.28
Grass cuttings.	Permitted after the plants are out of damage by sickles.	2.7.29
Closures	To be Notified.	2.7.30
Fire Protection	Internal fire lines to be provided.	2.7.31
Regeneration Survey	To be carried out every year	2.7.32
THE GRAZING OVERLAPPING WORKING CIRCLE		
Livestock Management	Prescribed	2.8.40
Grazing management	Suggested	2.8.41
Management of grazing lands	Prescribed	2.8.42
Management of Forest grazing lands	Prescribed	2.8.43
Research needs	Suggested	2.8.44
RESIN EXTRACTION		
Resin Blazes	Calculated and prescribed	2.9.3
Tapping Season	Defined	2.9.4
Method of tapping	Prescribed	2.9.5
Calculation of yield	338 Tonnes per year	2.9.8
Fire Protection.	Prescribed.	2.9.10
MEDICINAL PLANTS AND FUNGI		
Management	Prescribed.	2.10.5
Technique of Propagation	Prescribed.	2.10.8
Management of Fungi	Prescribed.	2.10.12
Survey, Study and Research	Suggested	2.10.13
PROTECTION AND MANAGEMENT OF WILD LIFE		

Heading	Prescription	Paragraph of the plan.
1	2	3
Preservation and protection of Wild Life	Measures prescribed	2.11.10
Study and Data Collection	Suggested	2.11.12
Scientific Study and Research	Suggested	2.11.13
MISCELLANEOUS REGULATIONS		
Petty fellings	Defined	2.12.1
Deviations	Defined	2.12.2
Timber Distribution	Prescribed	2.12.3
Roads, Paths and Bridges	Lists for new construction provided	2.12.4
Buildings	Suggested for new construction.	2.12.5 - 2.12.8
Water Supply	Suggested for supply and construction of over head Tanks	2.12.9
Fire Protection.	New fire lines prescribed.	2.12.10
Drought Mortality	Survey and mapping prescribed	2.12.11
Maintenance of Boundaries	Quinquennial programme of checking and maintenance laid down	2.12.12- 2.12.13
Survey and Maps	Prescribed for survey and demarcation of Shamlat/ceilingland by Survey of India.	2.12.15
Nautor, Included cultivation and encroachments	Measure prescribed for proper control	2.12.17
Research	Need and areas of Research stressed.	2.12.18
Meteorological Data	Installation of Rainfall, Temperature and Humidity recorders suggested	2.12.19
Miscellaneous	Minor Forest Produce-Extraction and Cultivation suggested.	2.12.20
ESTABLISHMENT AND LABOUR		
Re-organization	Reorganization of Blocks and beats proposed.	2.13.2
CONTROL AND RECORDS		
Control Forms	Prescribed	2.14.3-7
Nursery Journals	Suggested to maintain complete records	2.14.8
Plantation Journals	-do-	2.14.9
Fire Records	Prescribed to prepare fire maps.	2.14.10
Register of Books and Maps	Prescribed	2.14.11
Forest Register	Prescribed for proper maintenance	2.14.21
Register of Roads and Building	Prescribed to update entering new constructions.	2.14.13
Forest Beat Book	Prescribed to construct in detail.	2.14.15
Forest Block Book	-do-	2.14.16
Divisional Note Book	-do-	2.14.17

Heading	Prescription	Paragraph of the plan.
1	2	3
FINANCIAL FORECAST AND COST OF THE PLAN		
Past Yield	Tabulated	2.15.1
Future Yield	Expected annual yield prescribed	2.15.2
Past Revenue and Expenditure	Tabulated	2.15.3
Future Revenue and Expenditure	Revenue = Expenditure =	2.15.4
Financial Forecast	(+)	2.15.5
Cost of Enumeration	Rs.	2.15.6
Cost of Working Plan	Rs.	2.15.7

B.S. Pathania (HPFS)
Assistant Working Plan
Officer -cum-ACF
Rajgarh Forest Division

Rajesh Shukla (HPFS)
Divisional Forest Officer,
Working Plan-Cum-
Divisional Forest Officer,
Rajgarh.

Y.P. Gupta (IFS)
C.F. Working Plan & Settlement Solan.

R.K. Gupta (IFS)
Conservator of Forest,
Nahan Circle,
Nahan.

Deputy Commissioner
Sirmour Distt.(HP)
Nahan

C.C.F. Working Plan &
Settlement, Mandi.

R.K. Gupta (IFS)
Principal Chief
Conservator of Forest
Himachal Pradesh-Shimla.

GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT & FOREST
DAKSHIN MARG, CHANDIGARH-160030

Telephone No. (0172) 2638061
Fax No. (0172) 2638135
NORTHERN REGIONAL OFFICE
BAYS NO. 24-25, SECTOR 31-A

Dated: Friday, June 21, 2013
F.No.13-7(14)/97-ROC

To

The Pr. Secretary Forest,
Government of Himachal Pradesh,
Department of Forests,
Civil secretarial, Shimla,
Himachal Pradesh.

Sub:- Approval to the Working Plan of Rajgarh Forest Division for a period of 15
Years w.e.f. 1st April, 2013 to 31st March, 2028 –regarding.

Ref: Letter No. WP/Mandi/420 dated 7th June, 2013 of Addl.PCCF (Working Plan),
Mandi, H.P.

.

Sir,

The Working Plan for the forests of Rajgarh Forest Division (2012-13 to 2026-27) has been examined in accordance with the provisions of Forest (Conservation) Act/ 1980 as amended till date, National Working Plan Code, guidelines issued by Government of India, Ministry of Environment and Forests, New Delhi from time to time, National Forest Policy 1988 as well as orders dated 12th December 1996 of Hon'ble Supreme Court of India in PIL WP(C) 202 of 1995 read with WP (C) 171 of 1996.

2. After careful consideration of the proposed draft Working Plan, approval of the Central Government is hereby conveyed under Forest (Conservation) Act, 1980 subject to observance of the following conditions:-

- a) The approval shall be effective for a period of 15 year w.e.f. April 01, 2013 to March 31, 2028.
- b) All the provisions of the Forest (Conservation) Act, 1980 and various Rules & Guidelines issued under the Act shall be strictly enforced.
- c) Yield obtained from dead, dry and salvaged timber will form part of prescribed yield and in case prescribed yield has been achieved from dead and dry volume, no further felling will be carried out. Yield from dead, dry and salvaged timber must not exceed the prescribed yield in the working plan.
- d) All the felling must commensurate with regeneration and no fellings would be permitted unless funds for regeneration are available. In this regard, orders of Hon'ble Supreme Court of India will be strictly complied with.
- e) Intensive protection measures against fire, biotic interference and encroachment in forests shall be taken up.
- f) All the prescriptions prescribed in the working plan regarding plantation, protection and development of the forest area will be strictly followed and any change in the prescriptions will be treated as deviation for which prior approval of competent authority will be obtained.

- g) Sufficient budgetary allocations be ensured for timely implementation of various prescriptions regarding protection, regeneration and development of the forests.
- h) Midterm review of the Working Plan will be taken up on expiry of 5th year of the plan period i.e. in the year 2017-18; and
- i) The Work on revision of Working Plan shall be taken up well in advance so that the revised plan is ready before expiry of Working Plan.
- j) The following suggestions/observations are also made.
- i) As financial year 2012-13 is already over, the Working Plan period shall be revised w.e.f. 1st April, 2013. The activities undertaken during the financial year 2012-13 should find a mention in the Working Plan document and according the prescriptions for the period 2027-28 should be incorporated.
- ii) The administrative map of the Himachal Pradesh Forest Department should show Rajgarh Forest Division as an **“INSET”**. The maps of the forest ranges may also be incorporated.
- iii) The ‘Executive Summary’ may be given in a narrative form without various headings in the text.
- iv) The reference of letter of CWLW on **p-275** of the document is not correct and even the chapter quoted by the CWLW and Para number needs modification. The references made may also mention the page numbers of the document.
- v) So as to reduce the number of pages in volume-I, the tables extending in more than one page may be given appendices in volume-II (e.g. table 1.1.2 of rainfall which runs in four pages);
- vi) Scientific names at a few more places may also be shown in italics (e.g. page 52 and scientific names in appendices 16, volume-II).
- vii) It is suggested that to reduce volume and save on use of paper, the printing of document may be done on both sides of paper; and
- viii) Correct and printed copy of the document may be forwarded to this office for record.

The Central Governments reserve the right to review/modify or withdraw this approval at any point of time depending upon the management needs and any other guidelines of the Ministry of Environment and Forests, Government of India of Hon’ble Supreme Court of India.

Yours faithfully,

(Ishwar Singh)
Conservator of Forests (Central)

Copy to:

1. The Principal Chief Conservator of Forests, Govt. of Himachal Pradesh, Forest Department, Talland, Shimla.
2. The Chief Conservator of Forest, Working Plan and Settlement, Government of Himachal Pradesh, Forest Department, Purani Mandi, District Mandi, HP.
3. The Chief Conservator of Forest, Working Plan and Settlement, Government of Himachal Pradesh, Forest Department, Mist Chamber, Khalini, Shimla, HP.
4. The Divisional Forest Officer, Rajgarh Forest Division, Rajgarh, HP.
5. Guard file.

No./ WP Mandi/.....
Himachal Pradesh Forest Department.

Dated Mandi, the.....

From:- APCCF (WP&S) H.P. at Mandi.

To:- DFOs-Cum-WPOs Palampur, Dharmshala,
Una, Bilaspur, Nalagarh, Kunihar, Shimla,
Kotgarh, Nurpur, Dehra, Rajgarh & Dalhousie.

Subject:- Forwarding copies of approved printed Working Plan documents for
Maintaining record in this office-regarding "Signature of concerned officers
on the last page of Working Plan".

Memo:

Additional Principal Chief Conservator of Forests (Central) Chandigarh has desired that the signature of concerned officers (specimen enclosed) be included as last page before final printing in which the scanned copy of same can be included.

As such, you are directed to get the signature done on one separate page and include it as last page of approved Working Plan document.

After needful the final signed & approved Working Plan copy both hard and soft copy on CD be submitted to this office for printing so that printed document can be submitted to APCCF (Central) as desired.

Please note that the matter is most urgent and requires top priority and personal attention.

Encls.:- As above.

Addl. Pr. Chief Conservator of Forests,
Working Plan and Settlement,
H.P. at Mandi.

Endst. No. W.P./Mandi/-----Dated, Mandi the-----

Copy is Forwarded to :-

1. CCF(T) Chamba & CFs (T) Dharamshala, Shimla, Nahan, Bilaspur & Hamirpur for information & necessary directions to DFOs concerned.
2. CFs W.P.(N) Palampur & (S) Solan for information & necessary action.

Addl. Pr. Chief Conservator of Forests,
Working Plan and Settlement,
H.P. at Mandi.

HIMACHAL PRADESH FOREST DEPARTMENT
WILD LIFE WING

No. WL/D.XII-21(B) 1677

From:

Principal Chief Conservator of Forests (Wildlife)-cum-
Chief Wildlife Warden, H.P.

To:

Mr. Asif Khan, Creative Head,
Raheja Productions, W4D/5, Keshav Kunj,
Western Avanie, Sainik Farms, New Delhi-110062.

Dated, Shimla-1, the 06-05-2013.

Subject: Seeking permission to shoot National Parks & Sanctuaries of Himachal Pradesh for
Our weekly programme wilderness Days on DD (Delhi Doordarshan) National.

Sir,

1. This is in response to your office letter dated 06-04-2013 on the subject cited above.
2. The Government of Himachal Pradesh has fixed rates of shooting feature film and documentaries in forest areas of Himachal Pradesh as under:-

Film Shooting Rates per day:

i)	Feature film by any agency	Rs. 5,000/- per day.
ii)	Documentary film by any agency	Rs. 3,000/- per day.

Film Shooting Rates Weekly:

i)	Feature film by any agency	Rs. 25,000/- weekly.
ii)	Documentary film by any agency	Rs. 15,000/- weekly.

3. You are requested to send your detailed programme mentioning specific places (name of Wildlife Sanctuaries and National Parks) with dates so that necessary permission may be accorded accordingly please.

Yours faithfully,

Principal Chief Conservator of Forests,
(Wildlife)-cum-CWLW, HP Shimla.