HIMACHAL PRADESH GOVERNMENT

FOREST DEPARTMENT

REVISED DRAFT WORKING PLAN

FOR THE FORESTS OF

KULLU FOREST DIVISION

VOLUME –I

(2013-14 TO 2027-28)

PART – I

SUMMARY OF THE FACTS ON WHICH PROPOSALS ARE BASED

CHAPTER -I

The Tract Dealt With

1.1 Name and Situation:-

The current Working Plan, called revised Kullu Working Plan, covers the forests of Kullu Forest Division. It is a revision of Sh. J.S.Walia's Working Plan (1994-95 to 2009-10). The working plan of Sh. J.S.Walia covered two Divisions namely Kullu Forest Division and Parvati Forest Division. However, this working plan is only for the tract falling under Kullu Forest Division.

The Kullu tract lies between North latitude 31-53'18" N and 32-24'-06" N and East longitude 76-56'-17" E and 77-24'07" E. It covers the Manali Tehsil except Malana area and part of Kullu Tehsil of Kullu District. Mountain ranges of varying height, separate this division on the West from Bara and Chhota Bhangal of Kangra District, and on the North, Lahul and Spiti District, its southern and eastern boundary, adjoin Parvati Forest Division and a small portion in its South-Western corner, touches Mandi Forest Division (District Mandi).

1.2 Configuration of the ground:-

Tract lies in between 1148m and 5362 meters, above the main sea level. The lower most point is near Mohal. The slopes, in which forest is situated, vary from gentle to moderate to very steep. Forests in Butti range lie on steep to precipitous slopes. Up to about 3700 meters, is the tree growth, above which lie the grassy thatches, rocky terrain and snow cover.

1.3 Geology, Rock and Soil:-

The Kullu District forms a transitional zone between Lesser and Greater Himalayas and is characterized by high NW-SE trending ridges and deep river valleys, a number of which in their upper reaches bear imprints of glacial activity in the near post.. The area in general represents young, immature topography, controlled both by the structure and lithology of the underlying rocks. The weathering resistant rocks, like the dolomite of the Aut Formation and Quartzite of the Manikaran Formation, from cliffs and escarpments, while the slate, phyllite and schist of different formations from gentle to moderately steep slopes. The roughly N-S course of Beas river between Kullu and Aut is controlled by a fault.

The tributaries which drain the tract of Kullu Forest Division in Beas River are Solang, Manalsu, Sujoin, Phojal, Sarbari, Allain and Duhangan, etc. These have cut deep narrow valleys across to the Beas River, which are major draining antecedents. The rivers together with their

tributaries, define a sub-dendritic to sub-trellis drainage pattern. The ridges separating the Kullu and Kangra District, act as water divide between Beas River in the east and Ravi River on the west and ridges separating the Kullu and Lahul & Spiti District, act as water divide between Beas River in the south and Chandra River on the North.

1.3.1 Rocks:-The rock types found in the district are classified into various formations which can be summarized as follows:-

Group	Formation	Lithology	Age
	Hanuman tibba Granitoids.	Granite, Gneiss, Muscovite/Biotite Granit, Occasional Porphyritic.	Lower Palaeozoic
	Katarigali	Carbonaceous Slate, Phyllite, Quartzite, Subordinate Limestone.	Late Proterozic
	Manjir	Pebbly Slate, Gritty Quartzite	Middle of late Proterozoic
Larji	Aut	Grey Stomatolitic. Charty Dolomite, Pink and Grey Limestone	
	Hurla	White, Grey Quartzite, Shale	
	Naraul	Slate, Phyllite, Siltstone, Quartzite and basic flows	Middle Proterozoic
Kullu	Khokhan	Schist, Phyllite, Quartzite.	Middle Proterozoic
	Gahr.	Streky-Banded Gneiss, Augen Gneiss, Quartzite	Middle Proterozoic
	Khamrada	Carbonaneous Phyllite, Schist, Quartzite, Grey Phyllite, Subordinate Limestone.	
Rampur	Manikaran	White, Greenish White, Sericitic Quartzite.	Late Archean to Early Proterozoic
	Green-Bed	Schistose Basic Volcanics, Green Phyllite..	
	Bhallan	Phyllite, Slate, Quartzite, Few Basic flows	
Vaikrita	B-Formation.	Quartizite, Phyllite, Slate, Schist, Thin Bands of Gneiss, Hornblende, Garben Schiefer.	Late Archaean to Eraly Proterozoic
	A-Formation	Gneiss, Schist, Phyllite, Quartzite, Migmatite and Pegmatite	
Bandal Gneissic comples		Gneiss, Biotite/Muscovite Granite, Migmatite, Schist Phyllite, Quartzite.	Archaen

Bandal Gneissic complex: - Bandal Gneissic complex with its RB-Sr age of 2700 Ma represents the oldest stratigraphic unit of the area and occur in the eastern part of the area overlain by Manikaran quartize (Rampur group). It comprises porphydro balstic gneiss, granitic, streaky banded gneiss, folited biotite- muscotive granite and migmatite.

Vaikrita Group: - The Vaikrita Group represents the second oldest stratigraphic unit if the area and is divisional into two formation viz.:- Formation-A and Formation-B

Formation- A: - The lowermost formation- A of this group is represented by inter-banded sequence of prophyroblastic/augen gneiss, migmatite, kyanite gneiss, garnet ferrous-biotite schist, kyanite-staurolite schist.

Formation-B: - It comprises interstratified sequence of grey**,** medium to thick bedded, fine grained micaceous schistose quartzite, garnet-quartz.biotte schist, and thin bands of porphyroblastic/streaky gneiss, occasional thin bands of horn-blende garden schifer are also present.

Rampur Group: - The vast area southeast of the Kullu is covered by rocks of Rampur Group. On the basis of lithology, the Rampur group has been divided into three formations viz. Bhallan, Green Bed and Manikaran Formations.

Bhallan Formation: - The basal most Bhallan Formation of the Rampur group consists of massive, white quarte zite, grey/green phyllite, schist; white to grey thin, even parallel bedded fine grained quartzite and subordinate light to dark grey slate.

Green Bed Formation:- It comprises ark green schistose, basic flows interstratified with subordinate quartize and subordinate quartzite and phyllite.

Manikaran Formation:- The Manikaran Formation constitute the youngest strati-graphic unit of the Rampur bedded and is represented by white, greenish white, thin to medium , even parallel bedded, fine grained schistose quartzite and pocket of fuchsite and a few thin basis volcanic rocks. The volcanic inter-startified with the Manikarn Formation according to Nd –Sm isochorn age are 2500 Ma old.

Kullu Group:- Lithologically, The Kullu Group has been divided into three formations viz. – Khamrada, Gahr, and Khokhan Formations.

Khamrada Formation:- It comprises carbonaceous, phyllite, fine grained schistose quartzite and grey thin bedded platy limestone coating.

Gahr Formation: - The Gahr Formation id dominantly represented by quartzose, streaky to banded paragneiss interbedded with the few grey, thin to medium bedded, fine grained quartzite. The Gahr gneiss has yield of age 1430 (+) 150 Ma.

Khokhan Formation: - It consists of interbanded sequence of green puckered chlorite schist, green shiny phyllite and grey to thick bedded fine grained micaceous schistose quartzite.

Katarigali Formation: - The Katarigali Formation covered a major part of the area West of Kullu and consists of carbonaceous phyllite, light to dark grey thinly laminated slate, dark grey siltstone, greenish grey, thinly bedded fine grained limestone. The rock show profuse development of pyrite, the leaching of which brownish surface color to the rocks.

Hanuman Tibba Granitoids: - The granitic body is exposed between Beas Kund in the north of the Dorni Thach in Manalsu Nal in the South. This graintoids is represented by granitic gneiss, biotite-muscovite granite, occasionally porhyritic. The granite is profusely traversed by aplite, pegmatite and quartz veins.

1.3.2 Soil: - The Soils in the Himalayan change frequently, depending upon the underlying rocks and the effect of various agencies from time to time. Though, no specific soil survey has been carried out by The Geographical Survey of India, yet few generalizations, can be made about the formation of soil. The lateritic soil, rich in iron and alumina, can be found as cover over the gneissic rocks, whereas red soil forms on the granite and gneisses. The red soils are deficient, in phosphorus, lime and nitrogen. These also cover the rocks of green Bed Formation (Basic rocks). The sandstone, siltstone, quartzite yield sandy oil, while the area underlain by limestone and shale yield loamy soil. In the valley portions, both transported as well as *in situ*, alluvial soils reworked by water, can be found.

1.3.3 General effect on forest vegetation: - The composition of the forest vegetation and its evolution is influenced by the character of the rocks/soil underlying. Disintegrated quartzite support superior quality Chir, but is detrimental of Deodar. Gneiss and Schist break up to give rise to loamy clay Loams are conducted to the growth and development, of both Deodar and Kail. Superior quality Deodar Forest of Manali is testimony to the fact that the characters of underlying rocks do influence the composition of the forest vegetation. On heavy clay soils though, the natural regeneration of Deodar is profuse while the quality remains moderate. On higher elevations, the forest soil is thick with the undecomposed, acidic humus (low rate of decomposition of deficiency of broad leaved trees). The undecompossed soil creates problem in the Spruce and Silver Fir forest**,** as natural regeneration is hampered, since the seed does not reach for soil. Forests which adjoin villages are observed to have deteriorated soils, on account of incessant removal of litter from it. The soil in bihals is found to contain calcium carbonate and is generally alluvial, basic or neutral in reaction. By and large however, forest soils in Kullu tract are clayey loam, fertile, rich in organic matter and conducive to the tree growth.

1.3.4 Surface Drainage:-Drainage on the whole is good. There are only few patches where internal drainage is poor and water is found to stagnate. Soils, in which drainage is poor and impeded, thwart natural regeneration of conifers. However, these soils favour Iris, Balsam and *Strobilanthes*.

Erosion hazards are common- both gravitational and glacial erosion existing in the tracts. Parol forest of Naggar range bears testimony to severe landslides and slips. Erosion is frequent over such steep lands that lack of vegetation cover and unchecked grazing accelerate slips. Unchecked breaking of lands for agriculture, horticulture and road making intensify erosional hazards.

1.4 Climate and Rainfall: - The climate is typical of the temperate zone at higher altitude, above 1000 meters and subtropical at lower elevations. Plant succession and distribution are affected by varying climate conditions, especially temperature variations and patterns of rainfall. Generally April to June, October to November are dry months.

1.4.1 Temperature:- Temperature data of Kullu tracts w.e.f. 1995 -2011 is (in degrees centigrade).

Bajuara Station

Year	January		February		March		April		May		June	
	Max	**min**	**Max**	**min**	**Max**	**min**	**Max**	**min**	**Max**	**min**	**Max**	**min**
1995	10.1	-1.3	11.6	0.9	17.4	4.0	20.7	6.7	28.9	11.4	31.5	15.6
1996	12.2	-0.3	14.9	1.9	16.3	4.8	23.5	8.6	24.9	10.5	13.0	15.7
1997	12.8	-0.3	13.6	0.2	17.3	4.7	20.3	7.9	23.8	8.3	26.3	12.6
1998	10.7	-0.5	11.8	1.0	14.9	1.8	22.7	8.0	27.0	15.6	28.1	20.7
1999	10.0	3.8	15.2	7.0	18.5	8.4	25.0	13.4	25.7	15.6	27.8	17.7
2000	11.6	3.9	10.0	2.1	16.1	6.0	24.3	12.1	27.5	16.4	27.9	18.2
2001	13.6	3.0	17.1	5.7	15.4	7.8	18.3	11.1	26.6	15.8	26.9	19.1
2002	12.0	2.8	7.1	3.4	18.8	9.0	22.5	11.5	26.6	14.9	28.6	18.3
2003	14.0	3.6	13.1	4.3	16.4	5.8	22.2	11.7	24.9	11.9	26.9	16.1
2004	11.4	3.6	13.6	4.9	23.2	10.2	23.9	12.6	28.4	14.7	20.9	16.3
2005	8.6	2.7	9.1	3.5	16.2	8.3	20.6	10.2	23.3	11.4	28.0	16.6
2006	11.3	4.1	17.8	9.1	16.2	9.1	20.8	11.1	26.9	16.2	26.2	17.4
2007	12.6	3.7	11.8	4.9	16.4	6.9	25.9	14.1	25.6	14.8	28.3	18.4
2008	7.6	2.7	12.2	4.1	20.7	9.5	21.1	11.3	24.9	15.5	26.7	19.0
2009	11.8	6.6	13.8	7.7	17.7	9.2	21.8	11.8	24.6	13.9	28.1	17.6
2010	14.0	5.0	13.2	5.3	21.0	10.5	23.2	13.7	25.3	15.4	26.8	16.0
2011	9.9	2.5	10.8	4.3	18.2	9.1	20.3	10.6	25.8	15.3	26.5	17.7

Year	July		August		September		October		November		December		Annual	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1995	29.8	17.5	25.6	17.0	26.8	12.2	23.7	7.6	20.1	2.3	13.0	1.2	21.6	7.9
1996	28.4	17.5	27.8	18.0	18.3	14.2	24.3	7.3	20.1	4.0	16.9	-2.0	20.0	8.3
1997	27.7	16.3	25.5	14.3	25.7	13.0	20.3	6.4	15.1	2.4	11.4	1.4	20.0	7.3
1998	29.6	23.6	29.1	20.7	26.9	17.2	23.3	12.9	20.4	17.5	17.3	5.6	21.8	12.0
1999	28.7	20.3	27.2	20.6	27.7	18.2	25.3	11.8	20.8	7.3	15.9	4.4	22.3	12.4
2000	25.8	19.9	28.9	19.8	27.1	15.8	25.8	12.3	18.1	8.4	15.8	6.2	21.6	11.8
2001	28.9	21.9	28.8	21.7	29.1	15.8	25.9	12.5	20.0	8.8	14.4	4.5	22.1	12.3
2002	30.5	20.9	27.1	20.7	25.0	11.6	24.6	10.6	20.9	7.0	15.2	5.4	21.6	11.3
2003	28.2	20.9	28.1	20.2	26.4	17.5	24.7	9.5	18.8	6.6	13.7	4.4	21.4	11.0
2004	28.7	19.9	26.5	19.4	27.5	17.7	20.2	9.8	18.3	7.7	13.5	5.1	21.3	11.8
2005	26.2	20.0	28.0	19.9	25.7	18.0	23.8	11.2	18.9	5.6	15.4	3.7	20.3	10.9
2006	26.7	21.4	27.5	20.1	25.1	17.4	22.6	12.1	18.6	7.4	13.6	5.1	21.1	12.5
2007	26.8	20.2	27.5	19.2	22.5	18.9	23.8	11.9	19.7	9.2	13.1	4.8	21.2	12.2
2008	27.2	21.7	25.8	20.2	24.3	16.4	22.0	12.5	19.7	8.2	15.9	8.1	20.7	12.4
2009	28.8	20.0	27.9	20.9	25.7	18.6	23.4	11.7	17.3	7.5	13.3	6.1	21.2	12.6
2010	24.8	19.6	25.7	21.4	24.7	18.0	22.9	12.7	19.9	9.8	14.7	4.5	21.3	12.6
2011	26.1	20.3	25.4	20.2	25.2	18.2	22.9	11.8	19.7	8.5	14.6	4.4	20.4	11.9

1.4.2 Rainfall Data: - The average rainfall for different stations in Kullu Divisions for the period from 1995 to 2011 is as follows (In millimeters)

Bajuara Station

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1995	**4.93**	**10.32**	**3.19**	**10.22**	**3.05**	**2.01**	**19.69**	**10.02**	**14.46**	**1.71**	**1.16**	**0.61**	81.37
1996	**9.66**	**7.85**	**19.75**	**5.55**	**7.25**	**8.95**	**10.30**	**10.48**	**6.04**	**4.32**	**0.00**	**1.26**	91.41
1997	**5.43**	**6.38**	**10.10**	**13.69**	**5.80**	**7.64**	**9.65**	**27.24**	**3.22**	**4.50**	**13.29**	**9.26**	116.2
1998	**2.48**	**15.16**	**22.94**	**12.46**	**7.98**	**13.64**	**5.02**	**7.24**	**25.07**	**14.93**	**1.56**	**0.00**	128.48
1999	**8.90**	**3.95**	**7.66**	**0.31**	**10.63**	**8.52**	**28.27**	**21.06**	**9.94**	**0.00**	**0.00**	**0.00**	99.24
2000	**6.58**	**10.64**	**9.26**	**4.47**	**8.53**	**17.37**	**19.41**	**4.44**	**0.74**	**0.00**	**1.53**	**0.00**	82.97
2001	**2.63**	**2.10**	**9.69**	**6.50**	**6.26**	**10.48**	**18.55**	**6.80**	**1.99**	**0.26**	**3.89**	**6.17**	75.32
2002	**7.01**	**13.88**	**9.89**	**11.18**	**0.92**	**23.96**	**2.15**	**14.38**	**8.53**	**0.86**	**0.00**	**0.64**	93.4
2003	**2.50**	**12.69**	**14.03**	**1.09**	**1.77**	**5.70**	**5.94**	**11.57**	**6.91**	**0.00**	**2.44**	**3.77**	68.41
2004	**12.17**	**3.11**	**0.00**	**6.65**	**10.19**	**3.03**	**10.87**	**15.21**	**1.32**	**15.50**	**0.50**	**2.80**	81.35
2005	**7.84**	**18.41**	**13.56**	**4.82**	**7.91**	**2.06**	**29.88**	**5.66**	**8.58**	**0.00**	**0.00**	**0.00**	98.72
2006	**11.77**	**4.20**	**8.62**	**4.22**	**4.42**	**6.21**	**12.46**	**11.98**	**7.38**	**1.76**	**1.70**	**4.74**	79.46
2007	**0.00**	**16.58**	**19.03**	**1.26**	**7.18**	**5.49**	**14.56**	**14.83**	**2.10**	**0.50**	**0.00**	**2.30**	83.83
2008	**15.29**	**4.66**	**0.36**	**6.46**	**5.08**	**8.92**	**8.20**	**23.09**	**22.54**	**2.54**	**1.16**	**3.94**	102.24
2009	**1.88**	**3.64**	**3.88**	**5.88**	**4.58**	**4.78**	**10.12**	**4.31**	**20.10**	**0.24**	**5.18**	**0.14**	64.73
2010	**1.50**	**12.60**	**4.50**	**5.50**	**8.38**	**17.09**	**26.54**	**18.60**	**12.38**	**4.46**	**1.16**	**6.58**	119.29
2011	**2.72**	**10.22**	**9.04**	**8.99**	**5.38**	**10.89**	**9.69**	**34.68**	**7.17**	**0.00**	**0.16**	**3.28**	102.22

Katrain

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1995	**36.80**	**186.20**	**118.40**	**120.40**	**30.40**	**58.00**	**164.80**	**133.60**	**237.60**	**13.20**	**3.40**	**33.40**	1136.2
1996	**59.40**	**91.20**	**165.40**	**79.30**	**46.00**	**98.20**	**112.00**	**113.60**	**67.80**	**23.00**	**0.00**	**5.00**	860.9
1997	**17.60**	**68.60**	**108.00**	**92.80**	**98.20**	**25.00**	**104.20**	**254.80**	**39.60**	**40.40**	**146.40**	**77.60**	1073.2
1998	**21.50**	**79.40**	**159.50**	**90.10**	**80.60**	**160.80**	**45.00**	**127.70**	**22.90**	**208.10**	**1.00**	**0.00**	996.6
1999	**136.90**	**66.00**	**108.80**	**10.60**	**93.00**	**67.20**	**215.50**	**283.60**	**69.40**	**0.00**	**7.00**	**0.00**	1058
2000	**64.00**	**64.80**	**139.00**	**28.80**	**47.00**	**165.00**	**261.00**	**60.70**	**37.10**	**0.00**	**64.40**	**2.20**	934
2001	**9.00**	**40.80**	**123.70**	**106.90**	**60.30**	**105.00**	**133.80**	**101.60**	**23.80**	**2.20**	**48.10**	**91.80**	847
2002	**78.70**	**102.00**	**130.60**	**117.30**	**35.00**	**95.60**	**11.60**	**194.00**	**147.80**	**11.40**	**0.40**	**3.50**	927.9
2003	**49.70**	**193.20**	**91.00**	**85.70**	**73.80**	**59.90**	**78.20**	**114.30**	**124.80**	**0.00**	**30.60**	**34.60**	935.80
2004	**132.10**	**85.60**	**0.50**	**89.00**	**71.90**	**64.10**	**93.80**	**117.80**	**37.50**	**22.42**	**14.00**	**90.00**	818.72
2005	**606.00**	**160.13**	**208.80**	**33.50**	**90.30**	**55.30**	**305.00**	**49.20**	**132.60**	**0.00**	**0.00**	**0.00**	1640.8
2006	**174.00**	**53.10**	**326.75**	**141.50**	**76.75**	**156.25**	**401.75**	**328.25**	**207.00**	**101.50**	**8.73**	**10.48**	1986.1
2007	**0.00**	**420.50**	**269.70**	**53.70**	**440.00**	**60.00**	**219.00**	**104.70**	**40.80**	**13.40**	**0.00**	**39.90**	1661.7
2008	**320.20**	**55.80**	**0.00**	**89.40**	**45.00**	**180.00**	**84.90**	**151.60**	**144.30**	**36.70**	**0.00**	**73.00**	1180.9
2009	**61.70**	**65.80**	**84.20**	**101.10**	**46.40**	**120.00**	**118.20**	**90.10**	**145.00**	**4.40**	**143.20**	**17.40**	997.5
2010	**29.40**	**148.40**	**94.10**	**90.00**	**123.10**	**173.40**	**146.90**	**240.60**	**205.40**	**47.20**	**10.80**	**65.20**	1374.5
2011	**49.70**	**231.10**	**139.90**	**156.20**	**59.50**	**118.10**	**128.80**	**360.00**	**88.60**	**1.60**	**1.20**	**19.20**	1353.9

The above table points out existence of two conspicuous rainy seasons i.e. Monsoon rains from June end to September and winter rains in January to April. The two dry spells namely pre-monsoon (May-June) and post monsoon (Oct.-Dec.) are specific and particular to the area. These spells affect plant growth and planting operations.

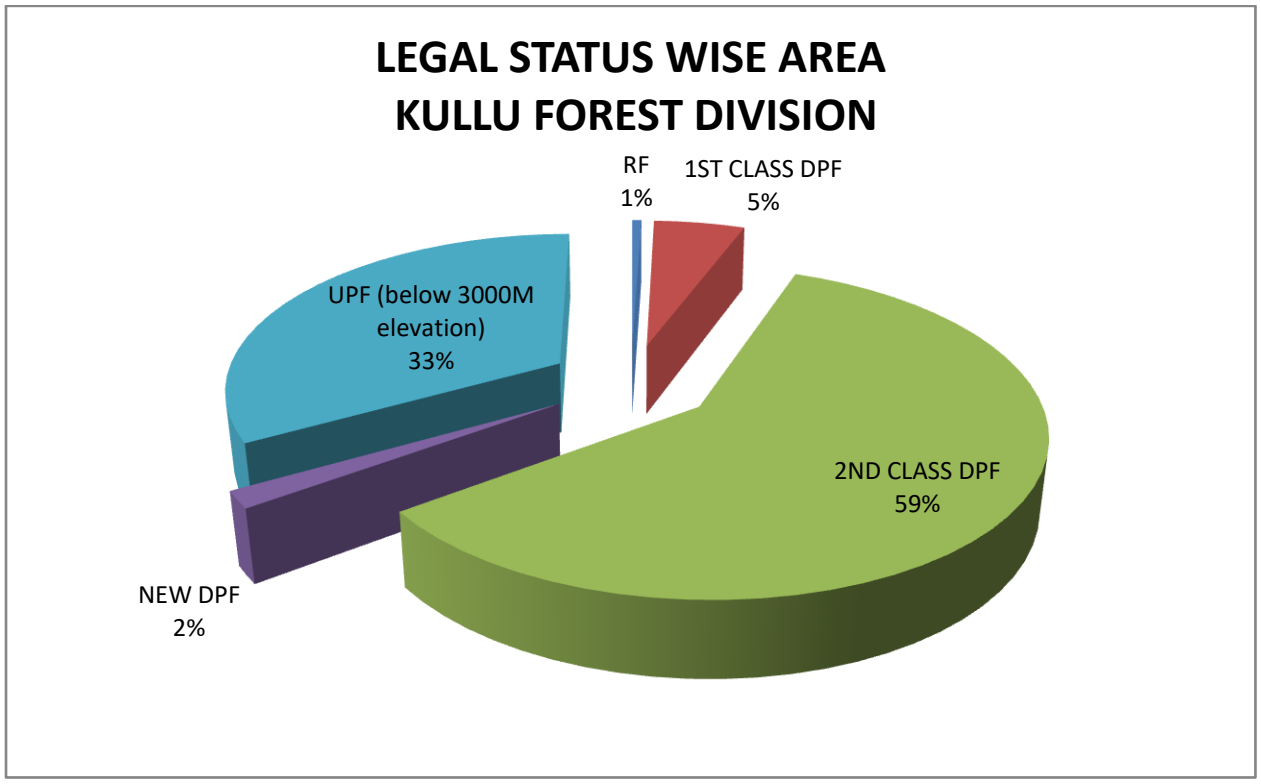
1.4.3 Snowfall Data:-Northern slopes receive heavy snow fall. Snow is found down to 1500 meters; though Bajaura, at 1200 meters, does receive only occasionally a fall. Snow above 2200 meters is long lasting and work at this height during winters is not possible. Average data of snowfall at Katrain are as Follows: - (In mm)

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1995	210.00	175.00											385
1996	375.00	25.00	100.00										500
1997	212.50	45.00									25.00	150	432.5
1998	0.50		13.50										14
1999	2.00												2
2000		86.00	5.50										91.5
2001	15.00												15
2002	3.50			2.30									5.8
2003		2.40	2.00										4.40
2004	345.00	20.00								10.00		320	695
2005	415.00	255.00											670
2006	240.00												240
2007		500.00	110.00										610
2008	42.00	110.00											152
2009													0
2010		230.00										55	285
2011	20.00	72.00	100.00									24	216

1.5 Water Supply: - The tract embraces the catchment of Beas River. Rivers, rivulets, natural's springs, brooklets and other source of water are plentiful. Drinking water is abundant. Melting of snow provides for the gurgling streams, which meander over the area. It is only during summer that some natural springs, located on exposed ridges at low elevations, dry up. During winter too, flow is reduced. However, most of the rivers and rivulets, which meander through the area, are largely perennial.

1.6 Distribution and area:-Total geographical area of the tract of Kullu Forest division is 1, 38,017.17 hectares. The area of forests according to their classification is given range wise:-

RANGE	RESERVE FOREST	IST CLASS DPF	IIND CLASS DPF	NEW DPF	UPF below 3000m elevation	TOTAL
MANALI	197.08	692.44	12519.68	457.21	1610.42	**15476.83**
NAGGAR	-	1317.71	7836.92	-	2470.245	**11624.875**
PATLIKULH	-	23.88	8258.72	-	5637.80	**13920.40**
KULLU	-	710.21	2810.43	523.71	4819.125	**8863.475**
BHUTTI	127.87	450.81	5123.18	86.00	5945.25	**11733.11**
G. TOTAL	**324.95**	**3195.05**	**36548.93**	**1066.92**	**20482.84**	**61618.69**



i) Reserve Forest: - The reserve forests situated in far flung areas, lie on steep and precipitous areas and have myths attached to them i.e. Devtas of evil spirits are said to reign there. This helps the area to remain protected. Since biotic pressure is low, these reserve forest retain their glory and tranquil environment. There are some grooves of mature trees considered sacred with reference to local deities. Lying in the vicinity, a number of these grooves had been included in the regeneration areas in Trevor's Plan. At present, these are beautiful even aged stands of good density and quality.

ii) First class demarcated protected forest: - These forests are found all over the tract. These exist at medium height, near the zone of human habitation and are honey-combed with cultivation. There is excess biotic pressure on these for fuel-wood, timber and minor forest produces. Heavy pressure of timber distribution demand of local population has caused depletion in growing stock. Deodar is the prominent species and thus these forests, are valuable both to the local inhabitants and also to the foresters. Lower Kullu region also has Chil. In the lower elevations, DPF 1st class have Kail and Deodar, while the upper elevation forests, in cooler and damper aspects, contain Fir, Spruce and broad leaved species. These Forests have well defined boundaries and their management is orientated towards increasing the area under Deodar.

iii) Second Class Protected forest:- These forest lie above the first class forests and are remote and away from habitation and lie at higher elevations. Fir and Spruce are the prominent species. Above these forests, lies the alpine and grassy meadows, which are very important for the shepherds. In the past, there was excess pressure on these forests for meeting fruit packing cases demand and this has resulted in depleting the stock. Good mature, middle aged trees were marked and felled to the remote saw millers leaving behind over mature, hollow and diseased stock. Natural regeneration too, of the Fir and Spruce is very poor because of excess biotic pressure. Erosional hazards have been noticed in these forests. Among the broad leaved species found are *Aesculus indica, Juglans regia, Rhododendron spp., Ulmus wallichiana, Taxus baccata, Betula spp.*. Kharshu Oak, *Celtis australis,* etc. It is observed that lower level of the forests have been demarcated. The IInd class protected forests usually extend upto the tree growth limit in Manali, Naggar and Kullu Ranges. Half of these forests contain a rugged, rough terrain, devoid of valuable forest vegetation but facilitating pasturage. These thatches are burdened with excessive grazing beyond their carrying capacity. Soil erosion/denudation has resulted in various places being devoid of soil cover. Oaks are found to be heavily lopped. Damage of the forests is prominent on account of buffalo grazing. Excessive unscientific exploitation of medical herbs from the thatches is observed, which is need to be checked.

iv) The Undemarcated or IIIrd class forests: - Orchards and an excess rise in the land prices have resulted in large scale encroachment in the IIIrd class forests. Nautor sanction too, was rampant in these forests, in the past. Since these forest lie near habitation, there is a maximum pressure for TD, fuel-wood and grazing. Thus, the biotic pressure from the local people is severe. Revenue authorities shy away from recording them as forest area. Since the forests are un-demarcated, only an approximate idea of their extent is available. The forest settlement wing has been busy converting and notifying many of the forested IIIrd class forests into demarcated

protected forests. Further, great afforestation drive has been launched in these forests and good Chil forests in Kullu are testimony to this. Social Forestry drive was also concentrated here.

Many of IIIrd class forests lie along a narrow belt/strips and are honey combed with the chaks (cultivations). Chaks foster encroachment and seriously jeopardize scientific management. During the 2nd World War, excess pressure for ballies was met from the IIIrd class forests.

Natural regeneration has come up where-ever there is protection from fire and grazing. Introduction of species as per choice of local villagers is mostly done in these areas in various schemes.

This is still a potential area for afforestation programmes as it addresses the need of local people. Since, there is no record or map of these areas existing; the protection of these areas is a real challenge. as forest staff is not aware of the boundaries of these forests. Keeping in view of the increasing land prices, the temptation to encroach upon the land is very high, which in turn is comparatively easy due to lack of proper records and maps of the area. Govt. must accord a very high priority to demarcate these areas and put every thing on records so that these areas can be managed properly in future.

1.7 State of Boundaries:- By and large, boundary registers showing the description, distance, forward bearing and backward bearing of boundary pillars are available in each range. Efforts to totally complete the work, to have an authentic record, matching ground reality, must be taken up on priority. Boundary pillars are in a dilapidated state in some forests. Maintenance should be given priority and the number along with direction to the next boundary pillar should be etched out in them. Many of the boundary pillars have been shifted, washed away or removed from their original position. This should be looked into on priority. Under the ODA programme, stress on maintenance of boundary pillars is being given. It is important to note that included cultivation in the demarcated protected forests have not been maintained by the forest department. These cultivations have slowly increased in area through encroachments and adjoining trees have been removed through girdling and consequent drying. Since boundaries of the private lands trespass into government lands, there is an urgent need for proper delineation. The quinquennial program of boundary pillar maintenance is not being adhered to, and needs to be strictly programmed. The field staff is also not conversant with boundaries, especially in the Fir zone. During frequent transfers, no one bothers to actually hand over the charge in the field. Many of the Forest Guards, thus, have no knowledge of their area boundaries, boundary pillars, etc. It is the need of hour to keep proper record of GPS locations of all the boundary pillars after due authentication from revenue staff so that it becomes an authentic record. To this effect, a detailed program with revenue authorities should be chalked and the process should be completed in a time bound manner.

1.8 Legal Position: - The settlement began in 1866 and carried in more or less regular manner. The Forest Act came in 1878. By that time, 11,000 acres were demarcated and rules were drawn up by Mr. Duff, the forester stationed in Kullu, under the provisions of rules 1855, which were

then in force. The first notification with a view to effecting the settlement of forests under Chapter-II of the Act was issued in July 1880. Punjab Govt. vide letter No. 511 dt. 28/11/1993 ordered that the work of forests were to be treated as "Protected" with only some small and special areas being constituted as "Reserves". Soon after the issue of order, work was commenced by Mr. Alexander Anderson, the Assistant Commissioner, assisted by Mr. Gisborne Smith, the local forester. Settlement report was submitted in June 1886. The complication of the great dependence of the people on the forest was sorted out. With the appointment of Sir Dennis Fitzpatrick as lieutenant government in 1890, the proposed "Reserves" were gazetted as such in 1895. The protected forests were notified in 1896, after considerable alteration had been made in the record of rights and in their proposed rules. In Kullu, government as recorded owner of the waste land had a free hand than in Kangra. The bulk of the wasteland in Kullu has therefore been declared to be protected forest, under one of the three kinds:-

- First class demarcated protected forest.
- Second class demarcated protected forest.
- Undemarcated protected forest.

The extent of rights of users and the amount of regulations necessary, differ for different classes. The notifications declaring these three classes of forests being protected are Nos. 280, 281 and 282 of 1st June, 1896. There are ancillary notifications under sections 29, 31, 51 and 75(C) of Act-VII of 1878. The final result of the settlement was the placing of the "reserves" under chapter –II of the Forest Act, 1927 while the others were placed under Chapter-IV. In the first class DPFs, the rights of the users are less extensive and more clearly defined as compared to rights in second class DPFs. The IInd class forests differ from IIIrd class forests, in having the grazing rights in them more clearly defined, and also in being intended to be preserved from being broken up for cultivation.

1.9 Rights and Concessions: - The Forest Settlement has linked/appended all right of concession to owners of agricultural lands and kept bereft of any rights, those that have no agricultural lands. Government, on receipt of the Garbett Enquiry Report, experimented with a changed definition of the right holder, from the one given under the Anderson's Settlement Report. However, realizing the perils, it contained for the very existence of the forests, the government has at present stuck to the original definition of a right holder, under Notification No. 4117 dt. 26th April, 1948. The condition No. 10 of the general condition prescribed in this behalf, expresses the desired concern and restricts the great advantage enjoyed by such agricultural land owners, who merely owned only small bits of land but enjoyed all the rights to the extent that the existence of the forest were threatened . It goes as follows- "All rights admitted are subject to the limitation that they may not be exercised to an extent that may endanger the existence of forest over which the rights are admitted. If the exercise of rights which is admitted would endanger the existence of the forest, a limitation must be placed on the

exercise of those rights, and in that case, the extent of the rights of right holders interest, shall be proportionate to the revenue assessed in respect of the land to which the light is appendant."

1.9.1 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 this Western Himalayan region.

Timber is supplied to right holders at concessional rates for the construction and repair of their houses and also for building meant for non-commercial purposes. Fallen/uprooted trees of Kail, Fir and Chil can be removed free of charge. The timber must not be disposed off to any one and must be used in the Kothi in which right holder pays the land revenue except under the express orders of Divisional Forest Officer, on merits, as provided under Government orders on the Garbett Report.

A right holder as per Kullu Settlement is "a person to whom right has been admitted in the records of any forests." In Kullu, only "Salam-Khata" holder is entitled for timber distribution and not persons with fractional holdings known as 'Min Khata' holders. The grant is not tenable for construction of palatial houses disproportional to the land holdings, commercial purpose and property for hire, etc. The rights are to be exercised only for bonafide, domestic and agricultural purposes of the right holders. As per para-137 of the Kullu Settlement, Deodar is to be supplied only for doors and windows according to the prevailing style.

Timber Distribution rights had become most contentious. Demand has increased manifold for timber, primarily Deodar, because of fragmentation of estates, and consequently of rights through partition at inheritance. Joint families are giving way to nuclear families who want to stay in separate houses. Further, the land price have risen sharply which too in its wake, brought about breaking up of and holding and rights. Increasing prosperity in the region can be seen in the large with well timbered houses and constructions of hotels for the expanding tourist industry. Thus, there has been a significant demand for timber for construction. What had become obscured in the enlightened humane view of timber distribution, meeting the basic requirement of local people? Many locals had covertly been selling all or a part of timber allocated, rather than using it for what is intended for. This way, they supplement household incomes. There is, thus, always a temptation to fell and remove more trees than authorized. Keeping all these facts in mind and on the order of Hon'ble High Court, Govt. of HP has now come out with new TD policy. The state has recently notified **H.P. Forest (Timber Distribution to Right Holders) Rules, 2010** for the rationalization of grant of timber. The Facts and Figures thereof are given below:

a. 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.

- These rules are 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) on one hand and are People centered as these provide timber on concessional rates.

- 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.

b. Entitlement:-

- 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.

- Only head of family as per revenue records is entitled to TD

- 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 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.

c. 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:

d. 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.

e. **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.

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

Rates of timber granted to right holders

Sr. No.	**All Species**	**Rate per tree**
1	Right Holders above poverty line.	30% of the rates at which timber is sold by Himachal Pradesh Development Forest Corporation Ltd. Commercially.

2	Right Holders below poverty line.	10% of the rates at which timber is sold by Himachal Pradesh Development Forest Corporation Ltd. Commercially
3	Right Holders suffering from natural calamities.	Free of cost.

g. 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.

h. 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.

i. 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.

j. 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 2011-12 were as under:

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***	
				For Right Holders above Poverty line	***For Right Holders below Poverty line***
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

k. 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.

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 Panchayat to the FG which will pass through the various channels of the Forest Deptt. and the applicants would get their converted TD at the earmarked depots between September to December.

1.9.2 Grazing: - Along with the timber rights the other rights which are allowed under the Anderson Settlement Report are as follow:-

a. Grazing of cattle, sheep and goats
b. Grass and leaves for fodder
c. Manure.

d. Agricultural and domestic implements.
e. Fuel torches, charcoal and wood cremation.

Amongst above rights, grazing right need elaboration being very important from perspective of forest health and regeneration.

a. Grazing of cattle, sheep and goats:

Grassland management is almost non existent in this division although problem of grazing is very important and need to be tackled. Anderson while recording grazing rights did not do so lucidly. According to L. Dane quoted in Anderson's, the following statement was made about the effects of live stock on natural regeneration – "Grazing does not do much harm as it is generally supposed to do. Throughout the valley where felling has been put to a stop and the situation is in any way favorable, the young growth of Kail specially, is coming up freely and many places which have now been left out of the demarcation will in few years are promising forests. And this occurs too, where the most extensive grazing rights exist.

The Settlement considers that a right holder may graze the number of cattle, sheep and goats necessary for his bonafide agriculture and domestic requirements. The right holders however, keep very large flocks of cattle, much more than the actual requirement. Increased heavy incidence of grazing is thus a severe strain on the forests. Amongst the most important forest grazing resources are high altitude Spruce and Silver Fir areas, with relatively open stand of mature trees. The Natural regeneration is being adversely affected because of heavy grazing intensity. Incident of grazing is highest over the IIIrd class forests, near the villages, and thus has led to great degradation. The alpine pasture/thaches have thus come under terrible strain both of the local and the migratory grazers.

In the present context, this statement can not be substantiated. Ever increasing cattle, human population coupled with need of land for livelihood (agriculture & horticulture) housing and infrastructure has put tremendous pressure on forests and wastelands. Therefore, it is wrong to say that grazing does not harm the forest'. However, trees come up notwithstanding the grazing and that grazing by cows and bullocks at any rate in moderation does no great damage. These animals do not touch the trees, if there is anything else for them to eat. Presently major problem has been posed by the stray cattle which are swelling in number and there exist no go-sadan or refuse to these animals. Their number is so high that most of the damage is done through trampling. All regeneration efforts are ruined by these stray animals.

In the high lying Fir Forest, having thick layer of un-decomposed humus, light grazing can be beneficial for natural regeneration but heavy grazing incidence is taking its toll resulting in failure of natural as well as artificial regeneration efforts.

Sheep and goats grazing: - Sheep and goats are kept for both meat and fiber production. The goats are also milked. Wool is used domestically for local spinning and weaving, for clothing, shawls, carpets etc. Goat hair is used for weaving, commonly for heavy clothing, bags

and rugs. There are two types of graziers that graze their flocks in high level pasture/thaches and forests of Kullu Divisions.

- Local inhabitants.
- Migratory graziers who come during summer and leave before the onset of winter.

Routes of entry are fixed and these graziers are permitted to enter Kullu via Sainj, Bhallan and Dukhi passes along Raghupur ridge. They are not allowed to enter before 28 May and stay beyond 5th October (Para 176 of the Settlement). The migratory graziers cannot halt for more than one night at one place and travel less than 8 Km per day. They are not allowed to graze flocks in the closed areas en-route.
Rates of grazing are:-

a) For local inhabitant in their own Kothi:-
Sheep @ Rs. 3/12 per hundred
Goat @ Rs. 4/69 per hundred
b) For local inhabitant grazing outside their own Kothi:-
Rs. 3/12 per hundred extra in addition to (a) above both for Sheep and Goat
c) For outside graziers
Sheep @Rs. 0.19 paisa per head
Goat @ Rs. 0.37 per head

Cattle, buffaloes, sheep and goats together constitute over 95% of the live stock unit population in Kullu District. Ratio of sheep to goat is nearly 2.4:1 in Kullu tract. It is estimated that probably half of the sheep and goat move seasonally to find grazing lands. Migration pattern vary, depending upon the home base location of the flocks. Some graziers have rights to local grazing, while other without rights, obtain permit from the Forest Department as well as obtaining agreement of local communities and paying local grazing fees on village or private grazing land. Migration routes and camping places are regulated by Forest Department. Complaints from the local land owners, urban communities and road users in the town along the route are increasing.
A survey of records from a limited number of check points observed in May/June 1989, suggest that perhaps 1,00,000 goats and 1,40,000 sheep move to summer grazing in Lahaul and Spiti on the route through Kullu and Rohtang Pass.

Buffalo Grazing: - Migratory buffaloes are herded by the gujjars who follow seasonal pattern of movement. These animals would number 1500 to 2000 as indicated by the record of permits and fee paid to the forest department since 1940, though buffalo is not permitted in the settlement. The DFOs, at his own discretion used to allow a certain number of buffaloes to graze on permits in the un-demarcated protected forests/ third class forest where they could do little damage. During summer time, a limited number were allowed to graze in the thaches of the IInd

class forests. Grazing of 55 buffaloes was allowed by issuing a notification no. 912/Ft. dated 29/03/1940 and out of this, 30 buffaloes were permitted in main Beas valley forests. The numbers kept increasing over the years, remaining steady at 85 from 1954 to 1970. During 1971, at the instance of the Hon'ble Forest Minister, regular permits started being issued to the rahdari gujjars for such forest which could withstand the buffalo grazing. During 1971-72, only 250 buffaloes were recorded. This rose to 2020 buffaloes during 1978-79. It must also be noted that the local people /panchayats are in league with migratory graziers for pecuniary benefit. They charge fee for excess animals/buffaloes from the gujjars and if checked, declare the excess numbers as their own. Present figure of buffalo

Grazing fee charged is Rs. 8 to Rs. 10/- per buffalo from migratory gujjars while Rs. 1/- per buffalo is charged from the locals. The Deputy Commissioner too under rule 8.1 of the Punjab Forest Manual (Forest Rules of Kullu) can allow gujjars to bring their buffaloes into Kullu District. This was called rahdari and it is not covered under any statutory powers. This was primarily intended to increase the milk supply but has led to great strain on the forests. Since private holding have reduced, illicit grazing in government forest/thaches continue under rahdari permit in connivance with local panchayats and laxity on the part of the forest department officials to check them. Many Migratory gujjars have settled in Hurla and Lower Kullu and as such have acquired rights.

1.9.3 Lopping:-Leaving aside Walnut, Box-wood and ash, all other broad leaved trees are allowed to be lopped for fodder, manure, fuel and manufacture of charcoal. In the IIIrd class forests, Kail lopping is permissible while the lopping of Spruce and Silver Fir is permissible in all the forests for the maintenance of cattle. Oaks are lopped without restriction. Shisham and Alder is lopped for manure only. Ruthless lopping has done considerable damage to the forests. What is noticed is that evergreen fodder trees i.e. *Quercus species* are lopped for winter fodder at mid altitude zone, while deciduous trees like *Robinia pseudoacacia, Celtis australis, Grewia optiva, Morus alba* and some *Ficus spp., Albizzia spp.,* etc. near villages and IIIrd class forests are lopped for material, at mid to high altitude. Spruce and Silver Fir are lopped for bedding material, at mid to high altitudes and fodder tree lopping is done in DPFs close to settlements. Damaging pressure on the Spruce and Silver Fir trees is on rise which are lopped to the extent of removing of all lateral branches, upto the top 1-2 meters of the trees. This affects the timber quality.

1.9.4 Fruit packing cases: - Horticulture has flourished in Kullu tracts. Prior to 1982-83, standing trees were marked to the saw millers for conversions into packing trees for further sale to the orchardists. From 1982-83 onwards, trees were marked and handed over to the HPSFC Ltd. for conversion into geltus and supply to the saw-millers from their depots for further conversion into packing cases and supply to the fruit growers. Next to T.D., the demand for packing cases has put an additional burden on the forests.

1.9.5 Charcoal: - Some malformed and diseased trees and also felling refuse can be granted free to the right holders for marking charcoal.

1.9.6 Slate quarries: - There are some quarries recorded in the revenue records and from here the right holders can remove stones and slates free of charge for the construction and repair of their houses. The non-right holders can obtain the stones and slates against the fee prescribed. Territorial DFOs must look into the slate quarry issue from the point of view of the provisions of the Forest Conversion Act, 1980.

1.9.7 Leaf Mould: - Leaf moulds called "Shur' can be collected by the right holders locally from the forests except those forests that are under regeneration. The practice of removal of shur can be harmful to the forest vegetation, on account of the continual removal of soil cover, as leaf mould is scrapped with an iron prong. Aggarwal, in his Working Plan, has mentioned that the increment of trees may be prejudiced upto 53%.

1.9.8 Phat Burning: - Phats or grazing grounds are burnt annually during winters. This is done on the false belief of the people that it would help to increase the productivity and quality of the grass. It is felt that old tussocks and litter would be stimulated. What really happens is that the inferior quality grasses multiply and eliminate the tender and nutritious grasses. Phats are to be burnt in the presence of the local Forest Guard, during the month of January and February. In practice, however, there is no adherence to any rules and this phat burning is done as and when villagers decide. The result is that the unchecked burning continuously poses a fire hazard to the adjoining forests and many times great devastation results. The Forest Department that is empowered to regulate the said practice is not able to control it. Controlled burning if done scientifically can check summer fires, control bush growth and help to maintain grasslands. Uncontrolled and at time deliberate burning can be quite harmful to our pine plantations. Farmers and livestock people, however feel that the extent, frequency and intensity of phat burning has reduced as compared to the past, perhaps due to a reduced accumulation of material to burn under heavier grazing pressures. The only rationalization for the continuance of phat burning is the requirement of controlling undesirable woody vegetation. Phat burning should thus be combined with agreed seasonal closure and rotational grazing.

1.10 Minor Forest Produce: - The right holders are allowed to remove roots, flowers, grass etc. free from the Forests, wherein rights have been recorded. Right to grass in the DPFs. is subject to control if it is felt that the same is detrimental to forest vegetation. Appendix 2 gives a detailed discussion regarding Non-timber forest produce earlier called minor forest produce. The powers to issue export permit has been given to Panchayats and there is hardly any control and record available now in divisions.

1.11 Nautors: - Nautors granted in the past have caused great problems to the forest department as they have encouraged encroachment of the government land. Nautors were sanctioned by Deputy Commissioner, through issue of a patta in the IIIrd class forest of a particular Kothi of which a person is resident. Many people are in possession of land which they term as "nautors" even though regular patta has not been given to them. There are many others who have encroached upon prime government land through "transfer" of their original nautor site. The situation is chaotic and even land settlement which is in progress is unable to redeem the situation. The detail of the area sanctioned as nautor from 1964-65 to 1980-81 is given below:-

Year	**No. of nautor case sanctioned**	**Area sanctioned Bigha**	**Biswa**
1964-65	1	30	-
1965-66	63	175	07
1966-67	116	349	18
1967-68	82	296	10
1968-69	14	58	12
1969-70	1	5	-
1969-70 to 74-75	No grant		
1975-76	1522	4474	-
1976-77	1519	4406	-
1977-78	197	226	-
1978-79	142	310	-
1979-80	396	1130	11
1980-81	158	432	01
	Total = 3557	**11894**	**02**

CHAPTER-II

FLORA AND FAUNA

CHAPTER-IIA (FOREST FLORA)

2.1 TREES: The important tree species occurring in Kullu Forest Division are Deodar (*Cedrus deodara*), Kail (*Pinus wallichiana*), Spruce (*Picea smithiana*), Fir (*Abies pindrow*), Ban Oak (*Quercus leucotrichophora*), Mohru oak (*Quercus dilatata*), Kharshu oak (*Quercus semecarpifolia*), Rakhal (*Taxus wallichiana*). Besides a number of other trees are found in the tract, list of which is given in glossary. A brief summary of description, composition and condition of these important species is given here under:-

1. **Deodar (*Cedrus deodara)***: Deodar is found mostly mixed with Kail in this division. This along with Kail occupies about 2436.29 hectare of the forest area but in mixture it is dominated by Kail (40:60). Regeneration is moderate due to biotic factors. The overall site quality of Deodar trees is I/II in this division.
2. **Kail (*Pinus wallichiana*)**: It is found in mixture with Deodar as explained above. The overall site quality of Kail trees is I/II in this division. Due to selective cutting of deodar for TD, proportion of Kail species has increased.
3. **Fir (*Abies pindrow*):** It is found in mixture with Spruce with rarely pure stands of Fir. It generally occurs on higher elevations on moist locations and along Nalas. Silver Fir predominates in higher reaches/ moist localities whereas Spruce is available lower down. In cooler localities and depressions, Silver Fir descends down to 2500 meters whereas along spurs and warmer regions, Spruce penetrates higher ups. The area under Fir/Spruce Working Circle is about 11285.63 Hectare.
4. **Spruce *(Picea smithiana*):** It occurs in mixture with Fir as explained above. It is managed under Fir/spruce Working Circle. Both Fir and spruce were recklessly cut for meeting demand for packing cases before 1990 and scar of those fellings are still evident in these forests.
5. **Ban Oak (*Quercus leucotrichophora*):** It is a protected species of the state and no green felling is allowed and is subject to heavy lopping near habitations. Amongst the broadleaved species, Ban Oak is most common. Regeneration of Ban oak is a problem. It is managed under Broad leave working circle.
6. **Mohru oak (*Quercus dilatata*):** It is an associate of Deodar-Kail and Spruce forests and is found in lesser proportion in the forests. Like Ban Oak, it is also a protected species. It is a very good fodder and local people use and manage these trees near the habitations.
7. **Kharshu oak (*Quercus semecarpifolia*):** This oak is found at very high elevation confining to the upper reaches. It is a protected species and is being maintained as such as natural reserve.

8. **Rakhal (*Taxus wallichiana*):** This is commonly called yew, occurs as short, gnarled, swiftly - tapering tree with height less then 40 ft. – 50 ft. It is found scattered through some of the Fir/Spruce forests. Its leaves are highly valued for taxol content. Govt. has completely banned its felling and extraction of leaves.

2.2 Composition and Condition of the crop:-

The Forests of Kullu Division lie in a terrain which in general, varies from being moderately steep to precipitous, except from some of the flatter bench land and adjacent hills in the main Beas River Valley and its larger tributaries. The main forests lie between the elevations of about 5000 feet to 10500 feet above mean sea level. Varied configuration of the group, varied climate and vegetation characterize it. A striking feature of this terrain is that there is a very marked relationship between the human habitation and the forests. The main area of forests occur on the slopes with northerly aspect, where the climate is moist and cool, while the human habitation mainly occurs along the valley bottoms on the bench lands or up the mountain sides, which have a South-Eastern aspect, where the climate is relatively warm and dry, favorable for crops, the two pines, Kail and Chil and the hardwood, Kharshu Oak are the main species favoring the warmer slopes with a Southern aspect.. The overall pattern is like a complex patchwork quilt made up of smaller blocks of Fir, Spruce, Kail or Chil Forests and their admixtures. Between 7000 feet to 8000 feet above mean sea level is called the "Tension Belt", a zone where Deodar, Kail, Fir and Spruce compete for survival. Interspersed between these smaller blocks of forests, are many areas of cultivation on productive forest areas and patches of hardwoods.

The forest boundaries which were fairly straight and regular are now being rapidly pushed back on account of two main reasons. At the lower altitude, the villages and their cultivated areas are expanding into the adjacent forests (both in protected and unprotected forests) through lopping of Fir, Spruce and Kail trees, next to the villages. This eventually causes dying of these lopped trees. The second reason which is producing an overall shrinkage in the forest area is the disastrous effect of uncontrolled grazing of a huge number of cows, sheep and goats in the coniferous forests, which eliminates any new coniferous regeneration of the forest's flora, as the grazing herds move upwards through the forests to the alpine pastures. The forests on the higher ridges and adjoining alpine pastures are also being subjected to indiscriminate lopping and serious on reversible action of hundreds of animal hoofs which harden the once porous soil to a hard water –resistant surface, causing fast run-off of water during heavy rains. This, in turn, brings about severe soil erosion lower down the slopes. There is a need for retrospection and immediate firm action, if the present forest area is to be protected/ maintained.

The distribution of several coniferous species found in the tract, conform (to a few exceptions), to fairly regular altitudinal stratifications:

Botanical Name	Common Name	Approx.Altitudinal Range (in Feet above M.S.L.)
1. Pinus roxburghii	Chir or Chil	3000 ft. -7000 ft.
2. Cedrus deodara	Deodar	6000 ft- 8500 ft.
3. Pinus wallichiana	Kail	6000 ft.-10000 ft.
4. Picea smithiana	Spruce	7500ft.- 10500 ft.
5. Abies pindrow	Silver Fir	7500 ft.- 11000 ft.

The common and important hardwoods found in the Kullu Forest Division are as follows:-

Botanical Name	Common Name	Approx.Altitudinal Range (Feet above M.S.L.)
1. Aesculus indica	Horse Chestnut	7000 ft. -10000 ft.
2. Quercus leucotrichophora	Ban Oak	3000 ft. – 5500 ft.
3.Quercus dilatata	Mohru Oak	5000 ft. - 7500 ft.
4. Quercus semecarpifolia	Kharshu Oak	8000 ft. – 11000 ft.
5. Betula utilis	Birch	9000 ft. – 12000 ft.
6. Juglans regia	Walnut	6000 ft. – 10000 ft.
7. Prunus padus	Bird-Cherry	6000 ft. – 10000 ft.
8. Acer caesium	Maple	6000 ft. – 10000 ft.
9. Alnus nitida	Alder	4000 ft. – 7000 ft.

At 7000 ft. – 8000 ft. there is a competition for dominance between Fir, Spruce, Deodar and Kail. Both pure and mixed stand of coniferous species exist. Chir and Kail are more light demanders than Fir and Spruce and lie on the slopes with southerly exposures. Chir Pine

which is an intense light demander is invariably found growing on other aspects as well. Deodar normally grows on soil, containing granite, gneiss, or shale and avoids badly drained soils and stiff clays. Pure Deodar stands are found, also as mixture with Blue Pine, Spruce and Silver Fir. Kharshu Oak found in Fir/ Spruce forest is an important firewood species. Pure Kharshu Oak stands are almost invariably found on the slopes with southerly exposure, although Kharshu Oak is commonly found mixed with Fir/Spruce on the northern slopes, where it is often attains a good height and a clear bole. Birch exists at highest altitude, while Walnut, Horse chestnut, Bird Cherry and Maples are found scattered through the forest. Homogeneous stands are not there. The species are normally found in or close to the damp nalas or stream beds. The Alder occurs in pure stands in some of the river beds, especially in the main Beas valley between Kullu and Manali.

Flowers brighten up the landscape. Primulas, Balsams, Anemones, Poppies, *Ranunculus*, Wild Strawberry, *Geranium*, *Potentilla* bloom and enchant in Kullu areas- "The Valley of Gods".

The Forests of this division can be classified into the following types, as per "a Revised Survey of the forest types of India" by H.G. Champion and Seth,1964 -:

Champion's classification of Forest types

2.2.1 GROUP 9 – Sub Tropical Pine Forest:

(i) 9/C.1. b Himalayan Chil Pine Forests.
(ii) 9/C.1. /D.S.I. Himalayan Sub-Tropical Scrub Forests.

2.2.2 GROUP 10-Sub Tropical Dry Evergreen Forests:-

(i) 10/C.1.a *Olea cuspidata* Scrub Forests.

2.2.3 GROUP 12- Himalayan Moist Temperate Forests:-

(i) 12/C.1.a Ban Oak Forests.
(ii) 12/C.1.b. Mohru Oak (*Quercus himalayana*) Forests
(iii) 12/C1.c. Moist Deodar Forest.
(iv) 12/C.1.d. Western Mixed Coniferous Forests.
(v) 12/C i.e. Moist Temperate Deciduous Forests.
(vi) 12/C.1.f Low level Blue Pine Forests.
(vii) 12/C.2.a Kharshu Oak Forests.
(viii) 12/C.2.b Western Himalayan Upper Oak Forests.
(ix) 12/D.S.1. Montane Bamboo brakes.
(x) 12/D.S.2. Himalayan Temperate Park Lands.

(xi) 12/ D.S.3. Himalayan Temperate pastures.

(xii) 12/S.1. Alder (*Alnus nitida*) Forests.

2.2.4 GROUP-14-Sub-Alpine forests:-

i. 14/C.1.a Western Himalayan Sub-Alpine Fir Forests.

ii. 14/C.1.b Western Himalayan Sub-Alpine Birch Fir Forests.

iii. 14/D.S.1 Sub-Alpine pastures.

2.2.5 GROUP-15-Moist Alpine Scrub:-

i. 15/C.1. Birch Rhododendron Scrub Forests.

ii. 15/E/1. Dwarf Rhododendron Scrub Forests.

iii. 15/E.2. Dwarf Juniper Scrubs.

iv. 15/C.3. Alpine pastures.

2.2.1 GROUP 9 – Sub Tropical Pine Forest:

(i) 9/C.1 b Himalayan Chil Pine Forest: - This type exists in southern aspect on degraded soils along river Beas mainly of plantation origin. The crop is irregular and patchy. Deodar and Kail is being planted now on the demand of local people so as to replace Chil. This can be seen Maharaja III, Mandalgarh III and Sari III; Chir is doing well on quartzite. Chir is ideal for dry and rocky soil and extend upto 1800 meters. In the middle canopy are found *Pistacia integerrima, Lyonia ovalifolia, Symplocos crataegoides and Pyrus pashia, Sapindus mukorossi,* etc. The undergrowth comprises of *Rhus parviflora, Rhus cotinus, Berberis aristata, Prinsepia odorum, Plectranthus spp* .

(ii) 9/C.1. /D.S.I. Himalayan Sub. Tropical Scrub Forests: - Under this type, comes the extensive grassy areas which serve as pasture lands scattered within the Chil areas. Fires are responsible for making the soil shallow and dry. A few Chil trees along with some board leaved trees exist in these forests, while in the undergrowth are found *Berberis spp., Rubus spp.,* and *Plectranthus rugosus.*

2.2.2 GROUP 10-Sub Tropical Dry Evergreen Forests:-

(i) 10/C.1.a *Olea cuspidata* Scrub Forests: - Along the banks of Beas River *Olea cuspidata* exists naturally as a main species, occurring in groves with Punica *granatum* as an associate.

2.2.3 GROUP 12- Himalayan Moist Temperate Forests:-

(i)12/C.1.a Ban Oak Forests:- *Quercus leucotrichophora* exists in abundance between 1500 meters to 2300 meters elevation in patches scattered all over the tract. Ban Oak is a climax type of vegetation. Associates are *Rhododendron arboreum and Lyonia ovalifolia*. Moist areas contains *Litsea umbrosa, , Aesculus indica* while the under growth consists of *Berberis lycium, Desmodium tiliaefolium, Rubus ellipticus, Rubus nieveus, Lonicera*

quinquelocularis, Viburnum cotinifolium, Myrsine africana, Plectranthus strictus, Salvia glutinosa and various grasses and ferns. Climbers such as *Vitis himalayana, Rosa moschata, Hedera helix and Smilax parvifilia* are also there. Forests occurring in this type are generally mature and devoid on natural regeneration

(ii) 12/C.1.b. Mohru Oak (*Quercus himalayana*) Forests: - Pure Forest of *Quercus himalayana* does not exist in this division. The species occur in patches in the Deodar zone. Uneven aged natural regeneration is observed at some places. Mohru Oak is heavily lopped for fuel-wood/charcoal and fodder. Associate species are Spruce, Deodar and Kail. Undergrowth consists of *Rosa macrophylla, Rubus spp; Viburnum spp; Berberis aristata, Indigofera gerardiana, Daphne cannabina, Thalictrum foliolosum, Galium aparine* and various ferns.

(iii) 12/C1.c. Moist Deodar Forest:- This type of forest lies at an elevation of 1500 meters and 2630 meters on Northern slopes, it grows even lower. While on the hotter southern slopes, it reaches higher along the spurs. Soil formed on account of disintegration of granite is ideally suited for Deodar, as it can be seen at Manali. Pure Deodar crop exists all over the tract in the lower zone, while the upper reaches contain Deodar in mixture with Kail and Spruce. The under storey comprises of *Quercus himalayana, Quercus leucotrichophora, Rhododendron arboreum, Lyonia ovalifolia Populus ciliata, Carpinus faginea, Ulmus wallichiana, Cedrela serrata, Juglans regia, Aesculus indica, Celtis australis, Cornus macrophylla, Prunus padus, Pyrus pashia, Buxus sempervirens, etc.* In the undergrowth are found *Indigoferra spp, Desmodium spp., Viburnum spp., Lonicera spp., Rubus spp., Berberis spp. and Spiraea spp., Rosa moschata, Wikstroemia cansecens and Elaegnus umbellata, Fragaria spp., Viola anaphalis, Geranium spp; Galium spp; Salvia glutinosa, Ainsilaea aptera, Thymus serpyllum,* etc. beautify the ground flora. Main climbers are *Vitis semicordata, Hedera helix* and *Clematis montana*. Leaving aside artificial plantations, the crop is uneven aged with preponderance of pole to middle aged trees. The attitudinal zone suits Deodar and therefore regeneration is proper biotic pressure and local demand renders the forest under stocked. Quality is 1/II

(iv) 12/C.1.d. Western Mixed Coniferous Forests: - This is a common type in the tract. Though pure stands of Spruce also exist, this species is mainly found in mixture with Deodar, Kail and Silver Fir. These types of forests lie at an elevation of 2300 to 3200 meters above the Deodar zone. In the lower reaches, Spruce predominates associated with Deodar on spurs and steep ground. Kail is confined to hot southern slopes and ridges with shallow slopes. In the central portion of the zone, pure stands of Spruce with Silver Fir occupying the upper most parts can be seen. In the topmost portion, Silver Fir dominates relegating Spruce to the second place along with Kharshu Oak. The Broadleaved species found are Oaks, (i.e. *Quercus leucotrichophora, Quercus himalayana*) while the species found in the depressions and along nallahs are *Prunus padus, Acer spp. Aesculus indica, Juglans regia, Corylus colurna*, etc. In Matikochar forests in Kullu range, *Taxus baccata* forms a dense under-storey. Undergrowth comprises of *Viburnum spp., Cotoneaster bacillaris. Ilex dipyrena, Staphylea emodi, Lonicera*

spp., Strobilanthes, Impatiens and Dispascus, Polygonatum spp., Valeriana, Fragaria, Anemone, Ferns and grasses. This zone contains irregular crop having middle aged to mature trees. Except for Spruce, the regeneration in Fir is scantly deficient.

(v) 12/C.1.e. Moist Temperate Deciduous Forests: - These types of forests are found at an elevation ranging from 1800 meters to 3200 meters. These are distributed all over the tract, confined to moist and damp locations along nallahs and depressions, unsuitable for conifers. Top canopy consists of *Aesculus indica, Acer caesium, Acer pictum, Carpinus spp., Ulmus wallichiana, Betula spp., Juglans regia, Prunus padus, Celtis australis, Fraxinus floribunda, Morus serrata and Populus ciliata*. The under storey has *Corylus colurna, Rhus punjabensis, Taxus baccata, Euonymus lacerus, Lyonia ovalifolia,* etc. These species are found singly or in groups and very often in groves. Under growth and ground flora is like type 12/C.1.d and 12/C.1.e. Under broad-leaved at places, some natural regeneration of Spruce and Fir is coming up. Lopping in broad-leaved is a menace. Ir-repairable damage is done to *Juglans regia* when its bark is extracted illicitly.

(vi) 12/C.1.f Low level Blue Pine Forests: - With *Pinus wallichiana* as the principal species, this type is found all over the tract at elevation of 1540 meters to 2630 meters. Kail, the prolific colonizer, invaded those areas where fires had destroyed the pre-existing species or where blanks were created by avalanches and land slides. Crop is comparatively even aged and ranges from pole to middle aged trees. Kandi forest and most of the IIIrd class forests in Kullu & Bhutti ranges have been affected by fires. Natural succession is clearly visible, as Deodar has started replacing Kail in the lower portion, while Spruce and Fir are coming in the higher reaches of the zone. Under storey is same as found under 12/C.1.c moist Deodar Forests.

. **(vii) 12/C.2.a Kharshu Oak Forest: -** These occur in Kullu at an elevation ranging from 2700 to 3500 meters. On the colder moist northern locations, Kharshu is found low down in mixture with Silver Fir and Spruce, forming an under storey while in the upper reaches it is found in the mixture with the *Rhododendrons* and *Betulas*. Natural regeneration is proper and all age classes are represented. In the central portion of this type of forest, Kharshu Oak occurs pure. Lopping of Kharshu by migratory graziers is very common. Under-storey comprises of *Taxus baccata, Rhododendron arboreum, Cotoneaster bacillaris, Viburnum cotinifolium, Skimmia laureola, Prunus padus, Betula alnoides, Salix spp., Rosa macrophylla*. Middle canopy has *Betula alnoides, Betula utilis, Corylus colurna and Acer spp.*

(viii) 12/C.2.b Western Himalayan Upper Oak Forests:- This is quite unique, two storied high forest which occurs in all ranges at elevation ranging from 2890 meters to 3400 meters. Silver Fir occurs over *Quercus semecarpifolia* and other evergreen and deciduous trees i.e. *Rhododendron spp., Cotoneaster bacillaris, Pyrus lanata, Prunus padus, Salix elegans and Rosa macrophylla.* Middle canopy has *Betula alnoides, Betula utilis, Corylus colurna* and *Acer spp.*

(ix) 12/D.S.1. Montane Bamboo brakes: - *Arundinaria falcata* is confined to lower zone and *Arundinaria spathiflora* which exists higher up in the zone occurs as under growth in the mixed coniferous, moist Deodar and Ban Oak forests. These two bamboo species are of great utility to villagers to occupy moist locations in northern aspect forming thickest and not allowing any other species to come under it.

(x) 12/D.S.2. Himalayan Temperate Park Lands: - This type of glade lies confined to the altitudinal zone of Silver Fir and *Quercus semecarpifolia*. Along with the grass, lie sporadic trees of Silver Fir, *Prunus padus, Acer spp., Quercus semecarpifolia*. Clumps of *Cotonester bacillaris, Viburnum cotinifolium* and *Berberis spp.,* are also found. This grassland is heavily grazed and is covered with manure. This accounts for the luxuriant growth of various flowers which are real beauty to such thaches. Ground flora consist of *Anemone, Potentilla, Fragaria, Viola, Delphinium, Primula , Anaphilis, Trifolium, Ranunculus spp., Balsam, Dipsacus, Polygonum* and *Rumex nepalensis.*

(xi) 12/D.S.3. Himalayan Temperate Pastures: - This type only comprises of grassy pastures devoid of tree growth. Such pasture are found in all ranges in the zone of Silver Fir and *Quercus semecarpifolia, Festuca spp., Calamagrostis spp., Dactylis glomerata, Bromus spp*., and *Danthomia spp*. In the lower reaches, species like *Themeda, Heteropogon* and *Chrysopogon* make their appearance. Grazing has reached alarming levels, much beyond the carrying capacity of the pastures.

(xii) 12/S.1. Alder (*Alnus nitida*) Forests:-All over the divisions, banks of rivers and streams (i.e. Beas River and its tributaries) consist of these types. *Alnus nitida* grows well on fresh alluvial deposits. Regeneration is good and various places contain all the age classes. The crop after the 1947 floods is even aged and is in pole stage. Species found in association are *Alnus nepalensis, Celtis spp., Toona ciliata* and *Dalbergia sissoo, Spiraea spp.* and *Nerium odorum*. Undergrowth consists of *Plectranthus, Berberis* and *Prinsepia, Rumex nepalensis, Polygonum, Ranunculus* and *Gerardiana heterophylla*. Great damage is done to these trees by the villagers who cut the trees mercilessly for fuel wood, even though these trees act as natural spurs/barriers reducing the cutting power of the river.

2.2.4 GROUP-14-Sub-Alpine forests:-

(i) 14/C.1.a Western Himalayan Sub-Alpine Fir Forests: - These type exist over 3000 meters altitude. Silver Fir is the principal species found in admixture with *Betula spp*. and *Quercus semecarpifolia*. In the under storey, we find *Rhododendron campanulatum, Taxus baccata, Prunus padus etc.* while the ground Flora is same as 12/C.2.a forests.

(ii) 14/C.1.b Western Himalayan Sub-Alpine Birch Fir Forests: - Above 3000 meters this occurs in the inner part of the division. Top canopy consists of scattered Silver Fir

and *Betula alnoides. Quercus semecarpifolia* and *Rhododendron campanulatum* are met with in the under storey. Ground flora consists of *Cotoneaster bacillaris, Lonicera* and *Rubus nievis, Primula, Anemone, Caltha spp., Potentilla spp.*

(iii) 14/D.S.1. Sub-Alpine pasture: - These types are basically pastures which serve as summer grazing. Grasses growing are *Agropyron longearistatum, Asemicostalum, Brachypodium sylvaticum, Dactylis spp., Dantonia* and *Festuca spp*. and some stunted *Rhododendron spp*.

2.2.5 GROUP-15-Moist Alpine Scrub:-

(i) 15/C.1. Birch Rhododendron Scrub Forests: - This is a low evergreen forest having *Rhododenron campanulatum* as the main species with some *Betula utilis* and *Quercus semecarpifolia* dotting the landscape in the under storey. We have *Viburnum nervosum* and *Cotoneaster spp., Lonicera spp., Berberis spp*. and *Polygonum vacinifolium* forming the undergrowth.

(ii) 15/E.1. Dwarf Rhododendron Scrub Forests: - These types exist on elevation varying from 3200 meters to 3800 meters and contain stunted *Rhododendron spp.* Ground flora is the same as that found in 15/C.1. Birch Rhododendron scrub Forests.

(iii) 15/E.2. Dwarf Juniper Scrub: - These types occur at elevation from 3200 meters to 4200 meters having *Juniperus recurva* as the main species in stunted from. Undergrowth and ground flora is the same as in Dwarf Rhododendron scrub forest.

(iv) 15/C.3. Alpine pastures: - These are extensive grasslands above the tree line and below snow line, which occur partially in all ranges. During summer, grazing is very common. Medicinal plants are found in abundance and exported/marketed from here. Along with grass are found occasional bushes i.e. *Juniperus recurva* and *Rhododendron spp*. Ground flora is rich and contains *Meconopsis, Delphinium, Acontium heterophyllum, Borago, Potentilla caltha, Senecio, Primula, Podophyllum, Jurinea macrocephala and Gentiana kuroo*.

2.3 Locality Factors: Aspect and slope exercise strong influence on the condition and composition of the crop. To a keen observer, the revelation dawns that Deodar can be found regenerating even in lower reaches, down to Chil zone, when the reason is the cooler, northern aspect. At higher elevation, Deodar is found on regeneration on southern warmer aspect, whereas the northern, cooler aspects now give way to Spruce and Fir. Both aspect and slope affect temperature and moisture condition in any particular tract. In the field it is observed, that normally as much as 305 meters difference exists between the elevations, up to which particular floristic association occurs, on the northern and southern sides of spurs without any marked difference in rainfall. As a rule, difference is directly proportional to the gradient, with the

difference becoming greater as the gradient become steeper. On warmer slopes, Kail extents up to Fir zone and on the cooler northern and north-eastern slopes, Fir descends down to Kail zone. Quality of crop at certain elevation is also influenced by the aspect. On the northern aspect because of adequate moisture level, the crop is of a higher quality (clear bole and majestic heights) than in the southern hot slopes at the same altitudes. The forester needs to understand the play of edaphic factors of the nature, whereby succession is being achieved. This helps him to recommend the proper treatment.

2.4 INJURIES TO WHICH CROP IS LIABLE: - The trees liable to injuries are due to following causes: -

(a) Natural/Climatic factors
(b) Damage by Fire
(c) Damage by Man
(d) Damage by Wild animals and Birds
(e) Damage by Insect and Fungi.
(f) Nuisance caused by climbers, bushes and weeds

2.4.1 NATURAL CAUSES/Climatic factors: - These factors are discussed as under:

a) **Storms and hail: -** Wind damage in the tract, as and when there is storm is not significant. Hailstorms to maximum damage to young seedlings in the nurseries and also to the plantations.
b) **Rain and snow: -** Kullu valley is said to be a rain shadow area. Even then, there are frequent heavy showers. Floods in 1993 rains destroyed valuable forest lands through erosion. Massive tree damage was noticed as huge trees were plucked far down from their roots and taken along torrents. Occasional cloudburst wrecks maximum damage to the forest crop. Erosion hazards come about as torrents in their wake causing land slips/land slides, trees get uprooted and young seedlings/saplings get buried under mud debris. The upper reaches experience snow. Wherever the crop is congested and even aged, damage on account of bending of trees under weight of snow, uprooting/breaking comes about. Young poles, especially of Deodar and Kail get skewed/bent and this deformity persists till maturity. Valuable portion of bole is rendered useless. Snow chokes young seedlings. Avalanches in upper reaches wreck havoc as they take soil cover and vegetation in their stride. Lightening damage is sporadic and occasional which can be witnessed in various coniferous stands. Trees get split, top damaged or permanently scratched.
c) **Frost: -** Frost lifting and consequent death in the nurseries/plantations especially of Spruce/Deodar and Silver Fir seedling is not uncommon. Forest protection measures are warranted in the nurseries i.e. leaves, grasses or polythene coverings.

d) **Drought: -** During some years, the month of May, June, October and November are drought periods. Moisture shortage through prolonged droughts stifles and wilts quite a lot of forest vegetation. The dry conditions also bring about hazards.

e) **Lightening**: - This type of injury is common in high mountain trees, which is mostly struck by lightening, splits damage and die.

f) **Damage due to Erosion: -** Excess damage to forest crop comes about on account of land slips/land slides. Meandering of rivers and streams also cause excess damage to prime forest land. Construction activity, especially road constructions disturbs the fragile strata. Deodar, especially, has very shallow roots because of which its soil holding capacity is low. Reduction of forest cover by illicit felling and unsystematic management practice i.e. mining, etc. increase erosion hazards. Heavy and continuous grazing loosens the soil, hence forming rills and gullies and destroying important soil cover.

2.4.2 Damage by Fires:-

The occurrence of forest fires has become an annual feature during summer months of April to June and also during drought periods, between October and December. Great damage is consequently wrought on the forest crop. Severe forest fires have been recorded during 1910-11,1915-16, 1921-22, 1929-30, 1931-32, 1946-47, 1952-53, 1965-66, 1969-70, 1970-71. 1921-22 year was said to have been really bad when Fir Forest also caught fire. The intensity and extant was so high that incalculable damage was done.

Table 2.4.2 Forest fires and area burnt in hectare in respect of Kullu Forest Division is as under:-

Year	No of Forest Fires	Area burnt in ha.
1993-94	Nil	Nil-
1994-95	3	29
1995.96	4	75
1996-97	11	266
1997-98	1	2
1998-99	4	120
1999-2000	11	157
2000-2001	10	158

2001-2002	Nil	Nil
2002.2003	13	260
2003-2004	3	109
2004-05	Nil	Nil
2005-2006	4	107
2006-2007	Nil	Nil
2007-2008	6	110
2008-2009	1	1
2009.2010	13	45
2010-2011	2	11
2011-12	2	5

The brochure on Forest of H.P. published during 1993, lists the cause adequately and also recommends remedies as under:

Causes are:-

- Lack of regular control burning which brings about increased weed growth and accumulation of excessive humus. Felling refuses and debris also results in decrease of regeneration, increased fire hazards.
- Mischief's by people i.e. careless stubble burning, throwing of biddi/cigarette, careless handling of torches, etc.
- Belief among people that fire helps in more grass production. Further, fires are caused by people to drive away bears and leopards.
- Natural Causes i.e. lightning or flint caused by rolling stones.

Remedies suggested are:-

- Effective maintenance of fire lines or creation of more lines and inspection paths.
- Public awareness of fire hazards through education, persuasion and perseverance. Rights should be linked to duties and responsibilities.
- Removal of misconceptions amongst masses
- Regular control and slash burning

- Watch towers and better communication network.

What the forester has to really watch are the fire caused accidentally or deliberately. The extent of destruction caused by the fires varies with the condition and composition of the crop, aspect under growth, presence of feeling refuse of season occurrence. Stand which are properly thinned and also those which are heavily grazed are damaged less by fire, provided felling refuse is cleaned regularly. Chil, except when it is very young is relatively fire hardy. Kail is extremely sensitive to fire and gets charred beyond recovery. In general, pure Deodar stands, Spruce and Fir are less prone to fires. However, once fire catches damage is excessive. A mixed crop of Kail and Deodar is favored as these are less prone to fire hazard.

2.4.3 Damage by man:-

Forests fire occurrence are much higher where forests are located near habitation lending credence to the belief that deliberate incendiarism is the major reason for them. Along with fire, the other ways in which man causes injuries to forest crop are:-

i. **Looping**: Looping of tree is resorted to by people for fodder, fuel, manure and animal beddings. When this practice becomes arbitrary, irreparable damage is done to trees. Heavy looping of Kail increases the susceptibility to the attack of *Trametes pinii*. Trees frequently lopped are Ban and Mohru, Maple, *Celtis, Robinia,* Spruce and also Chil. Kharshu Oak is lopped by graziers.

ii. **Illicit Felling:** Increased motorable roads and increased population growth has resulted in an increase in illicit felling. Deodar and Kail are felled for timber while Spruce is felled for fuelwood and packing cases. Broad leaved are axed for firewood and agricultural implements. A greater vigilance is required. Mushrooming to tourist resorts/hotels has given a spurt of illicit felling and timber activities.

iii. **Torch wood extraction**: Considerable damage is done to Chil and Kail trees by villager, in forest located near habitations, when they are cut deep to extract resinous wood from the basal portion of the stem for torch wood. Tree damages are much more vulnerable to increase fungal attack, and prone to breakage during storms.

iv. **Debarking**: Ban Oak, Spruce and Chil tree are debarked for tan, roofing material and sheds and for charcoal. Walnut roots are extracted to make ‘dandasa’ which is used in brushing teeth. Many times, encroachment of land, especially by fruit growers, comes through debarking, girdling and consequent death of tree in adjoining forest land to private areas.

v. **Non removal of felling refuse:** It is of prime importance to remove the debris or felling refuse lying in the forest. It is a fire hazard and it also hinders natural’s regenerations. There are many other activities which are ruinous to forest crop.

Removal of leaf mould can have bad effects on growth of trees and soil fertility. Quarrying and unsystematic mining, encroachment, disposal of industrial and human waste in forest etc., faulty agricultural practices on marginal slopes which accelerate soil erosion processes, can all contribute to damage forest crop.

vi. **Encroachment:** This is a serious and contagious issue. A sizeable chunk of forest land is encroached most commonly adjoining private land holdings. The detail of encroachments is put in volume II

vii. **Damage by Grazing:-**Controlled and light grazing can be beneficial, whereas heavy grazing can be disastrous. In Fir forest, where there is heavy weed growth and thick humus layer, light grazing rakes up humus and keeps down weeds. Further, light grazing eliminates inflammable grass and herbage and thus checks fire damage, and in IIIrd class forests, regeneration is fostered and weeds smothered. Heavy grazing however is ruinous, as seeding get browsed by sheep and goats. Soil gets hardened and in infertile and natural regeneration is hampered. In 2/12 Mathi-Ban and 2/11 Kothi-Tich C-I Forests, excess grazing has caused irreparable damage. In alpine pasture, heavy and continuous grazing erodes soil. Soil is loosened forming rills and gullies and consequently, fertile soil cover is lost. Regulated grazing and effective closures is must for protecting our forests. Large flocks of cattle, more then actual requirement are kept by the right holders, causing great nuisance to forest activities. Menace of 'Gujjars' and their buffaloes is sever in Kullu division, because of unregulated entry and loose control. Causes of uncontrolled and unsustainable grazing are aptly summarized in the brochure in the Forest of H.P.

Reasons pointed are:-

- Excessive livestock
- Nomadic grazing.
- Unscientific grass land management
- Non-availability of data grasslands

The Remedies suggested are:-

- Concentrated effort to bring about reduction of scrub cattle
- Encouraging stall feeding practices
- Settling nomadic graziers
- Assessment of carrying capacity of pasture
- Introduction of improved variety of grasses
- Grass nurseries, establishment of grass demonstration plots.

2.4.4 Damage by Wild Animal and Birds:-

Though wild animals and birds damage to forest crop, yet the damage is not so severe. Debarking of Deodar, Kail, Spruce by Wild Bear is observed. Permanent damage results when debarking is there to girdling stage. Fruit growing broad leaved tree and Oak are damaged by Wild Bear who dig out the root when there is shortage of roots. Flying squirrels consume unripe cones of Deodar, Kail and Chil, whereby a sizeable quantity of seed is destroyed. Birds gnaw away at young seedlings and destroy lots of seeds by eating fruit. In standing trees, holes are bored by woodpeckers.

2.4.5 Damage by Insect and Fungi:-

Damage to Deodar is there through the defoliator, *Ectropia deodara*. Deodar cones are destroyed by *Euzophera cedrella* while its young seedling is attacked by *Melolontha* (cook chafer) and *Elater* (wire worn). *Agrotis ypsilion* also cuts young seedlings. *Brachyxystus subsignatus* harms new shoots of Silver Fir, which consequently turn yellow and orange, withering and finally dropping away. Attack on Deodar and Spurce is low. Polyphagus species destroy Kail cones and occasionally Chil and Spruce cones. *Chlorophorous strobilicola* attack Chil cones. *Chermes abietispiceoe* causes galls on Spruce while *Photophagus chalcid* causes galls on Deodar needles and Spruce. Among the fungi, *Trametes pinni* preys on Kail, as also Chil Spruce, rendering tree useless, infecting heartwood. Looping of trees during monsoon is very harmful since it allows the said fungi to work on the cut *portion. Fusarium species* and *Fomes annous* attacks root of the young plants of Deodar on damp and badly drained soil causing drying and consequent death. *Perdermium cedrie* affect leading shoots of Deodar tree.

The fungus causes witches' broom in the crown which should be cut, to minimize the check of localized damage. *Perdermium campanulatum* and *Peridermium brevius* attach Chil and Kail needle. However, their damage is not significant. The typical orange tessels frequently seen in spring, in Spruce, emitting bad odor is a result of attack of *Barclayella deforman* fungi. In current year shoots of cones of Spruce, diseased shoots gets stunned and densely covered with curved needle, on which the mass of orange and teletiospores appears. Attack is not so menacing. Poor aeration of soil, water logging, humus and acidity are principle causes for attack of fungi.

2.4.6 Nuisance caused by climbers, bushes and weeds: - *Vitis semicordata, Hedera helix* and *Rosa moschata* coil up on young poles and sapling, devouring vital nutrients and moisture and strangulating plants. *Loranthus and Vicum* parasites affect Ban Oak and other broad leaved species. Natural reproduction is inhibited, and food, moisture and sun shine is limited for our economic species by numerous seeds and bushes i.e. *Strobilanthus,* Balsm, *Dipsacus, Polygonum, Iris, Arundinaria, Rubus, Viburnum and Indigofera spp*. Cultural operations i.e. climber cutting and removal of weeds/bushes is a must if healthy regeneration is to be fostered.

CHAPTER-II B

FOREST FAUNA

A varied fauna characterizes the Kullu tract. Diversity is due to a great variation in altitudes, topology, climates and vegetation. Wild animals and birds capable of thriving under different climatic conditions, ranging from sub tropical to arctic and from densely wooded areas to sparse tree growth are found here.

2.5.1 IMPORTANT ANIMALS FOUND ARE:-

a) *Panthera pardus*: - The leopard/panthers are sleek animal which is found at isolated rocky hills. It stealthily enters habitations, to steal dogs, calves and goats. The animal breeds all the year round and it is primarily gunned for its skin in/fur, which is of rufous fawn color with dark rosettes. The tail of Leopard is more or less ringed. The weight varies from 40 to 65 kg.

***b) Panthera uncia*: -** The snow leopard has a relatively long tail, has short muzzle, high forehead and vertical chin. The grant color of its coat is soft grey with pale to pure white on the underside. Spots are unbroken and distinct on the head, nape and lower parts of the limbs. On the body, they break into larger, paler rosettes. The snow leopard inhabits elevation above 3500 meters. A rare animal, it has been placed in Schedule-I, as it is poached for its magnificent creamy gray fur. It frequents rocky ground, killing Bharal, Thar, domestic sheep, goats and dogs. It is the state animal of Himachal Pradesh.

***c) Selenarctos thibetanus*: -** The Himalayan Black Bear is a big animal and is quite commonly found in the tract at an elevation ranging from 1500 meters to 3000 meters. It is all black except for a V shaped or horse-shoe white mark on the chest. The male is huge, weighing up to 44 lbs, while females are little smaller and lighter. Bears hibernate during winters, tending to come down to lower elevations, when it snows on the higher elevations. It prefers Oak stands inhabiting coniferous forests also. Black Bear causes maximum damage to crop, when they come near habitations. It is normally vegetarian and survives on wild fruits, flower roots and honey. Sometimes, it eats insects and flesh too. It peels off the Deodar bark and pine saplings during springs and early summers to get the sap and also breaks the bought of Walnut and other trees. The bear, especially female is furious and dangerous when provoked.

***d) Ursus arctus*: -**Himalayan Brown Bear is found at an elevation above 3500 meters and is of moderate build with brown fur with white on the chest. It feeds on fruit, acorns, etc. and occasionally sheep and goat when food is less. The Bear is somewhat sluggish and remains in the state of semi-torpidity. Mating takes place during autumn and young ones are born in February and March. It is poached for its skin and has been found in Solang Nalla.

e) Moschus moschatus: The Musk Deer or Kastura is found at an elevation above 2500 meters. It is agile and has been placed in Schedule –I, hunted primarily for its musk. It is protected by law. The Musk Deer holds a place between a deer and antelope. The absence of horns is compensated by great development of canine teeth, particularly in the male. The Musk Deer lives singly or in pairs and is generally met above the zone in pines. The food consists of grass, lichens and flowers. The breeding season is in January and young one is produced in June.

f) Muntiacus muntjak: **-** The Kakkar or Barking Deer is found upto 2500 meters all over the tract. It prefers thick jungles and is a solitary animal, unmatched in flexibility and process. Mating season is winter months and the off-spring comes in spring. The Deer is poached in winter when it comes down to habitations.

g) Nemorhaedus bubalinus: **-** Aimu or the Himalayan Goat is found in the same zone as the Kastura. It is relatively big with ears resembling a mule and has tough meat.

h) Capra ibex siberica**: -** The Himalayan Ibex is found in high altitudes, near the snow line i.e. it can be observed with Solang Nallah. It is an agile, timid, graceful animal with lots of endurance. The male and female generally lives in separate flocks. Mating is in October, while the young ones are delivered in May-June. The horns of the ibex are loner and more abruptly curved and tapering then the European Ibex.

i) Pseudois nayaur**: -** The Blue Mountain Sheep, also called Bharal has a habitat same as that of the Ibex and it has habits between goat and sheep. Bharal lives in flocks and prefers grassy slopes and rocky grounds. The animal is timid and ever watchful. Offspring is delivered in June-July.

j) Hemitragus jemlahicus**: -** The Thar is a big goat, having a finally round head, narrow erect ears, heavy body and longer robust limbs. Its horns are much shorter than that of the Ibex. Thar inhabits precipitous, rocky, inaccessible areas of high elevations, generally above 2500 meters, coming down during winter. It feeds on grasses growing between rocks. Thar lives in herds and its meat is much sought after.

k*) Martes flavigula***: -** The Himalayan Pine Martin is found upto 2500 meters elevation and thrives on birds, mice, squirrels and other small animals. It moves in pairs and it is also sought for its fur.

Other animals found are Langoor, Monkey, Jackal, Foxes and Hares, which are found all over the tract.

2.5.2 GAME BIRDS

a) Chakor (*Alectoris gracea*):- This mountain partridge is much sought after for its meat. It inhabits areas lying between 1500-3000 meters, but descends down to lower

elevations during winter. It is in flocks and feeds on grains, tender shoots of grasses, food crops and insects. Nesting season ranges between April to June and 8-12 eggs are laid at a time.

b) Common hill partridge (*Arbosophieo torqueola*):- This bird is found all over the tract up to an elevation of 2000 meters. It prefers bushy areas, Oak forests and dense coniferous stands, living in small flocks and roosting.

c) White crested Kalij Pheasant (*Lophura leucomelanos*):- This pheasant is found all over the tract between 700-3500 meters. Nesting is from March to June under thick shrubs. The pheasants usually live in pairs or family flocks

d) Cheer Pheasant (*Catreus wallichi*):- This pheasant has a special preference for bushy areas and open forests.

e) Monal Pheasant (*Lophophorus imejanus*):- This pheasant has a habitat among coniferous forests and grassy glades, at high elevations above 2500 meters, extending up to snow line during summer and lower down during winter. This bird is hardly found above the tree line. The male is a moderate sized pheasant with short, broad and square out tail, brilliant metallic green head, a glistening purple upper part, cinnamon colored tail, velvety black breast and a crest of beautiful feathers. The female is plain looking, mottled and streaked, dark and pale with a white throat and short crest of normal feathers. Monal is found in plenty in Matikochar Valley. Breeding is during May-June. The bird feeds on tubers, seeds, grubs, maggots, roots and young shoots of various shrubs and grasses, corns and berries. Though protected, it is poached for its beautiful dark green plume.

f) Koklas pheasant (*Pucrasia macrolopha*):- This pheasant occurs at elevation ranging from 2000 meters to 4500 meters, all over the tract especially in the coniferous forest. It feeds on leaves and buds. The male has dark green head with the central crest of fawn colour, and a white spot on each side of the neck. Breast and belly are the chestnut coloured while the rest of the body is streaked with black and grey. Breeding season is from April-June. This pheasant is killed for its meat.

g) The Western Horned Tragopan (*Tragopan melanocephalus*):- A high elevation bird, it remains near the snow lines during summers, but descends down to lower elevations during winter. Breeding is from April-July. Food consists of root, buds, insects, leaves etc. This pheasant is quite beautiful as its neck, the top of the crest and the band of the wings are red. Its bill is blackish and its eyebrow and face bright red. The female is paler and grey. It is the State Bird of Himachal Pradesh.

h) The Snowcock: - This is a big bird and is an excellent table bird. It is protected and is found at higher elevations near snow line. It comes down during winters. In appearance, it resembles a chakor and it thrives on tubers, tender shoots and grass.

The Kullu tract have numerous species of other birds i.e. Ring Dove, Spotted Dove, Shikara, Parrots, Tawny Eagle, Falcon, Pigeon, Gritton Vulture, Tits, Nutcrackers, Pies, Woodpeckers, Himalayan Fly Catchers, etc.

2.5.3 FISH: - The tract has abundant fish in various rivers and streams. Trout is found in cold water while Mahaseer is found in Beas. Black fish is met with in all streams. Illicit angling explosives cause irreparable damage.

2.6 Sanctuaries: -

2.6.1 In Kullu tract there are two sanctuaries, details of which are given below:-

I) MANALI SANCTUARY

i.	Notifications No. and date.	No. 70-G.P.53/97 dt. 28/02/1954
ii.	Situations	Eastern portion of the forest to the north of Manalsu Khad
iii.	Boundaries	N-Demarcated line of compartment-v of 2/5 Bungdwari
		E-1/1 Bajrundi demarcated forest and demarcated line of 2/5 Bungdwari C1
		W-Natural limit of Forest
		S-Banaru Nal and demarcated line of 2/6 CIV
iv.	Compartments and Area	Total area of sanctuary is 2887.00 ha.
v.	Elevation.	2000 mts. to 4000 mts. above sea level.
vi.	Aspect.	Southern
vii.	Flora	Kharshu Oak, *Betula*, Spruce, Silver Fir, Deodar, Kail and other Broadleaved species. Ground cover- *Cotoneaster, Indigofera, Desmodium, Viburnum, Balsam, Rumex, Fragaria, Plectranthus, Rubus, Polygonum, Ferns*.
viii.	Details of Wildlife	Black and Brown Bear, Leopard, Snow Leopard, Ghoral and Barking Deer, Monal, Cheer pheasant
ix.	Hazards of Wildlife	Population within area = 290.

		Population around area = 872.

II) KAIS SANCTUARY

i.	Notifications No. and date.	No. 70-G.P.53/97 dt. 28/02/1954
ii.	Situations	To the South 2/27 Padra Rias.
iii.	Boundaries	N-Demarcated line separating 2/32 Matikochar and 2/27 Padra Reas and 2/26 Marauri and Kais Nal
		E-Ridge separating Catchment of Beas and Parvati rivers.
		S-Compartment (vi) and (v) of 2/32 Matikochar and spur descending from dhara to Kais Nallah.
		W-Beas River
iv.	Compartments and Area	2/32 Matikochar. Total area of Sanctuary is 1365.00hectares.
v.	Elevation.	2000 mts. to 3680 mts. above sea level.
vi.	Aspect.	Southern
vii.	Flora	Kharshu Oak, Spruce, Silver Fir, Deodar, Kail, Acer, *Aesculus*, Walnut. **Ground cover**- *Indigofera*, *Desmodium*, *Berberis*, *Rosa*, *Viburnum*, Balsam, *Rumex*, *Fragaria*, *Plectranthus*, *Rubus*, *Polygonum*, Ferns, *Cotoneaster*, *Strobilanthus*, *Arundinaria spec*ies.
viii.	Details of Wildlife	Black and Brown Bear, Leopard, Snow Leopard, Ghoral and Barking Deer, Monal, Cheer Pheasant, Kalij Pheasant and Koklas Pheasant
ix.	Hazards of Wildlife	Population within area = 90. Population around area = 212. Sheep and Goat grazing.

		Fires

2.6.2 The process of rationalization of the boundaries of existing sanctuaries is also under consideration of Supreme Court of India vide IA No.155 in Writ Petition (Civil) No. (S) 337 of 1995 and as per record of proceedings Item No. 309 of Court No. 4, the Hon'ble Supreme Court has ordered "Permission is granted to the state of Himachal Pradesh to issue the final notification under Sections 26-A, 35 (4) and 36-A of the Wildlife (Protection) Act, 1972 as per prayer clauses (a) to (d) of IA No. 155. IA No. 155 stands disposed off." The Govt. has notified its intention to extend the Nargu wild life sanctuary which was confined to Mandi district earlier to Kullu Division also as detailed below:

I) **NARGU SANCTUARY**

i.	Notifications No. and date	No.FFE-B-F(6)-16/99 DATED 23.10.1999	
ii.	Notifications No. and date. (Intention for addition of area under rationalization process)	No. FFE-B-F (6)11/2005 dt. 28.07.2010	
iii.	Boundaries (Before Rationalization)	N: From Uhl river to Nargu peak along boundary of Kangra District.	
		E: From Nargu peak to Dulachi pass along the ridge passing through Bhubhu pass along boundary of Kullu and Mandi District.	
		S: From village Kandhi along Dulachi/Kataula Khad upto its confluence with river Uhl at Kamand.	
		W: From the confluence of Kataula Khad with Uhl river at Kamand along the Uhl river upstream upto the boundary of Kangra and Mandi Districts.	
iv.	Forest and Area (Only of Kullu Forest Division which are to be added after rationalization)	2/60 Hathipur PF	463.7 hectare.
		2/59 Longthach PF	399.81 hectare.
		2/58 Jammu Pani PF	405.48 hectare.

		2/54 Bhubu-ka-Nal PF	148.51 hectare.
		2/53 Gong PF	508.77 hectare.
		2/52 Super-nal PF	295.41 hectare.
		2/51 Bakar-Rera PF	406.3 hectare.
		2/50 Chebang PF	1205.94 hectare.
		2/49 Gorudugh PF	907.29 hectare.

2.6.3 In addition to the above, Govt. has issued notifications regarding its intention to form one national park namely Inderkilla National Park as under:

II) **INDERKILLA NATIONAL PARK**

i.	Notifications No. and date. (Intention of Govt.)	No. FFE-B-F (6)11/2005 dt. 28.07.2010
ii.	Proposed Boundaries	NORTH : From S.O.I. Bench mark No. 4270 thence upstream along Khrei Nala upto S.O.I. bench mark 4500 thence along the Pir Panjal Range upto S.O.I. bench mark 4930
		EAST: From S.O.I. bench mark 4930 along Pir Panjal Range to S.O.I. bench Mark 4265 thence upto 5290 (Boundary between District Kullu and Lahul and Spiti)
		SOUTH: From S.O.I. bench mark 5290 along Pir Panjal Range, thence along the ridge to Panjal Tapri thence to S.O.I. bench mark 4495 to Gogla thence to Phahlakanda.
		WEST: From Phahlakanda along 3480 meter coutour line to Jobrinala thence to its confluence with Alain nala upto S.O.I. bench mark 4270.

iii.	Compartments and Area	2/17 Hamtagahr = 1989.45ha, 2/16 Upper Rahni = 712.25 ha Part of Jagatsukh III = 7698.3 ha Total area = 104 Sq. Km

2.7 Wild Life Management:-

Wild life is scientifically managed and preserved can attract sustained revenue in Eco tourism Wild life can be an important component. The diversity of Wild life found in the tract requires to be given special focus. Poaching requires to be thwarted. Opening up of the area through motor roads and paths has increased menace. Grant of arm license under the pretext of crop protection must be very sparingly judiciously given. The following measures are suggested to minimize poaching.

1. Adequate staffing for Wild life Wing and enforcing of rules as per Wild Life act, 1972

2. Appointment of Rakhas on part time to assist the Wild life staff in detecting and apprehending poaches in areas of sanctuary and national park in the field properly through prominent sign boards, notices and display of rules.

3. List of proclaimed poaches and get given license cancelled from the competent authority.

4. Strictly regulate crop protection license.

5. Resort of wide publicity through pamphlet, lectures and JFM activity.

6. Reward informer who helps apprehending poaches.

7. Section-17 of the Wild Life Protection Act, 1972 which deals with restriction hunting is highlighted below:-

17(1) No person shall:-

(a) Hunt any wild animal, from or by means of, a wheeled or a mechanically propelled vehicle on water, or by aircraft;

b) Use an aircraft, motor vehicle or launch for the purpose of driving or stamping any wild animal;

c) Hunt any wild with chemicals, explosives, nets, pitfalls, poisons, poisoned weapons, snares and traps, excepts in so far as they relate to the capture of wild animals under the Wild Life Animal trapping license;

d) Hunt any special games or big game other then rifle, unless specially authorized by license to hunt with a shot gun using single-slug bullets;

e) Fir the purpose of hunting, set fire at any vegetation;

f) Use any artificial light for the purpose of hunting except when specially authorized to do so under a license in case of carnivore over a kill;

g) Hunt any wild animal during the hours of night that is say, between sun-set and sun-rise, except when specially authorized to do so under a license in a care of carnivore over a kill;

h) Hunt any wild animal on the salt lick or water hole or other drinking place or approach to the same, except sand grouse and water-birds;

i) Hunt any wild animal on land not owned by Government without the consent of the owner or his agent or the lawful occupier or such and;

j) Notwithstanding that he holds a license for the purpose, hunt any wild animal during the closed time referred to in section 16;

k) Hunt, with the help of dogs, and wild animal except water birds, chakor, partridge or quail;

Wild life Management calls for a Comprehensive study of animal breeding habits, population density, life span, feeding habits, cruising roads and tolerance of environment. Animal ecology has an important bearing of Wild Life Management. The surrounding habitat which includes factors like climate, light, oxygen, soil, topography and other environmental factors like shelter, food and water need to be studied.

CHAPTER III

UTILIZATION OF THE PRODUCE

3.1 Agricultural customs and wants of the population:-

Traditionally people of Kullu valley are agriculturalists mostly dependent on the adjoining forests but there happens very rapid economic and social changes. The apple industry and the fast growing tourism Industry have brought significant changes in the living standards of the people. Entire valley is blooming and booming with apple orchards and along with off season vegetables augers well for the impeding economic revolution and transformation of the living standard of the rural population. In spite of all this, there is still heavy day to day dependence on the forests for fuel wood, timber, medicinal plants and fodder/ grazing. A large number of developmental activities viz, construction of roads, provision of water supply system in the villages and opening up of new schools for education of children are going around with great speed. The tract is quite densely populated. Out of the total population of district, 59% of population lives in Manali and Kullu tehsil and mainly the population are rural. Based on 2011 census the population density of Kullu district is 79 persons per square km. against 123 persons per square km. for Himachal Pradesh. The statistics of human population for the tract since 1961 census is shown in Table 3.1.

Table 3.1: - Human Population figures for the Kullu and Manali tehsil:

Sr. No.	**Census Year.**	**Population.**
1	**2**	**3**
1.	2001	223858
2.	2011	258065

The human population of the entire district since 1981 Census is tabulated as under in Table 3.2 along with increase in percentage over previous census.

Table 3.2: - Human Population of the entire District since 1981 Census.

Sr. No.	Census Year	Population	Increase % over previous census
1	**2**	**3**	**4**
1	1981	230734	Not evaluated
2	1991	302432	+31.07
3	2001	381571	$^{+}$26.16
4	2011	437474	+14.65

Human population of the State since 1901 census is tabulated in Table 3.3 along with increase in percentage over previous census.

Table 3.3: Human Population of the State since 1901 Census.

Sr. No.	Census Year.	Population.	Increase % over previous census.
1	**2**	**3**	**4**
1	1901	19,20,234	-
2	1911	18,96,944	(-) 1.22
3	1921	19,28,206	1.65
4	1931	20,29,113	5.23
5	1941	22,33,245	11.54
6	1951	23,85,981	5.42
7	1961	28,12,463	17.87
8	1971	34,60,434	23.94
9	1981	42,80,818	23.71
10	1991	51,70,877	20.79

11	2001	60,77,900	17.54
12	2011	68,56,509	+12.81

The above table clearly shows that the decadal population growth in Kullu is higher than the state as a whole for last three decades which obviously puts pressure on the resources of the district.

The population of the track is mainly rural and mostly depends on agriculture and horticulture. But, nowadays, due to the tourist inflow, most of the local people have engaged themselves in the tourism activities. A good number of them earn their livelihood by rearing flocks of sheep and goats. The rural population is also dependent to a great extent on the forests for many of their usual requirements. The main requirements from Government forests are: timber for house construction, fuel-wood and charcoal, wood for agricultural implements, grass and fodder for the live-stock, leaves for manure, herbs for medicinal uses, etc. The forest settlement makes ample provisions to meet these requirements, either free of cost or at very concessional rates. The pressure of these rights or requirements on the forests is very high and is increasing steadily.

Table 3.4: Break up of population as per 2011 census.

Sr. No.	**Item.**	**Kullu and Manali Tehsil**	**Distt. Kullu.**	**H. P. State.**
1	**2**	**3**	**4**	**5**
1.	Total population.	258065	437474	6856509
2.	Rural population.	218220	396216	6,167,805
3.	Urban population.	39845	41258	688,704
5.	Density of population.	-	79	123
6.	Literacy rate.	81.07	80.14	83.78

Settlement report of Alex Anderson published in 1986 provides for complete account of rights to local people regarding fuel wood, grazing rights, and timber distribution. Land has come to be recognized as a prime resource.

Table 3.5-Area, statement for Kullu District under different land use is given as per the following table:-

Area	**As per 1981 report**	**As per 1991 report**	**As per Statistical Deptt.**
Total Geographical area	5503 Kms2	5503 Sq. Km	5503 Sq. Km
Total Agriculture land.	55600 hectares	64047 hectares	60948 hectares (2007-08)
Area under Horticulture	10590 hectares	16058 hectares	27826 hectares (2009-10)
Area under Horticulture (Apple)	2582 hectares	2335 hectares	

The explosive increase in the area under apple occurred in last 25 years. Apple orchards have spread, into mixed agricultural lands and up the mountain slopes. The allocation of nautors to the landless has reduced the forest area, leading to an increased pressure on the remaining area for grazing and tree forage resources.

3.2 LIVESTOCK: -

The people rear cattle and flocks of sheep and goats to supplement their meager agricultural income. The villagers depend on forest grass and wastelands for grazing their animals throughout the year. The bullocks and dry cows are left in the forests for months together. The grazing grounds are exhausted and the harmful effects of overgrazing are apparent. The pressure of grazing per unit area is beyond the carrying capacity of the pastures and forests. Grazing in forests is practiced all over in an unrestricted manner. Alpine pastures and dhars are very heavily grazed by flocks of sheep and goats belonging to local and migratory glaziers, so much that many of these are deteriorating. People are in the habit of rearing cattle far in excess of their actual requirements. The pressure is still higher near the thickly populated villages. Forest trees mainly Ban, Mohru, Kharshu, *Robinia*, Khirak, *Ulmus*, etc. are lopped for fodder especially during winters. Heavy lopping is also done in conifer trees for its leaves being used traditionally for making bed for animals. The livestock population in the Kullu district is given in Table 3.6-

Table: 3.6- Livestock Census of Kullu District:

S. No.	**Census Year**	**Livestock Population**
1	1977	327491

2	1983	332314
3	2007	386020

Table: 3.7.Tehsil-wise Livestock Population of Kullu District as per 18th All India Livestock Census-2007:

	Total Cattle	**Total Buffalo**	**Total Sheep**	**Goat**	**Total Horse**	**Remarks**
Kullu Tehsil	74549	540	60910	26639	863	Detail of other Miscellaneous species not given
Manali Tehsil	11293	7	11102	3124	655	
Total of Kullu & Manali Tehsil	85842	547	72012	29763	1518	
Kullu District Total	169019	872	114942	69535	1634	

Above figures shows that Livestock population is continuously increasing in the area. The higher population of sheep and goats is a threat to natural regeneration in forest.

3.3 Timber:

Demand for building timber and fuel wood has increased manifold, with the result that the forest have come under severe strain. The hotel industry has really grown with its demand for timber seriously affecting and jeopardizing forest resources. The sale of timber and firewood is handled through the Himachal Pradesh Forest Development Corporation through its depots at Manali, Patlikuhal, Kullu and Shamshi. From 1990, the supply geltus for manufacturing packing cases has been stopped giving some respite to forests. The timber to right holders has been provided under old timber distribution (TD) rules up to 2006. Thereafter new TD rules have been notified vide notification No. FFE-B-E (3)-43/2006-Vol-I dated Shimla-171002 2nd January. 2010. (Detail discussed in Chapter -1)

3.4 Market and Marketable Products:

The Forests of Kullu have commercial conifer species like Deodar, Kail, Rai and Fir beside important Broad Leaves species like Walnut, Ash, Angu, Oaks, etc. Kullu Forest Division provides a number of valuable products like timber, fuelwood, charcoal, medicinal herbs, and other minor produce like Cedar oil, cones of conifers and *Alnus nitida* for decorative purposes.

Prior to World War-II, an overall depression kept timber prices low. However, this changed after World War II when the prices spiraled up and showed a steep rise. Further, the improvement in economic conditions, development of tourism industry and migration of people to towns put an excess demand of timber and other forest resources. The demand has increased manifold. Presently, extraction and marketing is being done by HP State Forest Development Corporation.

The network of roads in the valley has facilitated economic development of local markets for broad species such as Walnut, Maple, Bird Cherry, Horse chestnut and Oaks. There is also a great demand for medicinal herbs extracted from the valley. However, the Gram Panchayats are allowed to issue export permit to local collectors by charging nominal rates which are based on market values of the forest produce. There is complete ban on export of *Taxus baccata* leaves.

3.5 Method of harvesting and their cost:

As mentioned above, Rivers of Kullu are most suited for floating of scantling than logs, especially of larger dimensions. Historically, Logs floated in 1923 in moderate numbers, under Talwara saw mill scheme, proved to be a failure and since then, no such work was contemplated in the future. During 1925-26 and 1926-27 small log of Kail for matchwood at the rate of Rs. 3.69/m3 were exported. During World war-II, as many as 4, 66,179 ballies equal to 17000m3 were extracted and floated in two years 1942-43 and 1943-44. The Method of extraction of timber in the form of scantlings has been standardized, after studying local condition over the years, and is incorporated in the Punjab Forests leaflet number 9.

Timber extraction division came into existence during 1961-62 and carried out extraction /exploitation works upto 1976. Extraction of timber by modern method of logging was introduced in 2/11 Kothi Tich, 2/12 Mathiban forest of Manali Range and 2/32 Matikochar of Kullu Range. A central saw-mill with workshop complex for industrial use of wood was set up at Shamshi in year 1961-62. Logs were transported to the saw mill and converted into sleepers and other sizes. Cost statement compared for different items of departmental extraction up to depot at Nangal, came out to Rs. 365/96 per m3 by conventional method as against Rs. 442/80m3 in 1978-79. Cost of extraction of timber by mechanical method is very high. However, at the same time, outturn of sawn volume is high, upto 30% in form of logs and 60-70% in case of Fir in form of scantlings. With the demand for broadleaved species during sixties extraction of these species become economical on account of the network of the roads and introduction of the mechanical logging methods. Logs of broad leaved species were supplied to the wood-based industries Division, Shamshi for manufacturing of rifle half-wroughts, shuttle and bobbin blocks and furniture etc.

H.P. State Forest Corporation Limited came into existence w.e.f. 25/03/1974, registered under The Companies Act, 1956. Now with the complete nationalization of forest with effect from 25/01/1983, the entire timber extraction work is being done by Forest Corporation. Exploitation work is being done through conventional methods. Mechanized logging cannot be

adopted, as the volume handed over is not in sizeable quantity. There is a complete ban on commercial green felling in the state and only salvage markings are being carried out.

3.6 Minor Forest Produce: - Detailed discussion on Minor Forests Produce is in Appendix 2.

3.6.1 Medicinal Herbs: - Recorded settlement rights authorize the right holder to collect barter or sell medicinal herbs, roots, flowers, fruits and aromatic plants from the forests. The modus operandii prescribed is that the local right holder must collect the medicinal herbs on his own without deploying labour for extraction. He then sells it to the middleman, who in turn exports the herbs outside the state. Amritsar has come as the principal market dealing in medicinal herbs.

The local panchayats were provided the necessary authorization to release the royalty for the medicinal herbs and to utilize the same for the general welfare of the rural folk of the Panchayats. The extraction is regulated by way of 3 year extraction cycle. The extraction cycle for Kullu Forest Division is as under:-

Huge demand for Nagchhatri (*Trillium govanianum)* roots has been observed from 2010 onward. It is supposed that it is sold in international markets at very high prices. Since, export permits are issued by the panchayats, no mechanism has been developed to keep record of medicinal herbs actually extracted and exported out of the division.

3.6.2 Resin Tapping: - In Kullu Forest Division, Chil forests have been raised during 1970 onwards and the crop is only in the pole stage. Thus, no resin extraction work is carried out in Kullu Forest Division.

3.7 Lines of Export:-

In the past, timber was exported to the markets of the plains through floating in River Beas and its tributaries. Timber was floated down to Dehra Gopipur from where it was rafted upto Kandrori near Pathankot and then subsequently sold. Timber was exported in the form of scantlings and small sized ballies to the facilitate river transportation. Ballies upto 14’ had been extracted in large numbers and floated down the River Beas and its tributaries during the war.

With the construction of large number of road networks connecting even very remote areas, timber floating is now very scarce. However, Kullu valley has skilled labour for transportation of timber from remote areas through gravity ropeway spans. Now, the timber is mostly transported through ropeway spans upto road head and thereafter through trucks upto various Himkasth Sale Depots situated in state itself at Nurpur, Bhadroya and Dhanotu by H.P. State Forest Corporation Limited.

CHAPTER-IV

ACTIVITIES OF HP STATE FOREST DEVELOPMENT CORPORATION LTD. IN HARVESTING AND MARKETING OF FOREST PRODUCE

4.1 GENERAL: - H.P. State Forest Corporation Limited is an undertaking of the HP Govt. which came into existence on the 25th of March, 1974 with a view to eliminate contractors/ leasees from working in the forest. However, as per the policy of the Govt., timber extraction works were transferred to the Corporation in a phased manner and the Corporation took over the complete working of the Govt. forests w.e.f. 25.01.1983.

This Corporation deals with the extraction and marketing of mainly Timber, fuel wood, pulpwood, bamboos, Khair, rosin, turpentine oil, subsidiary products (viz., phenyl, varnish, black Japan). In addition, a Fiber Board Factory at Baijnath and Timber Treatment Plant at Hamirpur, are presently engaged in the joinery works, timber chemical treatment and timber seasoning for Government as well as private timber. In addition, HPSFDC Ltd is also venturing into eco-tourism activities so as to tap huge tourism potential of Himachal Pradesh.

Objectives:-:

1. To carry out the extraction of timber and resin on scientific lines by adopting suitable modern techniques.
2. To eliminate the Contractor's agency in respect of works of timber extraction and resin tapping.
3. To obviate the chances of illicit felling of trees, illicit tapping of resin and other malpractices.
4. To work the forests on commercial lines by recycling of funds for works and also by raising funds from financial institutions as per requirements.

4.2 The Organization:-

The Chairman of the Board of director’s organization is Ex officio Forest Minister and vice chairman is nominated by the Govt. The board of director is as under:-

1. Forest Minister H.P.
2. Vice Chairman Forest Corporation.
3. Secretary Finance.
4. Secretary Forest.
5. P.C.C.F.Shimla.

6. Managing Director HPSFDC, Shimla.
7. Non official members.

Secretary (Forest) is administrative head and Managing Director is the head of the Organization. There are three Directorates viz. Director (Marketing), Director (North), and Director (South). Presently, there are 15 Forest Working Divisions, 5 Himkasth Sale Depots and, Two Resin and Turpentine factories at Bilaspur and Nahan. As on today, all ministerial staff and field functionaries upto Divisional Manager are permanent employees of the Corporation whereas DM and above are the officers of Forest Department deployed on secondment basis.

4.3 Expertise: -

4.3.1 TIMBER OPERATIONS:

The Corporation has a long experience of timber harvesting and extraction operations. The timber extraction process as per demand of the market, it's grading and marketing are mastered by Corporation over a period of time. Although, there is complete ban on the green felling of the trees in the state and Corporation is only getting salvage trees for exploitation comprising of dry, diseased, uprooted and damaged trees, handed over to it by the HP Forest Department for working. On an average, approx. 3.00 Lac m^3 standing volume is being felled and converted every year by the Corporation, which is sold in auction at the Sale Depots and also supplied to the Govt. Departments, non-right-holders, small scale industries etc. The different sizes of timber available and variety of prices are given below in Tables 4.1 & 4.2

Table 4.1: Sizes of Timber available

Sr. No.	**Kind of Timber/General Name**	**Dimensions (cm)**	**Vol. in m^3**
1.	**Beams**	366x31x16	0.182
2.	**Gattus**	305x31x16	0.151
		275x31x16	0.136
		244x31x16	0.121
		183x31x16	0.091
		122x31x16	0.061
3.	**Sleeper**	427x26x13	0.144

		366x26x13	0.124
4.	**Sleeper**	305x26x13	0.103
		275x26x13	0.093
5.	**Sleeper**	244x26x13	0.082
		183x26x13	0.062
6.	**Sleeper**	183x21x13	0.050
7.	**Scantlings**	427x21x13	0.117
		366x21x13	0.100
		305x21x13	0.083
		275x21x13	0.075
		244x21x13	0.067
8.	**Sleepers**	366x16x10	0.059
		305x16x10	0.049
9.	**Karries**	427x18x18	0.138
		366x18x18	0.119
		305x18x18	0.099
		275x18x18	0.088
		244x18x18	0.079
		427x16x16	0.109
		366x16x16	0.094
		305x16x16	0.078
		275x16x16	0.070
		244x16x16	0.062
		427x13x13	0.072

		366x13x13	0.062
		305x13x13	0.052
		275x13x13	0.046
		244x13x13	0.041
10.	**Side Slabs**	427x26x8	0.059
		366x26x8	0.051
		305x26x8	0.042
		275x26x8	0.038
		244x26x8	0.034
11	**Round Ballies**	366x50-59	0.069
		305x50-59	0.058
		244x50-59	0.046
		183x50-59	0.035
		152x50-59	0.029
		366x40-49	0.046
		305 -do-	0.039
		244 –do-	0.031
		183 –do-	0.023
		152 –do-	0.019
		366x30-39	0.028
		305 -do-	0.023
		244 –do-	0.019
		183 –do-	0.014
12	**Hakries**	L.183cm&mid.girth	0.093

		85cm & above	
		L.152 cm & above	0.077
		L.122 -do-	0.062
		L.92 -do-	0.047
		183x23x23	0.097
		152x25x25	0.095
		122x31x31	0.117
		92x36x36	0.119

Table 4.2: Weighted average sale price of timber at HSD Dhanotu:

Spp.	**2009-10**	**2010-11**	**2011-12**
Deodar	22179	25014	29225
Kail	21177	16279	19639
Fir	7726	8668	10372
Chil	6392	0	8783
B.L.	11440	6123	5273

4.3.2 RESIN TAPPING:

Since, the entire resin tapping work is being done by the Corporation, it has developed modern techniques of resin tapping and expertise in this respect is available for training as well as execution of works.

4.3.3 RESIN PROCESSING:

With the two rosin factories working for more than three decades, the Corporation has fully trained staff for this work and expertise in this respect is available for the purpose of resin processing.

4.4. HARVESTING / EXPLOITATION OF TIMBER: -

Due to nationalization of forest exploitation and ban on green felling imposed by HP Government, only dry and fallen trees referred to as salvage are handed over to Divisional Manager, HPSFDC Ltd. Kullu for harvesting/ exploitation who has jurisdiction over this division. Timber of Deodar, Kail, Fir/Spruce and other Broad Leaved spp. are exported from this division. The timber is sold by open auction at H.P. State Forest Development Corporation depots at Bhadroya, Nurpur, Dhanotu and Swarghat and subsequently exported out of the state. The position of trees handed-over to Divisional Manager Kullu for the last plan period is given in following Table 4.3:

Table 4.3: Position of year wise trees/ Volume handed over by Kullu Forest Division to DM Kullu during the previous Plan period

Year	Name of Marking	Deodar No./Vol. in m^3	Kail No./ Vol in m^3	Fir& spruce No./Vol. in m^3	Other B.L No/vol in m^3	Total No./ Vol in m^3
1993-94	Salvage	35/90.4	11/12.50	1864/8935.78	1108/2294.00	3018/11332.66
1994-95	-do-	21/9220	45/63.00	4922/11716.30	-	4988/11871.50
1995-96	-do-	231/372.4	128/448.90	2742/14411.91	-	3101/15233.21
1996-97	-do-	11/43.40	-	21/179.72	9828/1890.00	9860/1913.12
1997-98	-do-	-	163/499.85	2606/13456.08	15/ 30.90	2784/13986.83
1998-99	-do-	765/1428.70	308/708.50	330/1086.49	294/1062.97	1697/4286.66
1999-2000	-do-	-	-	215/1112.11	773/1185.47	988/2297.58
2000-01	-d0-	-	-	647/4131.15	-	647/4131.15
2001-02	-do-	5/16.20	99/179.50	3381/12982.417	751/1421.01	4236/14599.127
2002-03	-do-	-	-	760/2949.53	140/396.20	900/3345.73
2003-04	-	-	-	-	-	-

2004-05	-d-	110/218.70	1627/2958.00	3544/12702.44	3362/3945.57	8643/19822.64
2005-06	D0-	279/594.3	362/838.00	9990/31340.67	13561/15979.45	26192/48752.42
2006-07	-d0-	-	-	3317/13021.07	-	3317/13021-07
2007-08	-do-	-	-	9/51.52	27/112.4	36/163.92
2008-09	-do-	17/43.90	-	124/373.072	300/1028.4	441/1445.37
2009-10	-do	14/25.40	253/741.00	1944/8117.84	46/35.30	2257/8919.54
2010-11	-do-	22/32.30	54/233.30	58/274.89	-	134/540.39
2011-12	-Do-	0.22.00	57/181.20	25/181.20	-	102/320.11

The HPSFDC Ltd gets the exploitation work executed through Labour Supply Mates (LSMs). The employment to skilled, semi-skilled and unskilled labour 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.

4.4.1 Royalty rates charged from HPSFDC:

The royalty rates are charged for salvage lots handed over to corporation for which a fixed time schedule is adhered to which, for one year lots is as under:-

For High lying lots ½ royalty by 30th November.
½ royalty by 20th March.

For Chil Lots 1/3 royalty by 15th January
1/3 royalty by 20th March
1/3 royalty by 15th June.

The royalty is fixed on advalorem basis on the market rates achieved during previous year. The royalty rates for the year 2011-12 were as under:-

S. No.	Species	Rate/m^3 of Standing Volume (in Rs.)
1	Deodar	5903
2	Kail	3098
3	Fir/spruce	1030
4	Chil	704
5	Other BL	371

4.5 FUELWOOD AND CHARCOAL: - Forest working Division Kullu is major supplier of fuelwood to tribal areas of Lahul and Pangi sub divisions besides meeting local requirement. The

requirement is fulfilled from the salvage Broad leaved and conifer trees handed over as part of salvage lots. In addition, green trees are also marked in land diversion cases where approval from Govt. of India is received. However, extraction of charcoal is no more done now. There are 3 fuel wood sale depots in this division namely: Kullu, Patlikuhal and Manali besides one adjoining to this division at Shamshi which also caters to the demand of this division.

Quantity of fuel wood and charcoal sold from the retail sale depots of State Forest Corporation during the last five years is tabulated as under in Table 4.4:

Table 4.4: Fuel wood Sold at Retail Sale Depots:

Year	Name of Depot	Total Sale (In qtls.)
2007-08	Bhootnath	3116.16
2008-09		3003.74
2009-10		4602.34
2010-11		3805.29
2011-12		4076.83
2007-08	Manali	3919.00
2008-09		4682.00
2009-10		5328.00
2010-11		3087.00
2011-12		5012.09
2007-08	Patlikuhal	1364.97
2008-09		1156.55
2009-10		1370.71
2010-11		843.50
2011-12		724.12
2007-08		3742.37

2008-09	Shamshi	2672.00
2009-10		4393.51
2010-11		3001.17
2011-12		2222.91

In addition, Kullu Forest Working Division also supplies huge quantity of fuelwood to tribal areas of Pangi, Spiti and Lahul Forest Divisions. The quantity supplied during last three years is depicted below to show the trends:

Table 4.5: Demand of Fuel wood to Tribal Areas w.e.f.2009-10 to 2011-12

Year	**Name of Forest Division**	**Total Demand of Fuel wood**	
2009-10	Lahual	Hard	11700.00
		Soft	2200.00
		Total:-	13900.00
2010-11		Hard	12200.00
		Soft	4600.00
		Total:-	16600.00
2011-12		Hard	13500.00
		Soft	4300.00
		Total:-	13900.00
2009-10		Hard	2500.00
		Soft	0.000
		Total:-	2500.00
2010-11		Hard	1000.00

	Pangi	Soft	2507.00
		Total:-	3507.00
2011-12		Hard	2500.00
		Soft	0.000
		Total:-	2500.00
2009-10		Nil	
2010-11	Kaza	Hard	18600.00
		Soft	0.000
		Total:-	18600.00
2011-12		Nil	

4.6 PULPWOOD: -

Rai/ Fir and Kail pulpwood from the small-wood up to a minimum diameter of 20 cm. Under-bark is extracted from lops and tops and put to auction at Shamshi. The pulp wood is in great demand and fetches good market rate.

4.7 PRIVATE SALE LOTS:-

Trees existing in private lands, particularly nationalized species are also extracted by the Forest Corporation as private sale lots. The application for felling of trees is moved by the Special Power of Attorney (SPA) on behalf of the land owners along with their affidavits to Divisional Manager in the beginning of the year in which the area is open for felling under 10 year felling programme who further sends the case to DFO concerned after verifying the documents. The marking / demarcation is done by Forest, Revenue and Corporation staff jointly in the presence of SPA and felling order is issued by the DFO. This process should be completed in the same financial year in which the area is open failing for which deviation permission is required. PCCF can issue deviation up to one year and another one year deviation can be granted by Govt., no further deviation permissible. The working period of the private lots as per Govt. notification is 2 years for high lying lots and 1 year for low lying lots. The land owner/ SPA have option to choose the way to proceed sale is given. The prices and instructions in this regard are given by departmental notification from time to time. The last notification in this regard has fixed royalty rates for the year 2011-12 for Kullu Division as under:-

Table 4.6: Royalty rates for the year 2011-12:

S. No.	Species	Rates/Cum(in Rs.)
1	Deodar	4750
2	Kail	3115
3	Fir	1135
4	Chil	1078

I. Royalty basis.

In this regard the payment of price shall be made in the following manner:

(a) 50% of price shall be paid after the forest produce, reaches at Road Side.

(b) Balance price shall be payable immediately after final sale.

II. Sale price linked.

The Seller /Owners shall have an option to opt for price of forest produce linked with its actual sale realization. The process and method for determining the price of forest produce linked with sale, hereinafter known as "Sale Linked Price" shall be calculated by deducting actual direct expenses with interest and handling charges from the actual sale realization of the produce in the market, as under:-

A) Final sale realization (including of forfeiture of securities and earnest money, Insurance claim, if any) of the forest produce.

B) Actual direct expenses on felling, conversion, carriage, transportation, loading, unloading, stacking, insurance, road tax etc.

C) Interest on investment i.e. on item No. (B) ibid. at the borrowing rate of interest, prevalent on 1st April of each year, plus (+) 1% extra.

D) Handling Charges @ 18% on sale realization i.e. on item No. (A)

E) Price of the produce = A - (B+C+D)

F) Advances paid to the seller/ owners

G) Interest on the advances, if any, taken by the seller/owner till its recovery at the borrowing rate of interest, prevalent on 1s April of each year, plus 1% extra.

H) Interest payable to the seller/ owner at the borrowing rate of interest, prevalent on 1st April of the year in which final sale made, if balance amount is delayed beyond two months after the final sale.

I) Balance payable = (E+H)-(F+G)

Advances to the seller/ owner of the forest produce under the "Sale Linked Price" shall be made on request as below, by taking into account the expected yield to be obtained, likely expenditure and expected sale to be applied as per parameters stated above on tentative basis: -

(i) 25% after handing over the possession of forest produce and execution of the Sale Deed;

(ii) 25% on extraction of entire forest produce from forest and its carriage to Road Side; and

(iii) Balance after completion of sale and finalization of accounts, to be paid within two months of having recovered all dues including advances paid to the seller/owners. However, if final sale realization is delayed in that case till final sale realization, part payment of the sold produce may be considered by the HPSFC to the following extent:-

"*If entire extracted timber has reached at Sale Depot and out of that 70% or more has been sold and sale proceeds realized, the seller shall be given one opportunity for getting advance payment to the extent of 80% of the sale proceeds realized of his timber after adjusting 2 installments and all deductions of the amount spent on his total timber by the Corporation, interest, handling charges etc. The sellers shall not be entitled to this advance payment as a matter of right and applications shall be considered on merit to avoid hardship.*"

Table 4.7: Market rates of timber for right holders/ commercial (Govt. Departments) in Corporation Depots:

Rates of timber for Public & Govt. Departments w.e.f.2009-10 to 2011-12 (Rates per m^3)					
Year	Public / Govt.	Size	Deodar	Kail	Rai/Fir
2009	Public	305x26x13	46000	29000	16300
	Public	305x26x13	49900	40324	17264
	Govt.	305x26x13	47000	32218	16800
	Govt.	305x26x13	48570	39241	16800
2010	Public &	305x26x13	48570	41600	18140

	Govt.	305x26x13	48570	41600	18500
2011	Public & Govt.	305x26x13	51485	42850	22200
		305x26x13	56630	54420	28415

Table 4.8: Market rates of fuel wood for right holders commercial (Govt. Departments) in Corporation depots:

Rates of Fuel wood for Public & Govt. Departments for 2011-12 (Rates per qtls)			
Year	**Spp.**	**Public**	**Govt.**
2009	Coni.	300	534
	B.L.	360	616
2010	Coni.	340	610
	B.L.	410	710
2011	Coni.	340	610
	B.L.	410	710

CHAPTER-V

FIVE YEAR PLANS

5.1. GENERAL: The economy of India is based in part on planning through its five-year plans, which are developed, executed and monitored by the Planning commission of India The tenth plan completed its term in March 2007 and the eleventh plan is currently underway. Prior to the fourth plan, the allocation of state resources was based on schematic patterns rather than a transparent and objective mechanism, which led to the adoption of the Gadgil formula in 1969. Revised versions of the formula have been used since then to determine the allocation of central assistance for state plans. In the past, forests were source of revenue generation with very little spending on the resource development.

The forests of the division have been managed for getting sustainable yield through various Working Plans. The silvicultural fellings were mainly 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, etc. The increasing demands of forest produce in the state especially that of timber and fuel-wood resulted in focus on large scale plantations of commercially important species. Although the plantation programme started from Ist Five Year Plan but it gained momentum from IIIrd Plan onwards. The Plan wise management of forests and expenditure is as under:

5.2. FIRST FIVE YEAR PLAN (1951-56):- The national emphasis during this plan was on agriculture, Irrigations and building of dams.

During Ist Five Year Plan the forests of this division were managed under Shri. K.L.Aggarwal's working plan which came into being from 01/04/1949.and was covering period up to 1963-64. The forests of the tract were exploited commercially to meet the timber and fuel-wood requirements. There were four working circles namely Regular WC, Fir WC, Selection WC and Protection WC constituted and worked. The main emphasis was on prescription of yield which was prescribed on very high side in Fir and selection working Circles. There is very less emphasis on subsidiary silvicultural operations and regeneration. Protection of steeper areas was given priority but from these areas also yield was prescribed. The demand of local people for fuel and fodder was also taken care of. The Regular and Fir working circles were managed under "Punjab Shelterwood System" with aim to make advance growth up to pole stage as part of future crop.

5.3. SECOND FIVE YEAR PLAN (1956-61):- The second five-year plan focused on industry, especially heavy industry unlike the First plan, which focused mainly on agriculture, domestic production of industrial products was encouraged in the Second plan, particularly in the development of the public sector, The plan attempted to determine the optimal allocation of

investment between productive sectors in order to maximize long-run economic growth. It used the prevalent state of art techniques of operations research and optimization. The plan assumed a closed economy in which the main trading activity would be centered on importing capital goods. Hydroelectric power projects and five steel mills were established with increases coal production.

During 2nd Five Year Plan the forests of this division were managed under Shri. K.L Aggarwal's working plan which came into being from 01/04/1949.and was covering period up to 1963-64. The forests of the tract were exploited commercially to meet the timber and fuel-wood requirements. There were four working circles namely Regular WC, Fir WC, Selection WC and Protection WC constituted and worked. The main emphasis was on prescription of yield which was prescribed on very high side in Fir and selection working Circles. There is very less emphasis on subsidiary silvicultural operations and regeneration. Protection of steeper areas was given priority but from these areas also yield was prescribed. The demand of local people for fuel and fodder was also taken care of. The Regular and Fir working circles were managed under "Punjab Shelterwood System" with aim to make advance growth up to pole stage as part of future crop.

5.4. THIRD FIVE YEAR PLAN (1961-66):- The third plan stressed on **agriculture** and improvement in the production of wheat, but the brief Sino Indian war of 1962 exposed weaknesses in the economy and shifted the focus towards the Defence industry. In 1965–1966, India fought a War with Pakistan. Due to this there was a severe drought in 1965. The war led to inflation and the priority was shifted to the construction of dams continued. Many cement and fertilizer plants were also built.

During 3rd Five Year Plan the forests of this division were continued to be managed under Shri. K.L Aggarwal's Working Plan. Revision of plan was although started but could not be completed during this 5 year plan and forest continued to be managed as explained above.

5.5. FOURTH FIVE YEAR PLAN (1969-74):- At this time government nationalized 14 major Indian banks and the Green Revolution advanced agriculture in India.

During this period also the working plan prescriptions of KL Agarwal's WP continued. D.P. Kapoor's working plan came in to existence only in 1972-73.

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5.6. FIFTH FIVE YEAR PLAN (1974-79):- Stress was by laid on employment, poverty alleviation, and justice. The plan also focused on self reliance in agricultural production and defence.

During this period, Shri Kapoor's draft plan was proposals were submitted in 1972-73 but this WP was not approved, as he accounted for the period 1964-65 to 1978-79 with remaining five years effective period of the plan. Through Kapoor's draft plan was not formally put into any operation, it continued to be followed. Four Working Circles were constituted as per the draft:-

1. Regular Working Circles.

2. Fir Working Circles.
3. Protection Working Circles.
4. Broad-Leaved (Over-lapping) Working Circles.

Selection Working Circle of Aggarwal's plan was abolished and the forests were transferred to four Working Circles of the composition of crop and configuration of the ground.

5.7. SIXTH FIVE YEAR PLAN (1980-85): - The sixth plan also marked the beginning of economic liberalization. Price control was eliminated and ration shops were closed. This led to an increase in food prices and an increase in the cost of living. Family planning was also expanded in order to prevent overpopulation.

During this plan period Shri J.C. Sharma's Working Plan for Kullu And Parvati tract was operated from 1979-80 to 1993-94. The following working circles were constituted:-.

i) Deodar /Kail Working Circle.
ii) Fir Working Circle.
iii) Protection Working Circle.
iv) Broad Leaved Overlapping Circle.
v) Improvement Working Circle.

During this plan period complete ban on felling of green trees was imposed in the state and accordingly prescriptions of working plan for regulating felling were not implemented.

Table: 1.5.1. Revenue and Expenditure during VIth Five Year Plan

Year	Revenue in Rs.	Expenditure in Rs.	Surplus/Deficit in Rs. (+)/(-)
1980-81	2107540	4178850	-2071310
1981-82	2582545	5191040	-2608495
1982-83	3413478	5753621	-2340143
1983-84	14660758	6084488	8576270
1984-85	4590563	5903604	-1313041

Source: Kullu & Parvati Working Plan by J.S. Walia.

5.8. SEVENTH FIVE YEAR PLAN (1985-90): - The Seventh Plan laid stress on improving the productivity level of industries by upgrading of technology and to establish growth in areas of increasing economic productivity, production of food grains, and generating employment.

During this plan period also, Shri J.C. Sharma's Working Plan for Kullu and Parvati tract was operated from 1979-80 to 1993-94. The following working circles were constituted:-.

i) Deodar /Kail Working Circle.
ii) Fir Working Circle.
iii) Protection Working Circle.
iv) Broad Leaved Overlapping Circle.
v) Grazing & Improvement Working Circle.

During this plan period complete ban on felling of green trees was imposed in the state and accordingly prescriptions of working plan for regulating felling were not implemented. The social forestry umbrella project was launched and social forestry works were in full swing, main emphasis being on raising fuel, fodder, small timber and grasses to meet the increasing domestic needs of rural communities. The figures of revenue and expenditure during VIIth Five Plan of Kullu Forest Division are tabulated as under in Table: 1.5.2.

Table: 1.5.2. Revenue and Expenditure during VIIth Five Year Plan

Year	Revenue in Rs.	Expenditure in Rs.	Surplus/Deficit in Rs. (+)/(-)
1985-86	6352725	6508757	-156032
1986-87	2291125	8311909	-6020784
1987-88	1836662	9582809	-7746147
1988-89	1852881	12704561	-10851680
1989-90	2151099	14519962	-12368863

Source: Kullu & Parvati Working Plan by JS Walia.

5.9. EIGHTH FIVE YEAR PLAN (1992-97): - 1989–91 was a period of economic instability in India and hence no five year plan was implemented. Between 1990 and 1992, there were only Annual Plans. In 1991, India faced a crisis in foreign exchange (Forex) reserves. At that time India's free market reforms were launched that brought the nearly bankrupt nation back from the edge. It was the beginning of privatization and liberalization in India. The major objectives included, controlling population growth, poverty reduction, employment generation, strengthening the infrastructure, institutional building, tourism management, Human Resource Development, involvement of Panchayat Raj, Nagar Palikas, N.G.O'S and Decentralization and people's participation.

During this plan period Shri J.C. Sharma's Working Plan for Kullu And Parvati tract was operated for first two years with following working circles:-.

i) Deodar /Kail Working Circle.
ii) Fir Working Circle.
iii) Protection Working Circle.
iv) Broad Leaved Overlapping W. Circle.
v) Grazing & Improvement Working Circle.

For remaining period Sh. JS Walia's WP (1994-95) was in operation with following working circles:-.

i) Deodar /Kail Working Circle.
ii) Fir Working Circle.
iii) Protection Working Circle.
iv) Broad Leaved Overlapping Circle.
v) Improvement Working Circle.

During this period, The JFM approach also started in the division and the forestry activities were implemented under departmental schemes. Due to ban on green felling, the objective of management includes conservation and improvement of existing forests, prevention of denudation and erosion of hill slopes, meeting legitimate and bonafide domestic and agricultural requirements and adoption of Joint Forest Management approach. The constitution of forest development committees and their participation in planning and implementation was sought. The figures of revenue and expenditure during VIIIth Five Plan of Kullu Forest Division are tabulated as under:-

Table 1.5.3 Revenue and Expenditure during 8TH Five Year Plan

Year	Revenue in Rs.	Expenditure in Rs.	Surplus/Deficit in Rs. (+)/(-)
1992-93	1574461	12880993	-11306532
1993-94	1831560	20525376	-18693816
1994-95	1406428	18015000	-16608572
1995-96	3082650	21223100	-1814050
1996-97	2446840	26520600	-24073760

5.10. NINETH FIVE YEAR PLAN (1997-2002):- Ninth Five Year Plan mainly aimed at attaining objectives like speedy industrialization, human development, full-scale employment, poverty reduction, and self-reliance on domestic resources.

During this plan period, Sh. JS Walia's WP (1994-95 to 2009-10) was in operation with following working circles:-.

i) Deodar /Kail Working Circle.
ii) Fir Working Circle.
iii) Protection Working Circle.
iv) Broad Leaved Overlapping Circle.
V) Improvement Working Circle.

The JFM activities continued in this period and due to ban on green felling, the objective was mainly on afforesting denuded/degraded forests. The works of afforestration, soil conservation, entry point activity started by the VFDCs and microplan process learnt and executed. Sanjhi Van Yojna started on the principles of JFPM. Here again the focus remained on

restocking/regeneration of degraded forests with the help of local people. Requirement of local people was given due emphasis particularly for selection of area and species. The figures of revenue and expenditure during IXth Five Plan of Kullu Forest Division are tabulated as under in

Table: 1.5.4. Revenue and Expenditure during Nineth Five Year Plan

Year	Revenue in Rs.	Expenditure in Rs.	Surplus
1997-98	1,120,508	25,029,155	-23,908,647
1998-99	1,574,857	40,928,225	-39,353,368
1999-2000	1,332,564	33,696,702	-32,364,138
2000-01	838,987	26,512,670	-25,673,683
2001-2002	4,477,918	20,128,621	-15,650,703

5.11. TENTH FIVE YEAR PLAN (2002-2007): - The main aims of this plan was to attain 8% GDP growth per year, reduction of poverty, providing gainful and high-quality employment and reduction in gender gaps in literacy and wage rates.20 point program was introduced.

During this plan period, Sh. JS Walia's WP (1994-95 to 2009-10) was in operation with following working circles:-.

i) Deodar /Kail Working Circle.
ii) Fir Working Circle.
iii) Protection Working Circle.
iv) Broad Leaved Overlapping Circle.
V) Improvement Working Circle.

The JFM activities continued in this period and Due to ban on green felling, the objective was mainly on afforesting denuded/degraded forests. The works of afforestration, 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. Here again the focus remained on restocking/regeneration of degraded forests with the help of local people. Requirement of local people was given due emphasis particularly for selection of area and species. Due to intervention of the Hon'ble high court, ban on grant of timber distribution was imposed till department come out with new TD Policy on 2 June, 2006.

The figures of revenue and expenditure during Tenth Five Plan of Kullu Forest Division are tabulated as under:-

Year-wise Revenue & Expenditure during plan period

Year	Revenue in Rs.	Expenditure in Rs.	Surplus
2002-03	11,581,486	21,888,535	-10,307,049
2003-04	32,656,826	23,007,527	9,649,299
2004-05	127,349,762	23,702,094	103,647,668
2005-06	9,419,528	35,357,525	-25,937,997
2006-07	16,588,324	37,134,571	-20,546,247

5.12. ELEVENTH FIVE YEAR PLAN (2007-2012): - The eleventh plan has objectives like accelerate GDP growth, create new work opportunities, reduce educated unemployment, increase literacy rate, ensure electricity connection to all villages , ensure all-weather road connection to all habitation with population 1000 and above (500 in hilly and tribal areas). Beside this emphasis was also given on following environmental issues

- Increase forest and tree cover by 5 percentage points.
- Attain WHO standards of air quality in all major cities by 2011–12.
- Treat all urban waste water by 2011–12 to clean river waters.
- Increase energy efficiency by 20 %

The forests continued to be managed under JS Walia's working plan. New TD policy came in to picture on 13 Oct 2009 with major changes. Forest Development Agencies are created and strengthened wherein funds under FDA are spent through Joint Forest Management Committees. National Medicinal Plant Board project was launched in Kullu and Chamba district wherein planting of medicinal herbs, shrubs and trees incorporated. CAT plan works of AD Hydro Power Project also started in Manali and Naggar ranges. Since road connectivity was one of the aims of the plan, therefore land diversion cases increased and forest land diverted under FCA for non forestry activities.

Year-wise Revenue & Expenditure during plan period

Year	Revenue in Rs.	Expenditure in Rs.	Surplus
2007-08	76,282,372	30,841,801	45,440,571
2008-09	75,914,074	44,623,950	31,290,124
2009-10	2,875,645	41,791,918	-38,916,273
2010-11	10,750,120	40,219,323	-29,469,203
2011-12	7,727,691	39,982,001	-32,254,310

CHAPTER VI

STAFF AND LABOUR SUPPLY

6.1 Staff: - The sanctioned strength of Kullu Forest Division for various categories of staff as stood on 30-06-2012 is given in Table 6.1.

Table: 6.1. Staff position of Kullu Forest Division as on 30-12-2012.

S.No	Name of Post	Sanctioned post	Existing post
1	DFO	1	1
2	ACF	1	1
3	Supdt.	1	1
4	Sr.Asstt.	3	2
5	Jr.Asstt./Clerk	5	3
6	Forest Ranger	7	5
7	Deputy Ranger	21	18
8	Forest Guard	50	43
9	Driver	1	1
10	Peon	5	5
11	Chowkidar	11	9
12	Mali	5	5
13	Forest Worker	17	15
14	Peon/Chowkidar	1	0
15	Sweeper	1	0
16	Patwari	1	0
	Total	**131**	**110**

6.2 Executive Charges: -

There are five Ranges in Kullu Forest Division. The present list of the Ranges, Block and Beats in the Division are given as follows: -

Table 6.2: Name of Ranges, Blocks and Beats.

Range		**Block**		**Beats**	
1	**Manali**	1	**Manali**	1	Goshal
				2	Manali
				3	Shallin
		2	**Vashisht**	4	Prini
				5	Aleo
				6	Vashisht
		3	**Kothi**	7	Kothi
				8	Mathiban
		4	**Palchan**	9	Palchan
				10	Kangni
				11	Shanag
2	**Naggar**	5	**Naggar**	12	Jana
				13	Nathan
				14	Naggar
				15	Rumsu
		6	**Hallan**	16	Hallan
				17	Sarsai
				18	Batahar
				19	Barsai

		7	**Khakhnal**	20	Sajla
				21	Khakhnal
				22	Jagatsukh
3	**Patilikuhl**	8	**Fozal**	23	Fozal
				24	MandalGarh
				25	Neri
		9	**Katrain**	26	Patlikuhal
				27	Pankot
				28	Baragarh
4	**Kullu**	10	**Raison**	29	Beaser
				30	Raison
		11	**Kais**	31	Tandla
				32	Gahar
				33	Bijli Mahadev
				34	Borsu
		12	**Kullu**	35	Maharaja
				36	Sari
5	**Bhutti**	13	**Tarapur**	37	Tarapur
				38	Bhumter
				39	Bharai
				40	Kaisdhar
				41	Dughilag
		14	**Rujag**	42	Tiun
				43	Mashana

				44	Shalang
				45	Choparsa

In addition there is a check post at Palchan in Manali Range and one construction beat at Kullu.

6.3 Labour Supply:- With the present rate of Rs. 150/- for unskilled labour, it does become very difficult to engage labour during fruit growing seasons, especially during the apple season, when labour get plentiful employment with very high wages. Availability of Gorkha labour is scarce now due to improving conditions in Nepal and so is the migrant labour thankas to MNREGA. Local labour for various forestry works is not readily available and during plantation season labour is imported from Mandi area. Labour rates which are effective from 1st September 2012 in Rs. are as under in table 6.3:

Table: 6.3. Daily Labour Basic Rates

Sr. No.	**Category of Daily Labour.**	**Unit**	**Rate in Rs.**
A.	Beldar (Mazdoor)/Casual Labour	Per day.	150.00
	Mate	-do-	150.00
	Cook	-do-	150.00
	Mali	-do-	150.00
	Chowkidar	-do-	150.00
	Helper	-do-	150.00
	Khalasi	-do-	150.00
	Peon	-do-	150.00
	Chainman	-do-	150.00
	Unskilled Labour	-do-	150.00
	Assistant Saw mill operator	-do-	150.00
	Feller (Garani)	-do-	150.00
	Logger Dresser (Pachani)	-do-	150.00
	Climber (Looper)	-do-	150.00
	Zoo animal attendant	-do-	150.00

	Fire Watcher	-do-	150.00
	Miscellaneous Labour	-do-	150.00
B.	Bar Binder	-do-	162.00
	Sawyer (Charani)	-do-	162.00
C.	Fitter Grade-I,II	-do-	192.00
	Plumber Grade -I,II	-do-	192.00
	Mason Grade-II,III	-do-	192.00
	Earth work Mistry	-do-	192.00
	Forest Guard	-do-	192.00
	Electrician	-do-	192.00
	Work Supervisor	-do-	192.00
	Store clerk/Keeper	-do-	192.00
	Patwari	-do-	192.00
	Plumber	-do-	192.00
	Clerk	-do-	192.00
	Assistant Store Keeper	-do-	192.00
D.	Driver(Tractor,Jeep/Car/Truck)	-do-	205.00
E.	Junior Draftsman	-do-	240.00
F.	Hydrogeologist	-do-	420.00

Source: - Kullu Forest Division.

6.4 Labour for Timber Extraction operation:-Timber extraction work is mostly done by the Forest Corporation which floats tenders for extraction works. Labour engaged in timber extraction operation consists of (i) Felling labour (ii) Sawing labour (iii) land carriage labour (iv) Rope -way labour (v) Floating-cum-Rafting labour. Due to lack of skilled labour in timer extraction works and involvement of people in Horticulture and Tourism, labour is mostly imported from different part of Pradesh through contractors and labour supply mates, who are paid commission on the earning of their labour. However for petty departmental extraction works, local labour is engaged. Since the local people are getting handsome wages in horticulture, off season vegetable and tourism activities, it is not possible to get labour for this arduous work particularly with the existing schedule of rates.

CHAPTER-VII

PAST SYSTEM OF MANAGEMENT

7.1 General History: - It was only during the middle of 19th century, when princely states transferred to the crown, the forest of Kullu started being management scientifically. Departmental fellings done by the government were used on mere rough estimate of yields, as no proper working plan/scheme existed. Over-fellings could not be ruled out. Deodar however was recognized as a valuable species even then.

7.2 The First Working Plan: - An attempt to secure regular sustained yield, came about, only after CP Fisher took the task of preparing the first working plan. In 1894 (till1897), value was only given to Deodar, while other species were considered inferior and their felling was considered only with reference to right holders demand. Deodar yield calculations were done separately for each range and working circle. The annual yield was fixed by the number of 'I' Class trees. Felling prescriptions were followed and only estimated export removed. Considerable attention was paid to improvement felling and thinning which results in establishment of fairly large area of even aged young crop of Deodar and Kail. However, the system did not work well, as areas having older crops could not be closed satisfactorily, after selection fellings for concentrated regeneration. This affected adversely the plan objectives. Without effective closure, grazing was singularly responsible, for failure of regeneration, which would otherwise have been expected to come after the feelings.

7.3 The Second Working Plan: - Sir. E.G. Trevor during 1915 took the task of preparing the 2nd Working Plan (i.e. after 25 years), which came into operation from 1919-20. Sir Trevor's study, field experience and pragmatic approach could be seen from the act that he devised and adopted a closure scheme to help regenerate heavily grazed areas. Adopting the Uniform System, he placed all the forests except the most precipitous ones, into four working circles, so that definite forest areas could be closed and regenerated during fixed period of years. This was done without giving hardship to the villages near the forests, whose rights of grazing and ready access to mature timber within reasonable distance were recognized. Closures of compartment gave minimum possible inconvenience to right holders. The four working circles formed were:-

7.3.1 The Regular Working Circle:- This consist of all the Deodar, Kail, Chil and Oak Forests which were located on ground, easy to be worked under Uniform System. Four periodic blocks and a rotation of 120 years were adopted. However, PBI was kept at 25 years instead of 30 years, on the basis that a good deal of regeneration, which already existed in the block, could be completed at the earliest. Yield of 55,158.32 cum. was calculated on the basis of total enumeration carried down to 30 cm. diameter in the blocks plus half of the increment, divided by 25 years of the yield. Deodar constituted 13%, Kail 20%, Fir 64% and Chil 3%. A deficit was

however observed at the end of the plan period whereby Deodar was 39%, Kail 61%, Fir 77% and Chil 31%. Silviculturally the plan was sound, as excellent plantation of Deodar bear testimony to this. However, a great deal of discretion with the D.F.O. resulted in the prescribed yield not being obtained and neither being sustained. Artificial regeneration was obtained to a great proportion with Kail filling up the intervening blanks. Restocking of fire burnt areas of 1921-22, especially in the upper portions of the compartments, where Fir was the main crop, was inadequate. Closure, removal of humus and weeds, carried out in subsequent years fostered natural regeneration.

7.3.2 Fir Working Circle:- This consisted of all the pure Fir forests which would suitably be worked under the Uniform System. 30 years periodic blocks and rotation of 150 years was adopted. Annual yield of 65,286.70 m^3 was arrived at. However this could not be worked, for lack of proper market. Experimental regeneration fellings, and departmental fellings for Railways, for broad gauge sleepers, were undertaken on a limited scale. Deficit ran as high as 97%. Meeting right holder's demand was bad, for upper Kullu Range forests of Fir, which as such had an open crop. Effective Closure to initiate regeneration was not done. Devastating fires of 1921-22, made yield calculations unreliable for future wok. Revision of yield calculation was not done.

7.3.3 The Section Working Circle:- In this circle were placed, such Deodar, Chil and Fir areas, whose ground configuration was such that Uniform System could not worked and only selection System could be adopted. A rotation of 120 years was fixed. Yield for Deodar was calculated according to Hufnagl's formulas and fixed at 128.92 cft annually. A deficit yield of 38% was observed till the end of 1933-34. The yield calculated was very much over assessed as Hufnagl's formulas presumes existence of normal distribution of all the gradations. This is fallacious for Kullu, where younger age classes are very much deficient. Further even II^{nd} class trees were deficient. In practice, yield based on II^{nd} and III^{rd} class trees was obtained from I^{st} class trees leading to over felling. Moreover the fires of 1921-22 afflicted heavy damage to many portion of the circle, necessitating their working. These factors resulted in depletion of the growing stock of the forests. Inadequate regeneration added to woes, with the result that the removal of remaining over wood could not be allowed, for many years to come.

7.3.4 The Unregulated Working Circle: - In this circle were put such remote areas which were not possible to be worked for export and also such areas that were true protection forests.

7.4 The Third Working Plan: - Mr. W.H.G. Samler took up the revision of Trevor's plan from 1930 to 1934. His plan came up in operation from 01/04/1934 and was merely a continuation of Trevor's plan. The same four working circles, constituted earlier**,** were kept, except that a considerable area containing pure (or predominantly so) fir of the Regular Working Circles was transferred to the Fir Working Circle.

7.4.1 The Regular Working Circle: - Rotations was increased from 120 years to 150 years, and 5 periodic books each of 30 years were constituted. Increment was excluded from yield calculation. Preparatory fellings were prescribed in PB II and the yield was combined with the yield obtained from PB I and PB V. There was no justification for this, especially since both were regenerated in two different periods. While PB I was being regenerated, PB II was to be treated in almost the same manner as the rest of intermediate blocks. Prescription of PB-II fellings was most unfortunate as it led to heavy removals and reductions of yields in the next 30 years, when these forests passed on to PB I. Upto the end 1947-48 the extent of removals in Kullu Forest Divisions were:-

	Deodar (in cum.)	Kail (in cum.)	Chil (in cum.)
PB I	13516	24853	1354
PB II	4747	18971	321
PB V	1530	2947	1771

The yield was of two types – final and intermediate. The final yield consist of all trees, 60 cm and over in diameter and the latter of 2nd class trees, 40 cm to 60 cm. Over assessed yield of the plan adversely affected future yield, considerably. World War II called for enormous demand for timber, resulting in Working Plan programme estimates and forest management being upset. Independent triennial felling programme were taken up, with the result that at the end of the plan in 1947-48, the felling in case of Kail and Chil were considerably in excess. Easily accessible forests were overworked and intermediate blocks were opened. In the later years of the war, young pole crop in PB I and PB V was also hacked. Fortunately however, the deodar fellings remained in deficit.

7.4.2 Fir Working Circle: - Rotation was kept at 150 years. Trevor's enumeration in PB I was used in calculate yield. Increment was excluded and for yield calculation, trees 60 cm and over in diameter was considered. It was never anticipated that the War would put so much strain in Fir trees. Enumeration thus was limited to a few PB I areas, while the other forests allotted to this circle, were left undescribed or were not inspected. Felling excess stood at 9 years at the end of 1947-48. Deficit thus, was sharp. Felling were not confined to PB I, but were frequently carried out in other areas easily accessible. Maple and Walnut were much sought after for the rifle and gun half wrought. In Kullu Division, from 1942-43 to 1947-48, 2951 Maple and 266 Walnut trees were sold to purchasers. On the whole, regeneration in the Fir forest remained/neglected. It was only in some experimental plots, where the research Divisions carried out systematic cultural works, that the regeneration works satisfactory. The war ravages were also felt, in the accessible 3rd class forests, in which heavy fellings, ignoring plan protection (Para 219 of the plan) were done. The felling for 10 years, ending 1947-48 was as follows:-

Species	Number of Scantling	Volume in m^3
Deodar	66,717	4,872
Kail	1,90,706	13,564
Chil	15,918	1,145
Fir	17,861	1,307
Total	**2,98,202**	**20,8888**

The repeated of severe fellings seriously jeopardized the legitimate right holder demand.

7.5 The Fourth Working Plan: - Shri. K.L Aggarwal 1947-49 and his plan came into being from 01/04/1949. Yet again like Samler's plan, four working circles were constituted-

7.5.1 Regular Working Circle: - This comprised the valuable and important, easily accessible Deodar/Kail forests, with some Fir and Spruce located in the upper reaches and little Chil in the lower parts of the lower Kullu Range. This working circle remained almost as the same as in the previous plan, except that some steep and precipitous area were transferred to Selection Working Circle, while compact large portions, containing predominantly pure Fir, were place in the Fir Working Circle. Thus, this Working Circle Comprised, large proportion of 1st class forests, many reserved forests and few 2nd class forests. Complete enumeration down to 20 cm diameter, in 10 cm diameter classes were carried out. Stock maps on 4"=1 mile scale, showing different species, were prepared for all the compartments and area under different species calculated. Rotation was fixed 150 years and exploitable diameter kept at 60 cm d.b.h. Punjab shelter wood system was adopted, as it provided for felling as per terrain conditions and retention of compact groups of poles, as part of future crop. Further, only selections feeling in the system were to done on steep ground. Five periodic blocks of 30 years each, (in which PB I, PB ii and PB v were definitely allotted, while remaining two periodic blocks were grouped as PB inters) were constituted. A 30 years period was considered suitable for regeneration. For calculation of yield, the final yield was from volume of I[st] and II[nd] Class tress, in PB I and PB V. As a factor of safety against natural calamities such as fires, floods, land-slides etc., increment was excluded from yield. Yield estimates were based on field observations evolving a constant, indicating the %age of volume of each species available. Allowance under Punjab Shelter wood system was kept for compact pole groups, which were to be retained as advance growth, or tree allowed to stand in blanks, where regeneration had not established or on broken ground, where entire over wood could not be removed for silvicultural reasons. Formula for yield calculations from PBI was:-

$$Y = CI\ \frac{VI + C2\ V2}{P}$$

V1 = Volume of 1st class trees standing in PB I
V2 = Volume of II class trees standing in PB I
P = Length of the period i.e. years.

C1 was assessed as 0.6 for Deodar, 0.8 for Kail and Chil and 0.7 for Spruce and Fir. The value of C2 was estimated at 0.3 for Deodar, 0.5 for Kail, Fir and Chil. For Calculation yield from PB V areas, it was felt that such over wood which does not suppress regeneration, be left. Estimate was that 50% of 1st and 2nd class trees, otherwise available silviculturally, should be removed in the interest of the young crop, during the first 15 years plan. Formula for yield calculation from PBV was:-

$$Y = \frac{\frac{1}{2}(C1V2 + C2V2)}{P} \qquad P = 15 \text{ years for } 1^{st} \text{ class trees.}$$

C1 = 0.8 for 1st class trees for Deodar/Fir, C1 = 0.9 for Kail/Chil; for 2nd class trees, C2 Deodar/Chil is 0.3 and C2 for Kail/Spruce/Fir is 0.5. For Yield from over mature stock i.e. IB and over, was designated as final yield and was calculated by volume, with the estimate that 40% of the mature trees of Deodar and Chil and 60% of Kail and Fir, would be available for felling, during the plan period. Intermediate yield from PB inter was controlled by area rather than volume. Thinnings on silvicultural principles were undertaken. In PB II, no export was to be allowed. Only dead dry, uprooted trees were to be felled for grant to right holders etc. and counted towards yield. Yield by species was shown and provision was there, to adjust this yield between the species, at the end of 3 to 5 year, when it should not be in excess by more than 10% of the combined yield of Deodar, Kail and Chil. Summing up the result of management, it can be seen that through prescription of the Working Plan were carried out, yet subsidiary silvicultural operations were not paid attention. Out of 2,155 hectares area under PB I, only 1235.62 hectares were prescribed for seeding felling. Regeneration operation carried out after seeding felling, helped especially for Deodar regeneration, which progressed well with Kail filling up the blanks. Where regeneration did not come up, the reason was repeated fires. Under PB II, no felling for export was prescribed. In order to exercise check, it was prescribed that all 1st class trees, removed for what so ever reason, should count towards prescribed yield. However, only damaged/dead tree were permitted to be felled. In PB inter forest, which as such already open, thinning-cum-improvement fellings were under taken. In PB V, young crop was tended and over wood removed sequentially, except here too, some variance from prescription came about. Yield was prescribed for trees, 40cm d.b.h. and above in PB I and PB V and 60 cm d.b.h. and above, in PB Inter. At the end of 15 years however, felling were 3250 cum in excess of Deodar, 8,690 cum in excess for Kail, 23,685 cum deficit for Fir and 156 cum excess for Chil. Prescribed yield as per the plan was 2350.26 cum for Deodar, 1491.66 cum for Kail, 141.58 for Chil and 6711 cum for Fir. Yield control for valuable species was not done. Fir remained in deficit because yield estimates for it were on the higher side.

7.5.2 Fir Working Circle: - Except that some more Fir dominated areas where transferred to this Working Circle, the constitution of this Working Circle, remained the same as in the previous plan. Further, areas dominated by Deodar and Kail, were taken out from this Circle and

included either in the Regular Working Circle or Selection Working Circle. This Working Circle now consisted of, mature, over-mature Fir and Spruce, open and under stocked. Enumerations down to 30 cm d.b.h. were carried out in 10 cm diameter classes. Rotation kept was for 180 years with 6 periodic blocks and exploitable diameter was kept as 80cm d.b.h. Management of this Working Circle, was through the Punjab Shelterwood system. Stress on regeneration Fir/Spruce in the areas in the Working Circle was undertaken the valuable broadleaved species i.e. Ash, Maple, Walnut etc. which were propagated on the moist and damp localities. Prescribed final yield was 19,538.44 cum, with 5889.58 cum PB I and PB IV and 13,648.59 cum from the other PBs. Final yield from PB I, was based on the volume of trees of 60 cm. d.b.h. and over, while for the other PBs only volume of IC and ID trees of Fir/Spruce, could be removed. The volume of Deodar, Kail and Chil was ignored, being negligible. Prescriptions of the Working Plan were followed, by and large, except that due attention was not paid to subsidiary silvicultural operations. Fencing followed by sowing and planting works, carried out in the first instant, remained unattended subsequently, in later years. Protection against grazing and browsing was not enforced. Improvement-cum-selection fellings were undertaken, in the other PBs. At the end of 15 years, results of fellings were appears in Fir and Spruce, upto 8315 cum. It cannot be ruled out that yield was somewhat over assessed.

7.5.3 Selection Working Circle:- Irregular mixed forests, on steep and broken ground were allotted to this Working circle. Considerable area of this working circle was taken up by rocky and inaccessible terrain, with upper limits containing Kharsu, some Deodar and Fir/Spruce or alpine pasture. Enumeration of the conifers was done, down to 20 cm d.b.h. in 10 cm. diameter classes, wherever possible. Forests were maintained on irregular steep ground, but elsewhere on easier ground the technique of regeneration felling was followed, just like in Regular Working Circle. Exploitable diameter was kept at 70 cm. d.b.h. like in Regular Working Circle. Exploitable diameter was kept at 70 cm. d.b.h. and rotation was fixed at 210 years with felling cycle of 30 years. Higher rotation was justified on the basis that in Selection forests, growth was admittedly slower, than in forest of regular Working Circle. Annual yield was prescribed as 1019 cum for Deodar, 906 cum for Kail, 87 cm for Chil and 8890 for Spruce /Fir. At the end of 15 years, the result of felling were , Deodar :- 2988 cum deficit and Kail :- 373 cum deficit, Fir/Spruce :- 41,802 cum deficit and Chil :- 231 cum deficit which was approximately equal to 3 years prescription in case of Deodar, 4 ½ years prescription for Fir and 9 years prescription in case of Chil. The above data shows that except for Kail, the yield for other species was not silviculturally available and must therefore have been over-assessed. Regeneration works were not carried out systematically and did not progress well.

7.5.4 Protection Working Circle: - The balance DPFs and RF's which had not been allotted to any of other Working Circles were placed here. These Forests were inaccessible and remote and low economic value. Their value was however, from the soil and water conservation point of view, as they occurred at the head of streams. Except for meeting minor right holder demands,

these forests were kept at rest. Some selection fellings of Kharsu Oak was prescribed when maturity was reached. Some more steep in accessible/precipitous areas, from other Working Circles, were transferred to this Working Circle. Further all the IInd class forests were included in this Working Circle. The DPFs by and large did not undergo major fellings. In IIIrd class forests, rotational closure for 10 to 15 years at the most, taking not more than 1/4 th of the area at a time, under proper scheme, was suggested. However, by and large, IIIrd class forests remained heavily grazed, burdened with rights of grazing, timber and nautors etc. Closure followed by planting of blanks areas did not give much success.

7.6 Fifth Draft Working Plan by Mr. D.P. Kapoor : - Sh. K.L. Aggarwal, whose plan ended on 1963-64, had recommended an intermediate revision. With the coming into being of National Forest Policy in 1952, thinking underwent a drastic change. Both extrinsic and intrinsic benefits of forests were stressed. Where conservation of soil and water and eco-development was stressed, the importance of forest in industrial activity had to lean heavily on forest produce. Spruce and Fir were seen as raw ingredient for newsprint factories; Himalayan Maple and Bird Cherry were in demand in the textile industry; the sport industry required willow, while the match and plywood industries required Chil and Fir. Large areas came under horticulture and with propagation of Apple and stone fruit industry, many sawmills mushroomed to produce packing cases. To meet the new situation arising out of post independence development and reconstructional activity, revision of Sh. Aggarwal,s plan was ordered , In 1961, Sh. V.P. Bajaj was posted as WPO. He was replaced by Sh. S.S.Chahal, in 1963. In 1966-67, Shri. D.P. Kapoor joined and continued the completion of plan in 1972. However, Shri Kapoor's draft plan was not approved, as (he accounted for the period 1964-65 to 1978-79 submitting his proposals in 1972-73) the remaining five years effective period of the plan. Through Kapoor's draft plan was not formally put into any operation, it continued to be followed. Four Working Circles were constituted as per the draft:-

1. Regular Working Circles.
2. Fir Working Circles.
3. Protection Working Circles.
4. Broad-Leaved (Over-lapping) Working Circles.

Selection Working Circle of Aggarwal's plan was abolished and the forests were transferred to four Working Circles of the composition of crop and configuration of the ground. The Selection Working Circles had failed, since forest under it could not be worked effectively under the selection criterion, on account of steep and remote terrain. Regeneration too, was thwarted, on account of heavy grazing and browsing. Steady increase in demand for Walnut, Maple, Bird Cherry and Kharsu warranted need for Broad-Leaved (Over lapping) Working Circles.

7.6.1 Regular Working Circle: - General constitution of the working circle remained the same as in Aggarwal's plan. Deodar, Kail, Chil and Oak, whether pure or mixed and on proper easy terrain, were worked under the working circle, under Punjab Shelter wood system. Forest

containing Fir predominantly were transferred to Fir Working Circle, while such forests, wereKail or Deodar were principal species, were allotted to Working Circle. Manali R/1 to R/4 were transferred and kept in the Protection Working Circle for tourism purpose. Analysis and valuation of the crop was done, using figures of Aggarwal's plan. Aerial survey of Mr. G.A. Jones, a Canadian during 1962-64 was found unreliable. Management was under the Punjab Shelter wood System, which provided that compact group of poles, up to 30 cm d.b.h. and 0.2 hectare or over in extent, was retained as future crop in PB I areas. Selection marking on steep and precipitous areawas resorted, to avoid soil erosion. Deodar being a valuable species was given maximum stress, while on dry hot southern slopes, was Deodar could not come up, Kail was preferred. In moist damp localities, broad leaved species i.e Walnut, Bird Cherry, Poplar etc. were propagated. Rotation was kept for 150 years and exploitable diameter was 60 cm d.b.h. Since the existing uneven aged forests were in the course of conversion, rotation was only of academic interest. Five periodic blocks were constituted P B III and PB IV were clubbed together as PB I inter. Regeneration period was kept at 30 years. PB I Block contained the previous plan PB I areas, which had not fully regenerated or where regeneration was felling were not carried out. Some PB II and other areas, considered mature enough and suitable for working under concentrated regeneration fellings, were allotted to PB I. Similarly PB II contained PB II areas of previous plan with a few transfers to this circle, from other circles. The PB V areas of last plan and some of the fully regenerated PB I areas were allotted to this block. Yield was calculated by volume, for each periodic block. PB I and PB V yield, constituted final yield while PB Inter was intermediate yield. No yield removals were to be made from PB II. Increment was not taken into account, to safeguard against natural calamities like fires, floods and glaciers damage etc. * For final yield from PB I 60% of the growing stock of trees 30 cm d.b.h. and above were estimated available for felling during next 30 years, as also 20% to the total volume of trees below 30 cm d.b.h., which would be available by way of thinning and cleanings. Restrictions were retention of compact area pole group upto 30 cm d.b.h. seed bearer retention and selection fellings in step area pole group upto 30 cm d.b.h. seed bearer retention and selection fellings instep areas. In PB II, it was estimated that 10% of the total growing stock, would be available by ay of removal of dead, uprooted, fire burnt, snow uprooted/ damage trees during next 30 years. In PB V, observational estimation pointed out, that 40% of the volume of trees of 40 cm d.b.h. which would be available for felling from thinning and removals of dry/uprooted trees. Under PB Inter thinning-cum-improvement fellings would yield, 10% of the total growing stock. Prescribed yield from different PB's would yield, 4400 cum for Kail, 4800 cum for Spruce/Fir and 390 cum. for Chil. It was laid down that fellings, whether for export or right holders, would count towards prescribed yield. Further, deviation was not top be more than 10% of combined yield of Deodar, Kail, Fir and Chil at the end of 15 years. Fellings were carried out, as per prescription of the Working Plan. Biotic pressure and fires, combined however, to suppress natural regenerated by and large. At the end of 15 years i.e. period ending 1978-79, yield was in deficit for all the four species. Arrears were 10,294 cum for Deodar, 4,649 cum for Kail, 26,310 cum for Fir and 3,848 cum for Chil. Since markings and fellings were according to

rules laid down in the draft plan, it went to show that yield estimates, were slightly on the higher side. Chief Conservator of Forest, HP, issued instructions that yield prescription of Aggarwal's plan, is adopted for yield control. Comparing actual removal during Kapoor's draft paln, with yield prescriptions of Aggarwal's, it was found that there was excess removal to the extant of 17,839 cum in case of Deodar, 4,391 cum in case of Kail, 239 cum in Chil. Only Fir and Spruce were in arrears to the extent of 54,997.

7.6.2 Fir Working Circle: - The Working Circle remained the same as in Aggarwal's plan. Since Fir and Spruce were the principal species, some areas which could be worked under concentrated regeneration fellings, were transferred to this circle, while forest containing Kail/ Deodar, previously in this circle, were transferred out to the regular Working Circles. As also steep and precipitous areas, which went now to this Protection Working Circle? Enumerations were carried out only in PB I Mr. G.A. Jone's data was used for calculating growing stock estimation. Three fellings series were constituted:-

a) Newsprint felling series, which comprised Upper Kullu and Parvati Ranges.

b) Departmental fellings series, comprising lower Kullu and Hurla Range.

c) Packing cases felling series, which comprised selected forests of Upper Kullu, Lower Kullu and Parvati Ranges.

The Silvicultural system adopted was clear felling System, with provision to retain advance growth occurring singularly or in groups, up to 40 cm d.b.h. and carrying out selection marking on steep and broken grounds in PB I, and selection-cum-improvement felling in other PBs. Regeneration was to be artificially induced. Silver Fir and Spruce were the spruce were the species propagated, through Deodar was recommended in the lower parts, in the 'tension belt'. Sites where broad leaved species existed were to be left as such and conifers were not to be forced in here. Thus Acer, Walnut, Bird Cherry, Ash and Poplars were raised on such sites. The knowledge that fo Fir C.A.I. And M.A.I. crossed at 90 years was used to keep conversion period at 90 years. 30 years was considered ideal for regeneration. T9hree periodic blocks were thus framed. Regarding estimation of yield, it was noted that 90% o the volume of the growing stock, above 40 cm. d.b.h. in PB I, would be available for felling as also 10% of the growing stock, below 40 cm d.b.h. In Pb II, only sanitary fellings (10% of Stock), while in PB III thinning-cum-improvement fellings (10% of the stocks), while in PB III thinning-cum-improvement fellings (20% of stock) were resorted to. This removal counted towards yield and deviation was kept, within 10%. Table giving annual prescribed yield in cubic meters, from different PBs, for Fir and Spruce (ignoring Deodar and Kail, the yield of which was negligible) is as follows :-

	PB I	**PB II**	**PB III**	**Total**
Newsprint felling series	37,100	4,100	6,300	49,500
Departmental felling series	15,200	1,500	3,200	19,900
Packing cases felling series	23,100	-	2,000	25,100
G. Total	**75,400**	**5,600**	**11,500**	**92,500**

The above table shows that PB I and PB III yield was unreasonably high.
The result of management is important. All the forest prescribed for fellings were not felled. System of clear felling was ignored in 1974-75, as regeneration did not keep pace with felling. Subsidiary silvicultural operations were ignored, by and large. Many forests allotted to PB I were not worked, on account of various reasons (only 2049 hectares were worked out of 4004 hectares prescribed). Since the Newsprint Factory Project was not finalized, many forest prescribed for felling newsprint, were not worked. Inadequate staff and funding also deferred working in forests prescribed for departmental working. Mechanical logging did not allows sanitary felling in PB II, and only thinning-cum-improvement felling were done in PB III. In PB II, only 254 hectares of 3,460 hectares prescribed were felled/worked while in PB III, of 4,113 hectares, only a marginal area was taken up for working. Only such forests which were easily accessible, were worked, as saw millers and fruit growers were not prepared to get their demand fulfilled from remote areas, on account of high extraction costs. At the end of 15 years, against 13,87,500 cum of prescribed yield, only 3,08340 cum of Fir was removed. Deficit thus was of 10.79.160 cum. Adopting Aggarwal's yield as basis however, showed excess Fir felling to the tune of 15,222.43 cum. Regeneration effort by and large, where taken, where inadequate, as affective closure combined with planting with good stock, was amiss. This can be observed in 2/11 Kothi Tich C1, 2/12 Nathi Ban CI, CII, CIII, CIV, CV, CVI, 1/43 Nagni CIIa and CIIIA of Lower Kullu Range.

7.6.3 Protection Working Circle: - Demarcated Protected forests and Reserved for forests in steep, in accessible areas where allotted to this circle. Alpine areas and rocky tracts, containing Kharsu oak with scattered Fir and Birch, were placed here, as also the undemarcated Class-III forests. A further chunk of area comes to this Working Circle, on abolishing of Selection Working Circle. No enumerations and analysis were carried out in these forests. Only the demand of right holders was met from the III class forests; otherwise forests allotted to this circle, served primarily to meet soil and water conservation criterion. III Class forests have suffered on account of heavy timber distribution demand, grazing, lopping and also encroachments, as their boundaries were not fixed.

7.6.4 Broad Leaved (Over lapping) Working Circle: - This was an overlapping circle which was spread over the reserve, demarcated and undemarcated forests. Compact group sof broad leaved species, of one hectare and above, were included, whether they occurred in Regular, Fir and Protection Working Circle. Enumeration of 23 broad leaved species was done, down to 20 cm in compact block. Clear felling system, with a provision to retain compact groups of advanced growth, up to 40 cm d.b.h., was followed. Rotation was kept at 100 years. Yield was estimated at 50% of the growing stock. UPFs were excluded from felling and yield calculations, keeping them reserved for the right holders. The forests were categorized into 3 priority classes. Priority one being, where motorable road existed, priority two where roads needed improvement and extensions; and priority three where roads were non-existent, with no possibility of construction in the reasonable future. Exploitation in the beginning was recommended only in

priority one and two areas. Yield was combined for all species. During the plan period ending 1978-79, the following removals were there :- Maple; 2,384 cum, Bird Cherry; 21 cum, Horse chestnut; 432 cum, Broadleaved (miscellaneous) 12,156cum, Regarding regeneration, nothing tangible was done to replenish the growing stock of broad leaved species. Prescription that all felled areas, falling outside the PBI area, under regeneration fellings shall be closed and planted with broad leaved species has not been followed. This thus defeated the purpose for creating this Broad Leaved Working Circle.

7.7 The Sixth Working Plan by Shri J.C. Sharma :- Shri J.C. Sharma undertook revision work of the Working Plan for Kullu And Parvati tract and his plan was operated from 1979-80 to 1993-94. The following working circles were constituted:-.

i) Deodar /Kail Working Circle.
ii) Fir Working Circle.
iii) Protection Working Circle.
iv) Broad Leaved Overlapping Circle.
v) Improvement Working Circle.

7.7.1 Deodar/Kail Working Circle: - In this Circle were placed the really important and valuable forests of Deodar and Kail, lying in the tract, which are situated on comparatively easy slopes. A small proportion of Silver Fir and Spruce in upper reaches and little Chil on lower parts, were also placed in this Working Circle. Areas regenerated during the last 60 years are more or less uneven aged. Otherwise, the forest in this Working Circle is even aged containing all aged classes intimately mixed. In PB II or PB III, were placed the more or less even aged crop, prescribed to be properly tended along scientific lines. This Working Circle covered an area of 10,205.33 hectares, of which 1609.43 hectares were reserve forests and 8596.10 hectares was placed in DPFs. Stock maps on 4"=1 mile scale were prepared. Complete enumerations were carried out, in usual 10 cm diameter classes, down to 10 cm d.b.h. in all the periodic blocks. Exploitable diameter for Deodar, Kail and Chil was kept 60 cm d.b.h.

System of Management: - Punjab Shelterwood system adopted as the system, permitted fellings according to the configuration of the ground and retention of compact pole crop as advance growth.

Rotataion: - Rotation was kept at 120 years, with four periodic blocks with regeneration period of 30 years.

Peridic Blocks:- Periodic Block I consisted of two groups A and B blocks. Under Group "A" were placed such areas, which are unfelled PB I areas of the previous plan and some PB II areas, which were best available as far as the maturity of the crop was concerned. 759.69 hectares area was placed under this group. In group "B" 1749.88 hectares are placed. This group consisted of

such PB I areas, which were placed during the previous plan and regeneration was still progressing, Forest, which had been badly burnt by frequent firs. Or those that were exhausted by T.D. markings are required immediate attention, were also included in this group, to rehabilitate the same immediately. Forest which had a preponderance of maturing ages classes were allotted to PB II. Most of the PB Inter areas of Aggarwal's/Kapoor (draft) Plan and those transferred from PB last, had been allotted to PB III. The crop was mostly pole to middle aged, with scattered mature trees. Agarwal's/Kapoor (draft) Plan and other forest having young crop were allotted to PB IV.

Yield: -The yield was calculated by volume, separately for PB I (Group A), PB IV and PB III on the basis of enumeration results. Increment was ignored for the reason of safety against fire and other natural calamities, and also to serve as emergency reserve. The species which were situated at the locality were favored and preferred over the other species. Deodar and Kail were important species growing side wise side. Kail is much more susceptible to fire damage, heavy lopping and attack by fungus *Tremates pinni*.

Result: - The management prescribed in the Working Plan, were followed by and large and quite a few areas were successfully regenerated under this working circle. The removals in the forest remained restricted, because of the ban on green fellings. Thus a large number of areas could not be marked for felling despite prescription in plan.

7.7.2 Fir Working Circle: - Such forests which predominantly contained Silver Fir and Spruce and which were considered for suitable for working under concentrated generation fellings were allotted to this circle. Total area under this circle was 20,818.17 hectares, of which 1243.55 hectares was Reserved Forest and 19,574.62 hectares was DPFs. Stock maps of Aggarwal's plan was checked and corrected upto date. Total enumeration, down to 10 cm d.b.h. and in 10 cm classes, was carried out in periodic blocks. Exploitable diameter was kept at 60 cm d.b.h. Rotation was kept at 120 years and 4 periodic blocks, each of 30 years framed. A regeneration period of 30 years was found proper. PB I contained Group A areas, which included many unfelled PB I portion and Group B areas which had been felled during the period of Kapoor's draft plan; and also some forests of Aggarwal's plan, that remained unregenerated and where the regeneration was either still progression or had not come up at all. Total area under Group A was 2529.60 hectares and under group B was 2593.08 hectares. Under PB II were kept such forests, which had a preponderance of maturing trees. Area under PB IV was negligible, because practically nothing had been done to restock the PBI areas of this circle. Under PB III were kept the remaining forest, not allotted to any of the PBs. Punjab Shelterwood system was the Silvicultural system adopted. The system of clear felling adopted under Kapoor's draft plan, was abandoned. Under Punjab Shelterwood System, all healthy advance growth was retained to form future crop. In blank felled areas PB I, efforts to bring about a fast green mantle in the shortest possible was aimed at through valuable broadleaved species planting i.e. planting of Maple and

Walnut. Depletion was quite distinct in many places, as excess removals were undertaken to meet the special objective of meeting the demand of packing cases, in all the compartments and forests. The result is that there is hardly any scope for further fellings in these forests.

7.7.3 Protection Working Circle: - The object of management under this working circle was protection of hill slopes from denudation and erosion by preserving the forest cover. Effective soil conservation endeavors were to be undertaken; forest to be protected from indiscriminate felling and lopping, near the villages; and good grazing grounds were to be provided to local and migratory graziers. This Circle contained all DPFs not included in any of the previous working circles, being either inaccessible due to rocky, steep and precipitous terrain or those that were situated in the vicinity of famous tourist centres like Manali and sacred shrines, i.e. Bijli Mahadev, etc. Total area of this working circle was 1, 74,766.89 hectares. Almost every type of vegetation, typical to this tract, is met with in the forest allotted to this Working Circle as varied type of area are included and distributed, scattered over the tract. Most of the DPFs are reserved forests, except those around Manali. Others are either rocky, steep and unworkable areas, or are high lying Alpine pastures, rocks and snow covered area which are forest, in name only. Accounting for the nature of the terrain of these forests and the special objects of management, no enumeration and stock mapping had been carried out in the forests, which were previously in Regular o Fir Working Circle. The compartment history file however contain, the aerial stock maps prepared by Mr. Jones. Excepts for the rich forest around the Manali, this working Circle's growing stock comprised of scattered and unmanaged crop of conifers and broad leaved species, occurring on rocks or in bands between grassy blanks and rocks. The chief objective of management in this Working Circle was the soil and water conservation criterion. Hill slopes had to be maintained and tourist spot of scenic splendor had to be prescribed and contemplated in this Working Circle. 1/32 Kandi C III, 2/24 Parol C III, and reserved /DPFs in and around Manali were kept sacrosanct; otherwise a provision to mark trees to bonafide right holders was incorporated. Great depletion in the forest (except in Reserved Forests) resulted on account f TD marking, exposing hill slopes to denudation. The suggestion of opening of a departmental sale depot, in Manali to regulate TD and to supply timber to right holders, at concessional rates was sound. However, this was not implemented. Grazing rights as provided in the settlement report could not be interfered with; however, regeneration required temporary closure of some forests. those prescribed for immediate closure were :-

Forests		Area (hectares)
1/1 Bajrundi	C1a	45.32
1/1 Bajrundi	C11a	29.54
1/1 Bajrundi	C111a	18.61
1/4 Bajrundi	C II b	16.76
1/6 Aleo Behal	C I	14.16
2/24 Parol	C IV	316.05

Mr. J.C.Sharma's plan, prescribed, various soil and water conservation measure for the tract, which however could not be followed strictly, because of limited finances.

7.7.4. Broad-leaved (Over-Lapping) Working Circle: - This working circle was constituted overlapping other working circles. Need was felt to do so, since a great number of important broadleaved species lie scatters all over the tract. The importance is primarily for their value as raw material, for a number of wood based industries and also since they have fuel and fodder value. The forest included in this working circle, conform to Champion and Seth's classification type 12/C 1e, 12/C Ia. The crop available is generally uneven aged and natural regeneration of the valuable species is deficient. Special object of management are protection and conservation of these valuable forests broad leaved species. It was found necessary to improve the stocking of valuable species i,e. *Acer, Walnut, Carpinus* etc. by bringing them under the systematic and scientific management and to meet the requirement of fuel and charcoal of the people. Stocks maps were prepared on 1:15,840 scales, for the working circle and the area occupied by broadleaved species, in conformity with the special object of management which are mooted. The two felling series were:

- Industrial felling series
- Charcoal felling series

7.7.4(a)- Industrial Felling Series:- All the valuable broad leaved trees were enumerated in 10 cm diameter classes. Down to 10 cm d.b.h. Management System adopted was the Selection System. Trees of exploitable diameter were to be removed and thinning-cum-improvement fellings were prescribed in the rest of crop, to favour natural regeneration of growth of young crop of valuable species. Wherever natural regeneration did not work, artificial regeneration was resorted, to fill up blank patches with valuable species. Broadleaved species such as Walnut, Maple, Bird Cherry, Carpinus, Horse chestnut etc. were to be preferred. Exploitable diameter of 40 cm was fixed in case of Maple, Bird Cherry and *Carpinus* while in case of other species including Walnut, it was kept at 50 cm. d.b.h. A felling cycle of 15 years was adopted, coinciding with the period of plan. Rotation was kept at 45 years for coppice and 90 years standards.

6.7.4(b)- Charcoal Felling Series :- In this felling series the forest of Ban Oak of Gadsa valley were included. Enumeration in 10 cm diameter classes, down to 10 cm d.b.h. was carried out in all the forests. Coppice with standards was kept. As per yield table, average crop diameter at the age of 45 years, was estimated to be 22 cm and at the age of 90 years to about 35 cm. This was considered suitable for producing charcoal, as well as timber required for agricultural implements, by the local people. A felling cycle of 45 years was fixed, corresponding to the rotation of coppice. The Ban Oak forests, felled during the past generally, could not be

satisfactorily regenerated. However, Deodar planting done in some of the forest was fairly successful.

7.8 Improvement Working Circle:-This working circle had two parts, one dealing with alpine pasture and other dealing with IIIrd class forests, situated in the vicinity of villages. There are extensive areas above the line of tree growth in all the ranges of this division. More then half of the area in the alpine zone consists of massive rocks, ice and snow; while between the lines of tree growth of perpetual snow stretch, there exist the extensive area of alpine pasture. The second part consists of undemarcated protected forests, known as IIIrd class forest, that lie below IInd class forest and extent upto the river bed. Varied types of areas are included, scattered all over the tract. Almost every type of vegetation, typical to the forest division, is met with in the area.
Special management objective was as under:- To assess the grazing capacity of the alpine pasture, in order to regulate the grazing of buffaloes, goat and sheep and to improve the stocking of grasses requirement and local and migratory, grazers and to raise plantations of timber and fodder species for meeting the requirement of local people. The estimated area of alpine pasture is 71,523 hectares and 1, 00,142 hectares was estimated to b available for grazing in DPFs of UPFs below alpine zone. These areas were, by and large overgraze. Various suggestions and prescriptions were given in the plan, to reduce the cattle and livestock population in the area which could not be implemented. Chemical manuring of the pasture could not be done, on account of limited finances. Though some areas were taken up, and legumes and other grasses were introduced, yet this was very less as compared to the total degraded areas. Grazing lands, by and large, were rendered useless and were exposed to soil denudation.

7.9 The Seventh Working Plan by Shri J.S Walia :- Shri J.C. Sharma undertook revision work of the Working Plan for Kullu And Parvati tract and his plan was operated from 1994-95 to 2009-10. The following working circles were constituted:-.

i) Deodar /Kail Working Circle.
ii) Fir Working Circle.
iii) Protection Working Circle.
iv) Broad Leaved (Overlapping) Working Circle.
v) Grazing and Improvement Working Circle.

7.9.1 Deodar/Kail Working Circle: - This comprised the valuable and important, easily accessible Deodar/Kail forests, with some Fir and Spruce located in the upper reaches and little Chil mostly planted in the lower parts of the lower Kullu Range. This working circle remained almost as the same as in the previous plan. The forests which were transferred to wild life wing were excluded from this working circle. Areas regenerated during the last 60-75 years are uneven aged. Otherwise, the forests in this Working Circle are even aged. In PB II or PB III, were placed the more or less even aged crop, prescribed to be properly tended along scientific lines. This Working Circle covered an area of 2406.65 hectares, of which 30.5 hectares were

reserve forests and 2376.3 hectares was placed in DPFs. Stock maps on 4"=1 mile scale of previous WP were updated giving different colours as per working plan code. Complete enumerations were carried out in PB-I and PB-IV, in usual 10 cm diameter classes, down to 10 cm d.b.h. whereas partial sampling was done through Releskopic methodology in periodic blocks II and III. Exploitable diameter was kept 60 cm d.b.h which is economically viable and corresponds to rotation kept.

System of Management: - Punjab Shelterwood system adopted as the system which permits fellings according to the configuration of the ground and retention of compact immature growing stock as advance growth. Artificial regeneration is resorted to after 3 years of seeding felling if area is not fully regenerated.

Rotation: - Rotation was kept at 120 years, with four periodic blocks with regeneration period of 30 years.

Periodic Blocks: - Periodic Block I consisted of two groups A and B blocks. Under Group "A" were placed such areas, which are unfelled PB I areas of the previous plan and some PB II areas, which were best available as far as the maturity of the crop was concerned. 481.3 hectares area was placed under this group. In group "B" 136.35 hectares are placed. This group consisted of such PB I areas, which were felled during the previous plan and regeneration was still progressing, Forest, which had been badly burnt by frequent fires or those that were exhausted by T.D. markings and required immediate attention, were also included in this group, to rehabilitate the same immediately. Forest which had a preponderance of maturing ages classes were allotted to PB II. Open forests that contain predominantly younger to middle aged classes with scattered mature trees in varying proportion are allotted to PB III. The crop was mostly pole to middle aged, with scattered mature trees. Forest having sapling to young pole crop with scattered mature mother trees and group of advance growth retained as part of future crop were allotted to PB IV.

Yield:-The yield calculation was although considered redundant considering total ban on green felling still for academic interest yield was calculated separately for PB I (Group A), PB IV and PB III on the basis of enumeration results. Increment was ignored for the reason of safety against fire and other natural calamities, and also to serve as emergency reserve.
Effective closure and judicious manipulation of canopy is important for natural regeneration. However artificial regeneration efforts should start immediately to avoid manifestation of weeds and bushes. Deodar and Kail were important species growing side by side. Kail is much more susceptible to fire damage, heavy lopping and attack by fungus *Tremates pinni*.

Result: - The management prescribed in the Working Plan, could not be followed due to ban on green felling. No seeding felling has been done during plan period. However large gaps were

created due to Timber distribution and salvage removals. Regeneration efforts done and quite a few areas were successfully regenerated under this working circle. The objectives set fourth for gradual conversion of irregular crop in to normal even aged crop is main causality on account of ban on green felling on one hand and selective felling in TD in this working circle.

7.9.2 Fir Working Circle: - All such RF's and DPF's which predominantly contained Silver Fir and Spruce are kept. Total area under this circle was 11285.63 hectares, of which 294.6 hectares was Reserved Forest and 10991.03 hectares was DPFs. Stock maps of Aggarwal's plan was checked and corrected up to date. Total enumeration, down to 10 cm d.b.h. and in 10 cm classes was carried out in periodic block I only whereas in other PB's only partial enumeration through releskope have been done. Exploitable diameter was kept at 60 cm d.b.h. and Rotation was kept at 120 years and 4 periodic blocks, each of 30 years framed. A regeneration period of 30 years was found proper. PB I Group A areas included unfelled PB I areas of WP under revision and a few other areas being most suitable as far as maturity of crop is concerned. PB-I Group B included areas which had been felled during the previous plans that have remained unregenerated and where the regeneration was either still progressing or has not come up at all. In addition all such areas where large scale felling have been done for packing cases creating permanent gaps and areas where there is excessive damage due to fires and other natural calamities were included in this group for regeneration. Total area under Group A was 749.01 hectares and under group B was 2566.82 hectares. Under PB II were kept such forests, which had a preponderance of maturing trees. Area under PB IV was negligible, because practically nothing had been done to restock the PBI areas of this circle. Under PB III were kept the remaining forest, not allotted to any of the PBs and crop here is uneven aged. Punjab Shelterwood system was the Silvicultural system adopted. The system of clear felling adopted under Kapoor's draft plan, was abandoned. Under Punjab Shelterwood System, all healthy advance growth was retained to form future crop. In blank felled areas PB I, efforts to bring about a fast green mantle in the shortest possible was aimed at through valuable broadleaved species planting i.e. planting of Maple, Walnut, *Prunus* and ash. Depletion was quite distinct in many places, as excess removals were undertaken to meet the special demand of timber for packing cases, in all the compartments and forests. The result is that there is hardly any scope for further fellings in these forests.

7.9.3 Protection Working Circle: - The object of management under this working circle was protection of hill slopes from denudation and erosion by preserving the forest cover. Effective soil conservation endeavors were to be undertaken; forest to be protected from indiscriminate felling and lopping, near the villages; and good grazing grounds were to be provided to local and migratory grazers. This Circle contained all DPFs that were either inaccessible due to rocky, steep and precipitous terrain or those that were situated in the vicinity of famous tourist centers, like Manali (which were subsequently transferred to wild life division Kullu in plan under revision) and sacred shrines, i.e. Bijli Mahadev, etc. Total area of this working circle spread over only in DPF's was 26458.03 hectares. Almost every type of vegetation, typical to this tract, is

met with in the forest allotted to this Working Circle as varied type of area are included and distributed, scattered over the tract. Most of the DPFs are rugged forests, except those around Manali. Others are either rocky, steep and unworkable areas, or are high lying Alpine pastures, rocks and snow covered area which are forest, merely by name only. Accounting for the nature of the terrain of these forests and the special objects of management, partial enumeration has been done in an area of 1530.75 ha only. This working Circle's growing stock comprised of scattered and unmanaged crop of conifers and broad leaved species, occurring on rocks or in bands between grassy blanks and rocks. Aesthetic beauty of hill slopes had to be maintained and tourist spot of scenic splendor had to be identified and managed for eco tourism objectives. Great depletion in the forest resulted on account of TD marking, exposing hill slopes to denudation. However new TD policy will take care of this aspect Grazing rights as provided in the settlement report could not be interfered with; however, regeneration required temporary closure of some forests which is done of and on and generally not objected by the local inhabitants.
Mr. J.C.Sharma's plan had prescribed various soil and water conservation measure for the tract, which however could not be followed strictly, because of limited finances. The area being catchment of various Hydro electric projects, due emphasis is needed to be given to soil and water conservation interventions.

7.9.4. Broad-leaved (Over-Lapping) Working Circle: - This working circle was constituted overlapping other working circles. Need was felt to do so, since a great number of important broadleaved species lie scatters all over the tract. The importance is primarily for their value as raw material, for a number of wood based industries and also since they have fuel and fodder value. The forest included in this working circle, conform to Champion and Seth's classification type 12/C 1e, 12/C Ia, 12/C 2a, 14/C Ib. The crop available is generally uneven aged and natural regeneration of the valuable species is deficient. Special object of management are protection and conservation of oak, birch and other valuable broad leaved species. It was found necessary to improve the stocking of valuable species i,e. Acers, Walnut, *Carpinus* etc. by bringing them under the systematic and scientific management and to meet the requirement of fuel and charcoal of the people. Area of broad leaved species has been indicated on Stocks maps prepared for other Working circles. No felling series has been proposed and no yield and no silvicultural system of management prescribed. Partial enumeration through Releskope has been done. Artificial regeneration along with effective protection is required to fill the gaps.

7.9.5 Grazing and Improvement Working Circle:-This working circle had two parts, one dealing with alpine pasture and other dealing with IIIrd class forests, situated in the vicinity of villages. There are extensive areas above the line of tree growth in all the ranges of this division. More than half of the area in the alpine zone consists of massive rocks, ice and snow; while between the lines of tree growth to perpetual snow stretch, there exist the extensive area of alpine pasture. The second part consists of undemarcated protected forests, known as IIIrd class forest

that lie below II[nd] class forests adjoining to habitations and extend up to the river bed. Varied types of areas are included, scattered all over the tract. Almost every type of vegetation, typical to the forest division, is met with in the area.

*Special management objective were t*o assess the grazing capacity of the alpine pasture, in order to regulate the grazing of buffaloes, goat and sheep and to improve the stocking of grasses requirement and local and migratory, graziers and to raise plantations of timber and fodder species for meeting the requirement of local people in IIIrd class forests. The estimated area of alpine pasture is 26509 hectares .These areas were, by and large overgraze. Various suggestions and prescriptions were given in the plan, to reduce the cattle and livestock population in the area which could not be implemented. Chemical manuring of the pasture could not be done. Sample areas for demonstration effect of rotational grazing were not taken at all. Similarly no program for eradication of obnoxious weeds and unpalatable grasses was under taken. Though some areas were taken up under pasture development, and legumes and other grasses were introduced, yet this was very less as compared to the total degraded areas. Grazing lands, by and large, were rendered useless and were exposed to soil erosion. Many IIIrd class forests are converted in to New DPF's.

CHAPTER VIII

STATISTICS OF GROWTH AND YIELD

8.1 General: - For growth and yield, following records come in handy and useful-

1. *Cedrus deodara* (Deodar), multiple yield tables for Deodar (*Cedrus deodara*) by Mr. H.G. Champion and Mr. I.D. Mahendru, Indian forest Records, Volumes XV, Part-VIII, Silviculture Series-1993.

2. *Pinus wallichiana* (*Pinus excelsa*- Blue Pine) by Mr. H.G. Champion, Mr. P.N. Suri and Mr. I.D. Mahendru, Indian Forest Records, Volume XIII, Part-X, Silviculture series-1929.

3. Growth and yield statistics of Common Indian Timber Species (Himalayan Region), compiled by Director of forest Education F.R.I, 1967.

8.2 Volume Tables:- The volume tables adopted by Sh. J.C. Sharma which were the average of quality I and II volume tables, compiled by F.R.I. for Deodar, were used by previous working plan can be adopted for this working plan also. This is so because, average quality Deodar in Kullu tract conform to F.R.I. quality I and II. Many of the sample plots laid out by F.R.I. were situated in Kullu and Seraj areas, which goes to justify this decision. Total tree volume consisting of stem timber and small wood is to be considered, considering the small wood also economically a saleable commodity. Perusing through "Growth and Yield Statics of Common Indian Timber Species" (Himalayan Region Volume-I) at page 8 give us the following data:

For Deodar, Kail and Chil species:-

(Since there is no appreciable-difference between the figures for the Deodar, Kail and Chil, the same were adopted for the three species)-

Volume tables prescribed to be adopted for the plan, for Deodar, Kail and Chil would continue to be the ones in use by Sh. J.C.Sharma which is as under:-

Diameter class in cm.	**FRI/Q-I Cft.**	**FRI/Q-II Cft.**	**Average (I/II) Cft.**	**Volume of the table adopted for plan in m^3**
10-20	8	8	8	0.100
20-30	17	17	17	0.400
30-40	37	37	37	1.00
40-50	72.5	64.5	68.5	1.90
50-60	118	95	106.5	3.00

60-70	158	124	141	3.90
70-80	208	157	182.5	5.10
80-90	258.5	190	224.25	6.30
90 & above	314.5	-	314.5	8.80

For Fir and Spruce Species:-

For Fir and Spruce, Sh. J.C. Sharma adopted 0.6 m^3 for 10-20 cm class and 0.14 m^3 for 20-30 cm diameter class; for 90 cm diameter class or for a tree ID and over volume prescribed was 9.34 m^3. The volume tables were prepared by Trevor for Silver Fir and Spruce, based on actual outturn of trees. This matched well with the work done by the erstwhile Punjab Silvicultural Research Division and Sh. K.L. Aggarwal and is in conformity with Para -30 of the H.P. Forest Department Technical Order No. 11. The volume table prescribed for Fir and spruce species is as follows:-

Class	**Diameter (in cm)**	**Fir Spruce (Q-I/II) (in $m^{3)}$**
V	10-20	0.06
IV	20-30	0.14
III	30-40	0.85
IIA	40-50	1.70
IIB	50-60	3.11
IA	60-70	5.10
IB	70-80	7.08
IC	80-90	8.49
ID	90 & above	9.34

For Broad Leaved species:-

The local volume tables, for commercial timber, in respect of broad leaved species, were compiled by Mr. D.P. Kapoor below 20 cm. d.b.h. including branches. The same would hold good and are adopted for this plan. These are as follows:-

Species	**IV 20-30**	**III 30-40**	**IIA 40-50**	**IIB 50-60**	**IA 60-70**	**IB 70-80**	**IC 80-90**	**ID 90-100**	**Over ID 100+**
Quercus semecarpifolia	0.3	1.0	1.8	3.0	4.6	6.4	8.0	9.6	12.2
Aesculus indica	0.3	0.8	1.7	2.7	3.9	5.6	7.1	9.0	12.0
Juglans regia	0.2	0.8	1.5	2.5	3.8	5.1	7.2	8.9	11.3
Acer spp.	0.2	0.7	1.3	2.1	3.3	5.1	6.9	8.5	11.2

Prunus padus	0.1	0.7	1.4	2.2	3.2	4.3	5.6	6.9	9.6
Betula alnoides	0.3	0.9	1.6	2.3	3.3	4.4	5.4	6.6	7.8
Carpinus spp.	0.3	0.9	1.5	2.3	4.0	6.0	7.8	9.7	12.6
Populus ciliata	0.3	0.7	1.4	2.8	4.9	6.8	9.0	11.1	14.5
Cedrella serrata	0.5	1.0	1.8	2.8	4.4	6.0	8.0	9.0	13..3
Rhus spp.	0.3	0.7	1.4	2.0	2.9	4.0	5.1	7.0	10.1
Celtis australis	0.3	0.7	1.3	2.2	3.3	4.6	6.3	8.0	11.1
Alnus nitida	0.3	0.8	1.5	2.2	3.2	4.3	5.7	7.8	11.0
Salix spp.	0.4	0.8	1.5	2.4	3.1	3.9	-	-	-
Robinia pseudoacacia	0.3	0.6	1.0	1.4	1.7	2.0	-	-	-
Buxus sempervirens	0.1	0.2	-	-	-	-	-	-	-

- However for V class trees volume shall be ½ of IV class trees.

8.3 Age-Diameter Relation: - Multiple yield tables for Deodar are available. Trevor during the course of operation of his working plan ascertained the growth of the outturn of Deodar after ring counting over more than 1200 trees. F.R.I. sample plots also existed both in Kullu and Seraj division. Thus F.R.I. figures correspond very well with the terrain, available. The average quality of Deodar in Kullu confirms to I/II. Irregularity in terrain, aspect and soil considerations can thus be ignored. It must however be noted that diameter growth varies with treatment given i.e. grade of thinning. Figures for F.R.I. match with that of Trevor for quality I/II Deodar with E grade thinning. Comparison is given below:-

Diameter at breast height	Age as per Trevor	Age as per F.R.I. figures.
35 cms(14")	65 Years	64 Years
45 cms (18")	80 Years	90 Years
55 cms (22")	100 Years	124 Years
65 cms (26")	120 Years	160 Years
75 cms (30")	155 Years	212 Years

Figures for different species as worked out by Trevor, without any standardization of crops in quality classes having been done, are given below:-

Diameter at breast height	Ages in year				
	Deodar	Kail	Chil	Silver Fir	Spruce
35 cms (14")	65	50	60	84	65
45 cms (18")	80	63	85	104	80
55 cms (22").	100	82	109	130	100
65 cms (26")	120	104	143	150	115
75 cms (30")	155	132	NA	180	135

85 cms (34”)	-	-	-	-	-

For the current working plan, for Deodar (Quality) I/II according to table 6 on page 30-31 multiple yield tables are given below:-

Diameter (in cm)	**Age (in Year)**
10	22
15	30
20	37
25	45
30	64
35	65
40	75
45	90
50	106
55	123
60	140
65	160
70	180

For Silver Fir and Spruce average of data collected by different parties i.e. by Swaran Singh and by ACF research etc. as compiled by Kapoor in his draft working plan is adopted.

Diameter (cm)	**Age (years) Spruce**	**Age (years) Silver Fir**
5	14	23
10	24	40
15	35	57
20	58	94
25	58	94
30	71	109
35	84	124
40	101	142
45	114	162
50	114	180
55	134	200
60	151	221
65	179	-

Data collected by Kapoor for Kharshu and Maple is as follow:-

Age in years	Diameter in (cm)	
	Kharshu	Maple
10	2	3
20	6	8
30	9	13
40	12	28
50	15	23
60	19	28
70	22	33
80	25	38
90	29	43
100	32	47
110	36	51
120	39	54
130	49	57
140	46	60
150	49	62
160	52	-
170	55	-
180	59	-
190	62	-
200	65	-

For growth of high level broad-leaved species, reliable data is not available. An idea was mooted by Dr. R.V. Singh in his Working Plan for Mandi and Nachan. The same is elaborated below- Let "Z" be the mortality % from approach class to exploitable size and "T" the time taken by approach class to grow to exploitable size, then for different species, the comparison between "T" and "Z" is as follows:-

Species	**"T" years**	**"Z"%**
Acer spp.	40	40%
Aesculus indica	25	25%
Alnus nitida	25	25%
Betula alnoides	40	40%
Buxus spp.	25	25%
Carpinus spp.	25	25%
Corylus colurna	25	25%

Juglans regia	25	25%
Prunus padus	25	25%
Populus spp.	25	25%

8.4 Quality class assessment: - The quality of Deodar in Kullu conforms to F.R.I. quality class I/II. This figure can be used for Kail and Chil too.

8.5 Density: - Ocular estimate of density has been made and incorporated in each compartment.

8.6 Enumeration: - Since there is complete ban on green fellings in the state, therefore complete enumeration was not done however partial enumeration exceeding 5 % of area in Deodar and Kail WC as well as in Fir WC has been done in all the periodic blocks mainly for assessing the growing stock. Similarly sample enumeration was also carried out in other working circles for assessing growing stock. Enumeration has been done in 10 Cm diameter classes down to 10 cm diameter.

8.7 Increment: - Mr. J.C.Sharma in his Working Plan for Deodar/ Kail Working Circle, calculated increment for Deodar as 1.75%, Kail as 1.08%, Fir/Spruce as 1.26%, Chil as 1.86% and other species combined as 1.36%. For Fir Working Circle, the figure was 1.36% for Silver Fir and Spruce. These figures match the annual volume increment percentage, obtained by Forest Survey of India, Shimla for different species of the crop, over entire area covering Kullu-Seraj and Kotgarh Forest Division. The increment % for Deodar is 1.74%, Kail is 1.58%, Chil is 2.16%, and Silver Fir is 1.06% while the Spruce the figure is 1.20%. The said figures are used in the context of the present plan.

8.8 Stock Maps: - Stock maps are prepared for each compartment/sub-compartment on the scale of 1:15,000. Further a management map, on a scale of 1:50,000,

8.9 Growing Stock: -The position of growing stocks**,** in respect of Mr. J.S Walia's working Plan and current plan, which shows species wise and class wise number of trees of 10 cm and above per hectares and volume per hectares in Deodar/Kail Working Circle and Fir Working Circle is depicted below:-

Working Circle	**Previous Plan**		**Current Plan**	
	No. per ha	**Vol. per ha**	**No. per ha**	**Vol. per ha**
Deodar /Kail WC	146.274	180.83	303.80	401.04
Fir WC	75.120	172.36	134.18	363.70
Grazing & Improvement WC	62.040	33.10	107.45	60.12
Protection WC	52.920	178.66	53.24	136.84

The important point to note is that both for Deodar/Kail and for Fir Working Circles, complete enumerations were done by Shri J.S Walia's Working Plan for PB I and PB IV for Deodar/Kail Working Circle while in the Fir Working Circle complete enumeration was done only for PB I. For other PBs, sampling as done through releskope, which do give us an idea of approximate number of trees and volume, species wise, but does not give us the figure class wise. Where as, in present WP, only sample enumeration was done in all the working circles with sample size of approx. 5 %. Thus, comparing figures in respect of the current plan figures with the previous plan figures may not be that much proper.

From the above, it is observed that there is improvement in growing stock in all working circles except for protection WC. The reason for this improvement can be attributed to ban on green felling during whole plan period coupled with ban on timber distribution from 2006 onward till 2010. Even in 2010-11 and 2011-12 hardly any tree is removed for meeting demand under TD. As far as protection working circle is concerned, there happen to be heavy salvage removals during previous WP period. Further as stated above the growing stock figures calculated differently in both working plans and thus are not exactly comparable.

8.10 Outturn of Sawn Timber: - The conversion % of different species as fixed vide Chapter-XII, Para 123(c) of Punjab Forest Manual:-

Species	%
Deodar	49%
Kail	40%
Chil	45%
Fir/Spruce	30%

The conversion % as per HPSFC Working Division Kullu is as follows:-

Species	**%**
Deodar	55%
Kail	50%
Chil	35%
Fir/Spruce	45%

In order to minimize wastage, fuel wood and pulpwood are also being extracted from the waste wood in Forest Working Division Kullu.

Chapter IX

ESTIMATE OF CAPITAL VALUE OF FORESTS

9.1 Volume and Value of standing trees enumerated: Total enumeration of trees have been carried out in all Working Circles by randomly selecting samples. Enumeration was done between 5-8% of the area and the results so achieved are extrapolated to get the growing stock assessed. Thus, on the basis of enumerations carried out, total volume of standing trees has been tabulated as under:-

Species	Deo/Kail WC	Fir WC	Improvement WC	Protection WC	Total	Rate Per cum (Rs.)	Value (in Rs.)
Deodar							
Number	478211	102187	23091	71481	674970		
Vol.	709236.046	206811	18873.83	170189.7292	1105110.605	47624	52629787452
Kail							
Number	289079	95709	28828	9116	422732		
Vol.	195323.487	106685	14916.8	12479.71672	329405.003	38044	12531883934
Fir/Spruce							
Number	87377	872640	94	545348	1505459		
Vol.	118368.548	2751812	267.5013	1981478.479	4851926.528	22437	108862675508
B/L							
Number	9182	399077	1157	735284	1144700		
Vol.	14919.047	917912	1119.114	1455935.96	2389886.121	6888	16461535601
Chil							
Number	-	-	69295	-	69295		
Vol.	-	-	33349.13	-	33349.13	18630	621294292
Total	-	-	-	-	-	-	1,91,10,71,76,787

* The rates applied for calculation of value are as per PVVF HP letter No. Ft. 21-700/82(S) Vol. VII dated 24.09.2011for the year 2011-12.

9.2 Value of Forest land: - Under different working circles, Range-wise area, in hectares, is tabulated as under:-

RANGE	RESERVE FOREST	IST CLASS DPF	IIND CLASS DPF	NEW DPF	UPF	TOTAL (in ha)
MANALI	197.08	692.44	12519.68	457.21	1610.42	15476.83
NAGGAR	-	1317.71	7836.92	-	2470.245	11624.875
PATLIKULH	-	23.88	8258.72	-	5637.80	13920.40
KULLU	-	710.21	2810.43	523.71	4819.125	8863.475
BHUTTI	127.87	450.81	5123.18	86.00	5945.25	11733.11

G. TOTAL	324.95	3195.05	36548.93	1066.92	20482.84	61618.69

For assessment of the total value of the land, the value of land as applicable in FCA cases which was approved by Supreme Court of India can safely be applied. The minimum of the slab fixed is Rs. 580000 for open forest and same rate are applied here to calculate the value of land. The total value of land is thus:

61618.69 ha X Rs. 580000 = Rs. 35,73,88,40,200

The value of NTFP and grass production is not assessed and is therefore ignored.

The total value of Forests of Kullu Forest Division is assessed as:

(35738840200 +191107176787) = Rs. 2,26,84,60,16,987 only

PART II

CHAPTER I

BASIS OF PROPOSALS

1.1 General Information:-

Himachal Pradesh which is predominantly a hilly state. Forests have a significant role with respect to tree cover, soil and water conservation, watershed values as well as aesthetic value which make it a tourist hub. Forests cushion rain and storms discipline the rivers, control floods and ensure equitable and all weather flow of water in rivers and streams. Also called the 'heavenly abode of Gods,' Himachal has started drawing centre stage attention, of all those that are genuinely concerned with the preservation of the Himalayan Eco-System. Through its forests, Himachal had played a stellar role in the economic development of the vast Satluj-Ganga basin and in particular the Indo-Gangetic plains. Environmental and productive services are provided, as also livelihood to the people living in and around the forest. However, the Himalayas are one of the youngest mountain regions of the world, where the land mass has yet to take the final form, its eco-system is most fragile, sensitive and susceptible. Since Himachal form the catchment of the main rivers of North India, thus management of these watersheds have its effect on the flow of water and transport of sediments into the river and reservoirs of Indo-Gangetic plains, which are grainary of India and the very basis of the country's rural economy. Scientific management of forest of Himachal Pradesh must however account for the fact that Himachal is characterized by the diverse physio-climate, which is further rendered distinct by the high gradient and high relative relief variation.

1.2 Forest Policy and Legislation:-

National Forest Policy: The first National Forest Policy was enunciated by the Government of India in 1894. This policy forms the basis of future management strategies of forest in India. In 1904, special rule known as Shimla Forest Conservancy Rule were introduced by the Government of Punjab, under the policy laid down in 1894. By enlarging the scope of the 1894 Forest Policy, a new National Forest Policy was formulated in 1952, which inter alia prescribed the maintenance of forest cover 60% of geographical area, in order to prevent soil erosion and land degradation and to ensure the stability of fragile eco-system of hilly states.

In 1988 the Government of India revised the National Forest Policy, keeping present day requirement. The salient features are:-

- Two third of the area under forest cover in hilly state.
- Environmental stability and maintenance of ecological balance.
- Creating massive people's movement and involvement of women.
- Modification of land laws.

- Alternative avenues of income, suitably harmonized with the right land use practices.
- Strengthening of scientific forestry research and education.
- Relation of right concession to the carrying capacity of forests.
- Protection, improvement and enhanced production of minor forest produce.
- Wild life and biological diversity conservation.
- Establishing a strong data base.
- Use of modern methods to control forest fires.
- Public awareness.
- Strict control on diversion of forest lands for non forest purpose.

Since forestry is enunciated by the Government of Himachal Pradesh in 1988. The salient features are-

- Settlement of two-thirds of undemarcated and unclassed forests by proper demarcation and settlement in 10 years.
- Game development and preservation to be accorded high priority.
- People's participation in afforestation programmes.
- Attitudinal change in the forest personal and guideline for posting and transfers.
- Mandatory field inspection by forest personal.
- Control on felling strictly in accordance with the prescription of sanctioned working plans.
- Rationalization of provision of rights and concession and their codification.
- Discouraging agriculture on marginal lands.
- Proper watershed management.

Similarly specific guidelines of fruit packing cases, sawmills, grazing, private sales, construction of roads, tourism, minerals etc. were issued.

1.3 GENERAL OBJECTS OF MANAGEMENT: the general objects of management of forests are as under.

- Conservation and improvement of the existing forest cover, prevention of denudation and erosion of hilly slopes. Promotion of appropriate vegetative cover of trees, shrubs, bushes and grass, as the case may be, especially on degraded slopes and land slips. Maintaining of equitable flow of water in streams/rivers and preservation of natural eco-system.
- To improve the stocking of the forests and orientation towards bringing a normal forest condition i.e. a normal distribution of all age classes with normal regeneration, increment and optimum density.
- Meeting legitimate and bonafide domestic and agricultural requirements and needs of local populace for timber, fire wood, grazing, and other forest produce.
- Adoption of participatory management approach.
- Restocking of the Fir forests felled earlier, under concentrated regeneration fellings and supplementing less valuable broadleaved species with healthy useful broadleaved species i.e. Acer, Oaks, Birch, Walnut, Bird cherry, Ash and Horse chest nut etc.
- Improvement of grazing meadows, thatches, 3rd class forests lying near villages to provide quality/quantity grasses and fodder.

- Increasing area under valuable species in all the localities suited to their growth with emphasis on fast growing species.
- Improvement/increase of the minor forest produce base.
- Utilization of salvage trees (dry, dead &fallen/uprooted trees) for economic value through Himachal Pradesh Forest Corporation.
- To maintain and improve the aesthetic beauty of tourist complex areas.
- To maintain ecological balance for the protection, preservation and improvement of wildlife.

1.4 Constitution of Working Circle:-

The National Commission on Agriculture has classified forests into three types, to focus attention on the kind and object of management, necessary in each case.

- Protection forests i.e. such forest that must be preserved or created for physical or climate consideration.
- National forests i.e. those which have to be maintained and managed to meet national/state needs of defense, communication industry and other general purpose of public interest.
- Village forest which cater to the needs of the local for fuel, fodder and timber.

The constitution of Working Circle is based on the silvicultural treatment and laid down general object of management. The Forests of this division have been classified on the above lines as under:-

a) Protection Forest - Forest allotted to protection Working Circle.
b) National Forests – allotted to the :

- Deo-Kail Working Circle
- Fir Working Circle
- B/L overworking Circle.

c) Village forest – All New DPF's carved out of IIIrd class forests included in the Grazing and Improvement Working Circle. Thus the following 5 Working Circles are constituted:-

1. Deodar-Kail Working Circle.
2. Fir Working Circle.
3. Protection Working Circle.
4. Grazing and Improvement Working Circle.

In addition following overlapping working circles are also constituted:-

5. Broad leaved Over-Lapping Working Circle.
6. Wild Life (Overlapping) WC.
7. Participatory Forest Management (overlapping) WC.
8. Non Timber Forest Produce (Overlapping) WC.

1.4.1 Deodar & Kail Working Circle: - This working circle assumes significant importance, considering that it deals with two important economic species, namely Deodar and Kail. The

forest of Deodar and Kail lie on comparatively easier terrain, with Silver Fir and Spruce present in the upper reaches and a little Chil present in the lower parts. A more or less intimate mixture of all age classes is present. It is only the forest areas regenerated under shelterwood system in the past which are more of less even aged. The said areas stand allotted to PB-IV or PB-III. The objective to convert uneven aged irregular forest into regular, even aged forest would continue in spite of ban on felling. The Punjab Shelterwood silvicultural system is most appropriate and shall be continued. Aim is to manage each forest so as to contain a complete series from PBI to remaining PBs in itself. Regeneration of PBI is to be given a high priority. Green felling has been banned by the Government and new TD policy shall hopefully regulate felling for timber distribution in more scientific and effective way with lesser TD pressure. This will certainly be going to improve health of the forests in the PBI areas. Natural regeneration must be adequately supplemented with artificial regeneration through sowing and planting. Management must be geared to follow guidance provided by the nature. Though Deodar is to be favored, it has not to be forced in areas, where only Kail would grow best or where excellent growth of Silver Fir and Spruce exist.

1.4.2 Fir Working Circle: - Forest allotted to this Working Circle predominantly, contain Silver Fir and Spruce. However, concentrated regeneration felling, heavy marking to saw millers and Rampant opening up of the areas during 2nd World War, has left these forest in quite a bad shape. Adequate attention thereof has not been given. Many forests continue in a bad shape and have to be kept in PBI, until some amount of regeneration success is achieved. Again like in the Deodar & Kail Working Circle, in each forest, a complete series in itself has been aimed at, for effective scientific management. Management under Punjab Shelterwood System continues. Along nallahs and depressions, *Acer caesium*, *Juglans regia*, Ash, *Prunus padus*, etc. shall be propagated. Artificial regeneration of PBI areas must be given high priority.

1.4.3 Protection Working Circle: - Inaccessible areas under DPFs and RFs are included under this working circle. The forest lie in difficult terrain and stretch beyond the limit of tree growth; they lie at the head of the valleys and streams and are extremely important vis'a vis' soil conservation. Denudation and erosion in these forests have long lasting ill effect in the plains. Silting up of reservoirs/dams, floods, erosion of vulnerable areas causes extreme havoc. The vegetal cover in the forest under Protection Working Circle is required to prevent soil erosion and denudation of hill slopes. Thus essentially, the following types of areas would constitute this working circle –

a) Predominating steep and precipitous sloped forest areas.

b) Areas susceptible to soil erosion, owing to the geo-edaphic factors and those that need greater protection of green covers &

1.4.4 Grazing and Improvement Working Circle: - This Working Circle comprises the following types of area.

a) The alpine pasture

b) The IIIrd class forests areas-situated in the vicinity of habitations, as these are important.

c) The potential grazing land scattered all over the tract.

d) The newly notified DPFs which essentially are plantations, primarily of Chil.

The alpine grazing pastures are urgently required to be made productive. Overall improvement of the quality/quantity of timber, grasses and fodder species in this working circle is to be aimed at.

1.4.5 Broad Leaved (Over Lapping) Working Circle: - Existence of Broad leaved species in the forest is of utmost importance and a healthy proportion of these species is to be maintained. Various broadleaved species i.e. *Juglans regia, Acer caesium, Prunus padus, Aesculus indica, Fraxinus floribunda, Carpinus spp., Celtis australis* etc. are not only commercially important but also add aesthetic, environmental and social value to the forests. Moreover dependence of local people on broad leaved species is much high and accordingly programs like Social Forestry, Joint Forest Management etc advocated introduction of broad leaved species. Since these species found in a varying proportion and varying patch sizes in Deodar & Kail as well as Fir working circles, thus necessitating an over-lapping working circle. Pure patches of broadleaved are observed in nalas and depression, where soil depth is more and moisture is present. Intimate mixture with conifers is also there. Economical significance is being attributed to broadleaved species, necessitating scientific management of present resources and propagation in future, through extensive afforestation drives. Two broad classifications are required and not felling series, considering ban on felling. One group should consist of only pure stands of Oak while the other group should consist of other broadleaved species.

1.4.6 Wild Life (Overlapping) WC

This Working Circle is constituted for emphasizing the necessity of conservation of wildlife and collection of information for better management of wild life. The whole tract has a variety of wild animals and birds since the forests are distributed from low elevation to the high snow bound areas. Therefore, this working circle overlaps all other working circles. There are Manali and Kais Wildlife Sanctuaries in this Forest Division which is administered by the Divisional Forest Officer Wildlife at Kullu. In addition, govt. has notified its intentions to create a new National park named Inderkilla National park comprising Hamta area and spread over Manali and Naggar ranges. Under rationalization of boundaries of National Parks and sanctuaries, Nargu Wild Life sanctuary is proposed to be extended in to Kullu Division in Bhutti and Kullu ranges.

1.4.7 Participatory Forest Management (overlapping) WC

The framework for JFM in HP is provided by the Government of HP Order of 12 May 1993, which followed the June 1990 Government of India (JFM) Circular enabling the spread of JFM. The concept of Joint or Participatory Forest Management is an intervention to evolve organized

and collective thinking on the issues of forest management keeping in view the fact that the forest resources are limited and the claim over these are varied, no single solution can satisfy the needs of all. The philosophy aims at involving all the stakeholders in resource generation activities through motivation, active involvement in the process of management and sharing of benefits through adequate institutional arrangements.

The Govt. of HP has notified Himachal Pradesh Participatory Forest Management Regulations, 2001 and the Sanjhi Van Yojna Scheme, 2001 which have strengthened the JFM approach to a great extent. Constitution, strengthening and involving JFMC's in whole tract so as to ensure proper protection and conservation of forests is aimed at through this working circle.

1.4.8 Non Timber Forest Produce (Overlapping) WC.

This would be an overlapping working circle covering the entire working circle and is constituted to ensure systematic development and exploitation of non timber forest produce species that occur in the division. The main non timber forest produce found/extracted in the division are Medicinal plants, Cedar wood oil, minor minerals and grasses. The main emphasis/focus would be on medicinal plants its management, extraction cycle and conservation efforts.

1.5 Blocks and Compartment:- The rule followed is to keep forest and compartments as small units of roughly around 40 hectares. Natural features i.e. nalas, ridges/dhars, paths etc. have been kept as boundaries. Composition of the crop has also been kept in account while framing compartments. In only a few cases where natural feature absent, arbitrary lines from boundary pillar have been specified. However in forests which are inaccessible, precipitous, and rocky with unculturable terrain area of forest remained more than 40 ha. Detail of forest and compartments would feature in the concerned working circle.

1.6 Working Circles, their areas and distribution: - There are 4 main working circles where area allotment has been done and others are overlapping working circles

Area details Range-wise, Working Circle wise is as per table given below (ha):

RANGE	DEO/KAIL W.C.	FIR/SPRUCE W.C.	IMPROVEMENT W.C.	PROTECTION W.C.	TOTAL
MANALI	**437.6**	**3264.32**	**530.05**	**9634.4**	**13866.37**
NAGGAR	**941.76**	**2738.42**	**0**	**5474.45**	**9154.63**
PATLIKUHL	**23.88**	**1554.54**	**0**	**6704.18**	**8282.6**
KULLU	**657.96**	**1176.77**	**523.71**	**1685.91**	**4044.35**
BHUTTI	**527.26**	**2278.61**	**86.00**	**2895.99**	**5787.86**
G. TOTAL	**2588.46**	**11012.66**	**1139.76**	**26394.93**	**41135.81**

1.7 The Period of Plan: The period of plan shall be 15 years with effect from 01.04.2013 to 31.03.2028

1.8 Distribution of the area: Total geographical area of the tract is 1, 38,017.17 ha. The area of the forests according to their classification is given below Range wise:

RANGE	RESERVE FOREST	IST CLASS DPF	IIND CLASS DPF	NEW DPF	UPF below 3000m elevation	TOTAL
MANALI	197.08	692.44	12519.68	457.21	1610.42	**15476.83**
NAGGAR	-	1317.71	7836.92	-	2470.245	**11624.875**
PATLIKULH	-	23.88	8258.72	-	5637.80	**13920.40**
KULLU	-	710.21	2810.43	523.71	4819.125	**8863.475**
BHUTTI	127.87	450.81	5123.18	86.00	5945.25	**11733.11**
G. TOTAL	**324.95**	**3195.05**	**36548.93**	**1066.92**	**20482.84**	**61618.69**

CHAPTER –II

THE WORKING PLAN FOR THE DEODAR/KAIL WORKING CIRCLE

2.1- General Constitution: Deodar-Kail Working Circle, the name given to the Regular Working circle of Aggarwal's and Kapoor's plan in J.C.Sharma's Working plan is being continued. It includes all the reserved & demarcated protected forests situated on comparatively moderate & gentle terrain, which has Deodar & Kail as principle species. Essentially the forests remain as grouped together under J.C.Sharma's plan. Exercise to shift oak forests to Broad Leaved Working Circle and transfer of important aesthetic & religious consideration forests of Manali & Kullu and some forests having steep/ precipitous, terrain to Protection working circle has already been done. In this plan some forests areas stand transferred to the Wild Life Wing and these need to be excluded from this Working Circle. The following forests stand excluded-:

2.1.1 Statement showing areas transferred from and received by Deodar/ Kail Working Circle

(Table –1)

			Area transferred to D&K WC from					
Division	Range	Area of circle AS PER PREVIOUS WP (ha)	PWC	FWC	Imp WC	Total	Net +/-	Area of circle (ha)
Kullu	Manali	256.33	181.29	-	-	181.29	+181.29	437.62
	Naggar	941.61	-	-	-	-	-	941.61
	Patlikuhl	23.88	-	-	-	-	-	23.88
	Kullu	657.96	-	-	-	-	-	657.96
	Bhuthi	526.87	-	-	-	-	-	526.87
	Total	2406.65	181.29	-	-	181.29	+181.29	2587.94

2.1.2 List of forests of Deodar/ Kail Working Circle handed over to Wild Life Division as per previous working plan are given below-

(Table-2)

Name of Range	**Name of Forests**	**Area (ha)**
Kullu Range	2/32 Mathikochar C-VIc	20.00
	2/32 Mathikochar C-VId	33.42
	Total	53.42

2.2 General character of the vegetation: - The Forests in this Circle contain a large proportion of Ist class forests, which lie at low altitudes and near the vicinity of villages. Economically these forests are significant as they deal primarily with Deodar & Kail. Forests confirm to 12/C-Ie

(Himalayan moist temperate forests), 12/C-If(Low level Blue Pine forests) of H.G. Champion & Seth (Revised Survey of the forest Types of India-1964). Forests mentioned have also been described in Chapter 2 of Part I. The forest crop is mainly Deodar & Kail which occur either gregariously, or in mixture of varying proportions. In the mixed stands, the mixture is by groups as well as by single specie. Upper reaches and nalas of the forests contain a mixture of Deodar and Kail with Silver Fir and Spruce. Poles and saplings of Spruce form an understorey in some of the forests, especially on cooler northern aspects. In lower altitudinal zone, spurs and warmer aspects, Chil is contained. Depressions and nalas contain various broad leaved species i.e. Oaks, *Aesculus indica, Juglans regia, Acer caesium, Prunus padus* etc. Heavy lopping of Oak is witnessed. Deodar is confined to cooler aspects and depressions with the crop generally being irregular. The older plantations however have an even-aged crop. Preponderance of poles and middle aged classes is there, with mature Deodar trees lying scattered mostly. Stocking has been rendered poor near villages, due to heavy timber distribution marking. Stocking is also poor on southern slopes or on steep ground. Quality I/II Deodar and Kail trees are found in the tracts. Natural regeneration of Deodar is observed on cooler aspects while it is inadequate on southern dry aspects. Kail colonizes blanks and exposed spurs and shows increased proneness to fire and attack by *Trametes pinii*.

2.3 Block and compartments: - Mr. J.C. Sharma subdivided the compartments in such a way, that area of each does not go more than 40 hectares for intensive and scientific management. The composition of the crop and the configuration of the terrain have been kept in view. Natural features have been kept as boundaries of the compartments Boundary pillars, especially intermediate boundary pillars must be given due attention.

2.4 Felling series: - Only one felling series is prescribed.

2.5 Special objects of management: - Special objectives of management consistent with the general objectives are elaborated below –

1. To preserve and protect the forests in consonance and in conformity with the policy of H.P. State Government. The objective being to maintain a healthy ecosystem and pristine beauty of the forests so as to develop this area as major eco tourism hub.
2. To meet the legitimate and genuine demands of local people for timber fuelwood etc as per policy of the govt.
3. Gradual conversion of irregular crop into normal even aged crops.
4. Restocking of the PBI areas in a planned, organized manner through resorting to artificial regeneration.
5. To obtain progressive yield in perpetuity.
6. To avoid sacrifice of immature stock, by retaining compact well grown groups of poles as part of future crop.

2.6- Area and allotment: - Area as per the legal classification and range wise distribution of forests is given below –

(Table- 3)

Range	Reserve Forests	DPF Ist class	DPF IInd class	Total
Manali	-	247.65 hec	189.97 hec	437.62 hec
Naggar	-	941.61 hec	-	941.61 hec
Patlikuhl	-	23.88 hec	-	23.88 hec
Kullu	-	637.32 hec	20.64 hec	657.96 hec
Bhuthi	30.35 hec	391.72 hec	104.80 hec	526.87 hec
Total	30.35 hec	2242.18 hec	315.41 hec	2587.94 hec

2.6.1:- Statement of area as per Periodic Blocks rangewise:-

(Table-4)

Range	PBI	PBII	PBIII	PBIV	Total
Manali	152	143.3	58.67	83.7	437.67 ha.
Naggar	206	234.8	274.3	227	942.1 ha.
Patlikuhl	23.9	-	-	-	23.9 ha.
Kullu	169	158.2	240.8	89.8	657.8 ha.
Bhuthi	144	128.1	128.8	127	527.9 ha.
Total area	694	664.4	702.6	527	2588.0 ha.

2.6.2:- Statement showing area under different species (in ha):-

(Table 5)

Range	Deodar	Kail	Fir/ Spruce	B/L	Total
Manali	300.76	82.83	50.19	3.89	437.67 ha.
Naggar	647.39	178.29	108.05	8.38	942.11 ha.
Patlikuhal	16.42	4.52	2.74	0.21	23.89 ha.
Kullu	452.02	124.48	75.44	5.85	657.79ha.
Bhuthi	361.76	99.90	60.19	4.696	527.89 ha.
Total	1778.35	490.02	296.61	23.02	2588.0 ha.

2.6.3:- Statement showing area under thaches, culturable /un-culturable blanks:-

(Table-6)

Range	Culturable	Unculturable blank	Thaches blank	Mixed crop	Workable area	Total area
Manali	4.54	14.15	6.25	-	235.93	256.33
Naggar	15.85	15.76	-	-	925.85	941.61

Patlikuhal	0.50	-	-	-	23.88	23.88
Kullu	10.80	1.15	-	1.50	655.31	657.96
Bhuthi	12.25	6.54	-	-	520.33	526.87
Total	43.94	37.60	6.25	1.50	2361.30	2408.65

2.7- Analysis and valuation of the crop: - The old stock maps of Walia's plan have been up dated giving different coloures to different species as per the working plan code. The description's of the compartments and sub compartments have been rewritten, updated and posted in the respective compartment History files.

2.8- Site quality: - A compartment / sub compartment is assigned a quality class through ocular estimation of hieght and diameter of dominant trees. FRI multiple yield tables have been used and quality classes kept as I/II for deodar and Kail.

2.9- Density: - In the compartment History files have been placed, density estimates of the crop assessed occularly. Average is 0.6(Range varying from 0.4 to 0.8).

2.10- Enumeration: - Complete enumerations were carried out in randomly selected forests/ compartments of different Periodic Blocks in usual 10cm diameter classes down to 10cm d.b.h. The sampling intensity varies from 5 % to over 10% in different PB's. The enumeration results are then extrapolated to assess the growing stock of this working circle.

2.10.1 Enumeration results (Extrapolated) of Deodar –Kail Working Circle P.B.I

Total area of PB I = 694.31 ha Area enumerated = 82.56 ha Enumeration %age = 11.89%

Species	V	IV	III	IIA	IIB	IA	IB	IC	ID	Total	Volume
Deodar	**12144**	**3877**	**2447**	**3280**	**5256**	**5820**	**4003**	**2111**	**1480**	**27727**	**96647.515**
Kail	**58978**	**12110**	**2599**	**1085**	**1573**	**2599**	**2136**	**748**	**345**	**82172**	**48897.724**
Fir/Spruce	**976**	**378**	**395**	**521**	**622**	**378**	**252**	**101**	**76**	**3700**	**8549.281**
B/L	**706**	**151**	**93**	**59**	**17**	**25**	**0**	**0**	**0**	**1051**	**462.54**
Total	**72803**	**16517**	**5534**	**4945**	**7468**	**8822**	**6391**	**2960**	**1901**	**114650**	**154557.056**

2.10.2 Enumeration results of Deodar –Kail Working Circle P.B.II

Total area of PB II = 664 ha Area enumerated = 51.8 ha Enumeration %age = 7.8%

Species	V	IV	III	IIA	IIB	IA	IB	IC	ID	Total	Volume
Deodar	20356	17305	19638	17279	9127	7563	4845	2256	2192	100561	176515.872
Kail	29329	10652	6627	3897	3717	3615	2256	1243	641	61977	71454.165
Fir/Spruce	14267	5563	4435	3769	2013	731	1243	961	1064	34046	48699.276
B/L	859	1013	1359	1205	1474	641	295	179	192	7217	13760.660
Total	64810	34533	32059	26150	16331	12549	8640	4640	4089	203801	310429.973

2.10.3 Enumeration results of Deodar –Kail Working Circle P.B.III

Total area of PB III = 702.6 ha Area enumerated = 93.89 ha Enumeration %age =13.36%

Species	V	IV	III	IIA	IIB	IA	IB	IC	ID	Total	Volume
Deodar	38471	54814	58212	34939	21327	10514	5089	3210	2829	229405	326423.17
Kail	8935	5859	3719	2282	1946	1661	1220	763	823	27209	41881.974
Fir/Spruce	7453	6106	3734	3240	2073	1594	1369	711	397	26678	43995.454
B/L	30	277	172	90	60	30	0	7	0	666	633.827
Total	54889	67057	65837	40551	25405	13799	7678	4692	4048	283958	412934.425

2.10.4 Enumeration results of Deodar –Kail Working Circle P.B.IV

Total area of PB IV = 527 ha Area enumerated = 76.48ha Enumeration %age =14.51 %

Species	V	IV	III	IIA	IIB	IA	IB	IC	ID	Total	Volume
Deodar	**48104**	**27136**	**22608**	**10577**	**5795**	**2674**	**1640**	**944**	**1040**	**120518**	**109649.489**
Kail	**89448**	**18977**	**6064**	**1606**	**724**	**386**	**124**	**131**	**262**	**117721**	**33089.624**
Fir/Spruce	**8992**	**6932**	**3873**	**1316**	**599**	**599**	**317**	**124**	**200**	**22953**	**17124.537**
B/L	**145**	**90**	**7**	**7**						**248**	**62.02**
Total	**146689**	**53134**	**32552**	**13506**	**7118**	**3659**	**2081**	**1199**	**1502**	**261440**	**159925.666**

2.11 Silvicultural System:- Silvicultural system adopted for this working circle is "Punjab Shelter-Wood System". The said system permits felling according to the configuration of the ground and retention of immature growing stock as advance growth. Artificial regeneration is to be resorted to after 3 years of the seeding felling if the area has not been completely regenerated naturally. The Punjab Shelter-Wood system helps avoid unnecessary sacrifice of immature pole crop and protects area from soil denudation, as it does not allow for felling of trees in steep and precipitous terrain. Markings on selection fellings principles are proposed.

2.12 Choice of Species: - The principle should always to favour such species that is ideally suited to a certain locality. In the Deo/Kail Working Circle, Deodar and Kail grow side by side in a mixture. It is only in plantations raised artificially, during the last 60-70 years, that deodar occurs pure. Kail comes up in the drier, sunny areas. Thus propagating Deodar on hot southern slopes and exposed ridges is not proper. These areas are ideal for Kail. Pockets containing Silver Fir and Spruce should be left as such and not felled to give way to Deodar planting. However to foster Deodar, preference to retain Deodar as seed bearer, instead of Kail or Spruce, is proper. Kail is susceptible to fire damage and attack by the fungus *Tremetes pinii*. Thus wherever site permits, Deodar should be propagated. Scientific cleanings, thinnings and improvement felling be resorted to favour this species. Depressions, nalas, moist locations favour broad- leaved species and these must be retained and fostered. There are various broad- leaved species that are economically advantageous i.e. *Acer caesium, Juglans regia, Prunus padus, Aesculus indica , Ash, Carpinus,* Poplar, etc. One must never resort to violent transformations. Choice of species is ideally picked up, through lessons derived from nature which teaches us the best silviculture. Generally Deodar does well below 2500m, while spruce and Silver Fir grow well on higher altitudes. Susceptibility and treatment map for various sites should be well- planned and executed.

2.13 Rotation & conversion period:- Since the forests are under conversion, the rotation is merely of academic interest. Further due to complete ban on felling of green trees since 1980, the

process of conversion to uniform has virtually terminated. However a conversion period of 120 years as proposed in previous Working Plan is thus adopted.

2.14 Exploitable Diameter: - Exploitable diameter is fixed at 60 cm d.b.h. This diameter is economically viable and corresponds to rotation kept.

2.15 Regeneration Period: - Looking to growth trend, the regeneration period is kept fixed at 30 years. It is estimated that in this period, the Deodar plants will have attained a stage of saplings to young pole crop. The period is suitable legally also, as it is maximum period for which a forest can be closed to grazing and other rights of villagers.

2.16 Division into periods: - With a rotation of 120 years and regeneration period of 30 years, the circle will be divided into four periodic blocks.

2.16.1 Periodic Block I: - The PB-I was divided in to two groups in previous working plan namely group A –areas of un felled PB-I and some of the PB II areas being the best available as far as the maturity of the crop is concerned of JC Sharma's WP and Group B that include the felled PB-I areas of JC Sharma's WP where regeneration is still progressing. Since continuous ban on green felling continued from1980 onwards and likely to extend further, therefore there is no justification to continue with two groups in PB-I.

In present working plan, forests having a preponderance of mature to over mature age classes have been allotted to this periodic block along with PB-I areas of WP under revision where regeneration has not come up . In some of the forests of this PB, sizeable openings have been created due to heavy marking under Timber distribution, salvage lots and forest fires. The objective is to restock and rehabilitate them progressively.

2.16.1.1 Areas under PB-I

(Table 7)

Range	Name of Forest	Area(ha)
Manali	1/2 Gugtudhag CII	14.16
	1/3 Kalaunt CIII	16.59
	2/8 Shalingahr CIb	33.00`
	2/8 Shalingahr CIc	23.43
	1/4 Dudlu CII	36.42
	1/4 Dudlu CIV	28.33
Naggar	1/12 Dhamsu Kalon CIV	24.28
	1/13 Setadhag CIIIb	30.40
	1/17 Deoban & Chahar C-Ia	28.61
	1/17 Deoban & Chahar C-Ib	24.00
	1/18 Jhangar Kalon C-III	48.56
	1/19 Naggar Jhir C-I	11.33
	1/20 Rashnal C-I	10.12
	1/21 Lower Sesni C-III	13.76
	1/22 Phetaban C-III	11.74
	1/23 Ledi Chalon (Whole)	2.83

Patlikuhal	1/25 Fozal (Whole)	23.88
Kullu	1/26 Devi ki Jhir C-II	20.23
	1/28 Gogar shil C-III	22.70
	1/29 Chilgan Kalon C-I	6.07
	1/30 Jammu thach C-III	31.16
	1/32 Kandi C-I	27.90
	1/39 Riampin C-I	19.83
	1/40 Chota sungra C-I	16.59
	1/40 Chota sungra C-II	15.00
	1/40 Chota sungra C-IIIa	9.71
Bhuthi	1/36 Bakar Kiara C-I	32.37
	1/36 Bakar Kiara C-II	40.50
	1/37 Kailidugh C-II	18.20
	1/41 Reunsigahr C-II	34.40
	2/61 Marig CIII	18.21

2.16.1.2 Range wise areas in PB-I

(Table 8)

Range	**Forest area**
Manali	151.93
Naggar	205.63
Patlikuhal	23.88
Kullu	169.19
Bhuthi	143.68
Total	**694.31**

The enumeration results of PB I table 2.10.1 are compiled below.

Enumeration results of Deodar/ Kail Working Circle for PBI (by extrapolation of sample values)

(Table 9)

Species	**Number**	**Volume in cum**
Deodar	**27727**	**96647.515**
Kail	**82172**	**48897.724**
Fir/ Spruce	**3700**	**8549.281**
BL	**1051**	**462.54**
Total	**114650**	**154557.056**
# of trees/hectare	**165**	
Volume of trees / hectare	**222.60 cum**	

2.16.2-Periodic Block II: - Those forests having a preponderance of maturing age classes have been allotted to this periodic block. Table 2.10.2 is again compiled below-

Enumeration results of Deodar/ Kail Working Circle for PBII (by extrapolation of sample values)

(Table 10)

Species	**Number**	**Volume in cum**
Deodar	**100561**	**176515.872**
Kail	**61977**	**71454.165**
Fir/ Spruce	**34046**	**48699.276**
BL	**7217**	**13760.660**
Total	**203801**	**310429.973**
# of trees/hectare	**307**	
Volume of trees / hectare	**467.515 cum**	

2.16.3- Periodic Block III: - The crop is mostly pole to middle-aged with scattered mature trees which occur in varying proportions. Mostly these forests are open and contain predominantly younger age classes. Table 2.10.3 is again compiled below:-

Enumeration results of Deodar/ Kail Working Circle for PBIII (by extrapolation of sample values)

(Table 11)

Species	**Number**	**Volume in cum**
Deodar	**229405**	**326423.17**
Kail	**27209**	**41881.974**
Fir/Spruce	**26678**	**43995.454**
BL	**666**	**633.827**
Total	**283958**	**412934.425**
# of trees/hectare	**404**	
Volume of trees / hectare	**587.72 cum**	

2.16.4- Periodic Block IV: - The crop in this periodic block is sapling to young pole stage with scattered mother trees and groups of advance growth retained as part of future crop. Enumeration results of PBIV feature in table 2.10.4

(Table 12)

Species	**Number**	**Volume in cum**
Deodar	**120518**	**109649.489**
Kail	**117721**	**33089.624**
Fir/Spruce	**22953**	**17124.537**
BL	**248**	**62.02**
Total	**261440**	**159925.666**
# of trees/hectare	**496**	
Volume of trees / hectare	**303.46 cum**	

2.17 Comparison of growing stock of present working plan and Mr.J.S Walia's plan:-

(Table 13 a)

Walia's plan	PBI	PBII	PBIII	PBIV	Total
Number of trees /ha	92.41	77.52	132.16	301.71	124.67
Volume of trees/ha	195.40	153.77	207.34	246.06	194.94

(Table 13 b)

Current plan	PBI	PBII	PBIII	PBIV	Total
Number of trees /ha	165.128	306.93	404.15	496.09	303.80
Volume of trees/ha	222.605	467.51	587.72	303.46	401.04

2.18:- Record of removals: - During the plan period, the moratorium on green felling continued and no green tree was felled for commercial felling. However, marking of green trees for timber distribution continued upto 2006, when Hon'ble High Court imposed ban on any type of extraction till finalization of new TD policy. The new TD policy was notified by the govt. in 2010. Salvage removals, however, continued throughout the plan period, except for a short stint in 2006. The detail of removals during plan period is as under:

The details of felling / removals during previous WP period are as under:-

Details of removals during previous Working plan period

TYPE OF REMOVAL	SPECIES	P.B.				TOTAL
		I	II	III	IV	
THROUGH T.D./ FREE GRANT	DEODAR	994.98	510.4	3906.5	751.7	6163.58
	KAIL	1707	580.6	1217.9	589.79	4095.29
	FIR/SPRUCE	207.25	47.98	822.24	195.18	1272.65
SALVAGE REMOVALS	DEODAR	113.2	81.7	295	78.6	568.5
	KAIL	673.5	320.3	633.5	523.1	2150.4
	FIR/SPRUCE	227.5	82.09	464.79	114.51	888.89
	B/L	4.6	2.1	9.24	3.4	19.34
G. TOTAL	**DEODAR**	**1108.18**	**592.1**	**4201.5**	**830.3**	**6732.08**
	KAIL	**2380.5**	**900.9**	**1851.4**	**1112.89**	**6245.69**
	FIR/SPRUCE	**434.75**	**130.07**	**1287.03**	**309.69**	**2161.54**
	B/L	**4.6**	**2.1**	**9.24**	**3.4**	**19.34**

2.19- Calculation of Yield:- Although the yield calculations are redundant considering that there is a total ban on green fellings, however just for academic interest yield calculations have been done for PBI, PBIV and PBIII on the basis of extrapolated enumeration results. Increment has been ignored for the reasons of safety against fire and other natural calamities and also to serve

as emergency reserve. The yield we get from PBI and PBIV is designated as final yield while the yield from PBIII is called intermediate yield. Removals on account of TD must feature in the yield and must be strictly controlled.

2.19.1-Yiled from PBI: - Complete enumeration of sample PBI areas have been done in 10 cm diameter classes down to 10cm d.b.h. Yield has been calculated for PBI on the extrapolated enumeration results. The abstract of enumeration results of PBI is given under enumeration Para-2.10.1. Theoretically, leaving aside mother trees above 40cm in diameter, the entire growing stock should be considered for the plan period. However advance growth compact groups, trees on broken ground, and trees under emergency reserve and fire insurance must also be retained. Trees standing on blanks or over patches where regeneration has not established must also not be made available.

Yield on the basis of silvicultural availability is calculated as under:-

$$Y = \frac{CIVI+C2V2+C3V3}{P}$$

Where VI,V2 and V3 are the volumes of Ist class, IInd class and IIIrd &IV class trees respectively, P is the length of plan i.e. 15 years and CI, C2 and C3 are constants which have been considered the same as in Mr. J.C.Sharma's plan as they are reliable and emerged after considering field conditions.

(Table 14)

Species	C1	C2	C3	
Deodar	0.5	0.5	0.5	% is lower for Deodar as these are to be retained
Kail	0.7	0.6	0.5	As seed bearers as far as possible in preference to Kail
Spruce/Fir	0.6	0.5	0.5	
Chil	0.6	0.6	0.5	

Calculations:-

Deodar- Total volume of Ist class trees = 69435

Total volume of IInd class trees = 22000

Total volume of IIIrd and IV class trees= 3998

Average Yield = (69435*0.5+22000*0.5+3998*0.5)/15=3181m^3 or say 3200 m^3

Kail - Total volume of Ist class trees = 28778

Total volume of IInd class trees = 6779

Total volume of IIIrd and IV class trees = 7443

Average Yield = (28778*0.7+6779*0.6+7443*0.5)/15=1863 m^3 or say 1900m^3

Spruce/Silver Fir: - Total volume of Ist class trees = 5280

Total volume of IInd class trees = 2822

Total volume of IIIrd and IV class trees = 389

Average Yield = (5280*0.6+2822*0.5+389*0.5)/15=318.26 m^3 or say 300 m^3

Yield of various species is summarized as below: -

Deodar = 3200m^3
Kail = 1900m^3
Spruce/Silver Fir = 300m^3

2.19.2- Yield from PB-II: - No fellings are to be done in this block except removal of dead and uprooted trees only.

2.19.3- Intermediate yield from PBIII: - This block has an open crop which normally meets the ever rising requirement of TD for right holders. The annual increment put up on the growing stock existing in this block is as follows-

I) **Deodar:**

Total volume =326423cum, Annual increment = (326423*1.75)/100=5712m^3

II) **Kail:**

Total volume =41882cum, Annual increment = (41882*1.58)/100= 661m^3

III) **Fir/Spruce:**

Total volume =43995 cum, Annual increment = (43995*1.2)/100=528m^3

It is estimated that 20% of the annual increment will be available for felling. Hence the following yield is fixed for PBIII-

(Table 15)

Deodar	**Kail**	**Spruce/Fir**
1142.4 m^3	132.2m^3	105.6m^3
Or say 1150 m^3	Or say 150m^3	Or say 100m^3

This yield is merely for guidance. In the field silvicultural criterion must always be kept in mind.

2.19.4-Yield from PBIV

Complete enumeration again in 10 cm diameter classes down to 10cm d.b.h. was carried out in sample areas and extrapolated result is tabulated above

Increment is ignored for calculating yield, which has been based on the total volume of trees in the periodic block. Removal of all Ist and IInd class trees cannot be done as we must retain trees standing on precipitous and broken ground, retain trees as fire insurance and national emergency reserves. Trees, i.e. IInd class trees standing amongst patches of advance growth are not to be felled .Thus we must continue to keep 25% of the Ist and IInd class trees under silvicultural criterion. Further 10% of trees under the 20cm to 40cm d.b.h class will be available for thinning. Formulae to calculate the annual yield

Annual Yield = (VI*0.75+V2*0.10)/P would have P being the plan period of 15 years while V I is the volume of Calculations-

I) **Deodar:**

Total volume of Ist and IInd class trees = 33894+37482=71376 m^3

Total volume of IIIrd and IV th class trees =33463 m^3

AY = (71376*0.75+33463*0.1)/15= (53532+3346) /15 = 3792 m^3 or say 3800 m^3

II) **Kail:**

Total volume of Ist and IInd class trees = 5269+5221= 10490 m^3,

Total volume of IIIrd and IV th class trees = 13655 m^3,

AY = (10490*0.75+13655*0.10)/15= (7866+1365)/15 m^3= 615 m^3 or say 600 m^3.

III) **Spruce/Silver Fir:**

Total volume of Ist and IInd class trees for fir/spruce=8221 +4102 =12323 m^3

Total volume of IIIrd and IV th class trees of fir/ spruce =4262 m^3,

AY= (12323*0.75+4262*0.10)/15=644 m^3 or say 650 m^3.

2.19.5-Total Prescribed Yield: -The annual yield is given below with the yield from PBIII not available for commercial sales.

(Table 16)
(Yield prescribed in m^3)

Species	**PBI**	**PBIII**	**PBIV**	**Total**
Deodar	3200	1150	3800	8150
Kail	1900	150	600	2650
Spruce/Fir	300	100	650	1050

2.20-Table of fellings:

(Table 17)

YEAR	RANGE	FOREST	COMPTT.	AREA(ha)		
				P.B-I	PB III	PB-IV
2013-14	-	-	-	-	-	-
2014-15	NAGGAR	1/11 Sajla Shil	C-Ia		17.4	
	KULLU	1/40 Chhota Sungra	C-I	16.59		
2015-16	NAGGAR	1/10 Padri Chalon	C-I			25.9
	PATLIKULH	1/25 Fozal	Whole	23.88		
2016-17	MANALI	1/3 Kaloint	C-III	16.59		
	NAGGAR	1/12 Dhamsu Kalon	C-Ib		12.95	
	NAGGAR	1/12 Dhamsu Kalon	C-IV	24.28		
	MANALI	2/8 Shallinghar	C-Ib	33		
2017-18	MANALI	½ Gugtudhag	C-I		12.14	
	MANALI	1/3 Kaloint	C-I		1.50	
	MANALI	2/8 Shallinghar	C-Ic	23.43		
	NAGGAR	1/19 Naggar Jhir	C-I	11.33		
	BHUTTI	1/41 Reuinsighar	C-I		20.23	
2018-19	NAGGAR	1/13 Sheta Dhag	C-IIIc		24.68	
	NAGGAR	1/20 Rash Nal	C-IV		3.24	
	BHUTTI	1/36 Soja Bakar Kiara	C-I	32.37		
	BHUTTI	1/38 Chakoin	C-Ia			38.25
	BHUTTI	1/38 Chakoin	C-Ib			20.43
2019-20	NAGGAR	1/12 Dhamsu Kalon	C-Ia			8.09
	KULLU	1/39 Riampin	C-I	19.83		
	KULLU	1/39 Riampin	C-II			21.44
	BHUTTI	2/61 Marig	C-III	18.21		
2020-21	NAGGAR	1/10 Padri Chalon	C-II		23.47	
	KULLU	1/26 Devi de Jhir	C-II	20.23		
	KULLU	1/28 GogarShil	C-II		21.04	
2021-22	MANALI	½ Gugtudhag	C-II	14.16		
	NAGGAR	1/15 Somban	C-I		10.52	
	NAGGAR	1/15 Somban	C-II		8.09	
	NAGGAR	1/15 Somban	C-III			8.5
	NAGGAR	1/19 Naggar Jhir	C-III		12.55	
	NAGGAR	1/21 Lower Sasni	C-Ia		10.52	
	NAGGAR	1/21 Lower Sasni	C-II		10.52	
2022-23	MANALI	¼ Dudhlu	C-IV	28.33		
	MANALI	¼ Dudhlu	C-IIIb			29.37

	NAGGAR	1/18 Janghar Kalon	C-II			42.49
	BHUTTI	2/62 Manda Dwar	C-I		19.42	
2023-24	MANALI	1/6 Aleo Bihal	C-I		14.16	
	NAGGAR	1/24 Ledi Chalon	C-I		8.09	
	NAGGAR	1/24 Ledi Chalon	C-II		16.19	
	NAGGAR	1/24 Ledi Chalon	C-III		16.19	
2024-25	NAGGAR	1/17 Deoban	C-Ia	28.61		
	NAGGAR	1/17 Deoban	C-Ib	24		
2025-26	NAGGAR	1/10 Padri Chalon	C-IV		22.66	
	NAGGAR	1/12 Dhamsu Kalon	C-III			22.66
	NAGGAR	1/14 Padra Dhanach	Whole		23.47	
2026-27	MANALI	1/6 Aleo Bihal	C-II		12.54	
	NAGGAR	1/17 Deoban	C-II			34.8
2027-28	MANALI	1/3 Kaloint	C-II		11.33	
	MANALI	¼ Dudhlu	C-II	36.42		
	MANALI	¼ Dudhlu	C-IIIa			16.76
	NAGGAR	1/19 Naggar Jhir	C-IV			11.33

2.21.1-Method of executing fellings in PBI:- C.C.F's technical order No.2 of Punjab Forest Manual volume III elaborates the technique of regeneration markings . Pasting of a detailed treatment map of forest, indicating the types of marking carried out is required in the compartment history files. Aim must always be sustained yield. Natural regeneration must never be jeopardized. Herein lies the skill of the forester to successfully manipulate canopy and conserve all the favourable locality factors. On well drained soil, Deodar must be preferred to Silver Fir and Spruce, in the course of artificial regeneration. On damp sites, favouring Silver Fir and Spruce, the opening should conform to the requirements of the species, aiming at maximum natural regeneration. In moist, damp areas, in depressions and nalas, broad-leaved species do very well naturally and should be preferred to remain as such. The following principles are however laid out:-

1. About 30 to 35 trees per hectare should be aimed at. Thus average distance of seed bearers shall be 16 to 18 meters in case of Deodar and 18 to 20 meters in case of Kail.

2. Seed bearers should be mature, well grown, healthy, tall and clean boled. Trees of IA &II should be selected. Lower branches of mother trees should be pruned to free the young plants from over-head shade.

3. After conforming with the distance criterion, as far as possible, seed bearers shall be left on spurs and ridges and not in depressions for better seed dispersal.

4. conforming to requisites of Punjab Shelter wood system, retain advance growth/future crop. These are groups of healthy poles up to 40 cm diameter (diameter at the time of first marking i.e. seeding felling), not less than 0.1 hectares in extent and having density 0.4.

For retention of pole crop, the vigor and condition of the pole crop must be kept in mind. Pole crop retained are to be opened up for regeneration in subsequent years. No seed bearer will be retained in patches of advance growth, retained as part of future crop.

5. Selection criterion must hold on very steep, broken ground.

6. In mixed crops, Deodar is preferred to Kail.

7. Thinning in the groups of pole crop retained is required.

8. Valuable broad-leaved trees i.e. *Acer caesium, Juglans regia, Prunus padus, Celtis australis* and *Carpinus spp.* are to be preferred. Seed bearers should be spaced about 20 meters apart.

2.21.2-Method of fellings in PBII areas: No fellings are prescribed in this periodic block. Only dead, dying, diseased, moribund trees are to be marked and felled.

2.21.3- Method of fellings in PBIII areas: Felling in this block is meant for the improvement of crop. The rules are as follows-

1. Removals are aimed at improving the condition and composition of the crop. Thinning is to be favoured irrespective of vigorously growing trees.

2. No tree shall be marked to induce regeneration.

3. Dead, dying, diseased, moribund, stunted and unhealthy, wind damaged and fallen trees are to be marked.

4. No removals are to be done if the stocking is less than what normally can be expected as per yield table figures.

5. Remove mature trees that interfere with or suppress young, healthy crop and prefer valuable species to inferior ones. Broad – leaved species should not be cut unnecessarily on the pretext of improvement fellings.

6. All trees marked for any purpose shall be removed within a year. Thinning should conform to the principles laid down in Punjab Forest Leaflet numbers I and IA and well within yield table check.

2.21.4-Method of executing fellings in PBIV:- The marking should correspond to final removal of over wood which suppress and stand over the young crop. Thinning in patches of advance growth is also required. General principles laid down are-

1. Markings are not to obtain or induce regeneration. They are to free the established regeneration, through removal of the over wood i.e. class I and II trees.

2. All solitary II and III trees which stand amongst young crop and which would end up becoming wolf trees are to be removed.

3. Carry out thinning in groups of poles and patches of advance growth retained.

4. All marked trees likely to damage young crop underneath should first be lopped before felling.

5. Do not mark and fell broad – leaved species on the pretext of improvement fellings . Lop them where they are found to suppress the young crop.

2.22-Control of Yield:- It would not be prudent to assume that the removals of various species in a particular year would conform to or be equal to the prescribed yield for each species . Markings must be done only on silvilcultural basis. Yield is to be shown species wise in control forms and deviation statement. It must be borne in mind that fellings must correspond to the progress of regeneration. This is very important as in the past; fellings did not correspond to the afforestation drive, with the result that quite a lot of pristine forests were rendered blanks. All removals down to 10cm d.b.h. in all the periodic blocks count towards prescribed yield. Progress of regeneration must always be the index to monitor fellings. The yield should not exceed the prescribed yield, by more than 15% during a particular year and cumulative be 10% over a period of 5 years. The TD removals constitute an important component of yield and must be strictly monitored, so that the limit prescribed for annual yield in a year is not exceeded. Territorial DFOs must be made accountable if the said limit is surpassed, as this is the prime reason for depletion in forest wealth.

2.23-Subsidiary Silvicultural Operations in PBI:-Green felling is at present banned in the state. However as and when fellings are done in PBI as per prescription, the subsidiary silvicultural operations are to be carried out immediately after felling.

- As per Punjab Forest Leaflet number 6 prescription, fellings refuse is to be disposed off. Felling debris removal is urgently required.

- To foster growth of young regeneration, remove inferior species which interfere with their healthy growth. Weeding and bush cutting is urgently required. Remove those trees that are damaged and those marked trees which continue to remain unfelled. Lop those broad – leaved trees which interfere with the growth of younger conifer crop.

- Cleaning operations and climber cutting be done to foster regeneration.

- Shrub cutting be done to provide a clean seed bed.

- Effective barbed wire closure is to be done to check grazing.

- Control burning be done to foster healthy growth.
- Mechanical thinning can be done in thickets.

2.24-Artificial regeneration in PBI area:-Effective closure coupled with judicious manipulation of the canopy is very important, to induce good natural regeneration. Considering that a good seed year may not synchronize with the year of fellings it is very important to go in for artificial regeneration immediately, otherwise there is risk of proliferation of weeds and bushes. Punjab leaflet number 3 and 4 lays down the required technique of artificial regeneration. It is of prime importance to raise temporary nurseries of conifers and broad-leaved species, at close proximity to the PBI, area well in advance of year of fellings. Planting must be done in the rainy season following the year of exploitation. Patch and line sowing of Deodar should be done very sparingly. Artificial regeneration should be done through planting with

Deodar two and a half years old. Deodar plants of age one and a half year too would work in good Deodar zones provided nursery has been raised appropriately. Healthy plants should definitely be more than 25cms in height. On dry and exposed sites, Kail would be able to come up satisfactorily. Attempts to convert Spruce and Silver Fir forests into Deodar forests must be avoided. Only in degraded forests below 2400meters, Deodar artificial planting be done. Nalas and moist locations favour broad –leaved planting. Indicators of good Deodar sites are those where the following bushes grow, but do not form a dense cover i.e. *Sarcococca saligna*, Strawberry, *Viola*, Maiden hair fern, *Ainslaea*, etc. In such places natural regeneration would compliment artificial regeneration. However where weeds like Iris, Balsam, *Strobilanthes*, *Spiraea sorbifolia*, *Dipascus* and *Plectranthus* are dominant, there conditions are not suitable for natural regeneration of Deodar. In refractory areas suffering from heavy weed growth and overgrazing, artificial regeneration has to be tackled with real effort. It would always be economical to regenerate areas promptly after seeding fellings. Normally within 5-7 years of seeding fellings area should be regenerated.

Nature provides us the best approach regarding species vis'a vis' site. In thaches, phats, shallow rocky southern and south western slopes Kail should be the preferred species; otherwise grasslands should be enriched with nourishing grasses and kept as pastures. This would keep the local populace tuned to the forest department activities and would not antagonize them to resort to conflict situations.

Along with tackling normal regeneration operations in the PBI, areas there are certain problematic areas which require species attention. These are the degraded and depleted forests, as also the fire burnt areas. Artificial regeneration efforts taken in the past have been mixed. Adequate protection is must maintenance regular and systematic. A list up to the areas is given below:-

2.25- Miscellaneous Regulations:-

2.25.1 Closure: There is no denying the fact that effective closure is most essential for the success of a plantation. It is thus imperative to close a felled area from grazing, immediately after disposal of felling refuse. The closure must continue until the regeneration has established. Normally this would take 30 years. Issuance of government notification in this respect is very important to avoid legal complications.

2.25.2 Grazing: While taking up areas for regeneration and closure, a judicious mix must be kept vis'a vis' grazing rights as defined in the settlement report. This is a right which must be recognized, in case joint forest management is to be aimed at. Live hedge fencing should be done along with barbed wire fencing as it takes quite some time to establish.

2.25.3 Grass cutting: In areas which are not under regeneration, grass cutting should not be restricted. In PBI we must allow the plants to grow to a height of 1 meter, before we can allow grass cutting, under strict supervision of field staff, which must ensure that the plants are not cut along with the grass.

2.25.4 Right holder requirement: Demand of the right holders for TD timber is increasing day by day. However the DFO territorial must ensure that the annual yield prescribed must not be allowed to be surpassed. He must also ensure that TD is marked only in the approved period blocks prescribed. No trees are to be marked from PBI areas after seeding fellings have been done, till the regeneration is fully established. Marking and fellings must not be done for TD in PBII areas. From PBIII only such trees are to be removed that can be taken out on improvement fellings or in thinning. All the trees marked to the right holders shall count

towards yield. Settlement must always be adhered to . IIIrd class forests are being ruined, primarily because the ownership vests with the Revenue Department while the management is through the forest Department. These forests are heavily burdened with rights of the local populace, plus there are blatant transgressions i.e. encroachments. Even in the DPF's excess and unsilvicultural TD markings have rendered areas to have permanent gaps in the canopy.

2.25.5 Fire protection: It is of prime importance to protect our forest from fires. Incendiary forest fires must be checked and controlled. Fire lines, inspection paths and bridle paths should be maintained and fire watchers, engaged during dry season, must ensure strict vigil. In case of fires, local help is a must and where ever this is not forthcoming, curtailing of TD right must be strictly done. The forest floor must be kept clean of inflammable material such as debris, unwanted bushes, weeds, needles and grass.

2.25.6 Regeneration Survey: The regeneration survey of the felled PBI areas should be done as laid down under Para 57 of the Working Plan Code. Assessment of regeneration for effective planning is a must. Failures are to be effectively curtailed. Fellings are justified only when the success of regeneration is ensured.

2.25.7 Natural calamities: In case of natural calamities, the said area should be transferred as a PBI area.

PART II

CHAPTER III

THE WORKING PLAN FOR FIR WORKING CIRCLE

3.1-General Constitution: - All such Reserve Forests and DPFs which predominately contain Silver Fir and Spruce are kept in this Working Circle. The few changes done in the area of this working circle are as under: -

3.1.1 Statement showing the area transferred from and received by the Fir Working Circle

(Table 1)

			Area transferred from Fir WC to		**Area transferred to Fir WC from**			
Division	**Range**	**Area of circle as per previous WP (in ha)**	**PWC**	**Imp. WC**	**Prot. WC**	**Imp WC**	**Net +/-**	**Area of circle (in ha)**
Kullu	Manali	3782.31	445.15	72.84	-	-	-517.99	3264.32
	Naggar	2462.78	-	-	275.64	-	+275.64	2738.42
	Patlikuhl	1489.79	-	-	64.75	-	+64.75	1554.54
	Kullu	1116.07	-	-	-	-	-	1116.07
	Bhuthi	2278.61	-	-	-	-	-	2278.61
	Total	**11129.56**	**445.15**	**72.84**	**340.39**		**-177.6**	**10951.96**

The area of this WC transferred to WL division during earlier working plans is reproduced below for keeping record of such areas:

3.1.2 Range wise list of forests transferred to Wildlife Division from Fir working Circle

(Table 2)

Name of Range	**Name of Forest**	**Compartment**	**Area in ha.**	**Present status**
Manali	2/5 Bung Juari	C-II a	52.56	Manali WL Sanctuary
	2/5 Bung Juari	C-II b	40.51	--do--
	2/6 Manal Gahar	C-I a	45.00	--do--
	2/6 Manal Gahar	C-I b	18.00	--do--
	2/6 Manal Gahar	C-I c	45.05	--do--

	2/6 Manal Gahar	C-II b		40.00	--do--
	2/6 Manal Gahar	C-III a		29.65	--do--
	2/6 Manal Gahar	C-III b		25.00	--do--
	2/6 Manal Gahar	C-III c		40.05	--do--
	2/6 Manal Gahar	C-IV a		49.00	--do--
	2/6 Manal Gahar	C-IV b		52.17	--do--
			Total	436.99	
Kullu	2/32 Mathi kochar	C-I a		42.00	Kais WL Sanctuary
	2/32 Mathi kochar	C-I b		29.32	-----do-------
	2/32 Mathi kochar	C-II a		30.98	-----do-------
	2/32 Mathi kochar	C-II b		54.00	-----do-------
	2/32 Mathi kochar	C-III a		51.00	Kais WL Sanctuary
	2/32 Mathi kochar	C-III b		27.75	-----do-------
	2/32 Mathi kochar	C-III c		22.02	-----do-------
	2/32 Mathi kochar	C-IV a		23.00	-----do-------
	2/32 Mathi kochar	C-IV b		47.41	-----do-------
	2/32 Mathi kochar	C-V a		39.75	-----do-------
	2/32 Mathi kochar	C-V b		28.75	-----do-------
	2/32 Mathi kochar	C-V c		18.50	-----do-------
	2/32 Mathi kochar	C-VI a		22.61	-----do-------
	2/32 Mathi kochar	C-VI b		30.00	-----do-------
	2/32 Mathi kochar	C-VI c		20.00	-----do-------
	2/32 Mathi kochar	C-VII a		35.00	-----do-------
	2/32 Mathi kochar	C-VII b		26.19	-----do-------
	2/32 Mathi kochar	C-VII c		42.00	-----do-------
	2/32 Mathi kochar	C-VI d		33.42	-----do-------
			Total	623.70	

3.2 General Character of the vegetation:- The forests types as per Champion and Seth's classification conform to 12/C-Id (Himalayan moist temperate mixed coniferous forests), 12/C-IIb (Western Himalayan Upper Oak- Fir forests), 12/CIe (Moist temperate deciduous forests) on moist location and along nalas. Silver Fir and Spruce are the main species, with the former predominating on the higher reaches and the latter available lower down. In cooler localities and depressions, Silver Fir descends down to 2500 meters whereas along spurs and warmer regions, Spruce penetrates higher up. Scattered Deodar is found on rocks and precipices while Kail may be observed on exposed spurs and ridges. Depressions, moist locations and nalas contain various broad-leaved species i.e. *Acer caesium, Prunus padus, Aesculus indica, Juglans regia, Corylus colorna, Carpinus spp., Celtis australis, Betula alnoides* etc. Kharsu Oak is found mixed with Silver Fir or pure at the top belt. In the forests of Khirganga, Toshnala and Patalsu, *Betula alnoides* occurs pure along the tree line. *Taxus baccata* forms the understorey in some of the Silver Fir/Spruce forests. Because of excess demand for packing cases, pressure from remote saw-millers and excess marking after exaggerating yield, the Fir forests have been left

understocked. A preponderance of mature and overmature stock is available, many of the overmature stock being hollow and unsound. Local, remote saw-millers have got away with the best boles, for manufacture of packing cases while the crop retained is unhealthy. Younger age classes, fair amount of advanced growth and poles, are also observed on sloping ground. Natural regeneration is observed in tracts with Open canopy & well drained soil, and where grazing is controlled and weed growth has been kept to a minimum, and in forests away from habitations.

3.3-Special Objects of Management:- Consistent with the general objects of management, the special objects of management are-

A) To improve the existing stocking of the forests by supplementing natural regeneration of Silver Fir and Spruce with artificial regeneration.

B) To continue the efforts towards conversion of irregular forests into regular forests.

C) To avoid sacrifice of immature stock by retaining compact well frown groups of poles, as part of future crop.

3.4-Area statement: - The area statement by PBs according to the legal classification and rangewise distribution of the forests is given below (in hectares)

Statement of Area and growing stock of current plan (PB-wise)

(Table 3)

Range	PBI	PBII	PBIII	PBIV	Total area in hac
Manali	1275.27	1042.64	288.82	657.59	3264.32
Naggar	568.29	1296.96	398.8	474.37	2738.42
Patlikuhal	375.59	337.41	667.24	174.3	1554.54
Kullu	379.94	391.25	207.86	137.02	1116.07
Bhuthi	566.33	655.69	897.29	159.3	2278.61
Total	3165.42	3723.95	2460.01	1602.58	**10951.96**

Growing stock

No.trees/ha	119.51	164.02	137.61	88.58	134.18
Vol/ha(m3)	319.98	476.66	366.59	183.10	363.70

3.4.1 Statement showing area under different species (in hectares)

(Table 4)

Range	Deodar	Kail	Fir/ Spruce	B/L	Total
Manali	226.979	212.590	1938.317	886.434	3264.32
Naggar	190.411	178.340	1626.044	743.625	2738.42
Patlikuhal	108.092	101.240	923.069	422.139	1554.54
Kullu	77.604	72.684	662.710	303.071	1116.07
Bhuthi	158.439	148.395	1353.013	618.762	2278.61
Total	761.527	713.249	6503.153	2974.031	10951.96

3.4.2 Different types of areas i.e whether culturable/ non –culturable, thach etc.

(Table 5)

Range	Culturable area	Un-culturable area	Thach	Mixed crop	Workable area	Total area
Manali	567.82	114.25	100.39	-	3532.74	3747.38
Naggar	49.80	82.37	45.94	-	2334.83	2463.14
Patlikuhal	38.22	21.69	84.88	-	1520.15	1619.72
Kullu	22.31	53.93	55.19	-	1063.66	1176.78
Bhuthi	70.03	228.23	22.15	-	2028.23	2278.61
Total	748.18	500.47	308.55	-	10479.61	11285.63

3.5-Blocks and Compartments:- Efforts had been made earlier to subdivide all such compartments, that were more than 40 hectares in area, into smaller units for the purpose of intensive and scientific management of forests, giving due consideration to the composition of the crop and configuration of the ground. Proper blazing rings on trees were done to facilitate enumeration work. The same blocks and compartments are continued in this working plan also.

3.6-Felling Series:- Only one felling series is made.

3.7-Analysis and valuation of the crop:-

3.7.1 Site quality: - The overall site quality is I/II.

3.7.2 Density: - Ocular estimates of density have been made and incorporated in the compartment history files. Average density varies from 0.3 to 0.6.

3.7.3 Enumerations:-Total complete enumerations have been done only in PBI, while in the other PBs only partial enumeration through releskope have been done. Enumeration down to 10 cm d.b.h in 10cm diameter classes has been carried out in the PBI.

3.7.4 The abstract showing number and volume of trees in the Fir Working Circle is shown below:-

(Table 6)

Species	**Number of trees**	**Volume of trees (m^3)**
Deodar	102187	206811
Kail	95709	106685
Fir/Spruce	872640	2751812
BL	399077	917912
Total	1469613	3983220
No. of trees/ha.	**134.18**	
Volume/ha.	**363.70**	

3.8 –Regeneration assessment:-

Natural regeneration has on the whole been quite low. The reason is excessive grazing pressure, heavy weed growth and at some places accumulation of deep humus. Fir and Spruce forests, which lie in the route of the migratory gujjars and gaddi suffer the most, on account of the excessive grazing pressure. Examples of this type of damage to forests can be seen in 2/12 Mathiban & Kothi tich forests etc. Artificial regeneration endeavors too have not been serious. Considering that a Fir seedling is fit for planting after 4 & ½ years, while spruce is readied after 2 & ½ years nurseries for the same have by and large been ignored .The current trend to wards fast growing species and annual targeted planting has done maximum damage to this aspect. Economically an artificial regeneration programme for Fir and Spruce requires money for nursery cost, removal and raking of the deep humus layer, collection and burning of felling refuse, combating and removal of the tall and thick weed growth, constant fencing and subsequent maintenance. Fencing is important as many of the fir and Spruce forests lie in the route of the gaddi sheep to the alpine pastures. Indigo removal has become necessary in Mathiban and Kothi regenerated Fir and Spruce areas as it tends to suppress the plants. Maximum damage to the Fir and Spruce forests has been caused by the remote saw-millers, who are again trying to come to the forefront through political mileage. It was these sawmillers who caused haveoc to the Fir and Spruce forests. In the name of salvage removals middle-aged, healthy, green, clear bole trees of Fir were axed. The Forest Corporation too, can also be faulted for poor management and damage to these Fir/Spruce forests. The Fir and Spruce forests have also got a raw deal from the forester, whose obsession with Deodar led to his over-estimating the yield available. One has only to visit these remote Fir and Spruce forests to see for oneself, how poor forest management has led to total neglect and damage of this valuable resource. The

Fir and Spruce forests are invaluable, as these lie on hill slopes of important water catchments and their ruin will spell disaster for people in the plains. Replenishment and rehabilitation must be given due attention and special projects be designed for their upkeep and good health.

3.9 Choice of Species: Silver Fir and Spruce are the main species to be propagated, though proportion of Deodar in artificial regeneration could be increased where suitable, between 2400 meters and 3000 meters, depending on aspect and other factors. In moist locations/depressions and nalas, favour broad- leaved species i.e walnut, Maple, Bird cherry and Poplar etc.

3.10-Silvicultural System:- Aggarwal's plan adopted the Punjab Shelterwood System, while during Kapoor's draft plan, rotation was reduced from 180 years to 90 years and mechanized felling, led to the clear felling system. The artificial regeneration efforts did not match the felling with the result that an excess number of Silver Fir and Spruce trees were felled and forests damaged. Mathiban and Kothi tich forests were systematically ruined. Forest eye sores led to criticisms and forester's folly was a label attached to the foresters then. System of clear felling was shelved as it was a failure. Mr.J.C.Sharma allotted this working Circle to the Punjab Shelterwood System (para30 of Punjab Forest Leaflet No.11). Retention of healthy advance growth as future crop, while selection principle marking on broken ground, forms the main criterion. With the present ban on green felling some relief would be provided. The trend towards removing sound boles and retaining unsound, diseased trees as seed bearers must be reversed. Only salvage trees should be removed i.e moribund, dry, uprooted & diseased trees. As and when green felling ban goes, then management should conform to the Punjab Shelterwood system. Creation of large scale nurseries near planting sites must also be attended to on priority.

3.11- Rotation: - Since the forests allotted to this circle are in the course of conversion, rotation in the true sense has no meaning. A conversion period of 120 years as kept in the last plan should be continued.

3.12-Exploitable Diameter: - An exploitable diameter of 60 cm d.b.h. is fixed. The existing cop has a large preponderance of over-mature stock, which also renders the exploitable diameter only of academic interest.

3.13 - Regeneration Period: - This is kept at 30 years as it is hoped that in this period the Fir/Spruce saplings would have reached a height of 4-5 feet and would be beyond the damage by cattle. Legally too the Indian Forest Act allows a maximum closure of 30 years.

3.14 – Division into periods: - Four periodic blocks are constituted, each of 30 years, considering 120 years rotation and regeneration period of 30 years.

3.14.1 – Periodic Block I: - The PB-I was divided in to two groups in previous working plan namely group A –areas of un felled PB-I and some of the PB II areas being the best available as far as the maturity of the crop is concerned of JC Sharma's WP and Group B that include the

felled PB-I areas of JC Sharma's WP where regeneration is still progressing. Since continuous ban on green felling continued from1980 onwards and likely to extend further, therefore there is no justification to continue with two groups in PB-I.

In present working plan, forests having a preponderance of mature to over mature age classes have been allotted to this periodic block along with PB-I areas of WP under revision where regeneration has not come up . In some of the forests of this PB, sizeable openings have been created due to heavy marking under salvage lots and forest fires. The objective is to restock and rehabilitate them progressively.

PBI areas are listed below:-

(Table 7)

Range	**PB I**	
	Name of forest & comptt.	**Area in ha**
Manali	1/8 Jumari C-II	40.47
	2/1 Kangni CIa	46.36
	2/1 Kangni CIb	35.39
	2/1 Kangni CIIa	69.8
	2/1 Kangni CIIb	61.78
	2/1 Kangni CIIc	37.98
	2/7 Kanial Gahar CIIa	55.98
	2/11 Kothi Tich CIb	152.1
	2/3 Shangshill CIIa	71.00
	2/3 Shangshill CIIIa	40.88
	2/12 Mathiban CIa	40.58
	2/12 Mathiban CII	142.9
	2/12 Mathiban CIII	121.8
	2/12 Mathiban CIV	103.2
	2/2 Mirag ki Dhar CIa	92.2
	2/10 Patalsu CIVa	40.00
	2/10 Patalsu CIIIb	42.00
	2/8 Shalin Gahar CIVa	34.8
	2/8 Shalin Gahar CIVb	14.57
	2/8 Shalin Gahar CVb	31.48
	Total	**1275.27**
Naggar	1/9 Brundhar CIId	25.30
	1/11 Sajlashill CIb	25.49
	1/11 Sajlashill CIII	35.61
	2/18 Jamari Dhar CIIa	35.49
	2/19 Bhansai Dugh CI	48.56
	2/19 Bhansai Dugh CIIb	26.62
	2/20 Jamudugh CI	20.23
	2/21 Upper Sajla Shil CII	44.92

	2/23 Jangi CIIa	38.00
	2/23 Jangi CIId	28.99
	2/24 Parol CIb	34.76
	2/24 Parol CIVb	46.32
	2/25 Upper Sesni CIIb	20.00
	2/27 Padra Reas CIb	45.00
	2/27 Padra Reas CIIb	93.00
	Total	**568.29**
Patlikuhal	2/38 Hallanshill CIa	38.16
	2/38 Hallanshill CIIa	34.20
	2/38 Hallanshill CIIb	34.60
	2/37 Nagoni C-IIb	21.04
	2/40 Manjhla Ban CIa	24.98
	2/41 Peting CIb	37.06
	2/41 Peting CIIb	35.01
	2/42 Hamsushill CII	32.37
	2/42 Hamsushill CIII	28.33
	2/43 Jabhoshill CIII	26.71
	2/43 Jabhoshill CIVa	25.00
	2/43 Jabhoshill CIVa	38.13
	Total	**375.59**
Kullu	1/27 Pathanali C-II	22.26
	2/33 Mahout C-Ia	32.97
	2/33 Mahout C-Ib	41.90
	2/33 Mahout C-IVa	33.20
	2/45 Shilagahar CII	47.75
	2/45 Shilagahar CVb	31.34
	2/45 Shilagahar CVIb	62.48
	2/47 Shiladal CIIa	36.78
	2/47 Shiladal CIIb	41.32
	2/48 Upper Pathanali CII	29.94
	Total	**379.94**
Bhuthi	R/7 Jaung C-I	13.76
	R/7 Jaung C-IIb	21.94
	R/7 Jaung C-IV	34.39
	2/50 Chebang CIIb	43.76
	2/55 Shakhal C-I	40.47
	2/52 Supernal CIb	28.40
	2/52 Supernal CId	37.76
	2/56 Dali Kutla C-Ia	43.87
	2/56 Dali Kutla C-Ib	22.50
	2/56 Dali Kutla C-IIb	16.25

	2/57 Phetimel C-I	16.18
	2/58 Jamupani C-IVa	34.12
	2/58 Jamupani C-IVb	36.33
	2/58 Jamupani C-IVc	30.72
	2/59 Longthach C-II	48.56
	2/59 Longthach C-IIIb	45.20
	2/60 Hathipur C-IVa	37.15
	2/61 Marig C-IV	14.97
`	**Total**	**566.33**
Total area under PBI under FIR WC= 3165.42 ha		

Enumeration results of Fir Working Circle: The result of enumeration done in the samples selected randomly was extrapolated to whole areas in the periodic block to assess the growing stock and suggest the future yield.

(Table 8 a)

P.B. I

Total Area=3165.42ha Area enumerated= 198.3ha Enumeration %age = 6.2645%

Species	**V**	**IV**	**III**	**IIA**	**IIB**	**IA**	**IB**	**IC**	**ID**	**Total**	**Volume (in m^3)**
Deodar	3256	1979	1804	974	575	1213	575	239	463	11078	19739
Kail	17575	5491	1293	718	543	319	383	112	112	26546	13126
Rai/Fir	49421	34591	31351	28222	24758	22475	18213	13600	30233	252865	800853
B/L	19746	16904	13568	10487	7375	4262	5108	3687	6672	87811	179177
Total	**89998**	**58966**	**48016**	**40402**	**33250**	**28270**	**24279**	**17639**	**37480**	**378300**	**1012895**

(Table 8b)

P.B.II

Total Area =3723.95ha Area enumerated =199.01ha Enumeration %age= 5.344

Species	V	IV	III	IIA	IIB	IA	IB	IC	ID	Total	Volume (inm^3)
Deodar	8327	5876	6662	3031	3088	4323	2713	2657	2938	39614	98155
Kail	25318	9861	6381	6549	5277	2919	2339	1591	1029	61264	83522
Rai/Fir	56661	45003	44910	45190	54640	48839	27956	19592	29921	372712	1187432
B/L	31156	21369	12462	11920	10610	9487	9450	9337	21444	137236	405961
Total	**121462**	**82110**	**70414**	**66691**	**73614**	**65568**	**42458**	**33177**	**55332**	**610826**	**1775071**

(Table 8c)

P.B.III

Total Area =2460.01 ha Area enumerated =86 ha Enumeration %age =3.496%

Species	V	IV	III	IIA	IIB	IA	IB	IC	ID	Total	Volume (in m^3)
Deodar	5607	10040	11156	12557	4548	3690	1659	744	858	50859	88326
Kail	1831	944	1058	1201	400	658	114	0	0	6207	8252
Fir/ Spruce	17020	18450	22426	18593	22197	20710	12214	10269	20767	162646	596553
B/L	22684	31208	21082	11499	9068	7094	5092	4977	6121	118824	208694
Total	**47141**	**60642**	**55722**	**43851**	**36214**	**32152**	**19079**	**15990**	**27747**	**338537**	**901825**

(Table 8d)

P.B.IV

Total Area= 1602.6 Area enumerated = 95.68 ha Enumeration %age = 5.9703%

Species	V	IV	III	IIA	IIB	IA	IB	IC	ID	Total	Volume (in Cum)
Deodar	134	335	117	17	0	0	0	0	33	636	591
Kail	871	251	67	84	335	50	33	0	0	1692	1785
Fir/Spruce	21523	14773	13031	13467	7470	4037	3015	2177	4924	84417	166974
BL	7454	11155	10736	7253	4539	3635	3149	2412	4874	55206	124080
Total	**29982**	**26514**	**23952**	**20820**	**12344**	**7722**	**6197**	**4589**	**9832**	**141952**	**293431**

3.15:- Record of removals:- During the plan period, the moratorium on green felling continued and no green tree was felled for commercial felling. However, marking of green trees for timber distribution continued upto 2006, when Hon'ble High Court imposed ban on any type of extraction till finalization of new TD policy. The new TD policy was notified by the govt. in 2010. Salvage removals, however, continued throughout the plan period, except for a short stint in 2006. The detail of removals during plan period is as under:

Details of removals during previous Working plan period
(Table 9)

TYPE OF REMOVAL	SPECIES	P.B.				TOTAL
		I	II	III	IV	
THROUGH T.D./ FREE GRANT	**DEODAR**	349.3	113.8	197.6	0	**660.7**
	KAIL	102.3	15.6	111.1	116.36	**345.36**
	FIR/SPRUCE	1617.51	1503.64	2336.41	507.74	**5965.3**
SALVAGE REMOVALS	**DEODAR**	30.1	135.2	216.3	0	**381.6**
	KAIL	436.4	162.4	247.5	0	**846.3**
	FIR/SPRUCE	9597.51	19271.46	36348.51	1652.82	**66870.3**
	B/L	4929.88	2948.62	3713.56	60.4	**11652.46**
	TAXUS	-	6.2	-	-	**6.2**
G. TOTAL	**DEODAR**	**379.4**	**249.00**	**413.90**	**0**	**1042.30**
	KAIL	**538.7**	**178.00**	**358.60**	**116.36**	**1191.66**
	FIR/SPRUCE	**11215.02**	**20775.10**	**38684.92**	**2160.56**	**72835.60**
	B/L	**4929.88**	**2948.62**	**3713.56**	**60.4**	**11652.46**

	TAXUS	**-**	**6.2**	**-**	**-**	**6.2**

3.16- Calculation of Yield:- Considering the excess removals during the plan under revision , there is little scope for getting sufficient yield during the current plan . Further the ban on green felling also, restricts us from any fellings. Calculations of yield are thus theoretical. Further, it is observed that afforestation does not match the removals. This goes against the principle of sustained yield matched with planned afforestation. This too is a pointer that felling is to be seriously curtailed. Quite a lot of trees are available every year under salvage i.e uprooted, dry, half broken etc. This again leaves us with not much scope for felling.

3.16.1- Yield from PBI: - Sample enumerations down to 10cm d.b.h, in 10cm diameter classes have been carried out in all the PBI areas and result extrapolated in whole area. Let VI be the volume of growing stock of Ist class trees and V2 be the volume of IInd class trees, V3 be the volume of both IIIrd class and IVth class trees. Let CI, C2 and C3 be constants representing percentage of Ist, IInd, and IIIrd/IVth class trees respectively, available for felling during the plan period. Values of C1, C2 and C3 are kept the same as in the previous plan i.e 0.4, 0.2 and 0.2. This tally with the field conditions. Theoretically, we need to consider all trees above 40cm d.b.h leaving aside mother trees, as growing stock available for felling. However, as prescribed in the Punjab Shelter-Wood system we need to retain all compact groups of poles as future crop. We must further ensure no marking is done on broken and precipitous ground, where at the most selection principles are to be adhered to, retain some Ist and IInd trees as emergency reserve and also plan for fire insurance. Trees standing on blanks or in such patches where regeneration has not established are also not to be considered.

Calculations:

Deodar: Total volume of IVth and IIIrd class trees =2596
Total volume of IInd class trees =3574
Total volume of Ist class trees=13244
Kail: Total volume of IVth and IIIrd class trees =3489
Total volume of IInd class trees =2993
Total volume of Ist class trees=4886
Fir/Spruce: Total volume of IVth and IIIrd class trees =31491
Total volume of IInd class trees =124975
Total volume of Ist class trees=641422
B/L Total volume of IVth and IIIrd class trees =12879
Total volume of IInd class trees =34168
Total volume of Ist class trees=128180
VI= 641422
V2=124975
V3=31491

Annual yield (AY) = (VI*CI+V2*C2+V3*C3)/P, where P the plan period is 15 years.
AY= (641422*0.4+124975*0.2+31491*0.2)/15
AY= 19190.8 cum or say 19000 cum

3.16.2-Yield from PBIV: Sample enumerations down to 10cm d.b.h, in 10cm diameter classes have been carried out in all the PBIV areas and result extrapolated in whole area.

Deodar: Total volume of IVth and IIIrd class trees =251
Total volume of IInd class trees =32
Total volume of Ist class trees=295
Kail: Total volume of IVth and IIIrd class trees =167
Total volume of IInd class trees =1164
Total volume of Ist class trees=367
Fir/Spruce: Total volume of IVth and IIIrd class trees =13145
Total volume of IInd class trees =46126
Total volume of Ist class trees=106412
B/L Total volume of IVth and IIIrd class trees =9747
Total volume of IInd class trees =22227
Total volume of Ist class trees=90616

Around 75% trees can be taken in the Ist and IInd class while 25% trees are attributed to IVth and IIIrd class. Thus VI the volume of Ist and IInd class trees of Spruce and Silver Fir is (0.75*[106412+46126])=152538*0.75=114403.5 cum while V2 the volume of IIIrd and IVth class trees is = 0.25*13145=3286.25 cum. Looking to field conditions we see that CI to be 0.50 and C2 as 0.1. Thus with P being 15years, the annual yield AY is-
AY=(114403.5*0.5+ 3286.25*0.1)/15=4032.53 cum or say 4000 cum.
Again, though theoretically all trees above 40 cm d.b.h. diameter must be felled if the regeneration has established. In fact, silvicultural criterion would not let this be possible. Trees alongside nalas, precipitous slopes, broken ground, standing on the periphery of blanks are not to be felled. Further IInd class trees which stand amongst compact pole crop are not to be felled. This is why we have earlier assumed, that not more than 50% of the volume of Ist and IInd class trees, are available for felling during the period of the plan and further only 10% of the IVth and IIIrd class trees shall be available under thinning.

3.16.3 – Total Final Yield: Total final yield is calculated only from PBI and PBIV and that too only for Silver Fir and Spruce.

(Table 10)

Species	**PBI**	**PBIV**	**Total**
Fir/Spruce	**19000**	**4000**	**23000 cum**

We have ignored both Deodar and Kail, as they are in negligible quantity in this working circle. Yield of Deodar and Kail if obtained on account of silvicultural markings, shall count towards the yield of Spruce and Silver Fir.

3.16.4 – Yield from PBII & PBIII: No yield is prescribed in these PBs as a safeguard to build-up growing stock.

3.16.5 – Control of Yield: All removals down to 10 cms d.b.h. shall account towards yield. Deviation at the end of 5 years and at the end of plan period shall not exceed 10% of the annual yield. Commercial fellings must be backed by adequate artificial afforestation with healthy plantation stock. Regeneration survey & assessment is a must.

3.17 – Felling Progamme: No felling program has been suggested as there is complete ban on green felling. In case the ban on felling is lifted, DFO will make felling program and get the same approved.

3.18 – Method of executing fellings

3.18.1 Method of Executing fellings in PBI: - Technique of carrying out regeneration fellings is laid out in the Punjab Forest Leaflet number 2. Principles to be followed out are as follows –

1. Seed bearers of class I and II, should be mature, healthy, well developed, tall trees with clean boles.
2. The mother trees should be uniformly spaced. 30-35 trees should be there per hectare in case of Spruce and 40-45 trees in case of Silver Fir. For Deodar and Kail occurring on warmer slopes and in the lower belts, openings shall be created to an extent suitable for these species.
3. Retain seed bearers on ridges and spurs in order to have better dispersal of seed.
4. As defined by the Punjab Shelter wood system, all healthy advanced growth up to 40 cm d.b.h. covering not less than 0.1 hectares area shall be retained, as part of future crop. No seed bearers will be retained in patches of advance retained as part of the future crop.
5. Selection markings are required on steep and precipitous slopes.
6. Broad-leaved trees must be retained in the moist nalas and depressions. A little lopping would be warranted where overhead shade created, causes younger regeneration to be suppressed.

3.18.2 – Method of executing fellings in PBIV: - In this periodic block we are concerned with removal of over-wood which suppress and stand over the young crop. The felling would correspond to final felling. Attempt should never be to obtain or induce regeneration. Markings should aim at freeing the established regeneration, through removal of the over-wood. Marking of all those solitary trees which are likely to turn into wolf trees is required. Thinning in groups of poles and patches of advance growth are required to be carried out. Those trees which are marked and are likely to damage young crop need to be lopped before they are felled. On the pretext of improvement fellings, broadleaved trees are never to be marked unnecessarily. Some lopping may have to be done where the broadleaved trees suppress the young crop.

3.18.3 – Treatment to PBIII: - Only sanitary fellings consisting of the removal of dead and uprooted trees must be done, with all such removals counting as yield of the working circle. No commercial fellings are recommended. There is under-stocking in this block and younger age classes are deficient. The mature and over-mature trees cannot be removed as this would cause

permanent openings and invasion by thick weeds and obnoxious weeds. Forests of this periodic block are generally under stocked. Thinning of any sort are not to be done.

3.18.4 – Treatment of PBII: - No major fellings are prescribed during the plan period. Only dead, up-rooted and dry trees are to be removed in salvage marking, which would count towards total yield of the working circle.

3.19-Fire Protection: Adequate measures should be taken to ensure that fire lines, inspection paths and bridle paths are maintained. Ground forest floor must be kept clean of debris, unwanted bushes, inflammable material etc. Fire watchers must patrol intensively during dry season.

3.20-Subsidiary silvicultural operations in PBI: Green felling is at present banned in the state. However as and when fellings are done, in PBI as per prescription, the subsidiary silvicultural operations are to be carried out immediately after felling.

- As per Punjab Forest Leaflet number 6 prescription, fellings refuse is to be disposed off. Felling debris removal is urgently required.
- To foster growth of young regeneration, remove inferior species which interfere with their healthy growth .Weeding and bush cutting is urgently required. Remove those trees that are damaged and those marked trees which continue to remain unfelled. Lop those broad-leaved trees which interfere with the growth of younger conifer crop.
- Cleaning operation and also climber cutting be done to foster regeneration.
- Shrub cutting be done to provide a clean seed bed.
- Effective barbed wire closure is to be done to check grazing.
- Control burning for fostering healthy growth.
- Mechanical thinning.

3.21-Planting programme and Artificial regeneration: Forests under this working circle are quite denuded. Natural regeneration has by and large failed and an extensive artificial regeneration, programme has to be drawn up. The technique of raising nurseries and artificial regeneration features in detail in Chief Conservator of Forest Technical order number 3 and 4 of Punjab Forest Manual Volume III. Instructions contained in Chief Conservator of Himachal Pradesh letter number 401/PA (M) dated 8/3/1973 in respect of different operations to be carried out for raising a successful plantation may also be carefully studied. Silviculturally, we must realize that both Silver Fir and Spruce are very different species. Spruce requires almost as much light as Deodar, while Silver Fir requires fairly heavy shade for regeneration. Fir has been failing to regenerate because of thick layer humus, dense weed growth, uncontrolled grazing, debris accumulation, bad drainage and infrequency of good seed year. Raw humus dries up during summer months, before the roots of the seedlings are able to reach the mineral soil for moisture. Dense root growth offers root competition and also suppresses the seedlings. Heavy grazing adversely affects regeneration, as the seedlings are killed by trampling. Spruce grows in the lower parts while Silver Fir occupies the upper portions. Silver Fir prefers cooler, moist and shady locations while Spruce occupies raised grounds and exposed spurs. Thus the practice of

raising merely Silver Fir nurseries and planting the species, in sites which prefer Spruce, is not proper silviculture. We must appreciate the fact that Spruce seeds nearly every year in contrast to Silver Fir which seeds after 4-5 years. Raising spruce nurseries thus, would be advantageous. One and a half years plant of Spruce reach a height of 25 cms to 30 cms. Higher growth is there if the plants are raised in P/bags filled with mixed and manured soil from Fir zone. An increase is registered in the success percentage, if Spruce is raised in P/bags. This proposition is better than raising Silver Fir which taken 4 ½ years to propagate. Exorbitant weeding cost would also reduce. We would also reduce maintenance in beating up, bush cuttings etc. Broad leaved planting with *Juglans regia*, *Acer caesium, Prunus padus* and *Fraxinus spp.*, along with Spruce and Silver Fir planting, is helpful.

Experimental work (as per working plan in revision) has shown the following results with reference to Silver Fir-

1) Weeding helps establishment of Silver Fir and improves height growth.
2) To induce and establish natural regeneration, the canopy should not be opened wider than 11m x11. Where wider gaps are made, weeding should not be done to provide shade to young seedlings.
3) Removal of raw humus helps natural regeneration.
4) Introduction of poplars and other broad-leaved species with Silver Fir helps reduce raw humus and induces natural regeneration of Silver Fir and Spruce.
5) Clear-felling in strips is not proper; shelter wood system helps natural

regeneration. Silver Fir and Spruce seed ripen in September and October. During seed collection, it must be ensured that the trees from which the seed is collected are middle-aged, healthy, clear boled trees which also have a well-developed crown. Seeds of Silver Fir must not be collected from higher elevations because of free hybridization between *Abies pindrow* and *Abies spectabilis*. Such a seed source gives poor seedling growth in the nursery. Cones are collected during first fortnight of October, before their opening on the trees. Dry in the sun and also clear the seed of scales, wings and twigs. Storage in air tight containers, in a dry and cool place, must be done to ensure maximum viability. Nurseries must lie in the natural zone of Fir/Spruce, preferably towards the lower limit of the natural zone of the species. Exposed ridges, frost holes, natural blanks, badly drained pockets, steep slopes and southern slopes should be avoided. Choose areas having a moderate slope and near a water source. The soil should be deep, fertile, well drained and loamy. One pricking at the age of 1 ½ years has been found to be the best, both for optimum development of fibrous roots and proper height growth. There is no point in going for a second pricking at the age of 2 ½ years . It only retards height growth, with no extra advantage to the root system. Conditioning of plants, by cutting tap root is necessary for producing healthy plants with well-developed fibrous roots. Damping off be avoided, through soil fumigation with Formalin, before sowing. Mycorrhizal association is necessary for healthy seedling . Sowing in beds is done in raised beds of 2m*1msize. Sowing is done in lines 8cms apart. Shading of germination beds is necessary as also proper weeding. Transplanting and grading is also required to be done systematically. For

Silver Fir around 16500 seeds are available per kg while germination% is 30-40.Preferably, sowing should be done early in December, otherwise on the melting of snow. For Spruce we get on an average 60000 seeds per kg, germination% is 50-70 while sowing in the nursery is done in December or after snow fall has melted. A nursery area of about 100m2(5m2 for germination beds+95m2 transplant beds) will be needed to produce 1000 plantable plants annually. During planting it must be ensured that the Silver Fir/spruce plants have a size>25-30 cms. Hoe planting is also cheap and successful. Here spacing is kept 2m*2m. Normally pit size be 30cm3 and plant to plant distance kept as 2.5cms*2.5cms. Only in rocky areas, pits could be of size be 45cm3. Monsoon planting is done in July-mid August. In moist locations and depressions, broad-leaved species i.e Ash, Walnut, Maple, Bird cherry, etc may be tried. For broad-leaved species planting, winter months are proper. Size of the broad-leaved species should be 45 cum -60cms, attainable after 1 ½ to 2 ½ years. Beating up should be done systematically. Failures are beaten up in July of the year following the year of planting.

The failure of natural regeneration in Kullu tract is attributed to –

-Felled areas could not be regeneration in the previous working plan period.
-Heavy expenditure required for weeding, bush cutting and removal of humus.
-Non –availability of funds.
-Cold desiccating winds.
-Limited growing season.
-Heavy grazing due to migratory/local graziers.
-Poor seed year at an interval of 4-5 years.
-Lack of sincerity to take up such planting with healthy seedlings.
-Lack of effective closure and poor protection.

Vast areas have been felled in the past without ensuring restocking.

3.21.1-Areas felled under concentrated regeneration felling under the Fir Working Circle in Kullu Division during sixties to early eighties are as follows:-

(Table 11)

S.NO.	FOREST	COMPARTMENT	AREA (ha)
1	2/11 Kothi tich	C-I	364.22
2	2/12 Mathiban	C-I	67.58
3	2/12 Mathiban	C-II	142.85
4	2/12 Mathiban	C-III	121.81
5	2/12 Mathiban	C-IV	103.19
6	2/1 Kangni	C-I	81.75
7	2/1 Kangni	C-IIIb	43.56
8	2/1 Kangni	C-IIIc	74.60
9	2/1 Kangni	C-IIId	36.20
10	2/27 Padra Reas	C-I	82.96
11	2/32 Mathikochar	C-IV	70.41
12	2/32 Mathikochar	C-Vc	18.50
13	2/32 Mathikochar	C-VIa	22.61
14	2/32 Mathikochar	C-VIb	30.00

15	2/33 Mahout	C-I	77.97
TOTAL			1338.21

3.21.2- Statement of area requiring immediate attention

(Table 12)

Forest &comptt.	Area	Species reqd.	Cultural Operations	Remarks
Manali Range				
1/8 Jumari CI	38.04	Fir/Spruce	-	-
1/8 Jumari CIII	24.90	Fir	-	-
2/1Kangni CIa	46.36	Fir/Spruce with Acer, Walnut Poplar in moist location	-	-
2/1Kangni CIb	35.39	-do-	-	-
2/1Kangni CIIIb	43.56	-do-	-	-
2/1Kangni CIIIc	74.60	-do-	-	-
2/1Kangni CIIId	36.20	-do-	-	-
2/3 Sanagshil CIa	38.94	-do-	-	-
2/3 Sanagshil CIb	33.90	-do-		
2/4 Sanchalshil CI	45.32	-do-	-	-
2/7 Kanialgahar CI	44.51	-do-	-	-
2/8 Shalingahar CIVa	34.80	-do-	-	-
2/8 Shalingahar CIVb	14.57	-do-	-	-
2/10 Patalsu CIIa	53.55	-do-	-	-
2/10 Patalsu CIIb	46.00	-do-	-	-
2/10 Patalsu CIVc	40.01	-do-	-	-
2/11 Kothi tich CIb	152.10	Fir with Acer	Weeding	-
2/12 Mathiban CIa	40.58	Sir/Spruce with Acer & Walnut in moist location	-	-
2/12 Mathiban CII	142.85	-do-	Bush cuttings	-
2/12 Mathiban CIII	121.81	-do-	-	-
2/12 Mathiban CIV	103.19	-do-	-	-
Naggar Range				
1/9Brundhar CIIc	26.90	As above	Weeding	-
1/9Brundhar CIId	25.30	-do-	-	-
1/9Brundhar CIV	29.95	-do-	-	-
1/11 Sajlashil CIb	25.49	-do-	-	-

1/11 Sajlashil CIIa	17.92	-do-	-	-
1/11 Sajlashil CIII	35.61	-do-	-	-
2/18 Jumaridhar CIa	38.00	Deo/Kail Spruce	Bush cutting	-
2/19 Bansaida dugh CI	48.56	Fir Spruce with B/L	-	-
2/20 Jamudugh CI	20.23	-do-	-	-
2/21 Upper Sajlashil CI	46.94	-do-	-	-
2/22 Upper Shetadugh CI	48.56	-do-	-	-
2/23 Jangi CIIa	38.00	-do-	-	Bush cutting
2/23 Jangi CIIb	25.60	-do-	-	-
2/23 Jangi CIIc	30.84	-do-	-	-
2/23 Jangi CIId	28.99	-do-	-	-
2/26 Morhan CIIa	25.42	-do-	-	-
2/27 Padra reas CIa	37.96	-do-	-	Weeding
2/27 Padra reas CIIa	25.98	-do-	-	-
2/27 Padra reas CIIb	93.00	-do-	-	-
2/35 Khorudugh CIa	22.32	Fir, Spruce with B/L species walnut in moist location	-	-
2/37 Nagoni CIa	54.75	-do-	-	-
2/37 Nagoni CIb	10.00	-do-	-	-
2/38 Hallanshil CIIa	34.20	-do-	-	-
2/38 Hallanshil CIIb	34.60	-do-	-	-
2/38 Hallanshil CIIIa	32.98	-do-	-	-
2/38 Hallanshil CIIIb	52.00	-do-	-	-
2/40 Manjalaban CIa	24.96	-do-	-	-
2/41 Peting CIb	37.06	-do-	-	-
2/41 Peting CIIb	35.01	-do-	-	-
2/42 Hamsushil CII	32.37	-do-	-	-
2/42 Hamsushil CIII	28.33	-do-	-	-
2/43 Jobhoshill CIII	26.71	-do-	-	-
2/43 Jobhoshill CIVa	25.00	-do-	-	-
2/43 Jobhoshill CIVb	38.13	-do-	-	-
1/27 Upper pathanali	22.26	Fir/spruce	-	-

CII				
2/33 Mahut CIa	32.97	-do-	-	Weeding
2/33 Mahut CIb	41.90	-do-	-	-do-
2/33 Mahut CIVa	33.20	-do-	-	-do-
2/45 Shillagahar CVb	31.34	-do-	-	-
2/45 Shillagahar CVIa	55.69	-do-	-	Weeding
2/45 Shillagahar CVIb	62.48	-do-	-	-
2/47 Shiladal CIIa	36.78	-do-	-	-
2/47 Shiladal CIIb	41.32	-do-	-	-
2/48 Upper Pathanli CI	28.73	-do-	-	-
R/7 Jong CIIb	21.94	Fir/spruce	-	-
R/7 Jong CIV	34.39	-do-	-	-
2/55 Shakhal CI	40.47	Fir/spruce along-with *Acer* with walnut in moist locations	-	-
2/56 Dalikutla CIa	43.89	-do-	-	-
2/56 Dalikutla CIb	22.50	-do-	-	-
2/57 Phetimel CI	16.18	-do-	-	Weeding
2/57 Phetimel CII	17.40	-do-	-	-
2/58 Jammupani CIVa	34.12	-do-	-	-
2/58 Jammupani CIVb	36.33	-do-	-	-
2/58 Jammupani CIVc	30.72	-do-	-	-
2/59 Longthach CIa	58.64	-do-	-	-
2/59 Longthach CIb	31.52	-do-	-	-
2/59 Longthach CIIIb	45.20	-do-	-	-
2/60 Hathipur CI	27.11	-do-	-	-
2/60 Hathipur CII	24.63	-do-	-	-

3.22-Miscellaneous regulations:

1) Closure- Regeneration areas are required to be fenced and closed to grazing. Forests that lie en-route to Gaddis and Gujjars paths to their pastures need special care. Endeavour must be to foster goodwill and effective co-operation so that this enterprise is successful.

2) Weeding- For healthy growth, weeding and cleaning is a must. In Kothi Tich and Mathiban forests, Indigo is suppressing the Fir and spruce saplings and needs to be cleaned through removal. Growing season of Silver Fir is limited to the months of April, May and June when the plants must be kept free of weeds.

3) Right holder requirements: - Except for some marking in PBIII , there is not must of scope for marking to right holders. Dead, dying and uprooted trees should be used to fulfill urgent demand of right holders for genuine domestic and agricultural use.

4) Fire protection: - Precautionary measures should be taken to protect these forests from fire.

5) Regeneration Survey: - Standing instructions on the subject are to be followed. In case of natural calamity where a large number of trees are damaged/ uprooted etc, the area in question has to be brought in as a PBI area and an equivalent area from PBI, should be transferred to other PBs.

Chapter IV

Protection Working Circle

4.1 General Constitution of the Working Circle:-

Inaccessible areas mostly due to their being in rocky, steep and precipitous terrain and such forest that need to be protected for their aesthetic beauty or their important religious value (Forests in the vicinity of Manali town & near Bijli Mahadev, etc.) constitute this working circle. The Protection Working Circle forests are of prime importance. Many of them lie at the head of the valleys and streams and stretch far beyond the tree growth limit. They are thus important from soil and water conservation point of view. Forests that were in moderately sloped areas and where forest working was possible were transferred to various working circles, by Sh. J.C. Sharma, in his working plan.

4.1.1:- The changes in this working circle are elaborated below:

Details of forest transferred to Wild Life Division Kullu are as follows-

(Table 1)

Name of Range	Forest	Comptt.	Area	Remarks
Manali	R/1 Dhungri	C-I	7.69 hectares	Transferred to Wild Life Division for management vide Letter no. Ft. 385-42/79(E.I)
	R/1 Dhungri	C-II	4.85 hectares	
	R/2 Manalgan	Whole	22.26 hectares	
	R/3 Danabihal	Whole	10.93 hectares	
	R/4 Sial Bihal	Whole	24.68 hectares	
	2/5 Bungduari	C-I	180.08 hectares	
	2/5 Bungduari	C-III	100.36 hectares	
	2/5 Bungduari	C-IV	45.32 hectares	
	2/5 Bungduari	C-V	873.72 hectares	
	2/6 Manglgahr	C-IVc	1198.27 hectares	
Kullu	2/32 Matikochar	C-VIII	637.38 hectares	Part of Kais Wild Life Sanctuary

4.1.2:- Statement showing Area transferred from and received by Protection Working Circle:-

(Table 2)

			Area transferred to/from Protection WC				
Division	**Range**	**Area of circle AS PER PREVIOUS WP**	**D&K WC**	**FWC**	**Imp. WC**	**Net +/-**	**Area of circle (ha)**
Kullu	Manali	9334.49 ha	-181.29	+445.15	+36	+299.86	9634.35
	Naggar	5750.11 ha	-	-275.64	-	-275.64	5474.47
	Patlikuhl	6591.51 ha	-	+64.75	+788.58	+853.33	7444.84

	Kullu	1685.91 ha	-	-	-	-	1685.91
	Bhuthi	2896.01 ha	-	-	-	-	2896.01
	Total	26258.03 ha				+877.55	27135.58

4.2:- GENERAL CHARACTER OF THE VEGETATION: - We must appreciate that the scattered distribution of the forests of the working circle, throughout the tract, makes it possible for every type of vegetation typical to the Division, being found here. The forest types have been elaborated in Chapter 2 of part 1 of the Working Plan. The forest types found are-: 12/C-Ie (Himalayan Moist Temperate Deodar forests), 12/C-Id (Himalayan Moist Temperate Western Mixed Coniferous forests), 12/C-IIa (Kharshu Oak forests), 12/C-IIb (Western Himalayan Upper Oak forests), 12/D.S.2(Himalayan Temperate part lands), 12/DS3 (Himalayan Temperate Pasture), 12/SI(*Alnus nitida* forests), 14/C-Ia (Western Himalayan Sub Alpine Fir forests), 14/C-Ib (Western Himalayan Sub-Alpine Birch/Fir forests), 14/D.S.I(Sub Alpine Pasture), 15/E-I(Dwarf Rhododendron Scrub), 15/E.2(Dwarf Juniper Scrub), 15/C.3(Alpine Pastures).

4.3:- Special Objects of Management: - The special objects of management are-

1. Protection of inaccessible areas which are repository of snow and water resources by ensuring least disturbances.
2. Protection of hill slopes from denudation and erosion by preserving the forest cover and taking effective soil conservation measures where ever necessary.
3. To protect and preserve valuable forest wealth from indiscriminate fellings and lopping especially near the villages.
4. Consistent with the principles of sound silviculture, to meet the demand of right holders for timber, fuel wood and also fodder/grazing of local and migratory graziers.
5. To preserve the environment around tourist centers and religious places so as to maintain pristine beauty and landscape so that area continue to be most sought for tourist destination in the state.

4.4:- Blocks and Compartments: - No changes have been incorporated. The blocks and compartments remain the same as in the previous working plan.

4.5:- Area statement: - The total area of the working circle is 26455.63 hectares. Range wise details for protection Working Circle are given as under-

(Table 3)

Range	**RF**	**DPF Ist**	**DPF IInd**	**Total**
Manali	-	331.48	9302.92	9634.4
Naggar	-	-	5474.45	5474.45
Patlikuhal	-	-	6704.18	6704.18
Kullu	-	50.59	1696.02	1746.61
Bhuthi	-	-	2895.99	2895.99
G.Total	-	382.07	26073.56	26455.63

4.6:- Felling Series: - No felling series is constituted.

4.7:- Enumeration: - Complete enumeration has been done in the sample areas selected randomly and result extrapolated to the entire area of the working circle. On the basis of the extrapolated enumeration results, total number of trees and volume works out as under-

(Table 4)

Species	Number of trees	Volume in m^3
Deodar	71481	170189.7292
Kail	9116	12479.71672
Fir/ Spruce	545348	1981478.479
Taxus	47173	-
B/L	735284	1455935.96
Total	1408401	3620084

4.8:-Analysis and valuation of the crop:- The objective of management of these forests lie in their watershed values resulting in prevention of soil erosion and denudation of hill slopes, as also for maintaining the aesthetic and scenic beauty of the valley to develop tourism. Inaccessibility of most of the DPFs and RFs makes their landscape value most important. Forest working gives way to conservation and is as such limited, in this working circle. These forests are particularly important to maintain equable flow of water in the rivers and streams and need urgent total protection; so that mountain faces do not start eroding and flood havoc is not observed. Excess erosion would silt up our reservoirs, reduce dam life, cause breakage of embankments, and ruin our roads and bridges and over-run habitations causing havoc all around. Except of aesthetic forests, most of the protection forests have a stock which is uneven-aged, and scattered, in between rocks and precipices. The stock maps prepared by Mr. Jones from aerial survey photographs are relevant.

4.9:-Method of Treatment: - The forests under this working circle shall be strictly protected and preserved. No felling, except salvage markings are to be done. We must appreciate that the chief value of these forests lie in prevention of erosion and denudation of hill slopes, maintenance of equable flow of water in streams and rivers and preservation of aesthetic appeal and scenic beauty of tourist Places. These forests need to be strictly protected and preserved. No commercial felling is to be done. For remote areas there would not be much of demand as the habitations lie far of. Inaccessibility makes timber and fuel extraction both difficult and uneconomic. In such forests, dry, dying and moribund trees can be marked only in case of salvage removals. However for the DPFs and RFs, which lie near habitation and which are protected for aesthetic and religious reasons i.e. forests in and around Manali town, 1/32C-III Kandi forests, because it lies adjoining Bijli Mahadev temple and 2/24 Parol C-III above Naggar, a delicate and fragile strata which must be protected from the point of view of soil conservation, no felling of any sort must be done.

4.10:- Grazing: - The grazing rights as given in the settlement cannot be interfered with. However the territorial DFOs must take effective steps to forbid the grazing in sensitively erodible areas. Such vulnerable places need to be given rest and a time to heal. Areas under regeneration also require special care.

4.11:- Fire protection:- Incendiary forests fires are very common as such proper maintenance of firelines, inspection paths, bridle paths etc are a must . Wherever necessary, during dry season, fire watchers are to be employed. The forests floor must be kept clean of inflammable material such as debris, unwanted bushes and weeds and grasses. Needles are a fire hazard and must not litter fire lines, inspection paths etc.

4.12:- Miscellaneous regulations:- Miscellaneous regulations such as grazing, grass cutting and marking of trees must be followed as prescribed in the settlement or as elaborated before. The nalas, moist locations etc need to be planted up with broad-leaved species. *Acer caesium, Juglans regia, Prunus padus, Celtis australis, Corylus colurna, Quercus semecarpifolia, Betula utilis,* etc are good for these regions. Fir and Spruce plantations need to be given special attention and good nursery stock must be raised and planted. Nursery of spruce should also be started. This aspect is not getting due attention.

4.12.1:- Closure: - Regeneration areas are required to be fenced and closed to grazing. Forests that lie en-route to gaddi and gujjar paths to their pastures need special care. Endeavour must be to foster goodwill and effective co-operation so that this enterprise is successful.

4.12.2:- Weeding: - For healthy growth, weeding and cleaning is a must. In Kothi Tich and Mathiban forests, *Indigofera spp*. and *Strobilanthes spp.* are suppressing the Fir and Spruce saplings and needs to be cleaned through removal.

4.12.3:- Right holder requirements:- There is not much of scope for marking to right holders. However with change in TD policy, marking of dead, dying and uprooted trees should be done to fulfill urgent demand of right holders for genuine domestic and agricultural use.

4.12.4:- Regeneration: - Standing instructions on the subject are to be followed . All these areas are lacking regeneration and thus sincere and earnest efforts need to be done. Special schemes should be made for ensuring regeneration of these inaccessible areas. In case of natural calamity where a large number of trees are damaged/uprooted etc., the area in question has to be immediately closed and planted up with suitable species.

CHAPTER-V

WORKING PLAN FOR BROAD LEAVED (OVER-LAPPING) WORKING CIRCLE

5.1 General constitution: -

Broad leaved species plays a very important role in the Himalayan region where mainly conifers are predominant. These trees meet the requirement of fuel wood, fodder, fruits and ayurvedic medicine. Broad leaves are gaining quite a lot of prominence as raw material, for various wood based industries. Maple has gained prominence in the manufacture of bobbins and shuttles for the textile industry. Walnut, Bird cherry and Maple also find use in the manufacture of rifle half wrought. *Juglans regia* is an excellent s species for furniture. Broad-leaved species help to neutralize the acidic soils below coniferous forests and also act as an important source of fodder and fuel to local populace. Broad-leaved species are mostly found scattered, as also in groups in the Deodar, Kail and fir forests. The broad leaves mostly grow in nala or damper places in Deodar & Kail WC and Fir WC and work as shelter belt/ wind break and help in protection against spread of forest fires. This working circle has been constituted as an over – lapping working circle so that prominence is given to the broad-leaved patches of significance. This being an overlapping WC, therefore the forests allotted to this working circle in previous working plan are allotted to different WC as under

5.1.1 -Range wise detail of forests transferred to other working circles:-

Name of Range	Forest	Compartment	Area (ha)	Transferred to	Total area (ha)
Manali	2/9 Gumeri	C-Ib	35	Fir W.C.	35
Manali	2/9 Gumeri	C-IIIb	36	Protection W.C.	36
Patlikuhl	2/43 Chobhoshil	C-Va	18	Protection W.C.	18
Patlikuhl	2/43 Chobhoshil	C-Vb	30	Protection W.C.	30
Total			**119**		**119**

5.2 General Character of Vegetation:- The forests, included conform to Champion and Seth's following classification -12 /CIe (Moist temperate deciduous forests),12/CIa(Ban Oak forests), 12/C-2a (Kharshu Oak forests) and 14/C-Ib(Western Himalayan Sub- Alpine Birch-Fir forests). Moist and cool locations, nala strips, banks of streams and rivers have *Juglans regia, Acer caesium, Prunus padus, Aesculus indica, Cornus spp, Rhus punjabensis, Carpinus spp., Alnus nitida, Ulmus wallichiana*, etc. Upper reaches have Kharshu Oak which occurs pure and also mixed with Silver Fir. *Betula spp* is found in the top belt of IInd class forests i.e Solang & Rohtang valley of Manali Range. The crop in the broad-leaved forests is generally uneven aged and the natural regeneration is quite poor. Excess biotic pressure is the reason. A preponderance of over mature stock is found with respect to *Aesculus indica.*

5.3 Special Objects of Management: - The objects of management are-

- To protect, conserve and enhance the proportion of broad leaved forests so as to ensure increase watershed value of Himalayan region.
- To protect and conserve Oaks, Birches and other valuable broad-leaved forests by improving their stocking and by bringing them under systematic and scientific management.
- To rehabilitate the banks of river Beas and its tributaries (*Bihals*) by planting Kosh & Poplar for enhancing aesthetic beauty on one hand and for meeting demand of fuelwood particularly for cremation purpose.
- To ensure that right holders get fuel wood and fodder, on sustainable basis, in perpetuity from these broad-leaved stands.

5.4 Analysis and valuation of the crop: - On the stock maps prepared for the respective working circles, the areas under broad-leaved species have been indicated. Details of broad-leaved species in each WC are as under:-

Name of WC	Area	B/L trees		B/L trees per ha	
		No.	Vol.(in m^3)	No.	Vol. (in m^3)
Deodar & Kail	2587.91	9182	14919.05	3.54	5.76
Fir WC	10951.98	399077	917912	36.43	83.81
Protection	26455.63	735284	1455935.96	27.79	55.03
Grazing & Improvement	1038.84	1157	1119.114	1.11	1.08

From the table it can be concluded that the proportion of Broad leaved species is lesser in the Grazing & Improvement compared to the rest of the working circles. This might be because of the reason that all the new DPF's are included in this working circle and most of them are highly degraded and became barren. These areas need special attention as far as broad leaves introduction in plantation is concerned. Further being NDPF areas which are very close to habitation, increase in proportion of broad leaved species of varied utilities is a must.

5.5 Silvicutural system: - Since no yield is prescribed, no silvicultural system is needed. Artificial regeneration of various valuable species must be done in moist areas and also in nalas/ depressions.

5.6 Choice of Species: - Oaks and Birch forests shall be restocked with these species in their respective areas. Valuable broad-leaved species i.e. Walnut, Maple, Bird cherry, *Carpinus spp*. Horse Chestnut, *Salix*, Ash, *Corylus colurna spp.* etc will be encouraged in the mixed forests in depressions, nalas and other natural habitats. Where ever possible introduction of fruit bearing plants and medicinal plants should be encouraged in plantation program.

5.7 Treatment of area, artificial regeneration and nursery technique:- Artificial regeneration along with effective protection is required to fill up the gaps. Large chunk of areas

are available in the IIIrd class forests, where valuable Oaks can be grown. Nursery raised 1-2 year old plants should be planted. Natural regeneration is scarce due to excess biotic pressure. Weeding must be carried out in regenerated areas to keep the seedlings and coppice shoots free, till they can get established. Artificially regenerated areas must be closed until the area is regenerated. The areas of concern in lower zone are IIIrd class forests and banks of river Beas and its tributaries (*Bihals*). There is very heavy biotic pressure on these lands and their rehabilitation and management need to be properly planned and executed. The Joint participatory Forest Management is a key to success. Active involvement of community based organizations like Gram Panchayats, Mahila Mandals, Youth clubs, eco clubs in schools etc shall be a great help and must be involved in plantation programs Indiscriminate lopping is doing maximum damage and must be checked vigorously. Climbers and bush cutting must be done. Adequate fire protection must be ensured. Indiscriminate lopping of Ban Oak must be checked severely.

5.8 Nurseries: It is axiomatic that the degree of survival of plantations is directly linked to the quality of nursery stock raised in nurseries. More so, when we are faced with increasing swings in seasonal fluctuations, both in terms of erratic rainfall and rising temperatures. These recent changes in weather patterns exacerbate our historical woes of compacted soil, damage by fire and cattle and general lack of interest (and therefore concern) of local communities in our plantations. Vastly improved nursery stock can in a major way address most of these impediments coming in the way of establishing successful plantations in and outside forests.
Few important qualities of any good nurseries would include:

a) It should be large in size (at least 0.5ha) so that it is cost effective and also proper infrastructure including water supply, germination chamber (poly-house), Mali-hut, soil mixing yard, vermin-compost etc can de developed.
b) Adequately trained, dedicated staff should be available in each nursery. Mali and laborers should be trained and guided from time to time about raising of quality stock.
c) Each nursery should specialize in 5-6 species suited to the area and have large stock of each species, which is graded from time to time so that only quality stock goes for planting.
d) Soil mixture is most vital component for raising quality stock. Thus care must be taken not to compromise with quality of soil mixture (ideally 1:1:1 of soil:sand:vermi-compost)

CHAPTER VI

Grazing & Improvement Working Circle

6.1- General Constitution:-

Alpine pastures and IIIrd class forests constitute this working circle. The IIIrd class forests cover a major chunk of area adjoining the habitations and in the vicinity of villages. The alpine pastures exist mostly, above the line of tree growth and are quite extensive in area. More than half of the area in the alpine zone consists of massive rocks, snow and ice and lie between the line of tree growth and perpetual snow stretch and exists as alpine pastures. In this working circle, are also placed the newly notified DPF's, which were carved out from the UPF's and are essentially plantations, primarily of Chir.

6.2 General Character of the vegetation: - Forests of different types ranging from alpine to subtropical forests are included in this working circle, with scattered distribution throughout the tract. Almost every type of vegetation, typical of the territorial divisions, is met with in this working circle. The main forest types as per Champion and Seth's classification are – 14/DSI (Sub Alpine Pastures), 15/C-3 (Alpine Pastures), 9C-Ib (Himalayan Chir Pine), 12/C-Ia (Ban Oak Forests), 12/C-Ie (Moist Temperate Deciduous forests) and 12/C-If (Low level Blue Pine Forests).

6.3- Special objects of management:-

A) To assess the grazing capacity of grazing alpine areas and to assess the extent of pasture lands available to both grazing grounds on lower slopes near the habitation and alpine pastures.
B) To improve the stocking of grasses with better varieties, suitable to the localities.
C) Consistent with erosion control, to provide for grazing requirements of local and migratory graziers.
D) To protect the hills from denudation and erosion by preserving existing cover and by taking effective soil conservation measures.
E) To raise plantations of timber and fodder species for meeting the requirements of local people in such a way that the primary objective of maintaining grasslands does not get jeopardized.

6.4- Analysis and valuation of the crop: - Stock maps have been prepared and assessment done through partial sampling.

6.5- Animal Population: - Animal population shows increasing trend as per live stock census of district Kullu as under—

6.5.1-Livestock Census of Kullu District:

(Table 1)

S. No.	**Census Year**	**Livestock Population**
1	1977	327491
2	1983	332314
3	2007	386020

6.5.2-Tehsil-wise Livestock Population of Kullu District as per 18th All India Livestock

(Table 2)

TEHSIL	**Total Cattle**	**Total Buffalo**	**Total Sheep**	**Goat**	**Total Horse**	**Remarks**
Kullu Tehsil	74549	540	60910	26639	863	Detail of other Miscellaneous species not given
Manali Tehsil	11293	7	11102	3124	655	
Total of Kullu & Manali Tehsils	85842	547	72012	29763	1518	
Kullu District Total	169019	872	114942	69535	1634	

Census-2007

6.5.3-Detail of cattle head brought from outside the division, for summer grazing-

(Table 3)

Type of animal	**Number (Kullu)**
Buffaloes	1229
Horses	22
Cow	1
Sheep and Goat	-
Total	**1252**

Although no permit is issued for grazing of sheep and goats by migratory graziers yet there is Rahgir permit with migratory graziers and they camp in some particular forests enroute to Lahul and Spiti district. The higher population of sheep and goats is a threat to natural regeneration in forest in general and this working circle in particular.

6.5.4- Grazing requirement of the animal population: - The grazing requirement of animal has been determined in the grazing policy of Himachal Pradesh and the grazing units/ Animal units as per this policy, is taken as under:-

(Table 4)

Type of animal	**# of units assigned to each**
Sheep	1
Goat	1.5
Donkeys	3
Kine & Cattle	4
Mule	5
Buffalo	6

6.5.5- Area required:-The grazing area of 0.5 hectares per unit has been considered necessary as bare minimum, as per the grazing policy of Himachal Pradesh. Only a rough idea can be had regarding the total area required for the local cattle population and the migratory graziers.

(Table 5 a)

Name of animal	**# of animal**	**Total units**	**Area reqd.**
Kine and cattles	85842 X 4 =	343368	**171684**
Buffaloes	547 X 6=	3282	**1641**
Horses & Mules	1518 X 5=	7590	**3795**

Sheep Goats	72012 X 1= 29763 X 1.5 =	72012 44645	**36006** **22323**
		430897AU	**215449 ha**

Grazires:-

(Table 5 b)

Name of animal	**# of animal**	**Total units**	**Area reqd.**
Buffaloes Horses Cows	1229 X 6 = 22 X 5 = 1X 4 =	7374 110 4	
	1252l	**7488**	**7489 ha.**

6.6 – Area available for grazing:- The area as worked out in the previous working plan has been adopted for this working plan, since hardly any change has occurred. The area available for grazing has been worked out through the survey sheets for alpine areas. However for lower areas, by calculating the area of DPF's and UPFs and assuming that only 1/3rd area would be available for grazing, keeping a margin for regeneration and afforestation areas.

(Table 6)

Name of Range	**Total area of alpine zone**	**Estimated area fit for grazing**
Manali	35093	17160
Naggar	6520	3230
Patlikuhl	9323	4691
Kullu	275	142
Bhutti	582	286
Total	**51793 hectares**	**25509 hectares**

Below alpine pastures, total area of RF/DPF/UPF is around 61520 ha and area available for grazing shall be around 20500 ha. Thus total grazing area available would be around 46000 hectares as against 2,23,000 ha required for the animal population in Kullu Division.

6.6.1- Incidence of grazing:- It is observed that the forests of the tract are over-aged. The incidence of grazing comes out to be 0.105 ha/AU. Conditions, thus, are very bad and urgent remedial steps are required to be taken up. The deterioration of forests and grazing land is inevitable with such incidence of grazing. Unfortunately, this aspect is not properly addressed in any of the govt. policy and no nodal department has been fixed to look after this aspect.

6.7- Method of Treatment:- Live stock is one of the chief source of livelihood of the local populace, next only to agriculture, in the hilly tract. Grazing is one of the principal right of rural folk that stands recognized in the settlement reports. We can ill afford to ignore it, as it would antagonize the local population. This will not brood well for the forestry activities envisaged. Wisdom and skill thus is in adjusting the requirement of the people with our forestry programmes.

Suggestions made in the last Working Plan, to control and regulate grazing and for the improvement of pastures still holds good. The suggestions are elaborated below –

A) List up all grazing areas of both the territorial tracts and grazing capacity assessed at the rate of 0.5 hectares per unit. Strict control and check must be exercised and it must be ensured, that no further increase in the number of migratory cattle i.e. sheep, goats and buffaloes, who enter during summer, is allowed.
B) Educate and persuade the migratory graziers to reduce their herds. Further, educate the local people, requesting them to keep a few cattle of superior breed. Local graziers should not be allowed to increase their flock and should be dissuaded for keeping non-working cattle for manure purposes only. Adoption of stall feeding should be encouraged. Grass cutting rather than grazing should be encouraged. Loan and subsidies should be provided to the needy person under pasture improvement scheme for purchase of feed.
C) Provision of subsidy for vermi-compost and its use as manure is encouraged, so that dependence on cattle manure is reduced. The leaf litter of orchards can be best utilized for making vermi-compost.
D) Suitable areas should be taken as demonstration plots and beneficial effects of rotational grazing and other improved applications are made known to the people. Rotational closures should be enforced to give rest to the pastures and increase productive capacity. Permanent of periodic closure should be encouraged, in areas under erosion, gully formations or slips.
E) For erosion control afforestation, use fodder trees and shrubs rather than timber species. Suitable legumes like clovers etc should be introduced in the pastures to build up the soil fertility and to increase the nutritive value of the pastures. Soil conservations measures must be taken to stabilize slopes.
F) Fertilizers should be applied to grasses to get increased yields. Grass cutting in these plots, where fertilizer has been used, should be allowed in the month of October when seed has been shed.
G) Obnoxious weeds and unpalatable grasses should be eradicated and more nutritive fodder grasses, suited to the locality, should be introduced in the pasture. Pastures which have deteriorated through over use, will be closed to grazing for 3 years and after removal of inedible herbs and some surface dressing will be sown with a mixture of white clover and nutritious grasses like prairie grass i.e. *Bromus unioloides*, Perennial ryegrass- *Lolium perenne*, orchard grass or cocksfoot, *Dactylis glomerata*, timothy, *Phleum pretense* and other grasses. Timothy in combination with white clover is most suitable for alpine pastures.
H) Universities and institutions that have good experience of range land management should be involved so as to get fruitful results.

6.8- Afforestation and rehabilitation of IIIrd class forests: - Undemarcated protected forests commonly known as IIIrd class forest, constitute a large chunk of area which is honeycombed in between cultivations, villages and other habitations. Encroachment, excess timber distribution pressure, excess grazing has rendered these areas barren with varying degree of deterioration. Excess afforestation drive is being done by the forest department without getting closure through notification. Further increase of forest lands, means decrease of pasture land. This mean the conflict between the forest department and the local populace would increase. The result is that people are not spontaneously coming forth to give their consent for afforestation programmes. Any plantation effort in the IIIrd class forest will succeed, only if the local people are involved in planning, species selection and subsequent management. Instead of planting all areas with trees of high timber value, Forest department need to recognize grass lands as typical eco system which cater to different needs and have different role than forest eco system. Leave pasture as they are and only improve the composition and quality of the pastures, so that people get palatable and nutritious grass for their cattle. Fodder species would be acceptable to the local populace as that cater to their demand when no other green fodder is available. In pastures thus, only pasture improvement measures incorporating range management practices are to be undertaken.

Rehabilitation and reafforestation of IIIrd class forest is a must, considering their nearness to local habitations.

6.8.1- Range wise area of IIIrd class forest, below meters 3000 meters elevation:-

(Table 7)

Range	**Total area (in ha)**
Manali	1613.33
Naggar	2470.30
Patlikuhl	5641.64
Kullu	4836.71
Bhutti	5945.25
Total	**20507.23**

6.9- Constitution of New DPFs: - Under section 29(10 (Chapter IV) of the Indian Forest Act, 1927 as applicable to Himachal Pradesh, following forests have been declared Protected Forests. Proclamation under Section 29(3) of the IFA 1927, read with the rule 20(4) of the H.P. Forest Settlement Rules 1966 was issued to right holders of the state through range officers.

6.9.1- Range wise area:-

(Table 8)

Name of Range	Name of Forest	Area in hectare
Manali	Beas Tiba	2.00 hectares
	Buruwa phat	67.00 hectares
	Khanorinal	28.00 hectares
	Masa-ra-behal	3.00 hectares
	Beas Behal	32.00 hectares
	Manjhu Tapri	186.00 hectares
	Choyarnal	22.00 hectares
	Masa-ra-Nal	50.00 hectares
	Kulang I	25.70 hectares
	Kulang II	17.51 hectares
	Mandira Pandhe	24.00 hectares
	1/8 Jumari C-I	38.04 hectares
	1/8 Jumari C-II	34.8 hectares
	Total	**530.05 hectares**
Kullu	Grahan pande	59.00 hectares
	Neolinal	4.00 hectares
	Neoli pande	13.00 hectares
	Nainaseri	12.00 hectares
	Lanka Bekar	10.00 hectares
	Barindi	11.00 hectares
	Dhalpur	60.00 hectares
	Dhoba Behal	5.00 hectares
	Baddah landslip	12.00 hectares
	Tikra pande	13.00 hectares
	Rango-ri-bag	85.00 hectares
	Barchaninal	26.00 hectares
	Koliberh	18.00 hectares
	Nathanban	39.00 hectares
	Sarlitheg	38.00 hectares
	Bastoriban	34.00 hectares
	Kararsu Khaner	8.00 hectares
	Kararsu Behal	11.00 hectares
	Kais Khaner	12.00 hectares
	Rouginal	10.00 hectares
	Prakshi	5.00 hectares
	Seobag I	2.00 hectares
	Soebag II	2.71 hectares
	Hawai Khaned	9.00 hectares
	Khalayani Pandhe	25.00 hectares
	Total	**523.71 hectares**
Bhutti	Bagan	11.00 hectares

	Shilla I Shilla II Shishamati Dhara	8.00 hectares 10.00 hectares 21.00 hectares 36.00 hectares
	Total	**86.00 hectares**
G. Total		**1139.76 hectares**

6.9.2:- Number and Volume of trees in Improvement Working Circle (For New DPFs):-

(Table 9)

Species	**V**	**IV**	**III**	**IIa**	**IIb**	**Ia**	**Ib**	**Ic**	**Id & over**	**Total**	**Vol. (cum)**
Deodar	12702	3376	2668	1676	1535	590	283	94	165	**23091**	**18873.83**
Kail	16763	7319	2196	1086	661	378	165	212	47	**28828**	**14916.8**
Fir/Spruce	0	0	24	47	0	0	24	0	0	**94**	**267.5013**
Chil	6658	50809	11238	590	0	0	0	0	0	**69295**	**33349.13**
BL	685	165	47	71	47	24	118	0	0	**1157**	**1119.114**
Total	**36808**	**61669**	**16173**	**3471**	**2243**	**992**	**590**	**307**	**212**	**122465**	**68526.37**

6.10:- Prescription for new DPFs:

New DPF's being very close to habitation and were carved out of IIIrd class forests are not in good shape and are deforested and ruined due to over use and lack of proper management practices. The boundary pillars are still not erected in these areas and it is difficult to locate and define its boundaries in the field. The first job in hand should be to get these re-demarcated and erecting boundary pillar there upon. Local people should then be organized to form Joint Forest Management Committee and massive plantation drive with the species selected by JFMC members should be initiated. There are many III class forests which were measured by Forest Settlement wing, files prepared and cases sent to Govt. for issuance of notification declaring these areas NDPF but all these papers are lying pending. These should be pursued so that the efforts once put in should not be wasted.

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CHAPTER- VII

WILD LIFE MANAGEMENT (OVERLAPPING) WORKING CIRCLE

7.1 GENERAL CONSTITUTION: This Working Circle is constituted for emphasizing the necessity of conservation of wildlife and collection of information for better management of wild life. The whole tract has a variety of wild animals and birds since the forests are distributed from low elevation to the high snow bound areas. Therefore, this working circle overlaps all other working circles. There are Manali and Kais Wildlife Sanctuaries in this Forest Division which is administered by the Divisional Forest Officer Wildlife at Kullu. In addition, govt. has notified its intentions to create a new National park named Inderqilla National park comprising Hamta area and spread over Manali and Naggar ranges. Under rationalization of boundaries of National Parks and sanctuaries, Nargu Wild Life sanctuary is proposed to be extended in to Kullu Division in Bhutti and Kullu ranges.

7.2. IMPORTANCE OF WILDLIFE: The Kullu Forest Division extends from very low altitude of 1148 meters to high snow bound areas of altitude 5362 meters and touching the boundaries of Trans Himalayas. Therefore it has species assemblage of flora and fauna representative of front ranges of Western Himalayas to trans- Himalayas. The monsoon-affected forests and alpine meadows of the Himalayan inner ranges support a unique biota comprised of many distinct altitude-sensitive ecosystems and are home to many plants and animals. The Western Himalayas are considered an endemic bird area (EBA) by Birdlife International, supporting many restricted-range species, as well as a Conservation International Biodiversity Hotspot. This region as a whole has come under enormous pressure from human activities, both from the ongoing practice of traditional livelihoods, such as seasonal grazing, hunting and the collection of medicinal plants, as well as more recent developments such as the farming of temperate cash crops, commercial forestry, tourism and hydro-electric power development.

KAIS WILDLIFE SANCTUARY

Notifications No. and date	No. 70-G.P.53/97 dt. 28/02/1954
Situations	To the South 2/27 Padra Reas.
Boundaries	N-Demarcated line separating 2/32 Matikochar and 2/27 Padra Reas and 2/26 Marauri and Kais Nal E-Ridge separating Catchment of Beas and Parvati rivers. S-Compartment (vi) and (v) of 2/32 Matikochar and spur descending from dhara to Kais Nallah. W-Beas River
Total area of Sanctuary	1365.00hectares.
Elevation.	2000 mts. to 3680 mts. above mean sea level.

Manali Wild Life sanctuary

Notifications No. and date	No. 70-G.P.53/97 dt. 28/02/1954
Situations	Eastern portion of the forest to the north of Manalsu Khad
Boundaries	N-Demarcated line of compartment-v of 2/5 Bungdwari
	E-1/1 Bajrundi DPF and demarcated line of 2/5 Bungdwari C1
	W-Natural limit of Forest
	S-Banaru Nal and demarcated line of 2/6 CIV
Total area of Sanctuary	2887.00 ha.
Elevation.	2000 mts. to 4000 mts. above mean sea level.

INDERKILA NATIONAL PARK:-

Govt. of HP has notified its intentions to create New National Park named as INDERKILA NATIONAL PARK under section 35(1) of the Wildlife Protection Act-1972. However the final notification is yet to come. Details of notification are as under:

Notifications No. and date	NO. FFE-B-F (6)11/2005, DATED: 28/07/2010.
AREA	104 km^2.
BOUNDARIES	**NORTH:** From S.O.I. Bench mark No. 4270 thence upstream along Khrei nala up to S.O.I bench mark 4500 thence along the Pir Panjal range upto S.O.I. bench mark 4930. **EAST:** From S.O.I. Bench mark No 4930 along Pir Panjal Range thence up to S.O.I. bench mark no. 4265 thence up to 5290(Boundary between district Kullu and Lahaul & Spiti). **SOUTH:** From S.O.I. Bench mark No 5290 along Pir Panjal Range to Panjal Tapri thence to S.O.I. bench mark 4495 to Gogla Thach to Phahlakanda. **WEST:** From Phahlakanda along 3480 meter contour line to Jobrinala thence to its confluence with Alian nala up to S.O.I. bench mark 4270.
FORESTS INCLUDED:	Upper Rahni, Hamtagahr, Jagatsukh-III.

NARGU WILDLIFE SANCTUARY:

Govt. of HP has notified its intentions to add 40 km^2 areas in existing area of 278 km^2 as extension to the existing NARGU WILDLIFE SANCTUARY. The Governor, H.P. in exercise of the powers vested in her under section 26(A) of the wildlife protection Act-1972 intends to issue the final notification to declare the following area as extension to the existing NARGU

WILDLIFE SANCTUARY, being of ecological, floral, faunal, geomorphological and zoological importance for the propagation and protection of wildlife.

Notifications No. and date	NO. FFE-B-F (6)11/2005, DATED: 28/07/2010.
AREA:	278 km^2 (original) + 40km^2 (new), TOTAL: 318 km^2.
BOUNDARIES	**NORTH:** From Shirar Raa Tibbo to S.O.I. bench mark no. 4034 to 4042 to Seri Galu 3737 to Seri Dhar upto 4210 to 4603 to Bherlanga pass 4139 to Garalatinu Galu then along the boundary of Ghordug PF thence to 2664 thence along Sarvari khad to Ruaru ra thach to Samalang thence along the boundary of Chebanag PF up to 2582 to Kelakarao thach to malidug to 2459 thence along boundary of Sapurnal PF Gohang PF up to RH Karaun. **EAST:** Karaun RH to Dali in Bhubu-ka-nal PF thence along Jonga RF boundary to Matiana PF boundary and stream up to its confluence with Paha-nala up to the boundary Khokhan sanctuary. **SOUTH:** Nargu Sanctuary. **WEST:** Khokhan sanctuary.
FORESTS INCLUDED:	Chhebang, Bakar-Raira, Sapur Nal, Gong, Bhubu Ka Nal, Matiana, Hathipur, Longthach, JammuPani, Dali Kutla, Shakal, Rajgiri.

7.3 DISTRIBUTION OF WILDLIFE The distribution of wild life has been described in detail in Chapter IIB of Part-I of the plan.

7.4 SPECIAL OBJECTS OF MANAGEMENT

The primary goal of management of wildlife in Kullu Forest Division is to conserve wild life and its habitat, to mitigate human wildlife conflicts and to reduce poaching.

In order to achieve this goal, it is imperative to adopt multi pronged strategy and integrate the functions, i.e.

A. Working with the local communities to reduce their dependencies on the forests to minimize human-wildlife conflict.
B. Interventions for habitat management.
C. Interventions to manage monitor and protect wildlife.
D. Take steps to reduce poaching by enhanced interface with local populace.

7.5 MANAGEMENT STRATEGY

The strategic approach of wildlife protection/conservation in the Kullu Forest Division aims at recognizing the fact that the wildlife conservation is possible only through active support of the local community. There is a need to gain a more informed understanding of the different stakeholder groups and the major influences that shape them.

Accordingly, management prescriptions for the objectives mentioned above are given as following:

7.5.1 Working with the local communities to reduce their dependencies on the forests to minimize human-wildlife conflict

i) Help resolve man-animal conflict with emphasis on social and environmental justice for the poor people living in the Kullu Forest Division.
ii) The officials of Kullu Forest Division should provide for resolving the man-animal conflict with emphasis on social and environmental backdrop of the poor people living close to the forests. , and development of a competence based training programme for the Kullu Forest Division staff and the local community.
iii) Attitudinal change and increased sensitivity on part of field staff on the issues of wild life damages and more responsive and quicker actions.

7.5.1.1 Crop Depredation Historically, the villagers have been hunting the large bodied animals for meat and trophy (crest of a Monal, meat and horns of Ghoral, Thar, Blue sheep and Ibex) in whole of the forests of Kullu Forest Division. This was also a strategy to check the wild animal's populations from killing the livestock or damaging the crops.

About fifteen years back, the state govt. imposed ban on the hunting of wild animals (1986). Ever since, the number of wild animals have shown increasing trend in the area. Most of the villagers try to save their crops by putting up snares, traps, etc. This being an illegal activity, the resource-deficient villagers need to resort to labour intensive measures of crop protection. Such actions mostly result in disproportionate cost of raising crops by the poor and marginal villagers.

The villagers raise wheat, maize, barley, potato, rajmash, peas, and garlic. The time of growing these crops mostly depends on the altitude of the area. The wheat in higher altitude is harvested in May/June while at lower altitude it is harvested in April. This area is also very rich in Horticulture crops with apple have lion's share beside peach, plums, apricot, Kiwi and pear. The wild animals such as Ghoral, monkey, and parakeets do the maximum damage to these crops. Porcupine is known to dig out the potato, while black bear raids the maize crop. The parakeets feed mostly on fruits, while monkey and rats go for any crop. There are legal provisions to annihilate the small-bodied animals such as rats and many insects; the big-bodied animals are protected under the various Schedules of the Wildlife Protection Act. In this scenario the poor farmer living on the edge of the forest is faced with the problems of the crop depredation as well as the legal action in the event of his killing a wild animal.

The villagers often use retaliatory measures of harming/killing the wild animals of which there is hardly any record or report. The depredation enhances dramatically when there is an increase in the number of livestock as well as the area under cultivation close to the forests; when there is a decline in the availability of the natural food; when there is an increase in the number of large wild herbivores. In all these circumstances, the crop depredation or killings of livestock gets escalated exponentially.

Monkey which were earlier unknown in these areas are now started creating menace and their population is increasing very fast as religious belief protects them.

7.5.1.2 LIVESTOCK DEPREDATION Due to increasing population pressures and consequent degradation of forest habitat, the wild animals such as Himalayan Black Bear and leopards have become "refugees" in their own habitats. At the same time the rhesus macaque and langoors are able to adapt themselves to the human presence. It is a well-known fact that the wild animals avoid areas with disturbances. This means that when their habitat gets further restricted as a result, they venture into the human habitations. The wild animals also intrude into agriculture

fields as the crops raised are more palatable, and they are located in easy locations. In addition to this the poor and marginal farmers in the villages keep livestock such as sheep and goats, which usually survive on grazing on the forest and pasture land. For wild carnivores, such domestic livestock are very easy prey.

7.5.1.3 TIMING OF PREDATION BY THE WILDLIFE The timing of the predations by the wild animals is very crucial to understand human-animal conflict. The leopard killings are mostly in July to September; the Himalayan Black Bear made killings in almost same months. The wild carnivores remain active in the months of June to October when the livestock is in the forests/pastures of the forests.

7.5.1.4 COMPENSATION Human-wildlife conflicts have assumed different dimensions in terms of human casualties, livestock killings and agricultural and horticultural crop raiding at the interface of wildlife habitats and human use dominated landscape. Such a situation affects the diverse sections of the village society, differently. Those who live closer to the forest areas and away from the road-head are mostly poor and bear most of the burnt of the human-wildlife conflict.

The Himachal Pradesh Forest Department has a provision of providing compensation to the person whose sheep, goats or cattle have been killed by the wild animals. A close look at the Department's rules reveals their inadequacy with reference to the damage done by the wild animals in the field. The rules provide for postmortem report, and verification by the high authority in the villages such as Pradhan/up-Pradhan of Gram Panchayat/ and a forest official, not less that the rank of a Forest Ranger. For a poor person, it is difficult to approach these high authorities; as a result many cases went unreported. Moreover, most of the damage done relates to the crops and horticulture trees for which there is no provision of compensation.

Man-animal interface filter down to the base of the pyramid where the people are most directly affected by the depletion of physical resources, least able to fend off the ill-effects of man-animal conflict, and ill-equipped to take remedial action. Providing relief or compensation for damage to the crops and animals of the poor populations living close to the forests should become the priority for the Forest Officers.

Some of the suggested measures for the reduction in the conflict between man and animals:

PROACTIVE

- Constant interaction with the local people and to attend to problems faced by them on account of Man animal conflict.
- Educating and information sharing with local people regarding behavior, eating/ preying habits, timing and circumstances of attacking etc. of wild animals found in the area.
- The villagers are advised to use deterrents such as making sounds at night, beating drums, lighting a fire, or putting up a scarecrow in their fields.
- The Forest Officials need to take some proactive measures such as proper identification of the rogue animals, their tracking, and if needed "culling" or elimination.
- Feasibility of setting up of cages/radio collaring of the problem animals may be explored. The Forest Officials and the local villagers need to put up a combined defense against such animals.
- Training for capturing, tranquilizing and shooting of animals need to be imparted to 4-6 field officers in each division so that they can constitute a rescue team when ever required.

- There is a need of regular census of ungulates and carnivores in the forests. The prey-predator relationship needs to be studied and worked out for the mountain animals along with the carrying capacity of their habitats.
- The issue of crop insurance has a lot of promise to resolve the man-animal conflict for which forest department should take a lead by paying for small insurance premium.

REACTIVE

- However, once the damage is done, the provisions of compensation should be an easy and straightforward process so that the poor villagers are able to receive the compensation easily and without delay. Now under new rules, providing compensation in a time bound manner has been made "right to service". It will definitely going to help poor and marginal farmers.
- The compensation rates which are terribly low need realistic enhancement.
- In case of any animal becoming rogue, immediate remedial steps are required to be taken by forest department to capture or cull the same. The removal of problem animals may be considered after their properly identification.

In fact, the main solutions lie in awareness about the large-bodied animals, their ecology and behavior; at the same time recognition of the fact that these are the poor villagers showing tolerance to the existence to the crop damaging bear or livestock lifting Leopard. This enhances the limits of human existence with the large carnivores. The future of man-animal conflict resolution lies as much in the involvement of the local communities in the wildlife habitat management, as in the measure that are taken to leave the wild habitats to the wild herbivores.

7.5.2 DEALING WITH LEOPARDS The Divisional Forest Officer shall follow following criteria to deal with capture of naturally free ranging leopards and eliminating man eaters.

a) Mere sighting of leopards in the vicinity of a village or in inhabited area and ensuing political pressure, media attention does not qualify for its capture/elimination.

b) When first human killing is reported, the concerned Wildlife Warden must study the reasons on these lines: Whether it was a chance encounter? Whether outright aggressiveness? Was it a female leopard merely protective of her cubs? Was the leopard injured and unable to hunt? Whether the victim entered the forest to cut grass or collect firewood or otherwise and got killed when mistaken by leopard for its prey? How many times the leopard had mauled a man or killed a livestock in the past?

c) The Wildlife Warden should remember the underlying principle before declaring a leopard man-eater unless they actually consume the body of human killed. Jim Corbett, a renowned naturalist who had been dealing with man-eaters pointed out that *every human-killer is not a man-eater in the making.*

d) Shooting of leopards through identified shooters shall be considered only as a last resort once it is confirmed to be a man-eater after due observations and studies. Distinction between purposeful and accidental attack be made carefully. Purposeful attacks should always be dealt with immediately and the animal should be removed from the wild as soon as possible. In case of accidental attacks, the situation should be monitored.

e) No leopard captured as man-eater shall be released back into the wild and also should not be placed on display in a zoo. However, it can be kept in off-display facility in a zoo or rescue centre.

7.5.3 INTERVENTIONS TO MANAGE, MONITOR AND PROTECT THE NATURAL HABITATS AND RESOURCES.

1. Maintain and protect the natural vegetation communities (remove exotics and Invasive Alien Species), populations of large ungulates and pheasants.

   One of the important indicators of the success of management practices for wildlife protection is the abundance of animals (pheasants, large mammals). The inventories of mammals, birds, reptiles, amphibians, annelids, and insects (mostly butterflies and moths) may be prepared with the help of experts in HPFD or reputed institutions. Similarly the angiosperms, Gymnosperms, ferns, bryophytes, mosses and lichens need to be documented.

   - Services of institutions such as Wildlife Institute of India or NGOs of repute may be hired to train frontline staff including the Forest Guards, Forest Workers and wildlife watchers to measures abundance of species: absent, rare, occasional, common and abundant (first level).
   - Conduct proper field trainings for the Forest Guards, Forest Workers and wildlife watchers for the next/second level of information collection on evidence of the animal's presence, such as tracks, droppings, calls, nests, feeding signs, etc.
   - The advanced or third level of information collection is by determining the trends or indices of population growth and the actual population numbers/ density.

   Control of Poaching and Illegal Trade in Wild animal and plant species is needed with the help of enforcement measures. Intelligence gathering needs to be undertaken by the forest officials in this regard.
2. Provide facilities and opportunities in natural areas for purposes of formal and informal education, research and the study

   The training need analysis should clearly bring out all that is required (elements of competence) to help the target group to perform competently in the given area of the job/role. For agreed elements of competence it will be required that necessary performance criteria are generated which necessarily means that unless distinct performance criteria are developed for agreed elements of competences, there would always be an ambiguity with respect to what training be imparted to trainees. Once the performance criteria have been laid out, the mode of assessment becomes important. The assessment is about generating and collecting evidences that tell whether or not the trainee is able to perform as per the laid out standards.
3. Protect (with the consent of the local community) the cultural, historic sites such as Sacred Groves for research purposes as elements of the cultural heritage of the region.

   The Western Himalayas are home for some of the globe's most intact and colourful indigenous and traditional cultures. The people are manifesting their traditional lifestyle in form of Sacred Groves (*Devban* or forests of Gods). These areas show how local villagers combine their beliefs and religion with natural resource management. The sacred groves have been instrumental in biodiversity conservation. They have a religious connotation and mostly located away from each other. Each Sacred Grove has its own devta (deity) mostly related to Hindu pantheon. A very distinct characteristic of these devtas are that they are treated as a corporal entity by the villagers. The Devtas own property in form of a forest which is locally known as Devban. Most of the Devbans are treated as sacred. Enumeration of such sacred groves must be given top priority. Communities must be encouraged to maintain these forests in perpetuity. Forest department should encourage proper protection and management of such sacred groves and try to enhance

buffer forested area around these groves.

7.6 HUMAN RESOURCE DEVELOPMENT AND PERSONNEL PLANNING: - The challenging wildlife conservation requires committed wildlife managers who possess scientific competence and social awareness aided by communication.

7.7 SCIENTIFIC STUDY, RESEARCH AND DATA COLLECTION In order to avoid or reduce man-animal conflicts, the scientific study, data collection and possible local or expert aided solutions are required.

The wildlife damage related problems must be addressed on priority. The focus issues are:

7.7.1 MONKEY – HUMAN INTERACTION

Population surveys are of immense value in resolving man-animal conflict. For developing a conservation plan for a species such as monkey or leopard we need to answer several basic questions. Consider for example the rhesus monkey, the common red-faced monkey of India. How many rhesus monkeys are in Kullu Forest Division? Where do they mostly live? What do they eat? What is happening to the habitat of these monkeys? How do rhesus monkeys interact with the human beings?

7.7.1.1 MONKEY SURVEYS

- Initially we need to identify different segments in the Core Area (places of monkey concentration in the Kullu Forest Division) where the survey will be conducted. In these segments, various vantage points will be identified to closely observe the monkeys without interference. If a particular segment is quite big this may be further sub-segmented under a person/forest guard/observer to observe the monkeys from a vantage observation point, in the morning between 7 and 8 AM when monkeys come out to forage. This should be ensured that monkey in line-of-sight of the observer are counted and there is no repetition of count of the same monkeys by the other observers.
- Location and identification of these observation points should be noted/plotted on a map of the area with number of monkey recorded. Data Sheets will be prepared on the performa given below. Information regarding age and sex of the monkeys, and food provisioning and garbage disposal at surveyed sites need to be kept.
- The survey/population estimation is to be conducted in such a manner that all the monkeys in every observer's domain are counted in a period of half an hour to one hour depending on size of the segment. The period of counting should be such that the level of error of number is avoided due to migration of the animals from one observation point to another.
- The monkey survey is to be conducted by involving various NGOs, professionals and other similar institutions involved with monkeys. Perhaps involvement of Eco-clubs, schools/colleges in the vicinity of identified locations will be also a most desirable component
- The whole exercise is to be repeated during winter (January, March), Summer (May, July) and Autumn (September, November) at an interval of two months to know the standard variation and error if any.
- Once the results are obtained, the methodology may be improved and then approved to be replicated in different areas of the state to arrive at a figure of population of monkeys.
- A basic website/blog will be created to have an online access to the information to a wide

user/stakeholder groups

- The lessons from this exercise will be integrated with the standard wild life surveys/population estimations of the Wildlife Wing of HPFD.

In the year 2011, monkey survey simultaneously in all parts of the state was done on a single day which rule out any possibility of double count. The survey figures for Kullu Forest Division are as under:-

DATE OF SURVEY: 24/02/2012 DURATION OF THE SURVEY: 8-9 AM (1 hour)

S.No.	Name of Range	Beat	Total Troops	Total Adult	Total Infant	Total
1	Kullu	Sari	5	170	-	170
2		Maharaja	2	95	-	95
3		Raison	4	262	52	314
4		Beasar	3	168	9	177
5		Bijli Mahadev	2	157	17	174
6		Borsu	2	93	15	108
7		Gahar	3	253	32	285
8		Tandla	5	261	55	316
		Total	**26**	**1459**	**180**	**1639**
9	Naggar	Jagatsukh	3	92	32	124
10		Khaknal	1	6	4	10
11		Sajla	2	13	3	16
12		Barshi	1	25	0	25
13		Hallan	1	18	7	25
14		Batahar	2	27	11	38
15		Sarsai	3	35	25	60
16		Jana	3	30	25	55
17		Nathan	1	4	8	12
18		Naggar	3	47	77	124
19		Rumsu	3	13	18	31
		Total	**23**	**310**	**210**	**520**
20	Bhutti	Bharai.	3	53	14	67
21		Dugilag	3	50	11	61
22		Bhumten	4	70	20	90
\23		Tarapur	6	44	14	58
24		Shallang	6	102	26	128
25		Mashna	3	65	13	78
26		Chaparsa	4	63	7	70
27		Tiun	2	21	7	28
		Total	**31**	**468**	**112**	**580**
28	Manali	Manali	3	20	10	30
29		Shaleen	3	57	25	82
30		Goshal	2	24	6	30

31		Mathi ban	2	18	8	26
32		Aleo	1	7	2	9
33		Shanag	3	13	7	20
34		Palchan	2	12	4	16
35		Manali	2	15	5	20
36		Prini	1	11	5	16
		Total	**19**	**177**	**72**	**249**
37	Patlikuhal	Neri	2	23	7	30
38		Fojal	2	22	13	35
39		MandalGosh	2	20	6	26
40		Patlikuhal	1	15	6	21
41		Pankot	3	43	17	60
42		Baragarh	3	24	11	35
		Total	**13**	**147**	**60**	**207**
		Grand Total.	**112**	**2561**	**634**	**3195**

From the survey it is clear that the problem of Monkey Menace is more in Kullu Range where as this problem is comparatively lesser in Patlikuhl and Manali Ranges. It can also be concluded from the data that the Adults are more in no. than Infants (approx. four times). There was hardly any population earlier in this are but now its number, area affected is at increase which is a cause of concern and therefore continuous efforts are to be needed to eradicate/ to minimize the problem. This area is fruit bowl of the state and increased monkey menace will have severe adverse effect on economy of rural masses if not checked at this stage.

7.7.2 PHEASANTS

The Kullu Forest Division has Monal (*Lophophorus impejanus*, Kaleej (*Lophura leucomelana),* Koklas (*Pucrasia macroplopha) and Western Tragopan (Tragopan melanocephalus),* Red Jungle Fowl (*Gallus gallus murghi)* can also be seen in the lower areas. These spectacular birds are known through their fragmented surveys done so far in different regions. The non-availability of information from other areas is perhaps for lack of attention by the forest officials. A species like Western Tragopan occurs in inaccessible areas which would make its survey rather difficult. Obtaining access to these areas make the job of their survey difficult. Similarly Cheer Pheasant are quite common in their grassland habitat, though a serious and systematic effort to collect baseline information about them is lacking.

7.7.2.1 PHEASANT CENSUS The following method is advised for Kullu staff to observe/record their pheasants observations, systematically.

7.7.2.2 CALL COUNT This method can be used for most of the pheasants which call during morning hours in their breeding season. The counts can be made from a strategic point in the habitat of the particular pheasant. The number obtained can be doubled for obtaining the estimate of breeding population (e.g., one male; one female). The following factors will influence observations

1. **SEASON OF THE YEAR**

The count of calling males assumes that all the existing males in the area will call every morning. In the western Himalayas, the calling behavior of three species of pheasants during various months of the year is as following:

Koklas : January to June; September to December

Western Tragopan : April to June

2. **TIME OF DAY**

Most Koklas observations are made during a short period of early morning. The males usually call at dawn for 15 - 20 minutes. The Western Tragopan starts its song in early morning and continues intermittently throughout the day during breeding period.

3. **POSITION OF CENSUS POINT**

Surveys will be more successful if a strategic point is selected in the habitat of pheasant. This site should be identified on the day before the survey/census. The census point should allow the observer to hear the birds over as wide an area as possible. A point on a ridge usually allows the observer to listen to the pheasant calls on both the sides. It is possible to hear all the calling birds within a radius of 400 meters from the ridge; however, this can be reduced by the intervening ridges.

4. **POSITION OF OBSERVERS**

When there are multiple observers taking part in census operation of pheasants, they must be positioned at an interval of about 500m to 600m. All the observers must have visited their observation points on the previous evening of the census day. They should be in position well before dawn so that all the calling pheasants are counted.

5. **RECORDING OF OBSERVATIONS**

The observer should have good knowledge of identification of the calls of pheasants which s/he is likely to encounter in the field. The observers should practice counting the involved numbers of calling birds. An approximate range of each call and the direction of the call, must be anticipated. A compass can be used by the observer.

It is best to have similar formats for all the observers. These formats will have following details:

- Date of observation
- Time of start and end of observations
- Altitude of the observation point
- Major vegetation types within the sample area.
- Weather conditions on the day of observation including wind speed, precipitation, cloud cover, temperature etc.
- Marking of observation points on a large scale map of the area (marking of a conspicuous point such as a rock or a tree which can be located for subsequent census in the same area.)

7.8 FIELD CRAFT - HOW TO OBSERVE AND UNDERSTAND THE JUNGLE

(Adopted from an account by Dr. AJT John Singh of WII)

When guards/officers/others venture into the forest they should be equipped with certain indispensable articles: a small sharp knife, a compass, a lighter or a match-box (covered in a water-proof polythene bag), leech-proof socks (if it is a leech country), a small rope, rain-coat (if it is in the rainy season or in an area of high rainfall), a good pair of field shoes and field dress (olive green or khaki), which will merge with the background.

Animals such as Himalayan Black Bear, Brown Bear and Leopard can move much faster than humans. At the first close encounter they may snort, roar or scream. These sounds when heard in the setting of the jungle can frighten us terribly and only experienced lucky persons who have survived these encounters will be able to tell us how week and wobbly their knees became after the first nerve-wracking encounter. We should not think that we can easily outrun and escape these animals which, as said earlier, are much faster than we are. Also the terrain on which we will have to run- with slope, many holes, and sharp wooden stumps, tangle of creepers, dense tall grass, logs, and rocks- is not an ideal place to outrun these beasts which run with four legs while we have only two teetering legs.

Therefore, go with caution in a forest where there are dangerous animals. Please follow the dictum “I should see these animals before they see me and should hear them before they hear me". Do not talk unnecessarily. Human voice can be heard, even from a long distance, by the jungle animals, in the "silence" of the forest. If there is a need to communicate, better whisper and signal. The objective of our visit to the forest is to see as many animals as possible and observe them. This can be accomplished only when we move as quietly as possible. We spend a fraction of our life looking for and observing animals in the forests. During this brief period, we should be as quiet as possible and observant of the events that happen around us. Silence is an essential part of jungle-craft.

In the jungle, smokers should become non-smokers. This is necessary for several reasons: by not smoking (i) the animals will not be alerted by the smell of the smoke, (ii) we avoid setting fire to the jungle, (iii) we show the utmost reverence to the jungle which we have resolutely determined to conserve. When we walk along a forest trail, particularly when the wind carries our smell down the train, we should proceed with utmost caution. This is because animals like bear (particularly those which have had encounters with people earlier and therefore are not shy of people) can smell your approach and then either slink away or wait for your arrival. When the wind carries your smell down the path, walk slowly and silently, stop for a few seconds every 50-100 m, listen for sounds and then proceed. Most animals like bear make some sound and indicate their presence. All these can be heard if you walk silently.

FOREST RULES

- Never approach dangerous animals like black bear (particularly with the cubs) very close when they are in a flat terrain. With caution it is possible to approach them in a hilly or rocky terrain where the chances of escaping these animals are much greater.
- If there is a fresh blood trail on the path one should proceed carefully. A wounded animal (e.g. a bear wounded by a poacher) may be ahead of us and should turn aggressive if approached very close. The same is applicable to other potentially dangerous animals like the leopard.

- A leopard carrying its fresh kill may cause the fresh blood trail. Approaching a leopard on its fresh kill could be dangerous.
- While on a blood trail if there are alarm calls of monkeys, and birds ahead of us it could be an indication of the predator going ahead. Go with caution.
- If you are returning to your camp alone on foot late in the evening and if you see a dangerous animal (e.g. a bear with cubs), stop immediately. Stay at a safe distance. Hide behind a tree or rock, observe the animal and then by talking, by tapping on the tree with a stone or wood, or even by allowing the wind to carry your smell let the animal know that a human being is somewhere in the vicinity. The presence of the unseen human being makes most animals nervous and they make a slow but steady retreat away from your direction. Who will enter in to a patch of tall dense grass where you hear the hissing of a cobra but don't see the snake? We will move away from the area. The great naturalist Dr. George B. Schaller has successfully used the above technique of remaining unseen and scaring away the Himalayan black bears in Dachigam National Park, Kashmir, India.
- Do not stumble through the forest without carefully looking at the path.
- Climbing a steep hill slope by clinging on to trees, climbers and rocks. Particularly in a tropical habitat, needs to be done with great caution. Before placing the palms, which like the feet are not protected, to hold on to something, watch carefully. There could be a scorpion, a nettle plant or a wasp nest nearby.
- People often fail to differentiate between chasing and charging by a bear. Charging may stop with a forward aggressive rush for 20-50 m but chasing can go much beyond that even for a few hundred meters which could be very dangerous. When chased by an animal throw a conspicuous object (e.g. a white hand-kerchief) on a bush and run down a slope or run zig-zagging among the bushes. Put up as much distance as possible between you and animal. While chased, do not crouch inside a bush hopping to hide.
- When chased by an animal, never try to climb a tree. A jungle- living tribal can do that but not a guard if he is recruited from a town or a Manager who is not used to tree-climbing. The fear would drain all the energy needed to climb.
- Sometimes you will be forced to walk through the forest at night. If you are in a group, stay together. As you walk along make some noise (talk, sing, or tap on a tree or rock at regular intervals). Don't surprise animals by walking in to them. Tap the ground periodically, as you walk along, either with your foot or a stick. The vibrations will keep the snakes away and most animals will also move away when they are warned from a distance.

CHAPTER VIII

PARTICIPATORY FOREST MANAGEMENT (OVERLAPPING) WORKING CIRCLE

8.1 Joint Forest Management in Himachal Pradesh traces its history when social forestry was given impetus by National Social Forestry (Umbrella) Project in 1985. The project achieved its objective of planting more than 100,000 hectares of plantations, but physical targets took precedence over participatory objectives, and social and equity issues could not be addressed.

In the 1980s the World Bank-supported Social Forestry project (1984-92) and the Indo-German Integrated Dhauladhar project (1982-92) were taken up in HP. Both were more participatory than previous FD projects. In the 1990s both donors switched their focus to the Shivalik hills with the Indo-German Changer Project that went on till 2005-06, as did the WB IWDP Kandi project.

The framework for JFM in HP is provided by the Government of HP Order of 12 May 1993, which followed the June 1990 Government of India (JFM) Circular enabling the spread of JFM. The HP Order was compiled following study of JFM resolutions issued by other states.
The JFM Order coincided with the development of a donor-led (DFID) project for Mandi and Kullu districts, in which JFM was a key element. This Himachal Pradesh Forestry Project (HPFP) may be seen to have facilitated the introduction of JFM statewide. Donor support to Mandi and Kullu districts continued until March 2001. But as one HPFD officer put it: *"There were no rules and this plagued everything".*

Growth of JFM in Kullu and Mandi

Year	No. of VFDCs in Kullu	Area (ha)	No. of VFDCs in Mandi	Area (ha)	Total no.	Total area
1995-96	4	1,870	-		4	**1,870**
1996-97	4	2,685	8	3,110	16	**5,795**
1997-98	12	8,930	13	5,537	25	**14,467**
1998-99	21	12,426	35	7,134	53	**19,560**
1999-00	14	7,000	42	21,174	59	**28,174**
Total	**55**	**32,911**	**98**	**36,955**	**153**	**70,166**

In addition, in Mandi, there are 35 Forest Management Plans (FMPs) covering about 10,500 hectares, and in Kullu there are 21 FMPs covering about 10,000 hectares. While efforts were made to integrate these FMPs into Working Plans and a nascent GIS facility started at FTI, Sundernagar, and talk of using remote sensing for WP writing on the Karnataka model, the whole thing fell through after 2001 with the end of the second phase of the DFID project. At the end of the second phase of the HP Forestry Project in 2001, it was agreed that all the 153 VFDCs formed in Kullu and Mandi would be taken over by the SVY and converted into societies.

Until 1998, JFM in HP was confined to donor-supported pilot activities (DFID, GTZ, World Bank). Then, as in earlier years (see above with illegal timber) the arrival of a new PCCF in 1998 meant the search for a new program to make a positive public relations impact. Participation was the buzzword from Delhi, and a small group of three or four FD staff was tasked with developing plans for the new scheme. The Chief Minister was persuaded to launch *Sanjhi Van Yojna* (SVY). 'Entry point activities' – such as making pots, water taps, mending temples, small infrastructure developments; all designed to attract people to the project – were given a budget so that DFOs could be seen to be dispensing something worthwhile.

To support the state JFM Order, Participatory Forest Management (PFM) Rules were developed for HP, and notified on 23 August 2001. These Rules make provision for increasing the institutional autonomy of Village Forest Development Committees (VFDCs) by registering them as Village Forest Development Societies (VFDSs) under the Societies Registration Act. Importantly, the PFM Rules encourage VFDS formation panchayat ward wise thereby attempting to link these bodies directly with the panchayat structure with each elected Panch being on the executive committee of the VFDS, *ex officio*. However, the role of the VFDSs continues to be viewed narrowly, focusing mainly on helping the HPFD to police forests and on wage-based micro-plan activities.

This resulted in the 'New SVY' rules and guidelines being announced by the GoHP in August 2001. They contain provisions for VFDSs to become, in legal terms 'the forest officer' (not notified) for levying fines etc, and for 100 per cent share in intermediate usufructs while on final harvest 75 per cent would go to the VFDS and 25 per cent to the panchayat. The GoHP agreed to completely forgo any share from JFM areas.

Under 'New SVY': entry point activities are abandoned but "income-generating activities" introduced; forest guards will not be the member secretary of the Executive Committee; but local organizers – usually led by a literate woman linked to a local community-based organization, helps mobilize towards a properly representative VFDS based on a panchayat ward. Several meetings are held before a micro plan is initiated – this shows VFDS maturity. The FD sends a cheque to a local bank account. The VFDS agrees with the FD to furnish a 'utilization certificate' which can be monitored and checked.

Since January 2001 the Government of India agreed to bring "better" forests under JFM but how many have actually been included under micro plans is not known. Even under FDAs, JFM continues to be restricted to degraded forests.

At the policy level the PFM Rules and SVY Rules and Guidelines of August 2001 are seen as a major step forward, laying the basis for uniformity in approach to community based forest management. It also makes JFM poverty focused and is targeted to the resource dependent.

In 2003, MoEF started the Forest Development Agencies (FDAs) at district level – with DFOs getting direct access to central funding – for forest and plantation work for employment generation objectives. This is an 100 per cent central sector scheme, created to reduce the multiplicity of schemes with similar objectives (it merges four existing central schemes), ensure uniformity in funding pattern and implementation mechanism, avoid delays in availability of funds to the field level and institutionalize peoples' participation in project formulation and implementation. FDAs will be constituted at the territorial/ wildlife forest division level, and JFM committees will be the implementing agencies at grassroots level. FDAs are to work

through forest guards / deputy rangers- and thus appear to conflict with SVY rules which allow for the member secretary to be elected by the JFMC / VFDS.

The growth of FDAs and therefore of JFMCs since 2003 appears to be fluctuating as figures culled out from various departmental reports indicate. In March, 2003, 678 JFMCs were reported covering a forest area of about 1640 km^2 distributed in RFs, DPFs & UPFs. In March, 2005, 1690 JFMCs are reported covering a forest area of over 4200 km^2. As of December, 2008, 1381 JFMCs stand listed. However, as per field reports only 986 of these are said to be active. Area covered is not mentioned. In March, 2010, a total of 1109 JFMCs have been reported covering again an area of about 4200 km^2. In July, 2010, the total number of JFMCs has been pegged at 1270 but how much forest area they cover is not indicated.

8.2 THE LESSONS LEARNT The last three decades of dabbling with JFM / PFM under various EAPs and the homegrown SVY and now the centrally administered FDA do hold some valuable lessons and insights for the future of participatory natural resource management in the state.

1. PFM should focus in and around pockets of poverty i.e. remote, forested areas (better forests) and where livelihood dependence on forests is high. This would entail several genuine joint management activities (other than plantation) like collective protection against illicit felling, fires, poaching and so forth. Issues of Rights, equity and benefit sharing are better addressed and conflicts resolved.

2. In participatory approaches, the process is more important than achieving targets. Choosing and regularly training the right persons for the job is therefore critical.

3. Sharing of removals, intermediate and salvage felling with VFDSs are necessary to establish long term stake of local communities in PFM.

4. Continual policy and Rules adjustment and calibration to promote better market returns for wood and non-wood based enterprises. Example, the recent decontrol of bamboo trade and transit. Next: efficient markets for value added products.

5. Local Leadership – this is a critical role. Successful examples of JFM or CFM show that local leadership roles have been crucial in making the change. It could be an enlightened, accepted local person, an elected representative, a dedicated NGO/ CBO or even a committed forest officer. This is also important for sustainability of groups.

Why consolidate forest committees?

- Allow economies of scale to be applied, reducing the number of micro-plans to be established by one-quarter,
- More economical to produce field maps at a scale smaller than 1:20,000 and identifying all present land uses
- Development issues common to all villages could be addressed in a more efficient, coordinated and economic manner, including road upgrading, health and education, service delivery of agriculture and forestry extension, and minor irrigation,
- Facilitate dealing with common forestry problems
- Promote development of marketing cooperatives or federations, based on economies of scale for product sales, and improve market positions,
- Facilitate training for the communities by covering a larger, yet similar group,
- Support landscape-level forest planning that address conservation and economic goals,
- Allow scope for zoning community forests into areas conducive for timber and pole production, NTFPs, grazing and biodiversity conservation (with limited access).

Source: **Unlocking Opportunities for Forest Dependent People, World Bank, 2006**

8.3 CONCEPT OF PARTICIPATORY FOREST MANAGEMENT The concept of Joint or Participatory Forest Management is an intervention to evolve organized and collective thinking on the issues of forest management keeping in view the fact that the forest resources are limited and the claim over these are varied, no single solution can satisfy the needs of all. The philosophy aims at involving all the stakeholders in resource generation activities through motivation, active involvement in the process of management and sharing of benefits through adequate institutional arrangements.

Joint management of forest lands is sharing of responsibilities, control, decision making authority and products over forest lands between Govt. and local user groups. The primary purpose of PFM is to create conditions at the local level which enable improvements in forest conditions and productivity. It is a movement towards a more democratic management of natural resources founded on the principle of equity, transparency and social justice.

It is widely acknowledged that the Govt. and development agencies alone can not solve the growing problem of degradation of forests and natural resource depletion. The traditional approach to management worked satisfactorily in the past when the population was less but depleting natural resources have led to the concept and practice of participatory management.

8.4 SPECIAL OBJECT OF MANAGEMENT The basic objects of Joint or Participatory Forest Management are:-

i) To evolve consensus on the basic issues for the conservation of forest resources including soil and water.

ii) To empower the local communities to manage the forest resources with responsibility squarely lying on them for planning, execution and management of natural resources of their areas.

ii) To provide an effective treatment for wastelands, degraded forests and forest lands situated near villages through protection, afforestation, pasture development, soil conservation by active participation of local people.

iii) To maintain the environmental stability through preservation of natural resources through involvement of local people in management.

iv) To augment fuel wood, fodder and small timber production for use by local people.

The Govt. of HP has notified Himachal Pradesh Participatory Forest Management Regulations, 2001 and the Sanjhi Van Yojna Scheme, 2001 which have strengthened the JFM approach to a great extent.

8.5 IMPLEMENTATION OF JFM IN KULLU DIVISION The JFM approach has been implemented in the division through projects like Overseas Development Administration or DFID & Sanjhi Van Yojna. The micro plans were prepared in accordance with project philosophy and works executed by VFDC/VFDS. The activities like soil conservation, afforestation, village development activities, fire protection, grazing have been undertaken in the past but almost in all cases, the participation of locals remained upto fund flow only. Most of the committees are virtually inactive with few members taking the lead only when there is budget. There is a need to revive, activate and involve these rural committees in forest management activities.

The detail of VFDS in Kullu forest division as on 31.03.2012 is as under:

CURRENT STATUS OF JFMC'S IN KULLU FOREST DIVISION:

S.No.	Name of JFMC	Total Members	Male	Female
1	Shaldhari	15	7	8
2	Bhumteer	15	8	7
3	Bhalayani	15	6	9
4	Tandari/Gadiara	15	8	7
5	Bagan	15	8	7
6	Rujag	15	8	7
7	Bhanara	16	8	8
8	Sajla	18	7	11
9	Karjan/Dhamsu	15	9	6
10	Jamdagni	15	10	5
11	Haripur	15	10	5
12	Gajan	15	11	4
13	Dashal	15	12	3
14	Rumsu	15	8	7
15	Pilag	14	7	7
16	Nathan	14	7	7
17	Bhosh	15	8	7
18	Shilla	15	11	4
19	Meha	17	10	7
20	Niyalang	15	8	7

21	Riara	15	10	5
22	Bran	15	12	3
23	Pankot	15	12	3
24	Neri	16	10	6
25	Fozal	15	10	5
26	Bhekhali	14	7	7
27	Sari	14	4	10
28	Seogi	14	7	7
29	Tandla	15	8	7
30	Beasar	14	7	7
31	Babeli	14	8	6
32	Mathishill	15	8	7
33	Chachoga	17	11	6
34	Larikot	15	7	8
35	Vashishat	19	14	5
36	Prini	14	8	6
37	Palchan	17	10	7
38	Kothi	14	8	6
39	Solang	19	12	7
40	Chachoga	16	10	6
41	Majhach	14	6	8
42	Balsari	14	8	6
43	Shaleen	16	6	10
44	Parkshi	14	7	7
45	Padhar	15	8	7
	GRAND TOTAL	**684**	**389**	**295**

8.6 FUTURE SCOPE

8.6.1 There is tremendous scope for the JFM activities in the division. All the forests allotted to the plantation and all 3rd class forests (UPF's) are suitable/ potential sites for afforestation, soil conservation, grassland improvement, NTFP development besides other forests. The implementation of National Medicinal Plant Board project in Kullu and Kangra District since 2008-09 have huge potential for enhanced livelihood options, increases income and industry/value addition. The main bottle neck is the high average income of the people in this area due to which they shirk away from forestry activities with very high gestation period, comparatively low income and changing govt. policies. The lack of commitment both at fields and higher level, target/data driven approach and lack of community mobilization experts are some of the reason for not so good results. The dictum collective responsibility is no one's responsibility and indifferent attitude of local people to illicit felling and encroachments are other factors. However there is a ray of hope and possibly joint forest management is the only way to conserve, protect and enhance natural resources.

8.6.2 IDENTIFICATION OF JFM AREAS:- The degraded forest areas as well as common village land located in the vicinity of the villages are potential sites for JFM implementation. The deficiencies and strengths of these areas with regard to soil condition, water availability, grazing pressure, fuel wood production and requirements need to be understood, analyzed and shared with local people. It is important to identify the actual user group after stake holder analysis and their requirements vis a vis technical consideration should aptly be merged before initiating any intervention. There need to have at least two dedicated community mobilizes per division if long term joint forest management perspective is to be achieved.

8.6.3 NON TIMBER FOREST PRODUCE JFM can play an important role in collection, marketing and propagation of NTFPs. Many villagers are dependent on the collection of NTFP to sustain their livelihood. They usually collect various medicinal herbs and sell it to the middleman who further sells in the market. The various medicinal herbs that are found or can be introduced in the tract, their method of cultivation, collection, harvesting have been discussed in Chapter VIII.

8.6.4 VERMICOMPOSTING: In departmental nurseries a large amount of vermin-compost is required and this demand is difficult to meet with departmentally. Thus training may be imparted to local people preferably to women on vermin-composting and the department can give them buy back assurance. This will give a livelihood option to local people. The skill so upgraded will be of immense help in this horticulture/ cash crop rich area where demand for vermin-compost is ever increasing and ever lasting.

8.7 POTENTIAL ACTIVITIES OF JFM COMMITTEES The JFM/PFM committees are the future agencies of forest development, conservation and expansion. The potential activities to be executed through JFMC
Can be:-

- Afforestation activity (both departmental and MNREGS)
- Soil & water conservation through treatment of macro and micro watersheds in a catchment.
- Recharging of water bodies like boulies, ponds and underground water.
- Minor construction works of paths, irrigation channel, buildings etc.
- Awareness programmes for forest protection, fire protection ,propagation of medicinal herbs on a larger scale
- Livelihood options like Eco Tourism, vermin composting, cutting & pruning etc. through effective training.
- Collection, value addition and marketing of NTFP.

8.8 MODE OF WORKING Traditionally Forest Department has been involved in protection of forests and the concept of involving people in forest management is relatively recent in Forest Department. Forest Department especially Forest Guards who have more regular and direct interaction with people have to adopt ‘carrot and stick policy’ which is not always easy. Thus it is desirable to involve local CBOs, NGOs etc. in implementation of programs involving ‘people’. Forest staff is not imparted specialized training on participatory

management of natural resources, which is vital for success of any people centric program. To start with the mode of working could be as follows which will further evolve with time:

i) **Micro planning: -** Stake holder analysis done by involving community mobilizes and field functionaries and help of local Community based organization and NGO can also be taken. To assure better planning and management, the responsibility for all JFMC activities can be entrusted to Assistant Conservator of Forest as it is difficult for DFO to spare required time and indulgence. A long term planning for 5 to 10 years be done and there should not be any phasing out. Budget or no budget, but awareness and training program on more or less fixed time horizon must continue. Dove tailing of MNREGS schemes with other departmental schemes is the need of hour to ensure perpetual and sustained activities in the villages.

ii) **'USER GROUPS':** Whenever a plantation is raised or a water harvesting structure is constructed, it must be in consultation with local people, essentially with their end user. Such people should be constituted into User Groups, who will maintain assets, use them and if need be extend them. Thus Forest Department will be not only relieved of its function of monitoring each and every small plantation/ structure but will also be in a better position to connect with people. Such user groups will be registered and will have an account. Thus the budget received for plantation/ WHS etc can be directly transferred to their account. However, FD will monitor the quality of work and give technical guidance. Plants will be provided from departmental nurseries.

iii) **PANCHAYAT & COMMUNITY BASED ORGANIZATIONS:** The role and strength of local panchayat representatives can be made use of in forestry activities. CBO like Mahila Mandals, Youth Clubs and temple committees should be identified, duly recognized and involved in JFMC activities. Similarly, local NGOs also have potential and should be symbiotically associated. Social audit of each activity is a must for empowerment of local people.

CHAPTER IX

NON TIMBER FOREST PRODUCE (OVERLAPPING) WORKING CIRCLE

9.1 GENERAL CONSTITUTION This would be an overlapping working circle covering the entire working circle and is constituted to ensure systematic development and exploitation of non timber forest produce species that occur in the division. The main non timber forest produce found/extracted in the division are Medicinal plants, Cedar wood oil, minor minerals and grasses. The main emphasis/focus would be on medicinal plants.

9.2 SPECIAL OBJECTS OF MANAGEMENT The State has formulated Himachal Pradesh Forestry Sector Medicinal Plants Policy, 2006 which is aimed at conserving and strengthening medicinal plant resource base in forest areas as well as outside for use towards enhancing health and livelihood security of the people of the State on sustainable basis. The special objects of management would be:-

i) To conserve and augment existing non timber forest produce including medicinal plants resource in its natural habitat.

ii) To encourage cultivation of commercially important species of medicinal plants on private lands

iii) To develop a system of pricing the wild harvest so as to reflect both the conservation costs and the community benefits.

iv) To encourage public-private-community partnership for building capacity for cultivation, value addition and processing of raw material before export from the state.

v) To promote the use of commercially viable medicinal plants by the state owned and private pharmaceutical units and subsidiaries engaged in value addition.

vi) To maximize yield of medicinal plants through sustainable natural and artificial regeneration and scientific exploitation.

9.3 BLOCKS AND COMPARTMENTS The entire tract of the division will be covered by taking beat as a unit.

9.4 AREA STATEMENT The working circle is overlapping, no area statement is required.

9.5 ANALYSIS AND VALUATION OF THE CROP The entire tract is very rich in many useful shrubs, herbs, fungi which have been exploited from time to time. The area produces large quantities of Karu, Patish, Van Kakadi, Guchhi, Rakhal, Lichens, Berberis roots, Reetha, Kakar Singhi, Jatamansi, etc. A list of commonly used or economically extracted medicinal herbs, plants occurring naturally are given in the Appendix.

9.6 STOCK MAPS As the medicinal plants are mostly herbs and shrubs found on annual or perennial basis, stock mapping is not possible.

9.7 ARTIFICIAL PROPAGATION AND CONSERVATION Keeping in view the economic importance and demand of medicinal herbs, it is desirable to encourage naturally occurring medicinal plants in suitable localities. The demand of medicinal plants has picked up with setting

up of pharmaceutical industries in the state. The existing germplasm of different herbs needs to be conserved. Following measures are suggested for the conservation, protection and propagation of medicinal plants:-

- Systematic rotational collection should be followed strictly as given in Table 10.2
- Heavy grazing and destruction of medicinal herbs should be checked as these species do not produce sufficient seeds/vegetative form of regeneration.
- The raising of nurseries/herbal gardens, drug farms should be developed through various research institutes like HFRI, UHF Nauni, HPKVV Palampur, CSIR Palampur, Ayurveda Department who are engaged in medicinal and aromatic plants .
- Medicinal plant collectors should be educated and provided proper information or guidelines so that there is continuous regeneration of medicinal herbs.
- The community based organizations like panchayats, Mahila Mandals, Yuvak Mandals, VFDCs and other rural co-operatives should be involved in the development, protection, propagation and conservation of medicinal plants.

9.8 NMPB Project

YEAR	AREA PLANTED (in ha)	SPECIES PLANTED					
		TREES	NO.	SHRUBS	NO.	HERBS	NO.
2009-10	27	Chuli	11000	-	-	Nihani	357500
						Karu	25000
2010-11	43	Chuli	15200	Dioscorea	30800	Karu	44000
		Rakhal	2200			Nihani	162200
		Ritha	3150	Ashwaganda	4400	Chora	5000
		Daru	350				
2011-12	42.50	Ritha	4145	Dioscorea	24000	Nihani	99760
		Daru	3455	Kashmal	3200		
		Rakhal	2200	Bhekhal	300	Karu	53360
		Apricot	2700	Tirmira	480	Chora	1200
		Walnut	500	Basuti	5220	Sathjalari	36000
		Horsechestnut	300	Chora	2000	Bansakha	14280
		Chuli	7600				

9.9 NURSERY TECHNIQUE OF *Taxus wallichana*

Selection of Stem cuttings

1. Fifteen to twenty centimeters long
2. Juvenile stem cuttings with leaves
3. Three – four nodes
4. About 1.0 cm in diameter
5. From old trees
6. During May- June

Too many leaves in the cutting give negative effect because of higher transpiration rate and water deficiency that cause leaf shedding. At the same time, cuttings without leaves root poorly.

Preparation of Stem cuttings

The cuttings are dipped in hormonal solution of 10,000 ppm IBA for 18 hours prior to planting. Commercial IBA is available as solvent or water soluble.

Preparation of 10,000 ppm IBA solution*:*
I. Solvent Soluble IBA: Dissolve 10 grams of IBA in few ml of alcohol (70 percent or more) or rubbing alcohol available in medical stores. Isopropyl alcohol is commonly known as rubbing alcohol and usually comes in 50% pure and 70% pure. Mix IBA powder with half teaspoon of alcohol and gently shake the container. After the powder has dissolved, do not add the water to the solution; instead, add the solution to distilled water (again available in medical stores) making it up to 1 litre.

II. Water Soluble IBA: It will dissolve directly in water.

[For Information: 1 ppm = 1 mg / 1 litre; 10 ppm = 10 mg / 1 litre; 100 ppm = 100 mg / 1 litre; 1000 ppm = 1000 mg or 1 g / 1 litre; 10,000 ppm = 10 g / 1 litre]

Nursery Techniques:
These cuttings are planted in the locally prepared beds in a slanting (45 degrees) position. The cuttings should be protected from direct sunlight and high humidity (70 percent) should be maintained by a thatch covering.

The roots normally appear in six to eight months. A few cuttings could give roots after one year.

9.10 THREATS TO *Taxus wallichana*

1. LACK OF INVENTORISATION: We know next to nothing about the approximate number of trees of *Taxus wallichana*, their regeneration status and their pockets of occurrence across the appropriate altitudinal zone in the division.
2. This tree, though on the List of THREATENED TREES (IUCN, RED LISTING FOR HP), is not enumerated as part of the enumeration done in forests. There appears to be no nursery stock grown nor are there any efforts for planting this species in appropriate locations.
3. Though collection and export of *Taxus* leaves has been banned since 1994 and still continues, there are reports of its illegal collection and export, either as it is or in the name of Talis patra (*Abies webbiana* leaves), which is permitted and under present regulations export of which can be allowed by the Panchayat Pradhan.
4. *Taxus wallichiana* is a very slow growing tree and unless successful plantations of it are raised annually, in the long term, this tree will eventually disappear.
5. Berberis as one can see is being extracted in huge quantity. It is not clear how this is done, but there must be implications for soil conservation?

9.11 URGENT ACTION ON *Taxus wallichana*

1. There is an urgent need to locate pockets / distribution of this tree in the forests of Kullu, map these sites using GPS and inventory the trees, class wise.
2. A suitable nursery to be identified and stock of *Taxus wallichiana* raised from cuttings (done in February using rooting hormones). One lakh such cuttings to be raised in poly bags every year for the next 5 to 6 years. The nursery stock has to be retained for two and half to three and a half years in the nursery before planting out. Since this is a long term, cyclic affair with a long nursery period, it is important that cuttings are raised on the recommended scale annually.
3. If we have sufficient well grown stock of *Taxus*, it is feasible to grown live hedges of or with the species around our closed areas and also to encourage farmers to use this as a live hedge. A practice that can be incentivized in suitable areas through PES.
4. In view of 2 above, a planting schedule for *Taxus* can be developed after 3 to 4 years. But this must continue every year for a long time to come; across the next many future management plans.
5. In recent years, some private companies have introduced *Taxus* plants in Himachal imported from the North East. These are apparently being grown by farmers on their private land and then exported. It is important that this stock is not introduced in forests of the state, unknowingly or by design.

In order to avoid unrestricted heavy removal of leaves, the Govt. of HP has formulated policy regarding grant of permission for collection of *Taxus* leaves and export thereof vide letter No. FFE-B-F (13)-2/95 dated 4th June, 1996, which is reproduced as under:-

1. The export permission for each year outside the state (within country) for the export of *Taxus wallichiana* will be issued by the Govt. after proper scrutiny.
2. The collection permission of *Taxus wallichiana* leaves by the right holders will be allowed by the Principal Chief Conservator of Forests, HP after the prior approval of the Govt.
3. No collection of *Taxus wallichiana* be allowed in the forests where the right of collection of these leaves has not been admitted in the Forest Settlement and revenue records.
4. The leaves will be allowed to be collected only from trees with more than one metre girth at breast height and restricted to lower 1/3rd of the tree.
5. The collection of leaves will be allowed by plucking. In case a branch is cut on silvicultural consideration, it should not exceed a finger in thickness. No damage whatsoever be allowed to be caused to the trees. The privilege is not an absolute right and, therefore, may be withdrawn by the Govt. in the event of abuse.
6. The collection be allowed to the right holders in the presence of forest guard and the representative of traders and no labour be allowed to be engaged for the purpose.
7. The *Taxus wallichiana* leaves which are collected from the areas by plucking in a particular year are to be kept under reserve for four years and their next turn for collection of leaves will come in the fifth year.
8. Four years collection programme will be prepared for collection of these leaves and in case due to some reason the plucking is not done in fifth year, the deviation permission from the Govt. like 10 year felling programme is necessary.
9. The collection of Taxus *wallichiana* leaves will be allowed from April to December every year in accordance with 4 years cycle. The plucked material would then have to be disclosed by the parties and export permission sought from the Govt. from April to December and shall have to complete the export by 31st January next.

10. The storing of Taxus *wallichiana* leaves is to be allowed at a depot specified by the DFO.
11. No removal of leaves is to be allowed from the depot without valid permission for export and realization of export permit fee of Rs. 600/- per quintal fixed vide this department notification of even no dated 17.8.93. The movement within Divisions/Circles will be regulated under the relevant transit rules.
12. The right holders have tendency to remove bark which shall not be allowed.
13. Since the leaves are used for preparing medicine and the collection and sale is remunerative, it should be allowed in scientific manner. It should be ensured that no damage is caused in collection and also no illicit collection and its export be allowed to take place. Collection by right holders may be allowed with against permission and forests be inspected during collection as endeavor to ensure collection on scientific basis only.
14. The quantity extracted from the various forests be entered in compartment history files and details also furnished on the close of season in February to the Govt.

9.12 OTHER NON TIMBER FOREST PRODUCING PLANTS/PRODUCTS

9.12.1 *GUCCHHI* *Gucchhi* is a highly valued morel mushroom that grows over wide swathes of the countryside under deodar or mixed coniferous forests. It grows in March or early April (depending upon the altitude) and is collected by local people (men, women and children) as soon as one is spotted. This has led to heavy collection and consequently, gucchhi collections are said to be dwindling all over the state. Another reason for the decline is the manner in which the morel is collected. It is wrenched off the ground, possibly also yanking out the substrate mycelium as well. There is neither time nor patience to allow the mushroom to shed its spores. So the next crops are getting less and less.
If locals can be organised and trained to do two simple things, guchhi might have a chance to bounce back. One, the species needs to be collected after it has shed its spores. This might vary according to weather and altitude, but the local people know when. Secondly, a simple training to get the collectors to use a blade to cut the mushroom stem (instead of yanking it out) is all that is needed to help the species recover. Of course to do this apparently simple job, there is a need to find out some good NGO or trainers who can take up this with the collectors (who are numerous) and sort of organise them into monitoring collection methods as well?
The royalty or export permit fee rate on gucchhi is high: Rs 10,000 per quintal. While a quintal of gucchhi is a lot and given the current market rates (between Rs 5 to 7000/kg), they might seem reasonable; but people are not tuned to paying such taxes on forest produce (agriculture income is tax free). This high rate is a reason why much of the gucchhi trade seems to have gone underground. There is, therefore, a need to review these export permit rates for gucchhi and bring about a more transparent system in its trade.

9.13 POLICY ON INTRODUCTION OF MEDICINAL TREES IN FORESTS It is now the state policy that in different plantations of the forest department about 30% of the trees being planted need to be of medicinal value and also native to the tract where plantation is being done. There is thus a need to identify and grow suitable medicinal trees for different altitude zones in a particular forest division. While most trees may be technically “medicinal”, it is important that species like Deodar, Khair, Chil, etc. which are normally grown in forest plantations are not reckoned as medicinal trees.

9.14 CEDAR OIL The cedar oil is extracted from old Deodar stumps and roots. The oil has multiple applications including, medicinal, cosmetic, insecticidal etc. The extraction of Cedar oil has been allowed by the Govt. to M/S Mediroma Nilgeritis since 1908-09 The detail of stumps handed over and oil extracted is given as under:-

Extraction of Cedar Oil from Kullu Forest Division

Year	No. of stumps	Weight (Qtls.)	Royalty (Rs.`)	Oil extracted (Kg)
1998-99	415	1470.4	280316	-
1999-00	158	701.15	128584	6515
2000-01	758	1616.1	233196	6190
2001-02	1513	2278.8	328831	10486
2002-03	2197	3290	474747	11039
2003-04	2676	4094	590838	16640
2004-05	4095	5880.2	848507	19820
2005-06	4553	8754.2	1263234	62200

9.15 CALCULATION OF YIELD No yield can be prescribed as the most NTFPs are extracted through right holders. However, proper record of all the NTFPs exported through Panchayats and the department, should be maintained annually and entered in respective compartment history files.

9.16 SUBSIDIARY SILVICULTURAL OPERATIONS As no silvicutural system is prescribed, no specific operations are proposed. However, when the medicinal plants are raised in the nurseries or plantations, the regular operations like closure, weeding, bush cutting, protection from fire, grazing etc. are to be carried as in case of tree species.

9.17 MISCELLANEOUS REGULATIONS

This includes extraction or collection and export of NTFP's. The collection of NTFPs is allowed strictly as per provisions of Settlement report. The export is allowed under HP Forest Produce Transit (Land Rout) Rules, 1978 against payment of specified export permit fee.

CHAPTER-X

MISCELLANEOUS REGULATIONS

10.1 PETTY FELLINGS The felling of petty nature as detailed below may be treated as prescriptions of this working plan:-

1. Dry or green trees required to meet bonafide requirement of local people including the right holders and others.
2. Dry or green trees for ordinary departmental use or for other Govt. departments.
3. Dry or green trees to meet special free grant for construction of houses damaged/destroyed by natural calamities like fires, lightening etc. as per settlement provisions or as per Govt. orders.
4. The felling of dry or green trees after getting felling permission of competent authority under Forest Conservation Act, 1980.

All the trees and poles marked for such purpose shall be recorded in the respective compartment history files and such fellings will appear in the control forms. The silvicultural principles shall be strictly adhered to while carrying out such marking.

10.2 DEVIATIONS Any large or unusual felling operation not prescribed in the Working plan will be a deviation requiring prior sanction of the competent authority. The deviations may be due to:-

1. Large scale damage by snow, fire and wind storms.
2. Special fellings to meet the sudden unexpected heavy demand of particular industries or for security/defence purposes.
3. Large scale felling of trees coming in the alignment of major roads or transmission lines or hydro-electric projects.

10.3 ROADS AND PATHS

10.3.1 ROADS: - Generally, the construction of roads for public utility is undertaken by the PWD in the tract. However, if needed, small roads to meet the forest management requirement can be undertaken sparingly.

10.3.2 BRIDLE AND INSPECTION PATHS A number of bridle and inspection paths covering all important forests have been constructed in the past. The existing roads and paths are detailed in Volume-II. These should be kept well maintained as these act as fire lines. The inspection path should be constructed as far as possible along contours in such a way that whole of the forest is covered.

10.3.3 BUILDINGS A number of new buildings of various types have been constructed in the recent past. However, there is still a necessity of some more inspection huts and buildings for field staff. Some of the forest guard huts are in very bad condition which should be reconstructed. The existing and proposed new constructions are given in Volume –II. The existing rest houses and inspection huts are poorly furnished. Keeping in view the allotment of funds, these should be furnished adequately.

10.4 DEMARCATION AND SURVEY All the demarcated and un-demarcated protected forests are well demarcated and brought on 1:15000 scale survey sheets by the Survey of India. The area is also covered by 1:50000 scale maps.

10.5 FOREST BOUNDARIES The state of boundaries of forests is not satisfactory. The boundary registers are not maintained properly. The boundary pillars are not maintained on desired lines. As already recommended, the use of Global Positioning System (GPS) is the need of the hour for correct positioning of boundary pillars. The field staff must check the forest boundaries frequently. It is recommended that the forest guard will conduct complete annual checking of the boundaries of all forests and make a report to the Block Officer who in turn shall check at least 20% forests of his block complete in all respects at least once a year and make report to the Range Forest Officer. Similarly the range officer will conduct complete checking of 20% forests in his range in a year and shall make a report to the DFO.

10.5.1 A quiquennial programme for the repair and checking of boundary pillars and chak pillars have been prepared as under:-

Year	RF	1st Class DPF	2nd Class DPF	Newly Notified DPF
Manali Range				
2013-14	-	1/1	2/1 to 2/4	
2014-15	-	1/2 to 1/3	2/7 to 2/9	
2015-16	R/5	1/4	2/10 to 2/12	
2016-17	-	1/5	2/13 to 2/16	
2017-18	R/6	1/6,1/7 & 1/8	2/17	
Naggar Range				
2013-14	-	1/9 to 1/11	2/18 to 2/20	-
2014-15	-	1/12 to 1/14	2/21 to 2/22	-
2015-16	-	1/15 to 1/18	2/23	-
2016-17	-	1/19 to 1/21	2/24 to 2/25	-
2017-18	-	1/22 to 1/24	2/26 to 2/27	-
Patlikuhl Range				
2013-14	-	1/25	2/35	-
2014-15	-	-	2/36 to 2/37	-
2015-16	-	-	2/38 to 2/39	-
2016-17	-	-	2/40 to 2/41	-
2017-18	-	-	2/42 to 2/43	-
Kullu Range				
2013-14	-	1/26 to 1/27	2/33	
2014-15	-	1/28	2/44 to 2/45	
2015-16	-	1/29 to 1/30	2/46	
2016-17	-	1/31 to 1/32	2/47	
2017-18	-	1/39 to 1/40	2/48	
Bhutti Range				
2013-14	R/7	1/36	2/49 to 2/50	
2014-15	-	1/37	2/51 to 2/53	

2015-16	-	1/38	2/54 to 2/56	
2016-17	-	1/41	2/57 to 2/59	
2017-18	-	-	2/60 to 2/62	

In addition, the boundary pillar construction in all the New DPF's should be given top priority as these NDPF's are prone to encroachment.

10.6 MAPS The demarcated and un-demarcated protected forests have been stock mapped on 1:15000 scale. The stock maps have been filed in compartment history files.. The management map on 1:50000 scale has been prepared by making use of survey sheets.

10.7 RAIN GAUGES AND SNOW GAUGES No rain & snow gauge has been installed in this division. Since this data is being collected by many institutions/departments. Therefore, no need of investing time, labour and finances on this activity.

10.8 MISCELLANOEUS

SEED STANDS Following seed stands have already been identified and should be maintained properly. The names of forests are as under:-

Range	Block/beat	Species	Forest & compptt.	Area (in ha)	Remarks
Manali	Vashishat/ Vashishat	Deodar	1/4 Dudlu C-IV	28.3	
Naggar	Naggar/ Janna	Kail	1/24 Ledichalon C-II	16.19	
Naggar	Hallan/ Barashai	Kail	1/14 Padra Dhanach (Whole)	23.47	
Naggar	Hallan/ Sarsei	Kail	1/18 Janghar Kalon C-II	42.49	
Naggar	Naggar/ Naggar	Deodar	1/19 Naggar Jhir C-II	13.4	
Kullu	Kais/ Borsu	Deodar	1/31 Borsu C-II	36.42	

PRESERVED AND MONUMENTAL TREES:- Such historical, large sized/giant trees of important conifer and broad leaved species if found should be declared preserved and recorded, photographed, provided with a sign board giving its basic information.

TEMPLE GROVES:- All the temple grooves should be preserved irrespective of the species. No trees shall be felled from the temple groove.

TIMBER FOR RIGHT HOLDERS:- The genuine demand of right holders should be met as per provisions of settlement report, Govt. orders/instructions

TIMBER/ FUELWOOD SALE DEPOTS: - The HPSFCD Ltd. is operating fuel wood & timber depots at 3 locations. Many Timber sale depots/ Joineries/ Furniture workshops are being operated by private parties after due registration from Forest Department.

10.9 CAT Plans: - There is one CAT plan pertaining to Allain- Duhangan Hydro electric project covering areas of Manali and Naggar Forest ranges. The value of CAT pan amounts to Rs. 6, 05, 82,021/- only. This CAT plan is under implementation since 2005-06. In another CAT plan, pertaining to Kanchanjanga HEP in Patli Kuhal range, amount of Rs. 7004667/-only has been deposited so far. This CAT plan shall be implemented during plan period.

CHAPTER XI

CONTROL AND RECORD

To ensure the proper implementation of the prescriptions of the plan, the following record will be maintained in the division:-

11.1 COMPARTMENT HISTORY FILES The compartment history files of all the demarcated and un-demarcated protected forests have been prepared afresh. The un-demarcated protected forests converted in to New DPF's during plan period have been described for the first time. The new descriptions, enumeration results, allotment, prescriptions, stock maps have been filed in the divisional as well as range copies of compartment history files. Entries of all the work done should be posted by range officers in range CH files and then divisional CH files are also updated accordingly. Important notes on silvicultural operations, markings, TD markings, regeneration progress and other cultural and subsidiary operations are to be recorded in CH files every year and notes by the inspecting officers also appended. RO shall ensure timely updating.

11.2 CONTROL FORMS To exercise proper check and control on the prescriptions of the working plan, the Divisional Forest Officer will submit the control forms 2a, 2b, 4 and C annually to the Conservator of Forests in accordance with the instructions laid down in Punjab Forest Leaflet No. 11. The control forms must be completed and submitted to CF in duplicate in the first quarter of the following year. Each compartment history file will have control forms "A" and "B" (Exploitation) and control form "C" (Regeneration and plantation works) and forest journal control form 2a, 2b and 4. Control forms are maintained for the control of the following –

- Fellings:- Standard control form 2(a) (Volume control) and 2(b) (Area control) will be maintained.
- Subsidiary operations:- Control form 4 will be maintained for roads and buildings.
- Regeneration and plantation works:- Control form 'C' will be maintained for all regeneration and plantation areas. Regeneration survey results are to be submitted for all PBI areas on 1:15000 scales, along with control forms.

Summary of deviations for sanction of Pr.CCF, are to be submitted along with the control forms, on standard form. The DFO must submit through his Conservator detailed explanation for any deviation, especially with regard to pace of fellings and progress of regeneration.

11.3 PLANTATION, NURSERY AND SOIL CONSERVATION JOURNALS:

1) REGISTER OF ROADS, PATHS AND BUILDINGS The register of roads, paths and buildings existing as well as new constructions will be maintained showing the year of construction, cost and other important details.

2) FOREST GUARD MANUAL/BEAT BOOK The range officers shall see that all the beat guards keep and carry copies of maps of forests of their beats and other record mentioning various details like area, allotment, prescriptions, and particulars of rights of local people forest-wise, order issued from time to time and other important details of the beat. The further instructions as laid down in Punjab Forest Manual III shall be kept in mind.

3) RESEARCH JOURNAL The research journals should be maintained in each division and relevant research activities conducted/undertaken should be entered.

4) PLANTATION/SOIL CONSERVATION JOURNAL Wherever sowing, planting and soil conservation works have been carried out, journals shall be maintained indicating the details of works done from time to time along with cost. Printed plantation general supplied by PCCF

should be maintained and updated every year. The old plantation general should be kept in record properly by maintaining a register of all such plantation generals at range level. The location, legal status, boundaries, configuration, aspect, slope rock, geology, soil etc should be mentioned along with details of species planted, operations carried out and expenditure incurred. Maintenance done should also be entered in plantation generals. Inspection notes/ remarks of senior officers be kept as future record.

5) NURSERY JOURNAL A nursery journal for each nursery shall be maintained wherein the details of all the nursery operations like sowing, germination, weeding, pricking etc. shall be incorporated along with cost.

6) FIRE RECORDS A record of fires should be maintained according to the standing orders in force from time to time. The damage caused by fire to the forests should be properly described and corrective measures required should be taken and documented properly.

7) RECORD OF CAPITAL EXPENDITURE A record of capital expenditure on roads, buildings and other works shall be maintained in the prescribed form and separate registers should be maintained.

8) FOREST SETTLEMENT FILES All the forest settlement files should be well preserved and kept under the safe custody of ACF/Superintendent of the division. The efforts done by Forest settlement officers in past to declare UPF in to NDPF and its record files should be kept properly.

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Chapter XII

SUMMARY OF PRESCRIPTION

The following is the Summary of Prescriptions:-

Heading	Prescription	Paragraph	Page
	Deodar/Kail Working Circle		
Silvicultural system	Punjab Shelterwood System in which natural regeneration will be supplemented with artificial regeneration.	2.11	122
Regeneration period	30 years	2.15	123
Rotation (Exploitable diameter conversion period)	Exploitable diameter is 60cm d.b.h and rotation has been fixed as 120 years.	2.13	122-123
Division into periodic blocks	Four periodic blocks have been formed	2.16	123-125
Calculation of yield	Yield has been calculated by volume for P.B.I (A group), P.B.IV and P.B. III.	2.19	126
Prescribed annual yield	The prescribed annual yield in m^3 is as under:	2.19.5	129
Species	Final yield in m^3 Inter yield in m^3		
	P.B.I P.B.IV P.B.III Total		
Deodar	4300 1900 1600 7800		
Kail	3400 2400 600 6400		
Fir/spruce	3100 3100 200 6400		
Chil	38 20 200 258		
Total	10888 7420 2600 20858		
Control of yield	Control of yield for a period of 5 years and plan period to be +/- 10%.	2.22	133
Method of executing felling in P.B.I	General principles lay down.	2.21.1	131
Method of executing felling in P.B.III	General principles lay down with thinning prescribed.	2.21.3	132
Method of executing felling in P.B.IV	General principles lay down.	2.21.4	132
Sequence of felling.	Felling programme has been laid.	2.20	130
Subsidiary silvicultural operations in P.B.I	Works as per general principles.	2.23	133
Artificial regeneration in P.B.I	Carried out to supplement natural regeneration.	2.24	133
Miscellaneous	Effective closure of all P.B.I areas	2.25	134

regulations.	prescribed.		
Right holder requirements	Requirements to be met with as per Settlement.	2.25.4	134-135
Fire protection	Areas to be protected from fire.	2.25.5	135
Regeneration survey	Regeneration survey of felled P.B.I areas to be carried out every year on 1:3750 scales for assessment of the progress of regeneration.	2.25.6	135
FIR WORKING CIRCLE			
Silvicultural system	Punjab Shelterwood System in which natural regeneration will be supplemented with artificial regeneration.	3.10	141
Regeneration period	30 years	3.13	141
Rotation (Exploitable diameter conversion period)	Exploitable diameter is 60cm d.b.h. and rotation has been fixed as 120 years.	3.11	141
Division into periodic blocks	Four periodic blocks have been formed.	3.14	141
Calculation of yield	Yield has been calculated by volume for P.B.I	3.16	147
Prescribed annual yield	The prescribed annual yield in m^3 is as under:	3.16.3	148
Species	P.B.I P.B.IV Total		
Fir/spruce	9000 1700 10700		
Control of yield	Control of yield for a period of 5 years and plan period to be +/- 10%.	3.16.5	149
Sequence of felling.	Felling programme has been laid.	3.17	149
Method of executing felling in P.B.I	General principles lay down.	3.18.1	149
Method of executing felling in P.B.IV	General principles lay down.	3.18.2	149
Method of executing felling in P.B.III	General principles lay down with thinning prescribed.	3.18.3	149
Subsidiary silvicultural operations in P.B.I	Works as per general principles.	3.20	150
Artificial regeneration in P.B.I	Carried out to supplement natural regeneration.	3.21	150
Statement showing areas requiring immediate attention.	List of areas to be treated.	3.21.2	153
Miscellaneous regulations.	Effective closure of all P.B.I areas prescribed.	3.22	156
Right holder requirements	Requirements to be met with as per Settlement.	3.22.3	156
Fire protection	Areas to be protected from fire.	3.22.4	156

Regeneration survey	Regeneration survey of felled P.B.I areas to be carried out every year on 1:3750 scales for assessment of the progress of regeneration.	3.22.5	156
PROTECTION WORKING CIRCLE			
Method of treatment	Defined	4.9	159
Grazing	Defined	4.10	160
Fire protection	Defined	4.11	160
Miscellaneous regulations	Closures suggested for carrying out sowing/planting in degraded areas.	4.12	160
BROAD-LEAVED (OVER LAPPING) WORKING CIRCLE			
Silvicultural system	No system needed	5.5	162
Choice of species	Restocking with valuable B.L.	5.6	162
Artificial regeneration	Planting of broadleaved trees in suitable area suggested	5.7	163
GRAZING AND IMPROVEMENT WORKING CIRCLE			
Method of treatment	Treatment of alpine pastures suggested	6.7	168
Afforestation and rehabilitation of IIIrd class areas	Afforestation of degraded IIIrd class forests suggested	6.8	169
Prescription for new DPFs	Extent of area and species	6.10	171
MISCELLANEOUS REGULATIONS			
Petty fellings	Petty fellings have been defined	10.1	199
Deviation	Deviation defined and regulation made regarding the same.	10.2	199
Demarcation and survey	Checking of boundaries of the demarcated forests with the help of their maps and preparation of boundary registers has been prescribed. Survey and demarcation of undemarcated forests has been suggested.	10.4	200
Forest boundaries	A quinquennial programme for checking of forest boundaries has been prescribed.	10.5	200
Roads/ bridle paths/ contour paths and inspection paths.	Maintenance suggested	10.3.1 & 10.3.2	199
Buildings	Suggestion added.	10.3.3	199
Meteorological data	Rain/ snow gauges suggestions.	10.7	201
Miscellaneous i.e. Research and Sample plots, Seed stands, Monumental trees, Temple groves, Fire protection	Listing up of genetically superior trees suggested. Preservation and listing required. No fellings to be allowed from here. Fire lines, fire watchers employment, etc.	10.8	201
CONTROL AND RECORDS			
Control forms	Maintenance of control forms for fellings,	11.2	202

	subsidiary operations and regeneration works suggested.		
Compartment history files	Proper maintenance and updating prescribed.	11.1	202
Plantation journals and other forms i.e. Register of books and maps, Registers of RF and DPF, Register of roads and buildings, Fire records, Divisional note books, Forest guard beat manual	To be maintained	11.3	202-203

Sd/- (A.K. Sharma) Working Plan Officer, Working Plan Division, Kullu (H.P.)	Sd/- (----------) Conservator of Forests, Working Plan Circle, Kullu (H.P.)	Sd/- (----------) C.C.F.(Working Plan & Settlement), Shimla (H.P.)
Sd/- (----------) Divisional Commissioner, Mandi (H.P.)	Sd/- (----------) Deputy Commissioner, Kullu (H.P.)	Sd/- (R.K. Gupta) Principal Chief Conservator of Forests, Shimla (H.P.)