#### INTRODUCTION

Bhadarwah Forest Division is located in the Middle Himalaya and is predominantly a mountainous tract. It is endowed with vivid physiographic and climatic conditions. The micro-climatic variation influenced by altitude, aspect, degree of slope, soil condition, rainfall pattern etc. have rendered the division with a rich repository of biodiversity. It is a natural habitat of Black Cedar which is a best quality of Deodar in the state. The tract is blessed with bewitching natural beauty owing to lush green beautiful forests with intervening fresh water streams, for which it is recognized with a nickname "*Chotta Kashmir*".

Bhadarwah was a territory of Chamba State. It was acceded to Maharaja Gulab Singh in 1846 A.D. In 1930 after the recommendation of Private Domain Assimilation Committee, the Jagir status of Bhadarwah was changed. Consequently Bhadarwah became a Tehsil of Udhampur district in 1931 A.D. and the Jagir forests were amalgamated with the State forests. As such the Bhadarwah Forest Division is antecedental.

The forests of Bhadarwah have faced unprecedented vagaries of humans inflicted damage during the period of last Working Plan that coincided with the intervening period of militancy. This period ushered a tale of plunder of green wealth of Bhadarwah with deodar trees facing the brunt owing to its finest timber quality. Indiscriminate lopping of Deodar for fuel wood because of its high calorific value of wood is common that render considerable mutilation to a tree and consequent death. The desire to construct palatial houses that consume abnormal quantity of timber that cannot be met by legal sources, result in illegal damage. Another big issue faced by the Division is nefarious activities of girdling trees around *Chaks* practiced to enable cultivation rights up to extreme limits, a prelude to encroachment of forest land.

The process of layout and delimitation of forest boundaries was undertaken by Bhadarwah Forest Division during the year 2011. Out of total 479 Sample Plots, 418 (87%) have been enumerated by Bhadarwah Forest Division (T) and remaining 61 (13%) have been enumerated by WPO Working Plan Division-III, Chenab Circle, Doda. The entire exercise was carried out with a difficulty of shortage of staff. Bhadarwah Forest Division has poor maintenance of records, unorganized and incomplete. The Stock Maps, Compartment Description and Compartment History could not be traced.

The revision of Working Plan for Bhadarwah Forest Division is being taken up in this changed scenario. The previous plan, written by Sh. A.K.Singh, IFS, covered the period from 1986-87 to 1996-1997 extended upto 2015-16. The working circles constituted in the last plan have been

continued with necessary addition and alterations, graduating to the addition of Reboisement Working Circle and necessary mandatory overlapping Working Circles. Yield calculations have been kept on the conservative side, keeping with the need for environmental conservation and sustainable development.

The exercise of revising this plan involved a lot of teamwork. The Working Plan Officer (WPO) is highly indebted to Sh. A.K. Singh, IFS, Principal Chief Conservator of Forests, J&K for entrusting the responsibility in carrying out this prestigious assignment.

The WPO takes this opportunity to place on record his heartfelt gratitude towards the Chief Conservators of Forests, Working Plan and Research Circle, Sh. R.S. Jasrotia, IFS, for his constant guidance and moral support.

In the compilation of this plan the WPO has benefitted immensely from the constant guidance of Sh. Vasu Yadav, IFS, for which he deserves special thanks. I owe my debt of gratitude with special thanks to Dr. K. Anand, IFS, Conservator of Forests Working Plan for extending all possible assistance, constant guidance and taking a lot of pain during completion of this plan.

The author takes this opportunity to express sincere gratitude to the Conservator Forests, Chenab Circle, Doda Sh. M.P. Dogra, IFS for extending all kinds of assistance. The author is also thankful to DFO Bhadarwah, his field and office staff especially Sh. Raj Kumar for necessary cooperation.

I would like to thank Sh. Kuldeep Mehta, Survey Officer, PI Division, Jammu for his valuable contribution in the composition of maps

In the end, I would like to record my sincere thank to the staff who remained associated with this Division, and were actively involved in the revision exercise. This plan is a result of the efforts put in by the Range officers Sh. Rakeshwar Singh Rana, and Sh. Sanjeev Kumar, who did a commendable job not only in the field, but also during the compilation of this plan.

(Chander Shekhar) Divisional Forest Officer/ Working Plan Officer Working Plan Division-III

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# **GLOSSARY OF FLORA**

#### 1. Trees of Bhadarwah Forest Division

S. No.	Common Name	Botanical Name	Family
1	Akhrot	Juglans regia	Juglandaceae
2	Bankhor	Aesculus indica	Sapindaceae
3	Braari	Ulmus wallichiana	Ulmaceae
4	Bren	Ulmus villosa	Ulmaceae
5	Brimij	Celtis australis	Cannabaceae
6	Chaamp	Alnus nitida	Betulaceae
8	Deodar	Cedrus deodara	Pinaceae
9	Fir	Abies pindrow	Pinaceae
10	Haadi	Prunus armeniaca	Rosaceae
11	Hatab	Parrotiopsis jacquemontiana	Hamamelidaceae
12	Heru	Quercus ilex	Fagaceae
13	Kahu	Olea cuspidate	Oleaceae
14	Kail	Pinus wallichiana	Pinaceae
15	Kakarsinghi	Pistacia integerrima	Anacardiaceae
16	Kanjal	Acer caesium	Sapindaceae
17	Postul	Taxus baccata	Taxaceae
18	Shisham	Dalbergia sissoo	Fabaceae
19	Spruce	Picea smithiana	Pinaceae
20	Trikanni	Acer pictum	Sapindaceae
21	Tung	Cotinus coggygria	Anacardiaceae
22	White willow	Salix alba	Salicaceae
23	Zum	Prunus cornuta	Rosaceae

#### 2. Common Medicinal Plants of Bhadarwah Forest Division

S.No.	Common Name	Botanical Name	Family
1	Agg jari	Saxifraga jacquemontiana	Saxifragaceae
2	Ban tambaku	Verbascum thapsus	Scrophulariaceae
3	Banafsha	Viola odorata	Violaceae
4	Bankakdi	Podophyllum hexandrum	Berberidaceae
5	Belladonna	Atropa belladonna	Solanaceae
6	Bhang	Cannabis sativa	Cannabanaceae
7	Bhutyata	Corydalis govaniana	Papaveraceae
8	Brand	Phytolacca acinosa	Phytolaccaceae
9	Chalander	Viburnum grandiflorum	Adoxaceae
10	Chora	Angelica glauca	Apiaceae
11	Chukri	Rheum australe	Polygoniaceae
12	Chuku	Oxalis corniculata	Oxalidaceae
13	Dand jari	Rhodiola himalensis	Crassulaceae
14	Dhad Kopdi	Bergenia stracheyi	Saxifragaceae
15	Feku	Ficus palmata	Moraceae
16	Gaddo	Salvia moorcroftiana	Lamiaceae
17	Guggal	Jurinea dolomiaea	Asteraceae

S.No.	Common Name	Botanical Name	Family
18	Gul-e-snobar	Geranium wallichianum	Geraniaceae
19	Hamesh bahar	Calendula officinalis	Asteraceae
20	Handh	Taraxacum officinale	Asteraceae
21	Hillu	Impatiens glandulifera	Balsamiaceae
22	Jarjam	Sanecio chrysanthemoides	Asteraceae
23	Kaimal	Berberis lyceum	Berberidaceae
24	Kala zeera	Bunium persicum	Apiaceae
25	Kahjuban	Arnebia benthami	Boraginaceae
26	Kalishadi	Daphne oleoides	Thymelaeaceae
27	Kanhaji	Sorbaria tomentosa	Ranunculaceae
28	Kareel Kaimbul	Berberis aristata	Berberidaceae
29	Kesar	Crocus sativus	Iridaceae
30	Kim	Morina longifolia	Dipsacaaceae
31	Kinns	Diascorea deltoidea	Dioscoreaceae
32	Kour	Picrorhiza Kurrooa	Scrophulariaceae
33	Kuppad jari	Sedum ewersii	Crassulaceae
34	Kuth	Saussurea lappa	Asteraceae
35	Mooin	Artemisa maritime	Asteraccae
36	Mori	Delphinium roylei	Ranunculaeeae
37	Mulam	Inula royeleana	Asteraceae
38	Murma	Valeriana dubia	Valerianaceae
39	Nag Rus	Acorus calamus	Araceae
40	Neel Kanth	Ajuga bracteosa	Lamiaceae
41	Nichni	Rhododendron campannalatum	Ericaceae
42	Patrishi	Aconitum heterophyllum	Ranunculaceae
43	Postul	Taxus baccata	Taxaceae
44	Sapp Google	Arisaema flavum	Araceae
45	Shemar	Desmodium elegans	Leguminosae
46	Sheshak	Rhabdosia rugosa	Lamiaceae
47	Shutenger	Rhododendren anthopogon	Ericaceae
48	Suchal	Malva neglecta	Malvaceae
49	Tatnu	Caltha palustris	Rannnculaeeae

# 3. Common Flowering Herbs of Bhadarwah Forest Division

S. No.	Common name	Botanical name	Family
1	Avens	Geum elatum	Rosaceae
2	Baby's breath	Gypsophila cerastioides	Caryophyllaceae
3	Black Henbit, Henbane,	Hyoscyamus niger	Solanaceae

S. No.	Common name	Botanical name	Family
4	Bladder Campion	Silene vulgaris	Caryophyllaceae
5	Burdock	Arctium lappa	Asteraceae
6	Cinquefoil	Potentilla argyrophylla	Rosaceae
7	Cow Parsnip	Heracleum candicans	Apiaceae
8	Crame's bill flower	Geranium pratense	Geraniaceae
9	Cudweed	Gnaphalium hypoleucum	Asteraceae
10	Dandelion	Taraxacum officinale	Asteraceae
11	Darnel grass	Lolium temulentum	Poaceae
12	Foreget-me-Not	Myosotis sylvatica	Boraginaceae
13	Golden Rod	Solidago virgaurea	Asteraceae
14	Granny's Bonnet	Aquilegia fragrans	Ranunculaceae
15	Groundsel	Senecio chrysanthemoides	Asteraceae
16	Helleborine	Epipactis latifolia	Orchidaceae
17	Helleborine Orchid	Epipactis wallichii	Orchidaceae
18	Hound's Tongue	Cynoglossum zeylanicum	Boraginaceae
19	Kashmir Sage	Salvia hians	Lamiaceae
20	Larkspur	Delphinium vestitum	Ranunculaceae
21	May Apple	Podophyllum hexandrum	Berberidaceae
22	Milkvetch	Astragalus	Fabaceae
23	Millfoil	Achillea millefolium	Asteraceae
24	Mountain Sorrel	Oxyria digyna	Polygonaceae
25	Nepal Cinquefoil	Potentilla nepalensis	Rosaceae
26	Nepal Dock	Rumex nepalensis	Polygonaceae
27	Northern Bedstraw	Galium boreale	Rubiaceae
28	Pink Evening Primrose	Oenthera rosea	Onagraceae
29	Red Clover	Trifolium pretense	Fabaceae
30	Rock splitter	Bergenia stracheyi	Saxifragaceae
31	Silky Woundwort	Stachys sericea	Lamiaceae
32	St. John's Wort	Hypericum perforatum	Hypericaceae
33	Sun Spurge,	Euphorbia helioscopia	Euphorbiaceae
35	Wallich's Willow Herb	Epilobium wallichianum	Onagraceae
36	White spotted Lousewort	Pedicularis punctata	Orabanchaceae
37	Wild Indigo	Indigofera heterantha	Fabaceae
38	Wild Lettuce	Lactuca longifolia	Asteraceae
39	Wild Rose	Rosa webbiana	Rosaceae
40	Wild Strawberry	Fragaria nubicola	Rosaceae

# **GLOSSARY OF FAUNA**

S. No.	Common Name	Scientific Name
1	Beach of Stone Marten	Martes foina
2	Brown Bear	Ursus arctos
3	Common Langur	Semnopithecus entellus
4	Himalayan Black Bear	Ursus thibetanus
5	Himalayan Marmot	Marmot bobak
6	Himalayan Mouse Hare	Ochotona roylei
7	Himalayan Yellow Throated Marten	Martes flavigula
8	Ibex	Capra ibex
9	Jackal	Canis aureus
10	Jungle Cat	Felis chaus
11	Leopard	Panthera pardus
12	Long Tailed Marmot	Mamot caudate
13	Musk Deer	Moschus chrysogaster
14	Red Fox	Vulpes vulpes
15	Snow Leopard	Uncia uncial
16	Kashmir Grey Langur	Semnopithecus ajax

#### 1. Mammals of Bhadarwah Forest Division

#### 2. Birds of Bhadarwah Forest Division

S. No.	Common Name	Scientific name	Family
1	Alpine accentor	Prunella collaris	Muscicapidae
2	Alpine swift	Tachymarptis melba	Apodidae
3	Bearded vulture or	Gypaetus barbatus	Accipitridae
	Lammergerier		
4	Black and yellow grosbeak	Mycerobas icterioides	Muscicapidae
5	Black redstart	Phoenicurus ochruros	Muscicapidae
6	Black tit	Parus rufonuchalis	Muscicapidae
7	Black-eared Kite	Milvus migrans	
8	Black-naped green	Picus canus	Dicidae
	wood-pecker		
9	Blue rock pigeon	Columba livia	Columbidae
10	Blue Rock Pigeon	Columba livia	
11	Blue rock thrush	Monticola solitarius	Muscicapidae
12	Blue whistling thrush	Myophonus caeruleus	Muscicapidae
13	Blue-headed redstart	Phoenicurus	Muscicapidae
		caeruleocephala	
14	Blyth's leaf warbler	Phylloscopus reguloides	Muscicapidae
15	Booted eagle	Hieraaetus pennatus	Accipitridae
16	Brown bullfinch	Pyrrhula nipalensis	Muscicapidae
17	Brown dipper	Cinclus pallasii	Muscicapidae
18	Cheer pheasant	Catreus wallichi	Falconidae
19	Chukar patridge	Akectirus chukar	Falconidae
20	Cinamon tree sparrow	Passer rutilans	Muscicapidae
21	Collared grosbeak	Mycerobas affins	Muscicapidae
22	Common cuckoo	Cuculus canorus	Cuculidae
23	Common kingfisher	Alcedo atthis	Alcedinidae

S. No.	Common Name	Scientific name	Family
24	Common myna	Acridotheres tristis	Sturnidae
25	Crested black tit	Parus melanolophus	Muscicapidae
26	Crested lark	Galerida cristata	Alaudidae
27	Dusky craig-martin	Hirundo concolor	Hirundinidae
28	Eagle owl	Bubo bubo	Strigidae
29	European roller	Coracias garrulous	Coracidae
30	Fire capped tit	Cephalopyurs flammiceps	Muscicapidae
31	Gold billed blue magpie	Urocissa flavirostris	Corvidae
32	Gold crest	Regulus regulus	Muscicapidae
33	Golden eagle	Aquila chrysaetos	Accipitridae
34	Golden oriole	Oriolus oriolus	Oriolidae
35	Green backed tit	Parus monticolus	Muscicapidae
36	Grey- headed flycatcher	Culicicapa ceylonensis	Muscicapidae
37	Grey headed thrush	Turdus rubrocanus	Muscicapidae
38	Grey tit	Parus major	Muscicapidae
39	Grey wagtail	Motacilla cinerea	Muscicapidae
40	Grey winged blackbird	Turdus boulboul	Muscicapidae
41	Griffon vulture	Gyps fulvus	Accipitridae
42	Himalayan Bearded	Gypaetusbarbatus	
	Vulture	hemachalanus	
43	Himalayan Golden Eagle	Aquila chrysaetos	
44	Himalayan Griffon Vulture	Gyps himalayensis	
45	Himalayan monal	Lophophorus impejanus	Falconidae
46	Himalayan pied wood-	Dendrocopos himalayensis	Dicidae
	pecker		
47	Himalayan Rufous Turtle	Streptopelia orientalis	
	Dove	meena	
48	Himalayan snowcock	Tetraogallus Himalayensis	Falconidae
49	Himalayan swiftlet	Collocalias brevirostris	Apodidae
50	Himalayan tree-creeper	Certhia discolor	Muscicapidae
51	Hodgson's mountain finch	Leucosticte nemoricola	Muscicapidae
52	Ноорое	Upupa epops	Upupidae
53	House crow	Corvus splendens	Corvidae
54	House sparrow	Passer domesticus	Muscicapidae
55	House swift	Affinis	Apodidae
56	India white-backed vulture	Gyps bengalensis	Accipitridae
57	Indian cuckoo	Cuculus micropterus	Cuculidae
58	Indian ring dove	Stretopelia decaocto	Columbidae
59	Indian tree pie	Dendrocitta vagabunda	Corvidae
60	Jungle crow	Corvus macrorhynchos	Corvidae
61	Kashmir nuthatch	Sitta cashmirensis	Muscicapidae
62	Kashmir red breasted	Ficedula subrubra	Muscicapidae
6.0	Flycatcher		<b>P</b> 4 4 4
63	Kestrel	Falco tinnunculus	Falconidae
64	Kıklas	Pucrasia macrolopha	a 11.1
65	Koel	Eudynamys scolopaceas	Cuculidae
66	Koklass pheasant	Pucrasia macrolopha	Falconidae
67	Lesser pied kinglisher	Ceryle rudis	Alcedinidae
68	Linnet	Carduelis cannabina	Muscicapidae
69	Little forktail	Enicurus scouleri	Muscicapidae
1 70	Little owl	Athene noctua	Striaidae

S. No.	Common Name	Scientific name	Family
71	Little pied flycatcher	Ficedula westermanni	Muscicapidae
72	Long-eared owl	Asio otus	Strigidae
73	Monal Pheasant	Lophophorus impeajanus	
74	Olivaceous leaf-warbler	Phylloscopus griselous	Muscicapidae
75	Orange bullfinch	Pyrrhula aurantiaca	Muscicapidae
76	Orange flanked bush-robin	Tarsiger cyanurus	Muscicapidae
77	Pallas leaf-warbler	Phylloscopus proregulus	Muscicapidae
78	Paradise flycatcher	Terpsiphone paradise	Muscicapidae
79	Pariah kite	Milvus migrans govinds	Accipitridae
80	Peregrine	Falco peregrines	
81	Pied or white wagtail	Motacilla alba	Muscicapidae
82	Pink-browed rosefinch	Carpodacus rodochrous	Muscicapidae
83	Plain leaf-warbler	Phylloscopus neglectus	Muscicapidae
84	Plain or yellow browned	Phylloscopus inornatus	Muscicapidae
	leaf-warbler		
85	Plumbeous water-redstart	Rhyacornis fuliginosus	Muscicapidae
86	Red jungle fowl	Gallus gallus	Falconidae
87	Red turtle dove	Stretopelia tranquebarica	Columbidae
88	Red-breasted rosefinch	Carpodacus puniceus	Muscicapidae
89	Red-headed bullfinch	Pyrrhula erythrocephala	Muscicapidae
90	Red-mantled rosefinch	Carpodacus rhodochlamys	Muscicapidae
91	Rofous backed shrike	Lanius schach	Lanidae
92	Rose ringed parakeet	Psittacula krameri	Psittacidae
93	Rufos-streaked accentor	Prunella himalayana	Muscicapidae
94	Rufous trustle dove	Stretopelia orientalis	Columbidae
95	Rufous-tailed flycatcher	Muscicapa ruficauda	Muscicapidae
96	Scaly-bellied green	Picus squamatus	Dicidae
	wood-pecker		
97	Shikra	Accipiter badius	
98	Slaty blue flycatcher	Muscicapa leucomelana	Muscicapidae
99	Slaty headed parakeet	Psittacula himalayana	Psittacidae
100	Snow patridge	Larwa lerwa	Falconidae
101	Snow pigeon	Columba leuconota	Columbidae
102	Sparrow hawk	Accipiter nisus nisosimilis	Accipitridae
103	Spot winged grosbeak	Mycerobas melanozanthos	Muscicapidae
104	Spotted dove	Stigmatopelia chinensis	Columbidae
105	Spotted forktail	Enicurus maculates	Muscicapidae
106	Starling	Sturnus vulgaris	Sturnidae
107	Swallow	Hirundo rustica	Hirundinidae
108	Swift	Apus apus	Apodidae
109	Tickell's leaf-warbler	Phylloscopus affinis	Muscicapidae
110	Tree sparrow	Passer montanus	Muscicapidae
111	Tytler's leaf-warblers	Phylloscopus tytleri	Muscicapidae
112	Variegated laughing thrush	Garrulax variegates	Muscicapidae
113	Western tragopan	Tragopan melanocephalus	Falconidae
114	White breasted kingfisher	Halcyon omyrnensis	Alcedinidae
115	White cheeked bulbul	Pycnonotus leucogenys	Pycnonotidae
		Leucogenys	
116	White cheeked nuthatch	Sitta leucopsis	Muscicapidae
117	White throated tit	Aegithalos leucogenys	Muscicapidae
118	White-breasted dipper	Cinclus cinclus	Muscicapidae

S. No.	Common Name	Scientific name	Family
119	White-browned rosefinch	Carpodacus thura	Muscicapidae
120	White-capped water-	Chairmarrornis	Muscicapidae
	redstart	leucocephalus	
121	White-winged redstart	Phoenicurus erythrogaster	Muscicapidae
122	Wren	Troglodytes troglodytes	Muscicapidae
123	Wryneck	Jynx torquilla	Dicidae
124	Yellow wagtail	Motacilla flava	Muscicapidae
125	Yellow-headed wagtail	Motacilla citreola	Muscicapidae

# **PART-I**

# SUMMARY OF FACTS ON WHICH PROPOSALS ARE BASED

## THE TRACT DEALT WITH

#### 1.1. Name and Situation

1.1.1. This Working Plan deals with the forests of the Bhadarwah Forest Division. The tract lies between north latitudes 32°-50' and 33°-10' and east longitudes 75°-30' and 76°-10' represented on the Survey of India, 1:50,000 GT Sheet Nos. 43 P/9, P/13, O/12, O/16, 52 C/4 and 52 D/I. The forests of this Division are situated on the northern slope of Punchili, Pateran, Padri, Chattardhar, Kaplas and Sunderikot Ranges which forms the southern boundary. In the east it is bounded by inter-state boundary with Himachal Pradesh and to west and South lie the Billawar Forest Division, Ramnagar Forest Division and Udhampur Forest Division. The Chenab river runs practically east to west from Thatri and forms a dividing line between Doda Forest Division and Bhadarwah Forest Division.



Figure-1.1 Map showing the Division with Ranges

1.1.2. Bhadarwah town is the head quarter of the Division and connected with National Highway NH1-B at Pul Doda.

#### 1.2. Configuration of the ground

- 1.2.1. The tract is hilly and consists of a number of small valleys draining through various nallas into the Chenab river. The Eastern parts of this division generally consist of steep to precipitous hilly slope. Altitudinal variation is remarkable with 850m near Pul-Doda and 4343.5 m at Kaplas peak.
- 1.2.2. The entire tract can be divided into the following smaller valleys:

**Neeru valley** (Bhadarwah) lies at the western end of the division, drained through by a small river Neeru and its various small tributories and streams, which is fed by ice and glaciers at Kaplash and Ashapati (Sulbain). Finally Neeru River pours into Chenab at Pul Doda.

**Chiralla valley** lies to North-East of Neeru valley and runs almost parallel to it. This is a small valley which drains directly into the river Chenab through Chiligad.

**Jangalwar** is a tract that runs along left bank of the river Chenab and drains in to it directly through Kalnai stream.

**Jai** is a long and narrow valley lying to the East of Neeru and Chiralla valley. It drains through Jai Gad into Kagunagad.

**Bhalesh** is large tract that lies in the Eastern part of the Division. This tract is drained through by two large streams Chilli and Neeli.

**Padri** is small and almost virgin alpine strip on south-eastern side which that drains into the river Ravi in Himachal Pradesh.

1.2.3. The picturesque landscape of the division attracts the attention of adventurers and tourists from the entire country.

#### 1.3. Geology, Rock and Soil

1.3.1. The area represents a complicated geological history as this tract has undergone intensive folding and faulting and has witnessed many upheavals which resulted in the rise of the middle and great Himalayas. The resultant folds have a general NW-SW to NW-SE axial trend. The Bhadarwah- Thathri-Gandoh area lies south of the Pir

Panjal forming a part of the middle Himalaya. The area has mountainous and rugged topography comprising high ranges, flat, gently or steep sloping, escarpments and cliff faces. The area shows a great variation in elevation with a lowest altitude of 850 m near Pul-Doda and highest point reaching to 4343.5 m at Kaplas peak.

1.3.2. The rock formations exposed in the area are garnetiferous mica schists, gneisses, garnetiferous phyllites, slates limestone, granice, volcanic rocks, terrace scree and glacial deposits. These rocks range in age from precambrian to recant. The generalised sequence exposed in the area is as follow:-

#### Lithological Discription

- 1.3.3. **Salkhala Formation:** The rocks of the Salkhala formation are found in the area. These are composed of low to high grade metamorphosed highly puckerad and crenulated garnetiferous mica schists with quartazite bands at places these are easily susceptible to weathering and are well exposed in Thathri, Gandoh area. Salkhalas are divided into three members which in ascending order are (i) Central gneisses and schists (ii) Garnetiferous quartz mica schists and (iii) Mica schists with bands of Calcitramollite rock.
- 1.3.4. **Bhadarwah Formation**: Bhadarwah formation has been divided into three members which are (i) Garnet phyllites (ii) Bhadarwah slates and (iii) Quartzite. The garnet phyllites have been thrown in deep puckers, corrugation and crenulations which show shearing and slipping along the axial planes. These are well exposed along the Jai Gad, south of Jai Rest House and extended towards Daranga in the west and towards Ludunal south of Kansar in the east. The Bhadarwah slates are well exposed in and around Bhadarwah town and extend through Kalhotran-Tipri and Siru to Bhuja Topi beyond which they merge into the Chamba slates of Tissa area. These are dark gray to grey and carbonaceous. The Sunbaian quartzite is a coarse grained grayish white to greenish massive and hard quartizite. At places slate bands which are gritty and pebbly are also noticed. These rocks form the Sunbaian ridge south east of Bhadarwah.
- 1.3.5. **Kaplas Granites:** An extensive body of granite forms the most prominent physiographic feature of the area. It occurs in the form of an elongate dome which

rises to an elevation of 4500 m above the sea level. It is massive, highly jointed coarse grained porphyritic granite. It shows spheroidal weathering. It extends in a NE-SE direction and is situated south of Bhaderwah town.

- 1.3.6. Langera Conglomerate: It is composed of orthoquartzite conglomerate and lithic grewack. The rock is hard massive and can withstand weathering affects. It can be traced from just south east of Bhadarwah to Langera-Sangad area through Padri pass.
- 1.3.7. Katarigali Formation: It is composed of dark ash grey and bleached carbonaceous ferrogenous and calcareous slates, quartzites and lenticular bands and bodies of Limestones. These are very well exposed in Pasrigali, Katarigali, and Sceppa-Chola Bandhar area and also along Bisrana nala north of the Chound ridge.
- 1.3.8. **Panjal Formation:** These rocks are also divided into two members i.e Agglomeratic slate and Panjal trap. Agglomeratic slates are composed of shales, slates, sandstone limestone and conglomerates with interstratified and infolded bands fo massive trap. These are followed by Panjal Trap, which has fairly wide distribution in the area. The main trap band occupies the highest topographic ridges i.e the Batile Pateran ridge and extends upto Chalipurgali in the south east on a strike length of 15 kms. It is a very hard compact rock and is generally of greenish grey colour.
- 1.3.9. **Tram wala Formation:** It is composed of (i) Talai pebbly sandstones and (ii) Plant bed Talai pebbly band, varying in thickness from 1m to 8m. It is well exposed in Chimlo-di-gali Talai section and is composed of olive green to rusty brown dirty white sandstone and sandy shales.
- 1.3.10. **Gamgul Formation:** It is composed of carbonaceous shales, yellowish calcareous sandstone, shale and shelly impure limestone. These rocks are well exposed alone Ban-Ka-Goth, Gulu-Ki-Maddi and Gamgul-Talai pass.
- 1.3.11. **Dalmon Formation:** It is composed of shale slate interstratified with thinly bedded fine grained grey limestone. Its typical development can be seen around the Dalmon peak (3,515m ASL) and also the Dalmon Bishot and Kiara-Maund Tibba area.
- 1.3.12. **Metamorphism:** The lithological discriptions of the rocks of the Thatri-Gandoh and Bhadarwah area point out that these rocks show progressive increase in the grade of metamorphism from shale slate stage in the youngest rocks of Gamgul and Dalmon

formation to high grade kyanite, sillimanite stage in the oldest rocks of the Salkhala group.

1.3.13. **Mineral Resources:** The following rocks and minerals of economic importance are reported in the area.

**1**. **Building material:-** The rocks which can be used as building material in this area are granite, slates, quartazite and trap unweathered Kaplas granite that can be used as a good construction material.

2. Clays:- Good clays to be used as low grade ceramics for the manufacture of bricks and earth wares are found near Kandilu between Chhatargala and Sarthal. These are brownish in colour and resemble to upper Krewas of Kashmir.

**3. Marbles:-** Some impure marbles bands occur within schists and phyllites between Chinta-Jai Juara-Thathri and Kara.

**4. Limestone:**- Several lenticular bands and bodies of limestone occur within the Katarigali limestone which is of cement grade where the Dalmon limestone is both cement as well as flux grade.

**5. Phosphorite:-** The Gamgul formation shows very good concentration of concretionary nodules in Gamgul-Chimlo-de-Gali area.

**6. Asbestos:**- Flakes of asbestos are noticed in the tremolite actinolite schist in Chinta area of Bhaderwah Tehsil.

**7. Tal:-** One talcose schist band is noted in Chani-Chinchora area of Bhadarwah Tehsil.

**8. The Garnet:-** The vast stretch of garnet mica schist along Thathri Gandoh road are resplendent with 5cm to 15cm sized garnets. These garnets seem to be suitable to be used as semiprecious stones.

#### 1.3.14. **Soil**

The soil of the area is sandy loam and generally thick layered at moderate and gentle slopes and thin at higher reaches. The soil is very good in general to support the good forests.

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#### 1.4. Climate and Rainfall

1.4.1. The climate is hotter at lower elevations like Thathri and Pul-Doda wheras the climate becomes milder and temperat in rest of the tract. The warm months at Bhadarwah are July to September. The higher reaches are always cool and at some places snow melts very slowly and persists throughout the year in the form of glaciers. During winters, the whole region is blanketed with snow. The interior and high lying areas receive snowfall as early as November whereas in the main valley it falls in the mid-December. The snow remains on the ground for about 4 to 5 months and the main passes remain closed up till mid April. The climate on the whole is temperate and healthy, favourable for the growth of various conifer species found in the locality.

As a rule southern slopes, as they face these winds, receive more rainfall and the more porous, dry soils on the southern slopes get compensated by higher rainfall, than the heavy, rich and deep soils on the northern and colder regions. Spring rains are frequent and helpful in promotion of regeneration. Average annual rainfall in the division is 700 mm. Bulk of rainfall is received during July and August. Fairly good amount of spring rains are received in April and May.

The tract experience winter as well as Mansoon rainfall. Data of rainfall was collected from the officer-in-charge statistics.

- 1.4.2. The winter rainfall/snow fall constitute about 50% of the total precipitation. In the recent time, as is evident from the table, the winter rainfall extends up April-May. The reason of this deviation is attributed to the general ecological imbalance.
- 1.4.3. Rainfall recorded (in mm) at Doda by Indian Meteorological Department is as follows:

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2004	272.8	117.8	4.7	116.5	92.6	124.7	93.4	73.5	14.6	119.7	43.4	40.8
2005	206.9	576.4	231.1	70.5	64.1	39.3	266.3	60.6	72.9	6.2	11.4	0.0
2006	326.7	117.6	187.9	63.9	53.7	70.0	240.6	214.4	283.0	67.0	12.2	37.9
2007	4.9	151.9	353.2	14.0	62.3	66.9	88.7	100.4	28.8	0.9	0.0	83.9
2008	25.1	227.0	7.7	122.7	65.6	102.2	102.6	72.8	48.0	44.8	6.6	131.7
2009	160.0	151.9	82.7	141.0	59.6	50.6	112.2	51.7	59.1	7.1	81.2	19.1
2010	48.0	240.8	41.6	79.2	177.6	109.2	167.2	189.0	110.0	36.2	29.8	73.8
2011	65.0	230.4	140.8	128.0	72.6	53.6	80.2	130.2	83.0	45.0	8.4	38.2

Ta	bl	e	1		1
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#### 1.5. Water Supply

The area is drained mainly by three streams, Neeru, Neeli and Jai Khad all ultimately tributing to the River Chenab. Neeru stream originates from Sunbaian galacier in Kaplash range of Bhadarwah. It drains through a valley from Bhadarwah to Pul-Doda where it finally meets river Chenab. Bhalesh is a big area at the eastern end of the tract and is drained by two large streams Chilli and Kalgune which join and form Kara stream. The latter after recieving Jai nalla flows into Kalni and finally meets river Chenab at Thatri. Jai Khad drains through a beautiful valley known as Jai valley, which is a prime tourist attration in Bhadarwah. Jangalwar tract is drained by a small stream Kalnai nalla. Padri tract drains towards Chamba into the Ravi river.

#### Figure-1.2



#### 1.6. Distribution and Area

- 1.6.1. The Bhadarwah Forest Division is spread over Bhadarwah, Thathri, and Gundoh Tehsils of Doda District. As per the last Working Plan, the total area of the Division comes out to be 88634 ha of which 50562 ha is commercially available under different commercial working circle.
- 1.6.2. However it was observed that area of 4 Compartments and sub compartments of Chiralla range namely 2a/Jwr, 3/Jwr, 32a/Jai32a/Ch were not included in the calculation of previous Working Plan due to oversight.
- 1.6.3. The following statement shows the comparison of areas as per Dot Grid Method and the blocks under GIS as:
- Table-1.2: Statement of area of various forests under GIS & its comparison with area estimation by Dot Grid method as per last working Plan.

S.No. Name of the Forests		Area estimation as per	Area estimation as per				
	Block	Dot Grid Method (ha)	GIS (ha)				
Bhalesh Range							
1.	Chilli	14,987	13959.34				
2.	Jatota	4,806	4,511.89				
3	Kilhotran	6,945	6,541.48				
4	Neeli	10,038	9,344.80				
5.	Pingal	2,507	2,220.20				
	Sub- Total	39,283	36,577.71				
Chiralla Range*							
6	Chiralla*	5,504	5,070.36				
7.	Jai	7,086	7,590.00				
8	Jangalwar	2,571	3,473.01				
	Sub-Total	15,161*	16,133.37				
		Kellar Range					
9.	Guraka	3,828	3,647.07				
10.	Malothi	8,123	8,909.13				
11	Marmat	2,288	25,73.62				
12	Trown	1,395	1,308.81				
	Sub-Total	15,634	16,438.63				

S.No.	Name of the Forests	Area estimation as per	Area estimation as per			
	Block	Dot Grid Method (ha)	GIS (ha)			
Neeru Range						
13	Dandi	4,038	3,993.05			
14	Duggi	3,818	3,819.93			
15	Padri	1,442	148.95			
16	Puneja	9,258	9,146.43			
Sub-Total		18556	18446.36			
Grand Total		88,634*	87,596.07			

\* Doesnot include areas of 2a/Jwr, 3/Jwr, 32a/Ch & 32a/Jai

- 1.6.4. However as per the Form 1, communicated by the Demarcation Division, the area of Bhadarwah Forest Division is worked out to be 97559.393 ha. It indicates that the digitalisation of boundaries must be carefully done in resonanace with boundary pillars erected in the field. The major reason for above variation in areas may be attributed to digitalisation error.
- 1.6.5. The map 1.3 & 1.4 showing Blocks and Beats respectively enclosed overleaf. The forest compartments are digitalised based on the previous Working Plan Maps. The digitalised boundaries are corrected based on land marks, ridges, rivers, nallas etc.







Map - 1.4



Map- 1.5

1.6.6. The range wise distribution of demarcated forest areas as per Form-1 is tabulated as under:-

#### Table 1.3

S. No.	Range	Demarcated area (ha)	No. of B. Pillars	Area of Chaks (ha)	No. of B. Pillars in Chaks
1.	Bhalesh	54,879.558	1,275	1,120.991	536
2.	Chiralla	12,998.232	1,673	425.731	1,152
3.	Kellar	14,659.087	3,536	2,088.584	5,274
4.	Neeru	15,022.486	2,361	1,115.126	2,504
Т	otal	97,559.393	8,845	4,750.432	9,466

1.6.7. The range wise distribution of cropped area and uncropped area as per GIS is tabulated

as under:

#### Table 1.4

Range	Cropped Area (ha)	Uncropped Area (ha)	Total area (ha)
Bhalesh	11,713.17	24,864.54	36,577.71
Chiralla	8,563.44	7,569.93	16,133.37
Kellar	9,198.31	7,240.32	16,438.31
Neeru	9,791.07	8,655,29	18,446.36
Grand Total	39,265.99	48,330.08	87,596.07

1.6.8. For the purpose of management of the forest and enabling distinct locational reference the ranges have been further been divided into Blocks, Beats & Compartments. The compartment wise detailed area statement is included in Annexure-II Administrative constitution of different ranges in terms of number of Blocks, Beats and Compartments is given below. The maps showing layout of administrative units is given in Map-1.3, 1.4 & 1.5

#### Table 1.5

Administrative	Range					
Units	Bhalesh	Neeru	TOLAT			
Block	5	3	4	4	16	
Beats	15	11	15	15	56	
Compartments	128	121	99	109	457	

#### 1.7 Legal Position

1.7.1. In the beginning the land was the property of the king of Jammu and Kashmir. At the time of forest settlement, no individual ownership was required to be established and only a demarcation line separating forests from revenue land was delineated and as far as possible in a straight line avoiding sharp curves. The individual forest boundaries were thus surveyed by a joint team consisting of Forest and Revenue staff. Subsequently the order of settlement was issued by the Chief Conservator of Forest, declaring it as demarcated forests. Forest areas adjoining the revenue land that were left out of the demarcation line were characterized as Berun line forests. The legal status of the forests rests on the settlement orders issued by the Chief Conservator of Forest and its publication in the Government Gazette.

#### 1.8 **Rights and Concessions**

- 1.8.1. No Legal rights of the people were recognized in the State, however, people residing adjacent to forests were possessing liberal concessions in respect of timber for bona fide use for construction, agricultural implements and firewood. The distance of residence from forests has been the criteria used for ascertaining entitlement of concession from forests. Earlier an individual living within 5 Kms. of the boundary of forests was eligible and later two zonations of "A" & "B" were created for the purpose of concessional eligibility. "A" zone was areas lying within 3 Kms. from forest boundary and "B" zone consisted of area outside 3 Kms. These rules regarding the grant of concession and its exercise are embodied in the Jammu Forest Notice. These rules are very old and with the change of events and situation on ground, it is essential to revisit them and incorporate necessary provision keeping in sync with time.
- 1.8.2. Timber is given on concessional rates to local people from the adjoining forests. The forests of Bhadarwah especially arround the fringe areas have suffered unprecident loss during the peak years of militancy due to illegal felling, lopping and girdling.

#### Table 1.6

Concession	Rules regarding grants	Remarks	
Timber for house construction	In A" zone Kail & Fir @ 20% of the standard rate.	Timber so obtained cannot be alienated. Deodar is not granted on concession rates except as provided below when it is given free of cost.	
Timber for agricultural implements.	Is granted free of charge.	-	
Firewood	Can be collected free of charge from dead fallen wood		
Minor Forest Product	Required for agricultural and domestic use may be removed free.	This permission does not extend to removal of valuable minor products for sale.	
Lopping	Is permissible under rules except for valuable trees.	The conifers, Birch, Ash, Walnut, Tun and Sheesham may not be lopped.	

1.8.3. The tree issued to beneficiaries from forest during the past ten years from the division is as below

# Table 1.7 Statement volume of timber issued to Concessionists inBhadarwah Forest Division

S. No.	Year	Free Grants ( cft )	Concessional (cft)	Total (cft)
1	2006-07	0	24,034	24,034
2	2007-08	0	48,664	48,664
3	2008-09	0	79,575	79,575
4	2009-10	0	44,217	44,217
5	2010-11	0	75,978	75,978
6	2011-12	0	1,03,788	1,03,788
7	2012-13	0	1,29,420	1,29,420
8	2013-14	0	1,00,468	1,00,468
9	2014-15	0	54,900	54,900
10	2015-16	0	20,569	20,569

1.8.4 Additionally timber is also being provided from departmental Timber Sale Depots (TSD). The TSDs for the purpose of concessional rates have been designated as A, B, C & MC. Where "A" zone TSD is established in areas located in area within 3 Kms. of forest boundary. "B" zone TSDs are established in areas that are located between 3 to 5 Kms. and TSD outside 5 Kms. are classed a "C" zone. In areas located inside the municipal areas the TSD of category "MC" are established. The above categorization has increasing differential rates in the order given. Bhadarwah Forest Division at present has 9 numbers of TSDs. The timber supplied to beneficiaries in the previous years from TSDs is given in the table overleaf.

Voor	7000	Quantity of Timber Sold (cft)				
fear	Zone	Deodar	Kail	Fir	Chir	
	M.C.	0	0	0	0	
2006-07	В	354.48 cft	22.82 cft	0	0	
	А	0	0	0	0	
	M.C.	0	0	0	0	
2007-08	В	818.97 cft	0	0	0	
	А	0	0	0	0	
	M.C.	0	0	0	0	
2008-09	В	1093.39 cft	0	0	0	
	А	0	0	0	0	
	M.C.	0	0	0	0	
2009-10	В	808.94 cft	16.45 cft	0	0	
	A	0	0	0	0	
	M.C.	74.73 cft	0	0	0	
2010-11	В	706.83 cft	504.53 cft	0	0	
	А	6261.72 cft	0	0	0	
	M.C.	359.25 cft	0	0	0	
2011-12	В	0	0	0	0	
	А	16657.96 cft	1786.21 cft	0	0	
	M.C.	816.31 cft	127.43 cft	0	0	
2012-13	В	0	0		0	
	А	22734.66 cft	2492.36 cft	0	93.50 cft	
	M.C.	512.26 cft	229.02 cft	0	0	
2013-14	В	0	0	0	0	
	А	16854.51 cft	3977.70 cft	0	42.74 cft	
2014-15	M.C.	461.21 cft	95.31 cft	0	0	
	В	0	0	0	0	
	А	26123.93 cft	2815.85 cft	0	195.31 cft	
	M.C.	472.06 cft	0	0	0	
2015-16	В	0	0	0	0	
	Α	26586.82 cft	878.46 cft	531.30 cft	0	

### 1.9 Grazing

1.9.1. People enjoy liberal concession in respect of grazing in forests. People can graze their cattle anywhere and there is no restriction as to number of cattle grazed. The Division is gifted with numerous pastures (Behaks) the list of which is given in Table-1.12. Unfettered grazing has rendered them in poor health. Inconsiderate and excessive grazing often proves harmful to the natural regeneration and such forests are without regeneration near Behaks and habitations. People generally partition out amongst themselves such grazing areas and customs are so rigid that nobody crosses the other's fence. Any transgression is often delt with hostility between the parties. Grazing is carried out at will by nomadic graziers like Bakerwals, Gujjars, Shippi - Gaddi and also by the local inhabitants of the tract. Grazing is being regulated under the Jammu and Kashmir Khahcharai Act 1954 and the rules framed there under. Kahcharai levy able for various categories of animals under the provisions of the Act amended vide S.R.O No. 147 of 11-03-1978 is indicated below.

S. No	Animal type	Rate 'A'	Rate 'B'	Rate 'C'
01	Pack Bullocks	0.80	0.80	0.80
02	Teli Bullocks	0.50	1.00	2.00
03	Buffaloes	1.80	3.15	11.25
04	Riding Ponies	2.50	3.75	7.50
05	Pack Ponies, Mules	2.80	2.80	5.00
06	Donkeys	0.65	0.65	0.65
07	Sheep for Ladakh	0.15	0.20	0.60
08	Camels	5.00	10.00	15.00
09	Goats imported for commercial purpose			2.50
10	Sheep for rest of State	0.15	0.20	0.65
11 Sheep imported for commercial purposes				0.20

Table 1.9 Rate levyable for Migratory Cattle (in Rs.)

1.9.2. The livestock grazing the forests can be categorized into local cattle and migratory cattle. The regulation of grazing by the local cattle is done by the revenue officials and the regulation of migratory cattle is done by the Forest officials as Kahcharai officers under the Kahcharai Act. The number and different category of local livestock grazing the forest is as below:-

District	Cattle	Buffalo	Yaks	Sheep	Goats	Horse/ Ponies/ Donkey & Mules	Total live stock population
Doda	248089	34185	793	348126	114702	13887	759782

Table 1.10 Village Livestock population (in Nos.)

Table 1.11 Range wise list of Behaks

S.No.	Range/Block	Name of Behek	Location	Remarks
1	Neeru	Roudhal	Co.3/N	Nomadic + Zamindari
2	Neeru	Lolroo	Co. 3/N	Nomadic + Zamindari
3	Neeru	Tibba	Co.13/N	Nomadic + Zamindari
4	Neeru	Binomi	Co.23/N	Nomadic + Zamindari
5	Neeru	Dal	Co.26/N	Nomadic + Zamindari
6	Neeru	Zamani	Co.28/N	Nomadic + Zamindari
7	Neeru	Jhinghny	Co.29/N	Nomadic + Zamindari
8	Neeru	Guldanda	Co.39/N	Nomadic + Zamindari
9	Neeru	Sangran	Co.39/N	Nomadic
10	Neeru	Tipri	Co.39/N	Nomadic
11	Neeru	Bastinala	Co.39/N	Nomadic + Zamindari
12	Neeru	Tnanthera	Co.39/N	Nomadic + Zamindari
13	Neeru	Dhramon	Co.41/N	Nomadic + Zamindari
14	Neeru	Kithrhi	Co.42/N	Nomadic + Zamindari
15	Neeru	Chatri	Co.42/N	Nomadic
16	Neeru	Chamartapor	Co.43/N	Nomadic + Zamindari
17	Neeru	Jigar Kudh	Co.46/N	Nomadic
18	Neeru	Ramtund	Co.46/N	Nomadic + Zamindari
19	Neeru	Nakan Dhar	Co.46/N	Nomadic + Zamindari
20	Neeru	Bihbarut	Co.47/N	Nomadic + Zamindari
21	Neeru	Manglala	Co.50/N	Nomadic + Zamindari
22	Neeru	Baloth	Co.53/N	Nomadic + Zamindari
23	Neeru	Budhal	Co.53/N	Nomadic + Zamindari
24	Neeru	Massha-rno	Co.54/N	Nomadic + Zamindari
S.No.	Range/Block	Name of Behek	Location	Remarks
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25	Neeru	Bishbug	Co.55/N	Nomadic + Zamindari
26	Neeru	Roshira	Co.55/N	Nomadic + Zamindari
27	Neeru	Dahwarah	Co.60/N	Nomadic + Zamindari
28	Neeru	Ichoni	Co.63/N	Nomadic + Zamindari
29	Padri	Padri		Nomadic
30	Padri	Derpoth		Nomadic
31	Padri	Badro-thy Goth		Nomadic
32	Padri	Kundla Than		Nomadic
33	Padri	Jammanwalagoth		Nomadic
34	Padri	Sattar Gali		Nomadic
35	Padri	Copru		Nomadic
36	Padri	Kanganwalagoth		Nomadic
37	Padri	Hundrat		Nomadic
38	Padri	Jangarwalagoth		Nomadic
39	Padri	Goap		Nomadic
40	Padri	Bidhy		Nomadic
41	Padri	Gangu goth		Nomadic
42	Padri	Githy		Nomadic
		Khuroo-wala-		
43	Padri	goth		Nomadic
44	Padri	Padri Block		Nomadic
45	Kellar	Jagnot	Co.11/K	Zamindari
46	Kellar	Nalsoon	Со.30/К	Zamindari
47	Kellar	Charari Nala	Со.24/К	Zamindari
48	Kellar	Ichon	Со.30/К	Zamindari
49	Kellar	Rihon Dhar	Со.29/К	Nomadic
50	Kellar	Dalhon	Co.35/K	Zamindari
51	Kellar	Chilora	Co.42/K & 43/K	Nomadic
52	Kellar	Neli-di-That	Co.35/K	Zamindari
53	Kellar	Chilora	Со.40/К	Nomadic
54	Kellar	Dalhon	Co.34/K & 36/K	Nomadic
55	Kellar	Madrain	Co.46/K & Co.50/K	Nomadic
56	Kellar	Talai	Co.46/K	Nomadic
57	Kellar	Gathee	Со.50/К	Nomadic
58	Kellar	Kalhoo	Со.59/К	Nomadic
59	Padri		Со.58/К	Zamindari
60	Padri	Daggri Ranagoth	Co.65/K & Co.69/K	Zamindari
61	Jai	Jantran	Co.2/Ch & 36/Jai	Zamindari
62	Jai	Gohroo	35/Jai	Nomadic
63	Jai	Gangerpur	Co.34/Jai	Nomadic
64	Jai	Gathi phat	Co.34/Jai	Nomadic + Zamindari

65	Jai	Phukkan	Co.33/Jai	Nomadic
66	Jai	Kimle	Co.33/Jai	Nomadic
67	Jai	Jai	Co.31/Jai & Co.32/Jai	Nomadic + Zamindari
68	Jai	Haldays	Co.28/Jai & 29/Jai	Nomadic
69	Jai	Gasthuk	Co.24/Jai & 25/Jai	Nomadic
70	Jai	Saroolar	Co.23/Jai	Nomadic
71	Jai	Badroo goth	Co.22/Jai	Nomadic
72	Jai	Jamoon wala	Co.22/Jai	Nomadic
73	Jai	Khosloo	Co.22/Jai & 23/Jai	Nomadic
74	Jai	Bach	Co.22/Jai & 22/Jai	Nomadic + Zamindari
75	Jai	Kandloo	Co.22/Jai	Nomadic
76	Jai	Satal	Co.21/Jai	Nomadic + Zamindari
77	Jai	Palai	Co.19/Jai & 20/Jai	Nomadic + Zamindari
78	Jai	Soon	Co.16/Jai	Nomadic
79	Jatota	Mohidhar	Co.13/Jai	Zamindari
80	Jai	Koti	Co.12/Jatota	Nomadic
81	Jatota	Dagrund	Co.3/Jai	Zamindari
82	Jatota	Sarora	Co.14/Jatota	Nomadic + Zamindari
			Co.14/Jatota &	
83	Jatota	Kilro	15/Jatota	Nomadic
0.4	latata	Caluman	Co.11a/Jatota &	Neveedie
84	Jatota	Gabroon		Nomadic
85	Jatota	Jamoon Padar	11b/Jatota	Nomadic + Zamindari
86	Jatota	Makhmal	Co.10/Jatota	Nomadic
87	Jatota	Nagni	Co.09/Jatota	Nomadic
88	Jatota	Lalu Pani	Co.09/Jatota	Nomadic
89	Jatota	Bnatin	Co.8/Jatota & 9/Jatota	Nomadic + Zamindari
90	Jatota	Logan	Co.7/Jatota	Nomadic
91	Jatota	Unser	Co.12/Jatota	Zamindari
92	Bhalesh	Ghildhar	Co.2/Jatota & 3/Jatota	Nomadic
93	Bhalesh	Phaty Khary	Co.9/Bhalesh	Nomadic + Zamindari
94	Bhalesh	Kathyanrob goth	Co.12/Bhalesh	Nomadic + Zamindari
95	Bhalesh	Kin	Co.14/Bhalesh	Nomadic + Zamindari
96	Bhalesh	Phaty	Co.12/Bhalesh	Nomadic + Zamindari
97	Bhalesh	Rich Goth	Co.12/Bhalesh	Nomadic + Zamindari
98	Bhalesh	Kandsone	Co.12/Bhalesh	Nomadic + Zamindari
99	Bhalesh	Basar	Co.12/Bhalesh	Nomadic + Zamindari
100	Bhalesh	Angoth	Co.12/Bhalesh	Nomadic + Zamindari
101	Bhalesh	Lakhnan	Co.11/Bhalesh	Nomadic + Zamindari
102	Bhalesh	Amreye	Co.12/Bhalesh	Zamindari
103	Bhalesh	Shehotry	Co.20/Bhalesh	Zamindari

S.No.	Range/Block	Name of Behek	Location	Remarks
104	Bhalesh	Kaintha	Co.20/Bhalesh	Zamindari
			Co.21/Bhalesh &	
105	Bhalesh	Mehar	22/Bhalesh	Nomadic + Zamindari
106	Bhalesh	Bermenhy Nala	Co.21/Bhalesh	Zamindari
107	Phalach	Mashad	Co.1//Bhalesh &	Zamindari
107	Dildiesti	IVIdSITUU	Co 34/Bhalesh &	Zammuan
108	Bhalesh	Sunye	35/Bhalesh	Nomadic
109	Bhalesh	Genglal	Co.35/Bhalesh	Nomadic
110	Bhalesh	Garlat	Co.31/Bhalesh	Zamindari
111	Bhalesh	Bhernola	Co.46/Bhalesh	Zamindari
112	Bhalesh	Damoth	Co.53/Bhalesh	Zamindari
113	Bhalesh	Bagan	Co.44/Bhalesh	Nomadic + Zamindari
114	Bhalesh	Nirguari	Uncompartmented	
115	Bhalesh	Dulchy	Uncompartmented	
116	Bhalesh	Mangi	Co.62/Bhalesh	Zamindari
117	Bhalesh	Bahhant	Co.78/Bhalesh	Zamindari
118	Bhalesh	Dagan	Co.78/Bhalesh	Zamindari
119	Bhalesh	Bogoi	Co.73/Bhalesh	Zamindari
120	Bhalesh	Iti	Co.73/Bhalesh	Zamindari
121	Bhalesh	Mulai wala	Co.73/Bhalesh	Zamindari
122	Bhalesh	Talai	Co.74/Bhalesh	Zamindari
			Co.73/Bhalesh &	
123	Bhalesh	Goha	74/Bhalesh	Zamindari
124	Bhalesh	Donera	Co.67/Bhalesh	Zamindari
125	Bhalesh	Nigar	Co.67/Bhalesh	Zamindari
126	Bhalesh	Heripal	Co.65/Bhalesh	Zamindari
127	Bhalesh	Badwani	Co.65/Bhalesh	Zamindari
128	Bhalesh	Singar siroo	Co.65/Bhalesh	Zamindari
129	Bhalesh	Kandelwar	Co.64/Bhalesh	Zamindari
130	Bhalesh	Kanit	Co.64/Bhalesh	
131	Bhalesh	Borgula	Co.64/Bhalesh	Zamindari
132	Bhalesh	Khercoa	Co.64/Bhalesh	Nomadic + Zamindari
133	Bhalesh	Morouth	Co.63/Bhalesh	Nomadic
134	Bhalesh	Khei	Co.63/Bhalesh	Nomadic
135	Bhalesh	Kohari	Revenue land	Nomadic + Zamindari
136	Bhalesh	lawali	87/Bhalesh	Nomadic + Zamindari
137	Bhalesh	Bhal Padri	Co 92/Bhalesh	Nomadic
			Co.58/Bhalesh &	
138	Bhalesh	Bager	59/Bhalesh	Nomadic + Zamindari
139	Bhalesh	Thunga	Co.95/Bhalesh	Zamindari

S.No.	Range/Block	Name of Behek	Location	Remarks
140	Bhalesh	Manglola	Co.97/Bhalesh	Zamindari
			Co.104/Bhalesh &	
141	Bhalesh	Konthi	106/Bhalesh	Nomadic + Zamindari
			Co.99/Bhalesh &	
142	Bhalesh	Kotri	103/Bhalesh	Nomadic
			Co.94/Bhalesh &	
143	Bhalesh	Phaty	96/Bhalesh	Nomadic + Zamindari
			Co.96/Bhalesh &	
144	Bhalesh	Melapadar	97/Bhalesh	Nomadic + Zamindari
			Co.92/Bhalesh &	
145	Bhalesh	Naglotan	93/Bhalesh	Nomadic
			Co.97/Bhalesh &	
146	Bhalesh	Khamle	98/Bhalesh	Nomadic + Zamindari

## **FOREST FLORA**

#### 2.1.1. Trees

2.1.1.1. The forests of the Division are predominantly coniferous with intermittent speckles of broad leaved species. The conifer trees of economic importance are Deodar (Cedrus deodara), Kail (Pinus wallichiana), Fir (Abies pindrow), Spruce (Picea smithiana). Pines also have their representation in this region. Chir pine occur predominantly in compartments located along the river Chenab in the Chiralla Range from Thathri to Pul-Doda. It is also found in compartments of Kelar Range. The distribution pattern of conifers viz; Deodar, Kail and Fir and Spruce generally conform to the altitudinal zonations, however climate, aspect, slope, geology and soil exercise their influence as well. The conifers get purer within their respective habitats. Deodar, as a pure crop or as an associate of Kail is represented mainly in the Neeru, Kellar, Chiralla Ranges. It is also represented in few compartments of Bhalesh range. Kail constitutes the main crop in lower elevations. It generally prevails on the southern aspects and on exposed slopes. Fir comes as a principal species in higher altitude and extends to the alpine zones, above where it gives way to Rhododendrons, Birch, Juniper and high altitude willow. Higher still alpine pastures with their luxuriant ground flora appear. Spruce, in small percentage, is found admixed with Fir while at certain locations Yew especially in the Kaplash region of Neeru occurs in patches locally. The broad leaved trees, in more or less pure patches, are found along nallas, cooler aspects and shady ravines. The Oaks (Quercus ilex, Quercus incana, Q. dilitata, Q. semicarpifolia), Walnut (Juglans regia), Horse Chest nut (Aesculus indica), Maples (Acer caesium), Ash (Fraxinus excelsior), Pohu (Parrotiopsis jacquemontiana) constitute the main broad leaved species found in the tract. The shrub which is most commonly mat with the forest is *viburnum narvosum*. Other common shrubs with in the forests are Spps. like *Berbaris* species, *Desmodium* tilaifolium, Plactranthua rugosus, Indioofare species, Prinsipiautilis, Rubus spp. Rose moschats, Daphne spp and Sarcococa saliora.

- 2.1.1.2.The ground flora consists mainly of *Viola species, polygonum species, Gerardiana haterophlla, Podohyllum emodi,* along with Bracken fern and Maiden hair ferns which are found through out these forests.
- 2.1.1.3 The consepicuous absence of the climbers are noticeable. *Vitis parvifolis* is occasionally found in Chir forests and *Vitis semicordats* is occasional in Fir forests. *Hedera helix* creeper also mats with in the Deodar forests.
- 2.1.1.4. The list of tree species found across the terrain of this division along with their altitudinal zonation is given as below;-

<b>Botanical Name</b>	Common Name	Elevation (above MSL)	Family
Abies pindrow	Fir/ Badlu	2300-3600	Pinaceae
Aesculus indica	Hunakdun	2000-2800	Sapindaceae
Cedrus deodara	Deodar	1600-2500	Pinaceae
Juglans regia	Dun	2000-3000	Juglandaceae
Morus nigra	Tul	1500-2000	Moraceae
Parrotiopsis jacquemontiana	Poa	1800-3500	Hamamelidaceae
Picea smythiana	Spruce	2400-3600	Pinaceae
Pinus excela	Kail	1500-2500	Pinaceae
Pinus roxiburgahii	Chir	500-2000	Pinaceae
Populus alba	Phrast	2000-2200	Salicaceae
Populus ciliata	Phrast	2000-2200	Salicaceae
Populus nigra	Phrast	2000-2200	Salicaceae
Robina pseudoacacia	Kikur	1500-3000	Fabaceae
Taxus baccata	Yew	2000-3500	Taxaceae
Ulmus wallichiana	Bren	2200-3000	Ulmaceae
Betaula utilis	Birch	2500-2700	Betulaceae
Rhodhodendron companulatum		2500-3000	Ericaceae
Alnus nitida	Champ	1500-2300	Betulaceae
Quercus semicarpifolia	Kharsu	1800-2200	Fagaceaea
Quercus ilex	Heru	1000-1500	Fagaceaea
Quercus incana	Ban	1000-1500	Fagaceaea
Quercus dilitata	Mohru	1300-1700	Fagaceaea
Corylus colurna	Thangi	1800-2000	Betulaceae
Platanus orientalis	Chinar	1000-1700	Platanaceae

#### Table-2.1

#### 2.1.2. Deodar Forests

- 2.1.2.1. Commercially important species Deodar is abundantly represented in the Division. It is usually found on higher altitudes of mountain slopes along the northern aspects between elevations of 1700 mtrs, to 2300 mtrs. above M.S.L. They preponderate on easier slopes having well drained loamy soil. Deodar occurs either as pure crop or mixed with Kail. The main Deodar forests are found in Neeru and Chiralla valley. These forests when given proper protection regenerate profusely. These forests are under working since 1902 and were selectively felled. In higher reaches at places huge sized trees are still found. The composition of the species is between middle aged to young throughout the division. The crop in general is of good health. Deodar generally demonstrates ample regeneration in its habitat zone where dense seedlings and saplings occur in abundance. The major reason of which seems to be the presence of over arching canopy cover disallowing any peculation of sunlight to enable establishment of new regeneration. Suppression resulting out of the tangled growth of Pohu (*Parrotiopsis jacquemontiana*) and heavy incidence of grazing as well as abundant liter on forest floor are also attributable minor impediments to regeneration. The Broad leaved associates of Deodar include Walnut (Juglans regia), Bird cherry (Prunus cornuta) Thangi (Corylus colurna), Maple (Acer spp), Horse Chest-nut (Aesculus indica), Hum (Fraxinus excelsa) and Morhu (Quercus dilatata), Heru (Quercus ilex). The common shrubs constituting the undergrowth are Viburnum foetens, Cotonaster spp and Indigofera spps. The ground cover is comprised of Banafsha (Viola canescens), Wild Strawberry (Fragaria vesica) and Gebo grass (Oryzopsis aquiglumis).
- 2.1.2.2 The deodar forests near habitation are under great pressure for timber and other needs of local people most of the illicit fellings occur in these areas.

#### 2.1.3. Kail Forests

2.1.3.1. Kail is the other main conifer in the Deodar Kail zone. The species is usually found as mixed crop with Deodar in its zone or with Fir over higher reaches on warmer aspects. At certain locations which are prone to disturbance or abrupt opening. Kail is found in pure patches. The mature trees are discernible near habitations, along the lower

fringes of forests and where ever the canopy is broken. Being a colonizer, Kail takes a lead over other conifers in establishing itself on the fresh alluvial sites, stiff clays; ill drained soils and openings, whether easy or steep, provided given some time and protection. As the habitat conditions improve and become damp, Kail is seen giving way to comparatively more mesophytic Deodar. It occurs gregariously on all aspects between 1700 to 2200 mtrs, above M.S.L. but at times may extend upto 2400 mtrs, as well, on warmer aspects.

2.1.3.2. The natural regeneration of Kail comes up profusely if accorded a little protection. The regeneration, however, suffers considerably from the odds of heavy grazing and illicit damage.

#### 2.1.4. Fir Forests

- 2.1.4.1. The Fir zone lies between 2100 mtrs, and 3400 mtrs, above M.S.L. The Fir forests are essentially found as more or less pure stands in regions bordering alpine pastures. The species, however, forms a light mixture with Kail on exposed sites and extends down into the Kail zone along the cooler damp aspects and shady depressions. The Fir forests are also associated with Spruce (*Picea smithiana*) and Yew (*Taxus baccata*) at places. Above 3380 m. elevation, Fir attains a stunted form to get finally replaced by the high level broad leaved species viz, Betula, Rhododendron etc. Spruce forms a less percentage of the Fir crop. Regeneration of Fir, as a whole, is deficient although scattered patches of it came across. Fir regeneration, in itself, is never a problems but its establishment is. The inimical factors responsible include thick deposits of undecomposed humus, unregulated and excessive summer grazing, heavy weed growth and the low moisture retentively of the higher steep reaches.
- 2.1.4.2. The Broad leaved associates of the Fir are Bird cherry (Prunus cornuta), Maples (Acer caesium), Horse Chest-nut. (Aesculus Indica), Thangi (Corylus colurna) etc, the shrubs met with include Viburnum spp. Sambucus ebulus, Skimmia laurea, Podophyllum hexandrum and Parrotiopsis jacquemontiana. The ground flora includes Viola, Fragaria, Polygonum, Rumex, Anemone, Phytolaca, Aralias and Atropa.

### 2.1.5. Broad Leaved Species

2.1.5.1. The Broad leaved species are confined in patches, and generally seen in the moist depressions, damp aspects and glens formed by the streams in the coniferous zone. Heru is an exception and is the most distinct broad leaved species found in the division. It stands out from other broadleaf species by being represented as a uniform band between conifer forests and agriculture land along the northern aspects across all the 4 ranges of the division. The Heru wood makes very good firewood but these forests have reached a miserable state owing to ruthless felling for firewood, and due to overgrazing impacting its regeneration. Small patch of *Dalbergia sissoo* also can be seen in Chiralla and Kellar on the rocky and baldened southern aspects along river Chenab. This area gives the appearance of Kandi belt of the subtropic plains.

	Total Stem distribution in the Division (in nos.)										
Dia-class	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	>100	Total
Chir	24472.92	17367.60	26244.69	23973.37	24246.86	18366.58	8877.09	1498.28	0.00	0.00	145047.38
Deodar	123794.39	126434.31	241936.91	348622.67	472151.10	510008.84	451138.81	210870.85	132912.09	59975.10	2677845.07
Kail	163907.97	148111.40	254075.38	374166.63	510220.81	501383.33	328656.39	223401.90	134938.56	83979.54	2722841.90
Fir	76652.91	71968.60	224679.26	492196.18	1063750.21	1679624.42	1947019.41	1542044.03	1469475.41	1080494.11	9647904.54
	388828.19	363881.90	746936.24	1238958.84	2070368.99	2709383.18	2735691.70	1977815.05	1737326.06	1224448.76	15193638.90

The Total Growing stock in the division and the Total Stem Count in the Division is given in Table. 2.2 and 2.3.

Total Growing Stock of the Division (cum)									
Dia-class	30-40	40-50	50-60	60-70	70-80	80-90	90-100	>100	Total
Chir	12597.45	27089.91	53585.83	65017.51	43231.44	9289.64	0.00	0.00	216251.02
Deodar	212233.80	399873.73	660439.57	726945.89	744893.79	377362.91	205978.68	105267.22	3489411.13
Kail	219787.21	433096.84	729823.90	771121.49	499410.14	332971.04	190863.64	124398.60	3372556.75
Fir	217847.30	527210.07	1209338.83	1918514.70	2134100.30	1702522.50	1582219.72	1138104.08	10495680.17
Total	662465.76	1387270.55	2653188.12	3481599.59	3421635.68	2422146.09	1979062.04	1367769.89	17573899.06

## 2.1.6 General Description of the Growing Stock

2.1.6.1. The Forests of Bhadarwah Forest Division have been categorized and described in the light of Revised Forest Types of India (1968) by Champion and Seth the tabulated list of which is given below, followed by brief description.

S No		Classification
3. NO.	FORESTITE	code
	MONTANE SUBTROPICAL FORESTS	
	Sub Tropical Dry evergreen Forests	
1.	Himalayan or Montane Chir pine forests	9/C1b
2.	Sub-Tropical dry evergreen Olea cuspidate scrub forest	10/C1a
	MONTANE TEMPERATE FORESTS	
	Himalayan Moist Temperate Forests	
3.	Ban oak forest (Quercus incanna)	12/C1a
4.	Moru oak forest (Quercus dilatata)	12/C1b
5.	Moist deodar forest (Cedrus deodara)	12/C1c
6.	Western mixed coniferous forest	12/C1d
7.	Moist temperate deciduous forest	12/C1e
8.	Low level blue pine forest (Pinus wallichiana)	12/C1f
9.	Kharsu oak forest (Quercus semicarpifolia)	12/C2a
10.	Himalayan temperate pastures	12/D S3
11.	Alder forest	12/151
	HIMALAYAN DRY TEMPERATE FORESTS	
12.	Dry broadleaved and coniferous forest	13/C1
	(Quercus ilex / Pinus gerardiana)	
13.	West Himalayan high-level dry blue pine forest	13/C4
	(Pinus wallichiana)	
	SUB ALPINE FORESTS	
14.	Birch / fir forest	14/C1b
	ALPINE SCRUB	
	Moist Alpine Scrub	
15.	Birch / Rhododendron scrub forest	15/C1
16.	Alpine pastures	15/C3

## 2.1.7. Montane subtropical Forests

2.1.7.1. In subtropical forests, the temperature regime is determined more by altitude than by latitude and is characteristically developed in the hilly areas. The subtropical zone is

considered as transitional from the tropical to a temperate zone and is sometimes hardly distinguishable either in form or composition from one or the other.

#### 2.1.8 9/C 1b- Himalayan or Montane Chir pine forests

- 2.1.8.1. *Pinus roxburgii* (Chir) is the characteristic species of this type of forest and is found localized in extent. This type varies from 800 m to 1800 m and is confined lower parts of Guraka, Chiralla and Jangalwar blocks at lower parts which are warmer, and give way to deodar and kail above it. As a rule no other trees reach the top story and there are only few trees found scattered representing second storey. Annual fires prevent the development of shurbs which would otherwise from an under growth.
- 2.1.8.2 Snowfall in winter is not heavy and rainfall is good in summer. The crop is mostly young to middle aged to mature type and is of low quality. *Pinus wallichiana* and *Quercus ilex* (Heru Oak) occur at upper and lower limit respectively. Sporadically *Dalbergia sissoo* occurs in the lower drier parts. This type is also subjected to heavy grazing and fires are usually common. This type of forest is in climatic sub-climax.

#### 2.1.9. 10/C 1a Sub-Tropical Dry Evergreen Olea cuspidata Scrub Forest

2.1.9.1. Olea cuspidata (Kahu) is the chief species of this forest. This sub-type occurs along the lower limits of the Division in the narrow valleys and extends in the higher reaches until it is replaced by *Quercus ilex*. It occurs in pure patches and is under heavy human pressure. The common associates are the *Punica granatum*, *Pistachia integerrima*, Chir, *Dalbergia sissoo*, *Myrsine africana*, *Daphne oleoides* and *Plectranthus sp*. This sub types forms only negligible percentage of forest land and is mostly spread over revenue lands. It is common only on drier southern slopes. This type extends along the Chenab river and ascends roughly upto 1100 m.

#### 2.1.10. Montane temperatate Forests

2.1.10.1.The northern mountain temperate forests can be best classified by the rainfall during the season of vegetative activity, which may be taken as roughly the months with mean temperature over 13°C. Three types are distinguishable two of them mainly coniferous, though broadleaved trees (either evergreen oaks or mixed deciduous species) are often

associated with the conifers, only the wettest type being predominantly broadleaved evergreen.

### 2.1.11 12/C 1a- Ban Oak forest (Quercus incana)

2.1.11.1. This sub type is feebly represented in the area and is only found along the transitional belt between Deodar, Kail and *Quercus ilex* or Chir belt represented in western portion of Jangalwar block. This type occupies shallow and hotter stretches, mostly on southern and south western aspects receiving good amount of monsonic rains. This type represents climatic sub-climax. Being close to the habitation, Ban Oak is heavily lopped for fodder and also cut for firewood. These forests are subjected to damage or destruction through human agencies, being locted at favourable altitude for settlement and cultivation. Lopping is extremely prevalent and combined with fuel demand it has led to the final disappearance of the forest over large area. The damage falls more heavily on Oak then the other species.

### 2.1.12. General floristic

2.1.12.1. Quercus incana, Kail, Deodar, Chir, Quercus dilitata, Quercus ilex, Pyrus pashia, Celtis spp.Indigofera spp., Berberis spp., Daphne oleoides, Myrsine africana, Rosa moschata and Hedera helix are the common climbers.

## 2.1.13.12/C 1b- Moru Oak Forests

2.1.13.1. *Quercus dilatata* (Moru) is the index species although it does not occur gregariously, it is found as a widely distributed crop, usually as an under storey with Kail and Deodar. It extends between 1700 m to 2000 m. This type is in climatic climax and heavily lopped and cut for fodder. The species is not regenerating due to heavy biotic pressure. Its common associates are *Cedrus deodara*, *Pinus wallichiana*, *Quercus incana*, *Ulmus wallichiana*, *Fraxinus excelsior*, *Cedrela serrata* and *Alnus nitida*. *Quercus dilatata* often occurs as under storey but seldom as consociation.

#### 2.1.14.12/C 1c- Moist Deodar Forests (Cedrus deodara)

2.1.14.1. Cedrus deodara is the characteristic species of this type and it often occurs as pure but at times mixed with Kail, Fir and Spruce. These forests are most extensive and covering major portion of the Neeru, and Chiralla valleys and to a lesser extent the Jai, Jangalwar, Bhalesh valleys. This type does not form climax as it is directly or indirectly influenced by human activities. It occurs in the altitudinal zone of 1700 m to 2300 m generally but descends to lower levels on cooler Northern aspects and is replaced here by Kail. It occurs on all geological formations on well drained soils and avoids ill drained and damp soils. It clothes all types of slopes.

The common associates are *Pinus wallichiana*, *Abies pindrow*, Picea *smithiana*, *Quercus ilex*, *Quercus dilitata*, *Quercus incana*, *Rhus succeanea*, *Prunus padus*, *Fraxinus floribanda*, *Aesculus indica*, *Rhododendron arboreun*, *Celtis australius*, *Populus ciliata* and *Alnus nitida*. Under dense canopy of Deodar, the under storey of Broadleaved species is often missing and under growth very sparse, but in open crop, dense under storey of broadleaved species like *Rhus*, *Cedrela*, *Aesculus*, *Corylus colurna*, *Prunus*, etc are found. On clear felled patches or fire burnt sites Populus appears on cooler sites and Kail on hotter aspects. The chief under growth is of *Parrotia jacquemontiana* particularly on North-Western and Western aspects and when it is dense, it inhibits the regeneration of Deodar

Deodar commonly occurs pure but also occurs in association with Kail, Fir, Spruce, *Quercus spp.* Kail in moist Deodar zone is of seral types and is in its progression towards Deodar. Young Deodar is often found as an under storey with Kail.

Fire does not usally originate in the Deodar forest. Leaf litter is generally removed by local population; however fire is liable to sweep up from Chir or blue pine forests below and occasionly cause wholesome dustruction particularly in young crop.

#### 2.1.15.12/C 1d- Western Mixed Coniferous Forests

2.1.15.1. This type refers to the main community of *Abies pindrow* and *Picea smythiana*, mixed at places with Deodar and Kail. The occurrence is mostly governed by edaphic and microclimatic variations in this type. Fir occurs on cooler portions, kail on hotter spurs

and Deodar on steep grounds as well as on shallow and rapidly drained soils in this type. Spruce is found in invariable mixture with Fir especially on rougher and tougher grounds. This type also carries varying intermixture of evergreen and deciduous broad-leaved trees, often as pure glades. This type is well developed between 2400 to 3000 m and is found in the interior of Bhalesh, Jai and Neeru valleys.

*Taxus baccata* forms a common associate and in the upper limits is replaced by *Betula utilis* (Birch) throughout on cooler aspects. Betula is conspicuously absent on hotter southern aspects where Juniperus recurve caps these forests. Walnuts and Poplars, *Acer sp. Corylus colourna, Prunus padus* are the outstanding broad leaved species. *Viburnum spp. Spirea spp. Skimmia laureola* are the characteristic shrubby growth. The incidence of these under growth becomes intense with the dampness of the soil and when occurring dense, proves inimical to Fir regeneration. Spruce is regenerating with better ease than Fir as it is less palatable and hardy, likes drier tracts in this type.

Heavy grazing is resorted to in this type, as most of the temperate pasture grounds are situated in this zone. The regeneration of Fir is absent near such sites and the crop abundantly carries mature and over mature trees and few middle aged trees. The proportion of younger age classes increases with the increase of distance from the grazing grounds. Another important inimical factor, in obtaining natural Fir regeneration is huge accumulation of raw humus. Since debris burning is usually neglected, the general floor conditions remain incondusive for Fir regeneration. The seed is effectively prevented to strike the soil by thick layers of humus.

#### 2.1.16. General Floristics:

- 2.1.16.1.Abies pindrow, Pinus excelsa, Cedrus deodara, Betula utilis, Acer spp., Prunus padus, Aesculus indica, Corylus colurna, Populus ciliate, Juglans regia, Taxus baccata, Rhododendrar sp., Quercus semicarpifolia, and Fraxinus floribunda.
- 2.1.16.2. Viburnum spp., Spireas spp., Skimmia laureola, Sambuscus spp., Salix spp., Polygonum spp., Grasses.Important medicinal plants like Kuth, Podophyllum (Bankakri) Dhoop, Patis, grow profusely.

#### 2.1.17. Moist Temperate Deciduous Forests

2.1.17.1. This type covers a wide altitudinal range and occurs in the both Moist Deodar and western mixed conifer forest types. This type is represented by broad-leaved species which occur in moist and damp depression in Deodar and Fir forests invariably. These are found often pure but usually in association with conifers. The canopy formed is often too dense to permit light to the forest floor. Moisture loving and shade bearing shrubby flora like *Vibrunum, Spirea* and even *Parrotiopsis* becomes common.

#### 2.1.18.General Floristic

- 2.1.18.1. Jugians regia, Aesculus sp., Acer pictum, Corylus colurna, Populus ciliata, Ulmus wallichiana, Prunus padus, Fraxinus floribunda.
- 2.1.18.2. Viburnum foetens, Sarocococca saligna, Skimmia laureola, Spiraea, Parrotiopsis, Hetrophylla geradiana.
- 2.1.18.3. This type is in edaphic climax and the regeneration of the species is good.

### 2.1.19. Low Level Blue Pine Forest (Pinus wallichiana)

2.1.19.1. Kail crop occurring with moist Deodar and western Mixed Conifer type described above from this type. This formation has resulted due to colonization of hotter gaps by Kail. Kail occurs pure but at times with slight mixture of Deodar, Spruce and Fir. Undergrowth is usually absent. The formation has resulted due to fire protection measures adopted in the past. Regeneration of Kail is adequate. The crop is mainly even aged comprising middle aged and younger age classes. Undergrowth is usually absent but present where the canopy is broken.

### 2.1.20. General Floristic.

2.1.20.1.Pinus excelsa, Cedrus deodara, Picea smythiana, Abies pindrow, Quercus diltata, Quercus ilex, Indigofera sp., Desmodium sp., Vibrunum, Fragaria sp., Galium sp. This type forms an unstable edaphic sub-climax as progression towards Deodar is going on in these forests.

#### 2.1.21.12/C 2a- Kharsu Oak Forest

2.1.21.1. This type consists of *Quercus semicarpifolia* forests, often pure, capping western mixed coniferous forests type on southern slopes and merges with Alpine zone above. It also forms an under storey with Fir and replaces Fir where biotic influence are excluded. Characteristics species are *Quercus semicarpifolia, Betula utilis, Acer caesium, Rhododendron, Abies pindrow, Picea smithiana*. It is developed between 2500 to 3300 meter altitudes and is regarded to be in stable climatic climax. Best example of this type may be found in Saoj Dhar and Padri Block. This forest is habitat of Chamba Langur. In shaltered sites Oak is displaced with Fir forests, Rhododendron and birch, but it often abuts directly on the alpine pastures.

#### 2.1.22. Himalayan Temperate Pastures

2.1.22.1. This type includes blanks known commonly as Behaks or Dhars conspicuously devoid of all tree growth. The ground is completely covered with grasses and herbaceous flora. These are used as seasonal pastures by the nomadic Gujjars and Bakarwals whose huts are found scattered there. The blanks seem to have been cleared where water facility existed and the intense continued biotic and human interference have made them perpetual pastures. These pastures are heavily grazed, even much beyond the carrying capacity of such pastures. This type seems to be in biotic climax.

Althought the surface denudation is slight, soil structure is altered by exposure, treading and the presence of grass mat and especially where the soil is clayed. It is generally rendered unfavourable to tree regeneration. At higher elevation increased exposure to wind and cold and the greater accumulation of snow are also factors inimical to racolonisation. Accumulation of cattle dung also has marked affect on the composition of ground flora.

#### 2.1.23. Alder Forests

2.1.23.1. The characteristic species of this type is *Alnus nitida* locally called '*Champ*' trees. It is found along all the running streams banks in wet depressions and extends from sub-tropical to temperate zone. Its place is taken up *by Populus ciliata* which forms pioneer

species in colonizing the riverine beds and other freshly exposed damp sites at higher altitudes.

#### 2.1.24. General Floristic

2.1.24.1.Populus ciliata, Aesculus sp., Faxinus floribunda, Ulmus sp., Celtis australis.
Viburnum sp., Spiraea sp, Hetrophylia gerardiana, Polygonum sp. This type is in stable edaphic climax. The regeneration of Alnus nitida is profuse.

#### 2.1.25. Himalayan Dry Temperate Forests

#### 2.1.25.1. Dry broad leaved coniferous forest (Quercus ilex)

The characteristic species are *Quercus ilex* and *Pinus walichiana*. This type occupies mostly drier, very steep and difficult lower slopes in the inner valley including dry Kandi belts. *Quercus ilex* (Heru Oak) is the main species and it occurs pure and gregariously. It is extensively found in Chiralla range, continues in Kelar range and runs upto lower areas of Neeru range. It forms chief source of firewood and fodder during winter and tusser worms thrive best on its leaves. Regeneration of *Quercus ilex* is good but heavily lopped for fodder and firewood. Mature trees become hollow and unsound. It coppices well.

#### 2.1.25.2. West Himalayan High-Level Dry Blue Pine Forests

*Pinus wallichiana* is the characteristic species often found pure, occurring between 2200 to 2800 m. Fir and spruce are the main associates. Deodar is very rare and only occurs in the lower limit of the zone. This is principally developed on the inner, hotter, southern and south western slopes. This type represents climatic sub-climax and has resulted due to secondary succession. Heavy grazing continues in this type as well which hinders the progress of the colonization.

#### 2.1.26. Sub alpine Forests

#### 2.1.26.1. Birch Fir Forest

The characteristic species are *Betula utilis* (Birch), *Abies pindrow* and *Rhododendron* spp. which forms open forests. This type is finally replaced by Birch, Rhododendron

and Alpine pasture types. This type is quite extensive and occurs throughout the tract. This type is under great biotic pressure as heavy grazing is resorted to in the summer. This type is Bio-climatic climax.

#### 2.1.27. Alpine Scrub

#### 2.1.27.1. Birch / Rhododendron Scrub Forests

This type is exclusively developed in higher reaches of Bhalesh and Neeru ranges. The characteristic trees are Betula *utilis* as forming upper storey and *R. campanulatum* as under storey with herbaceous flora. This type is heavily grazed.

#### 2.1.27.2. Alpine Pastures

The characteristic vegetation is only herbaceous. Anemones and Potentillas and occasional funipe species of family Ranunculaceae, compositae and Primulaceae are also found in abundance. This type is also heavily grazed.

### 2.1.28. Injuries to which the Forest crop is liable

The forest crop is amenable to the damages by two main categories of agencies.

#### (a) Biotic (b). Abiotic

The injuries of biotic type include those caused by the man, his cattle, insects and pests.

#### 2.1.29. Local graziers

2.1.29.1. In addition to the subsistence agriculture locals also rear the animals for milk, meat and wool. During summer months these animals are fed with green grasses and foliages. As the entire area is covered under snow during winters the locals are used to cutting grasses during autumn season for feeding the animals during winter. The activity of grass cutting removes all the current recruits of forest species from the floor. It is the major factor against natural regeneration of conifer forests. There is a constant quarrel between the local and nomadic graziers about sharing of the pasture land available. The incidence of heavy grazing render retarded regeneration of forests. Goat and Sheep cause the major damage.

#### 2.1.30. Forest fire

2.1.30.1. In the temperate areas, forest fire occurs mainly during October and November and rarely in the month of April. The dryness is major factor facilitating fire and not the temperature. The forest fire damages the young pole crops heavily. After the fire incidence, the first colonizer of the forest floor is Parrotia. After taking reasonable efforts the fire burnt area, can be regenerated properly. During fire season attention should be focused on areas of young regenerating crops and pole crops. Fire should be extinguished before it takes the form of crown fire. The beneficial effects of fire should be used in the management of alpine pastures.

### 2.1.31. Lopping

2.1.31.1. Though conifers are prohibited to be lopped but still a great incidence of loppings are noticed arround villages and the towns causing considerable mutilations of trees and consequent loss of timber. Moreover, broad-leaved trees, even the special class are lopped for fodder. Not contenting with this the lopping is carried out even upto the tip of the crown and tree virtually gets killed. The illicit damage is to be curbed down and species permitted for lopping shall only be lopped as per standing lopping rules.

#### 2.1.32. Girdling

2.1.32.1. Girdling is very common along demarcation line, particularly around "chaks" and encroached areas. This is primarily done to encroach upon the adjoining forest upto extreme limits slowly and gradually.

#### 2.1.33. Encroachment

2.1.33.1. Fully knowing the repercussions of such havoc deliberately inflicts damage and encroachments where the trees are girdled and felled and even burnt. Illicit damage is common in the forests in the fringe areas town, where as in the interior or it is negligible.

## 2.1.34. Parasites:

2.1.34.1The parasite *Arceuthobium minutissimum* cause demage to Kail. Young and old crop is damaged equally, tree loose increment and ultimately die. Fomes fungi are most damaging that rot a tree and practically render it useless.

## 2.1.35. Climatic

2.1.35.1 Some damage is caused by snow slides. In years of abnormal snowfall and rainfall especially wet snowing during spring in congested patches break the trees especially followed by strong winds.

## 2.1.36. Road Constuctions

2.1.36.1 Road constructions along forest tract have caused havoc to the forests. The mug produced during digging of roads are illegally dumped off to adjoing areas that slide down the slopes and causing considerable damage to the intervening plants that mutilate and ultimately die.

## 2.1.37. Illegal felling

2.1.37.1 Worst of the vagaries that human inflict to the forests is illegal cutting. To meet the palatial house demand and for firewood collection complemented by laxity of law and fearlessness thereupon has caused invariable demage to forests.

## Chapter-II B

## **FOREST FAUNA**

### 2.2.1. General Description

2.2.1.1. A variety of fauna is found in this division because of varied climatic conditions and altitudinal zonation prevailing in the tract. The list as well as description of some of the species is given as under.

### **Table-2.5 List of Wild Animals**

English Name	
Himalayan Musk Deer	
Asiatic Ibex	
Himalayan Serow	
Himalayan Goral	
Common Langur	
Rhesus Macaque	
Common Leopard	
Snow Leopard	
Jungle Cat	
Small Indian Mongoose	
Yellow Throated Martin	
Himalayan Marmot	
Kashmir House Rat	
Short-Tailed Bandicoot Rat	
Birch Mouse	
Himalayan Brown Bear	
Asiatic Black Bear	
Jackal	
Wolf	
Hill Fox	
Kashmir Gray Langur	

## 2.2.2.Mammals

## (A) CARNIVORA

a) **The Leopard or Panther** (*Panthera pardus*) It is commonly known as 'Chita' or 'Chitra' by the locals. Its presence is felt throughout the division. Sometimes it kills domestic animals, with the result that locals hunt this animal largely for protecting their livestock. Its number is on sharp decline.

- b) **The Snow Leopard** (*Panthera uncial*). It is expected to be found in higher reaches of Bhalesh range. It generally inhabits the snow capped mountains.
- c) **The Jungle Cat** (*Felis chaus*) A small number is found in lower scrub forests of this division. It preys upon small animals and birds. This cat has long legs comparatively short tail and distinctive pale green eyes exhibiting a cruel expression.
- d) **The small Indian Mangoose** (*Herpestes auropunctatus*) Its small size, shorter tail, olive-brown gold-flecked, soft silky fur are distinctive. This animal lives in holes it burrows by itself. It is mostly found in low lying areas of this division and around cultivated fields. It feeds on rats, mice, snakes, scorpions, centipedes, wasps and insects.
- e) **The Jackal** (*Cains aureus*) This animal is commonly found in the division up to elevation of 1500 meters above mean sea level, mostly around towns, villages and cultivation areas; sheltering in holes in the ground, dense grass and scrub. It is nocturnal in habit. It sometimes attacks small domestic animals like goat, sheep, and their young ones and birds. It is one of the most common scavengers in nature.
- f) Brown Bear (Ursus arctos) It is commonly known as 'Lal Bhalu' because of reddish brown colour of its coat. It is heavier in built than black bear. Open peaks high above the tree line is where its usually hunts. It is omnivorous; prefers grasses, ants, termites, honey, variety of fruits and flowers. Many a times it attacks sheep and goats when hungry.
- g) **The Himalayan Black Bear** (*Selenarctos thibetanus*) It is black in colour with characteristic 'V' shaped breast mark which may be white, yellow or buff. In summers it is found near the tree line ( 3000 to 3500 m), whereas it descends to low lying area during the winter months. It lives on a variety of wild fruits, berries, insets, termites and larvae. It raids the maize fields and sometimes causes heavy damage to the crop.
- h) **The Himalayan Weasel** (*Mustela sibirica*) The Himalayan weasel lives in temperate and alpine forests and open grass and scrub above tree line. It hunts rats, birds and their eggs.
- i) **The Stone Martin** (*Martiw foina*) Its built suggests a mixture of squirrel and cat. It has moderately long legs, and tail about half as long as its head and body. It generally

inhabits the temperate and alpine zone of the division and is rarely found below 1500 m. It lives both in the forests, and on the barren heights above tree line. It preys on mouse, hare, lizards and snakes. It also feeds on honey, nuts and fruits.

## j) The Chamba Langur (Semnopithecus ajax)

Also known as Himalayan Grey Langur was enlisted as critically endangered in 2008 in IUCN red data list. It is restricted to high tracts of Padri and Kaplash along Gamgul Wildlife Sanctuary.

## 2.2.3 Rodents

- a) **The Indian Field Mouse** (*Mus booduga*) It is common in fields, compounds, and generally ventures into the houses. It lives in burrows and feeds on grass, fruits, roots and nuts etc. It damages agricultural crops, nurseries and plantations.
- b) **The Indian Procupine** (*Hystrix indica*) It favours rocky hill sides of sub-tropical and tropical belt and is encountered in the Chiralla range. Its hair is completely modified into spine like structures. The neck and shoulders are crowned with a crest of bristles 15 to 30 cm long. The quills on the back are very profuse, and are ornamental with deep brown or black and white rings. It damages nurseries and young plantations.
- c) **The Indian Hare** (*Lepus nigricollis*) This animal is commonly found up to an elevation of 2500 meters. It is earthy brown in colour and generally weights between 2-3 kg when fully grown up. It runs fast and damages agricultural crops in kandi belt.

## 2.2.4 Deer

a) **The Musk Deer** (*Moschus moschiferus*) It is a small, horn-less deer, not more than 50 cm height at the shoulder. Its food consists of grasses, lichens, leaves and flowers. The male of this species secretes *musk*. This deer has mercilessly been killed for its musk pod and is now threatened with extinction. The males carry no antlers, but have peculiar tusks, which are elongated upper canine teeth. Musk is secreted in a glandular sac under the skin on the abdomen in males. It has a strong odour and is largely used in perfumery. It, therefore, needs special protection. It is reportedly seen in Bhalesh range.

## 2.2.5. Injuries to Which Fauna is Liable

2.2.5.1. The fauna of the tract is liable to injuries by man, wildlife epidemics, atmospheric influences and fires.

## 2.2.5.2. Injuries by Man

2.2.5.2.1. Man poses the biggest threat to the fauna. Hunting of wild animals and birds has always been a sport for man. Wild animals and birds are killed for their valuable skin, horns and flesh. Even the slightest damage by the wild animals to the crops or live stock is not tolerated, and this results in killing of wild animals and birds.

## 2.2.5.3. Injuries by Fire

2.2.5.3.1. Fire is responsible for large scale destruction of small animals, birds and micro-fauna.At times wild animals also get trapped and killed in the forest fires.

## UTILIZATION OF THE PRODUCE

### 3.1. Agricultural customs and wants of the population

3.1.1. **Demography:** According to the 2011 census, Doda district has a population of 409,576. The district has a population density of 79 inhabitants per square kilometre. Its population growth rate over the decade 2001-2011 was 27.89%. Doda has a sex ratio of 922 females for every 1000 males, and a literacy rate of 65.97%. The district consists of four tehsils namely Bhadarwah, Doda, Thatri, Gandoh. There are a total of 403 revenue villages in the district. The district is very far flung and backward. Connectivity in general is poor, however road density has improved from the yester years due to focused implementation of central scheme PMGSY. As a general pattern the villages are located along the fringes of the demarcated forests. Population consists of hill clans of Thakurs, Kashmiries, Gujjars, Rajputs, Bhramans, Sippis and Gaddi. The tract is also visited by nomadic population of Gujjars and Bakerwals tribe during the summer months of the year for grazing their animals in the alpine pastures of the forests. These communities inhabit the areas just bordering on, or within the forests. Many local castes and languages are met within the jurisdiction of this division. Literacy rate is low at 47.96%, albeit of late the density of schools has increased after the implementation of central scheme Sarva Siksha Abhiyan. However the quality of education leaves more space for improvement. The villagers generally put up in huts which are made up of sun-burnt bricks, mud and wood. Wood provides the reinforcement for the walls and is used as load bearer for the roof and also used in the roofing. The Gujjars usually live in single storied flat roofed and mud plastered Kothas. The gradual up-liftment of socio-economic conditions of the people in the town is visible as the Kacha houses/ Kothas have given way to Pucca houses. Schools, Health and Social Welfare centers have also been opened in Bhadarwah Gandoh and Thatri.

- 3.1.2. **Agriculture:** Agriculture and Government jobs are the main occupation the population is engaged in agricultural practices are still primitive and agricultural lands are located generally on small platues located along the valley beds. Total area under agriculture in the district is 7127 acres. Despite the presence of many perennial nallas the agricultural lands do not have access to irrigation except the tract along Neeru river in Neeru and Kellar range. Farmers generally practice single cropping.
- 3.1.3. The main kharif crops are Maize and Paddy and the main rabi crop are Wheat and Mustard. People also keep livestock such as cow, sheep, goats and in the upper regions of the division yaks and horse/ponies are being domesticated.
- 3.1.4. The forests play vital role in the lives of villagers who depend upon them profoundly for their requirements. Forest form major part of land in the district and more than 90% of villages are located adjoining forests. Villagers as well as the town dwellers requirement for constructional timber, firewood, torchwood and fodder for livestock are met from the forests. These demands of the local population exert tremendous pressure on the forests, which has resulted in progressive deterioration of crop stand and at certain places their depletion.

#### 3.2. Markets and marketable products

- 3.2.1. There is no well developed market in Bhadarwah. The nearest market is Jammu. However due its unique geographical location, there exists ample scope for development of local markets for niche products. The niche products of Bhadarwah that can be marketed successfully are forest timber, forest based NTFPs, Kala zeera, Gucchi, Horticulture crops and floriculture. There has been a significant improvement of the road connectivity from Jammu to Bhadarwah and this should augur well for the development of local market. Bhadarwah is also connected with Bani and Basoli via Bani-Basoli road and with Himachal via Bhadarwah- Chamba Road. These roots can be utilised for extension of markets.
- 3.2.2. The forests are rich in timber species of Deodar, Kail and Fir. Traditionally this area was major source of timber to the state during the operations of lessees, during when green marking was in vogue. However the ban on green felling significantly contracted the

timber trade to insignificance. NTFPs like medicinal plants from the wild upper and middle Himalayas are of the best quality in terms of the concentration of active ingredient from a given unit weight. Prominent among them are Kuth, Dioscorea, Patis, Dhup, Bankakri, *Belladona, Artemesia*, Suranjan talakh, Muskhbala, Banafsha, *Aconitum* etc. Kaplash area of Bhadarwah region is a rich repository of medicinal plants inhabiting diverse and unique medicicinal plants. In the recent time another herbs Nagchatri (*Trillium govanianum*) has been in quite a demand in markets in Amritsar. Guchhi are also premium products found in the area which can be marketed for its uniqueness from the locality. Water is another product that is abundant but is grossly underutilized. The mountain tops of Bhadarwah are repository of fresh water. Generally the tract is possession good amount of water availability except areas of Bhalesh, Thatri and areas located on higher altitudes.

### 3.3. Demand and Supply of forest produce and pressure on forests.

#### 3.3.1. Timber Requirement

3.3.1.1. The estimated population in Bhadarwah Forest Division is 2, 35,721 with 44,655 household. An average sized household has 6 members and therefore. On an average the construction of an average sized house with wooden truss requires 7 cum. Given a decadal growth rate of 25 percent, around 9822 new households will be added every 10 years, in turn annually 983 households. Of the 983 households only 50% ie. 492 would need new houses. Assuming that the house has longevity of 25 years, the requirement of timber for constructional need would work out as below.

#### Table-3.2 Estimated requirement of volume timber.

Timber requirement	Calculation	Volume of timber (m <sup>3</sup> )
Annual timber requirement for new houses	492x7	3444
Annual timber requirement for the renovation of old houses. (assuming 50% of timber from old house is used)	44655/25x7x0.50	6252
Total timber requirement per annum		9696

3.3.1.2. Against an estimated requirement of 9696 m<sup>3</sup> per annum, the Forest Department has supplied on an average around 1900 m<sup>3</sup> of timber per annum to the concessionists, which works out to only 20 percent of the total timber requirement. The gap between supply and demand seems imposing and is discussed in chapters ahead.

### 3.4. Firewood

3.4.1. People require firewood for cooking, heating and cremation purposes. A study to evaluate the firewood demand in Bhadarwah town was conducted. First step of the study was to collect the fuel wood data. For this purpose, the entire municipal area was divided into respective wards to ensure the true representation. Total population of Bhadarwah municipality is 11235 (April 2012 cases) having 2144 househols as per the data provided by Bhadarwah Town Area Committee. The general consumption pattern found was; a) domestic use b) Commercial use (Bakery/Dhaba/Teastall) c) for relegious activities and funerals d) others (brick kilns, Govt. offices, army establishments etc). A total of 17,545 Quintal of firewood requirement for winter period (Nov to March) was evaluated by recieving data from 5 households from each ward. It gave a rough estimate of demand of firewood in town. The forest department provides roughly 800 quintal rest all is met from illegal sources. It has been observed that the quality of firewood in the Bhadarwah town firewood depot is not of good gality and the rates for domestic consumption other than relegious or cremation purpose are high that does not commensurate the quality of firewood available in the depot. It attracts less buyers and prople generally tend to buy good quality firewood illegly in comperative cheaper rates.

This is only a glimpse of firewood consuption in town. The rural population living adjoining to the forests resort totally on firewood for cooking and warming with few househols owining LPGs. It is expected that the recent move of government to cap the number of subsidized cylinders is going to nudge the population to relook for cheaper cooking options, which invariably would be firewood. During peak winter when the roads are blocked and power lines snapped, arrangement of firewood is a must. The non availability of good quality and cheaper firewood from firewood depot encourage

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the petty thieves for their illegal supply. It is expected that annually atleast 1500 quintals can be stocked for such an eventuality.

The people in the villages are bereft of any access to LPG cylinder, and depend entirely on forests for firewood. It is estimated that the firewood consumption is 10 times more than urban areas. Trouble arises when forest floor along profusely habituated stretch is devoid of any dead, dry fallen wood, and resultantly in order to sail over the winters the village folks are forced to hack down standing trees. The staff is also unable to do much in such situations. In the entry point activities, technological initiatives must aim to improve the efficiency of fuel wood using effecient devices so that the energy content in the wood is optimally use through VFCs. Beside, monitoring of illegal trade of firewood should be stricktly maintained.

Year	Broad leaved	Conifers	Total
2006-07	0	70.16	70.16
2007-08	0	127	127
2008-09	0	66	66
2009-10	0	136	136
2010-11	0	321	321
2011-12	0	503	503
2012-13	0	589	589
2013-14	0	563	563
2014-15	0	254	254
2015-16	0	207	207
2006-07	0	70.16	70.16
2007-08	0	127	127

Table-3.3 Quantity of Firewood sold	(Quintal) in Bhadarwah Forest Div
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## 3.5. Methods of harvesting and their costs

3.5.1. The forest felling extraction operations are still archaic. The tree is felled using axe and two man saw. The felled tree is delimbed and logs are cross cut to 10-12 feet sizes. The logs are then debarked and then converted into standard B.G size scants. In situations where the extracted scants are minimal and road head less than 5 km head load carriage to nearest road head is opted. In areas having stream with appropriate flow speed, wet slides are established and in their absence dry slides are the rule. However when the sleepers were to to cross longer distance and down many deep valleys aerial ropeways or cranes are used. When sleepers were to be transported down the slope Tar spans were used. The tar spans operate on the principle of gravity. Usually more than one tar span are required to be established to transport to road head due to high mountains. Movement of scants are regulated by issuance of launching permission and transportation permission by river and road. In movement through rivers, River F-25 is issued and also in case of mechanical transportation by road F-25 is issued. The permission for transportation is issued by Divisional Forest Officer within his territorial jurisdiction and when transported outside the Division the permission is issued by the concerned CF territorial. Timber after reaching the sale depots are graded and arranged into lots and then sold by open auction.

#### 3.6. Lines of Export

3.6.1. In the earlier times in the absence of road network rivers were the preferred mode of transport. However, now the Division has comparatively better road connectivity, which has made it feasible for haulage of timber to far off markets by mechanical transportation, and also made it possible for the transportation of timber round the year. To minimize the chances of interruption in supply during winters, the forest produce is transported down the fair weather roads during dry season and dumped at loading points adjacent to the pucca roads for onward dispatch to the market. It would also be necessary to construct fair weather road to interior forest areas to enable uniform forest working and to improve access to facilitate protection of forests and transport of forest produce. It has been noticed that non availability of easy access has

often resulted in the forests being not worked according to plan. In the earlier times, timber used to be exported out of the state by railways in addition to road transportation.

### 3.7. Past and Current Prices

3.7.1. The timber in the division area is supplied to people either directly from the forests or from the Timber Sale Depots. The price of timber direct from forest is governed as a proportion of the standard rates. The standard rate proposed in the year 1992 is still in vogue and in course of time has become completely outdated. There is a need to revise the standard rates to give it some remblance of the prevailing market rate. The financial feasibility of working plan would depend on dynamic fixation of rates of timber annually in time with the market price movement. The standard rate adopted at present is as below.

Dia-Class	Deodar	Kail	Fir	Chir
0-10	170	110	70	40
10-20	650	410	270	110
20-30	1310	720	750	215
30-40	2450	1540	1130	625
40-50	4250	2740	2060	1480
50-60	6700	4560	3940	2830
60-70	10480	6780	6480	4570
70-80	14030	8890	9060	6260
80-90	18110	10880	10970	7990
90-100	24080	13620	13670	9020
100-110	26460	14940	14820	10000
110-120	28360	15280	15770	11400
120-130	29800	16000	16460	11810
130-140	30840	16320	17120	12170
140-150	32040	17000	17580	12420
150 & over	33120	17400	17900	17580

#### Table-3.4 Standard rates (in Rs)

3.7.2. The supply of timber from Timber Sale Depots are done on depot rates prescribed by the Government every year. The present rate and previous revision of the depot rates is given below for reference.

Table-3.5 Depot rates (in Rs.)

S. No.	Govt. order	Zone	Timber Form	Deodar	Kail	Fir
		А	Log	185	130	74
212 FST of 2010			Sawn	215	160	104
	В	Log	345	245	138	
T	dt:13/5/2010		Sawn	375	275	168
		С	Log	513	360	205
			Sawn	543	390	235
		А	Log	161	102	59
			Sawn	202	121	81
		В	Log	246	160	120
2	278 FST of 2006		Sawn	281	193	136
2	dt:19/5/2006	С	Log	299	173	119
			Sawn	362	231	132
		M/C	Log	391	226	156
			Sawn	474	307	173
	А	Log	146	93	54	
			Sawn	184	110	74
		В	Log	197	128	96
2	314 FST of 2005		Sawn	225	154	109
3	dt:1/8/2005	С	Log	299	173	119
			Sawn	362	231	132
		M/C	Log	391	226	156
		Sawn	474	307	173	
		А	Log	146	93	54
			Sawn	184	110	74
4	501 FST of 2003	В	Log	197	128	96
4 dt:21/10/2003	dt:21/10/2003		Sawn	225	154	109
		С	Log	272	157	108
		Sawn	329	213	120	
		А	Log	162	103	60
_ 517 FS			Sawn	204	122	82
	517 FST of 2002	В	Log	246	160	120
5	dt:31/1/2002		Sawn	281	192	136
		С	Log	340	196	134
			Sawn	411	266	150

3.7.3. The demand for timber has not been met by supply through Government outlets and that has been supplemented by sale of timber by private Timber Sale Depots. The private TSDs are registered by the Divisional Forest Officer. The private TSDs prefer sale of imported timber, however, the demand for the same is still to catch up. The average

price of timber in the local Bhadarwah market from the private Timber Sale Depots is as under:

## Table-3.6 (in Rs.)

Year	Species	Private Depot-1	Private Depot-2
		Rate/ cft.	Rate/ cft.
	Deodar	1045	1043
2012-13	Kail	719	719
	Fir	461	462

3.7.4. The average price of timber sold by SFC Depot at Jammu is as below:

## Table-3.7 (in Rs.)

Year	Species	Rate/ cft.	Class
2012-13	Deodar	1841	В
	Deodar	1013	С
	Kail	1142	В
	Kail	584	С

# ACTIVITIES OF STATE FOREST CORPORATIONS IN HARVESTING AND MARKETING OF FOREST PRODUCE

### 4.1. Jammu & Kashmir State Forest Corporation

4.1.1. The J&K State Forest Corporation came to existence by the act of legislation, namely The Jammu and Kashmir State Forest Act, 1978. The rules for its operation were framed in the year 1981. The forests were worked out by forest lessees before 1984. There was broad consensus that the operations by lessees were not delivering expected returns and that there was a need to supplant it with government working. Accordingly nationalization of forest working was effected by the Jammu and Kashmir Nationalization of Forest Working Act, 1987. Thereafter the Forest Department hands over eligible forest coupes as per the working plan to the SFC and the SFC in return pay royalty to the Forest Department. The royalty rates changed species wise from SFC is as below. The rates were fixed in the year 1989-90 and have not since been revised.

#### Table-4.1

Species	Rate/ cft.
Deodar	94.23
Kail	44.77
Fir	35.02

4.1.2. The Hon'ble Supreme Court giving voice to the increased public concern for the protection of environment and forest imposed a moratorium on green felling of trees in 1996. The Court directed the state government to constitute a Qualitative and Quantitative norms (popularly Q&Q Norms) Committee to come up with recommendations for extraction of timber annually from forests of J&K State. As per the Q&Q norms committee recommendations which were accepted by the Supreme Court, 80 lakh cft by volume of conifer trees (dry, fallen; basically hygienic markings) was annually allowed to be extracted from forests. This resulted in significant reduction

of the annual quantum of timber extracted by the SFC, which otherwise was handling huge volume of timber every year.

- 4.1.3. The SFC annually surveys the forest coupes for availability of extractable timber. If the coupe satisfies the conditions prescribed by Q & Q norms, then dry/ fallen trees in the coupe are enumerated. The proposal for extraction is technically cleared by the Conservator of Forests (Working Plan) and felling of trees administratively approved by the Chief Conservator of Forests of the region. The markings are then handed over to the SFC for extraction.
- 4.1.4. The SFC prepares the estimate for the timber operation, based on the expected out turn and calculates the financial cost for extraction and transportation of timber upto its central depots. SFC then allocates the work to the contractors for execution of timber operation based on competitive bids. When the timber is dumped in the road head, the transportation of timber is permitted by either Conservator of Forests (Territorial), after due verification of the stocks.
- 4.1.5. The entire operation of timber extraction and transportation is closely monitored by the territorial field staff. All operations from the starting of felling operation to the disposal of debris and felling refuse is monitored. Strict conditions are enforced in the execution of felling. Felling of marked tree starts, only after the proper handing over of the markings to the SFC. The felling is carried out along the up-hill side and in rare cases along the contour, however never along the downhill side. The felling is undertaken in a manner that falling tree does not injure other nearby standing trees. The territorial department shall be reported about the progress of the felling operation every month. After completion of operations and before handing over back the compartment any irregularity during the course of operations is accounted for.
| S. No | Activity                                |       | gory ( norr | n rate in Ru | ipees) |
|-------|---|-------|-------------|--------------|--------|
|       | SAWN FORM                               | D     | С           | В            | А      |
| (a)   | Extraction (on FMM)                     |       |             |              |        |
| 1     | Felling (per cft)                       | 2.91  | 2.44        | 2.20         | 1.73   |
| 2     | Hand Sawing – under/odd size ( per cft) | 38.53 | 35.21       | 32.60        | 29.66  |
| b.    | Hand Sawing – standard size (per cft)   | 44.04 | 40.24       | 37.26        | 33.89  |
| (b)   | Of f-road Transportation (on DMM)       |       |             |              |        |
| 3     | Pathroo (per cft/Km of 33 chain)        | 6.44  | 6.26        | 6.11         | 5.94   |
| 4     | Pacci nail (per cft/Km of 33 chain)     | 2.41  | 2.17        | 2.17         | 2.08   |
| 5     | Tarspan ( per span/cft)                 | 5.44  | 5.16        | 5.16         | 5.16   |
| 6     | S.N Mahan (per cft per km of 33 chain)  | 1.69  | 1.59        | 1.59         | 1.47   |
| 7     | Main Nallah Mahan (cft/Km)              | 1.47  | 1.47        | 1.47         | 1.47   |
| 8     | Head carriage (forests) (per cft/chain) | 0.47  | 0.47        | 0.47         | 0.47   |
| 9     | Crane (per cft/Km)                      | 8.14  | 7.73        | 7.73         | 7.73   |
| 10    | H/C after nikkasi ( per cft/chain)      | 0.50  | 0.50        | 0.50         | 0.50   |
| (c)   | Minor Related Activity (on DMM)         |       |             |              |        |
| 11    | Launching (S.N Mahaning) / cft          | 0.36  |             |              |        |
| 12    | Nikassi (per cft)                       | 0.71  |             |              |        |
| 13    | Stacking (per cft)                      |       | 0.67        |              |        |
|       | LOG FORM                                |       |             |              |        |
| (d)   | A. EXTRACTION (A1 +A3)                  |       | 6.53        |              |        |
|       | A1 CONVERSION                           |       | 4.35        |              |        |
| 14    | A1.1 Debranching & Debarking /cft       |       | 0.89        |              |        |
| 15    | A1.2 Sawing &log marking/cft            | 3.46  |             |              |        |
| 16    | A3 Felling (per cft)                    | 2.18  |             |              |        |
| 17    | Loading logs (per cft) 3.92             |       |             |              |        |
| 18    | Un- loading Logs (per cft)              | 0.05  |             |              |        |

Table-4.2: The rates in vogue in SFC for timber operations during 2013-14 are as follows:

# (e) Log Rolling

#	Log rolling upto Kutcha Loading Point (Per cft chain)	Norms Rate in Rupees
1	Category A (0-20 degrees)	0.80
2	Category B (20-30 degrees)	0.59
3	Category C (30-40 degrees)	0.42
4	Category D (> 40 degrees)	0.19

# (f) Kutcha Road Transportation (Log Form)

Volume Slab cft.	Distance slab					
	0-50 km	6-10 km	11-20 km	Above 21 km		
Upto 5000	2.97	2.28	1.78	1.39		
5001-10000	2.92	2.11	1.49	1.03		
10001-20000	2.78	2.05	1.46	1.00		
20001-40000	2.64	1.95	1.38	0.95		
40001-80000	2.50	1.81	1.27	0.85		
Above 80001	2.36	1.70	1.18	0.79		

# (g) Pucca Road Transportation (Log Form)

(Figures in Rupees)

(Figures in Rupees)

S. No	Distance slab in Km	Rate in Rs/ cft/Km	Rate with 15% Contractor's profit (Rs/cft/km)
1	0-20	0.30	0.35
2	20-40	0.26	0.30
3	40-70	0.24	0.27
4	Above 70	0.21	0.25

# (h) Pucca Road Transportation (Sawn Form) – National Highways

(Figures in Rupees)

S. No	Distance slab in Km	Rate in Rs/ cft/Km	Rate with 15% Contractor's profit (Rs/cft/km)
1	0-50	0.16	0.18
2	51-100	0.15	0.17
3	101-150	0.13	0.15
4	Above 151	0.12	0.14

(i) Road Transportation (Sawn form) Other than National Highways

Loading charges (sawn timber)

(j)

= Rs. 0.19/ cft/ km = Rs. 1.26/ cft

# (k) Extraction in log form on old NPC procedure

Activity	Rate
Extraction including felling , conversion	At the average rate of Rs. 191 per labour
rolling etc. (all operations) upto KLP	per day as per NPC procedure

#### 4.2 Socio Economic Survey

Forests play a vital role in the rural economy of Bhadarwah. More than 85% of population of this area is rural and human habitations form a honey comb pattern along entire tract. Bhadarwah, Bhalla, Thatri, Kahra, Phigsoo, Chiralla, Gandoh, Chilli Pingal and Marmat tehsils fall under the spread of this tract. The population of this Division is approximately 2, 35,721 and majority of population is living in rural areas. The literacy rate of the Division is 64.68% (Doda district). The Division is having a high pressure of grazing/browsing which can be substantiated by the fact that Bhadarwah Division support grazing of cattle population almost equivalent to human population in this division. In the rural areas few people are employed in Government job and the remaining people practice the agriculture, Horticulture and rearing of animals for their subsistence. Agriculture is a predominant sector of the economy of this Division that supports majority of its population. Maize is chief crop of Bhadarwah prople, followed by rice. The agricultural of this tract is mainly rainfed, except few irrigated areas along Neeru River. Majority of the population have their own agricultural land and therefore food grain production comparatevely satisfactory. Firewood is a main source of energy for cooking and heating purposes. The socio economic status of forest fringe population is an indicator of dependence of local population on forest resources. After analyzing the same it emerges that the socio-economic condition of areas falling under Bhadarwah Forest Division is not very encouraging for forest. More than 85% population is rural living in and around the forests nearby creating lot of biotic pressure on the already degraded Forests of the Division. A culture of construction of palatial houses has evolved in Bhadarwah, which resulted in consumption of abnormal quantity of timber. However, an encouraging fact is the electrification of 95% of all the households in the Division and switching to LPGs has been successful in relieving the pressure off the forests for fuelwood and energy requirement of the local population which was not the case before. But still huge quantity of timber is utilised during winter period when most of the areas remain snow bound.

# Chapter-V

#### **FIVE YEAR PLANS**

#### 5.1. Importance of Forestry Sector

5.1.1. Nationally forests are facing severe biotic pressure as 2.4 % of world total geographical area is sustaining 17% of world population and 18% livestock. Nationally the per-capita forest area is 0.06 hectare as against the world average of 0.64 ha The forests are meeting 40% of domestic fuel-wood needs of the people and 30 % of the fodder needs of the cattle in our country. The demand and supply gap of timber, fuel-wood and fodder is widening in the country. As such forests are one of the key parameters of progress and development of nation and thus are a part of planning process. Ever since the launching of Five Year Plans regular provisions have been made for forestry development and forest based programmes. However, the importance that is due has not been given and is reflected in the meager allocation of 0.4 to 0.5% of the total national plan outlay. The Forest policy of 1988, while reiterating the "Directive Principles of State Policy" mandated the forest cover to one-third and two-third in the country and the hilly region respectively. This was further reinforced by the National Development Council by stipulating monitorable target for the forest cover at 25% and 33 % by the end of 10th and 11th plan respectively. In the 12th plan, National Mission for a Green India (GIM) has been approved by the Prime Minister's Council on Climate Change for Rs 46000 crore over 10 years coinciding with 12th and 13th FY Plan.

#### 5.2. Plan Allocation under different Central Schemes

5.2.1. The programme and funds that have been received in the division from various centrally sponsored pan schemes are as follows.

			11 <sup>th</sup> Fiv	e Year Pla	an			12 <sup>th</sup> Five	e Year Pla	an
Head	2007-08	2008-09	2009-10	2010-11	2011-12	Total	2012-13	2013-14	2014-15	Total
Intensification										
of Forest	0.00	0.00	13.24	13.24	28.00	54.48	16.72	14.79	44.18	75.69
Management										
12th Finance	0.00	0.00	16.36	5.00	0.00	21.36	0.00	0.00	0.00	0.00
Commission										
13th Finance	0.00	0.00	0.00	53.41	6.00	59.41	6.00	9.50	26.00	41.5
Commission										
Backward										
<b>Region Grant</b>	0.00	0.00	0.00	0.00	10.50	10.50	0.00	6.00	10.00	16.00
Fund (BRGF)										
National										
Afforestation	0.00	0.00	50.00	20.813	20.87	91.68	20.36	31.34	0.00	51.70
Programme										
(NAP)										

Table-5.1 Plan allocations in different Centrally Sponsored Schemes (in lakh)

- 5.2.2. From the table above it is evident that the allocation to forestry sector is meager and more funds are required for upkeep of the forests. The fact that forests have dropped off the radar of governments is clearly apparent. It is perhaps because of the inability of the sector to play a major role either commercially or in servicing the needs of the people. As such the forestry sector as a whole is slowly losing focus of successive governments.
- 5.2.3. In the year 2011-12 Rs 200 Crores have been allocated for the preparatory activities. The Green India Mission as it is known, aims at both increasing the forest and tree cover by 5 million ha, as well as increasing the quality of existing forest cover in another

5 million ha The Mission proposes a holistic view of greening and focuses not only on carbon sequestration targets alone, but, on multiple ecosystem services, especially, biodiversity, water, biomass etc, along with carbon sequestration as a co-benefit. The GIM recognizes that climate change phenomena will seriously affect and alter the distribution, type and quality of natural resources of the country and the associated livelihoods of the people. GIM acknowledges the influences that the forestry sector has on environmental amelioration through climate mitigation, food security, water security, biodiversity conservation and livelihood security of forest dependent communities.

# **STAFF AND LABOUR SUPPLY**

# 6.1. STAFF

6.1.1. Bhadarwah Forest Division has total sanctioned staff strength of 225. The following table shows the sanctioned strength and actual strength distribution of staff of Bhadarwah Forest Division.

#### Table-6.1

Staff				
Designation of Post	Sanctioned strength	Actual strength		
Deputy Conservator of Forests	1	1		
Assistant Conservator of Forests	1	0		
Range Officer Grade-I	4	2		
Range Officer Grade-II	1	1		
Forester	37	11		
Deputy Forester	13	2		
Forest Guard	124	94		
Senior Assisstant	1	1		
Accountant	1	1		
Junior Assisstant	9	4		
Driver	1	0		
Orderly	5	13		
Mali	9	25		
Chowkidar/ F.R.H Chowkidar	10	29		
Watcher/ Rakhas	4	25		
Safaiwala	1	1		
Farash	1	4		
Chainman	1	6		
Cattle Pond Keeper	1	1		
Total:	225	221		

6.1.2. The total salary requirement for the staff as per sanctioned strength is approx Rs. 7 crores annually. There is an acute shortage of staff at the cutting edge level of Forest Guards and Foresters, and also the supervisory staff level.

### 6.2. LABOUR

6.2.1. The presence of adequate labour has historically been a limiting factor. Plantation activities do not necessarily involve skilled labour but still some difficulty is faced in sourcing labour during the season. Much of the crises is in arranging labour for getting the work of extraction done. There is an acute shortage of skilled labour especially for felling and conversion of timber. At times the whole operation of extraction is held hostage to the idiosyncrasies of the extraction labour mate. It is an inescapable reality due to the improvement of standard of life and living, as well as, less people ready to take up the vocation of sawing. The fact that operation of sawing is physically demanding and involves considerable hardship can be attributed to the reduction in the number of people opting for the work, which is also accentuated by the fact that employment assurance schemes like MGNREGA offer better remuneration, at comparatively lesser hardship. It is expected that this issue is hereafter going to become more compelling; as such it is advised that efforts at mechanization of sawing operation should be earnestly explored. The department in collaboration with SFRI should narrow down on available technology and conduct a field feasibility study on its applicability.

# **PAST SYSTEM OF MANAGEMENT**

## 7.1. Early History of Forests in Bhadarwah

- 7.1.1. Long back in history the forests were considered a laissez faire. Anybody could come and lift timber from the forests according to his requirements. A "Girdawar" who used to be called as 'Banwazir' used to collect the revenue at some nominal rate per house for use of forest produce. This was a paltry sum and in return the people were at liberty to fell as many trees as they liked and anywhere. No restriction was imposed regarding the size of trees or the place of fellings. People used to fell trees as per their choice near the banks of floatable nallas and near cultivations. Forests were worked with an object to get whatever little could be possible from them.
- 7.1.2 1871 AD Punjab traders started working in the forests. They used to pay Rs. nominal amount per deodar tree as royalty and felled trees anywhere they chose. Unregulated and uncontrolled felling prevailed all over the region without any systematic management. The forests were thus converted into woods of inferior species and shrubs with scattered Deodar trees. These Punjab traders left timber in the forests because of transport difficulties. This dead wood was removed from the forests by the forest department contractors known as dead wood contractors. Government used to work out certain deodar areas and the stuff so obtained was dispatched to Punjab for sale under the supervision of Military officers. All this resulted in the deterioration and devastation of the forest wealth.
- 7.1.3. 1891 AD was a turning point in the history of State Forests, when the Forest Department was organized under the control of Mr. Mc. Donnel I.F.S. as the first Conservator of Forests. Forest Regulation No. 1 of S.1894 AD was passed by the State Council with a view to introduce Forest Conservancy on systematic lines. Demarcation was undertaken, construction of roads and buildings started and ranges and beats etc. were organized. Unregulated fellings however continued, of course, on a reduced scale

confining the activities to dead deodar and kail. These fellings were conducted under the monopoly system by contractors. Small volumes of green stuff marked in advance were sold to the P. W. D or other local purchaser at fixed standard rates. Energy of the Forest Department was wholly devoted to working out the felled trees and export of logs and sleepers left in the forests by the previous workers. Departmental working was given up in 1902 AD and sale of standing stuff to contractors introduced with the introduction of intensive and effective management of forests.

- 7.1.4. In early days of its history, Bhadarwah forests were not given importance and therefore, there was no planned harvesting of the forests. 'Banwazir', an officer under Wazir Wazarat of the District used to collect fee from each house for the use of these forests. It was in 1871 A.D the commercial exploitation of the forests started. There was no restriction of size or place of fellings.
- 7.1.5 Bhaderwah remained Jagir of Raja Sir Amar singh from 1877 to 1880 A.D. and again from 1886 to 1909 A.D. Then it passed over to his heir Maharaja Sir Hari Singh and amalgamated in Jammu and Kashmir State in 1929 A.D.
- 7.1.6 The extraction of sleepers both BG and MG continued till 1902 without any plan mostly confined to Neeru valley.

#### 7.2. First Plan for Management of Bhadarwah Forest Division (1902-1932 A.D)

- 7.2.1. It was Mr. W. Mayes of Imperial Forest Service Officer who prepared the first working plan. He prescribed Indian Selection System underwhich a limited number of first class trees of 2.25m girth were to be felled in each compartment (upto 3000 annually) followed by supplimentary felling. Because of the bad execution of the felling large number of the trees of harvestable girth and approaching classes standing over the regeneration were removed.
- 7.2.2. The result of this removal resulted in uniformity of the crop with scattered overwood. This was more pronounced in Neeru and Chiralla valleys than in Jai and Bhalesh owing to its steepness.

# 7.3. Second Management Plan by F.C Gupta's Plan (1932-33 to 1942-43 A.D)

- 7.3.1. Mayes's Plan was revised by Sh. F. C. Gupta. Blocks and compartmentation was done on better line, but emphasis was laid on area of the compartment above 500 Acres. Following four Working Circles were constistuted:
- 1. Uniform working circle
- 2. Selection working circle
- 3. Improvement working circle
- 4. Unregulated working circle.

**7.3.2 UNIFORM WORKING CIRCLE:** Uniform System was introduced in the important Deodar-Kail forests situated on easy slopes. The entire growing stock above 12 inches dbh (30cm) was enumerated in 6 dia class (15 cm) upto 36 inches (90cm). The Shelterwood Compartment System was prescribed to convert the crop into uniform crop. Rotation was fixed at 150 years with regeneration period 30 years, 120 years was prescribed as conversion period. It was also presumed that conversion to uniform began 30 years ago. Two fifth of the area was allotted to the regeneration block and rest was kept in unallotted block. Trees upto 18 inches DBH (45cm) were considered as regeration and groups of 18-24 inches (45cm-60cm) to be retained as future crop along with poles. The yield was calculated by the formula:-

### Y= G/100

Where **G** = Growing stock

100 in the number of the years which a tree took to attain 30 inches (75cm) diameter.Yield for whole Working Circle worked out as:- Deodar=7.40 lacs CFT &Kail= 2.60 Lacs CFT. Yield for regeneration block worked out to be:- Deodar = 5.70 Lacs CFT.& Kail= 2.0 Lacs CFT.

The difference between the two was to be removed in the form of thinning and light improvement fellings.

**7.3.3. SELECTION WORKING CIRCLE:** Deodar, Kail and plenty of Fir on steeper slopes were allotted to this circle. Complete enumaration up to 12 inches DBH (30cm) was

carried out. Exploitable diameter was fixed at 30 (75cm) was carried out. Felling cycle was fixed at 30 years. The yield was calculated by the formula:-

Y = G (30 inches and above) / 30

Where, G = Growing stock

The yield for Deodar and Kail worked out as: Deodar= 2.96 lacs CFT & Kail = 1.27 Lacs CFT. Fir was not controlled, and also no cultural operation took place. Therefore no improvement in natural regeneration was recorded

- **7.3.4 IMPROVEMENT WORKING CIRCLE**: One third of the area of this circle was kept for improving the poorly stocked crop of Chir, Deodar and Kail but no work of improvement like thinning, cleaning improvement felling was carried out.
- **7.3.5 UNREGULATED WORKING CIRCLE:** No work was prescribed excepted markings for concessionists and other local demands whereever necessary.
- 7.4. Third Management Plan by Sardar S.S Malik (1943-44 to 1952-53 extended to 1953-54 A.D).
- 7.4.1. Mr. Gupta's Plan was revised by Sardar S.S. Malik D.C.F. Following Working Circles were constituted:-
- 1. Uniform Working Circles.
- 2. Deodar-Kail Selection Working Circle.
- 3. Fir Selection Working Circle.
- 4. Un regulated Working Circle.
- **7.4.2. UNIFORM WORKING CIRCLE:** In addition to the old areas of this working circle, fresh area from Improvement Working Circle was added to it. The rotation and regeneration periods were fixed at 150 and 30 years respectively. The conversion period continued to be at 120 years. Growing stock was emmerated upto 12 inches DBH (30cm).

The calculations for whole Working Circle was done by Von Mantal's formula

Y = 2V/R

Where: V is the volume of entire growing stock above 18 inches diameter (45cm) and R denotes rotation i.e 150 years. Yield was further reduced by 5% and final figures emerged for the circle as under: Deodar =7.74 Lacs CFT, Kail= 2.54 Lacs CFT & Fir = 2.40 Lacs CFT.

7.4.3. DEODAR KAIL SELECTION WORKING CIRCLE: Suitable areas from Bhalesh valley were added in the old Selection Working Circle, simultaneously pure Fir areas especially of Jai valley were separated out and put in the Fir Selection Working Circle to be worked along Deodar-kail Selection forests. Enumeration was conducted in whole working circle upto 12 inches DBH (30cm). The exploitable diameter of 30 inches (75cm) was kept for all species. Rotation kept at 150 years and felling cycle of 30 years was adopted.

felling cycle of 30 years was adopted.

Yield was calculated on the basis of recoupment from approach class, and removal of surplus stock in 50, 40 and 40 years for Deodar, Kail and Fir respectively. This worked out as 1.84 Lacs, 1.42 Lacs and 6.51 lacs CFT for Deodar, Kail and Fir respectively. An interesting feature of this was that, it was assumed that only 55% of the surplus stock will be available for removal for silvicultural reasons.

For comparsion sake, yield was also calculated by Von Mentel's formula 2 V/R (where: V is the volume of the stock 12 inches (30cm) and over in diameter and R is 150 years, the rotation age Results were: Deodar = 3,68,747CFT, Kail = 3,10,943 CFT & Fir = 7,70,039 CFT. No cultural operations were carried out.

7.4.4. FIR SELECTION WORKING CIRCLE: The rotation for Fir was adopted as 180 years. The exploitable diameter of 30 inches (75cm) was continued in this plan also. Enumeration upto 12 inches DBH (30cm) were carried out in 50% of the commercial areas. Incidently this area had more of the Deodar.

The yield was calculated in the same manner as in the case Deodar-Kail Selection Working Circle. Yield worked out to be as: Deodar = 0.25 Lacs CFT, Kail = 0.14 CFT & Fir = 0.13 CFT.

For comparison sake the yield was also calculated by Von Mantel's formula 2V/R (where, V is the volume of the stock 12 inches and over in diameter and R is rotation age 180 years as Deodar= 48,809 CFT, Kail = 26,822 CFT & Fir = 5, 52,695 CFT.

**7.4.5. UN REGULATED WORKING CIRCLE**: Fellings for concessionists were prescribed in this working circle. However Chir overwood was removed from Chir forests

## 7.5. Chenab Valley Fir Plan (1943-1952 A.D)

All suitable area left out in Malik's Plan were intended to be managed under the Chenab Valley Fir Plan to supply raw material for paper and factory which could not be materialise and therefore, no works were conducted in these areas.

### 7.6. R.N. Khushoo's Plan (1954-55 to 1973-74 A.D)

7.6.1. Malik's plan was revised by Sh. R.N. Khushoo following working circles were formed:-

- 1. Uniform Working Circle.
- 2. Mixed Coniferous Working Circle.
- 3. Fir Selection Working Circle.
- 4. Un regulated Working Circle.
- **7.6.2 UNIFORM WORKING CIRCLE:** Some areas of Deodar- Kail Selection Working Circle of previous plan were added in the previous Uniform Working Circle. Therefore area under this working circle enlarged. A rotation of 150 years corresponding to 24 inches diameter was aadopted and conversion period was fixed at 80 years from the beginning of this plan.

The growing stock was enumerated in 6 inches (15cm) diameter classes. The enumeration was done for 8549 acres of conversion block. Growing stock in rest of the areas was assessed on the basis of figures of previous plan increased by increment percent and sample area enumeration. The estimation for total growing stock for whole working cirle above 18 inches (45 cm) is as, Deodar = 7,27,66,013 CFT, Kail = 2,39,29,655 CFT & Fir = 80,14,331 CFT.

Yield was calculated as following for Deodar, Kail and Fir (in round figures) Deodar: 1 % of total G.S. for Deodar. i.e. 7,27,66,013/100= 7,27,660 or 7,28,000 CFT.

Kail: 1.5 % of total G.S. for Kail.

i.e. 1.5 X 2,39,29,655/100 = 3,58,945 or 3,59,000 CFT.

Fir: 1.3 % of total G.S. for Fir

i.e. 1.3 X 80,14,331 /100 = 1,04,186 or 1,04,000 CFT.

Exploitation period was fixed at 20 years. All the trees upto 18 inches diameter was to be removed in regeneration block leaving group of trees of 20-21 diameter which merged with crop. Thinnings of B, B/C, C & L.C grades were recommended in Unallotted Working Circle.

**7.6.3. MIXED CONIFEROUS WORKING CIRCLE:** This working Circle comprised of old Deodar-Kail Selection Working Circle. However some of it has been transfered to Uniform Working Circle and new areas with mixed crop from Uniform Working Circle and large area from Bhalesh and Neeru valleys were added. The net result was that area in this working circle increase form 48,662 acres to 53,156 acres.

The forests were to be worked under Selection System. Exploitable diameter for Deodar was fixed at 30 inches (75cm) and for Kail and Fir at 24 inches (60cm). A rotation of 180 years was fixed based on Maye's growth curve and take into account slower growth at higher elevation. Felling cycle was kept at 30 years.

No enumeration were carried out, instead enumeration figure of last Working Plan was taken as the base. Since the beginning of plan 20 years of felling cycle was over. Last 10 years yeild was over subscribed by only 69% of the area and some more areas had been added. The felling cycle was raised to 40 years. An area of 11,529 acres was allotted for 20 years.

Deodar: Y =  $\frac{I + II}{Period of removal} + \frac{III - Disappearance\% of III}{Year of disappearance}$ 

Kail : Y = 
$$\frac{I + II}{Period of removal} + \frac{IV - Disappearance\% of IV}{Year of disappearance}$$

Fir : Y= 
$$\frac{I + II}{Period of removal} + \frac{IV - Disappearance\% of IV}{Year of disappearance}$$

Where: I, II, III, IV were quality classes.

Period of removal was 60 years.

Disappearance % in case of Deodar = 15%, Kail = 30% & Fir = 30% Year of disappearance in case of Deodar = 50 year, Kail = 40 year & Fir = 50 year The yield prescribed was as: Deodar = 2,00,000 CFT, Kail = 1,00,000 CFT & Fir =

4,00,000 CFT.

**7.6.4. FIR SELECTION WORKING CIRCLE**: Most of the compartments which were included in Chenab Valley Fir Plan and some compartment to containing pure Fir separated from Uniform Working Circle and Deodar Kail Selection Working Circle formed this working circles. No enumeration was carried out in this working circle. Treatment prescribed was selection cum improvement fellings.

Yield was calculated on the basis of figure of the previous working plan and plans of adjoining areas. Yield figure came out to be 30 CFT and 25 CFT for area of western and eastern felling series. Western felling series comprised of Neeru, Kellar, Jai, Chiralla and Jangalwar block and eastern felling series comprised of Jatota, Bhalesh and Bunjwah (now in Kishtwar Forest Division).

Exploitable diameter was kept 30 inches for Deodar and 24 inches for Kail and Fir.

Rotation was fixed at 180 years.

Annual yield was prescribed for Fir was as under: Western F.S. = 4, 20,000 CFT, Eastern F.S. = 3,80,000 CFT

**7.6.5 UN REGULATED WORKING CIRCLE:** This working circle included all those forests which were not fit for systematic working because of the slope, stocking etc. were to be retained as such for protective purposes. Two felling series were constituted as under:-

#### **Chir Felling Series:**

(i) Except for concessionist no yield was prescribed.

- (ii) Fire protection was recommended.
- (iii) Thinning in congested crop was recommended.
- (iv) Development of High level pasture was recommended.

# Miscellaneous Felling Series:

(i) It was recommended that crop of this area should be maintained for soil and water conservation.

- (ii) Marking for concessionists were allowed
- (iii) Selection felling of Fir areas adjoining other commercial area was recommended.
- (iv) Development of High Level pasture was recommended.
- **7.6.6. EXTENSION OF THE PLAN:** The Working Plan of Mr. R. N. Khushoo's was deemed to be extended till 1977-78.

# 7.7. R.N. Saxena's Plan (1979-80 – 1983-84) and extended upto 1986-87:

Mr. R. N. Saxena IFS revised the R. N. Khushoo's plan. Following Working Circles were constituted:

- 1. Deodar- Kail Working Circles.
- 2. Mixed Coniferous Selection Working Circle.
- 3. Fir Selection Working Circle.
- 4. Un regulated Working Circle.

S.No.	Name of the Working Circle	Commercial Area (ha)	Un-commercial BL/Blank Area (ha)	Total (ha)
1.	Deodar- Kail Working Circle	19966	1194	21160
2.	Mixed Coniferous Working Circle	16543	4963	21506
3.	Fir Selection Working Circle	13245	6691	19936
4.	Un regulated Working Circle		47328	47328
	Total	49754	60176	109930

7.7.1. DEODAR-KAIL WORKING CIRCLE: The name Uniform Working Circle was changed to Deodar-Kail Working Circle as it was thought that uniformity is not possible to achieve hence aim should be remove irregularity as far as possible. A combination of Indian Shelterwood and Group Shelterwood System was adopted. Rotation of 120 years corresponding to 60 cm dbh of Deodar was adopted. A conversion period of 60 years was adopted. Instead of fixed periodic block , floating P.B. was considered right for the forests. The trees up to 40 cm dbh were considered as advanced growth and exploitable diameter was fixed at 60 cm dbh all the three species viz, Deodar, Kail and Fir. Growing stock of entire area was assessed by point sampling method. In this regard Mr. Saxena can be regarded as pioneer in introducing this method after trail in Batote Forest. By this method No. of trees/hectare for different dia class was obtained.

Once the number of tree/hectare dia class wise was obtained the number of trees present in particular dia class in the entire working circle multiplied with volume of the tree of the dia class gave the volume over entire working circle (of the dia class) For calculation purpose all, the tree above 60 cm were converted towards yield as well as 50% of the trees of 40cm to 60cm dbh dia-class in conversion block. Therefore the total volume was divided by 60 (the conversion period) to get the annual yield which was further reduced by 15% for non availability due to silvicultural reasons. The annual yield thus calculated for conversion block is given as (round figures): Deodar = 23700 cum, Kail= 10100 cum & Fir = 1800 cum.

The yield from unallotted block was proposed in the form of thinnings. A 30 years thinning cycle was adopted and annual unit was proposed to the tune of 262 hectare (i.e. 218 hectare Deodar, 118 hectare Kail and 8 hectare Fir) the average Growing stock was assessed as 238 m<sup>3</sup>, 161 m<sup>3</sup> and 86 m<sup>3</sup> per hectare was assessed. The yield so came after multiplying the annual unit under each species with average growing stock the following yields were recommended (in round figures) for each species as Deodar = 5000 cum, Kail = 1700 cum and Fir = 80 cum.

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Only one series corresponding to the area of the working circle was adopted. In the area where regeneration was not coming up well, artificial regeneration was advocated.

Although 2363 hectare areas were kept in the conversion block but actually only 1010 hectares were new area, rest were the areas kept in the conversion block in Khushoo's plan which continued in this plan too. Some of the compartments of previous plan (Saxena's) are still undergoing felling operations.

In 1979 heavy snow fall took place and there were damages in the forests. The department allowed the marking of the snow damaged trees. This was not visualized and resulted into excess drain of the timber some trees marked in the garb of snow damage which continued (extraction of timber) till 1984. 7432.00 m<sup>3</sup> Deodar, 4956.93 m<sup>3</sup> Kail, 234.23 m<sup>3</sup> Fir and 5515 m<sup>3</sup> pole crop was marked.

No cultural operation was done. It seemed that department only bothered about extraction and revenue part of the forestry operations.

**7.7.2 MIXED CONIFEROUS SELECTION WORKING CIRCLE:** All the area of previous plan were kept in Mixed Coniferous Selection Working Circle continued to be in this circle, exploitable size for Deodar, Kail and Fir was fixed at 60 cm DBH. Silvicultural system adopted was Indian Modification of Selection System.

No rotation was fixed. A felling cycle of 30 years was adopted. Growing stock was assessed by "Point Sampling Method" in the entire working circle and the distribution of number of trees in different dia classes were computed and volume in different dia classes was calculated.

Yield was calculated by "Brandis method". The annual yield prescribed after rounding figures it was as: Deodar= 19,800 cum, Kail= 20,900 cum and Fir = 26,700 cum.

No annual coupes were prescribed. Annual coupe size was fixed at 550 hectare. Snow damage removal also took place in this working circle which caused excess drain of the resource. Cultural operation was not at all taken up except extraction of timber.

**7.7.3 FIR SELECTION WORKING CIRCLE**: Commercial forests predominantly occupied by Fir were kept in this working circle. There was no change in area from Khushoo's plan. Indian Selection System was prescribed for these forests.

Expoitable size was fixed at 60 cm dbh. Rotation was not fixed however, it was stated that Fir attains 60 cm dbh in 180 years. A felling cycle of 30 years was fixed, and only one felling series were recognized. Growing stock was assessed in the same manner as in case of working circle discussed earlier. But volume was calculated block wise for different dia-classes. No reason was given for this sudden change from other.

The yield was calculated in the same manner as in the case of Mixed Coniferous Working Circle and was as: Fir= 40,800 cum. Size of annual coupe was fixed at 335 hectare. No silvicultural operations were prescribed except debris removal. It was prescribed that artificial regeneration should be taken up and the funds become available. However it was not at all attempted so far.

- **7.7.4. UN-REGULATED WORKING CIRCLE**: Forests not covered in any other circle were kept in Unregulated Working Circle for protective functions. Growing stock was assessed by Point Sampling method but data was not analysed. The working circle was divided in to two groups: A as Chir Group and B as Miscellaneous Group.
- A. Chir Group: No major marking were prescribed. It was recommended to be closed and given rest for regeneration.

The prescriptions were most blantantly ignored and the forests resources were misused when they were put to Resin tapping. About one lakh blazes were tapped every year.

B Miscellaneous Group: No specific prescriptions were made except leaving the forest to the nature.

### 7.8. A.K. Singh (1987-88 – 1996-97) Extended upto March 2016

Sh. A.K. Singh revised the working plan of Bhadarwah Forest Division by Mr. R. N. Saxena for the period 1987-88 to 1996-97. A proper evaluation of how the working plan prescriptions have been applied over a period of time is possible only if the data

pertaining to the said period are maintained meticulously, compartment/subcompartment wise and working circle wise. Unfortunately neither the control forms nor the compartment history files were maintained for the plan period. In fact, the Division Office is in the possession of neither the compartment history files, nor the stock maps prepared at the time of revision of the plan by Sh. A.K.Singh.

Sh. A.K. Singh in his working plan, constituted the following Working Circles:

- 1. Deodar Kail Working Circle.
- 2. Mixed Conifer (Selection) Working Circle.
- 3. Fir Selection Working Circle.
- 4. Chir Working Circle
- 5. Protection Working Circle.
- 6. Highland Pasture Development (Overlapping) Working Circle.
- 7. Soil Conservation (Overlapping) Working Circle.

### 7.8.1 DEODAR KAIL WORKING CIRCLE

All well stocked Deodar- Kail Forests occupying easier slopes that were deemed fit forconcentrated working and conversion to uniformity were allotted to this working circle. Out of a total of 23332 ha area allotted to this working circle, 6869 ha fall in Neeru range, 8545 ha in Kellar rang, 7046 ha in Chiralla range and 872 ha in Bhalesh Range. The forests constituting this working circle consist mainly of Kail and Deodar with some amount of intersperced Fir and Chir.

The Deodar- Kail Working Circle was prescribed to be worked under the Modified Indian Shelterwood System. Existence of regeneration was to be the main criteria while effecting removals. Thus, in view of irregular distribution of age classes and prevailing locality factors, conversion of more irregular forests into regular forests type was aimed. A rotation of 150 years with a balance conversion period of 60 years was adopted. Anything below 50 cm in diameter was to be treated as advance growth.

The whole working circle formed only one felling series and was divided into two main floating periodic blocks viz. Regeneration block and Unalloted Block.

## **REGENERATION BLOCK:**

The regeneration block was comprised of conversion block and converted block.

#### **Conversion Block**

This block comprised of those areas for conversion and regeneration that were to contribute major part of the yield of this working circle. This block was further divided into two sub-groups as:-

#### **GROUP "A" AREAS**

The crop in these areas was varying in nature. At places they were young and middle aged with mature and over mature tree. At places groups of mature and over mature trees with no regeneration underneath were present. The treatment may vary from seeding to final fellings depending upon the crop. Through it was, proposed that bulk of the yield would come from this block.

### **GROUP "B" AREAS**

All the compartment kept in the conversion block of the previous plan which are converted, and some of them were still under the process of conversion were kept in this group because they were not full with regeneration and required cultural treatment.

**Converted Block** All those areas which had been worked and had sufficient advance growth or otherwise successfully regenerated were allotted to converted block. This block will need removal of the left over.

# **Unallotted Block**

The unallotted block included those unconverted areas which were not taken up for conversion. Only improvement felling and occasional light grade ordinary thinning.

# **Yield Regulation**

The trees upto 30 cm were treated as advance growth. Trees below 50 cm shall not be available for felling. On the basis of past experiences it was assumed that only 50% the 50-60 cm dbh and 60-70 cm dbh shall be available.

The annual yield for the working circle was prescribed as follows:

SPECIES	Regeneration Block	Unalloted block	TOTAL
DEODAR	9045m <sup>3</sup>	4640 m <sup>3</sup>	13685 m <sup>3</sup>
KAIL	970 m <sup>3</sup>	80 m <sup>3</sup>	1050 m <sup>3</sup>
FIR	75 m <sup>3</sup>	175 m <sup>3</sup>	250 m <sup>3</sup>

# 7.8.2 MIXED CONIFERS WORKING CIRCLE

Compartments containing well stocked commercial areas of Deodar, Kail and Fir, but occupying steep and rugged slopes thereby rendering them unfit for concentrated working, were allotted to this working circle. A total of 21546 ha of forest area was allotted to this working circle of which 13519 ha was in Bhalesh range, 3325 ha in Neeru range, 2817 ha in Chiralla rane and 1885 ha in Kellar range.

Keeping in view the importance of these forests in soil and water conservation, selection system was prescribed for the management of these forests. Silviculturally available trees above exploitable diameter from areas having adequate and established regeneration were proposed to be removed. Exploitable diameter was fixed at 70 cm for Deodar and Kail with rotation of 150 years and 120 years respectively. In case of Fir

it was taken as 250 years. Felling cycle of 25 years was adopted. There was only one felling series in this working circle.

# **Yield Regulation**

The yield for Mixed Conifer Working Circle was calculated on volume basis using Brandis Diameter Class Method. An area check was also provided. The yield was computed on the basis of commercial growing stock only. Accordingly, the annual yield from entire working circle was fixed as follows:

Deodar	=	15,000 m <sup>3</sup>
Kail	=	7,000 m <sup>3</sup>
Fir	=	4,000 m <sup>3</sup>
Total	=	26,000 m <sup>3</sup>

The size of annual coupe size was worked out to 678.44 ha.

#### **Application of the Prescriptions and Results**

The prescriptions relating to securing of regeneration were largely ignored and this is reflected in the inadequacy of established regeneration over most of the working circle area.

## 7.8.3 FIR WORKING CIRCLE

All well stocked, commercially exploitable Fir forests of Bhadarwah Forest Division were allotted to this working circle. This working circle covered 8763 ha Forest area in Bhalesh range, 3525 ha in Chiralla range, 2443 ha in Kellar range and 2267 ha in Neeru range respectively. Mature and over mature trees formed a large proportion of the growing stock in this working circle. The regeneration was deficient or less satisfactory.

Keeping in view the silvicultural requirements of the species and the need for soil and water conservation in upper catchment areas, these forests were proposed to be managed under Indian Selection System. Removal of exploitable sized silviculturally available trees was prescribed from areas having adequate and established

regeneration. Deodar, Kail trees above 70 cm and Fir trees above 80 cm were considered exploitable. A felling cycle of 30 years was adopted.

# **Yield Regulation**

The yield was calculated using the Brandis Diameter Class Method and was subject to area check. Only commercial growing stock was taken into account for the purpose of yield calculation. The annual yield from the entire working circle was prescribed as under:

Deodar	=	300 m <sup>3</sup>
Kail	=	200 m <sup>3</sup>
Fir	=	<u>19,000 m<sup>3</sup></u>
Total	=	19,500 m <sup>3</sup>

The volume yield was subject to area check and the size of annual coupe was fixed at 145 ha

### **Application of Prescriptions and Results**

Prescriptions relating to cultural operations, artificial regeneration and grazing control were ignored as a result of which the status of regeneration in Fir areas is pathetic.

Following table show the Working Circlewise timber extracted by Forest Department from 1996 to 2016

Working	Name of Species*							
Circle	Deodar	Kail	Fir/Spruce	Chir	Total			
DKWC	2253.07	824.45	26.83	2.18	3106.53			
MCWC	152.68	403.49	69.14	0.00	625.31			
FWC	53.72	31.69	26.82	0.00	112.23			
Total	2459.47	1259.63	122.79	2.18	3844.07			

Yearwise detail is appended under annexure VXII.

Following table show the marking handed over to SFC from 1996-2016 and actual extraction done from 1996-2016

Working Period	Volume of Species in m <sup>3</sup>						
1996-2016	Deodar	Kail	Fir/Spruce	Total			
Marked Volume	217272.69	151420.17	88549.68	457242.54			
Extracted volume	116924.25	86964.63	67027.86	270916.74			

Felling of green trees was banned by the Government of Jammu and Kashmir in January 1990. Therefore, the only major markings that were carried out were prior to 1990. Thereafter, removals have been restricted to dry, fallen trees and trees marked in connection with developmental projects only. Aspects relating to regeneration have been thoroughly neglected. The areas proposed to be regenerated were exposed to continuous grazing. Little was done by way of artificial regeneration and the plantation programs have mostly concentrated in fast growing exotics like *Robinia* and *Ailanthus*.

This plan period coincided with a period of extreme militancy during its second half that has completely stalled the execution of prescription of this plan. In the garb of militancy, locals and forest mafia inflicted heavy damage to deodar crop in the fringe areas of human habitations.

## 7.8.4 CHIR WORKING CIRCLE

The working circle included all the compartments of unregulated "Group" which have mainly Chir crop and were understocked, devoid of regeneration and under heavy biotic pressure. An area of 1614 ha in Chiralla range and 883 hectares in Kellar Range was placed under this working circle. Chir occurs mostly as pure crop except at higher places where it is found mixed with Deodar and Kail. These forests are poorly stocked and the regeneration too is highly inadequate. Most of the crop is mature to over mature. Major objective of this working circle was to rehablitate and restock the forests mainly with Chir therefore yeild was not calculated. The working plan prescriptions were totally ignored as a result of which these forests got more degraded than before. Though some plantation has been done under CAMPA after 2009 but still it is not adequately represented.

#### 7.8.5 Protection Working Circle

Those compartments of Bhadarwah Forest Division that had not been allotted to any of the working circles above were placed under this working circle. Generally these areas included precipitous hill slopes devoid of vegetal cover, inherently unproductive and uneconomical. This working circle was spread over 24743 ha of forest area. No felling of whatsoever nature was prescribed in this area.

### 7.8.6 HIGH LEVEL PASTURE DEVELOPMENT (OVER LAPPING) WORKING CIRCLE

This working circle included the high level pasture lands, which were part of Blank area of Protection Working Circle kept in unregulated working circle group "B" of the previous plan.

The improvement and management of pastures involved utilization of a package of programme including preparation of scientific plan based on ecological principles. Apart form these reducing the biotic pressure, removing unwanted vegetation moisture management technique, improving the herbage quality and quantity grazing management practices were also to follow. Unfortunately, these prescresptions were not implemented because of dual reasons, non commitment of forest officer and staff and period of militancy.

### 7.8.7 SOIL CONSERVATION (OVER LAPPING) WORKING CIRCLE

This working circle included all such forests which were under severe soil erosion. It included compartments having intense biotic pressure, absence of regeneration, poorly stocked and prone to erosion. Following compartments were alloted to this working Circle: 18/Bh, 20/Bh, 54/Bh, 57/Bh, 106/Bh, 5a/Jai, 5b/Jai, 22b/Jai, 36b/Jai, 36b/K. Felling of any kind was prohibited and engineering measures to avaoid and control

erosion were prescribed. Unfortunately, prescriptions were not followed rendering the compartments to worse conditions.

# 7.8.8 CHAPTER ON WILDLIFE MANAGEMENT

A separate chapter on Wildlife Management was added emphasising the importance of this tract for wildlife. A new sanctuary Padri Wildlife Sanctuary was proposed along Padri and adjoining Neeru compartments. A total 4830 ha area was proposed for this sanctuary. Nothing in this direction has been done so far and wildlife management has remained neglected.

# STATISTICS OF GROWTH AND YIELD

## 8.1. Volume table of Conifer species

8.1.1. In this revision exercise the assessment and estimation of volume of timber from different tree species has been done by applying the Kulu volume table, due to its wide acceptability. In the previous working plan efforts were made to develop a local volume table, however still the Kulu volume table was eventually applied for purposes of yield calculation. Chenab valley has traditionally been a landscape contributing to supply of timber and has evoked keen interest among the foresters in developing a local volume table specific to the area. This culminated in the preparation of volume tables by the Pre-Investment Survey of Government of India and by Mr. B. L. Tickoo former ACF. The efforts on developing a local volume table by the previous Working Plan Officer, Mr. Narsinghia though hitherto un-adopted, remains a compelling study. The same is reproduced below along with Kulu volume table for a comparative analysis and future reference. Kulu volume table shall be utilised for purposes of timber volume extraction calculations from forests under this division.

Dia -0	Class	10- 20	20- 30	30- 40	40- 50	50- 60	60- 70	70- 80	80- 90	90- 100	100 & above
Kulu	Deodar	0.13	0.13	0.76	1.33	2.10	3.14	4.39	5.66	6.85	7.56
Volume	Kail	0.13	0.13	0.76	1.36	2.27	3.34	4.42	5.35	6.14	6.74
Table	Fir	0.13	0.13	0.85	1.56	2.97	4.90	6.85	8.30	9.40	10.19
Kishtwar	Deodar	0.15	0.36	0.94	1.87	2.88	4.24	5.87	7.75	9.89	12.30
Local	Kail	0.39	0.50	0.86	1.64	2.78	4.28	6.15	8.39	10.98	13.95
table	Fir	0.12	0.40	0.87	1.70	2.95	4.34	5.96	7.82	9.92	12.22

	Table-8.1	Volume Table	(In cum)
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8.1.2. The volume table for Fir shall as well be applicable for Spruce though the rate of growth of spruce is slightly faster than Fir. The Diameter–age table worked out in the previous Working Plan based on stem analysis is reproduced below for future reference.

However, for analysis of crop the standard age progression as per the yield table has been used.

Diamatar (ama)	Age in years					
Diameter (cms)	Deodar	Kail	Fir			
10	33	39	33			
15	46	51	47			
20	58	61	61			
25	70	70	74			
30	81	79	87			
35	91	87	100			
40	102	95	113			
45	111	102	125			
50	122	110	137			
55	132	116	149			
60	142	123	161			
65	151	129	173			
70	161	136	185			
75	170	142	196			
80	179	148	208			
85	188	153	219			
90	197	159	230			
95	206	165	242			
100	215	170	253			
105	223	176	264			

# Table-8.2 Dia-Age Relationship

8.1.3. The periodic Mean Annual Volume increment percent worked out from Age/Volume table by Presselers formula is as under.

# Table-8.3

Deodar	2.12%
Kail	3.17%
Fir	2.13%

8.1.4. For the purpose of calculation of yield, the following survival coefficient percentages based on the All India Volume Tables in respect of Deodar, Kail, Fir and Spruce have been used.

#### Table-8.4

Diameter-class	Survival percentage of species					
D.B.H (cm)	Deodar	Kail	Fir and Spruce			
30	30%	45%	20%			
40	60%	60%	40%			
50	80%	80%	50%			
60	90%	90%	60%			
70	95%	95%	85%			
80			95%			

8.1.5. While examining the crop stand and age class distribution the following table on normal distribution of stem over the age classes has been utilized.

Diameter – class (cm)	10-20	20-30	30-40	40-50	50-60	60-70	70 <
Normal Distribution in percentage	41%	25%	15%	9%	5%	3%	2%

#### Table-8.5

#### 8.2. Preliminary Exercise

### A. Calculation of Area

8.2.1. Using open GIS softwares, scanned maps, satellite imageries such as LISS IV (supplied by ISRO, Hydrabad) and Google Earth, the compartment boundaries of Bhadarwah Forest Division have been digitalised The digitalisation is based on old scanned management maps cross verified with the Survey of India GT (1:50,000). Resultantly the compartment boundaries are now geo-referenced. As a natural progression, the compartment, beat block and range maps are also prepared on the GIS platform. The exercise has ensured the creation GIS based spatial database for the division. The layers have been connected to attribute table enumerating the individual compartment characteristics. Based on this exercise the area of the forest compartments and the administrative units were ascertained and the values so derived have been reflected in Estate Area Statement.

#### B. Assessment of Growing Stock

8.2.2. The revision of exercise was undertaken under severe constraint of staff in the this division. The estimation of growing stock involves the preparation of stock map, collation of information on compartment description and sampling to ascertain the Growing Stock.

### C. Preparation of Stock Map

8.2.3. For the purpose of assessment of crop stand in the compartments and its inventorization, stock mapping was done with the help of Satellite imagery and Google earth images. From the Satellite imagery the extent of forest was delineated. For this purpose multi spectral LISS-IV imagery with 5 mtrs spatial resolution obtained from NRSA Hyderabad are used. The LISS-IV imagery will also act as the base line information for the current date when the exercise was taken up. It shall be of application in assessing future change in crop spread, density and land use. It shall be of particular use in ascertaining encroachment status at a future date.

## 8.3. Field Exercise

#### A. Sampling Technique

8.3.1. For the estimation of growing stock sampling technique of partial enumeration by sample plots has been adopted. Sample plots of the size of 0.1 ha were used. As the immediate accomplishment of the revision exercise was a major exercise parameter, the sampling method of stratified random sampling was used. Stratified sampling technique was appropriate as it reduces the number of samples required for estimation of crop without sacrificing accuracy.

### B. Procedure for laying of sample plot

8.3.2. The sample plots were to be laid in compartments as arrived from random coordinates. The area of the sample plot was 0.1 hectare and laid in square shape with each side having length of 31.62 mtrs. First the area was cleared for bushes, if any, with khukri and the premeasured ropes laid on ground securing the corners with pegs. The length is corrected for slope so that 0.1 ha horozontal area is marked for enumeration. All trees inside the plot were measured and the readings of diameter at breast height were recorded for each tree inside the layout by a group of 3 members. The trees at the corner are marked with 2 rings to distinguish the plot area. The trees located on boundary line of one side were not be counted; correspondingly on another side, the boundary trees were counted. Hence, on lengthwise, it will be counted in one side and on the contour sides; it will be counted in one side only.



**Design of Sample Plot** 

## C. Layout and Delimitation of boundaries

8.3.3. In the revision exercise the layout and delimitation of compartment boundaries and Range boundaries has been undertaken. The layout of boundaries of Range and Compartment are undertaken after detailed ground survey using GPS and existent working plan map. The boundaries are delimited on ground by marking the trees located on or adjacent to the boundary by coal tar rings. As per past convention in such delimitation exercise, single ring is used to denote compartment boundary, two rings to denote range boundary and three rings for divisional and state boundary. And the rings are marked in such a manner that from one ring the other ring is visible. At places of prominence where the Compartments are separated are marked by Boards on the tree trunk. The boards depict the compartment number and the natural features separating them along with the direction of location of the compartments by arrows. And were Boards already exist, they are refreshed.

## 8.4. Analysis of Data

8.4.1. The data obtained from the field was compiled in the Computer. The data was further processed and analysed using Microsoft Excel software. The sampling data obtained was then put to statistical test to arrive at acceptable accuracy levels. From the field data was then ascertained the average stem distribution in dia-classes per hectare. This data was then extrapolated for the entire area of the Working Circle to arrive at an estimate of the stem stand and the growing stock of the Circle. For the purpose of calculation of yield Brandis Volume Method (Indian Method) was used and the annual yield so arrived at was cross checked by Von Mantel's Volume limit for normal forest.