CATCHMENT AREA TREATMENT PLAN FOR ALLAIN-DUHANGAN HYDRO-ELECTRIC PROJECT

KULLU FOREST DIVISION
KULLU FOREST CIRCLE

CATCHMENT AREA TREATMENT PLAN
FOR
ALLAIN –DUHANGAN HYDROELECTRIC PROJECT

CHAPTER 1

1. Introduction :-

Rajasthan Spinning and Weaving Mills Ltd. propose to construct Allain Duhangan Hydroelectric project by utilizing the water of Allain and Duhangan Nallahs. The total catchment area of "Allain Nallah" is 128 Km^2 and that of "Duhangan Nallah" is 66 Km^2. A major portion of catchments of both these Nallahs is snow covered unculturable waste. The culturable portion of the catchment of 'Allain Nallah' falls in the area of 2/16 upper Rahni and 2/17 Hamtagarh forests. Similarly the culturable parts of catchment of Duhangan Nallah are confined to 2/18 JamariDhar, 2/19 Bansai-da-Dugh and Jagatsukh IIIrd class forests. Therefore the proposed works of afforestation, pasture development and soil conservation are confined to these areas only.

2. Configuration of the ground :-

Catchment area of both Nallahs lies between 2740 m to 6000 m (maximum). The nallahs originate from permanent ice fields of the Pir Panjal Range. The Allain Nallah is formed by Hamtal and Pataori Nallahs , which originate at an elevation of 4680m & 4800m respectively , while the Duhangan nallah originates at an elevation of 4400m from the Chandratal glacier. The barrage axis in case of Allain Nallah is at an eleavation of 2740m, while in case of Duhangan it is at an elevation of 2782m . The catchment area beyond the barrage axis in both the Nallahs (which is proposed to be treated in this CAT Plan), comprises mainly of fir and spruce forests till an elevation of 3500m, alpine meadows and alpine pastures, gradually giving way to huge glaciers, ice walls, rocky/ stony waste and land under permanent snow.

3. Geology, Rock and Soil :-

3.1 Geology and Rock :-

The rock formation in the area belongs to unfolliliferous Paleozoic Group of rock having thrusted contact with older rocks. The region is characterised by these well defined structural units viz. Central Crystalline, Kullu formation and Dibilana granites. Micaceous quartizites, quartz mica schists are found on the upper reaches of Allain and Duhangan Nallahs. At the Allain Barrage site, the entire river section is filled with 15 to 20m thick river fill material while highly jointed and massive gneisses are well exposed on right abutment. At the Duhagan wier site, the valley has steep blanks and almost the entire valley section is occupied by

INDEX

fluvioglacial deposits, while porphyritic granitic gneiss with occasional schists bands are exposed on the banks.

3.2 Soil :-

The soil characteristics vary from place to place between clay, loam, gravel, sandy loam and clayey loam. The soil contains small to large rocky particles. General texture has indicated sandy loam type of soils.

4. Climate :-

The climate of Kullu District is typical of temperate zone at higher altitudes. In general three seasons are prevalent; cold season (October to February); hot season (March to June) and Monsoon ((July to September). However in the catchment area under description, the winters are prolonged & harsh, extending from October to April, while light summer is experienced in May-June. July to September are typical monsoon months. The tract experiences heavy snowfall from November to March and is cut off from rest of the region. The average annual rainfall data from 1979 to 1994 for Manali and Naggar stations shows 1302.96mm and 1187.12mm rainfall respectively. The snowfall data available for Manali shows a snowfall of 343.26mm annually. The catchment area as a whole (beyond the barrage axis), reaches a minimum ambient temperature of about 3 degree centigrade in winters. The working period in the catchment is very limited.

5. Water Supply :-

The tract embraces the catchment of Beas river. Nallahs, rivulets, brooklets, natural springs and other sources of water are plentiful. Drinking water is abundant. Melting of snow provide for inflows in the water sources. During winter, the flows are very reduced. However the tract has adequate water supply throughout the year.

6. FLORA and FAUNA :-

6.1 FLORA:-

The tract rises from 2800 m to about 5500m altitude. The flora begins with fir and spruce and its associates and end at alpine pasture near the permanent snow line. The main groups according to the revised Champion and Seth's classification are described below:-

a)	12/C.1.d.	- Western mixed coniferous Forests.
b)	12/C.1.e.	- Moist Temperate Deciduous Forests.
c)	12/C.2.a	- Kharsu Oak Forests.
d)	12/C.2.b	- Western Himalayan Upper Oak Forests.

e)	12/D.S.2	- Himalayan Temperate Park Lands.
f)	12/D.S.3	- Himalayan Temperate Pastures.
g)	14/C.1.a	- Western Himalayan Sub-Alpine Fir Forests.
h)	14/C.1.b	- Western Himalayan Sub- Alpine Birch Fir Forests.
i)	14/D.S.1	- Sub Alpine Pastures.
j)	15/C.1	- Birch Rhododenderon Scrub Forest.
k)	15/E.1	- Dwarf Rhododenderon Scrub.
l)	15/E.2	- Dwarf Juniper Scrub.
m)	15/C.3	- Alpine Pastures.

The following tree/shrub/herb spp. are commonly found in the catchment area

Trees	Shrubs	Herbs
Fir	Viburnum	Polygonatum
Spruce	Cotoneaster	Fragaria
Kail	Berberis	Valeriana
Kharsu oak	Indigofera	Primulas
Acer	Desmodium	Anemones
Horsechestnut	Ilex dipyrena	Potentilla
Walnut	Lonicera	Viola
Prunus paddus	Deutzia	Delphinium
Corylus colurna	Strobilanthes	Trifolium
Taxus baccata	Impatiens	Ranunculus
Birch	Rhus	Balsam
Rhododenderon	Rosa	Rumex
Ash	Rubus	Anaphilis
Carpinus		Festuca
Ulmus wallichiana		Bromus
Populus ciliata		Agrostis
Willow		Dactylis
Juniper		Danthonia
Devidyar		Brachipodium
		Aconitum
		Podophyllum
		Jurinea
		Gentiana

6.2 FAUNA:-

The wildlife commonly found in the tract and adjoining similar tracts is, Black bear, Brown bear, Snow leopard,Musk deer,Ghoral,Ibex,Monal pheasant,Kaleej pheasant etc.

7. Human and Cattle Population :-

In the Catchment area (beyond the barrage axis), there is no human settlement. However migratory and local graziers of sheep, goats and buffaloes (locally called gaddis and gujjars respectively) do visit the Catchment for grazing of their flocks.

An estimated 5000 sheep and goat and 400 buffaloes graze and browse in the Catchment area in the temperate, sub alpine and alpine pasture lands. The graziers move down to lover elevations before snow comes in.

8. Land use:-

The total Catchment area of both Nallahs is 194Km^2.The Catchment area beyond the barrage axis is about 100km^2. One land use of total Catchment as determined by RITES by interpretation of satellite imagery & aerial photography is depicted below in Table No. 1, which gives a clear idea of the Catchment which lies beyond the barrage axis. The map showing the catchment area is enclosed as Annexure 7.

TABLE NO. 1

	LAND USE	AREA(KM^2)	%
1	Forest	37.3	19.22
2	Agricultural land	5.96	3.07
3	Scrub land	12.32	6.36
4	Alpine pasture	48.19	24.85
5	Stony/Rocky Waste	43.24	22.29
6	Snow cover	46.99	24.21
	TOTAL	194.00	100.0

As per the above table, the estimated forest cover comprising the Catchment area (beyond the barrage axis) is about 10 Km^2.

9. Degradation :-

The forest cover in the Catchment area comprises of dense, open, degraded, culturable & unculturable blanks. To reduce run off & to improve permeability; it is proposed to carry out afforestation in degraded forest areas and in culturable blanks falling in tree zone.

The complete, sub alpine and alpine pastures have been subjected to heavy & uncontrolled grazing in the part. Though these pasture lands have been rejuvenating in the past, yet due to increased biotic pressure, the lands now

require management intervention to improve their productivity. Thus improvement of pasture lands is called for. The Catchment area is subjected to soil wash on account of geological and man made forests like grazing, lopping & felling of trees etc. The temperate and sub alpine pastures have been gullied at places. The Allain and Duhangan Nallahs also erode the stream blanks of certain places. At a few places, the forest land is subjected to sinking and sheet erosion. Glaciers have also added to the problem of erosion at one or two places. All these sites required comprehensive soil conservation (engineering) measures to stabilise and or stop erosion.

AISLUS has classified the Allain Duhangan Catchments as of very high and high priority. The details are given below:

S. No.	Name of Site Catchment	Area in ha	Watershed Code	Area ha	Priority
1.	Allain Nalla	650	BPg3a	2232	H
2.	Duhangan Nalla	6000	BPg3a	1500	H
			BPg2c	2368	VH
			BPg2d	2508	VH

These sub Catchments have not been treated under the River Valley Project Scheme.

The combined effect of afforestation, pasture improvement/ development and soil conservation measures is to ensure the longevity of the hydroelectric project.

CHAPTER II

1. Afforestation :-

It is proposed to carry out afforestation over 300 ha. area as per details given in the table No 2.

TABLE No. 2

ALLAIN NALLAH CATCHMENT		DUHANGAN NALLAH CATCHMENT	
NAME OF AREA	EXTENT (Ha.)		EXTENT (Ha.)
2/17 Hamtagarh C-III	150	2/19 Bansai-da-dug	50
2/17 Hamtagarh C-Ic,C-Id,C-IIa,C-IIc	50		
2/16 Upper Rahni (whole)	50		
TOTAL	250	TOTAL	50

GRAND TOTAL =300Ha.

The following species shall be planted i.e. Fir, Maple, Walnut ,Horsechestnut Kharsu, Poplar (local) etc. The plantation shall be carried out at a cost norm of Rs.17,500/- ha. at 1999-2000 prices (Detailed cost analysis is given at Annexures (1,2 & 3). The cost norms have been increased by 10% every year to compensate for wage inflation. The plantations shall be maintained for five years. The cost norms for new afforestation and maintenance are given in table No.3 below.

TABLE No. 3

New Afforestation	Rs. 17500/- ha.	(At 1999-2000 prices)
Maintenance	1st year = 2050/- ha.	-Do-
-Do-	2nd year = 1375/- ha.	-Do-
-Do-	3rd year = 825/- ha.	-Do-
-Do-	4th year = 600/- ha.	-Do-
-Do-	5th year = 600/- ha.	-Do-

The total expenditure on afforestation and its maintenance works out to Rs. 1,24,00,000 or 124.00 lacks. This includes a sum of Rs.18.00 lacs towards creation of 4 new nurseries at a cost of Rs. 4.50 lacs each.

The year wise physical and financial phasing is depicted in table No.4 below.

TABLE No. 4

YEARWISE PHASING OF EXPENDITURE (AFFORESTATION)

YEAR	NORM	PHYSICAL	FINANCIAL	NSY.	MAINTENANCE					GRAND TOTAL
					1st	2nd	3rd	4th	5th	
2000-01	19250	----	------	4 NO.	---	---	----	----	----	1800000
2001-02	21175	2/16 Upper rahni (whole),50 Ha.	1058750	---	---	---	----	----	----	1058750
2002-03	23300	2/17 Hamtagarh C-III, 50 Ha.	1165000	---	2475x50 123750	---	---	---	----	1288750
2003-04	25630	2/17Hamtagarh C-Ic,Id,IIa,IIc, 50 Ha.	1281500	---	2700X50 135000	1800X50 90000	----	----	---	1506500
2004-05	28200	2/19 Bansai-da-dug ,100 Ha.	2820000	---	3000x50 150000	2000x50 100000	1200x50 60000	---	---	3130000
2005-06	31000	2/17 Hamtagarh C-III ,50 Ha.	1550000	----	3300x100 330000	2200x50 110000	1300x50 65000	925x50 46250	----	2101250
2006-07					3600x50 180000	2400x100 240000	1450x50 72500	1000x50 50000	1000x50 50000	592500
2007-08					---	2600x50 130000	1600x100 160000	1100x50 55000	1100x50 55000	400000
2008-09					---	---	1750x50 87500	1200x100 120000	1200x50 60000	267500
2009-10					---	---	----	1300x50 65000	1300x100 130000	195000
2010-11					---	---	---	---	1450x50 72500	72500 12412750

GRAND TOTAL = 12412750
Or Say Rs. 124.00 lacs

2. **Pasture Development (Temperate & Sub- Alpine) :-**

It is proposed to carry out pasture development over 450 ha area as per details given in table No.5 below.

TABLE NO. 5

ALLAIN NALLAH CATCHMENT		DUHANGAN NALLAH CATCHMENT	
NAME OF AREA	EXTENT (Ha.)	NAME OF AREA	EXTENT (Ha.)
2/17 Hamtagarh C-III	150	2/18 Jamaridhar (Patishu thach)	70
2/16 Upper Rahni (whole)	50	2/19 Bansai-da-dug (Saral bag)	30
		Jagatsukh-III (Rinna thach)	50
		Jagatsukh-III (Ujla bansiroo)	50
		2/19 Bansai-da-dug (Patishu thach)	50
TOTAL	200	TOTAL	250

GRAND TOTAL=450 Ha.

It is proposed to plant Festuca grass and red/white clovers in this component. The works of pasture development shall be carried out at a cost norm of Rs.9000/- ha. at 1999-2000 prices.(Detailed cost analysis is at Annexures 4 & 5).

The cost norms have been increased by 10 % every year to compensate for wage inflation. The works shall be maintained for two years. The areas shall not be fenced. The norms for new grass planting and subsequent maintenance are given in table No. 6.

Pasture Development Norms

TABLE No. 6

New Planting	Rs.9000/- ha	At 1999-2000 prices.
Maintenance	1st year 1925/- ha.	-Do-
Maintenance	2nd year 1925/ ha.	-Do-

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(The cost analysis for maintenance norm is at Annexure 6)

The total expenditure on pasture development and its maintenance works out to Rs.81,70,000/- or Rs. 81.70 lacks. This include a sum of Rs.8.80 lacs towards creation of 2 new grass nurseries. The year wise physical and financial phasing is depicted in table No. 7 below.

TABLE No. 7

YEARWISE PHASING OF EXPENDITURE (PASTURE DEVELOPMENT)

YEAR	NORMS	TARGETS		NSY. ESTT.	MAINTENANCE		TOTAL
		PHYSICAL (Ha.)	FINANCIAL		1st Year	2nd Year	
2000-01	10000	150	1500000	2 Nos. 880000	---	---	2380000
2001-02	11000	150	1650000		150 ha @ 2300/ 345000	----	1995000
2002-03	12000	150	1800000		150 ha @ 2500/ 375000	150 ha @ 2500/ 375000	2550000
2003-04					150 ha @ 2700/ 405000	150 ha @ 2700/ 405000	810000
2004-05						150 ha @2900/ 435000	435000
						GRAND TOTAL	**8170000**

3. Soil Conservation (Engineering) works.

Under this component, the following works are proposed :-

a) Construction of small check walls/check dams in D.R.S.M. to prevent rill formation and plug gullies. 5000 such small structures are proposed at cost norm of Rs.2000 per structure.
b) Construction of 2 Nos. glaciers retardation structures in 2/17 Hamtagarh C- III over area of 10 ha. @ Rs.1,50,000/- ha.
c) Slip treatment over area 30 ha. @ 1,00,000/-ha.
d) Construction of 3 Nos. spurs at Chikka @ 2.5 lacs/- spur.

The catchment wise detail is given below in Table No. 8.

TABLE No. 8

ALLAIN NALLAH CATCHMENT		DUHANGAN NALLAH CATCHMENT	
ITEM OF WORK	Nos./	ITEM OF WORK	Nos.
Construction of small check walls/check dams.	3000	Construction of small check walls / check dams.	2000
Slip treatment in 1/17 Hamtagarh C-Id, below Sethan village.	10 ha.	Slip treatment in 2/19 Bansai-da-dug (Saral bagh thach)	20 ha.
Glacier retardation structures in 1/17 Hamtagarh.	10 ha.	Spurs in crate wire at Chikka	3

The works shall be spread over period of 5 years starting from 2000-01. The cost norms have been enhanced by 10 % annually to compensate for wage inflation. Provision maintenance @ 25 % has been made. The total expenditure on this component works out to Rs. 2,16,50,000/- or Rs.216.5 lacks.

The year wise physical and financial phasing of works is depicted in table No. 9.

TABLE No. 9

YEAR WISE PHASING OF EXPENDITURE (SOIL CONSERVATION)

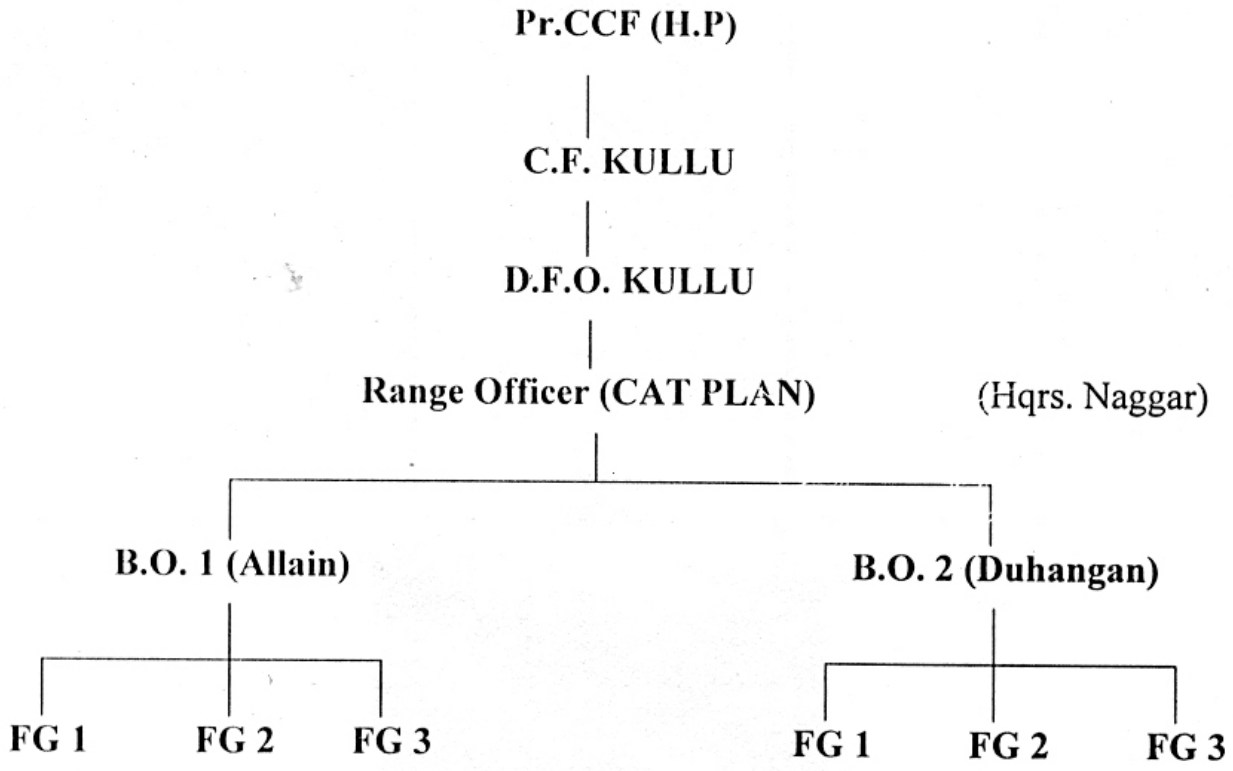
YEAR	CHECK WALL/ CHECK DAM		SLIP TREAT MENT		SPURS		GLACIER RETARD. STUCTURE		TOTAL
	PHY.	FIN.	PHY.	FIN.	PHY.	FIN.	PHY.	FIN.	
2000-01	1000 No @,2000/	2000000	10 Ha. @100000/	1000000	---	---	---	---	3000000
2001-02	1000 No. @,2200	2200000	20Ha. @100000/	2000000	---	---	---	---	4200000
2002-03	1000 No. @2400	2400000	----	----	3 No. @,250000/	750000	---	---	3150000
2003-04	1000 No. @,2600/	2600000	----	----	----	-----	---	----	2600000
2004-05	1000 No. @,2900/	2900000	----	-----	-----	-----	----	----	2900000
2005-06							10 Ha. @,150000/	1500000	1500000
2006-07	MAINTENANCE								
2007-08	TO BE CARRIED								
2008-09	OUT DURING								
2009-10	THESE YEARS @25% OF TOTAL EXPENDITURE i.e. 17350000X25% = 4300000								4300000
	GRAND TOTAL								21650000

4. Infrastructure and staffing :-

The CAT plan envisages spending of over Rs.4.22 crores in six years period, in a difficult terrain and at an altitude which is nearly 3000m. The working season is limited and the intensity of work load will be extremely high. The existing staffing pattern where one forest guard looks after the Catchment of one Nallah is totally insufficient to carry out such a huge workload. Therefore the CAT plan has to be run on lines of project with independent executive staff.

The overall superintendence & control will lie with the Head of Department i.e. the Pr.CCF H.P., who shall be assisted by the Conservator of Forest, Kullu and Divisional Forest Officer, Kullu.

Beyond this level, it is utmost essential to create a full fledged Range (which does not mean creation of new posts, the same shall be managed by the Forest Deptt. from its existing strength). The staffing pattern to be created to carry out the works of CAT plan is depicted below :-



The headquarters of B.O 1(Allain) will be at Prini, while that of B.O. 2 (Duhangan) will be at Jagatsukh.In addition, 1FG, and three Class IV staff shall also be provided.

The establishment of 1 FR, 2 DRs, 7 FGs and 3 Class IV (Peon 1,Chowkidar 1, Dak Runner 1) shall draw their pay and allowances from the funds of CAT Plan.

As per the existing pay scales, the expenditure on salary & allowances comes to Rs. 76 lacs. (Details are at Annexure 7).

The difficult terrain, high altitude and special circumstances prevailing in the area call for development of infrastructure, to support the CAT Plan activities. These are listed with their costs below in Table No. 10.

TABLE No. 10

INFRASTRCUCTURE DEVELOPMENT EXPENDITURE			
NAME OF ITEM	NOS.	UNIT	COST
Construction of Range Office cum Residence	1	L.S.	1000000
Construction of B.O. Office cum Residence	2	L.S.	1000000
Construction of prefabricated houses for Forest Guards and Labour	2	L.S.	1500000
Provision of a Motorcycle for Range Officer	1	L.S.	50000
Provision of high altitude tents	10	L.S.	150000
Provision of warm clothing, snow boots, jackets, etc.	10	L.S.	200000
Office equipment i.e. (Computer, Almirahs, chairs etc.)		L.S.	150000
Communication equipment i.e. wireless sets and telephone etc. (Challenger 1 No. & tacphones 8 Nos.)		L.S.	150000
Add 10% cost on recurring expenditure on items like energy, Stationary, POL, etc.			425000
GRAND TOTAL			**4675000**

4. Abstract of cost and year wise phasing.

The total cost of CAT Plan works out to Rs.5,45,34,250.
The component wise break up is given in Table No. 11,while year wise phasing is given in Table No. 12

TABLE No.11

ABSTRACT OF CAT PLAN COST		
S.NO	NAME OF COMPONENT	COST
1.	AFFORESTATION	12414250
2.	PASTURE DEVELOPMENT	8170000
3.	SOIL CONSERVATION	21650000
4.	ESTABLISHMENT & INFRASTRUCTURE	12300000
5.	**GRAND TOTAL**	**54534250**

OR SAY Rs.5.45 CRORE

TABLE No. 12

YEARWISE PHASING OF EXPENDITURE					
YEAR	**AFFORESTATION**	**PASTURE DEVELOPMENT**	**SOIL CONS.**	**ESTT. & INFRA.**	**TOTAL**
2000-01	1800000	880000	3000000	5568000	11248000
2001-02	1058750	1500000	4800000	1318000	8676750
2002-03	1288750	1995000	3750000	1318000	8351750
2003-04	1506500	2550000	3250000	1348000	8654500
2004-05	3130000	810000	5000000	1355000	10295000
2005-06	2101250	435000	950000	1393000	4879250
2006-07	594000		900000		1494000
2007-08	400000				400000
2008-09	267500				267500
2009-10	195000				195000
2010-11	72500				72500
TOTAL	**12412750**	**8170000**	**21650000**	**12300000**	**54534250**

Conservator of Forests
Kullu Circle Kullu

Divisional Forest Officer
Kullu Forest Divn. KULLU

ANNEXURE 1

COST NORMS FOR AFFORESTATION

A. Cost of Fencing

S.No	Item of work	Unit	Rate	Amount
1.	Cutting and preparation of fence post, 480 No.	Per %	395.10	1896.48
2.	Carriage of fence post O/D 5 Km., 480 No.	Per % per Km	207.95	4990.80
3.	Digging of holes, 480 No.	Per %	276.60	1327.68
4.	Fixing of fence posts, 480 No.	Per %	212.35	1019.28
5.	Stretching of B/Wire, 4200 Rm.	Per RM	1.45	6090.00
6.	Carriage of B/Wire by truck /tractor	--	L.S.	800.00
7.	Carriage of B/Wire by Labour O/D 5 Km., 6 quintal	Per quintal	52	1560.00
			Sub-total	17684.24
			Add 11.48% increase	2030.15
			Total	19714.39
8.	Add cost of B/wire, 6 quintals	Per quintal	2500	15000.00
9.	Add cost of U-Stapple, .09 quintal	-do-	2300	207.00
			Total	34921.39

Or say Rs. 35000

B. Cost of Planting

S.No	Item of work	Unit	Rate	Amount
1.	Survey and Demarcation over plantation area, 10 ha.	Per ha.	31.20	312.00
2.	Layout of pits over 10 ha.	-do-	52.0	520.00
3.	Digging of pits over 10 ha., 45 cm x 45cm x45cm	Per 100 No.	145.60	43665.00
4.	Filling of pits	-do-	83.20	12480.00
5.	Planting of entire plants	-do-	56.10	8415.00
6.	Carriage of naked roots plants O/D 5 Km.	Per 100 No. per Km	66.50	8100.00
7.	Preparation of inspection path, 1500 RM	Per RM	3.30	4950.00
			Sub-total	78442.00
			Add 11.48% increase	9005.14
			Total	87447.14

Therefore, planting cost = 35000 + 87447 = 122447/10
= 12244.70
or say Rs.12250 per ha.

ANNEXURE 2

Cost norms for raising B.L. Nursery (Walnut, HCnut etc.) in Kullu Forest Division.
(30,000 plants, nursery area =1600 m2,bed area = 1000 m2)

S.No.	Item of work	Unit	Rate	Amount
1.	Preparation of nursery beds over 1000m2 area (330 beds of 3m x 1m)	per m^2	6.25	6250.00
2.	Preparation of nursery paths over 450m2 area.	-do-	2.00	900.00
3.	Preparation of water channels 100m2 area	-do	2.10	315.00
4.	Mixing of FYM area 1000m2 area in beds.	-do-	0.83	830.00
5.	Cost of seed.		L/S	1000.00
6.	Sowing of seeds in beds over 1000m2.	per m^2	2.50	2500.00
7.	Cost of FYM including carriage 50 quintals	L/S	120/-	6000.00
8.	Application of Insecticide/Pesticide over 30000 plants thrice in season.	per %	0.60	360.00
9.	Hand watering over 1000m2 30 times as per watering schedule.	per m^2	0.50	15000.00
10.	Weeding and hoeing over 1000m2 6 times as per watering schedule.	-do-	3.10	18600.00
11.	Extraction of entire plants.(27000 Nos. only)	per %	16.65	4495.50
				56250.50
	Add. 5 % contingent expenditure on nursery plants, fence repair, A/pipe, Cost of insecticides etc.			2812.50
			Sub Total =	59063.00
			Add. 11.48 % increase =	6780.00
			Grand Total =	65843.00

Or say Rs. 66000/-

Cost per plant = $\frac{66000}{27000}$ = 2.44/- Or say Rs.2.45/- per plant.

Watering Schedule	Time	Weeding Schedule	Time
April-	8	April-	1
May-	8	May-	1
June-	8	June-	1
September-	2	July-	1
October-	2	August-	1
November-	2	September-	1
Total	30 times	Total	6 times

ANNEXURE 3

Cost norms for raising Fir Nursery in Kullu Forest Division.(1 lakh seedlings in perpetuity)

(Area required = 1.6 ha., bed area for pricking =9000 m2, bed area for sowing 600 m2, total bed area required = 9000+600 9600 m2 or say 1000 m2 or 1 ha.)

S.No.	Item of Work	Unit	Rate	Amount
1.	Preparation of nursery beds for sowing fir seed (100 beds of 3m x 1m, total area =3000 m2)	per m2	6.25	1875.00
2.	Preparation of Nursery paths area 250 m2	-do-	2.00	500.00
3.	Preparation of water channels area 50 m2	-do-	2.10	105.00
4.	Mixing of Humus over 300 m2 area (30 Kg. Humus in each bed)	-do-	0.83	249.00
5.	Collection of Humus 25 Quintal	per quintal	14.55	363.75
6.	Carriage of Humus 25 Quintal over distance 1 Km.	L/S	51/Quintal	1275.00
7.	Sowing of Fir seed over 300 m2 area (200 gms.in each bed assuming germination percentage of 35 %)	per m2	2.50	750.00
8.	Cost Fir seed 20 Kg.	per Kg.	114.40	2288.00
9.	Watering to nursery beds over 300 m2 21 times as per watering schedule No.1 till the plants are one and half year old.	per m2	0.50	3150.00
10.	Weeding/ hoeing to fir plants over 300 m2, 8 times as per weeding schedule	per m2	3.10	7440.00
11.	Preparation of nursery beds for pricking fir plants, 1000 beds of 3m x 1m, total area 3000 m2.	-do-	6.25	18750.00
12.	Preparation of nursery paths over 2500 m2.	-do-	2.00	5000.00
13.	Preparation of water channels over 500 m2.	-do-	2.10	1050.00
14.	Mixing of Humus over 3000 m2 area (30 Kg. Humus in each bed)	-do-	0.83	2490.00
15.	Collection of Humus 250 quintal	per quintal	14.55	3637.50
16.	Carriage of humus 250 quintal over distance 1 Km.	L/S	51/-quintal	12750.00
17.	Watering to nursery beds over area 3000 m2 37 times as per watering schedule No.2 from one and half year old to four and half year old.	per m2	0.50	55500.00
18.	Weeding /hoeing to pricked for plants over 3000 m2 17 times as per weeding schedule No.2 from one and half year old to four and half year old.	per m2	3.10	158100.00
19.	Pricking and transplanting of one and half year old seedlings in July in nursery beds 100000 seedlings over area 3000 m2.	-do-	12.80	37500.00
20.	Application of Insecticides/pesticides to 100000 seedlings four times.	% Nos.	0.60	2400.00
21	Uprooting of 85000 seedlings	% Nos.	16.65	14152.50

22.	Maintenance of nursery paths & water channels, 3 times a year (Total 12 times 2000 m2 area)	per m2	0.60 (for three times)	4800.00

334125.75

Add. 5 % for contingent expenditure like fence repair, nursery plates, HDEP pipes, water storage tank etc. 16706.29

Sub Total = 350832.04

Add. 11.48 % increase 40275.52

Grand Total 391107.56

Or say Rs.390000/-

Cost per plant = $\frac{390000}{85000}$ =4.59 or say 4.60/-

(Assuming 85 % survival)

Watering Schedule No.1		**Time**	**Weeding Schedule No.1**		**Time**
April-		1	May-		1
May-		4	June-		1
June-		4	July-		1
September-		2	August-		1
October-		1	September-		1
April-		1	October-		1
May-		4	May-		1
June-		4	June-		1
Total	=	21	Total	=	8

Watering Schedule No.2		**Time**	**Weeding Schedule No.2**		**Time**
July-		1	August-		1
September-		2	September-		1
October-		1	October-		1
April-		1	May-		1
May-		4	June-		1
June-		4	July-		1
September-		2	August-		1
October-		1	September-		1
April-		1	October-		1
May-		4	May-		1
June-		4	June-		1
September-		2	July-		1
October-		1	August-		1
April-		1	September-		1
May-		4	October-		1
June-		4	May-June		1 each
Total	=	37 times	Total	=	17 times

ANNEXURE-4

COST NORMS FOR PASTURE DEVELOPMENT

S.No	Item of work	Unit	Rate	Amount
1.	Survey and demarcation of plantation area	P/Ha.	31.20	31.20
	Collection of debris in small heaps at convenient places	-do-	156.00	156.00
3	Layout of patches	P/% No.s	52.00	52.00
4.	Preparation of patches of size 30cmx30cmx25cm, 3000 patches in one Ha.	-do-	99.80	2994.00
5.	Planting of grass tufts i.e. slips @ 3 slips per patch	-do-	35.00	1050.00
6.	ost of grass slips	P/No.s	0.4	3600.00
7.	Ca. ge of grass slips to work site from nurs over distance 5 k.m.	---	L/S	150.00
			Sub Total	8033.2
		Add 11.48% increase		491.70
				8524.90
		Add 5% contingency charges		426.24
		TAL		8951.14
		OR SAY		9000.00

ANNEXURE-5

COST NORMS FOR RASING OF GRASS TUFTS/SLIPS

S.No	Item of work	Unit	Rate	Amount
1.	Preparation of Nursery beds, 100 beds of size 10 m x 1 m.	Per sq m	6.25	6250.00
2.	Preparation of nursery paths, 325 sq.m	-do-	2.00	650.00
3.	Preparation of water channels, 175 sq.m	-do-	2.10	367.50
4.	Mixing of FYM in nursery beds over area 1000 sq.m	-do-	0.83	830.00
5.	Cost and carriage of FYM, 40 quintals	Per Quintal	120	4800.00
6.	Cost of grass seed	--	L.S.	500.00
7.	Sowing of seed in nursery beds	Per sq.m	2.50	2500.00
8.	Flood irrigation in nursery beds @ once a week for 4 ½ months i.e., 18 times	-do-	0.25	4500.00
9.	Weeding in nursery beds once a months i.e., two times	-do-	3.10	6200.00
10.	Uprooting of grass tufts, 100000 nos.	Per hundred nos.	10.40	10400.00
			Sub-Total	36997.50
			Add 11.48% increase	4247.31
				41244.81
			Add 5% contingency	2062.24
			Total	43307.05

Therefore, cost per tuft = 43307.05/100000 = 0.43 or say 0.40 per tuft

ANNEXURE 6
NORMS FOR MAINTENANCE OF PASTURE

S.No	Item of work	Unit	Rate	Amount
1.	Re-digging of failed patches, 750 patches per hac.	Per hundred nos.	49.9	374.25
2.	Planting of tufts/slips, 3 slips in a patch	-do-	35	262.50
3.	Carriage of tufts/slips	--	L.S.	100.00
4.	Cost of grass tufts	Per no.	0.4	900.00
			Sub-Total	1636.75
			Add 11.48% increase	187.89
				1824.64
			Add 5% contingency	91.23
			Total	1915.87

Or say Rs. 1925 per hac.

Annexure-7

Cost of establishment i.e. pay & allowances of CAT Plan staff.

1)	One Forest Ranger in the pay scale Of 5800-9200 average emoluments After considering wage hike.=13,000/-	13,000 x 12 x 6 =9,36,000/-
2)	Two Dy. Ranger in the pay scale of 5480-8925 average emoluments after considering wage hike. =10,000/-	10,000 x 12 x 6 x 2 =14,40,000/-
3)	Six Forest Guard in the pay scale of 3120-5160 average emoluments after considering wage hike.= 8,000/-	8,000 x 12 x 6 x 6 = 34,50,000/-
4)	Three Class-4 in the pay scale of 2520-4140 average emoluments after considering wage hike.= 5,000/-	5,000 x 12 x 6 x 3 = 10,80,000/-

	Total :	Rs.	69,06,000/-
Add 10% for TA, DA, HRA, Medical etc.		Rs.	6,90,600/-
	Grand Total :	Rs.	75,96,600/-
	Or say	**Rs.**	**76,00,000/-**

CATCHEMENT AREA TREATMENT (CAT)PLAN (REVISED)

IN RESPECT OF

ALLAIN DUHANGAN HYDROELECTRIC PROJECT (2 X 96 MW)

Period: 2004-05 to 2014-15

Cost : Rs. 6,15,74,490 /-

DISTRICT KULLU
HIMACHAL PRADESH

March, 2004

REVISED CAT PLAN

1. **Afforestation: -**
It is proposed to carry out afforestation over 300 ha. area in the same area where proposed with original proposal as per details given in the table No.1.

TABLE No. 1

ALLAIN NALLAH CATCHMENT		DUHANGAN NALLAH CATCHMENT	
NAME OF AREA	EXTENT (Ha.)		EXTENT (Ha.)
2/17 Hamtagarh C-III	150	2/19 Bansai-da-dug	50
2/17 Hamta C-Ic, C-Id-IIa, C-IIe	50		
2/16 Upper Rahni (whole)	50		
Total	250	Total	50

GRAND TOTAL =300 Ha.

The following species shall be planted i.e. Fir, Maple, Walnut, Horsechestnut, Kharsu, Poplar (local) etc. The plantation shall be carried out at a cost norm of Rs.41,000/- ha. at 2003-2004 prices (Detailed cost analysis is given at Annexure 1). The plantations shall be maintained for five years. The cost norms for new afforestation and maintenance are given in table No.2 below.

TABLE No. 2

New Afforestation	Rs.41000/- ha.	(At 2003-2004 prices)
Maintenance	1st year =2358 /- ha.	-do-
-do-	2nd year =1529 /- ha.	-do-
-do-	3rd year = 828 /- ha.	-do-
-do-	4th year = 701 /- ha.	-do-
-do-	5th year = 701 /- ha.	-do-

The total expenditure on afforestation and its maintenance works out to Rs.1,77,48,610 or say Rs. 177.48 lac. This includes a sum of Rs.20,00,000 towards creation of 4 new nurseries at a cost of Rs. 5 laes each.

The year wise physical and financial phasing is depicted in table No.3 below.

Divisional Forest Officer,
Kullu Forest Division, Kullu

TABLE NO.3

YEAR WISE PHASING OF EXPENDITURE (AFFORESTATION)

					MAINTENANCE					
Year	Norm per ha.	Phy.	Fin.	Nursery (in Nos.)	1st	2nd	3rd	4th	5th	Grand Total
2004-05	500000	0	0	4	0	0	0	0	0	2000000
2005-06	41000	2/17 Hamatagarh C-III (50 ha.)	2050000	0	0	0	0	0	0	2050000
2006-07	41000	2/16 upper Pahni (whole) 50 ha.	2050000	0	117900	0	0	0	0	2167900
2007-08	41000	2/17 Hamtagarh C1c,Id,IIa,IIc 50 ha.	2050000	0	117900	76450	0	0	0	2244350
2008-09	41000	2/19 Bansai-da-dug 100 ha.	4100000	0	117900	76450	41400	0	0	4335750
2009-10	41000	2/17 Hamtagarh C-III 50 ha.	2050000	0	235800	76450	41400	35050	0	2438700
2010-11				0	117900	152900	41400	35050	35050	382300
2011-12				0	0	76450	82800	35050	35050	229350
2012-13				0	0	0	41400	70100	35050	146550
2013-14				0	0	0	0	35050	70100	105150
2014-15				0	0	0	0	0	35050	35050
									Total	**16135100**

Total = 16135100

Add: 10% of the total is provided as contingency to take care of escalation in wages and materials costs. = 1613510

Grand Total = 17748610

or say Rs. 177.48 lacs

Divisional Forest Officer
Tullu Forest Division Zaili

2. Pasture Development (Temperate & Alpine):-

It is proposed to carry out pasture development over 450 ha area as proposed earlier with original proposal as per details given in table No. 4 below.

TABLE NO.4

ALLAIN NALLAH CATCHMENT		DUHANGAN NALLAH CATCHMENT	
NAME OF AREA	EXTENT (Ha.)	NAME OF AREA	EXTENT (Ha.)
2/17 Hamtagarh C-III	150	2/18 Jamaridhar (Patishu thach).	70
2/16 Upper Rahni (whole)	50	2/19 Bansai-da-dug (Saral bag)	30
		Jagatsukh-III (Rinna thach)	50
		Jagatsukh-III (Ujla bansiroo)	50
		2/19 Bansai-da-dug (Patishu thach)	50
Total	200	Total	250

GRAND TOTAL = 450 Ha.

It is proposed to plant Festuca grass, red/white clovers etc.in this component. The works of pasture development shall be carried out at a cost norm of Rs.12,200 /- ha. at 2003-04 prices. Detailed cost analysis is at Annexure 2.

Divisional Forest Officer
Tehri Forest Division

TABLE NO.6

YEAR WISE PHASING OF EXPENDITURE (PASTURE DEVELOPMENT)

		Targets			MAINTENANCE					
Year	Norm per ha.	Phy.	Fin.	Nursery Estt.(2 Nos.)	1st	2nd	3rd	4th	5th	Grand Total
2004-05	12200	150	1830000	2025000	0	0	0	0	0	3855000
2005-06	12200	150	1830000	0	367050	0	0	0	0	2197050
2006-07	12200	150	1830000	0	367050	229350	0	0	0	2426400
2007-08				0	367050	229350	137700	0	0	734100
2008-09				0	0	229350	137700	114750	0	481800
2009-10				0	0	0	137700	114750	114750	367200
2010-11				0	0	0	0	114750	114750	229500
2011-12				0	0	0	0	0	114750	114750
									Total	10405800

Total = 10405800

Add: 10% of the total is provided as contingency to take care of escalation in wages and materials costs. = 1040580

Grand Total = 11446380

or say Rs. 114.46 lacs

Soil Conservation (Engineering) Works:

Under this component, catchment wise detail is given below in Table No. 7

TABLE No. 7

ALLAIN NALLAH CATCHMENT		DUHANGAN NALLAH CATCHMENT	
ITEM OF WORK	Nos./	ITEM OF WORK	Nos./
Construction of small check walls/check dams.	3000	Construction of small check walls check dams.	2000
Slip treatment in 1/17 Hamtagarh C-Id. below Sethan Village	10 ha.	Slip treatment in 2/19 Bansai-da-dog (Saral bāgh thach)	20 ha.
Glacier retradation structures in 1/17 Hamtagarh	10 ha.	Spur in crate wire at Chikka	3 Nos.

The works shall be spread over period of 5 years starting from 2004-05. The provision for maintenance @ 25% has been made. The total expenditure on this component works out of Rs.2,65,37,500/- or 265 Lac.

The year wise physical and financial phasing of works is depicted in Table No.8

Divisional Officer
Soil Conservation Division

TABLE No. 8

YEAR WISE PHASING OF EXPENDITURE (SOIL CONSERVATION)									
YEAR	CHECK WALL/CHECK DAM		SLIP TREATMENT		SPURS		GLACIER RETARD STRUCTURE		TOTAL
	PHY.	FIN.	PHY.	FIN.	PHY.	FIN.	PHY.	FIN.	
2004-05	1000 No. @ 2500 /-	2500000	10 Ha. @ 130000 /-	1300000	-	-	-	-	3800000
2005-06	1000 No. @ 2500 /-	2500000	20 Ha. @ 130000	2600000	-	-	-	-	5100000
2006-07	1000 No. @ 2500 /-	2500000	-	-	3 No. @ 300000 /-	900000	-	-	3400000
2007-08	1000 No. @ 2500 /-	2500000	-	-	-	-	-	-	2500000
2009-10	1000 /- @ 2500 /-	2500000	-	-	-	-	-	-	2500000
2010-11							10 Ha. @ 200000 /-	2000000	2000000
2011-12	MAINTENANCE								
2012-13	TO BE CARRIED								
2013-14	OUT DURING								
2014-15	THESE YEARS @ 25% OF TOTAL EXPENDITURE i.e. 19300000 X 25%= 4825000								4825000
								TOTAL	24125000

10% of the total is provided as contingency to take care of escalation in wages and materials costs. = 2412500

G. Total = 2,65,37,500

Division [illegible] Officer
Kullu Forest Division Kullu

The difficult terrain, high altitude and special circumstances prevailing in the area call for development of infrastructure, to support the CAT Plan activities. These are listed with their costs below in Table No.9.

TABLE No.9

INFRASTRUCTURE DEVELOPMENT EXPENDITURE			
NAME OF ITEM	Nos.	UNIT COST	COST
I MOBILITY AND COMMUNICATION (To be provided by the user agency on kind basis)			
1. Purchase of Gypsy King Hard Top for DFO Kullu	1	4.57 Lac	4,57,000
2. Purchase of Toyota Qualis for DFO JFM	1	6.0 Lac	6,00,000
3. Purchase of Computers	3	0.50 Lac	1,50,000
4. Purchase Fax Machine	2	0.25 Lac	50,000
5. . Purchase of Photo copier	2	1.25 Lac	2,50,000
Total I			**15,07,000**
II BUILDINGS, ROAD & PATH			
1. Major repair F.R.H. Kothi	1	3.0 Lac	3,00,000
2. Major repair New Hut, Manali	1	2 Lac	2,00,000
3.Major repair FRH Cedar Manali	1	1 Lac	1,00,000
4. Major repair of FRH Naggar	1	2.5 Lac	2,50,000
5. Construction of inspection hut at Hamta	1	11 Lac	11,00,000
6. Repair of Bridal Path, I/Path in Manali and Naggar Range	5	2 Lac	10,00,000
Total II			**29,50,000**
G. Total I+II			**44,57,000**

ESTABLISHMENT COST

This will include recurring costs like office expenses, travelling allowance, POL & Motor Vehicle and amenities to staff and labour. These expenditure will be borne by the department in implementation of the CAT PLAN.

Table No. 9A

YEAR WISE PHASING OF ESTABLISHMENT COST					
Year	Office Expenses	Travelling Expenses	POL & Motor Vehicle	Amenities to Staff & Labour	Total
2004-05	75000	50000	100000	50000	275000
2005-06	75000	50000	75000	50000	250000
2006-07	75000	50000	75000	50000	250000
2007-08	50000	25000	50000	25000	150000
2008-09	50000	25000	50000	25000	150000
2009-10	20000	15000	20000	10000	65000
2010-11	20000	15000	20000	10000	65000
2011-12	20000	15000	20000	10000	65000
2012-13	15000	10000	15000	5000	45000
2013-14	15000	5000	10000	5000	35000
2014-15	15000	5000	10000	5000	35000
Total	430000	265000	445000	245000	1385000

Divisional Forest Officer
Kullu Forest Division

Abstract of cost and year wise phasing.

The total cost of CAT Plan works out to RS.6,15,74,490.
The component wise break up is given in Table No.10, while year wise phasing is given in Table No.11

TABLE No. 10

ABSTRACT OF CAT PLAN COST		
S.NO.	NAME OF COMPONENT	COST
1.	AFFORESTATION	17748610
2.	PASTURE DEVELOPMENT	11446380
3.	SOIL CONSERVATION	26537500
4.	INFRASTRUCTURE & DEVELOPMENT	4457000
5	ESTABLISHMENT COST	1385000
	G.TOTAL	**61574490**

OR SAY RS.615.74 Lac

TABLE No. 11

YEAR WISE PHASING OF EXPENDITURE (In lacs)						
YEAR	AFFORES TATION	PASTURE DEVELO PMENT	SOIL CONSER VATION	INFRA.STR. DEV.	ESTT. COST	TOTAL
2004-05	22.00 (Nsy.)	42.41	52.25	22.29	2.75	141.70
2005-06	22.55	24.17	70.13	8.91	2.50	128.26
2006-07	23.85	26.69	46.75	8.91	2.50	108.70
2007-08	24.69	8.08	34.37	4.46	1.50	73.10
2008-09	47.69	5.29	34.37	-	1.50	88.85
2009-10	26.83	4.04	27.50	-	0.65	59.02
2010-11	4.21	2.52	-	-	0.65	7.38
2011-12	2.52	1.26	-	-	0.65	4.43
2012-13	1.61	-	-	-	0.45	2.06
2013-14	1.16	-	-	-	0.35	1.51
2014-15	0.37	-	-	-	0.35	0.72
Total	**177.48**	**114.46**	**265.37**	**44.57**	**13.85**	**615.73**

NOTE: The financial outlay includes 10% contingency charges to take care of wage escalation and material cost hike)

Conservator of Forests
Kullu Forest Circle Kullu (H.P.)

Divisional Forest Officer
Kullu Forest Division Kullu

Annexure-1

Cost norms for afforestation (as in February, 2004)

A. Afforestation

(i) Planting component: -

- Approved cost norms of planting per ha.
  Rs. 12,600/- for 1100 plants @ Rs.51/- per day wage rate.
- Cost of planting per plant = Rs. 11.45 per plant.
- Proposed No. of plants = 1500 per ha.
  for compensatory Afforestation.
- Cost of Compensatory afforestation =Rs. 17,175/- per ha.

(ii) Soil & Moisture Conservation works

Construction of Retaining walls, Check dams,
Check walls and vegetative measures etc. = 15,000 per ha. (L/S)

Total Cost (Planting, maintenance & Soil Conservation works (I)+(ii) 17175+15000 = 32175

Revised labour rates from 15th August, 2003 = Rs 65 /- day

Add increase in labour rates (27.45 %) = 8832

Grand Total norm/ha. = 41007 /-

Cost norms per ha. Rs. 41,007/- ha.

Or say Rs.41,000 /-

(iii) Maintenence/ha. : -

Year	@ RS. 51/- per day	@ Rs.65/- per day i.e. 27.45 % increase
I Year	1850/-	2358/-
II Year	1200/-	1529/-
III Year	650/-	828/-
IV Year	550/-	701/-
V Year	550/-	701/-
Total	4800 /-	6117 /-

11

Divisional Forest Officer
Kullu Forest Division Kullu

Annexure-2

Cost norms for Pasture Development (as in February 2004)

Sr.No	Item of Work	Unit	Rate	Amount
(A) 1	Survey and demarcation of plantation area.	per Ha.	34.8	34.80
2	Collection of debris in small heaps at convenient places.	per Ha.	173.9	173.90
3	Layout of patches.	per Ha.	58%	58.00
4	Preparation of patches of size 30cmx30cmx25cm,3000 patches in one Ha.	per %	111.20%	3336.00
5	Planting of grass tufts i.e.slips@ 3 slips per patch.	per %	39%	1170.00
6	Cost of grass slips.	per %	0.5	4500.00
7	Carriage of grass slips to work site from nursery over distance 5Km.		L/S	300.00
	Total norms per ha.=			9572.70
	Add increase in wage rate (27.45 %)			2627.71
	Grand Total norms per ha. =			12200.41

or say RS. 12,200 /- per ha.

Cost norms per ha. for new area of pasture development say Rs. 12,200/- ha.

(B)

Maintenance	Rate @ 51/- day	Rates @ 65/- per day i.e. 27.45% increase
I Year	1920	2447
II Year	1200	1529
III Year	720	918
IV Year	600	765
V Year	600	765
Total	5040	6423

Divisional Forest Officer,
Kullu Forest Divn. Kullu