

**INTEGRATED
WATERSHED MANAGEMENT PROJECT**

**AMLAWA-SELIGAD, KHUTNUGAD, BENALGAD
SUB WATERSHEDS**



**FOREST DEPARTMENT
UTTAR PRADESH**

1	2	3	4
	Institutional dimensions	3.4	
	Forest department	3.4.1	
	Forest panchayats	3.4.2	
	Gram Sabha	3.4.3	
	Environmental status	3.5	
4	Critical appraisal of ongoing programmes	4.1	25
	Modifications suggested	4.4	
5	The project	5.1	28
	Objectives	5.1	
	Project period	5.2	
	Project components	5.3	
	Fodder development	5.4	
	Proposals for fodder development	5.4.1	
	Estimated additional production	5.4.3	
	Demand and supply	5.4.4	
	Planting model and cost	5.4.6	
	Fuel wood development	5.5	
	Proposals for fuel wood development	5.5.1	
	Fuel wood production	5.5.2	
	Demand and supply	5.5.3	
	Planting model and cost	5.5.3	
	Energy conservation	5.6	
	Fuel efficient Chullhas	5.6.1	
	Pressure cookers	5.6.2	
	Biogas plant	5.6.3	
	Burning ghats	5.6.4	

1	2	3	4
	Cost	5.6.5	
	Rehabilitation of degraded forest	5.7	
	Planting model and cost	5.7.2	
	Priority areas	5.8	
	Soil and water conservaton	5.9	
	Cost	5.9.1	
	Fire protection	5.10	
	Udyan Vaniki	5.11	
	Plant distribution	5.12	
	Eco-development	5.13	
	Phasing of targets	5.14	
	Research	5.15.1	
	Training	5.15.2	
	Fellowship	5.15.3	
	Staffing requirement	5.15.4	
	Building	5.15.5	
	Vehicles	5.15.6	
	Equipment	5.15.7	
	Extension activities	5.15.8	
6	Organisation and management	6.1	45
	Organisation	6.1	
	Project Coordination	6.2	
	Measures to ensure local population	6.3	
	Extension training	6.4	
7	Cost estimate and financing procedure	7.1	50

1	2	3	4
8	Production and distribution of benefits	8.1	52
	Modelitics of harvesting and distribution	8.3	
9	Benefits, justifications and risks	9.1	55
	Benefits due to project	9.1	
	Impact on environment	9.2	
	Financial analysis	9.4	
	Risk to project	9.5	

LIST OF ANNEXURES

S.No.	Name	Page
1	2	3
1	Land is allotted to Erosion Intensity classes	60
2	Plantation Model No. 1	63
3	Fodder Development Programme	65
4	Plantation Model No. II	67
5	Fuelwood Development Programme	68
6 (a)	Plantation Model No. III	70
6 (b)	Plantation Model No. III	71
6 (c)	Plantation Model No. III	72
7 (a)	Reclamation of degraded Oak area	73
7 (b)	Increasing productivity of degraded forests	74
7 (c)	Encouraging natural regeneration in regeneration deficient areas	76
8	Units rates of soil water and energy conservation components	77
9&9(a)	Fruit tree planting unit cost to be borne by the project	78
10	Plantation Model No. IV	79
11	Component Phasing	80-82
12	Staff	83
13	Summary of Project Cost	84-85
14	Component-wise Detailed Cost	86-88
15	Yield Estimates-Fodder	89-90
16	Yield Estimates - Fuelwood	91-92
17	Yield estimates - fruit tree planting, rehabilitation of degraded forest	93
18	Cash in flow from produce	94-95
19	Cash flows of the project	97

LIST OF ABBREVIATION

A.C.F.	- Assistant Conservator of Forests
C.B.	- Cost Benefit
Dy. F.R.	- Deputy Forest Rangers
D.C.F.	- Deputy Conservator of Forest
C.F.	- Conservator of Forest
F.R.	- Forest Ranger
F.Gd.	- Forest Guard
F.P.	- Forest Panchayat
F.D.	- Forest Department
G.S.	- Gram Sabha
M & E	- Monitoring and evaluation
N.G.Os.	- Non Governmental Organisations
N.P.V.	- Net Present Value
M.W.S.	- Micro Water Shed
R.F.	- Reserve Forest

PROJECT SUMMARY

GENERAL :

The preservation, conservation and improvement of Himalayan ecology and environment is not only essential for the hill people but is equally important to ensure the existence of the entire Gangetic-plains. The forests in U.P. hills, which form sixty seven percent of total Geographical area, are not only socio-economically important for the local inhabitants but also have a major function of soil and water conservation. The various adverse factors causing serious problems of soil and water conservation, and degradation and destruction of forests are not only threatening the economy and the very existence of hill environment but also that of Gangetic plains. Only scientific, rational and efficient management can ensure soil and water conservation, increase productivity and can sustain the demands of local people. It is in this context the Amlawa-Seligad, Khutnugad and Benalgad project has been prepared.

CATCHMENT CHARACTERISTICS :

1) AREA AND SITUATION :

The Amlawa-Seligad, Khutnugad and Benalgad sub-watershed lie in the northern part of Dehradun District.

Area-wise details of sub-watersheds is as under :

Subwatershed	Microwatershed	Area(Ha.)
Amlawa-Seligad	10	23499
Khutnugad	4	17600
Benalgad	19	45265
TOTAL	33	86364

2) TOPOGRAPHY, SOIL AND CLIMATE :

The entire area is hilly with undulating topography and rugged terrain. The altitude ranges from 600 mts. to 2500 mts. The soil in the area is mostly shallow, stony and dry. Due to considerable variation in altitude the climate varies from subtropical to temperate.

SOCIO-ECONOMIC STATUS :1) LAND USE :

The present land use pattern is as under :

Total Area	- 86364 Ha.
Reserved Forests	- 19.75%
Civil Panchayat Forests	- 42.5%
Agriculture	- 26.35%
Others	- 11.31

2) POPULATION :

The total population of the project area is 91516 with a density of 106 persons per square km.

3) LIVESTOCK :

Livestock forms an integral part of rural environment. The cattle population is 114141 which accounts for 76339 cattle units.

4) OCCUPATION :

The main occupation of the population is agriculture. But 68.61% of the farmers own less than 1 ha. of land and come under the category of marginal farmers. Migration to plains in search of a living is common as the holdings are small and fragmented and the yields are low.

FORESTS :

The area under different categories of forests is 62.34%. The larger percentage of forests as compared to agriculture underlines the basic importance of forests in the life, economy and development of the region. The Civil, Panchayat, and the reserved forests near habitation, are generally of poor density and deficient in regeneration, due to heavy biotic pressure. These degraded forests require immediate attention, for bringing about ecological-stability and preventing environmental degradation.

DEMAND AND SUPPLY POSITION :

1) FODDER :

For 76339 cattle units in the project area an estimated 557274 MT of green fodder is required annually. However the present production estimates of fodder is only about 88175.6MT/year. This reflects imbalance in fodder supply position in the area.

2) FUELWOOD :

The total number of families residing in the project area is 18303. The annual requirement per family of 5 is 3.65 MT of fuel wood. Which for the entire project area comes to 66805.95 MT per year. At present a major portion of this demand is met from the forest area. This reflects acute shortage of energy resources.

PROJECT OBJECTIVE :

The main objectives of the projects are :-

- 1) To protect, and conserve and improve the existing forest and vegetal cover, check degradation, and increase productivity of forests. Also soil, water and energy conservation.

- 2) To create resources and assets for meeting the requirements of fuelwood, fodder and small timber in rural areas within shortest possible time.
- 3) To motivate village community to actively participate in plantation programmes, through extension and equitable sharing of produce.
- 4) To optimise use of land resources on scientific basis and provide labour opportunities.

PROJECT FEATURES :

- 1) The project is designed to promote multi-use of invaluable land resources and improve the productivity of existing forest resources. It envisages to utilise community grazing lands, denuded waste lands, degraded forest lands and marginal farm lands to create fuel, fodder, fruit and forest resources, and to check the degradation of environment.
- 2) Active association of forests panchayats in implementation and management of plantation and also in the distribution of produce.

PROJECT PERIOD :

The duration of the project will be 5 years.

PROJECT TARGETS :

- A) Component wise physical targets are listed below :-

COMPONENT	TARGET
1. Fodder development - ha.	1500 block planting
	100 Agricultural bund
2. Fuelwood development - ha.	2250
3. Energy Conservation :-	
i) Fuel efficient chulahas - no.	500
ii) Pressure cookers - no.	1500
iii) Biogass plants - no.	15
iv) Burning ghats - no.	5
4. Rehabilitation of degraded forests - ha.	3000
5. Soil and water conservation :-	
i) Various type of check dams drop structures etc. -no.	5550
ii) Protection of water sources-ha.	75
iii) River side plantation - ha.	150
iv) Rain water harvesting tanks-no.	150
6. Fire Protection	Entire forest area
7. Fruit tree planting :-	
i) Creation of new orchards - ha.	15
ii) Rejuvenation of old orchards-ha.	15
iii) Top dressing of Mehal - no.	5000
8. Seedling distribution :-	
i) Fuel & fodder species for farm bunds - nos	300000
ii) Fruit species for homestead gardens	27000

B) PROJECT COSTS :

The total project cost is 117327 thousand rupees.

PROJECT BENEFITS :

The project inputs will contribute substantially to arrest and reduce the rate of desforestation, regain ecological balance and to improve rural environment. Over a period of 34 years the project shall produce 320.25 thousand cmt of fuelwood, 1022.91 thousand MT of fodder, 14.878 thousand MT of fruits 120 thousand cmt of smallwood and poles worth 550612 thousand rupees at current prices. The soil, water and energy conservation measures will provide innumerable direct and indirect benefits.

FINAL ANALYSIS :

The investment analysis of the project shows the B.C. ratio to be more than one and the internal rate of return around 14.6%.

* *

CHAPTER - 1

INTRODUCTION

1.1 The hilly region of the state of Uttar Pradesh comprises of eight districts viz. Nainital, Almora, Pithoragarh, Garhwal, Chamoli, Tehri, Uttar Kashi and Dehradun. The entire region, except the southern most part, is mountainous - consisting of ridges of varying altitudes with narrow and wide valleys and gorges in between. The altitude shows wide variation ranging from about 250 metres to 7800 metres. The region boasts of having some of the highest mountain peaks in the world, such as Nanda Devi, Nandakot, Panchachuli, Trishul, Chaukhamba and Bandar Punch. From these originate a number of important rivers of Northern India such as Ganga, Yamuna, Kali, Dhaul, Eastern Ramganga, Alaknanda etc. These major rivers have their catchments separated by secondary mountain ridges which form the origin of many tributaries of the main rivers viz. Tons, Yamuna, Sarju, Kosi, Western Ramganga, Nayar etc. The foothills are formed by steep fall of the secondary and tertiary ridges ultimately merging into plains. All major rivers in the tract, being snowfed, are perennial and usually cause floods during the monsoon.

1.2 Wide altitudinal variation results into wide variation of the climate also. The area above 4000 meters is perpetually under snow. Areas above 1500 meters experience snowfall during winters and occurrence of frost is also common in this zone. The valleys too have frost during the winters. The terai and bhabar areas and low valleys are usually hot during

summers while the weather is usually pleasant in areas above 1500 meters even during the summer. The average annual rainfall varies from 900 mm to 2500 mm with the monsoon setting in around mid-June and continuing upto mid-September. Winter rains, caused by Western disturbances, occur intermittently from December to February.

1.3 The recorded forest area in the U.P. hills is sixty seven percent of the total Geographical area. However, the actual good forest cover is only about thirty seven percent. The population is predominantly rural and agriculture is their main occupation. Forests form an integral part of socio-cultural and economic life of the people of U.P. hills. They are mainly dependent on forests for meeting their daily needs of fuelwood, fodder, timber etc. At the present level of consumption of forest produce and on the current rate of productivity, the area needs a minimum of 0.47 ha of forest per individual in order to meet his basic needs. The continuously increasing population, both of humans and cattles and its almost parasitic dependence upon forests, has resulted in continuous depletion and degradation of forests, the civil forests being the most adversely affected and almost disappearing at places. The average productivity of forest is just 0.5 cu.m per ha. which is well below the world average of 2.1 cu.m per ha. and is in urgent need of preservation and improvement.

1.4 These forests are not only socio-economically important for the local inhabitants but also being in eco-sensitive zone, they have a major role in ecological balance and in soil and water conservation. Geologically unstable formation, disproportionate

biotic pressure, unscientific and defective agricultural practices and landuse, overgrazing and unregulated lopping, recurrent and devastating fires . menacingly destructive and unscientific mining and road construction etc. are the major adverse factors causing serious problems of soil and water conservation and degradation and destruction of hill environment .and also threatening the economy and the very existence of the gangetic plains.

1.5 it has been clearly understood that preservation, conservation and improvement of the hill ecology and environment is not only essential for the welfare of the hill people but is also equally important to ensure the existence of the entire gangetic plains. Therefore, only scientific, rational and efficient land-use can ensure soil and water conservation, can increase the productivity of forests and agriculture, can sustain the demands of local people and ensure healthy living for them .and they in return shall ensure social, economic, industrial and environmental development of the region.

1.6 It is in this context and with this goal of scientific, rational and efficient land use , to ensure environmental and human well being . that this project covering Amlawa-Seligad, Benalgad and Khutnugad sub - watershed, in Dehradun district of Uttar Pradesh has been prepared.

CHAPTER - 2

NEED AND JUSTIFICATION OF PROJECT

2.1 The forests of Himalayas are important for the maintenance of ecological balance and environmental stability which is vital for the survival of all life forms, human, animal and plant. These forest enjoy a special status because they are not only important for environmental security and ecological balance of the hill region, but they also affect the productivity and fertility of Indo Gangetic plain to a large extent.

2.2 With the increase in human and animal population, the hill ^{eco}-system has degenerated. The hill forests provide most essential items of daily needs of rural population in the shape of fuel, fodder, grass, non-timber forest produce as well as small timber, besides maintaining environmental stability. The growing demand of forest resources, and lack of adequate investments, has resulted in depletion of the growing stock of forests leading to soil erosion, flood, lost of fertility and diminishing availability of forest produce essential for rural people.

2.3 The total number of families residing in the project area is 18303. The estimated daily consumption of fuel wood per family is 10 kg. Thus the annual consumption of fuel wood is 66805.95 Mt. tones. This is mostly met by lopping and cutting of the forest in and around the village settlements. Similarly, it is estimated that the current requirement of green fodder in project area is 557274 Mt. tons per annum, whereas the total production from forest, pastures and agriculture

lands is around 88175.6 Mt. tons. The gap between the two is made up by cutting into whatever standing forests are left with. The large number of benefits, the rural population derived from the forest and its impact as indicated above, makes it clear that the villagers of the sub catchment are very much dependent on the forest resource for their every day needs as well as economic gains. It is therefore essential that the land in and around villages is carefully evaluated for its productive capacity and put to best possible use in the need-based sectors like forestry, fruit-tree planting, fodder development and water conservation. This will also avoid pressure on high forest system and enhance possibility of their conservation and protection.

2.4 The total area of three sub-watersheds is 86364 ha. Out of this 76417 ha. are subject to erosion and degradation due to over exploitation and lack of substantial tree cover. More over most of agriculture area in the sub-watersheds is rainfed and suffer from chronic cycle of drought. These areas have remained economically under-developed. Therefore, for sustainable development attraction has to be focussed on ecological, social, agricultural, hydrological and economic components of the sub watershed area. To achieve this goal forestry activities of raising fuel, fodder, timber forest, soil and water conservation, and pasture development should form the core sector for integrated development of the sub-watershed and thereby improving the economic condition of th villagers.

2.5 The proposed project is therefore designed to ensure

protection of forest, improvement of water regime, prevention of soil erosion and thereby increase in soil fertility and production. It provides measures for pasture improvement and planting of fuel and fodder trees to meet the essential requirements of local villagers. Efforts for the restoration of tree cover will also ensure soil and water conservation besides increasing productive capacity of land. Availability of fuel, fodder and non timber forest produce from nearby newly created plantations will considerably reduce the workload of village women who are mainly responsible for collection of these items. This will enable them to provide time for earning supplementary income from processing of fruits, fibres and other NFTP into products like jam, juice, pickles, ropes etc. A major portion of expenditure in forestry and soil conservation work is disbursed as wages. Therefore the project will enhance employment opportunities for rural poor. Realising the significance and importance of people involvement for the success of programme, extension training, research and promotional activities form an important component of this project. The development of forests and creation of fodder, fuel and fruit and grass land near villages will thus create ecological stability and awareness amongst local villagers.

CHAPTER - 3

CURRENT SITUATION - CATCHMENT CHARACTERISTICS,
SOCIO-ECONOMIC AND ENVIRONMENTAL STATUS

3.1 CATCHMENT CHARACTERISTICS :

3.1.1 AREA AND SITUATION :

The Amlawa-Seligad, Kuthnugad and Benalgad sub-watershed lies in the northern part of Dehradun district, covering Chakrata and Kalsi development blocks. It lies between $30^{\circ} 31' 14''$ N to $30^{\circ} 37' 15''$ N latitude and $77^{\circ} 42' 0''$ E to $70^{\circ} 59' 23''$ E longitude covering an area of 452.65 sq.km. Chakrata, Tuini and Kalsi are the major towns falling in the sub-watershed.

3.1.2 The Amlawa-Seligad sub-watershed has been divided into 10 micro-watersheds. The Kuthnugad sub-watershed has been divided into 4 micro-watersheds and Benalgad sub-watershed has been divided into 19 micro-watersheds. The area of the sub-micro-watershed is given in table 3.1.

TABLE - 3.1

MICRO WATERSHED WISE AREA

S.N.	Sub-watershed	Micro-watershed	Area in ha.
1	2	3	4
1.	Amlawa-Seligad	1. Kalsi	2439
		2. Amlawa Nadi	3888
		3. Bantalgaad	1398
		4. Semaltagaad	1259
		5. Suindagaad	2438
		6. Seligad	5333

1	2	3	4
		7. Debragad	2031
		8. Minsi	1266
		9. Sarmo Ka Khala	2547
		10. Bingad	1900
TOTAL			23499
2.	Khutnugad	1. Kotuwagad	2368
		2. Dewangad	7118
		3. Khatwagad	6380
		4. Saiya	1734
TOTAL			17600
3.	Benalgad	1. Bhur-Phanar	1904
		2. Khadro	5751
		3. Balgad	1785
		4. Sukher Khad	1288
		5. Daragad	2470
		6. Chadi Khad	993
		7. Silikhad	3073
		8. Khodragad	2978
		9. Mashakgad	1988
		10. Pipanu Khad	1657
		11. Gharatigad	1607
		12. Gilia Khad	834
		13. Butor Khad	1436
		14. Jamradgad	2227

1	2	3	4
		15. Nagro Khad	4277
		18. Kota	2610
		17. Mandajgad	2123
		18. Aragad	1587
		19. Bhanjro	4677
TOTAL			45265
GRAND TOTAL			86364

3.1.3 TOPOGRAPHY, SOIL AND CLIMATE :

The entire area is hilly with undulating topography and rugged terrain. The altitude ranges from about 600 metres to 2500 metres. Both, aspect and slope, are very variable. Soil ranges from gravelly loam to clayey loam, and is generally acidic in nature. Soil near habitations is generally shallow and poor. Due to considerable variation in altitude, climatic variation is natural, varying from sub-tropical to temperate. Monsoon rains normally start by June and continue upto middle of September. Winter rains normally start by the end of December and continue upto February. The average annual rainfall recorded at Chibru and Chakrata is 1463 mm and 1400 mm respectively.

3.1.4 PRESENT LAND USE :

The total area of the three sub-watershed is 86364 ha and contains 209 villages in Amlawa-Seligad, 82 villages in Khutnugad and 53 villages in Benalgad sub-watersheds. Of the total area, the area of reserve forests with the Forest

Department is 17058 ha. (19.75%). The area under civil and panchayati forests is 46568 ha (53.90%). Agriculture covers 22738 ha (26.35%), out of which 2273 ha (9.99%) is irrigated and 20465 ha (90.01%) is unirrigated. Grasslands cover 9774 ha (11.31%). Blank area accounts for 29662 (34.34%). The detailed figures of present land use, based on forest and revenue records, are given in table 3.2.

TABLE 3.2

LAND USE PATTERN

Name of sub-watershed	Area in ha									Total area ha
	Forests		Grass lands	Uncultivable waste	Cultiv- able waste	Cultivation		Current fallow	Old fallow	
	Reserve	Civil/ Panchayat				irri- gated	unirri- gated			
1	2	3	4	5	6	7	8	9	10	11
Amlawa-Seligad	1928	2832	1535	443	8136	862	7453	77	233	23499
Khutnugad	4160	2341	6929	40	831	330	2849	30	90	17600
Benalgad	10970	1959	1310	209	20003	1081	9345	97	291	45265
TOTAL	17058	7132	9774	692	28970	2273	19647	204	614	86364
PERCENTAGE OF TOTAL	19.75	8.25	11.31	0.80	33.54	2.64	22.76	0.23	0.72	

3.1.5 EROSION CLASSES :

The Land Survey Directorate of the U.P. Forest Department has classified the various types of existing land use categories into different erosion classes. The erosion class-wise area of the three sub-watersheds is given in table 3.3. The basis of classification is given in Annexure-1.

TABLE 3.3
AREA UNDER DIFFERENT EROSION CLASSES

Land use	Erosion class	Sub-watershed wise area (ha)			Total
		Amlawa Seligad	Khutnugad	Benalgad	
1	2	3	4	5	6
Agriculture	E1	344	223	1158	1725
	E2	7596	3050	3059	13705
	E3	669	26	6591	7286
	E4	16	-	6	22
TOTAL		8625	3299	10814	22738
Forest	E1	169	1460	6349	7978
	E2	2363	3959	5188	11510
	E3	1550	333	1356	3239
	E4	34	-	36	70
TOTAL		4116	5752	12929	22797

1	2	3	4	5	6
Blank	E1	10	116	118	244
	E2	1560	7500	1192	10252
	E3	8745	893	20003	29641
	E4	443	40	209	692
TOTAL		10758	8549	21522	40829
GRAND TOTAL		23499	17600	45265	86364

3.2 SOCIO - ECONOMIC STATUS :

3.2.1 POPULATION AND DENSITY :

The total population of the project area residing in 344 villages is 91516, with a density of 106 persons per square km. Out of this 51602 (56.38%) are males and 39914(43.62%) are females. The literacy percentage is 29.98 among males while 9.30 percent females are literate. The population is predominantly rural. Though the density of population is much below the national level, its concentration around agricultural fields and uneven distribution results in high and unsustainable biotic pressure around habitations. The details of population are given in table 3.4.

TABLE 3.4

POPULATION

Name of Sub-water- shed	Families	-----											
		Male	Female	Total	General	S.C.	S.T.	Literate		Total	Illiterate		Total
								Male	Female		Male	Female	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Amlawa-Seligad	10201	28850	22156	51006	510	2001	48495	10386	1931	12317	18464	20225	38689
Khutnugad	2678	7349	6041	13390	133	2250	11007	1881	258	2139	5468	5783	11251
Benalgad	5424	14403	11717	27120	271	1653	25196	3200	1523	4723	12203	10194	22397
TOTAL	18303	51602	39914	91516	914	5904	84698	15467	3712	19179	36135	36202	72337
Percentage	-	56.38	43.62	100	1.0	6.45	92.55	29.98	9.30	20.96	70.02	90.70	79.04

3.2.2 SOCIO ECONOMIC STATUS :

Agriculture is the main occupation of the predominantly rural population. The increase of many households is supplemented by rearing sheep and goats and growing cash crop like ginger, potato and beans. Some people also have trade and business as their occupation.

3.2.3 The area is not adequately connected by motorable roads and also there is a lack of other basic facilities such as transport, communication, medical facilities etc. especially in the villages located in the interior of the project area.

3.2.4 LAND HOLDINGS :

A large majority of the farmers comes under the category of marginal farmers, with farmers having less than 1 ha. of land being predominant. Individual land holdings are small, fragmented and scattered making agriculture more labour demanding. The land holding details are given in table 3.5.

TABLE 3.5

LAND HOLDINGS

Land Holdings	Number of farmers			Total	Percentage
	Amlawa	Khutnugad	Banalgad		
1	2	3	4	5	6
Less than 1 ha	5919	2263	7420	15602	68.61
1 to 2	1352	517	1696	3565	15.67
2 to 3	627	240	786	1653	7.27

1	2	3	4	5	6
3 to 4	331	127	415	873	3.84
4 to 5	172	66	216	454	2.00
Above 5	224	86	281	591	2.61
TOTAL	8625	3299	10814	22738	100.00

3.2.5 LIVESTOCK :

Majority of the people living in the project area keep cattles. Sheep and goats are reared for food and wool. The cows and buffaloes are kept for agricultural purposes and production of milk. However the number of cattles are unproductive and wasteful. The details of livestock population is given in table 3.6.

TABLE 3.6
LIVE STOCK POPULATION

S.N.	Animal	Sub-watershed wise population			Total
		Amlawa Seligad	Khutnugad	Benalgad	
1	2	3	4	4	6
1.	Cow	14721	9062	17816	41599
2.	Buffalo	4801	2954	2857	10612
3.	Goat	7834	4826	42191	36860
4.	Sheep	3059	1883	15177	20119
5.	Others	907	553	3491	4951
	TOTAL	31331	19278	63532	114141

3.2.6 CATTLE UNITS :

Based upon the daily fodder intake, different categories of animals have been converted into cow units. The details are given in table 3.7.

TABLE 3.7

COW UNITS

S.N. Animal		Population (No.)	Cow Units	Total
1	2	3	4	5
1.	Cow	41599	1.0	41599
2.	Buffalo	10612	1.5	15918
3.	Goat	36860	0.2	7372
4.	Sheep	20119	0.2	4024
5.	Others	4951	1.5	7426.00
TOTAL		114141		76339

3.3 RESOURCE STATUS :

3.3.1 FORESTS :

All types of forests cover 241.90 square km., constituting 28 percent of the total 8.63.64 sq. km. area of the three sub-watersheds. As against this, all the eight hill district of U.P. contain 34399 sq. km. of forests. Constituting about 67 percent of the total geographical area. The larger percentage

of area under forests as compared to agriculture emphasises the basic importance of forests in the life, economy and development of the region. Besides, the role of hill forests in maintaining ecological stability and preventing environmental degradation everywhere cannot be ignored.

3.3.2 Of the total of 34399 sq. km. of forest area in the eight hill districts, 23819.65 sq. kms. (69%) is under the control of the forest department. The remaining 31 forest area is under Civil-Soyan, Panchayati and Private Forests. In Chakrata Tehsil of Dehradun district, out of the total forest area of 806.72 sq. kms., 361.68 sq. kms. or 44.83 percent is with the forest department, while the remaining 55.17 percent is under Civil, Panchayati and Private Forests. In the three sub-watershed, 170.58 sq. kms. of forests which constitute 19.75 percent of the total forest area are with the forest department, the remaining 80.25 percent being under the control of the revenue department as Civil and Panchayati Forests.

3.3.3 The tree cover in the area is mainly confined to the reserved, Panchayati and Civil Forests, the private lands being almost totally devoid of tree cover. Forest areas near habitations are generally of poor density due to excessive biotic pressure. Unscientific and unregulated lopping, and absence of natural regeneration, especially of broad-leaved species, are the other major problems in these forests. Chir pine is major species followed by Oaks and Deodar. These species have their associate species too. A statement of the area under

important species on the forests under the control of the forest department is given in table 3.8.

TABLE 3.8

SPECIES WISE AREA OF RESERVED FORESTS

S.N.	Species	Area (Ha)			Total	Percentage
		Amlawa-Seligad	Khutnugad	Benalgad		
1	2	3	4	5	6	7
1.	Chir	516	67	1755	2338	13.71
2.	Oak	1348	3352	1609	6309	36.98
3.	Deodar	-	456	6735	7200	42.20
4.	Fir	-	235	825	1060	6.22
5.	Rocky	64	41	46	151	0.89
TOTAL		1926	4160	10970	17058	100.00

3.3.4 The local villagers are mainly dependent upon these forests for their daily requirement of fodder, fuel wood and small timber. The excessive demand of these, disproportionate to the carrying capacity of the forests, is a source of continuous depletion and degradation of these forests.

3.3.5 FODDER :

The total cow units grazing in the area are 76339, as given in table 3.7. As estimated by the Animal Husbandary

Department, an average cow requires 7.30 Mt. tonnes (20 kg. daily) of green fodder annually. The total requirement of green fodder annually is, thus, 557274.7 Mt. tonnes.

3.3.6 The main source of fodder in the area are forests, agricultural fields, grasslands and other culturable wastelands. As per the estimates of the Animal Husbandary Department, production of fodder per hectare from different categories of land is as follows :-

1) Fodder crops in irrigated area	-	10 Mt.tonnes/ha.
2) Food crop residues	-	1.2Mt.tonnes/ha.
3) Forest areas	-	1.5 Mt.tonnes/ha.
4) Grasslands	-	1.0 Mt.tonnes/ha.
5) Groves, Civil and other	-	0.5 Mt.tonnes/ha.

Based upon the above production estimates, the total green fodder available from different categories of land in the area is given in table 3.9.

TABLE 3.9
AVAILABILITY OF GREEN FODDER

S.N.	Land category	Area (Ha)	Estimated production per ha. (Mt. tonnes)	Total available fodder (Mt. tonnes)
1	2	3	4	5
1.	Forest	24190	1.5	36285.0
2.	Agriculture	22738	1.2	27285.6
3.	Grassland	9774	1.0	9774.0
4.	Waste land	29662	0.5	14831.0
TOTAL		86364		88175.6

The above table clearly shows that against the fodder requirement of 557274.7 Mt. tonnes, the green fodder available is just 88175.6 Mt. tonnes. The vast gap between demand and supply is a major source of degradation of the forests.

3.3.7 FUELWOOD :

The total number of families residing in the three watersheds is 18303, all living in the rural areas. According to various estimates and studies, a family of 6 members on an average requires 10 kg. fuelwood everyday. The average annual requirement, therefore, comes to 3.65 Mt. tonnes. As alternate source of energy available and used in the area are negligible, and whatever little one used are negated by the shops using fuelwood as energy, the annual requirement of fuelwood of the area comes to 66805.95 Mt. tonnes. A major portion of this demand at present is met from the forest area. This demand is far in excess of the carrying capacity of these forests which thus has an adverse effect on them.

3.3.8 RIGHTS AND CONCESSION :

The bonafide residents of Jaunsar Babar enjoy liberal rights and concessions. both in the reserved forests and other forests. In brief, they can graze cattle free without count or restriction in any of the forests outside regeneration areas, fodder reserves and plantations. With certain restrictions of areas and species, the residence have the concession to lop trees. The residents also have a right to free constructional

timber and timber for agricultural implements. The bonafide residents have also been granted the concession to use fallen wood for fuel, miscellaneous underwood, fodder, thatching and bhabar grasses, dry leaves, fruits and roots, bark of creepers, bamboos, ringals, slate, limestone, clay and building stones from these forests. These rights and concessions are unrestricted in the Civil Forests. With the continuous increase in population of both man and animal, the pressure on the forests for rights and concessions continuously increasing.

3.4 INSTITUTIONAL DIMENSIONS :

The public forests in the area are managed by the Forest Department, Forest Panchayats and Gram-Sabha.

3.4.1 FOREST DEPARTMENT :

The reserved forests in the area are managed protected and developed by the Forest Department. The entire reserve forest area in the sub-watersheds is managed by Chakrata Forest Division in Dehradun district. The harvesting of non-timber forest produce is done by the forest department while timber harvesting is done by the U.P. Forest Corporation. While there are some overlapping functions with other departments like Soil Conservation, Agriculture, Horticulture and Animal Husbandary, but critical links and co-ordination on them are not developed to the desired level or are even absent.

3.4.2 FOREST PANCHAYATS :

The panchayati forests are managed and protected by the forest panchayats under the provision of Forest Panchayat

Rules, 1976, framed under section 28 of The Indian Forest Act, 1927. The forest panchayat consists of 5 to 9 elected members who in turn elect a Sarpanch. The administrative control of the panchayati forest is with the District Magistrate, while forest department has been given the responsibility of technical guidance.

3.4.3 GRAM SABHA :

Civil Forests, which are under the control of the District Magistrate, are managed and protected by the gram sabhas which is an elected body. As the management of these forests is not backed by a legal provision and there is no technical department to look after them, they are the forests in worst shape. Apart from other agencies, plantations in both Civil and Panchayati forests are done by the Civil and Soil Conservation Division of the Forest Department.

3.5 ENVIRONMENTAL STATUS :

Land and water are the basic resources on which Forestry, Agriculture and Animal Husbandary depend in the hill region. In the past, the traditional rural socio-economic systems were in harmony with the environment and were based on the concept of recycling of resources. The constant and excessive increase in human and animal population, beyond the carrying capacity of the eco-system, has resulted in depletion of forest resources and degradation of the hill eco system. The over exploitation of forest areas for timber, fuel, fodder etc. has not only resulted in the lowering of density but has also caused reduction of species diversity. The condition

is worse near habitations, especially so in the Civil and Panchayati forests.

3.5.1 With the increase in population, agriculture has extended to areas unsuitable for agriculture, moving up the hill slopes and even on steep slopes more than 30° and not suitable for agriculture. This added with improper terracing, has resulted in acceleration of run-off and the resultant disruption of the ground water regimes. Many natural springs have either disappeared or the water output has been reduced.

3.5.2 Excessive biotic pressure coupled with faulty land use practices has accelerated soil erosion from the area, resulting in lower agricultural production, degraded forests and denuded hill sides.

CHAPTER - 4

CRITICAL APPRAISAL OF ON GOING PROGRAMMES

4.1 The effective area covered by well stocked forests being much less than the minimum percentage of 60% for hills as laid down in the National Forest Policy of India, U.P. Forest Department realised the importance of developing to their full potential. in the degraded lands. classified as Civil and Panchayati forests. some state and contrally - sponsored scheme were started from the Vth plan period. Under these schemes. afforestation, pasture development and soil and water conservation works were undertaken. The area treated under various such schemes upto 1991. is as under :-

S.No.	Name of Scheme	Plantation (ha.)	Pasture devel- opment (ha.)	Density impro- vement (ha.)	Soil Cons- ervation works (No.)
1	2	3	4	5	6
1.	Integrated soil and water conservation scheme	9341	2580	-	646
2.	Integrated wasteland development	1942	200	-	1110
3.	Development of Civil Soyam forest	1062	-	3577	195
TOTAL		12345	2780	3577	1951

4.2 The growing demand on forest resources and lack of adequate investments. has resulted in slow progress of this programme. The VIIth plan out-lay. for forestry sector. is only 183% of the total state out-lay. As such. it is felt that

the time has come for massive investment under forestry sector for meeting the daily needs of the rural people, as also to provide additional economic gains and ecological security through forestry activities.

4.3 CRITICAL APPRAISAL OF ON-GOING SCHEMES :

Critical analysis of the on going schemes and programmes brings into focus some major shortcomings which need rectification. Plantation activity has been treated as a departmental responsibility, with minimal active involvement of local people. Forestry being a long term activity, immediate needs of the local people have not been taken care of in the ongoing schemes. Therefore, all afforestation efforts have been done in isolation without any major stress on soil, water and energy conservation. The approach has not been integral on the basis of treating a watershed as a whole. Paucity of funds has been responsible for lack of after care of the plantations raised in the area. Hill species being slower growing, they require longer periods of aftercare. The problem has been more acute in Civil and Panchayati forests, where even successful plantations have not been taken back by the local people, because of lack of organisational back-up.

Presently, forestry research has been limited to traditional forestry research only, while it requires, to be more responsive towards socio-economic aspect of forestry. The present schemes are devoid of any useful extension activities, and training of the staff, so as to reorient these towards the social aspects of forestry.

4.4 MODIFICATION SUGGESTED :

In mountains, catchment area of rivers and streams are a link between inter-dependent physical, biological and human process, and this constitutes the basic geographical unit for resource -planning and eventually for erosion and flood control. The watershed has been adopted at the macro-level of planning and execution, with the household in the watershed being the ultimate beneficiary at the micro-level. Intregrated development has been envisaged as a tool of watershed management and development. All the activities proposed are to be undertaken by the active participation and involvement of the local people, organisations and non-gorvermental organisations. It will be endeavoured to meat the forest-based needs of the rural people without causing any adverse effect to the ecological stability, the special emphasis on soil and water conservation. Efferts are to be made to strengthen the existing local institutions as forest panchayat, gram sabhas etc. Research and training of the staff will be so oriented as to meet the new challenges before the planners.

CHAPTER - 5THE PROJECT5.1 OBJECTIVE :

The large gap between demand and supply of fodder and fuelwood, faulty and unscientific land use practices, and the near total dependence of the local population on adjoining forests to meet their daily needs of fuelwood, fodder timber etc., with alternative sources of energy being out of reach of the common masses, has resulted into the depletion, degradation and deterioration of environment and forests, which demand determination and sustained efforts to mitigate the situation. Thus, the main objective of the project is to protect, conserve and improve the existing ecosystem. Subsidiary objectives are to satisfy the local demand of fuel, fodder and other forest produce, besides optimal use of the land and improvement of the economic status of the local population. The project has been formulated to meet the following objectives : -

- 1) To protect, conserve and improve the existing forests and vegetal cover.
- 2) To conserve soil, and minimise soil erosion.
- 3) To conserve water, and minimise water run-off, by plantation and rain-water harvesting.
- 4) To improve the existing, and create new fuelwood, fodder and timber resources to meet the needs to the local people.

- 5) To optimise and adopt scientific land-use, with the active co-operation of the local people.
- 6) To improve the density of the degraded forest, and to increase the productivity of the existing forests.
- 7) To reduce the dependence of the people on forests, by introducing alternative sources of energy by increasing the efficiency of the existing energy-using devices.
- 8) To improve employment opportunities and economic status of the local people.
- 9) To educate and advice people in scientific land-use practices, soil and water conservation and afforestation and to seek their active participation in achieving the objectives of the project.

5.2 PROJECT PERIOD :

The period envisaged for the project is five years.

5.3 PROJECT COMPONENTS :

The components of the work needed to achieve the objectives of the project are given below in detail. The problems of the area, their proposed solutions, technique and funds required for the same, have been briefly described in the following paragraphs.

5.4 FODDER DEVELOPMENT :

5.4.1 PROPOSALS FOR FODDER DEVELOPMENT :

The following areas are proposed to be taken up for fodder development :-

1)	Grasslands	-	1000
2)	Cultivable waste	-	300
3)	Civil Panchayat forest	-	200
			<hr/>
	TOTAL		1500 ha
			<hr/>
5)	Bunds of Agricultural fields		100 ha

5.4.2 The following strategy will adopted for fodder development-

- 1) Developing root stock of grasses in nurseries.
- 2) Fencing the areas selected for fodder development.
- 3) Use of fertilizers to increase production.
- 4) Weed control.
- 5) Planting and sowing of grasses.
- 6) Distribution of fodder Minikits and grass root stock to farmers.
- 7) After one year, planting 250 fodder shrubs and 750 fodder trees per hectare in the area fenced for the purpose.

5.4.3 ESTIMATED ADDITIONAL PRODUCTION :

As a result of works to be done under the fodder production scheme, it is estimated that the average production per hectare will go upto 15 Mt. tonnes against the present average of 1.5 Mt. tonnes per ha. Thus the production is estimated to register a net increase of 13.5 Mt. tonnes per hectare. Thus 21600 Mt. tonnes of additional green fodder

will be available from 1600 hectares.

5.4.4 DEMAND AND SUPPLY :

The details of the gap between demand and supply are given in Table 5.1.

TABLE 5.1
FODDER - DEMAND AND SUPPLY GAP

Fodder Demand Mt. tonnes)	Fodder Availability (Mt. tonnes)		Total	Gap(Mt. tonnes)
	PRESENT	ADDITIONAL		
557274	88175.6	21600.00	109775.6	447498.4

5.4.5 A small proportion of the total demand will be met from the farm sector and other plantations. But it is clear from the above statement that, with the present cattle population, it is only possible to meet 19 percent of the total fodder demand. Therefore, to cover this gap, it will be essential to take effective steps to reduce the number of unproductive livestock, improve the breed of animals and to encourage stall-feeding. Though this component has not been provided in the project, yet efforts will be made to seek co-operation of the Animal Husbandary Department to implement such programmes in the project area.

5.4.6 PLANTING MODEL AND COST :

The planting model of fodder scheme is given in Annexure 2, and the per hectare cost is given in Annexure 3.

5.5 FUELWOOD DEVELOPMENT :

5.5.1 PROPOSALS FOR FUELWOOD DEVELOPMENT :

The following areas are proposed to be taken up for fuelwood plantations.

1) Cultivable waste and blanks	-	1500 ha
2) Civil and Panchayat forest	-	750 ha
TOTAL		----- 2250 ha -----

5.5.2 FUEL WOOD PRODUCTION :

After 30 years, these planted areas will produce 50cm. mts. (35.00 Mt. tonnes) of fuelwood per hectare per year. Thus, an additional production of 78750 Mt. tonnes of fuelwood will be obtained every year from the planted areas.

At present the production from these areas is negligible because these are either treeless or of very poor density, with an estimated annual production of 0.2 Mt. tonnes per hectare.

5.5.3 DEMAND AND SUPPLY :-

As already stated in para 5.5, the fuelwood at present is mostly extracted from the forest areas. This additional production of 78750 ^{Mt} Mt. tonnes will remove the pressure from the forest areas, and thus protect the forests.

5.5.4 PLANTING MODEL AND COST :

The planting model of fuelwood scheme is given in Annexure 4 and the per hectare cost is Annexure 5.

5.6 ENERGY CONSERVATION :

The additional production of 78750 Mt. tonnes will be available after 30 years. During the gestation period, to meet the excess demand and reduce the pressure on forests, it is proposed to introduce energy-saving devices and alternative sources of energy in the project area.

5.6.1 FUEL-EFFICIENT CHULLAHS :

As per the report of the watershed management project, 0.722 ^{MT} Mt. tonnes of fuelwood can be saved annually, per Chullah, by using fuel-efficient chullahs. During the project period, it is proposed to distribute 500 fuel-efficient chullahs, kerosene stoves, which will save 361 Mt. tonnes of fuelwood annually.

5.6.2 PRESSURE COOKERS :

Use of pressure cookers reduces the cooking time by 50 percent and thus reduces the fuel consumption by 30 percent. Hence, the use of pressure cooker can save 1.10 metric tonnes of fuelwood per family, annually. It is proposed to distribute 1500 pressure cookers to families living within the project area during the project period, thus saving 1650 metric tonnes of fuelwood annually.

5.6.3 BIOGASS PLANT :

Biogas plants have been found to work successfully only in the lower areas and valleys, the upper reaches being cold are not conducive to the working of biogas plants. Therefore, it is proposed to install 15 biogas plants in the valleys of the project area.

5.6.4 BURNING GHATS :

About 40 percent fuelwood can be saved by using more fuel-efficient burning ghats. Therefore, it is proposed to replace one burning ghat, annually, into more fuel-efficient ghats to reduce the consumption of fuelwood.

5.6.5 COST :

The per unit cost to be increased on energy saving devices is given in Annexure-8.

5.7 REHABILITATION OF DEGRADED FORESTS :

The reserved forests, being heavily burdened with rights and concessions and overloaded with excessive biotic pressure, are continuously getting depleted, degraded and losing their protective capabilities. Excessive, unregulated and unscientific lopping has reduced a number of oak areas into oak scrubs. Some of the such degraded forests have density which is less than 0.5. It is, therefore, very necessary to recoupe the lost capabilities by increasing density. Therefore, 3000 ha has been targetted, in this project period, to be rehabilitated by increasing the density by underplanting and gap-planting.

5.7.1 The following works are proposed to be undertaken for reclaiming the degraded forests :-

- 1) Reclamation of degraded oak areas.
- 2) Gap ^{planting} and underplanting.
- 3) Encouraging natural regeneration in regeneration-deficient areas.

5.7.2 PLANTING MODEL AND COST :

The planting model, for rehabilitation of degraded forests, is given in Annexure 6 (a) (b) (c), and per unit cost in Annexure 7 (a) (b) (c).

5.8 PRIORITY AREAS :

Plantations to be undertaken, under all the above plantation schemes, are also aimed at conserving the soil and water, apart from meeting the local requirement. Therefore, areas under severe erosion-classes, E4 and E3, will be given the top-most priority while choosing the areas for plantation. Fuelwood plantations are proposed to cover mainly E3 and E4 classes, fodder plantations will first cover E1 and E2 classes, while rehabilitation of degraded forests will cover all the classes from E1 to E4.

5.9 SOIL AND WATER CONSERVATION :

The following works are proposed to be undertaken for the purpose :-

1) CONSTRUCTION OF CHECKDAMS :

In soil conservation works the main activities proposed are construction of gully plugs, various types of check dams and drop structures. Within this project period, it is estimated that 4500 brushwood checkdams, including stone rubble checkdams, 750 crate-wire dams and 300 drop structures spurs, embankments etc. will be constructed. If needed, smaller structures, more in number, will be made within the same total cost. To protect the river banks from erosion, crate-wire stone-spurs will be constructed.

2) PROTECTION OF WATER SOURCES :

It is proposed to fence and plant 75 ha. of land around the water sources, each source on an average covering around 2 ha. of area.

3) RIVER SIDE PLANTATION :

It is proposed to plant trees of suitable species on either side of the rivers of the project area, covering a total of 150 hectares, during the project period, each hectare having 2500 plants.

4) RAINWATER HARVESTING :

It is proposed to construct 150 rainwater harvesting tanks in 25 percent of the total villages of the project area, alongwith irrigation channels upto 45 km. in length wherever economically viable.

5.9.1 COST :

The per unit cost of different soil and water conservation works is given in Annexure - 8.

5.10 FIRE PROTECTION :

The forest in the project area are predominantly Chir and as such are fire-prone, especially during the summer. These fires not only destroy the vegetation but also retrograde the site quality. Protecting these from fire will mean better grasses and more successful plantations.

5.10.1 PROPOSALS FOR PROTECTION :

The following measures are proposed to be undertaken in the project area, during the project period :-

1) FIRE FIGHTING CREWS :

It is proposed to set up 5 seasonal crew stations in the project area from March to June. Each will be manned by 3 crew members who will be responsible for prevention, early detection and extinction of fire in the area demarcated for them.

2) MOBILITY AND COMMUNICATION :

It is proposed to supply wireless sets to the staff in the project area for better communication when fire does occur, and to provide atleast one vehicle for mobility. The vehicle will be used for extension purposes during non-fire-season.

3) MODERN FIRE FIGHTING EQUIPMENT :

Each crew will be suitably equipped with modern fire fighting tools, consisting of chopping, felling and clearing tools, raking, hoeing and trenching tools and swatting tools and pumps.

5.11 UDYAN VANAKI :

In order to improve the living standard of people, to seek their active co-operation and to motivate and encourage them to adopt proper land-use pattern, it is proposed to plant fruit trees on unirrigated agricultural fields and areas not suitable for cultivation.

5.11.1 FRUIT GROVES :

The following works are proposed to be under-taken during the project period :-

- 1) Fruit tree planting on 15 hectares of unirrigated areas.
- 2) Rejuvenation of 15 hectares of old orchards.
- 3) Top dressing of 5000 mehal plants will be done. Pears will be grafted.

5.11.2 HOMESTEAD GARDEN :

It is also proposed to distribute 27000 fruit plants and 300000 fuel and fodder plants to cover about 50 percent of the total families in the project area at the rate of 5 plants per family to be planted in their courtyards or fields otherwise not suitable for agriculture. This will involve the people in plantation programme and at the same time improve their financial condition too.

5.11.3 COST :

50 percent of the cost of raising and rejuvenation of fruit plants and the cost of fertilizer, weedicides and pesticides in the subsequent two years, will be borne by the project, the details of which are given in Annexure - 9.

5.12 PLANT DISTRIBUTION :

In order to actively involve the local people in planting programme, it is proposed to distribute 8,00,000 seedlings to cover 800 hectares of E2 class agriculture areas during the project period.

5.12.1 MODEL :

The distribution model is given in Annexure-10.

5.13 VILLAGE ECO DEVELOPMENT :

During early period of forest management the Britishers declared commercially important forest of Chir, Deodar, Fir etc. as reserved forest, whereas forest areas near villages consisting of Oak and other broad leaved species were constituted as Civil and Panchayati forest. While a few panchayati forests are well protected by local panchayat, but some reserve forests around villages are in depleted condition. Here, the main problem is lopping of Oak and other broad-leaved species for fodder and fuel, and frequent fires spreading from field while burning crop residue. The success of any rehabilitation efforts in such areas depends largely on enforcement of strict protection measures, which ^{are} is only possible through local participation. It is, therefore, proposed to form GRAM PARYAVARAN SURAKCHA SAMITI. (Village eco development committee) in each village. This committee will be responsible for protection of these areas from grazing, ^{and} lopping, fire-protection and ^{protection of} other assets created through other components of this project. This component will provide assistance to village^ars to enable them to form SURAKSHA SAMITIS and provide incentive for best efforts.

5.13.1 COST :

About Rs. 50,000/per annum is provided for creation of SAMITI's and holding regular meetings. Each year, 3 SAMITI's shall be awarded for best protection work. This award will

be ^{utilised} made through local gram sabha, ^{and} panchayat for creation of community assets like school, community hall, bridge-path etc. A lumpsum of Rs. 6 lacs per year at the rate of Rs. 2 lacs per village, has been provided for this purpose.

5.14 PHASING :

Physical phasing of the targets is given in Annexure-11.

5.15 OTHER COMPONENTS :

5.15.1 RESEARCH :

The research organisational of the U.P. Forest Department has a research unit at Nainital, headed by a D.C.F. This unit will be actively associated with the research activities in the field of hydrological studies, propagation and field trials of fuel and fodder-yielding shrubs, fodder grasses and tree species. Socio-economic studies, impact-assessment etc. will be conducted through various academic institutions. A provision of 10 lacs has been made for this purpose during the project period.

5.15.2 TRAINING :

The implementation of the project will require additional trained A.C.Fs, F.Rs., Dy. F.Rs. and F.Gds. The existing field staff will also be imparted short orientation courses in extension and communication method. Training upto the level of F.Rs. is provided within the state. The project will finance the training of 2 A.C.Fs., 5 F.Rs., 20 Dy. F.Rs. and 40

F.Gds and ⁶10- Malis. The training of various staff shall cost Rs. 8 lacs.

5.15.3 FELLOWSHIP :

It is necessary to keep ^{up} with development in the field of watershed management and learn from experiences in other states of the country and abroad. In all, 15 man-months and 10 man months of international and national level fellowships, respectively, are provided. On this, a total expenditure of Rs. 7 lacs has been provided in the project.

5.15.4 STAFFING REQUIREMENT :

The details of various categories of existing and staff proposed to be added is given below :-

Category	Existing Staff	Additional Requirement
A C Fs	1	1
F Rs	5	-
Dy. F Rs./Fr.	20	-
F.Gd.	40	-
Mali	4	6

5.15.4.1 COST :

The expenditure to be incurred on required staff is given in Annexure - 12.

5.15.5 BUILDINGS :

The following building are proposed to be constructed during the project period for the staff.

TABLE - 5.3

Type	Category	Type	Number	Unit cost '000Rs.
1. Residential	ACF	IV	2	300
	FRs	III	5	200
	F.Gds	I	10	100
2. Non Residential	Garage for jeep	I	2	50
	Sheds for vehicle		3	20

5.15.6 VEHICLES :

For mobility and better supervision, the officers of the rank of ACF will be provided with jeeps and the FRs with motorcycles. Vans are required for transport of material and plants and also for extension and fire-protection works. The requirement of vehicles is given in Table No. 5.4.

Category	Number	Unit Cost (000)
1	2	3
Jeeps	2	200
Van/Trucks	1	300
Motorcycles	10	25

5.15.7 EQUIPMENT :

Plantations, nurseries, extension, fire protection monitoring and office work will require equipments like sprayers, audio-visual aids, P.Cs, typewriters, photocopiers, wireless-sets etc. The provision of equipment is listed in Table 5.5.

TABLE - 5.5

Sl.No.	Category	Number	Unit Cost '000Rs.
1	2	3	4
1.	Sprayers	10	5
2.	Electronic Typewriters	2	30
3.	Personal Computers	2	200
4.	Photocopiers	2	100
5.	T.V.	2	20
6.	V.C.R.	2	25
7.	Wireless-sets	5	30

5.15.8 EXTENSION ACTIVITIES :

The staff entrusted with extension work shall be responsible for publicity, motivation, organising training camps for farmers, seedling distribution, distribution and demonstration of wood - saving devices, and for obtaining resolutions from gram-sabhas and panchayats for raising fuel and fodder plantations on community lands.

Each year, 3 gram sabhas/forest panchayats shall be awarded for best work done, and for active participation and co-operation in the project activities. For extension works a lumpsum of Rs. 5 lacs has been provided in the project.

CHAPTER - 6

ORGANISATION AND MANAGEMENT

6.1 ORGANISATION :

The project will be implemented by the forest department. The existing forest department organisation in hills, headed by CCF (Hills), will continue to function under over-all supervision and control of the PCCF.

6.1.1 At the operational field level, the existing DCF's at Kalsi, District Dehradun shall execute the work in his jurisdiction. Since a number of new disciplines have been included in the catchment area treatment programme, there will be an escalation of about 100% in the existing physical targets. As a result CCF's are left with about two fold increase in the work load during the project period. The additional work load will be borne by adding only the field staff, at the levels of ACF's and below.

6.1.2 The ultimate objective of the project is to transfer the activity of community-forestry to the community, with the forest department acting only as catalyst and guide. Therefore, to achieve this objective, it is felt necessary to separate the two functions, ^{viz.} (1) protection and afforestation in RF. and (2) Proposed activities in community and individual lands along with extension and motivation, by allotting separate staff.

6.1.3 It is therefore proposed to have 2 additional ACF's to assist the existing DCF in the execution of project. Five

additional FR's each assisted by 4 Dy. Frs and 8 FGds, will be required for the activities proposed in community and private lands. They will also be incharge of raising and distribution of seedlings, initiate follow-up action on this activity and assist the programme of installation of energy-saving devices. They will also perform the task of extension and motivation. The existing FR's will look after the activities proposed in the RF.

6.1.4 Planning, information and reporting will continue to function within the existing frame-work of the FD. At present the M & E is the responsibility of DCF and CF in the FD reporting to the head of the department, and this procedure will continue to function for this project also.

6.2 PROJECT CO-ORDINATION :

It is proposed to constitute one committee at sub-watershed level and one at each micro-watershed level. Membership of the committee will be flexible, to be adjusted to suit the needs of the project in each sub-watershed or micro-watershed, to make them more effective and useful. However, care would be taken to include respective Block Pramukhs at sub-watershed level, and Sarpanch or Sabhapati at micro-watershed level, and other persons of public with community repute and interest in community forestry. Women representatives, and representatives of local NGO's like Mahila Mandal Dal, Yovak Mangal Dal etc., *have to be included* in the committee. The DCF will co-ordinate project activities at sub-water^{shed} level with the guidance of MWS level committee.

Terms of reference of the committee may include:-

- Fixing priorities for selection of area and species.
- Identifying social and administrative bottlenecks in the implementation of programme and suggest remedial measures.
- Spreading the message of tree ^{planting} plantation and forage ⁱⁿ in all unused/underused land, or farm bunds etc.. and better propagation of project objectives through social and political influence of local leaders.
- Reviewing the progress of programme and advise ways and means for better implementation of the programme.

6.3 MEASURES TO ENSURE LOCAL PARTICIPATION :

The afforestation programme under Civil Soyamm scheme and integrated wasteland development programme has made good impact in this region and has created considerable awareness for trees. Though the village community, particularly the gram sabhas, are still not willing to take the responsibility of protecting the established plantations, their willingness to provide community land for plantation shows their confidence towards afforestation programmes. The following measures have been proposed to ensure effective local participation.

- 1) The stone-wall fencing, pit-digging and planting work will be executed through local gram sabhas, and forest panchayats and NGOs, for which payment will be done at approved schedule rates.

- 2) Grasses grown inside fenced areas will be distributed free of cost to local villagers through Gram Sabhas and Forest Panchayats.
- 3) The project also proposes to offer incentives to farmers for planting fruit trees in marginal and unirrigated fields.
- 4) Local people will have first right over the benefits according to norms fixed by village representatives and the FD.
- 5) Conversion of established plantations in Civil areas into Forest Panchayats for people's participation in the management.
- 6) Farmer camps will be organised to stimulate interest in tree planting.
- 7) Local people will be given first preference to employment as plantation, Nursery and fire watchers.
- 8) Grass seeds and seedlings distribution will help to stimulate interest and participation of local people. They will be motivated to grow trees and grasses in the farm bunds and in their private waste lands.
- 9) It is also proposed to recruit lady forest guards to enable the department to reach village women.

6.4

EXTENSION TRAINING :

- 1) Short orientation courses in communication and extension methods, for FR's and Dy. Frs, will be arranged at forestry training institute, Haldwani.
- 2) The FGd's, who will also act as village level extension workers, will receive initial training ^{at} as FGd. Training centre at Kalsi, and later on short - duration specialised training in grass cultivation at Vivekanand Laboratory Almora, and in horticulture at Chaubatia-Ranikhet.
- 3) The village extension worker would visit villages in the project area and keep close touch with selected contact - farmers in each for the transfer of technology in project area.
- 4) Farmer camps will be organised by the DCF's in the selected villages for sharing and communicating ideas.

CHAPTER - 7
COST ESTIMATES AND FINANCING
PROCEDURE

7.1 The detailed cost of the various project components has been discussed in various annexures of the project report. A summary of the financial aspects of the various project components is given in Table 7.1. The year wise details of expenditure are given in Annexure - 13.

TABLE - 7.1
SUMMARY OF COST ('000Rs.)

S.No.	Component	Proposed Area (Ha.)	Estimated Cost
1	2	3	4
1.	Fodder Development	1500	16339.00
2.	Fuelwood Development	2250	24525.00
3.	Energy Conservation	-	1390.00
4.	Rehabilitation of Degraded Forests	3000	19012.95
5.	Soil and Water Conservation	-	29760.00
6.	Fire Protection	-	1000.00
7.	Fruit Tree Planting	30	200.00
8.	Plant Distribution	-	570.00
9.	Staff	-	10785.25
10.	Operating Cost	-	500.00
11.	Vehicles	-	950.00
12.	Equipment	-	950.00

1	2	3	4
13.	Building	-	2760.00
14.	Research	-	1000.00
15.	Training and Fellowship	-	1500.00
16.	Extension	-	500.00
17.	Contingency	-	5586.99
TOTAL			117327.24

or Say Rs. 117327.00

7.2 The component wise detailed cost is given in Annexure-14.

7.3 FINANCING PROCEDURE :

The financing procedure adopted will be according to the decision taken by the Government of India, State Government and Funding Agency.

CHAPTER - 8

PRODUCTION AND DISTRIBUTION OF BENEFITS

8.1 In all cases, as far as practicable, plantation designs stress quick-maturing, and coppicing, species of trees and shrubs which enable early harvesting, thinning and lopping to ^{meet} provide household fuel and fodder needs. However, choice of species and production shall vary considerably, due to varying edaphic and climatic factors. The following are estimates of average yield for various project components -

YIELD/Ha.

Produce	Project component				Fruit tree Planting
	Model I	Model II	Model III	Model IV	
1	2	3	4	5	6
A) Fodder					
i) Grass Mt.	4	4	2	10	-
ii) Leaf Fodder Mt. from shrubs	5	-	-	-	-
iii) Leaf Fodder Mt. from trees	6	1	5	5	-
TOTAL	15	5	7	15	-
B) Fuelwood					
i) Shurbs Cmts.	-	2	-	-	-
ii) Thinnings					
10th year Cmts.	-	5	5	-	-
20th year Cmts.	-	10	10	5	-
iii) Final felling Cmts.	10	35	35	10	-
TOTAL	10	52	50	15	-

1	2	3	4	5	6
C) <u>Small wood</u>					
Thinnings 30th year Cmts.	-	-	40	-	-
Fruit Mt.	-	-	-	-	5.00

8.2 Annexures 15 to 18 gives year-wise yield due to project and its value. Over a period of 34 years, the project shall produce 320.25 thousands cmts. of fuelwood, 1022.99 thousand Mt. of fodder, 14.878 thousand Mt. of fruits, 120 thousand cmts. of smallwood and poles 456 worth 372310 thousand Rs. at current price.

8.3 MODALITIES OF HARVESTING AND DISTRIBUTION OF PRODUCE :

The procedure of harvesting and sharing of produce will be as follows : -

1) FODDER :

The fodder raised on the community land will be harvested by villagers and will be shared by them according to the distribution norms decided by the gram-sabha or forest panchayat, and will be free of cost. The villagers will continue to exercise their rights in the reserved forests also and the fodder from these areas will be cut by the villagers in the presence of forest guard. Grazing will, however, be discouraged in RF.

2) FUEL WOOD :

The fuelwood from the plantations raised on the community land will be harvested by the villagers and distributed according to the norms fixed by the gram sabha or forest panchayat and will be free of cost. The markings, however, will be done by the forest department. The gram sabhas and panchayats are free to sell any surplus, and the income generated will be utilised for community welfare. The villagers will continue to exercise their rights in the reserved forests also.

3) REJUVENATION OF DEGRADED FORESTS :

The harvesting will be done departmentally. The villagers will continue to exercise their rights to timber, fuelwood and fodder.

4) FRUIT-TREE PLANTING AND SEEDLING DISTRIBUTION :

Harvesting shall be at the choice and responsibility of the owner and all benefits shall accrue to him.

CHAPTER - 9

BENEFITS, JUSTIFICATION AND RISK

9.1 BENEFITS DUE TO PROJECT :

The most important benefit of the project will be an estimated production of 1022.99 thousand Mt. of fodder and 320.25 thousand cmts. of firewood over a period of 34 years. Following are the important direct and indirect benefits:-

- 1) Availability of fuelwood near villages will save time and labour of women and children wasted on collection of fuelwood from distances. Easier availability of fuelwood along with improved stoves will ease cooking conditions.
- 2) Demonstration effect of highly visible planting of fruit and forest species of private, community and Government wastelands and peripheries of houses lots and fields, which would make important contribution to greater community and political awareness and uptake to the programmes.
- 3) The project will create 2815 thousand mandays of employment during the project period. Most of the employment will be created in rural areas which would help in solving rural unemployment problem. Far-reaching of the project may be creation of round-the-year labour opportunities. This is expected to reduce exodus of labour from village.

- 4) The project will also help in regaining ecological balance. The increased production of fuelwood and fodder will reduce pressure from forests. Tree cover in and around villages will reduce pollution and improve environment. Use of marginal and sub-marginal land for tree raising will check degradation of land thus, contributing to over-all improvement in environment.
- 5) 14.878 thousand Mt. of fruits produced due to project will also contribute for food nutrition.
- 6) Tree belt raised around farms through seedling distributed under the project will provide shelter belt effect and contribute towards increased productivity.
- 7) Increase in productivity would create additional resources for the community and the State there by increasing the disposable income and shifting away from the fuelwood oriented energy consumption.
- 8) Time and energy will be saved from the use of improved stoves, crematoria and pressure cookers.

9.2 IMPACT ON ENVIRONMENT :

Major impact of the project is expected in the form of a favourable change in the supply position of fuelwood, small timber and fodder, amelioration of pollution effects, aesthetic

comforts and micro climate in the locality. of these, only quantifiable impact is that in supply position of fuel, small timber, fodder and fruit. However overall impact on environment will be sum total of micro-changes effected. A list of possible impact is given below :-

- 1) Creation of resources for community development.
- 2) Increased employment opportunities, thereby diversion of human energy for productive use.
- 3) General improvement in the quality of life due to increased availability of housing material. energy for cooking, time for child care and nutrition to children etc.
- 4) Creation of sustained base for production of agriculture as well as forestry crops.
- 5) Reduction in pressure on forests and thereby checking further degradation of forest and farm lands.
- 6) Soil and water conservation for checking further degradation of Himalayan environment.
- 7) Provision of sustained base of survival for small and marginal farmers cultivating on available lands.

9.3 There may be other impacts, less pronounced in nature, and so less visible. All the effects may not be observed to have the same intensity of impact at all places. However,

the sub total of the impact is expected to create better living condition through optimum use of land and water resources, and check further degradation of Himalayan environment.

9.4 FINANCIAL ANALYSIS :

The total cost of the project is Rs. 117327 thousands. The benefits from the project, are valued at 550612 thousand, will accrue over a period of 34 years.

9.4.1 The investment analysis of the project shows (see Annexure - 16) the B C ratio to be more than one and net present value (N P V) is positive, indicating the project is sound from financing point of view, treating the opportunity cost of the money to be 14% (which is the rate term deposits at nationalised banks). The internal rate of return (IRR) works out around 14.5% which further proves the above point.

9.4.2 The cost components of land & buildings equipment, staff, training, extension, energy and water conservation are not taken into account while doing the investment analysis because they are treated to be the part of social obligation or treating them as social cost. Nevertheless, above components do indirectly give benefits like employment, energy saving etc.. Which can also be quantified, but would become an academic exercise.

9.5 RISKS TO PROJECT :

Foreseeable risks to project are few, and their impact is not expected to hamper the achievement of objectives of

the project to great extent. These could be :-

- 1) Due to natural causes, like droughts and floods. In a specific year, the project's physical achievements might be affected due to drought or heavy rain. The effect is expected to be limited to a particular year and it should be possible to make up for the loss in subsequent years of favourable conditions.
- 2) Since, of the major presumption is that there will not be any major change in the socio-economic conditions of the country in general, and the area of the project in specific, any major deviation in these may lead to goal disorientation. Whose chance is very feeble.

ANNEXURE NO. 1

LAND IS ALLOTTED TO EROSION INTENSITY CLASSES AS UNDER

Slight E1	Moderate E2	Severe E3	Destroyed E4 (Area in ha.)
1	2	3	4
(1) Arable Land			
(i) Natural slope upto 5 percent (14°) field slope below 5 percent (3°) arrangement for the disposal of excess water provided terraced.	(i) Natural slope upto 25 percent (14°) defective terracing either field slope exceeds 5 percent (3°) or water disposal arrangement absent. (ii) Slope between 25 percent (14°) to 60 percent (31°) with proper terracing.	(i) All unterraced field with no well defined gullies. (ii) Natural slope between 25 percent (14°) & 60 percent defective terracing. (iii) All slope 60% (31°) with proper terracing.	(i) All unterraced field with gullies cut up heavy silt discharge. (ii) All defectively terracing fields beyond 60 percent (31°).
(2) Grass Land			
(i) Natural slope upto 60% (31°) and density of grass or bush cover exceeding 0.7 no rills.	(i) All slope density grass or bush cover between 0.5 & 0.7. (ii) Gullies less than 0.3 metre in depth and upto 60 metre in length per ha.	(i) All slope with density of vegetation less than 0.5. (ii) Gullies deeper upto 60m per ha. or gullies upto 0.6 metre deep & length more then 60m. per ha.	(i) Badly gullied or ravine soil exposed heavy discharge

(3) Wood Land

(i) Natural slope upto 60% and density of top canopy of tree. Species exceeding 0.7, no gullies or rills.

(i) All slope density of vegetation between 0.5 & 0.7.

(i) All slope with density of vegetation less than 0.5.

(i) Badly gullied or ravined, silt exposed heavy silt discharge.

(ii) Natural slope exceeding 60% (31°) vegetation density exceeding 0.7.

(ii) Gullies deeper than 0.2m. and length upto 60m. per ha. or gullies upto 0.2m. deep & length more than 60m. per ha.

(iii) Gullies less than 0.2m. deep and covering less than 60m. per ha.

(4) Roads

(i) All road with arrangement for the disposal of ,slope, banks upto 5m. of centre of road protected through stable rock of vegetation cover.

(i) All road with defective arrangement for the disposal of excess water gullies upto 0.1m. high along 25 percent, berms exposed.

(i) All roads with defective arrangements for the disposal of excess water, gullies more than 0.1m. deep and or slips exceeding 1m. deep and or slips exceeding 1m. high along more than 25% length.

(i) Badly gullied or ravined, soil excess heavy silt discharges.

1

2

3

4

(5) Streams

(i) Banks low vegetated or otherwise stabilized upto 75 percent of the length, bed clear, practically no silt contribution.

(i) Banks upto 50% of length vegetated, or otherwise stabilized, banks liable to under cutting, bed rising with no clear is land formation.

(i) Banks upto 25% length vegetated or otherwise stabilized, banks being under cutting bed with clear is land formation channel meandering.

(i) Channel branched, serious under cutting of banks, heavy silt discharge.

ANNEXURE No. -2PLANTATION MODEL - I

- Title - Fodder Development.
- Design - 1,000 Fodder plants consisting of 750 trees and 250 shrubs - species will be planted. Grasses and legumes will be planted along the 1,000 R.Mt. trenches to be dug per hectare. Also 5 mini kits per ha. of legumes and fodder grasses shall be distributed to individual farmers for planting / sowing on their agricultural bunds.
- Species Composition - The suggested species for plantation are-
1. Grass
 - 1) Upto 1,500 metres -
Anjan, Pangola, Kikui, Ginni, etc.
 - 2) 1,500 to 2,800 metres -
Coxfoot, Kikui, Rye, Clovers.
 2. Shurbs
Desmodium elegans, Desmodium Parvifolia, Desmodium microphyllum,
Debregasia Lypoloeca, Excaecaria acerifolia, Avamia dulphis.
 3. Trees
Quercus leucotricophora, Q.glsuca,
Q.serrata, Ficus spp., Bauhinia spp.,
Salix spp., Alnus nepalensis etc.
- Soil Preparation - Pits will be dug for planting fodder & shrubs and grasses. Tufts / seeds will be planted / sown along the contour trenches.

Protection

- The area will be fenced with stone wall fencing. A watchman will look after the plantations. atleast for two years.

ANNEXURE No. 3

Fodder Development Programme (1,000 plants/ha.) Cost Rs./ha.

S.No.	Details of works	Unit	Rate	Pre-planting	Planting year	First year maintenance	Second year maintenane	Third year maintenance
1	2	3	4	5	6	7	8	9
1.	Survey	ha.	16	16	-	-	-	-
2.	Cost of plants							
	1,000 plants	No.	1.0	1000	-	-	-	-
	grass / hm.	No.	0.65	650	-	-	-	-
3.	Fencing	ha.	2500.00	2500	-	-	-	-
4.	Manuaring (including cost of legume grasses)	ha.	1300.00	650	650	-	-	-
5.	Repair of fence	ha.	650	-	650	-	-	-
6.	a) Digging of pits (1000)	No.	0.85	850	-	-	-	-
	b) Digging of trenches (1000)	No.	1.30	1300	-	-	-	-
7.	Filling of pits	No.	0.15	-	150	-	-	-

Contd...

1	2	3	4	5	6	7	8	9
8.	Planting including Carriage plants (1000) Trenches (1000)	No. No.	0.40 0.65	- -	400 650	- -	- -	- -
9.	Weeding, hoeing and multching	No.	0.35	-	350			
10.	Beating up in planting year	ha.	185	-	185			
11.	Other expenses	ha.	195	-	195			
12.	Wages of watcher	ha.	650	-	650			
13.	Maintenance after first year	ha.	-	-	-	780		
14.	Maintenance in second year	ha.	-	-	-	-	480	
15.	Maintenance in third year	ha.	-	-	-	-	-	480
				6966	3880	780	480	480

Total Cost : 12586/ha or Say Rs. 12600/ha

ANNEXURE No. - 4PLANTATION MODEL II

- Title - Fuel Development
- Design - A total of 2000 plants and shrubs per hectare will be planted, not specific.
- Species Composition - The species suggested for plantation are -
- 1) Shurbs
Rhus parviflora, Woodfordia Fruticosa,
Cretageous crenulata etc.
 - 2) Trees
Oak spp., Acacia spp., Gravellia robusta, pinus roxburghii etc.
- Soil Preparation - Pit size will be .30x.30x.45 metres. Gulley plugs will be constructed where ever necessary.
- Protection - The area will be fenced with stone wall fencing. A watchman will look after the plantations, atleast for three years.

ANNEXURE No. - 5

FUEL WOOD DEVELOPMENT PROGRAMME

Cost per ha (2,000 plants/ha) in Rs.

S.No.	Work	Unit	Rate	Pre-planting	Planting year maintenance	First year maintenance	Second year maintenance	Third year maintenance
1	2	3	4	5	6	7	8	9
1.	Cost of plants	No.	1.0	2000.00				
2.	Digging of pits (30 x 30 x 45 Cm.)	No.	0.85	1700.00				
3.	Filling of pits	No.	0.15	-	300			
4.	Planting including Carriage of plants	No.	0.40	-	800			
5.	Weeding, hoeing and Multching	No.	0.25	-	500			
6.	Chemical manure and insecticides	No.	0.05	-	100			

Contd...

1	2	3	4	5	6	7	8	9
7.	Cost of transportation	No.	0.50	-	1000			
8.	Other expenses	ha.	260.0	-	260			
9.	Survey and demarcation	ha.	16.00	16.00				
10.	Shurb cutting	ha.	520.00	520.00				
11.	Fencing	ha.	2500.00	2500.00				
12.	Beating up in planting year	ha.	365.00	-	365			
13.	Watcher (wages)	ha.	650.00	-	650			
TOTAL				6736.00	3955.00			
14.	Maintenance cost in first year		-	-	-	1000	-	-
15.	Second year maintenance	-	-	-	-	-	800	.
16.	Third year maintenance		-	-	-	-	-	400
Grand Total			-	6736	3855	1000	800	400

Cost per ha. Rs. 12891/ha say 12900/ha.

ANNEXURE - 6 (a)PLANTATION MODEL NO. III

- Title - Reclamation of degraded Oak areas.
- Location - Degraded Oak forest areas in reserve forest and Civil & Soyam areas.
- Design : Silvicultural operations will be carried out in 750 Oak trees which includes pruning, singling and spacing. Also 250 Oak plants per ha. will be planted in gaps.
- Soil works - 250 pits of size 30cmx30cmx45cm will be dug in advance year and Thawla-bandi, weeding, hoeing will be carried out next year after planting.
- Portection - The area will be fenced with stone wall fencing. This will be reinforced with vegetative fencing if necessary. A watchman will look after the plantations atleast for three years.

ANNEXURE No. 6 (b)PLANTATION No. III

- Title - Rehabilitation of Degraded Forests and plantation areas.
- Location - Degraded forests or plantation areas, of less than 0.5 density, will be taken up for rehabilitation.
- Design - 1,000 plants per hectare will be planted and special silvicultural operations done to rehabilitate the degraded Oak areas.
- Species - The species suggested for plantation are - Pinus roxburghii, Cedrus deodara, Cupressus torulosa, Alnus nepalensis, Gravellia robusta, Quercus spp., Salix spp., Wattles.
- Soil Preparation - Pit size will be 0.30x0.30x0.30 metres.
Gulley plugs will be constructed wherever necessary.
- Protection - The area will be fenced with stone wall fencing. This will be reinforced with vegetative fencing, if necessary. A watchman will look after the plantations atleast for three years.

ANNEXURE No. 6 (c)
PLANTATION MODEL NO. III

- Title - Encouraging natural regeneration in regeneration-defecient areas.
- Location : Natural regeneration-defecient areas, having density less than 0.5, will be taken ^{up} to encourage the natural regeneration.
- Design - The area will be fenced and special silticultural operation will be done, alongwith dibbling of seeds to encourage the natural regeneration in regeneration-defecient areas.
- Protection - The area will be fenced with stone-wall. This will be reinforced with vegetative fencing, if necessary. A watchman will look after the area, atleast for three years.

ANNEXURE No. 7 (a)RECLAMATION OF DEGRADED OAK AREAS

S.No.	Component	Unit Cost /ha.	Year					
			I	II	III	IV	V	
1	2	3	4	5	6	7	8	
1.	Survey and demarcation	16	16					
2.	Fencing & protection	2500	2500					
3.	Silvicultural (750 P/ha) operation	1.0	750					
4.	Raising of plants	1.00	175	75				
5.	Pit-digging	.85	212.50					
6.	Pit - filling	.15		37.00				
7.	Transportation of plants	.50		125				
8.	Planting, including local cause transport	.40	-	100				
9.	Weeding & hoeing & mulching	.25	-	62.50				
10.	Chemical, manure & insecticide	.05	-	12.50				
11.	Wages of watcher	650	-	650	650	650	650	650
12.	Miscellaneous expenditure	100	100	100				
Grand Total			3753.5	1162.5	650	650	650	

Total expenditure Rs. 6866/ha

or Say Rs 6900/-

ANNEXURE No. 7 (b)

Increasing Productivity of degraded forests Cost per ha. Rs.

Plants 1000/ha.

S.No.	Details of works	Unit	Rate	Pre-planting year	Planting year	First year maintenance	Second year maintenance	Third year maintenance
1	2	3	4	5	6	7	8	9
1.	Cost of plants	No.	1.00	1000	-	-	-	-
2.	Digging of pits	No.	0.85	850	-	-	-	-
3.	Filling of pits	No.	0.15	-	150	-	-	-
4.	Planting	No.	0.40	-	400	-	-	-
5.	Weeding, hoeing and mulching	No.	0.25	-	250	-	-	-
6.	Chemical manuring including insecticides	No.	0.05	-	50	-	-	-
7.	Transport	No.	0.50	-	150	-	-	-
8.	Other incidental expenditure	No.	0.26	-	260	-	-	-
9.	Survey and demarcation	ha.	16	16	-	-	-	-

Contd...

1	2	3	4	5	6	7	8	9
10.	Shurb cutting	ha.	520	520	-			
11.	Fencing/walling	ha.	2500	2500	-			
12.	Beating up during planting year	ha.	180	-	180			
13.	Wages.of watcher	ha.	650	-	650			
TOTAL				4886	2440			
14.	Maintenance in first of planting	ha.	-	-	-	780		
15.	Second year of maintenance	ha.	-	-	-	-	480	
16.	Third year of maintenance	ha.	-	-	-	-	-	390

Total expenditure Rs. 8996/ha or Rs. 9000/ha

ANNEXURE No. 7 (c)
ENCOURAGING NATURAL REGENERATION IN REGNERATION
- DEFICIENT AREAS.

S.No.	Component	Unit Cost /ha.	Year				
			I	II	III	IV	V
1.	Survey & Demarcation	16	16	-	-	-	-
2.	Fencing & Protection	2500	2500	-	-	-	-
3.	Sowing of seed & other cultural operations	700	-	700	-	-	-
4.	Weeding	500	-	-	300	-	-
5.	Wages of watcher	650	-	650	650	650	650
6.	Miscellaneous expenditure	100	100	100	-	-	-
Total			2616	1450	950	650	650

Total expenditure Rs. 6316/ha.

or Say Rs. 6300/-

ANNEXURE No. - 8
UNITS RATES OF SOIL, WATER AND ENERGY
CONSERVATION COMPONENT

S.No.	COMPONENT	SUB-COMPONENT	UNITS	RATES (RS.)
1	2	3	4	5
1. ENERGY CONSERVATION				
		1) Fuel-effecient Chullahs	No.	200.00
		2) Pressure Cookers	No.	600.00
		3) Biogas plant	No.	15000.00
		4) Burning ghat	No.	33000
2. SOIL AND WATER CONSERVATION				
		1) Brushwood Checkdams	No.	1000.00
		2) Cratewise dams	No.	10000.00
		3) Drop-structure, spurs, walls etc.	No.	1500
		4. Water-source protection (per ha.)	ha.	55000
		5) Riverside planting	ha.	As per fuelwood scheme
		6) Rainwater ^{storage} tanks	No.	20000.00
		7) Irrigation channel	Rm.	100.00

ANNEXURE No. - 9FRUIT TREE PLANTING UNIT COST TO BE BORNE BY THE PROJECT

S.No.	Component	Cost (Rs.)
1	2	3
1.	Fruit Tree Planting 250 plants/hectare Fencing, Cost of plants, Fertilizers, weedicides, etc.	4,000.00
2.	First year Maintenance Cost of Fertilizer, weedicides etc.	500.00
3.	Second year maintenance Cost of fertilizer, weedicide, etc.	500.00
Total		5,000.00

ANNEXURE No. - 9 (a)HOME-STEAD PLANTATION

S.No.	component	Unit	Cost (Rs.)
1	2	3	4
1.	Cost of fruit plant ,including transportation	per plant	10.0

ANNEXURE No. - 10
PLANTATION MODEL - IV

- | | |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Title | - Seedling Distribution |
| Location | - Office (compounds, School compounds, Religious places, Home - streads, Farm - bunds, Agricultural lands etc. |
| Design | - 1,000 plants per hectare, and 5 fruit plants per family. |
| Species | - Apart from the fruit plants like mango, citrus, pear, plum, walnut etc., Fodder and fuelwood species will also be distributed. These may be <u>Emblica officinalis</u> , <u>Quercus spp.</u> , <u>Bauhinia spp.</u> , <u>Celtis australis</u> , <u>Boehmeria rugulosa</u> , <u>Diploknema butyracea oojeinensis</u> etc. |
| Soil Preparation | - To be done by the individual of institute, under the guidance of Forest department. |
| Protection | - To be done by the planting agency or individual. |

COMPONENT PHASING

COMPONENT	SUB-COMPONENT	YEAR					TOTAL
		I	II	III	IV	V	
1	2	3	4	5	6	7	8
1. FOODER DEVELOPMENT	(1) FENCING & PLANTING (Ha.)	300	300	300	300	300	1500
	(2) GRASS TUFTS DISTRIBUTION (Ha.)	20	20	20	20	20	100
2. FUELWOOD DEVELOPMENT	(1) PLANTING (Ha.)	450	450	450	450	450	2250
3. ENERGY CONSERVATION	(1) CHULLAHS (No.)	100	100	100	100	100	500
	(2) PRESSURE COOKERS	300	300	300	300	300	1500
	(3) BIOGAS (No.)	3	3	3	3	3	15
	(4) BURNING GHATS (No.)	1	1	1	1	1	5
4. REHABILITATION OF DEGRADED FORESTS	(1) FENCING PLANTING AND CULTURAL OPERATING (Ha.)						
	a) Reclamation of degarded oak areas.	150	150	150	150	150	750
	b) Rehabilitation of degarded forest and plantation area.	300	300	300	300	300	1500
	c) Encouraging material and generation	150	150	150	150	150	750

1	2	3	4	5	6	7	8
5. SOIL AND WATER CONSERVATION.	(1) CHECKDAMS (No.)						
	a) Brush Wood	900	900	900	900	900	4500
	b) Crate Wire	150	150	150	150	150	750
	c) Drop structures, Spir, Wall etc.	60	60	60	60	60	300
	(2) WATER SOURCE PROTECTION (Ha.)	15	15	15	15	15	75
(3) RIVERSIDE PLANTING (Ha.)	30	30	30	30	30	150	
(4) RAINWATER TANKS (No.)	30	30	30	30	30	150	
(5) IRRIGATION CHANNEL RMT.	9000	9000	9000	9000	9000	45000	
6. FIRE PROTECTION	(1) CREW (No.)	15	15	15	15	15	75

Contd.....

1	2	3	4	5	6	7	8
7. FRUIT TREE PLANTING	(1) PLANTING (Ha.)	3	3	3	3	3	15
	(2) REJUVENTATION (Ha.)	3	3	3	3	3	15
	(3) TOP DRESSING OF MEHAL (No.)	1000	1000	1000	1000	1000	5000
8. PLANT DISTRIBUTION	(1) SEEDLING DISTRIBUTION (No.)	60000	60000	60000	60000	60000	300000
	(2) FRUIT PLANT DISTRIBUTION (No.)	3000	6000	6000	6000	6000	27000

ANNEXURE NO. 12

STAFF

Sl. No.	Post	Number	Pay Scale	Unit Cost ('000Rs)	YEAR					TOTAL
					I	II	III	IV	V	
1.	Assistant Conservator of Forests.	2	2200-4000	24.00	96.00	105.60	116.16	127.78	140.56	586.10
2.	Forest Ranger	5	1400-2600	30.00	150.00	165.00	181.50	199.65	219.61	915.76
3.	Deputy Ranger and Forester	20	1200-2040	24.00	480.00	528.00	580.80	638.88	702.76	2930.44
4.	Forests Guards	40	825-1200	18.00	720.00	792.00	871.20	958.32	1054.15	4395.67
5.	Mali	10	750- 940	16.00	160.00	176.00	193.60	212.96	234.25	976.81
TOTAL					1606.00	1766.60	1943.26	2137.59	2351.33	9804.78
Travelling Allowance (10% of salaries)					160.60	176.66	194.32	213.76	235.13	980.47
Grand Total					1766.60	1943.26	2137.58	2351.35	2586.46	10785.25

ANNEXURE NO. 13
SUMMARY OF PROJECT COST ('000Rs)

S.No.	COMPONENT	YEAR					TOTAL
		I	II	III	IV	V	
1	2	3	4	5	6	7	8
<u>FORESTRY COMPONENT</u>							
1.	Fooder Development	2609.80	3273.80	3507.80	3651.80	3795.80	16339.00
2.	Fuelwood Development	3031.20	4810.95	5260.95	5620.95	5800.95	24525.00
3.	Energy Conservation	278.00	278.00	278.00	278.00	278.00	1390.00
4.	Rehabilitation of Degarded Forests.	2421.15	3544.95	4018.95	4357.95	4669.95	19012.95
5.	Soil and Water Conservation	5827.08	5945.73	5975.73	5999.73	6011.73	29760.00
6.	Fire Protection	200.00	200.00	200.00	200.00	200.00	1000.00
7.	Fruit Tree Planting	40.00	40.00	40.00	40.00	40.00	200.00
8.	Plant Distributionj	90.00	120 .00	120.00	120.00	120.00	570.00
Total		13997.23	18213.43	19401.43	20268.43	20916.43	92796.95
OR Say		13997.00	18213.00	19401.00	20268.00	20916.00	92795.00

Contd.... 84

	1	2	3	4	5	6	7	8
<u>PROJECT ORGANISATION</u>								
1. Staff			1766.60	1943.26	2137.58	2351.35	2586.46	10785.25
2. Operating Cost			100.00	100.00	100.00	100.00	100.00	500.00
3. Vehicles			650.00	300.00	-	-	-	950.00
4. Equipment			950.00	-	-	-	-	950.00
5. Buildings			1560.00	1200.00	-	-	-	2760.00
Total			5026.60	3543.26	2237.58	2451.35	2686.46	15945.25
1. Research			200.00	200.00	200.00	200.00	200.00	1000.00
2. Training & Fellowship			750.00	750.00	-	-	-	1500.00
3. Extension			100.00	100.00	100.00	100.00	100.00	500.00
Total			1050.00	1050.00	300.00	300.00	300.00	3000.00
Grand Total			20073.60	22806.26	21938.58	23019.35	23902.46	111740.25
Contingency (5 percent)			1003.68	1140.31	1096.92	1150.96	1195.12	5586.99
Total Project Cost			21077.28	23946.57	23035.50	24170.31	25097.58	117327.24
Or Say			21077.00	23947.00	23035.00	24170.00	25098.00	117327.00

ANNEXURE NO. 14
COMPONENT-WISE DETAILED COST ('000Rs)

Sl. No.	COMPONENT	SUB-COMPONENT	YEAR					TOTAL
			I	II	III	IV	V	
1	2	3	4	5	6	7	8	9
1.	FOODER DEVELOPMENT	(1) Plantation	2089.80	3253.80	3467.80	3631.80	3775.80	16239.00
		(2) Grass distribution	20.00	20.00	20.00	20.00	20.00	100.00
Total			2109.80	3273.80	3507.60	3651.80	3795.80	16339.00
2.	FUEL DEVELOPMENT		3031.20	4810.95	5260.95	5620.95	5800.95	24525.00
Total			3031.20	4810.95	5260.95	5620.95	5800.95	24525.00
3.	ENERGY CONSERVATION	(1) Chullahs	20.00	20.00	20.00	20.00	20.00	100.00
		(2) Cookers	180.00	180.00	180.00	180.00	180.00	900.00
		(3) Biogas	45.00	45.00	45.00	45.00	45.00	225.00
		(4) Crematorium	33.00	33.00	33.00	33.00	33.00	165.00
Total			278.00	278.00	278.00	278.00	278.00	1390.00

Contd..../..

1	2	3	4	5	6	7	8	9
4.	REHABILITATION OF DEGRADED FORESTS	(a) Reclanating of degraded area	562.95	737.25	834.75	932.25	1029.75	4096.95
		(b) Rehabilitation of degraded forest/plantation area	1465.80	2197.80	2431.80	2575.80	2692.80	11364.00
		(c) Encouraging material regeneration.	392.40	609.90	752.40	849.90	947.40	3552.00
Total			2421.15	3544.95	4018.95	4357.95	4669.95	19012.95
5.	SOIL AND WATER CONSERVATION	(1) Brushed Dams	900.00	900.00	900.00	900.00	900.00	4500.00
		(2) Cratewire Dams	1500.00	1500.00	1500.00	1500.00	1500.00	7500.00
		(3) Drop structure spurs, embankment etc.	900.00	900.00	900.00	900.00	900.00	4500.00
		(4) Water source protection.	825.00	825.00	825.00	825.00	825.00	4125.00
		(5) Riverside plantation	202.08	320.73	350.73	374.73	386.73	1635.00
		(6) Rainwater Tanks	600.00	600.00	600.00	600.00	600.00	3000.00
		(7) Irrigation Channel	900.00	900.00	900.00	900.00	900.00	4500.00
Total			5827.08	5945.73	5975.73	5999.73	6011.73	29760.00

1	2	3	4	5	6	7	8	9
6.	FIRE PROTECTION	-	200.00	200.00	200.00	200.00	200.00	1000.00
	Total		200.00	200.00	200.00	200.00	200.00	1000.00
7.	FRUIT TREE	(1) Planting	15.00	15.00	15.00	15.00	15.00	75.00
		(2) Regeneration	15.00	15.00	15.00	15.00	15.00	75.00
		(3) Top dressing	10.00	10.00	10.00	10.00	10.00	50.00
	Total		40.00	40.00	40.00	40.00	40.00	200.00
8.	PLANT DISTRIBUTION	(1) Seedlings	60.00	60.00	60.00	60.00	60.00	300.00
		(2) Fruits	30.00	60.00	60.00	60.00	60.00	270.00
	Total		90.00	120.00	120.00	120.00	120.00	570.00
	Grand Total of Forestry Component		13997.23	18213.43	19401.43	20268.43	20916.43	92796.95
	OR SAY		13997.00	18213.00	19401.00	20268.00	20916.00	92795.00

ANNEXURE NO. 15
YEILD ESTIMATES FODDER

Figure in '000MT
Models I to IV

Years	Fooder Development	Fuelwood Development	Rehabilitation of degraded forests	Seedling distribution	Total
	Model-I	Model-II	Model-III	Model-IV	
1	2	3	4	5	6
1.	0.45	0.67	0.60	0.2	1.92
2.	1.80	2.70	1.80	0.4	6.70
3.	3.60	5.409	3.60	0.6	13.20
4.	4.80	7.20	4.80	0.8	17.60
5.	6.00	9.00	6.00	1.00	22.00
6.	7.50	6.75	6.00	1.00	21.25
7.	9.00	6.75	6.00	1.00	22.75
8.	10.50	4.50	6.00	1.00	22.00
9.	12.00	4.50	6.00	1.00	23.50
10.	13.50	3.37	6.00	1.00	23.50
11.	13.50	2.25	6.00	1.00	23.50
12.	13.50	2.25	6.00	1.00	22.75
13.	13.50	2.25	6.00	1.00	22.75
14.	13.50	2.25	6.00	1.00	22.75
15.	15.30	2.25	9.00	1.80	28.35
16.	17.10	2.25	12.00	2.60	33.95
17.	18.90	2.25	15.00	3.40	39.55
18.	20.70	2.25	18.00	4.20	45.15
19.	22.50	2.25	21.00	5.00	50.75
20.	22.50	2.25	21.00	5.00	50.75

Contd...../..

1	2	3	4	5	6
21.	22.50	2.25	21.00	5.00	50.75
22.	22.50	2.25	21.00	5.00	50.75
23.	22.50	2.25	21.00	5.00	50.75
24.	22.50	2.25	21.00	5.00	50.75
25.	22.50	2.25	21.00	5.00	50.75
26.	22.50	2.25	21.00	5.00	50.75
27.	22.50	2.25	21.00	5.00	50.75
28.	22.50	2.25	21.00	5.00	50.75
29.	22.50	2.25	21.00	5.00	50.75
30.	22.50	2.25	21.00	5.00	50.75
Total	465.15	96.96	376.80	84.00	1022.91

ANNEXURE NO. 16
YIELD ESTIMATES FUELWOOD

Figures '000 Cmt.
Model I to IV.

Years	Fuelwood development	Fooder development	Rehabilitation degraded forests.	Seedling distribution	Total
	Model-I	Model-II	Model-III	Model-IV	
1	2	3	4	5	6
7.	0.90	-	-	-	0.90
8.	1.80	-	-	-	1.80
9.	2.70	-	-	-	2.70
10.	5.85	-	3.00	-	8.85
11.	6.75	-	3.00	-	9.75
12.	6.75	-	3.00	-	9.75
13.	6.75	-	3.00	-	9.75
14.	6.75	-	3.00	-	9.75
15.	4.50	-	-	-	4.50
16.	3.60	-	-	-	3.60
17.	2.70	-	-	-	2.70
18.	1.80	-	-	-	1.80
19.	0.90	-	-	-	0.90
20.	4.50	-	6.00	0.15	10.65
21.	4.50	-	6.00	0.15	10.65
22.	4.50	-	6.00	0.15	10.65
23.	4.50	-	6.00	0.15	10.65
24.	4.50	-	6.00	0.15	10.65
25.	-	-	-	-	-

Contd...../..

1	2	3	4	5	6
26	-	-	-	-	-
27	-	-	-	-	-
28	-	-	-	-	-
29	-	-	-	-	-
30	15.75	3.00	21.00	0.30	40.05
31	15.75	3.00	21.00	0.30	40.05
32	15.75	3.00	21.00	0.30	40.05
33	15.75	3.00	21.00	0.30	40.05
34	15.75	3.00	21.00	0.30	40.05
Total	153.00	15.00	150.00	2.25	320.25

ANNEXURE NO. 17YIELD ESTIMATESFRUIT TREE PLANTING & REHABILITATION OF DEGRADED FOREST

<u>'000 MT</u>		<u>'000Cu.Mt</u>	
Years	Fruit Production	Years	Model No. III Small Wood and poles.
1	2	3	4
5	0.057	30	24.00
6	0.140	31	24.00
7	0.140	32	24.00
8	0.527	33	24.00
9	0.527	34	24.00
10	0.735		
11	0.735	Total	120.00
12	0.735		
13	0.735		
14	0.735		
15	0.750		
16	0.750		
17	0.750		
18	0.750		
19	0.750		
20	1.350		
21	1.350		
22	1.350		
23	0.750		
24	0.735		
25	0.527		
Total	14.878		

ANNEXURE NO. 18
CASH IN FLOW FROM PRODUCE

('000 Rs)

Year	Fodder Development	Fuelwood Development	Rehabili- tation of Degraded Forests	Fruit Tree planting	Total
1	2	3	4	5	6
1	192.00	-	-	-	192.00
2	670.00	-	-	-	670.00
3	1320.00	-	-	-	1320.00
4	1760.00	-	-	-	1760.00
5	2200.00	-	-	399.00	2599.00
6	2125.00	-	-	980.00	3105.00
7	2275.00	630.00	-	980.00	3885.00
8	2200.00	1260.00	-	3689.00	7149.00
9	2350.00	1890.00	-	3689.00	7929.00
10	2387.00	6195.00	-	5145.00	13727.00
11	2387.00	6825.00	-	5145.00	14357.00
12	2275.00	6825.00	-	5145.00	14245.00
13	2275.00	6825.00	-	5145.00	14245.00
14	2275.00	6825.00	-	5145.00	14245.00
15	2835.00	3150.00	-	5250.00	11235.00
16	3395.00	2520.00	-	5250.00	11165.00
17	3955.00	1890.00	-	5250.00	11095.00
18	4515.00	1260.00	-	5250.00	11025.00
19	5075.00	630.00	-	5250.00	10955.00
20	5075.00	-	-	9450.00	21980.00

Contd..../..

1	2	3	4	5	6
21	5075.00	7455.00	-	9450.00	21980.00
22	5075.00	7455.00	-	9450.00	21980.00
23	5075.00	7455.00	-	5250.00	17780.00
24	5075.00	7455.00	-	5145.00	17675.00
25	5075.00	-	-	3689.00	8764.00
26	5075.00	-	-	-	5075.00
27	5075.00	-	-	-	5075.00
28	5075.00	-	-	-	5075.00
29	5075.00	-	-	-	5075.00
30	5075.00	28035.00	24000.00	-	57110.00
31	-	28035.00	24000.00	-	52035.00
32	-	28035.00	24000.00	-	52035.00
33	-	28035.00	24000.00	-	52035.00
34	-	28035.00	24000.00	-	52035.00
Total	102291.00	224175.00	120000.00	104146.00	550612.00

ANNEXURE NO. 19CASH FLOW OF THE PROJECT

(Rs. in '000s)

Year	Cash out flows	Cash out flow at PV	Cash in flows	Cash in flows at PV 14%.
1	2	3	4	5
1	7892.15	6923.00	192.00	168.42
2	11989.70	9226.07	670.00	515.56
3	13147.70	8874.70	1320.00	891.00
4	13990.70	8283.89	1760.00	1042.10
5	14626.70	7597.11	2599.00	1349.92
6	-	-	3105.00	1414.64
7	-	-	3885.00	1552.45
8	-	-	7149.00	2506.44
9	-	-	7929.00	2438.17
10	-	-	13727.00	3702.17
11	-	-	14357.00	3396.87
12	-	-	14245.00	2957.26
13	-	-	14245.00	2594.01
14	-	-	14245.00	2274.93
15	-	-	11235.00	1574.02
16	-	-	11165.00	1372.18
17	-	-	11095.00	1196.04
18	-	-	11025.00	1042.47
19	-	-	10955.00	908.17
20	-	-	21980.00	1600.14

Contd.../...

1	2	3	4	5
21	-	-	21980.00	1402.32
22	-	-	21980.00	1230.88
23	-	-	17780.00	873.00
24	-	-	17675100	761.79
25	-	-	8745.00	330.56
26	-	-	5075.00	167.98
27	-	-	5075.00	147.68
28	-	-	5075.00	129.41
29	-	-	5075.00	113.68
30	-	-	57110.00	1119.36
31	-	-	52035.00	936.56
32	-	-	52035.00	832.43
33	-	-	52035.00	780.37
34	-	-	52035.00	728.30
Total	61646.95	40904.77	550612.00	44051.78

I. B.C. Ratio = $\frac{44051.78}{40904.77}$

II. N.P.V. at 14% interest = $\frac{44051.78}{40904.77}$
i.e. positive 3147.01

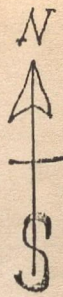
III. I.R.R. is around 14.6%.

Note : (1) The rate of interest at which the PV is calculated is the opportunity cost of the money invested i.e. the term deposit rates of Nationalised banks though the project is supposed to be financed by the International agencies where the lending rate is less than 14%.

(2) The case flows are based on the Management plans of the Forests, Projects on Animal Husbandry, and Horticulture.

SELI-AMLAWA SUB-WATER SHED

SCALE 1:10000



AMTIAR GAD

KHUTZO

YAMUNA RIVER

ASAN RIGHT

INDEX

SN.	PARTICULAR	Sym.
1.	RIVER	
2.	SUB WATER SHED BOUNDARY	
3.	M.W.S. BOUNDARY	
4.	CULTIVATION	
5.	FOREST	
6.	BLANK	

LOCATION MAP

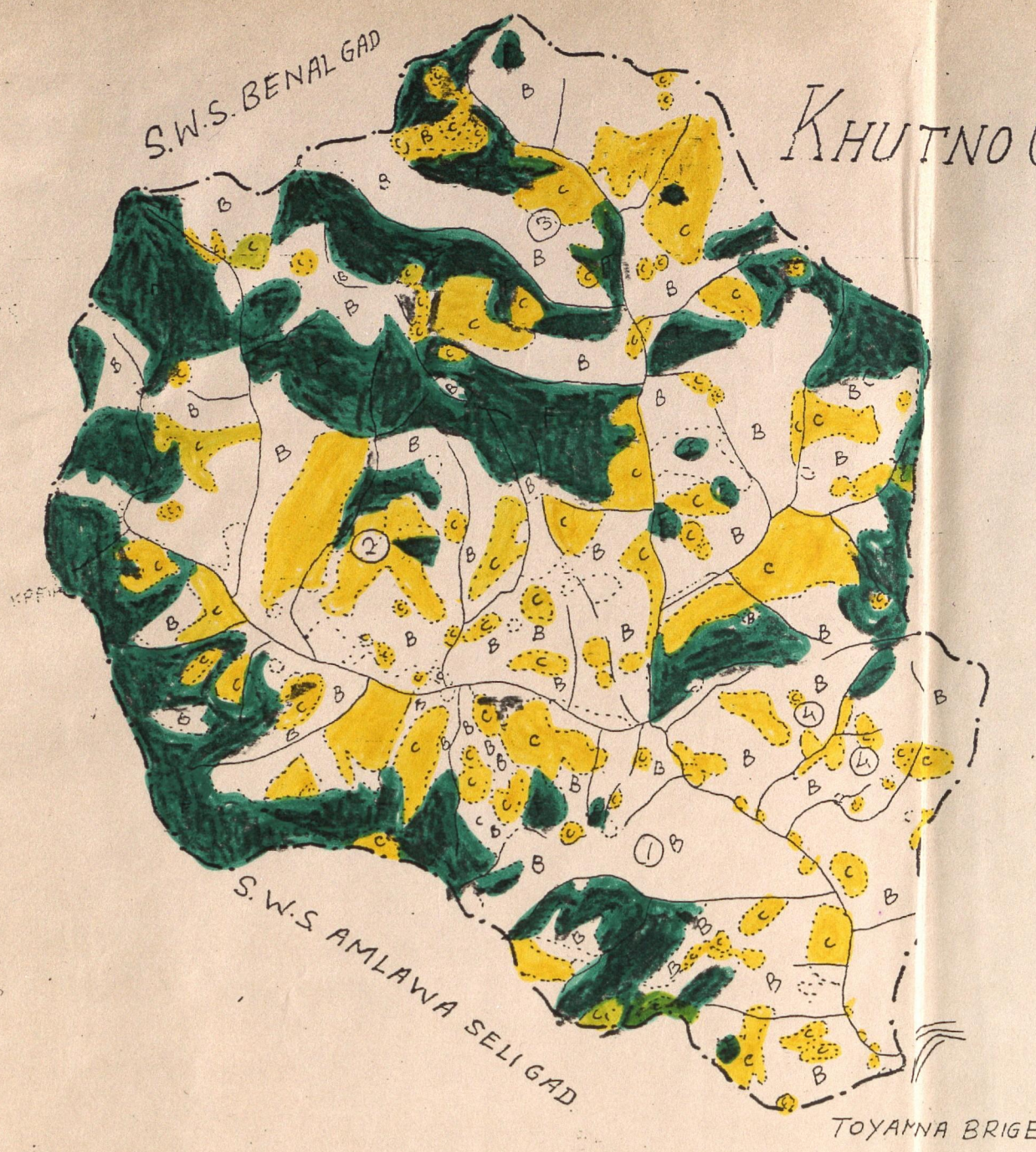
AMLAWA SELIGAD S.W.S.

SCALE: 1:100000



INDEX

No	PARTICULARS	SYM
1	RIVER	
2	ROAD/PATH	
3	S.W.S. BOUNDARY	
4	M.W.S. BOUNDARY	
5	HABITATION	
6		
7		
8		



KHUTNO GAD SUBWATER SHEDS

SCALE - 1:100000

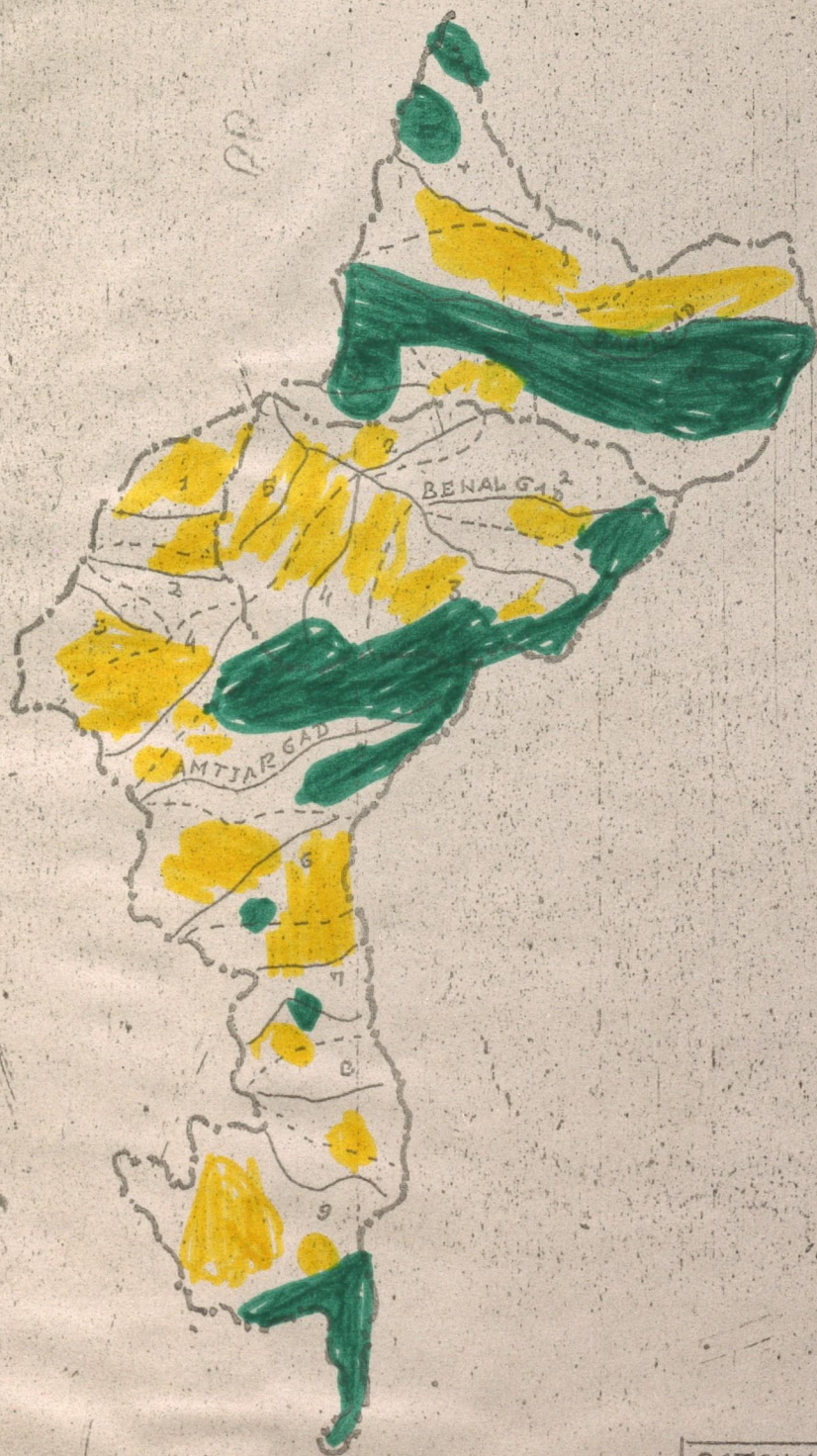


S.N	PARTICULAR	Sym.
1.	S.W.S. BOUNDARY	-----
2.	M.W.S. BOUNDARY	-----
3.	RIVER & NALA	~~~~~
4.	CULTIVATION	Yellow fill
5.	FOOT PATH	-----
6.	HABITATION	□ □
7.	FOREST	Green fill
8.	BLANK	-----

CATCHMENT BOUNDARY	-----
SUB WATER SHED BOUNDARY	-----
MICRO WATERSHED BOUNDARY	-----
RIVERS	~~~~~
M.V.S. Nos.	1

BENAL GAD S.W.S

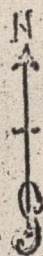
Scale 1:25,000



CATCHMENT BOUNDRY	-----
SUB WATERSHED BOUNDRY
MICROWATERSHED BOUNDRY	-----
RIVERS	~~~~~
M.V.S. Nos.	1

BENALGAD S.W.S

Scale 1:25000



CATCHMENT BOUNDARY	
SUB WATERSHED BOUNDARY	
MICROWATERSHED BOUNDARY	
RIVERS	
M.V.S. No.	8

