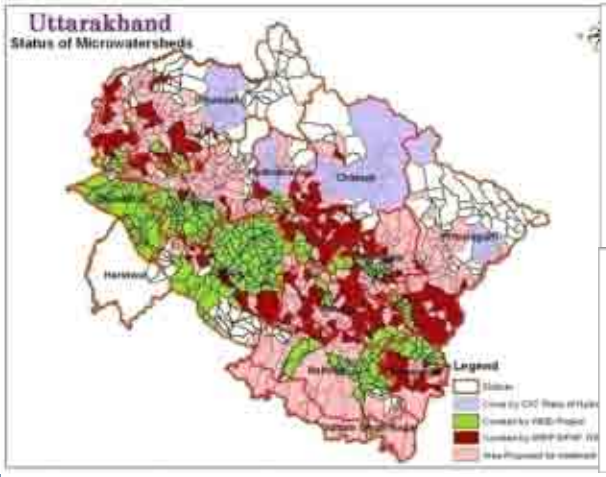
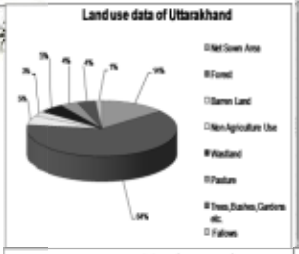
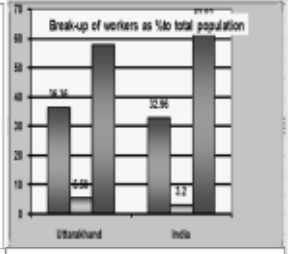
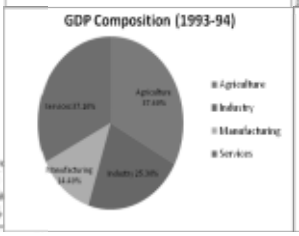
Uttarakhand State Perspective and Strategic Plan

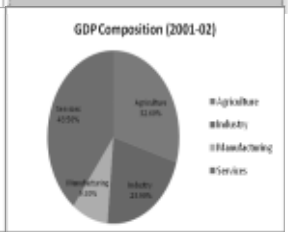
2009-2027











Watershed Management Directorate, Dehradun

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UTTARAKHAND STATE
PERSPECTIVE AND STRATEGIC PLAN, 2009-2027

EXECUTIVE SUMMARY

Uttarakhand is located between 28º 43' – 31º 27' N latitudes and 77º 34' – 81º 02' E longitudes. The river Tons separates the state from Himachal Pradesh in the north-west, whereas the river Kali separates it from Nepal in the east. The greater Himalaya is the northern boundary of the state and is also the international border with China (Tibet). Foot-hills in the south are bound by Uttar Pradesh. The region, being situated centrally in the long sweep of the Himalaya, forms a transitional zone between the per-humid eastern and the dry to sub-humid western Himalaya. Uttarakhand became the 27th state of the Republic of India on 9 November 2000.

The population of the state primarily depends on agriculture for livelihood; about 70% of the population is engaged in agriculture. Out of total reported area, only 14.02% is under cultivation. More than 55.0% of the cultivated land in the State is rainfed. The cropping intensity is 160.6%. The landholdings are small and scattered. The average land holding is around 0.68 ha (that too is divided into many patches) in the hills and 1.77 ha in the plains.

About 70% of hills population is engaged in agriculture. There is hardly any other major source of livelihood deriving from the secondary or tertiary sectors. These sectors are very poorly developed primarily because of inaccessibility and vulnerability of mountain regions. Although almost 70% of the population is dependent of the primary sectors, the contribution of this sector of the GDP/NDDP is only 37.5. As a result, it does not provide sufficient income levels to the people. This subsistence nature, which leads to low incomes and unstable incomes, which in turn lead to a sizeable out-migration of male members that leads to only women headed families behind, and the role of women in the household economy becomes more important.

After attaining statehood in 2000, the economic progress of Uttarakhand has been rapid, with its economic growth rate increasing from just over 3% per annum to 11% per annum. However, this rapid growth has been accompanied by adverse impacts on the local ecology, thus making the incorporation of sustainable development practices into the State's overall development strategy an imperative.

Water, agriculture, forestry and energy, among other issues, are central to the State's inclusive strategy for future growth. Most of the people of this state are dependent on their natural environment, with over three-

fourths of the total population dependent on agriculture for their livelihood. Also, with over fifteen important rivers and over a dozen glaciers in the State, Uttarakhand is a valuable fresh water reserve. There are also about 200 large and medium sized hydro-projects and therefore hydroelectricity continues to be a prime source of capital for the local economy. Forests cover a large percentage of the land area with many industries being forest based.

The Himalayan watersheds are under constant threat of mass wasting and erosion caused by depletion of forest cover, unscientific agronomic practices and hydrologic imbalances. The ever increasing population, the need to provide a better quality of life to the people and the pressure on natural resources is further compounding the problem. The total of 7.66 lakh ha. cultivated area in the State 4.21 lakh ha. area is rainfed. An insight into the rainfed regions reveals a grim picture of poverty, water scarcity, rapid depletion of ground water table and fragile ecosystem. Land degradation due to soil erosion by wind and water, low rainwater use efficiency, high population pressure, acute fodder shortage, poor livestock productivity, under investment in water use efficiency, lack of assured and remunerative marketing opportunities and poor infrastructure are important concerns of enabling policies. The challenge in rainfed areas, therefore, is to improve rural livelihoods through participatory watershed development with focus on integrated farming system for enhancing income, productivity and livelihood security in a sustainable manner.

The main objective of the proposed project is to increase the productivity and income of the rural inhabitants in the Rainfed Micro-watersheds of the State on priority basis area through sustainable management of the natural resources. Since agriculture and related activities are the main source of livelihood for the proposed target area, land based activities and livestock will play a significant role in achieving the project objectives. The project will reduce the emphasis on traditional crops and will increase prominence on high value crop and value addition through grading, packaging, processing and encouraging organic farming. Further, to ensure the sustainability of the proposed activities and ensuring cost sharing by participants for capital investments and also the recurrent costs associated with maintenance of the assets.

To realize the above objectives following three components and sub components need to be incorporated in the Integrated Watershed Management Project (IWMP).

1. Participatory Watershed Development and Management

- *Promotion of social mobilization and community driven sustainable and equitable decision making*
- *Collectively planned Watershed Treatments*

2. Enhancing Livelihood Opportunities

- *Farming Systems Improvement supporting increased employment and productivity*
- *Value addition and marketing support*
- *Income Generating Activities for Self Help Groups integrated with watershed Development*

3. Institutional Strengthening and promotion of economic/livelihood activities

- *Capacity building of all tiers of PRIs and local community institutions in exercising rights and responsibilities*
- *Information, Education and Communication to promote optimization from amongst different strategies.*

A number of watershed management projects are being executed in the state under different schemes; the Micro watersheds where these schemes are being implemented have been selected more on the grounds of suitability of working areas to the Project Implementing Agency (PIA) than on the basis of any priority made in an objective manner. There are a number of projects/ schemes operational in the State which is implementing MWS treatments. Keeping these schemes in view only the untreated MWS were shortlisted for the above project.

In the State 1110 MWS have been delineated leaving Haridwar District. In the untreated MWS which are 537, 124 micro watersheds have been identified above 3200 mt. altitude comprising a total area of 14, 25,750 ha. These are areas with little to no human habitations, snow bound glaciers, rocky and forest covered areas. The status of this land is mainly Reserve Forest which is under the jurisdiction of the State Forest department. Micro watersheds in this zone are land slide prone having slopes greater than 30 degrees gradient. Besides, these areas are also facing tremendous pressure and degradation of their natural resource due to high tourist and pilgrim inflow. Any watershed treatment required in this zone (> 3200mt) will be undertaken as convergence projects requiring special interventions by the concerned departments.
Within the 537 untreated MWS, 409 micro watersheds have been identified which are below 3200 mt. altitude comprising a total area of 18,11,887 ha. and additionally 1,20,000 ha. of area from Haridwar district have been prioritized for treatment (MWS have not been delineated in Haridwar district). The total area available for treatment under the plans has also been calculated for every district. The criteria and weightage for selection of MWS has been done on the basis of criteria provided by Department of Land Resource Ministry of Rural Development, Govt. of India.

These MWS could also be taken up under various convergence schemes. Amongst the various convergence schemes specific projects designed by various Line Departments like Forest, Agriculture, Rural Development can be taken up. Any Externally Aided Project working on Watershed Guidelines could also prove to be a good convergence project. Within these projects also NREGS could also be used as an effective convergence tool.

19.31 lakh ha. area would be taken up for treatment in all the districts of the State. Of the 537 untreated MWS 409 have been shortlisted for the Integrated Watershed Management Project (IWMP).

The plan wise phasing of the physical and financial program of watershed development has been depicted in (Annexure Table 8.2 a). Uttarakhand State being predominantly a hill state with difficult terrain a financial outlay of Rs. 15000 per ha. has been taken for the hill district and for the plain districts of Udhamsingh Nagar, Haridwar and some part of Nainital districts financial outlay of Rs. 12000 per ha. has been taken. Thus a total outlay of Rs. 2742.52 crores has been projected for a period of 18 years. The financial provision required for the 11th plan is Rs. 621 crores for the 12th Plan, it is Rs. 624 crores, for the 13th Plan Rs. 660 crores and for the 14th Plan it is 858.52 crores.

The annual plan for the remaining 11th Plan showing the Watershed areas planned for treatment and financial provision year wise has been depicted district wise in (Annexure Table-8.2 b). 86 MWS covering an area of 4.3 lakh ha. are proposed to be taken up for treatment in the 11th plan period.

Watershed Management works entail considerable amount of budget and hence a proper monitoring and impact evaluation is desired to assess the benefits accrued out of the expenditure incurred. Thus, to monitor the achievement of our defined project objectives certain output indicators have been designed which will help in quantifying the objectives any change in achievement of objectives will help in flagging our procedural shortcomings like ineffective community mobilization, poor PRA process improper prioritization of natural resource management objectives etc.

LIST OF ABBREVIATIONS

AWP	Annual Work Plan
APMC	Agriculture Produce Marketing Committee
BPL	Below Poverty Line
BQ	Black Quarter
CBO	Capacity Building Organization
CEO	Chief Executive Officer
CAPART	Council For Advancement of People's Action And Rural Technology
CAT	Catchment Area Treatment Plan
CAS	Country Assistance Strategy
CSWRTI	Central Soil and Water Research and Training Institute
DWDU	District Watershed Development Units
DPC	District Planning Committee
DPAP	Drought Prone Area Program
DPR	Detailed Project Report
DCCBs	District Cooperative and Credit Banks
EDP	Entrepreneurial Development Program
ES&A	Environment and Social Assessment
ERR	Economic Rate of Return
FFS	Farmers Field School
FPAP	Flood Prone Area Project
FMD	Foot & Mouth disease
FYM	Farmyard Manure
FIGs	Farmer Income Group
GDP	Gross Domestic Product
GPWDP	Gram Panchyat Watershed Development Plan
GP	Gram Panchayat
IMM	Integrated Moisture Management
IEC	Information Education and Communication
IWM	Integrated Weed Management
IWMP	Integrated Watershed Management Project
IWDP	Integrated Wastelands Development Program
IGA	Income Generating Activity
IPDM	Integrated Pest & Disease Management
IPNM	Integrated Plant Nutrient Management
KGK	Krishi Gyan Kendra
KVK	Krishi Vigyan Kendra
LSD	Land Survey Directorate
MWS	Microwatersheds
MoU	Memorandum of Understanding
MIS	Management Information System
NWP	National Water Policy
NABARD	National Bank of Agriculture and Regional Development
NGOs	Non Government Organizations
NREGA	National Rural Employment Guarantee Act
NWFPs	Non-Wood Forest Products
NWDPRA	National Watershed Development Project for Rainfed Areas

NWFP	Non Wood Forest Produce
NRAA	National Rainfed Area Authority
NIRD	National Institute of Rural Development
PIAs	Project Implementing Agencies
PCNA	Participatory Communication Needs Assessment
PRA	Participatory Rural Appraisal
PDS	Public Distribution System
PAD	Project Appraisal Document
PDOs	Project Development Objectives
PIP	Project Implementation Plan
PACS	Primary Agriculture Credit Societies
RF	Revolving fund
RBM	River Bed Material
RVP	River Valley Project
SHPI	Self Help Promoting Institution
STCR	Soil Test Crop Response
SHG	Self Help Groups
TA	Technical Assistant Team
VDC	Village Development Communities
UKUMP	Uttarakhand Krishi Utpadhan Mandi Parishad
UOCV	Uttarakhand Organic Community Board
UDWDP	Uttarakhand Decentralized Watershed Development Project
UGs	User Groups
VOs	Voluntary Organizations
WMD	Watershed Management Directorate
WDF	Watershed Development Fund
WDT	Watershed Development Team
WC	Watershed Committees

CHAPTER 1
INTRODUCTION

Uttarakhand is located between 28° 43' – 31° 27' N latitudes and 77° 34' – 81° 02' E longitudes. The river Tons separates the state from Himachal Pradesh in the north-west, whereas the river Kali separates it from Nepal in the east. The greater Himalaya is the northern boundary of the state and is also the international border with China (Tibet). Foot-hills in the south are bound by Uttar Pradesh. Starting from the foot hills in the south, the state extends upto the snow-clad peaks of the Himadri making the Indo-Tibetan boundary. The region, being situated centrally in the long sweep of the Himalaya, forms a transitional zone between the per-humid eastern and the dry to sub-humid western Himalaya. Uttarakhand became the 27th state of the Republic of India on 9 November 2000. Historically, Uttarakhand is believed to be the land where Vedas and the Shastras were composed and the great epic, the Mahabharata, was written.

The average annual rainfall of the state, as recorded is 1,547 mm. With an altitudinal variation ranging from 200m to more than 8,000m above mean sea level. The climate of the state is quite harsh particularly in winter when temperature goes occasionally below freezing point in many of the subdivisions of the state.

The state of Uttarakhand, embodying the Kumaon and Garhwal Himalayas with a geographical area of about 53,485 sq. km, supports a human population of 84,79,562 (Census 2001) persons. The state, also comprising two administrative divisions - Garhwal and the Kumaon, consists of 13 districts–Dehradun, Uttarkashi, Chamoli, Dehradun, Pauti Garhwal, Tehri Garhwal, Rudraprayag, Haridwar (in Garhwal Division), Almora, Pithoragarh, Nainital, Bageshwar, Champawat and Udham Singh Nagar (in Kumaon Division). It is further divided into 46 tehsils, 73 towns, and 95 development blocks, 7541 Gram Sabhas, and 671 Nyay Panchayats and 16826 inhabited villages. The population constitutes 0.83% and 21.40% of the total population of Indian Republic and Indian Himalayan Region (IHR), respectively. Within an altitudinal variation ranging from 200 m to more than 8000 m above msl, the state comprises five lithotectonically and physiographically distinct subdivisions namely, the Outer Himalaya comprising the Tarai and Bhabhar, Sub-Himalayan belt

of the Siwalik, the Lesser Himalaya, the Great Himalaya and the Trans-Himalaya or Tethys. Human habitation is found up to an altitude of 3500 m above msl; however, the zone between 1200 - 2000 m, largely falling in the Lesser Himalaya (1500 - 2500 m above msl), is densely populated. The decennial growth rate of the population of the state for the decade 1991-2001 was 19.20. In this region the human population is continually increasing and the region is experiencing major difficulties in sustaining its growing population on its squeezing environmental resources-land availability, forests and grasslands, water resource, etc. Much of the environmental resource degradation is governed by mountain specificities, viz., inaccessibility, fragility, marginality, diversity (heterogeneity), niche (natural suitability) and adaptability (human adaptation) apart from the growing population. They result in limited external linkages and replication of external experiences, slow pace of development, intra-regional imbalances and underutilization of regional potential.

The total area of the state is distributed in altitude zones as given below:

Altitudinal Zone	**Percentage of area**
Below 1000 meter	26.00
1000 - 2000 meter	33.00
2000 - 3000 meter	13.00
Above 3000 meter	28.00
Uttarakhand State	100.00

The population of the state primarily depends on agriculture for livelihood; about 70% of the population is engaged in agriculture. Out of total reported area, only 14.02% is under cultivation. More than 55.0% of the cultivated land in the State is rainfed. The cropping intensity is 160.6%. The landholdings are small and scattered. The average land holding is around 0.68 ha (that too is divided into many patches) in the hills and 1.77 ha in the plains.

The State supports about 4.75 million livestock population out of which about 21.3 lakh are cattle, 11.00 lakh are buffaloes, 3.60 lakh are sheep and 10.97 lakh are goats. As much as 36.5% of the population of the state lives under poverty line. Three hill districts, i.e., Chamoli, Tehri Garhwal and Uttarkashi have more than 45% of their population below poverty line while the other districts have around 30-40% of population below the poverty line. Another important aspect of poverty distribution is that poverty is more pronounced amongst some disadvantaged groups as Scheduled Castes and Scheduled Tribes, where 44% of families are below poverty line. Inequalities are also evident in other parameters of poverty, such as literacy and nutrition levels. For example literacy rate is 84.01% for males and 60.26% for females. In case of urban areas male literacy is 87.21% against a female literacy rate of 74.78%. It is comparatively lower in the case of rural areas with figures of 82.74% and 55.52% for male and female respectively. Literacy rates in case of Scheduled Castes people are even further low with 46% and 20% for males and females respectively.

About 70% of hills population is engaged in agriculture. There is hardly any other major source of livelihood deriving from the secondary or tertiary sectors. These sectors are very poorly developed primarily because of inaccessibility and vulnerability of mountain regions. Although almost 70% of the population is dependent of the primary sectors, the contribution of this sector of the GDP/NDDP is only 37.5. As a result, it does not provide sufficient income levels to the people. This subsistence nature, which leads to low incomes and unstable incomes, which in turn lead to a sizeable out-migration of male members that leads to only women headed families behind, and the role of women in the household economy becomes more important.

Because of the extraction of natural resources by the inhabitants for subsistence living far beyond their capacity to regenerate, many areas of the state are facing degradation of natural resources. For example, against the requirement of 18 ha of forests land including 5-12 ha of well-stocked forests, per ha of cultivated land, the ratio of forest to agriculture is only 1.33:1 and the ratio of well-stocked forests to agricultural land is only 0.84:1. Further, soil erosion from the different land use

systems in the watersheds has increased many-fold and land productivity has been declining. The water retention capacity of the fragile watersheds has reduced and people are now facing acute shortage of water. Grazing intensity is high; each ha. supports about 7.99 units of livestock against the appropriate 2 livestock units. The green fodder requirement has been estimated as 259 lakh mt per annum, but present production is only 52 lakh mt. both from the forests and agriculture.

To reverse this order of deterioration of natural resources and support livelihood activities for the inhabitants watershed management has been taken up as the functional and planning tool for conservation of natural resources and sustainable development by the Government of India through its Common Guidelines for Watershed Development Projects 2008. The State of Uttarakhand, through its Watershed Management Directorate (WMD) which has been designated as the State Level Nodal Agency for the same will be formulating State Level Perspective Plan (SLPP) for Integrated Watershed Management Project (IWMP) in Uttarakhand for 15 years period (i.e. 2009-24).

Objectives

The main objective of the proposed SLPP is to increase the productivity and income of the rural inhabitants in the Rainfed Micro-watersheds of the State on priority basis area through sustainable management of the natural resources. Since agriculture and related activities are the main source of livelihood for the proposed target area, land based activities and livestock will play a significant role in achieving the project objectives. The project will reduce the emphasis on traditional crops and will increase prominence on high value crop and value addition through grading, packaging, processing and encouraging organic farming. Further, to ensure the sustainability of the proposed activities and ensuring cost sharing by participants for capital investments and also the recurrent costs associated with maintenance of the assets.

Components

To realize the above objectives following three components and sub components need to be incorporated in the Integrated Watershed Management Project (IWMP).

1. Participatory Watershed Development and Management

- Promotion of social mobilization and community driven sustainable and equitable decision making
- Collectively planned Watershed Treatments

2. Enhancing Livelihood Opportunities

- Farming Systems Improvement supporting increased employment and productivity
- Value addition and marketing support
- Income Generating Activities for Self Help Groups integrated with watershed Development

3. Institutional Strengthening and promotion of economic/livelihood activities

- Capacity building of all tiers of PRIs and local community institutions in exercising rights and responsibilities
- Information, Education and Communication to promote optimization from amongst different strategies.

CHAPTER 2
ABOUT THE STATE

GENERAL STATE PROFILE

Uttarakhand which came into existence on 9th November 2000 is the 27th Indian state and the 10th in Himalayan region. It lies between 28^0 43' and 31^0 27'N Latitude and 77^0 34' and 81^0 02'E Longitude. The total geographical area of the state is 53,483 sq. Km., of which approximately 89% is mountainous. Of the total geographical area, about 19% is under permanent snow cover, glaciers and steep slopes. The total population of the state is 8.48 million (Census 2001) of which over 5 million people live in the mountainous parts of the state. Below Poverty Line population in hills is 44% and in the plains is 19%, thus, making the State average BPL population 36.5%.

Uttarakhand is a part of the North-Western Himalayas bounded by Nepal in the East and Himachal Pradesh in the West. The Northern boundary goes upto Tibet/China whereas southern boundary extends into Indo-Gangetic Plains. The major North Indian Rivers the Ganga and the Yamuna, originate from this region.

Uttarakhand state covers over 53000 sq.km. of geographical area, it is split into 13 districts within two revenue divisions **(MAP-1- Map showing District and Block Boundaries).**

1. Garhwal Revenue Division includes following 7 districts-
   i. Dehradun
   ii. Tehri
   iii. Pauri Garhwal
   iv. Uttarkashi
   v. Chamoli
   vi. Rudra Prayag
   vii. Haridwar
2. Kumaon Revenue Division includes 6 districts
   i. Nainital

ii. Almora
iii. Pithoragarh
iv. Champawat
v. Bageshwar
vi. Udham Singh Nagar

These thirteen districts include 49 Tehsil, 95 Development Blocks and 16,826 revenue villages within their administrative boundaries. Almost 65% (34,662 sq.km.) of the total geographical area of the state (53,662 sq.km.) is under forests with 12 Protected Areas covering an area of 6,479 sq.km **(Annexure Table- 2.1**)

Population

The district wise population detail as per Census 2001 is given below in Table-2-a

Table-2-a District wise population detail ***(in '000)***

S.No	District	Male	Female	Total	SC			ST		
					Male	Female	Total	Male	Female	Total
1	Hardwar	773.173	671.040	1444.213	131.652	111.006	242.658	1.128	0.898	2.026
2	Almora	293.576	336.870	630.446	63.269	65.033	128.302	0.530	0.386	0.916
3	Bageshwar	118.202	131.251	249.453	28.038	27.896	55.934	0.875	0.948	1.823
4	Nainital	400.336	362.576	762.912	60.704	53.972	114.676	1.739	1.653	3.392
5	US Nagar	649.020	585.528	1234.548	65.559	55.747	121.306	44.407	41.920	86.327
6	Pithoragarh	227.592	534.557	462.149	46.613	44.845	91.458	9.081	9.071	18.152
7	Cham-pawat	110.916	11.545	224.461	16.393	14.715	31.108	0.254	0.193	0.447
8	Dehradun	675.549	603.534	1279.083	74.251	63.213	137.464	44.510	39.566	84.076
9	Uttarkashi	151.599	142.580	294.179	28.082	26.512	54.594	1.205	1.095	2.300
10	Pauri	331.138	365.713	696.851	45.046	45.636	90.682	0.859	0.641	1.500
11	Rudra prayag	107.425	120.036	227.461	4.868	4.821	9.689	0.006	0.001	0.007
12	Chamoli	183.033	186.165	369.198	29.297	28.258	57.555	4.873	5.212	10.085
13	Tehri	294.842	309.766	604.608	36.710	35.964	72.674	0.260	0.348	0.608
	Total	4316.401	4163.161	8479.562	630.482	577.618	1208.100	109.727	101.932	211.659
(Source: Census 2001)										

The total population of the state is 84,79,562 which live in 16,826 villages. The population is multi-ethnic belonging to varied cultural origins. Around 36.5% of the population is Below Poverty Line (BPL).

PHYSIOGRAPHIC ZONES OF UTTARAKHAND

Major Physiographic zones

The Uttarakhand Himalayas are divided into the following distinct non-montane and montane physiographic zones **(Map -5 State Map showing different Altitude Zones)** as follows:

a. Non-montane

i. Bhabhar: This is a level surface zone at the foothills of the Himalayas 34 km wide where the Himalayan torrents rush down from the steep slopes and disappear under boulders and gravels due to the extremely porous soil type of Bhabhar.

ii. Tarai: Situated below the Bhabhar and parallel to it, the Tarai is a marshy and damp tract (once 80-90 km wide) containing fertile soils with good water retention capacity.

b. Montane

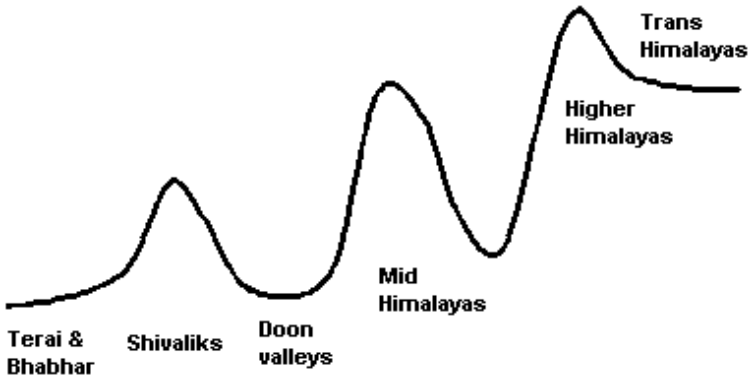
i. Sub-Himalayas: Called Sub-Himalayas because it possesses the least of Himalayan features. It consists of two zones, the **Shivaliks** - the youngest of the Himalayan ranges and the **Doon** (flat longitudinal structural valleys) to the north of Shivaliks. The Shivaliks extend in a narrow varying width of 6 to 30 km with altitudes of 300 to 1000 m.

ii. Mid Himalayas : This zone extends in a varying width of 60-90 km in an abrupt rise in elevation between 1000 m to 3000 m. It contains two types of physiographic sub-units

- The Himachal ranges
- The Himachal valleys and lake basins.

iii. Greater Himalayas: This zone has a varying width of 40-60 km. The altitude varies between 3000-7000 m. Except for lower valleys, this zone is perpetually covered with snow hence called Himadri. The region covers glacial landforms above 3000 m.

iv. Trans-Himalayas: Also known as the Tethys Himalayas and Indo-Tibet plateau, the region is in the rain-shadow of the Greater Himalayas and is therefore a cold desert. It slopes down to the Yarlungtsangpo (Brahmaputra) river valley in Tibet.



The various physiographic zones of the State are classified into different soil types, crops produced, district wise, alongwith the rainfall distribution in these zones in the following table.

Table-2-b Physiographic zones of Uttarakhand, their attributes, major produces and livestock

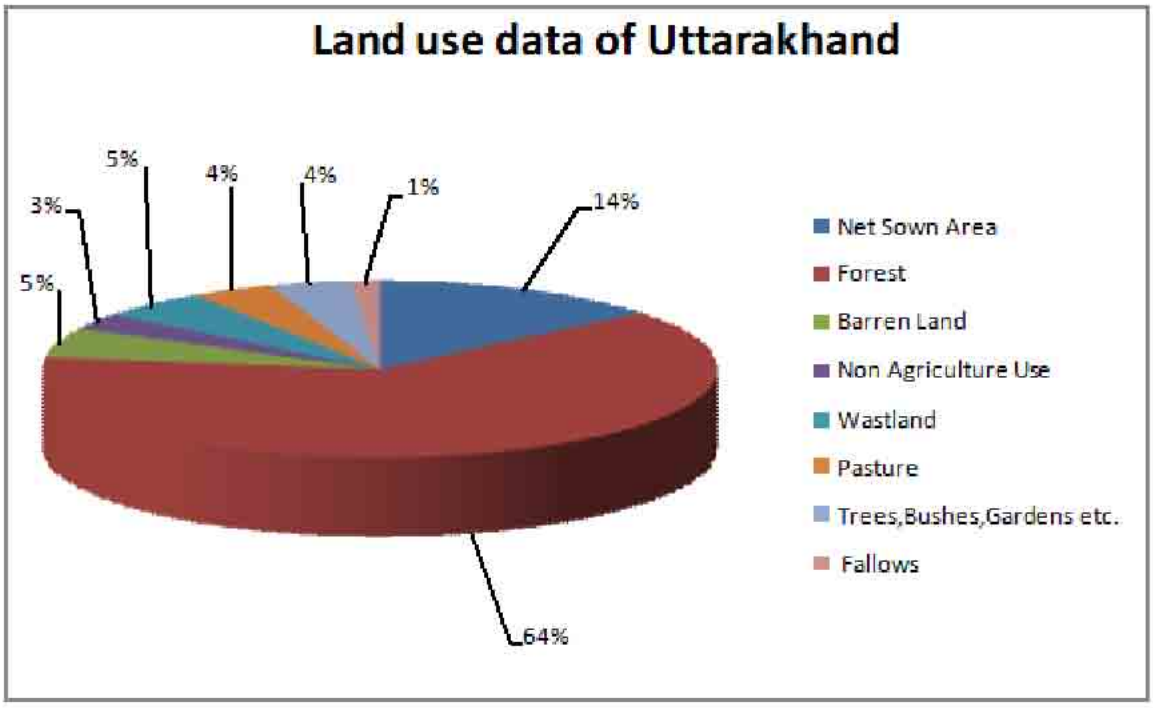
S. No	Zone	Farming situation	Soil	Rainfall (mm/ year)	Districts	Principal farm produces and Livestock
1.	Zone A upto 1000 m	Tarai irrigated	Alluvial	1400	U.S.Nagar, Haridwar	Rice, wheat, sugarcane, lentil, chickpea, rapeseed-mustard, mango, litchi, guava, peach and plums. Livestock: Buffalo and cattle.
		Bhabar irrigated	Alluvial mixed with boulders and shingles	1400	Nainital, Dehradun and Pauri Garhwal	Rice, wheat, sugarcane, rapeseed-mustard, potato, lentil, mango, guava, and litchi. Livestock: Buffalo and cattle
		Irrigated lower hills (600-1000 m)	Alluvial sandy soil	2000-2400	Champawat, Nainital, Pauri Garhwal, Dehradun, Tehri Garhwal	Rice, wheat, onion, chillies, peas, potato, radish, cauliflower, pulses, oilseeds, soybean, mango, guava, plums, and peaches. Livestock: Buffalo and cattle
		Rain-fed lower hills (600-1000 m)	Residual sandy loam	2000-2400	Champawat, Nainital, Pauri Garhwal, Dehradun, Tehri Garhwal, Bageshwar	Finger millet, maize, rice, wheat, pulses, mango, guava, plums, and peaches. Livestock: Buffalo, cattle and goat

S. No	Zone	Farming situation	Soil	Rainfall (mm/ year)	Districts	Principal farm produces and Livestock
2.	Zone B 1000-1500m	Mid hills south aspect (1000-1500 m	Sandy loam	1200-1300	Champawat, Nainital, Almora, Dehradun, Tehri Garhwal, Bageshwar	Rice, finger millet, wheat, potato, tomato, peas, Cole crops, pulses, peach & plums. Livestock: Cattle, sheep & goat
3.	Zone C 1500-2400m	High hills (1500-2400 m)	Red to dark	1200-2500	Pithoragarh, Almora, Chamoli, Bageshwar	Amaranth, finger millet, French-beans, Cole crops, potato, peas, peaches, plums, pear, apple, stone fruits. Livestock: Cattle, sheep and goat,
4.	Zone D >2400 m	Very high hills	Red to dark Black clay	1300	Pithoragarh, Chamoli, Uttarkashi	Amaranth, buckwheat, peas, Cole crops, apple and potato. Livestock: Sheep, goat

Agro Climatic Zones

Uttarakhand State is divided into two agro climatic zones only i.e. the hills and plains. The rainfall distribution in the various districts is given in (**Annexure Table 2.3.)** as seen by the land use data of Uttarakhand 64% of the land area of Uttarakhand is under forest cover and about 14% area is under agriculture.

Exhibit -2-I



LAND USE

Like most other hill economies, the people of Uttarakhand practice integrated systems of farming, forestry, horticulture, livestock and off-farm activities. The recorded forest area constitutes 64.79% of the total reported area, though the actual cover based on remote sensing and satellite imagery information is only 44 percent. The net sown area for the region is a little over 13% of the total reported area, although there are wide variations in this percentage from district to district. About 33% of the total area in Uttarakhand is either rocky/ snow covered/ glaciated or otherwise unproductive and degraded land. About 12% of agricultural land has got irrigation and about 90% land is used for growing cereals, fodder (berseem) and some vegetables.

The extent of wasteland in the State district wise has been given in (**Annexure Table 2.4**.) Nearly 30% of the geographical area of the State has been classified into various types of degraded land. The status and extent of soil erosion has been given in (**Annexure Table 2.5.)** Majority i.e. 53% of the area falls in the category of severe and very severe soil erosion.

NATURAL RESOURCE BASE OF UTTARAKHAND

FOREST COVER

As per the State of Forest Report 2005 the recorded forest area of the state is 34662 sq.km, which constitute 64.79% of its geographical area. By legal status reserve forest constitute 71.08% protected forest 28.51% and unclassified forest 0.41% of the total forest area. Major forest types occurring in the state are Tropical Moist Deciduous, Tropical Dry Deciduous, Sub Tropical Pine, Himalayan Moist Temperate, Sub Alpine and Alpine Forests. Forests are largely distributed throughout the state with conifers and Sal being major forest formation **(MAP-2- Forest Cover Map of the State).**

WATER REGIME

The predominantly hilly State of Uttarakhand has a varied hydrogeological setup and can be divided broadly into two distinct hydrogeological regimes viz. the Gangetic alluvial plain and the Himalayan mountain belt. The former is covered with a vast expanse of alluvium and unconsolidated sedimentary material of varying size fractions (ranging from boulder to clay) and is a promising zone for ground water development. The latter zone, being predominantly hilly, offers much less potential for large scale development of ground water. Ground water in the hilly region occurs mostly in fissures/fractures and emerges as springs. The springs are amenable to small scale development of ground water resources in the State. The yield of tube wells in Shiwalik formation ranges from 50.4 m^3/hr to 79.2 m^3/hr, in Bhabar formations yield is upto 332.4 m^3/hr. In Tarai belt yield of tubewell ranges 36m^3/hr to 144 m^3/hr and in Indo-Gangetic plains yield varies from 90 m^3/hr to 198 m^3/hr.

Major River Basins and Sub Basins

The main drainage system of Uttarakhand have been grouped into following six catchments **(MAP-4-State Map showing major Rivers and Drainage Systems):**

Yamuna Catchment - The Yamuna river originates from the base of Bandarpunch peak. It has carved a deep V- shaped gorge. The Yamuna cuts across the Nag Tibba range and Mussoorie range near a place called Yamuna bridge. The rivers Tons, Pabar and Aglar are its important tributaries. It passes through the Doon valley on its Western boundary.

Bhagirathi Catchment – This is one of the two rivers which join to form the river Ganga. It originates from the snout of the Gangotri glacier at Gaumukh which is at the base of Chaukhamba peak. The Bhagirathi river has cut a deep gorge across the granitic rocks of the higher Himalayas of Garhwal. Its main tributaries are the river Janhavi and the Bhilangana.

Alaknanada Catchment - This river joins the river Bhagirathi at Devprayag to form the river Ganga. It originates from the eastern slopes of Chaukhamba – from the Bhagirathi

kharak and Satopanth glaciers. The river flows along the Badrinath temple. Its main tributaries are the Khiraonganga, Pindar Dhauliganga, Birahi, Nandakini, Mandakini etc. It has formed a broad valley at Srinagar (Garhwal).

Mandakini Catchment - It comes out from the Mandakini glacier near Kedarnath. It cuts through a gorge of glacial debris. The river has formed road terraces at Augustmuni and Tilwara. At Tilwara it is joined by the river Lastar Gad. The river Mandakini joins the river Alaknanda at Rudraprayag.

Pindar Catchment- The river Pindar originates from the Pindari Glacier which is located between Nanda Devi and Nanda kot peaks. Sundardhunga river joins the Pindar near Dhakuri. The Pindar joins the river Alaknanda near Karanprayag.

Kali Catchment – The river Kali forms the boundary between Kumaon and Nepal. The Towns of Champawat and Pithoragarh are situated on the back of the Kali river. Its important tributaries are Darma and Saryu rivers.

The Land Survey Directorate (LSD) has divided the Uttaranchal into 8 catchments, and then into 26 watersheds, then into 110 SWS and finally into 1110 MWS and shown in Map. Haridwar district is yet to be delineated by the Land Survey Directorate but essentially an area of 2.33 lac ha. needs to be taken up for the watershed works. The number of SWS and MWS falling in each district of the state is given in **Table 2.3** below:

Table 2-c **Details of Catchments, Watersheds, Sub watersheds and MWS in Uttarakhand**

S.No.	Catchment	Watershed	No. of Sub-watersheds	No. of MWS	Total Area (ha.)
1	Alaknanda	Alaknanda	7	86	6,69,643
		Lower Alaknanda	5	32	95,475
		Mandakini	5	33	1,68,049
		Pindar	5	56	1,87,800
	Total		**22**	**207**	**11,20,967**
2	Bhagirathi	Bhagirathi	14	120	5,77,523
		Bhilangana	4	39	1,49,660
	Total		**18**	**159**	**7,27,183**

Table 2-c **Details of Catchments, Watersheds, Sub watersheds and MWS in Uttarakhand**

S.No.	Catchment	Watershed	No. of Sub-watersheds	No. of MWS	Total Area (ha.)
3	Ganga -A	Song	5	56	1,76,597
4	Ganga- B	Hiyunl/mal	6	28	1,00,683
		Nayar	6	59	2,08,612
	Total		12	87	3,09,295
5	Kali	Kali	5	82	5,49,682
		Lower Kali	3	34	1,17,760
		Saryu	8	123	4,45,494
	Total		**16**	**239**	**11,12,936**
6	Kosi	Bhakra	3	9	1,64,746
		Gola	3	20	1,65,988
		Kosi	4	71	2,10,075
		Nandhaur Left	3	17	1,23,618
	Total		**13**	**117**	**6,64,427**
7	Ramganga	Dhela Nadi	1	2	45,393
		Khoh	2	8	48,723
		Ramganga	8	75	3,33,926
	Total		**11**	**85**	**4,28,042**
8	Yamuna	Aglar	2	7	25,698
		Asan	3	18	82,088
		Lower Tons	3	19	45,265
		Tons	4	36	1,67,926
		Yamuna	7	80	2,29,185
	Total		**19**	**160**	**5,50,162**
	Grand Total		**116**	**1110**	**50,89,610**
				+ Haridwar	2,33,506
				Total	53,20,291

Table 2-d **District wise total number of Micro-watersheds and their area in ha.**

S.No.	District	No. of MWS	Area (ha)
1	Pauri Garhwal	129	5,38,775
2	Dehradun	95	3,05,043
3	Chamoli	138	8,22,225
4	Uttarkashi	164	7,86,921

5	Tehri	134	4,14,588
6	Rudraprayag	40	1,82,223
7	Almora	100	3,18,324
8	Bageshwar	59	2,14,590
9	Pithoragarh	128	7,51,958
10	Champawat	41	1,45,712
11	Nainital	74	4,28,646
12	Udham Singh Nagar	8	1,77,780
13	Haridwar	-	2,33,506
	Total	**1,110**	**53,20,291**

Soil

Soil is one of the most important natural resource of Uttarakhand. This natural resource is depleting gradually, day by day, as soil erosion in the area is increasing with the increase in deforestation for different developmental activities.

Soil scientists as well as Metrological experts have grouped different types of soil of Uttarakhand in to the following soil zones based on different climatic zones.

Table 2-e **- Different Soil Types distribution in Uttarakhand**

Sl.No.	**Soil zones**	**Altitude (m)**	**Climatic Zones**	**Types of soil**
I	Shiwalik and Doon areas	300-900	Moist -Dry	Jalod soil
II	Lower Himalayas	900-1800	Dry-Temperate	Grey forests soil
III	Upper Himalayas	1800-3000	Moist-Temperate	Grey deciduous soil
IV	Alpine areas	3000 & above	Moist-Temperate	Himani soil

In another classification, depending upon the land use pattern and agriculture pattern, soils of Uttarakhand has been divided into following categories.

i. Soil of Tarai and Bhabar region
ii. Grey Forests Soil
iii. Dark Grey Soil
iv. Acidic/Alkaline Forests Soil
v. Hilly Grey Soil
vi. Himani Soil
vii. Soil covered with snow

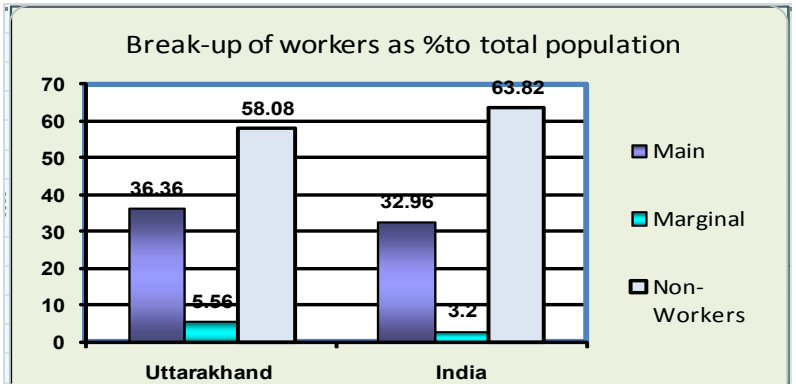
DEVELOPMENT INDICATORS OF THE STATE

The Development indicators of the State have been given in (**Annexure Table 2.6).** The poverty ratio of the State is 31.8% which much higher than the national average of 21.8%. The literacy rate of the State is 71.6% which is considerably higher than the national average of 64.8%. The Per Capita income of the State is also considerably lower than the national average.

OPERATIONAL AND LIVELIHOOD STATUS

In Uttarakhand main workers and marginal workers percentage is higher than that of Indian average of 32.96% and 63.82% respectively. Non workers are nearly 5 percent lower than the Indian average which is 3.2%.

Workers comparison with Indian Average Exhibit -2-II



Source: Census of India 2001(Provisional Population Totals), Uttaranchal, Tata statistical outline of India, 2000-2001,Uttarakhand Update, Joshi A. et. al.

IRRIGATION STATUS

As mentioned earlier net irrigated area in the State is less than 50% of the total cultivated area. Rainfed area constituted 55% of the total cultivated area. The hill districts like Chamoli, Almora, Champawat, Pithoragarh and Pauri Garhwal have more than 90% area under rainfed cultivation. The districts of Udhamsingh Nagar and Haridwar have 2% and 11% area respectively under rainfed cultivation **(Annexure Table 2.13).** As Uttarakhand is predominately a hill state open wells and tanks are present only in the plain regions of Dehradun, Haridwar, Pauri Garhwal and Udhamsingh Nagar Districts. Canal irrigation is present in the whole of the state but hill districts like Chamoli and Tehri Garhwal have less than 1000 ha. of area under canal irrigation. Tube / Borewells are mainly situated in Haridwar and Udhamsingh Nagar Districts. Irrigation in the hill districts is mainly through pipelines laid from the water sources present in the hills (**Annexure Table 2.14).**

Uttarakhand being a hill state groundwater status of only the plain areas has been studied by the State Ground Water Board. They have listed Bhagwanpur block of Haridwar District as an over exploited block and Bahadrabad, Narsain and Roorkee blocks in Haridwar Districts as semi critical **(Annexure Table 2.15 a.).**

DROUGHT AND FLOODS

Uttarakhand is a disaster prone state. Landslides, forest fires, cloudbursts and flash-floods are seasonal in nature and these strikes at a certain period of the year with high frequency. Earthquakes are the most devastating in the mountains and are unpredictable. So far, in the recent years (1990 onwards) Uttarakhand has experienced two major earthquakes (magnitude > 6) in Uttarkashi (1991) and Chamoli (1999) and a series of landslides/cloud burst such as Malpa (1998), Okhimath (1998), Fata (2001), Gona (2001), KhetGaon (2002), Budhakedar (2002), Bhatwari(2002), Uttarkashi (2003), Amparav (2004), Lambagar (2004), Govindghat(2005), Agastyamuni(2005) and Ramolsari(2005).

Apart from frequent cloudbursts in hilly regions of the State which cause a great deal of damage to life and property in hills. There are frequent droughts in the State as main stays of agriculture in the hills are mainly rains. Each year many districts face drought like conditions which result in failure of the crops.

When drought like conditions prevails most of the remotely located springs in the hills start drying up or the discharge is reduced to such a level that they are unable to fulfill the basic requirement of the residents. There is also a drastic reduction in the flow of major rivers in the State. In the Himalayan region, 'naula' (12 m deep well, mostly lined to get water from seepage), 'dhara' (spout springs) and 'hand pumps' (at few places) are the main sources of water for irrigation and household consumption, because rural water supply (if it is available) is either irregular or unwholesome. Except the spout spring, which delivers water at the ground surface naturally, 'naula' and 'hand pump' are artificial methods to extract water from the sloppy aquifer. Perennial or non-perennial nature of these water sources depends upon the aerial coverage of the discharging aquifer. In turn, these aquifers are recharged by rain or by snow-melt water, which gets infiltrated through the land surface and percolates to join the aquifers. The natural rate of groundwater recharge is reckoned to be 31% of the total annual rainfall. Therefore, soil characteristics and land use play a major role in recharging sloppy aquifers. Deforestation, grazing and trampling by livestock, erosion of top fertile soil, forest fires and development activities (e.g. road-widening, mining, building construction, etc.) cause reduction in the infiltration rate and sponge action of the land and thus the failure of the watershed, which results in unchecked flow of water during the monsoon to cause a sudden swelling of streams and rivers, so that there are floods in the foothills and even in the plains, and droughts in the villages located on the slope of the mountains. Regarding nature's role, there is about 30–40% decline in average rainfall over the past 50 years. Under such circumstances, rainwater harvesting and its storage is the only option left with us.

AGRICULTURAL GROWTH AND DEVELOPMENT

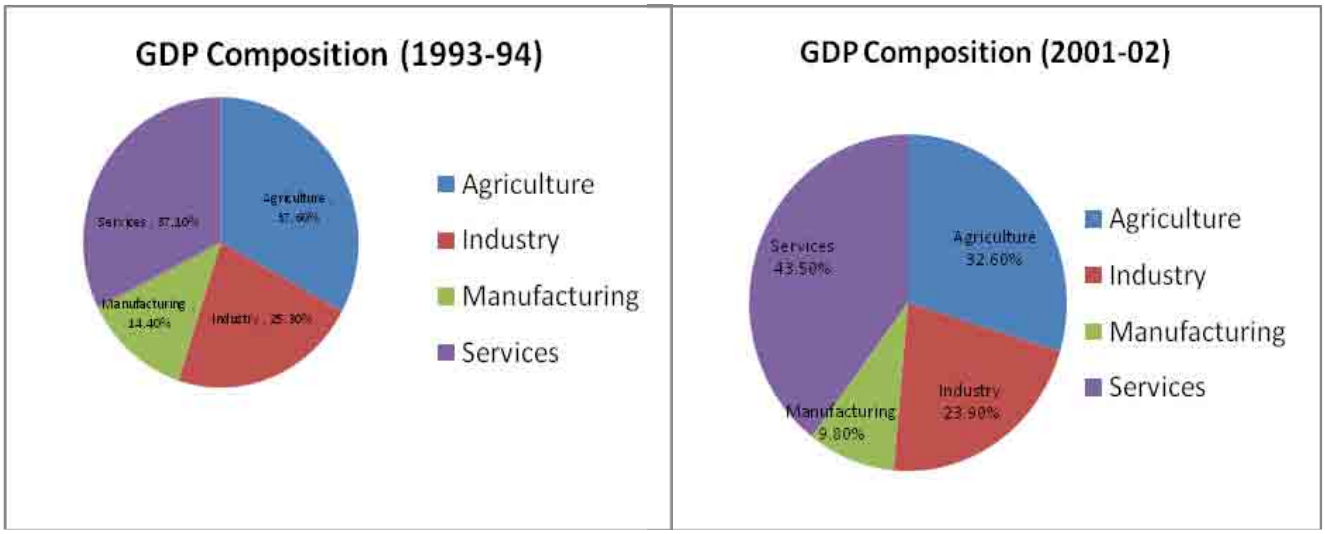
Uttarakhand is largely rainfed, irrigation facilities are minimal, land holdings are small and fragmented, with a predominance of wastelands. Crop yields in Uttarakhand are low and there is a lack of effective marketing infrastructure including all post-harvest activities such as collection of the farm produce from the fields, transportation to warehouse, storage, processing, packaging, access to potential markets, information about prices, and finally marketing the produce at a price which is most remunerative to the farmer. In addition, there is a lack of availability and accessibility to horticultural inputs and the knowledge/information about suitable and remunerative crops and scientific management practices is scanty. Limited credit facility to farmers, remains another big constraint.

Uttarakhand has just 14% of the total land under cultivation and about 65% of population depends on agriculture for their livelihood. The region also suffers on account of heavy soil erosion and significantly lower yields as compared to the national average. Since agricultural income cannot sustain the families for more than four months in a year, each family has almost one or two persons working outside the state that remits regular money to sustain the family for the rest of the year. In addition, the region did not receive the attention it deserved till the inception of the state (2000-2001). Under these present circumstances, the major challenges before the state is to achieve economic prosperity without losing out on its biodiversity. In this context the state has made a conscious choice of pursuing the path of organic agriculture, which not only fetches a premium price for the farmer with minimum external inputs but is also environmentally benign. Because of a variety of agro-climatic niches that exists within the region, the state has tremendous potential to emerge as a regular supplier of seeds to other states in the country. Taking advantage of relatively higher literacy rates, coupled with new initiatives in ICT (Information Communication Technology), Uttarakhand is poised to become a knowledge state in agriculture. The agricultural portal being developed by the state will have 2700 kiosks and will provide a one ‘stop

shop' for all farmers. In addition, GIS (Geographic Information Systems) based data bank is being developed for monitoring of watershed development works. There is also a need of cultivating horticultural crops particularly medicinal and aromatic plants and other high value species while promoting biotech industry for seed production.

Breakdown of the state's latest available aggregate GDP shows clear dominance of the services sector. Given the terrain of the state and favourable climatic conditions, agriculture continues to be the major source of income for more than three-fourths of the state's population. Agriculture and allied activities with an average share of about 37.3 per cent during 1993-94 to 2001-02, is a significant contributor to the state domestic product as against the national average of 27.8 per cent during the period considered. The State hosts all major climatic zones thus giving it an edge in developing activities based on floriculture, fruits and nuts, vegetables and vegetable seeds.

Given that Uttaranchal has significant area under forests, forestry and logging is a key component of the agricultural GDP (7.1 per cent of the agriculture GDP) during the period. The state outperformed the national aggregates of the yield of some of the major crops. During 2001-02, Uttaranchal posted significantly high yield of major coarse cereals



Agricultural land use Statistics Exhibit-2-III

As per **(Annexure Table 2.8)** the cropping intensity of the State is 161% of the net sown area less than 50% area is irrigated, rest of the cultivated area is rainfed. Nearly 50% of the area of arable area of the State is held by the marginal and small farmers i.e., farmers having less than 2 ha. of area for cultivation **(Annexure Table 2.9).**

In the Kharif Season nearly 68% of the area is rainfed of the total area major area is under cereal and pulse productions. As area under cereal production is the maximum of which 66% is rainfed the yield in rainfed area is 14.7 qt. per ha. which is very less compared to irrigated areas where it is 21.4 qt. per ha. The overall yield from all the major crop in the rainfed area is 13.93 qt. per ha. compared to the yield in irrigated area which 21 qt. per ha **(Annexure Table 2.10).** In the Rabi season again majority of the area is under cereal cultivation of which nearly 60% of the area is rainfed. The overall productivity in rainfed areas is just 10.67 qtl. per ha. compared to yield in rainfed area which is 30.94qtl. per ha. **(Annexure Table 2.11).**

In terms of major horticultural crop of the total approximately 2.72 lac ha. area under production, nearly 70.15% area is rainfed. Total fruit production in the State is rainfed and vegetable production is irrigated. The yield of fruits which are totally rainfed is 53.26 qtl. per ha. and vegetable production is 131.28 qtl. per ha. **(Annexure Table 2.12).**

INPUTS IN AGRICULTURE

When hill districts of the state are examined more closely, agriculture emerges as the main activity of all the hill districts. Since most of the land is covered with forest there is very little scope for diversification. However, some districts have already diversified into alternative farm-based activities like fruits and vegetables, aromatic and medicinal plantations and some have also tried to extract the potential from animal husbandry activities like dairy and poultry. Forest trees also offer an alternative source of livelihood. The cropping pattern of the hill districts is mainly based on traditional agriculture. In almost all the hill districts, rice, wheat, mandwa, and sanwa remain the main crops with the maximum area under cultivation. Production is mainly for self consumption and

distribution in village markets; there is not much statistical evidence of development of mandis and markets to dispose off any surpluses.

As expected, the yields are not very high in Uttarakhand as a whole and also the productivity of the hill districts is generally lower than the state average. This is because of the small and fragmented land holdings, low use of quality seeds, limited irrigation facilities, lack of extension and low farm mechanization. Due to the small size of the land holdings, farm mechanization was not technically feasible. On an average, about two-third of the land holdings are marginal in size with an average land of less than 0.66 ha in all the districts.

The majority of Uttarakhand agriculture is rainfed and there is not much surplus for the market. As a result most of the able-bodied men have migrated to other places in search of employment. Only women are left in the hills and they have started looking after the farms. The challenge is to change this structure and create employment through agriculture. This could be done by diversifying the agricultural pattern so as to create alternative income and better living standards. The alternative areas of diversification are towards horticulture crops, spices and condiments, tea plantations, and herbal and medicinal plants. Development of organic farming is another option for agriculture-based hill regions. Development of animal husbandry and forest resources are already a part of hill livelihood, which has limitations on its further expansion.

Horticulture: In addition to staple foods, the hill districts of Uttarakhand have diversified into the production of condiments and spices like chillies, ginger, and garlic. The area under these is as high as 2275 ha in Almora, 1098 ha in Champawat and 962 ha in Pithoragarh. Some areas in Pauri grow sugarcane also. The area under fruit cultivation is quite high in Uttarkashi and, in almost all the hill regions, substantial areas are under vegetable cultivation. There is great potential for diversification into oilseeds like sesamum, rapeseed, mustard and soybean that will contribute towards increasing income in the hill regions.

Herbal and Medicinal plants : Uttarakhand has observed an increase in the area under cultivation of aromatic and medicinal plants. This positive attitude of farmers towards aromatic plant cultivation is because of the high returns from this crop. Intercropping of aromatic plants with food grains can also help diversify the income basket for small and marginal farmers. Farmers can derive huge benefits by diversifying into the cultivation of aromatic plants. These benefits have been generated with the help of the Herbal Research and Development Institute (HRDI) that works on aromatic plants used in cosmetics, soaps, and perfumes. Although the productivity of land in the hills is very low, there is a huge demand and ready market for aromatic plants. The HRDI has identified areas in selected hill regions where these crops can be grown and adopted a clustered approach that includes production and processing.

There is huge commercial value in the oils and essences extracted from aromatic and medicinal plants. Aromatic plants like lemon grass, citronella, palmarosa, chamomilla, tulsi, geranium, naramotha, Japanese mint, khuas, and marigold are used extensively in the cosmetics industry. The main problems are the high cost of processing and the difficulty of getting buyers to the processing units. Oil extracted from plants is not linked with the pharmaceutical industry because of low production. Since limited quantities of aromatic and medicinal plants are produced, buyers are not able to establish linkages. There is scope for medicinal plants and medicinal trees like tejpatta, amla, harad, and bahera are being planted. There is high demand for ritha but the forest department has not taken any initiatives. For medicinal plants, support prices by the government are required because of long-term plantation. To increase production and productivity it is important to establish the cluster approach and low-cost processing. Forest cooperation has made 3-4 mandis where auctions take place. No government initiative has been taken in the case of aromatic plants. There is a great deal of potential for the development of these crops in the hill regions without much heavy investment. The HRDI has tried to install processing units among the clusters of farmers close to their farms. The institute also has storage facilities where farmers can store their oil extracts if they are not sold at an appropriate price in the market. There is a need to take appropriate measures for improving productivity and production of herbal and medicinal

plants and their trade in the state. Medicinal and aromatic plants can be a strong option for diversification but linkages with the market should be developed.

Organic farming: Yield levels can be effectively raised in a stable and sustainable manner only by adopting organic farming methods, since extensive use of chemical fertilizers ultimately leads to soil deterioration. As per statistics, the use of fertilizers in the hill districts is very low. In Uttarakhand around 10,000 ha land is under organic farming, covering over 15,000 farmers and 45 crops. The key objective of diversifying towards organic farming is to improve crop productivity, soil health and the price of the output, and thus the income of the farmers. Organic products have a parallel market which, if captured in a strategic manner, can lead to the rapid development of these hill districts.

The hill regions are disconnected from the plains due to a poor road network and, thus, fertilizers is limited and expensive. This has increased the number of organic activities and farmers growing organic produce. Uttarakhand is the first state of the country to be declared an organic state. Due to this, a great need was felt to constitute an organization to promote and coordinate dispersed organic activities and efforts for organic farming in the state. The Uttarakhand Organic Commodity Board (UOCB) came into existence. The role of the Board is to promote organic farming in the state and to provide options in diversifying towards organic farming. Training in organic food processing and value addition has been imparted to the producer groups, but lack of infrastructural facilities is a major constraint. It is necessary to integrate the farmers to generate surplus for exports, but the physical geography of the hill villages makes this difficult. Another issue that emerges in marketing and making agriculture a commercial venture is branding the products so that they can be sold globally.

STATUS OF FORESTS

The recorded forest area of the State is 34,662 km^2, which constitutes 64.79% of its geographic area. By legal status, Reserved Forests Constitute, 71.08% Protected Forest 28.51% and unclassed Forests 0.41% of the total area.

Major forest types occurring in the State are Tropical Moist Deciduous, Tropical Dry Deciduous, Sub-Tropical Pine, Himalayan Moist temperate, Himalayan Dry Temperate, Sub Alpine and Alpine Forest. Forests are largely distributed throughout the State with conifers and sal being the major forest formations. The State has 6 National Parks and an equal number of Wildlife Sanctuaries covering an area of 0.71 million ha, which constitutes 13.35% of its geographic area. The famous Corbett Tiger Reserve is located in the State covering an area of 0.13 million ha. Nanda Devi Biosphere Reserve, having an area of 0.59 million ha. is also located in this State.

The Forest Cover of the State, based on satellite data of October – December 2004, is 24,442 sq.km, which is 45.70% of the geographic area. Very dense forest is 4,002 sq.km. moderately dense forest 14,396 sq.km. and open forest 6,044 sq.km.

Van Panchayats in Uttaranchal were born out of conflicts and compromises that followed the settlements and reservations of forests in the hills at turn of the last century. The first government approved Van Panchayat was thus formed in 1921. According to recent estimates, there are 6,069 Van Panchayats managing 405,426 hectares of forests (13.63% of total forest area) in the state. Most of these have been carved out of civil (protected) forests under the jurisdiction of the Revenue Department. The area under each Van Panchayat ranges from a fraction of a hectare up to over 2,000 hectares.

It may be mentioned here that Community forests managed in accordance with Van Panchayat Act is a hybrid of state ownership and community responsibility. In its efforts to manage and control community forest use Forest committees are guided by Revenue Department rules and by the technical advice of the Forest Department. In contrast to civil forests, community forests or Panchayati forests as they are popularly known are not ‘open’ forests. Access and use of forests is guided by rules elaborately designed and implemented by the communities. Infact four identifiable working rules exist relating to Use, Monitor, Sanctions and Arbitration. Though only notionally or nominally owned by the communities, community forests are in a very real sense common property with an identifiable user group, have finite subtractive benefits and are susceptible to

degradation when used beyond a sustainable limit. However what is more important is that the local users consider them as their collective property and in real sense they are not actually divisible. These forests though are not completely immune from misuse and the condition of the forests varies from poor to very good.

Despite being an excellent example of state-people partnership which has been relatively successful in managing forest resources in the region, the institutions are facing challenges from unrealistic and target driven policies which would affect its democratic functioning. There is a need to replicate such institutions in other areas rather than interfering with the existing ones. Moreover Non-governmental Organizations need to play more active role in keeping these institutions alive by bringing the communities to the centre stage of decision making. In order to strengthen such community oriented institutions, one needs to identify such similar institutions and undertake comparative studies on the same so that anomalies if any can be removed.
Forests play an important role in the economy of the state. Timber and fuel form the major produce group, while bamboo, drugs, grasses, gum and resins etc., the minor produce group. Forests are the major source of raw materials for industries, buildings, railways and other tertiary sectors. There is an increased pressure on forests for fuel, fodder and timber requirements that is having an effect on the desired level of forest density and productivity of forests. The destruction and degradation of forests are taking a heavy toll on soil and water resources, making the land less productive and leading to impoverishment of the rural population.

Potential for forestry and waste land development : The State has good forest cover which needs to be protected. The State has also large scale wood based industries in the form of paper mills, Plywood units, Katha factories and rosin factories and small scale units mainly of saw milling, carpentry, packing cases, sports goods, furniture, carving, toys, etc. with large scale building activities both in private and public sector, residential and other purpose, consumption of wood in solid and processed form has gone up. This has resulted in increased demand of forest produce specially timber and will certainly put additional pressure on the existing forests. No systematic wood

balance study has been conducted in the State, but considering the demand of various forest produce in the State, a systematic planning needs to be attempted.

In order to bridge the gap between demand and supply and ensure regular supply of raw material to the wood based industries, other agencies and farmers also have to play important roles in the afforestation/ plantation program. This also provides opportunities for the farmers to go for farm forestry and agroforestry in the State.

The choice of species has to be based on agro- climatic conditions, objectives and market demand in the area. Accordingly, Poplar, Eucalyptus, Bamboo, Jatropha, Khair, Chyura and Sisal have been recommended for plantation in these districts. State Government is giving special emphasis on bamboos and Jatropha plantation and proposes to cover 2 lakh ha area under each of these species in the State.

In Tarai areas and in foot hills, there is a vast scope for agro- forestry programs where fast growing species like Poplar, Eucalyptus, Bamboo etc. can be taken up to meet the increasing demand of industries and the local people. Planting of Sisal in hilly areas also holds promise.

The areas which are covered under Poplar plantation are Haridwar, Dehradun, Nainital and Udhamsingh Nagar. These districts are considered best for plantation of Poplar in combination with field crops and farmers have adopted this species on their farm lands. It is estimated that nearly 1000 ha land is under poplar plantation on farm lands under agro forestry system in above mentioned 4 districts.

Resin : Resin obtained from the chirpine trees is an important non wood forest produce. Resin and turpentine are used in the paper, soap and paint industry. Resin extraction is an important livelihood opportunity for the rural population at present in Uttarakhand. There are 116 resin based industries in the State. Resin extraction was experimentally started in the year 1916 and from the year 1920 regular extractions started.

Till the year 1993 resin extraction was done through ‘French cup and lip technique’. Though, the Resin extraction per tree varied between 1.5 to 1.75 kg. it lead to extensive

damage of the chir tree. From the year 1994 resin extraction is being done through the 'Rill Technique' through this technique the damage of the trees is limited. Extraction is done from the month of October to March. Resin so collected is then auctioned to various industries. In the year 2006-07 Rs. 4632.87 lakh worth resin was auctioned by the State.

River Bed Material : In the Bhabar areas of the State a lot of boulders and sand collects in the rivers after the rains. It is essential that for silvicultural purposes and to save the nearby habitations these boulders and sand be removed so that the river course is not diverted. Thus, collection of this river bed material is an very important livelihood option for the locals of the area. The State Forest Department takes due permission from the Govt. of India for the removal of RBM. The amount of RBM to be removed every year from each river is calculated on technical basis and these areas are then leased out to the Forest Corporation for removal. The Corporation in turn engages local people for removal of RBM. This RBM is then taken to various stone crusher units for grading and sorting purposes. In the year 2006-07 the Forest Corporation earned revenue to the tune of Rs. 4531 lakhs through RBM removal. The main rivers in which RBM removal is done are Gaula, Sharda, Kosi, Dabka, Ganga, Yamuna and Song.

Bamboo: As per the national scenario, Uttarakhand comes under bamboo deficit area. There are 7 major species of bamboos viz. *Dendrocalamus strictus, D. hamitonii, Bambusa nutans, Arundinaria faccata, Themonocalamus spathiflora, Himalecalmus falconeri, Sinarundunaria jaunserensis*. Forest land under Bamboo is 139409 ha. There is no survey of bamboos available on private lands. Major bamboos markets in Uttarakhand are Haldwani, Dehradun, Ramnagar, Khatima and Jwalapur.

Uttarakhand Bamboo and Fiber Development Board: In order to promote bamboos in Uttarakhand, the State Government has set up Bamboos and Fiber Development Board. The Board has identified three naturally occurring Bamboos viz. *Bambusa nutans, D. Strictus* & *D. hamiltonii* for promotion in the State. Recently, the State Government has signed a MoU with a Thailand based company which would invest a sum of Rs. 211 crores for bamboo plantation activities in Van Panchayats of

Uttarakhand. The Company targets a total of 1.5 lakh ha for bamboo plantation during 2004-14.

More than 20 bambusetums have been established all over Uttarakhand at forest division level representing various bamboo species. Centre of Excellence for Bamboo has been established at Lacchiwala and Centre of Excellence for Bamboo and Fiber has been established at Paniyali, Kotdwar. A Government order from the Principal Chief Conservator of Forest, Forest Department has been issued to make felling and transit rule for bamboos easy by lifting the ban on felling and transit of bamboos outside the forest area.

Uttarakhand Bamboo and Fibre Development Board has set up two Ajeevika Vatika's at Peepalkoti, Chamoli and Kapkot, Bageshwar. The key components in these Vatika are bamboo and fiber nursery, demonstration plantation, bambusetum, treatment and processing of bamboos, training facilities for artisan's production and marketing of bamboo products. The board has established a High tech Nursery in Haridwar district with a capacity of 2.0 lakh seedlings.

The Board is also conducting trainings on Ringal Design Prototype Development in Ringal handicrafts, Bamboo furniture making, skill upgradation and design diversification trainings, Bamboo housing demonstration and training, entrepreneur development etc., under National Bamboo mission launched by govt. of India.

Jatropha plantation : The State of Uttarakhand has potential for promoting Jatropha especially in the low elevation areas. For this purpose state government has set up Uttarakhand Biofuel board. The board plans to raise Jatropha plantation on Van Panchayat lands in different forest divisions by selecting intended beneficiaries from Van Panchayat members. The plantation will be raised mainly on wasteland/ degraded Van Panchayat lands. The State Government has planned to cover around 2.0 lakh ha area under Jatropha plantation in two phases through the Board. However, in the first phase, 1.0 lakh ha would be covered in four years i.e. 25000 ha each year for 2005-06, 2006-07, 2007-08 and 2008-09. The Board has assured buyback arrangement of

Jatropha seeds through Forest Development Corporation which in turn will supply seeds to Uttarakhand Biofuel Company for processing.

Carbon stock and mitigation potential of forests: A comprehensive study by Roy and Joshi (undated) based on the remote sensing data has reported 266.96 Mt of C in the biomass pool of state forests. As per this study (Table) total Carbon content in pools of biomass, forest floor litter and soil is 537.02 Mt.

Table 2-f **-** Carbon stock in various forest types of Uttarakhand

Forest Type	**Area (Km2)**	**Carbon**				
		Biomass Pool	**Forest loor Litter (Mt)**	**Soil Pool (150 cm) (Mt)**	**NPP (t ha-1)**	**Net Accumulation in biomass (Mt yr-1)**
Tropical conifer (pine)	5418	33.4	1.74	61.71	3.14	1.43
Temperate conifer	6017	37.1	1.9	68.54	3.49	1.59
Temperate broad leaved	7809	119.3	2.39	111.95	4.72	2.29
Moist deciduous	3027	54.4	0.30	15.10	1.85	0.92
Dry deciduous	695	12.5	0.07	3.47	0.42	0.21
Sub Tropical(sal)	562	10.1	0.05	2.80	0.34	0.17
Total	**23528.05**	**266.96**	**6.48**	**263.58**		**6.61**

Source: Roy and Joshi in Singh 2007

Mitigation potential of the State forest is quite high and is a very important tool for carbon sequestration. This potential can be enhanced by afforesting wastelands and increasing the density of open forests. Culturable wastelands and permanent fallows cover 0.457 Mha of area (Ministry of Agriculture, 2005). Likewise open forests and scrub cover 0.293 Mha of the area in the state (FSI, 2008). Even if 25% of these available areas could be planted, the mitigation potential can be enhanced by 0.472 Mt/year assuming a very conservative sequestration rate of 2.52 t C /ha/yr (Singh, 2007a).

Payment for ecosystem services: The Himalayan region has 69% of India's freshwater resources. The region houses high concentration of poor population and the interactions between the people and the water-related ecosystem are more evident here than anywhere, also they are more affected due to high rainfall and sudden climatic variations. The water resources of the region provide great environmental and ecosystem services through fish production, biomass and wildlife, and transport of fertile soils carried by floodwaters. The high discharge of rivers and the steep terrain provide high potential for power generation. On the flip side, the Himalayan region is riddled with political conflicts over sharing of water resources between states and nations. With the rising inter and intra state water conflicts in the country, smooth inter-sectoral management and allocation of water have become a prime need. The economic value of the services being provided by Himalayan forests is being increasingly recognized. Water availability in downstream states, for example, critically depends on forest cover in the upstream Himalayan states. Several of these states have demanded that they be compensated for maintaining high forest cover at the cost of (foregone) development options. Internationally as well, the notion of *'payments for environmental services'* is receiving wide attention. It is being argued that services that were previously not valued in an economic sense and hence were kept outside the purview of market/policy mechanisms need to be explicitly valued so that upstream areas these can be paid for. The payment system could either operate through the market (as a voluntary transfer between a two or more well-defined groups) or through a politically negotiated inter-state (or inter-region) fiscal arrangement.

In the above context, the Report of Task Force on the Mountain Ecosystems under the Eleventh Five Year Plan (Planning Commission 2006a) explicitly recognizes 'the need for clearer understanding of resource flows to and from mountain areas'. The Report also contends that this will lead to increased income to mountain communities and a fairer distribution of earnings from natural resource exploitation and services provided (Planning Commission 2006a). The Uttarakhand government had submitted a proposal to the 12th Finance Commission in the context of valuation of water resources and has asked for a financial award for the ecosystem services rendered by the state to the

nation. The Terms of reference of the 13th Finance Commission states that in making its recommendations, the Commission should consider *"the need to manage ecology, environment and climate change consistent with sustainable development."*

It is essential to regenerate degraded forest and wastelands. A large area of degraded land in the state can be reclaimed as most of the land needs only basic water and soil conservation measures and some amount of plantation and protective work. Agro-forestry can play an immensely important role in the rural economy. The wasteland can be converted to grow plants, fodder and fuel. All the hill districts have more than 60 per cent of the area under forest. Thus, many of the livelihood options in these regions depend on forest-based products. The maximum pasture and grazing land is in Bageshwar, Champawat and Pithoragarh; this is crucial for better fodder availability for livestock in these districts. Champawat also has large tracts of fallow land due to poverty, lack of water and the un-remunerative nature of farming.

LIVESTOCK

Uttarakhand has a mix of almost all domesticated species of livestock, very large in numbers and very low in productivity, across the board. In economic terms they are a wealth indeed, low productivity not-withstanding, as the sector supports livelihoods of nearly 80 per cent of the rural households in the state, at least in part in the majority of cases and in full in some (tribals and nomads exclusively living off livestock).

Livestock production in Uttarakhand is the endeavour of the small holder (marginal, small and landless) and takes place in millions of small and tiny holdings scattered across the state. The predominant farming system is mixed crop-livestock farming, both in the plains as well as the hills, irrigated in the plains and rain fed in the hills.

Individual livestock holdings are small (5 or 6 animals), often made up of a mix of different species, the combination made up invariably of cattle and or buffalo and goat. Cattle are the most popular species and are farmed for milk production in the plains (commercial); and in the hills for work animal production as well as for milk for home

consumption. Sheep are held in larger flocks of 10-15 animals along with a few goats in some cases, except by the tribals and nomads where flocks are much larger (100–1000 of sheep, goats or both) and migratory (summer grazing in the alpine pastures in the upper reaches).

Distribution of livestock is equitable, almost 80 per cent of all species and types are owned by the marginal farmers. Much smaller percentages are held by the small farmers. Land less rural households own milch animals where milk marketing infrastructure exists; and local poultry, often for supporting family nutrition. Income from livestock are for these reasons more equitably distributed compared to income from land.

Major Livestock Products in Uttarakhand are Milk, Meat, Eggs, Wool and Work Output. During the course of centuries the livestock rearing is well spread over in the life of mountainous community and until 50 yrs. back the livestock raised by the villagers were the status symbol and indicator of prosperity. Even today the livestock enterprises are important for the economic development of hilly region.

In terms of fodder availability mainly in the plain districts of Uttarakhand fodder crops are cultivated Udhamsingh Nagar and Haridwar district has more than 10000 ha. area under fodder crop. In terms of grazing land availability the hill districts particularly in the higher Himalayas grazing lands known as Bugyals are predominant. The district of Pithoragarh, Chamoli, Pauri Garhwal, Almora and Bageshwar have more than 20000 ha. of grazing land available. With the introduction of cross breed, mix cross bred indigenous cattle are found in the state with Dehradun, Nainital, Udhamsingh Nagar and Haridwar having more than cross bred cattle availability. Among the buffalos improved varieties are present in all the districts of the state with Udhamsingh Nagar, Haridwar and Dehradun leading in numbers. Amongst the sheep's improved varieties are found a maximum in Uttarkashi district. Goatary and poultry are also very popular in all the district of the state (**Annexure Table 2.16).** An average of 2.35 liters per household per day production of milk has been recorded which is much better than the national

average of 1.47 liters per house hold per day. The marketing of milk is done through SHGs cooperatives and dairies **(Annexure Table 2.17)**

FISHERIES

Fish is a nutritious food product it not only helps in eradicating malnutrition but also helps in creating livelihood opportunities for the rural folk. The state of Uttarakhand is developing a fisheries policy in this regard so that fisheries can help in economic growth of the State. The State of Uttarakhand has a large variety of fish species and various types of water sources both natural and manmade. Aquaculture can be a source of livelihood for the locals by providing opportunities for angling and ecotourism also. The length of major rivers in the State is about 2686 km. There are a number of natural lakes in the higher reaches of Garhwal Himalayas and a number of lakes in Kumaons middle Himalayas. The area of these lakes is about 300 ha. The State is also known for world popular Trout and Mahaseer fish which are an angler's delight. The State at present is producing fish seed of an amount of Rs. 3.5 crores. These seeds are then given to the fish growers and also released in various water sources.

Cold water fisheries: The fishes of commercial importance in cold water are Mahaseer, Trout, Snow Trout and Mirror Carp only and are present in number of lakes and rivers of the State. The Mahaseer, Trout, Snow Trout and Mirror Carp are highly suitable fish species for Sport / Game/ Food fisheries in the hills, and have potential to attract a large number of tourists. The state has cold water streams of about 2686 km. length which is suitable for food and game fishes like, Snow Trouts, and Mahaseer. At present the production of these fishes from the streams is very poor and are not well managed from recreational and conservation point of view. If developed scientifically, this is likely to generate considerable revenue for the state Govt. through promotion of tourism related to game fisheries. In the recent years the population of Mahaseer has depleted drastically in the state. To maintain the natural stock of Mahaseer species, there is a need to launch conservation programs by the department.

Natural lakes: Uttarakhand is having thirty one natural lakes in the state covering an area of about 300 ha. the fishing rights of most of the lakes are under the control of the Forest Department (in some cases the Municipal Corporation). The production of fish from these lakes is merely 6 mt annually which could be enhanced upto a level of 20 mt through appropriate Scientific and Management Policy. Average fish productivity from these lakes is very low. For enhancing the same, efforts are required from NRCCF (ICAR) situated at Bhimtal, Nainital.

Reservoirs: The State is endowed with seven large sized man- made reservoirs in Udhamsingh Nagar district covering an area of 20,075 ha. The Sharda Sagar reservoir is the largest reservoir with 6880 ha. water area and Nanak Sagar reservoir with an water area of 4084 ha. is the second largest. The average fish productivity of these reservoirs is of order of 50 kg/ ha. as per the study conducted by BABCONS in the recent past, the production level from these reservoirs have further gone down considerably. These reservoirs are owned by Irrigation Department and extension services are provided by the Fishery Department. There is an urgent need for formulation of stocking policy and aqua culture technologies through scientific stock management of these reservoirs for exploiting these extremely precious resources in the State.

There are a total of 1545 ponds/ tank covering an area of 604 ha. in the state and also there are 7 reservoirs covering an area of 20075 ha. in Udhamsingh Nagar District which are used for fisheries production. The yield per tonne per ha. in reservoirs is 0.079 tonnes per ha. The yield from ponds and tanks is 2.92 tonne per ha. These ponds and tank are basically community owned. The production of fish per annum is 2811 mt. for the whole of state. There is a scope for increased in productivity and it can be taken up a livelihood activity for Self Help Groups (**Annexure Table 2.18).**

Processing, canning facilities, quality labs, research centers and reefer vans etc. are required to make this into a potential revenue generator for the state. The ‘unique selling proposition’ of cold water fish is that it has a big export potential.

AGRICULTURE MARKETING, CREDIT AND PROCESSING

Agriculture marketing today means more than linking the producer with consumer, it includes creation of favorable economic environment for farmers to enthuse him to grow more and improve their income. Towards this end, Market Yards have become instrumental for higher remuneration to them through proper weighing, cleaning, and grading and better price realization of their produce. The farmers look forward to a regulated market yard as a dependable infrastructure to further their economic goal. The advantages of a regulated market yard system are immense and wherever such a system exists, it has been so widely appreciated that today the farmers consider it as a boon to them where they can confidently sell their produce and get an appropriate return for the quantity and quality they produce year after year.

Market yard are classified into three categories according to the mode of sales i.e., primary, secondary and terminal. Sellers of a primary market yard mainly farmers of the command area; in case of secondary market yard, farmers and traders beyond the command area bring their commodities for marketing.

A primary market yard should be suitably located for easy accessibility and have provisions to sell produces grown by farmers in the command area and have sundry shops to meet the immediate requirements of a farmer when he comes there to sell his produce. It should also have facilities for the traders, commission agents and other market functionaries to facilitate easy trading and smooth price realization to the farmers. The facilities should match to the functional requirements of the commodities to be traded and also to the surrounding locality where the market yard is to function. Secondary and terminal market yards are located in semi urban and urban areas and the facilities are planned for the commodities for the commodities to be traded.

Market yards in Uttarakhand : Uttarakhand has adopted the “Krishi Utpadan Mandi Act” on 27th December 2000 and Uttarakhand Krishi Utpadan Mandi Parishad (UKUMP) is an apex body of the market committees. Regulated to market yards at convenient production and marketing centre’s provide the ideal platforms for marketing and selling the agricultural produce and related products at remunerative price. Marketing and

selling of agricultural produce and related products at remunerative prices are one of the most important aspects necessary for sustainable agriculture. To achieve this objective, availability of adequate and appropriate marketing and storage infrastructure is necessary.

Direct marketing in agriculture : Farmers come into direct contact with the consumers and receive the payment directly from the consumers. This marketing strategy in agriculture enables the farmers to sell their produce to the processors or bulk buyers at lower transaction costs and may be at better price than what they get from intermediaries or from the wholesale market.

Agriculture Produce Marketing Committee (APMC) Act and its amendment: The wholesaling of agricultural produce is governed by the agricultural produce marketing act of the State Govt. once a commodity is notified, the APMC act makes its transaction mandatory in the regulated market. The market fees charged on value of produce sold (Mandi tax) does not reflect the actual operation and maintenance cost of the wholesale market but seen as another tax on agricultural commodities. The focus of the APMCs has been on regulation and not development of markets for the local products, introducing grading and encouraging local processing etc. The APMC have also not played any significant role in bringing better market information to the farmers. The operation in APMC creates monopolies of the State Marketing Board/ Market Committees in regulation the wholesale market by not allowing direct marketing, often leading to cartelization of a few brokers or aartis and non- transparency in price setting to the disadvantage of the farmers. The monopolistic operation of the market committee also acts as a disincentive to private sector in setting up processing unit for value addition, as they do not have direct linkage with the farmers, which would otherwise help them in getting raw materials of assured quality and quantity. In tune with liberalization, the policy framework should give farmers the liberty to freely market their produce anywhere including direct marketing to processors or other buyers without paying any market fees. However, in case they want the facilities of the market yard,

they have to pay a service charge, which should be sufficient to cover the operation cost of the market committee.

Storage Godowns : Storage godowns ensure storage of agricultural produce in a scientific manner resulting in longer shelf life, reduction in post harvest losses, preservation in quality of produce, prevention of distress sale, maintenance of stability in price and assured availability all through the year, promotion of pledge financing and marketing credit and introduction of a system of warehouse receipt in respect of agricultural commodities stored in godowns, etc. It also provides capacity required for buffer and operational stock of food grains to maintain PDS. FCI also has its own storage capacity of about 60,126 MT in the state.

Cold storage **:** Cold chain facilities is one of the important forward linkages of agricultural activities and cold storage provides infrastructural facility for reducing post harvest losses in respect of horticultural / floricultural / perishable agricultural produce i.e. fruits, vegetable, species. Besides, dairy products and forest produce can also be stored in a cold storage. Cold storage facilities ensure quality and extension of shelf life, prevent distress sale and glut situation during harvest and scarcity during off season, and provide marketing flexibility, thus, providing remunerative prices to farmers. Potato, tomato, vegetables, fruits like apple, mango, species, dairy products, fish, meat etc. are the major commodities in the State requiring cold storage facilities. Besides, marketing and transit centers acting as links between production and consuming point also have greater demand for cold storage facilities. Cold chain infrastructures under integrated production and post harvest management/processing system with upgraded technology are encouraged.

Processing: Uttarakhand State does not have adequate units to undertake the processing of Horticulture and agro – based products though there is ample potential for such units. Cultivation and processing of white buttons mushroom, floriculture under control conditions, micro-propagation of plants through tissue culture, species, processed fruits and vegetables etc. are some of the potential activities which can be taken up in State. Only a small quantity of fruits and vegetable harvested are commercially processed.

Micro Credit : The State of Uttarakhand has a total population of about 85 lakhs most of which resides in rural areas. As per the recent BPL survey 2002 carried out, out of 13.10 lakh rural households in the state 6.21 lakh households belong to BPL families which constituted 47.42% of the total households.

After formation of Uttarakhand State, vigorous efforts have been made to promote micro finance with active association of NGOs' Banks, Government Department through various schemes. As at the end of October 2007, about 38000 SHGs have been formed in the State and about 23000 SHGs have been credit linked with Banks. The SHG movement, though has reached each and every district of the State, the spread, however, is uneven and the progress in promotion and credit linkage of SHGs is not encouraging in Haridwar, Chamoli, Pauri Garhwal, Rudraparayag, Champawat and Pithoragarh districts.

CHAPTER -3
STATUS OF RAINFED AREAS IN THE STATE

POSITION OF RAINFED AREA IN THE STATE

On the basis of various climatic factors, influencing crop productivity, the State's agriculture in hill is divided in four climatic regions.

A.	Lower hills, rainfed	Below 1000 m above msl
B.	Mid hills, rainfed north aspect	1000-1500 m above msl
C.	Mid hills rain fed south aspects	1000-1500 m above msl
D.	Mid hills, irrigated	1000-1500 m above msl
E.	High hills, rainfed north aspect	1500-2400 m above msl
F.	High hills, rainfed south aspect	1500-2400 m above msl
G.	Very high hills	Above 2400 m above msl

Though the rainfall pattern vary from district to district and also with altitudes and slopes, the average annual rainfall experienced in Uttarakhand is 1500 mm. In the 71 development blocks of hill being fully rainfed, the monsoon behavior like onset/ duration of precipitation, intensity of precipitation and withdrawal of monsoon etc. cast great effect on crop production. As per the Annual report of Uttarakhand Organic Commodity Board it has been found through analysis of rainfall pattern during last many years that:-

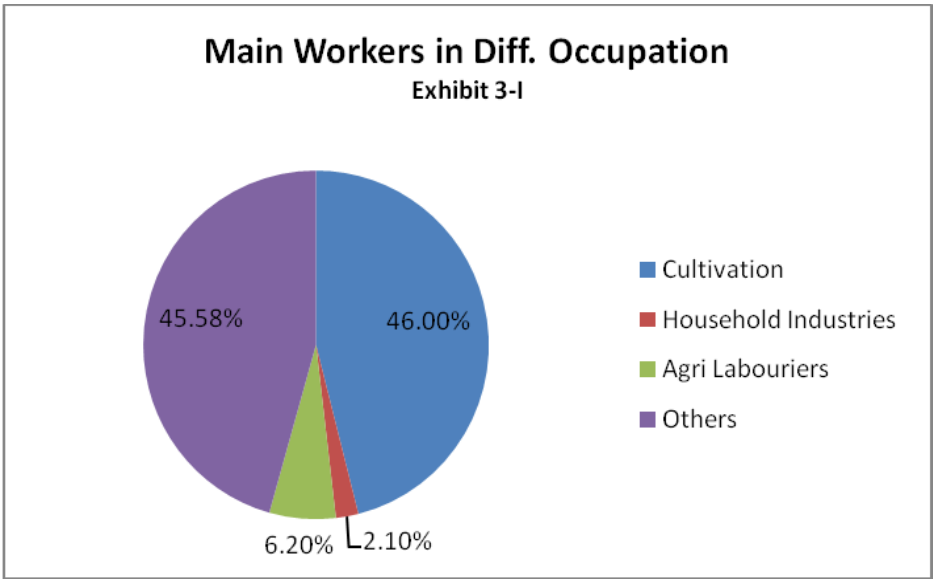
- Rainfall in monsoon is generally deficient and erratic over the years.
- Peak rainfall is shifting from the mid July to mid August.
- The total number of rainy days is shrinking.
- During Rabi Season, rainfall was erratic/ negligible over the years.
- Peak rainfall in Rabi season is shifting towards harvesting season.

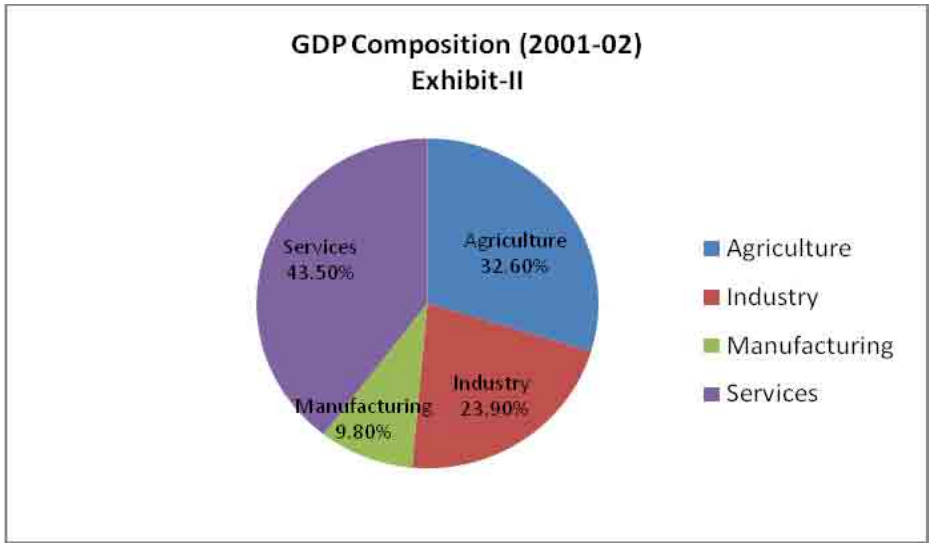
Of the total States area 9.38% is the net rainfed area under agriculture, 4.79% area is under Horticulture, 24.72% area is under the other categories i.e., areas under non agriculture Use (NAU), culturable wastelands, pasture lands etc. Almora, Bageshwar,

Champawat, Dehradun, Pauri Garhwal, Pithoragarh and Tehri Garhwal districts have more than 10% net area under rainfed agriculture. Udhamsingh Nagar, Haridwar and Palin areas of Nainital District have mostly irrigated agriculture **(Annexure Table 3.1).**

LIVELIHOOD ANALYSIS IN RAINFED AREAS

The work force engaged in agricultural activities is 58.39 percent of total work force. The share of female work force in total work force is 36.31 percent. The occupational distribution (2001 census) indicates that the share of cultivators was predominant in occupational structure. The occupational structure of main and marginal workers is given in following Exhibit 3-I and 3-II.





Main workers are those workers who had worked for the major part of the reference period i.e., six months or more are termed as main workers. Marginal workers are those workers who had not worked for the major part of the reference period i.e, less than six months are termed as marginal workers.

The proportion of marginal workers is 1/4th of total work force and a higher proportion of marginal workers are engaged in agriculture sector. It indicates that development programs should be devised in such a manner so that adequate employment opportunities on sustainable basis are provided to the marginal workers. It would help in reduction of poverty level as also arresting in migration of labour force from rural to urban areas.

(Table 3.a) District wise details of main and marginal workers

District	**Main workers**	**Marginal workers**	**Total workers**	**% age of marginal workers to total workers**
Uttarakashi	114842	21062	135904	15.50
Chamoli	96900	67829	164729	41.18
Tehri Garhwal	181205	83510	264715	31.55
Dehradun	336504	63971	400475	15.97
Pauri Garhwal	171647	98224	269871	36.40
Rudraprayag	76068	25965	102033	25.45
Haridwar	353556	71707	425263	16.86
Pithoragarh	124062	74647	198709	37.57
Almora	204649	87533	292182	29.96
Nainital	220995	57952	278947	20.78
US Nagar	300141	92015	392156	23.46
Bageshwar	85613	33231	118844	27.96
Champawat	56165	34043	90208	37.74
Total	**2322347**	**811689**	**3134036**	**25.90**

The district which are having high proportion of marginal workers than State average (25.90%) are Chamoli, Tehri Garhwal, Pauir Garhwal, Almora, Pithoragarh, Bageshwar and Champawat which indicates that employment opportunities on sustainable basis needs to be generated in these districts particularly under wage employment. In addition to this, the no. of unemployment persons registered in Live register were 4.14 lakh (2005-06) and for them also employment opportunities on sustainable basis needs to be provided.

There are 16.14 lakh non workers in the age group of 14 to 16 years. Assuming that 11.20 lakh (80%) of non workers would be from age group of 18-60 years, it would not be possible to absorb this work force in agriculture sector alone. Major portion of the non workers can be gainfully employed in Non Farm sector activities which are not only labour intensive but also give rise to wage / self employment in rural areas and will be helpful in arresting migration to urban areas. Of the 16.14 lakh Non workers, 12.18 lakh are women constituting 75.5% of Non workers. In order to provide gainful employment to such large number of women, it calls for focusing our efforts on making schemes most suitable to women, especially household industry.

(Table 3.b) Classification of Workers and Its Percentage to Total Workforce

					Numbers in Lakh
Type of workers	**Main**	**Marginal**	**Total**	**Male**	**Female**
Cultivators	10.67 (34.0)	5.03 (16.1)	15.7 (50.01)	6.84 (21.8)	8.86 (28.3)
Agricultural laborers'	1.43 (4.6)	1.17 (3.7)	2.6 (8.3)	1.90 (6.1)	0.69 (2.2)
Household industry	0.49 (1.6)	0.23 (0.7)	0.72 (2.3)	0.44 (1.4)	0.29 (0.9)
Others	10.63 (33.9)	1.69 (5.4)	12.32 (39.3)	10.78 (34.4)	1.54 (4.9)
Total	23.22 (74.1)	8.12 (25.9)	31.34 (100)	19.96 (63.7)	11.98 (36.3)

MAJOR PROBLEMS AND CONSTRAINTS OF AGRICULTURE PRODUCTION IN UTTARAKHAND

Like elsewhere in Indian in the state of Uttarakhand, the farmers also adopt two types of agriculture practices i.e. the rainfed and the irrigated. Cereals are emphasised in the irrigated agriculture and two crops are taken in an agriculture year. However in the rainfed system millets, pulses and tuber crops are grown along with cereals and other oilseeds. Mono cropping is a common practice in the irrigated areas. Contrary to this mixed cropping is common in rainfed areas. Mixed cropping, practiced in the hilly region helps in maintaining the crop diversity and reduces the risk of environmental and business uncertainty.

The land use pattern of crops in Uttarakhand reflects a declining trend in the acreage of conventional crops like barley and at the same time increase in non-conventional crops like soyabean and other vegetable crops. Farmers are gradually shifting from low value crops to high value crops. The decline in the area under traditional crop has been relatively higher in the Kharif season as compared to Rabi season. During the kharif season the farmers are putting a sizable land area under the production of offseason vegetables. The land under production of traditional kharif crop has declined at 10 percent as against 8 percent for rabi crop. Despite the small holdings most of the farmers who are relatively well connected to the market and have adequate irrigation facility have opted for a shift in production from low value food grains to high value commercial crops particularly vegetable and pulses.

The distinct geographical features of Uttarakhand with dominantly mountainous part, coupled with Bhabar & Terai regions makes it a unique region where it is possible to grow varieties of fruits, flowers and other horticultural crops. With altitude gradient varying from 250 meters above sea level to 7187 meters above sea level, combination of geographical features determines the climatic condition favourable for many fruit crops, consequently, nearly all types of fruits ranging from tropical to temperate fruits can be grown easily.

- Uttarakhand has about 13 percent of its geographic area under cultivation out of which about eighty percent of the land does not have assured irrigation facilities thus making agriculture crops totally dependent on vagaries of nature.
- However in these dry lands fruit plants can be grown successfully provided agro-climatic and soil conditions are right.
- Similarly in the irrigated land cultivation of off-season vegetables, flowers and seed production of flowers and vegetables can be more remunerative.
- This region also offers good potential for growing certain specialized crops as Mushroom, olive, Asparagus, spices, ornamental flowers which not only hold high commercial value but also have export potential value as well.
- Floriculture: Gladiolus, tuberose, lilies, tulips, carnation, begonias, dahlias, roses.
- These horticulture crops not only improve per unit returns but also help in protecting the environment.

During the past main emphasis of nearly all- horticultural schemes has been towards increasing the area and production of fruits and vegetables. Marketing and post harvesting management have received a very negligible attention.

Analysis of Agriculture and Horticulture produce in Uttarakhand

We have used a two dimensional matrix for the Agriculture and Horticulture produce of the state. The matrix is an interpolation mapping of the Agriculture and Horticulture produce of the state based on their relative economic returns as well as their relative market potential. The analysis is based on the relative returns in the present conditions. The state could use the matrix to prioritize on the commodities to be focused so as to generate more revenue for the farmers and the state. The various produce in this matrix have been categorized as Stars, Cash Cows, Under Dogs and Question Marks, which are elaborated after the matrix.

After the matrix analysis we have done a SWOT analysis for the overall farming scenario of the state.

(Table 3.c) Two Dimensional Matrix for Agriculture Produce in Uttarakhand

MARKET PROSPECTS		
HIGH	**QUESTION MARKS** • Floriculture • Tea • Sericulture • Apiculture • Organic produce • Mushroom cultivation • Medicinal and Aromatic plants	**STARS** • Horticulture (fruits) • Off season vegetables • Potato • Seeds • Basmati rice
LOW	**UNDER DOGS** • Coarse Grains (Mandwa, Oat, - Sawan Fafar, Uggal, chua, etc.) • Hills cereals production • Fisheries	**CASH COW** • Cereals • Pulses • Oilseeds • Sugarcane • Spices • Dairy
	LOW	HIGH
	ECONOMIC RETURNS	

The above matrix is an interpolation of the agriculture produce in Uttarakhand based on their relative economic returns as well as their relative market prospects. The analysis of returns is based on the present conditions. Whereas the state needs to analyze this matrix and should prioritize on the commodity to be produced so as to generate revenue both for the state as well as the farmers. The various produce of the state has been categorized as stars, cash cows, dogs, and question marks.

Star: Stars are those produce which have relatively high returns for the producer as well as have high market growth prospects. The rate of return are higher than compared to other crops, also per unit costs are reducing due to economies of scale. Off-season vegetables are one of the star performers within this category. Due to its varied agro climatic conditions the state is able to produce off-season vegetables, which have high demand in the plains as well as city markets. The agro-ecological diversity also promotes cultivation of large number of subtropical as well as temperate fruits, which have high economic value as well as better growth prospects in future. Similarly the state has a unique resource in terms of medicinal and aromatic plants which at present is a trade worth fifty crores, has very high market prospect, it has the potential to be a

star if developed. The Delhi market itself has a demand of about 500 crore worth of medicinal plants. The other commodity in this category is potato, which is demanding a premium in the market the potential is increasing up both in terms of consumption as well production. Efforts should be made to further the developments and create avenues for better and sustained results.

Cash Cows: Cereals (excluding basmati rice), pulses, oilseeds and other cash crops like sugarcane, spices etc can be termed as cash cows because of their assured market as well decent returns compared to other coarse grains as the market of these crops are saturated and the demand has is expected to remain constant (changing only with rise in population). The need for marketing of these produce are less because they classify as necessity and their demand elasticity is relatively less compared to the horticulture produce.

Efforts are required for them to develop further to maintain their position both in terms of productivity and production. Value addition to these produce could be a resource for increasing revenues.

Under Dogs: Due to the subsistence nature of agriculture, lack of extension services and risk aversive behaviour of farmers, many of them (farmers) in the state grow coarse grains, which is produced for home consumption. The market for these produce are almost negligible and hence the returns (if there) area also abysmally low. There is a need for finding scope of value addition for these products so that they become economically viable for the farmers. By this way the biodiversity could be maintained here rather than going for only few crops there by posing a threat to the environment.

Focus on development of various crops, which still have an unrealized potential, creating market demand by propagation of their intrinsic properties. Some crops which have a very low productivity and market demand should be dissuaded in lieu of other crops for cultivation.

Question marks**:** The international market for floriculture is expanding but the domestic market at present is very small. But in the years to come the floriculture industry is

poised for an expansion. Similar is the case for organic produce as well as honey. The market for these produce are promising and the ability to harness them will depend on the states preparedness as well as infrastructure support to these industry. All these aspects classify floriculture, organic produce, honey in the category of question marks.

The focus of development should be to turn the items in the question marks to Stars and Cash Cows in over the period of next 5-10 years.

Swot Analysis of Uttarakhand Agriculture

Strengths:

- The state falls in agro-ecological zone 4 and 11. In addition to this the varied topographical conditions provide the state with a unique combination of agro-climatic condition suitable for a plethora of flora and fauna.
- Due to the above condition the state has rich crop diversity which includes a large number of cereals, pulses, oilseeds and other cash crops like sugarcane.
- The state has a huge potential for diversified horticulture development in the state, like Tea, Sericulture, Medicinal Plants and Herbs, mushroom, apiary, etc.
- Traditional method of cultivation in most of the part of the state has lead to lesser exploitation and hence lesser degradation of the natural resources.
- The area of Plain, Terai and Bhabar is characterized by rich soil and good irrigation facility. These areas have excellent agriculture and can be termed as the granary of the state.
- The districts of Haridwar, Dehradun, Udhamsingh Nagar are famous for its basmati rice and have a presence in the national as well as international market.
- The Pantnagar University of Agriculture Science & Technology forms the backbone of the states R&D and education in the field of agriculture.
- The state has an existing set up of research stations KVKs and KGKs which can be geared to meet the states need.

Weakness:

- Lack of sub-regional and ecological approach to agriculture planning and management.
- Fragility of ecosystem.
- Steep slopes and shallow soils in the hill leads to increased erosion leaving behind less productive soil for crop production.
- Small and scattered land holdings lead to economical unviable agriculture. More than seventy percent of the land holding are less than one hectare in size and the average per-capita land holding is about 0.91 hectare making farm mechanization difficult.
- Limited area under irrigation. Only about ten percent of the cultivated land in the state is irrigated the rest is rainfed. Even in this thirty percent there is a stark variation in the amount of land under irrigation in different districts. The rainfed agriculture restricts the number of crop taken in a year and thus reduces the cropping intensity of the state.
- Due to difficult terrains and fragile ecosystem there has been inadequate infrastructure development in the area. This has direct bearing on the development of agriculture development.
- Further, lack of post harvest technology as storage, grading, processing leads to lack of interest/initiative among farmers to grow high value crop, and thus restricting itself to subsistence farming.
- Lack of proper market linkage leads to increased number of intermediaries which results in low value realization to the producer.
- Lack of supply of inputs at the right time and in right quantity coupled by inadequate extension work leave the farmers to practice traditional agriculture
- Continued vicious cycle of low production, low productivity and low input supply unawareness of new technologies and lack of extension support leaves the farmer

practicing the conventional agriculture which is not sufficient for him to sustain his livelihood.

- Socio-economic constraints.

Opportunities:

- The present yields of almost all the crops are very low. There is an immense scope of increase in productivity through quality inputs (e.g. High-yielding varieties, assured irrigation etc.)
- As mentioned earlier about 55% of the cropped area in the state is rainfed. Opportunities lie in the state in harnessing the rainwater and watershed development leading to increased area under assured irrigation. This would subsequently increase the cropping intensity of the state. Harvesting the rainwater and subsequently storage at higher elevation would help providing life saving irrigation. The stored water could be utilized through gravitational force to low lying areas.
- Areas under rainfed agriculture can be shifted to cropping of oilseeds and pulses because they require less water.
- Diversification of agriculture: Variation in altitude and microclimate offers natural advantage for crop diversification. Less remunerative crops can be replaced /alternated with more remunerative crop on a rotational basis. This will take care of sustainability as well as economic viability.
- Production of high value field crops. Promotion of cultivation of these crops will fetch higher prices to the farmers and hence higher net returns even if the production is low.
- Value added products: In regions where it is not feasible to grow high yielding variety or it is not suitable for diversification of crops, value addition to the existing produce can be done. For example, the hills form the natural habitat for growing crops like finger millets, barnyard millets, amaranthus, buckwheat etc. these crops are rich in various nutrients which are essential for proper growth to the body. A number of

products can be prepared from these crops to provide nutritional security. Research on nutritional aspect and value addition at local level would on one hand result in sustainable agriculture and on the other hand help in checking migration.

- Integrated Nutrient and pest management can help increase yield and decrease the loss due to insects and diseases.
- Popularizing zero tillage, minimum tillage, surface seeding would on one hand reduce the cost of cultivation and at the same time make agriculture more sustainable as through reduced erosion.
- Developing hill specific technologies: Developing of low cost portable as well as efficient tools is needed to augment the production in terraced field and other hilly regions.
- Huge scope for getting value and development of sustainable agriculture by promotion of Organic Farming. Use of bio-fertilizer in place of synthetic fertilizer can help in restoring the humus content of the soil and hence can prepare the state in a big way to take up organic farming.
- Huge scope of bio-compost production in the state, it has capacity to export a major quantity of produce.

Threats:

- Increased population and subsequently decreasing per capita availability of land may lead to unsustainable practices like monoculture, increased used of fertilizers and plant protection chemicals.
- Market oriented agriculture may lead to unsustainable practices. So it would be prudent to take care of the aspect of sustainability while deciding the cropping pattern of the state.
- Continuous rice wheat cropping system may lead to depletion of humus and other soil nutrients.
- Unavailability of agri-inputs on time. Since the terrains are inaccessible so non-availability of quality inputs may hamper the production productivity.

- Development of the region specific technology may remain in the lab if it is not disseminated through proper extension work.
- Lack of market support will further de-motivate the farmers from taking initiative on the production side.
- Remunerative crops in horticulture may push the farmer to go in for the same. This may further decrease the per unit land available for agronomic crops.

ANALYSIS OF ISSUES FOR DEVELOPMENT OF AGRICULTURAL CROPS

With the immense bio-diversity and production capabilities the state has not yet leveraged its potential to increase revenue generation through focused cultivation of its diverse crops. Increased revenue generation will have direct impact on the rural development. Some issues which need to be addressed are:

1. Fragmented and scattered land holdings - Land holding pattern in the state – The State has nearly 70 percent of land holdings, which are sub-marginal less than 1 hectare, which is nearly 27 percent of the cultivable land. While 26 percent of land holdings are between 1- 4 hectares in size, which is nearly 51 percent of the total cultivable area; and above 4 hectares of land is held by around 3 percent, which is nearly 22 percent of the total cultivable area. Land consolidation is required for economies of scale in crop production.
2. Low productivity of crops – The productivity of crops especially of the hills is low, as they are mostly relied on for subsistence farming and is mostly rain-fed. The crops grown are also not agro-climatically best suited for cultivation in the area. What is required is micro-crop planning best suited to the particular area's micro climate.
3. Low penetration of extension services and research - The extension services, especially in the hill areas has very limited reach. The lab to land transfer to technology is hardly taking place. Inputs like seeds, pesticides, fertilizers, etc. are also difficult to access. Focused impetus is required for the increasing the reach of the extension services and research to the farmers all over the state.

4. Irrigation facilities are poor – Hills mostly rain-fed. Focused action plans along with the watershed development made for optimizing the resources.
5. Information, transportation and communication infrastructure lacking. This infrastructure needs to be developed with public and private sector investments.
6. Lack of Markets and marketing facilities and infrastructure. – Focused development of supply-chain of produce from village markets to consumer is needed.
7. High Migration from the state: A big number of able bodied men leave the villages for work in towns, army etc. leaving women to do most of the household work as well as cultivation. This leads to subsistence farming with the least amount of effort.

ANALYSIS OF ISSUES IN AGRICULTURAL PRODUCTION

- In Uttarakhand State, agriculture covers 7.81 lakh hectares. Out of which Hill regions covers 4.43 lakh hectares around 56.8 percent and the plain region covers 3.37 lakh hectares 43.2 percent. Irrigated areas in the Hills are around 10 percent whereas in the plain areas it is around 85 – 90 percent.
- There are nearly 9.26 lakh farmers in the state out of which nearly 8.16 lakh farmers are small & marginal farmers, which is around 88 percent of the total farmers. Small and marginal holdings of these farmers adversely affect production of agriculture crops in the state.
- Production of cereals in the state is around 8.64 lakh M.T. & in plains is around 9.53 lakh M. T. Productivity in the state cereals in Hill region is around 13.05 quintals/hectare and in the plains is around 28.4 quintals/hectare. The productivity is more than double in plains than in Hills.
- Requirement of the cereals is around 14.82 lakh M.T. whereas the production is around 18.18 lakh M.T. The production of pulses and oil seeds around 0.23 lakh MT & 0.18 lakh MT respectively where as requirement of pulse & oil seeds are around 2.74 lakh MT & 2.08 lakh MT respectively. Production of coarse cereals is done on

2.21 lakh hectares producing 3.01 lakh MT with a productivity of 13.61 quintals / hectare.

- Farming in hills is varied to that of plains. It requires set of package of practices, which are area and crop specific.
- Area under cultivable wasteland is around 3.22 lakh hectares.
- Overall cropping intensity in the state is around 161%.
- In the plain areas there is excessive use of fertilizers & mono cropping resulting in low humus content in the soil. Thereby affecting the physio – chemical & biological properties of the soil. In hills, excessive slope washes away top soil reducing humus content of top soil thereby reducing the water holding capacity of the soil.
- Excessive use of fertilizers and in the plains agriculture increases the cost of production of the crops resulting in lower profits to the farmers.
- Lack of research in traditional crops such as Jhingora, Ramdana, Rajma, Fafar, Oggal etc in the hills, which have a substantial growth potential.
- Seed replacement rate have been negligible in hills though few varieties of major crops have been developed by lab. There is a paucity of certified seeds in the state available to the farmers.
- Lack of quality control labs in the state, which could check the quality of pesticides, fertilizers etc.
- The state lacks in quantity and quality of bio-fertilizers to augment the farming in the state.
- Lacks in the marketing facility of the produce.
- Loss of crops because of natural calamities
- The diversity of varied agro-climatic conditions in the state is not tapped as yet.
- Women work force in agriculture constitutes nearly 80 percent of the workforce.
- Lack of suitable farm equipment and machinery for hills.

ANALYSIS OF ISSUES IN LIVESTOCK MANAGEMENT

Agriculture in Uttarakhand is interlinked with animal husbandry and forestry to form a production system. Agriculture & Animal Husbandry contribute two-third of net domestic output from commodity producing sectors in Uttarakhand. In Uttarakhand, small and marginal farmers have a strong dependence on livestock sector as it is not only a source of milk and draught power, but it's by products, such as, manure, hides, bones, etc help in supplementing farm income.

While Uttarakhand has a very high population of animals the productivity is very low. Most of the grazing pastures are in the hilly districts. Generally, the cattle stays in small sheds, these sheds have no concrete floor and usually have tin or thatched ceilings. During the daytime animals graze in the forests, they are also given animal feed prepared by the farmers. In the plains animals are fed grass mixed with hay and they are kept in the tin sheds.

The Uttarakhand Agriculture Policy spelt out the priorities as:

- Programs for artificial insemination for breed development of animals.
- Ensure availability of required investment and expansion & strengthening of medical facilities to encourage animal husbandry.
- Provide solutions to increase productivity of local animals.
- Special attention on Angora rabbit breeding, and strengthening of its distribution system.
- Promote dairy by expanding milk processing capacity, expansion of intensive mini dairy and strengthening of distribution structure.

Fodder Management: Conservation and scientific management of pastures spread over an area of 1.84 lakh hectares on high altitudes, also measures to check uncontrolled grazing on the same.

- Plantation of feedstock trees like shatoot, Bhimal, chamlai and grasses like clover, talfatue.
- Mixed cropping will be emphasized in the villages.

- Production of barseem, barley, oat at the plains of the mountains.
- Cold tolerance varieties will be included in the cropping pattern.
- Cultivation of grass and pulses (intercropping on orchards and on field boundaries).
- Establishment of fodder bank and ready -to- eat type of concept.

Health Care **:** In Uttarakhand most of the districts have health infrastructure, which is grossly inadequate. The infrastructure available in need for immediate attention to be fully functional, and there is an urgent need to have more health centers near the villages, so that the immediate medical attention is available for the animals. For example there are 23 veterinary hospitals functioning in the Dehradun district. These veterinary hospitals are wide spread in the District. Places like Chakrata, Tyuni, Lakhamandal, Kalsi, Sahiya, Lakhwara, Vikasnagar, Harbartpur, Sesambara etc. are all connected by road.

In spite of the present set up, livestock markets do not have any veterinary facilities. Animals in Uttarakhand are very susceptible to epidemics. Diseases, such as, Foot & Mouth disease (FMD), Haemorrhagic Septicemia (HS), Black Quarter (BQ), Gastro Intestinal Parasitism and Schistosomiasis are potential threats. Since the livestock markets are a large gathering of animals, preventive action needs to be taken. In most districts the animal health infrastructure is grossly inadequate.

ANALYSIS OF ISSUES RELATED TO INTEGRATION OF AGRICULTURE AND FORESTRY:

Subsistence agriculture is the prime source of livelihood for more than 80 percent people of Uttarakhand. In this region, terraced slopes covering 85 percent of the total agricultural land are generally rain fed while the valley covering 15 percent of the area are irrigated. Agriculture of this region is very complex as it is interlinked with crop husbandry, animal husbandry and forest to form a production system. Inaccessibility, environmental heterogeneity and ecological fragility favored evolution of subsistence production system sustained with organic matter and nutrients derived from the forests.

The forests cover 63.44 percent of the total area of Uttarakhand. The forests constitute the most important natural resource in Uttarakhand. They form an eco-system and the protection of forest has remarkable contribution in the process of economic development and environmental stability.

The locals of the region are dependent on forests for employment and resources like fuel wood, timber, fodder, medicinal herbs etc. But rising population and increasing needs have led to indiscriminant exploitation of forest resources and hence to depletion of forests. Therefore, there is an urgent need to take action towards maintenance and rejuvenation of forests without harming the livelihood of local people.

Evaluation of present state of agriculture and forest lead one to the conclusion that strategies need to be developed to reach a balance between agriculture and forests. Also the strategies or action plan is required to ensure fulfillment of both ecological and economic needs. The forest wastelands and forest areas suitable for agro forestry should be utilized for agriculture to increase the revenues and the employment opportunities for the states rural population.

So far there has been a dichotomy between agriculture sector and forests. According to Government policy, at least 60 percent of the total area is required to be under forest cover. Rest 40 percent is only available for habitation, cultivation, grazing land etc. As the rising population is putting more pressure on agriculture, it is necessary to increase the crop production. Since the area available is limited, one of the options can be to integrate agriculture with forests in the village common lands. That is, coexistence of agricultural crops with forests.

A few suggestions for the integration of agriculture and forests are -

1. Alley cropping: In alley cropping, an agricultural crop is grown simultaneously with a long-term tree crop to provide annual income while the tree crop matures. Fine hardwoods like walnut, oak, etc. are favored species in alley cropping systems and can potentially provide high value lumber or veneer logs. Nut crops can be another intermediate product.

2. Forest Farming: In forest farming, high-value specialty crops are cultivated under the protection of a forest canopy that has been modified to provide the correct shade level. Crops like medicinal plants and herbs, spices, culinary products, special varieties of mushrooms, decorative ferns, etc. could be effectively grown without disturbing the eco balance. Forest farming provides income while high-quality trees are being grown for wood products. Some products, especially medicinal and botanical, can have tremendous economic value, while others provide a lower but steady supplemental income.
3. Silvipasture: Silvipasture combines trees with forage and livestock production. The trees are managed for high-value saw logs and at the same time provide shade and shelter for livestock and forage, reducing stress and sometimes increasing forage production. In plantations of conifers or hardwoods for timber, managed grazing provides added products and income.
4. Horticulture: The climatic conditions of the region are suitable for plantations like apple, walnut, apricot, litchi etc. The fruit plantations can serve dual purpose of maintaining forest cover and at the same time provide employment and economic benefits to farmers.
5. Fodder management: This region is home to a large number of domesticated animals. This reflects the huge fodder requirement of the region. Technology has been developed for the production of erect grasses like hybrid Napier, Setaria spp. and Desmodium coloratum on cultivated field terrace risers, degraded and steep sloppy lands, wet land sites etc. Pangola grass is the most suitable grass species under Pine and Deodar trees.

ANALYSIS OF ISSUES RELATED TO IRRIGATION

Most of the agriculture in the state is rainfed. The net irrigated area of the state stands at 339769 hectares (1996-97). The net irrigated area to net sown area for the state is 45%. At present, the sources of irrigation in Uttarakhand are canals, wells, Rahat, tubewells etc. But given the hilly terrain of the state, these sources are also not available in all the

parts of the state. So there is a need to generate alternate sources of irrigation to increase the net irrigated area, which in turn shall also increase the cropping intensity of the State. These alternative sources can be rainwater harvesting, check dams, hydram for lift irrigation etc. Technologies like drip irrigation, sprinklers etc. can also be used for better water management.

YIELD GAPS OF MAJOR CROPS

Sustainable production of food is imminent importance in the state. Basic elements considered while talking of food security is considered in terms of cereals, millets and pulses.

Uttarakhand has the advantage of very fertile Terai region, which contributes maximum of its cereal production. Also this region, comprising of districts Nainital, Haridwar and Udham Singh Nagar, which have high productivity. But the production and productivity in hill districts of Uttarakhand is relatively quite low due to small land holdings, adverse geo-climatic condition and non-availability of agricultural inputs (both in terms of quantity and quality). Also the technology transfer to these areas is very difficult. Also the State is deficit in production of cereals and millets. The area and millet and pulses cultivation has reduced over the years.

Cereals : The cereal production in Uttarakhand is high because of its high productivity in plain districts of Haridwar, Nainital and U.S. Nagar. The productivity in the hills is very low the following tables can explain the production scenario in Uttarakhand explicitly. The production of cereals from rain-fed hill areas where the production as well as productivity are low, should be dissuaded. And other crops according to their agro climatic and microclimates should be promoted.

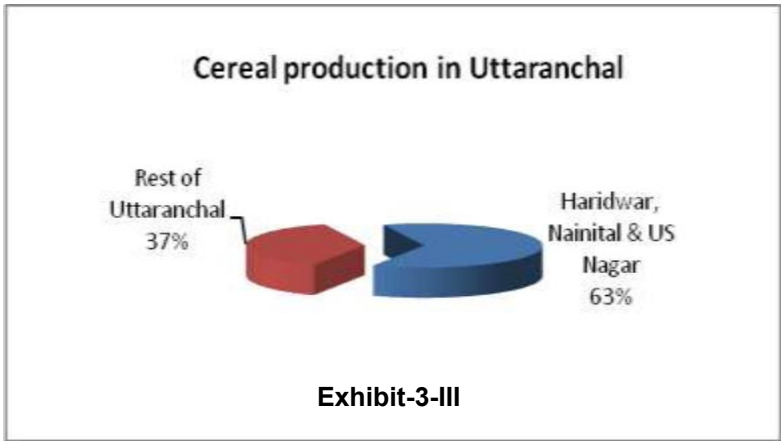


Exhibit-3-III

Pulses : As is evident from the graph, the State is severely lacking in pulses, which are a critical part of food security as most important supply of protein. The state has been traditionally producing Rajma, Guerns (Lal dal) and Gahat. There is potential for development of other pulses in the state. Cropping patterns and 'package of best cropping practices' needs to be extended to the farmers, and there is a need to increase the area under production and productivity of pulses in the state. The state also has the opportunity for producing and marketing the traditional pulses with high nutritional value like Gahat. This highly nutritious pulse is mainly consumed in winter. Soup made from this grain is believed to maintain body warmth during severe winters. This soup has medicinal properties, it is a cure to kidney stone. Other pulses grown in the state are Arhar, Urad, Moong, Gram and Masoor. Masoor is the main pulse from the state with nearly 15,950 hectares under cultivation. The productivity of the pulses and area under production can be increased with promotion of scientific cropping patterns in the state.

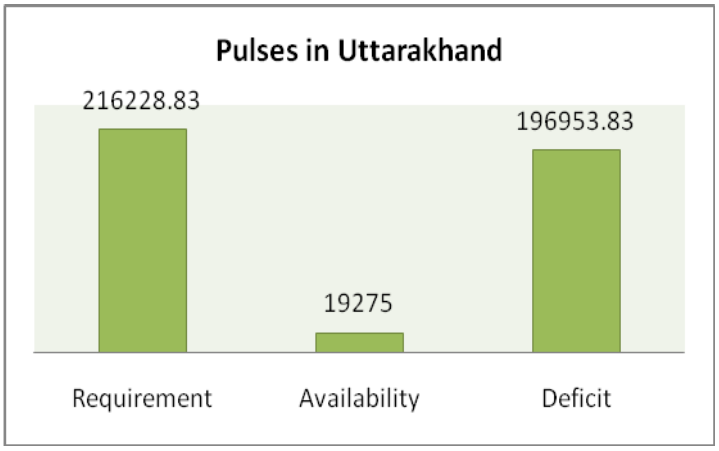


Exhibit-3-IV

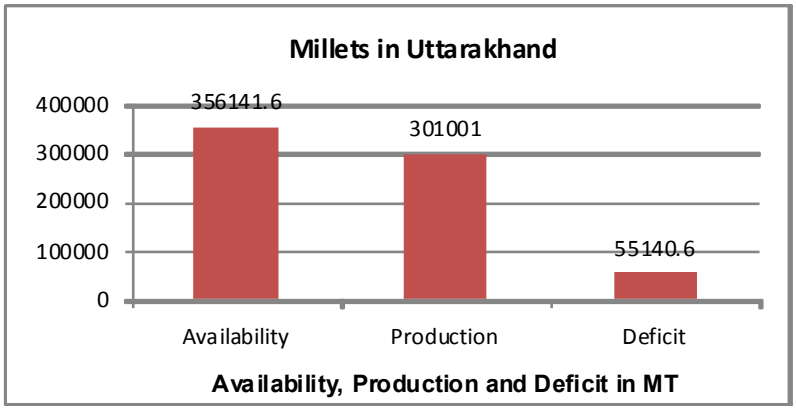
Millets : The State of Uttarakhand is deficit in millet production that includes madua, sawaa, koto and oat. Though eight of the thirteen districts produce more than their local requirement. The millet requirement per capita per year is 42 Kg.

Millet is a very important crop for the difficult Himalayan conditions as they have high nutritional value and are one of the cheapest sources of dietary energy, in the form proteins and carbohydrates. Such crops are particularly valuable in the mountains where most of the population depends on vegetable proteins and carbohydrates as dietary

staples. Traditionally in the Himalayas many of these traditional crops supplement the wheat and rice meals.

The production of Millets in Uttarakhand could be given focus to achieve self-sufficiency. Millets production zones and cropping patterns could be augmented and streamlined for attaining sustainable and optimum production.

Exhibit-3-V



YIELD GAPS IN HORTICULTURE CROPS

Various topographic and agro-climatic conditions are congenial for different kind of fruits cultivation at different altitudes e.g. apples, peaches, plums, apricots, walnuts, pecans, cherry are grown successfully between altitudes of 2000 – 3000 meters, almonds, kiwis etc, at 1000 – 2000 meters. In areas below 1000 meters and in fields of Terai and Bhabar, mango, litchis, jackfruits, aonla, and papaya can be easily grown.

The areas of expansion should be taken up strategic locations in accordance to the topography, agro climatic zone and soil conditions. Here help should be taken from the GIS mapping of the state with the watershed and micro watershed analysis data.

Present area under fruit cultivation is around 1.89 lakh hectares. The area under fruit cultivation can be increased by nearly 25,000 hectares over the next five years.

Productivity : The productivity of the fruit crops in Uttarakhand is low. For example when compared with apple production the Jammu & Kashmir the productivity in the year 1998

– 1999 was around 9500 Kg/Hectare as to 3210 in Uttarakhand. Recent proactive steps of the horticulture department should enhance the productivity trends comparable to neighboring states. Improving crop productivity would include various components like uprooting senile and virus infected plants, integrated pest and nutrient management, training to the farmers (up gradation of skills) and supply of high yielding variety of planting material and seeds.

YIELD GAPS IN FISHERIES

The issues for consideration by the State Government for increasing the productivity in the fisheries sector are :

Extension Services: The fishery department must take up on priority, creation of awareness among the fish farmers as also promotion and popularization of fisheries schemes in the State. There is no major constraint for supply of fingerlings, feed and bank loan to support fisheries development. Fishery Department may therefore, provide necessary extension.

Exploitation of potential areas: Some of the districts like Udhamsingh Nagar, Haridwar, parts of Nainital and Dehradun have the potential for intensive fish farming. Similarly, fish seed production units have also a good scope in these districts. There is a need for identifying prospective entrepreneurs for such schemes. The department must provide forward and backward linkages, extension and subsidy support to the entrepreneurs to promote fisheries development. There is a need for convergence of efforts by different agencies, with FFDA acting as the nodal agency for inland fisheries development.

Sport fishery: Apart from existing angling sites in the streams / lakes, efforts may be made to identify more area of the Kumaon and Garhwal region for fishery sport in the State. Where ever possible, infrastructure facilities for anglers may be provided created by fisheries department.

Promotion of High Tech fish farming, intensive fish farming: The State Govt. may encourage private fish centre to set up project of high tech fish farming for intensive

culture of carps in the plain district with high density stocking and heavy feeding with water exchange and oxygenation using aerators.

Increasing fish seed production: Development of mini fish seed hatcheries in the private sector in all potential districts on the pattern existing in UP, Punjab and Haryana may be encouraged, so as to achieve self.

Utilization of available technical expertise in the State: The Uttarakhand has good research support in the fishery sector in the Shape of NRCCF, the ICAR centre at Bhimtal, College of fishery sciences, GB Pant University of Agriculture and technology, Pantnagar and various other universities located in Garhwal and Kumaon regions. The support of these agencies may be availed to extend expertise in setting up of a trout hatchery/ Mahaseer hatchery to meet the expected requirement of trout and Mahaseer fingerlings.

Increasing fish productivity: As the average annual fish productivity of the existing lakes and the streams is very low, it is proposed that development of minimized hatcheries in the private sector in all potential districts on pattern existing in UP, Punjab and Haryana may be encouraged by the State government so as to achieve self sufficiency in seed production in the State.

Marketing facilities for fish: Department is running fish marketing centre's at Kiccha and as such centre's are very helpful for realizing better price for their produce, department/ government may come out with a programmer for creating marketing centre's in all major cities and towns in the state.

Organic fish culture: Organic fish culture is being practiced in almost the entire State by default as, almost negligible quantity of chemical fertilizers are being used. However, occasionally, in order to meet the phosphate requirements of the pond water, some of the farmers are using super phosphate. The Government of Uttarakhand may consider promoting the technology of organic fish farming with an ultimate view to export of organic fish harvest in order to fetch a better market price.

INPUTS, CREDITS, PROCESSING AND MARKETING GAPS

Agriculture Inputs: Adequate and timely availability of inputs is essential for agricultural growth. A dynamic and growing, agricultural sector requires seeds, fertilizers, plant protection chemicals, bio pesticides, agricultural machinery and credit at reasonable rates to the farmers. Inputs management becomes an important component of modern agriculture. Balanced use of high quality inputs at the appropriate time brings in the much-desired results in terms of both production and productivity. The detrimental effects of injudicious use of chemicals is an area of concern and ways and means have to be found to ensure sustainable agricultural growth by promotion of balanced use of chemicals and emphasis on organic farming.

Seeds: Uttarakhand is ahead of many states in the production as well as the distribution of high yielding hybrid variety of seeds. The largest State Seed Corporation 'Terai Seed Development Corporation' forms part of the state. Besides that around 100 private seed companies are engaged in the production and distribution of certified seeds in the state. Seed distribution is also handled by the cooperative agencies working in the state.

The distribution of the certified seeds is on constant rise in the state, which is a positive feature as the seeds distributed are of high yielding variety and also are treated. Seed production through self-help groups and by private nurseries is to be encouraged

Fertilizer: Fertilizer is one of the most critical inputs in agriculture. The consumption of chemical fertilizer in the state is 69.10 kg/ha (Agricultural Directorate Uttarakhand, Progress report 1999-2000) as against national average of around 95.33 kg /ha (CMIE – EIS November 2000). But it is seen that the consumption of fertilizers is not uniform in the state. It is highly skewed with Haridwar, Nainital, U. S. Nagar, Dehradun accounting for maximum fertilizer consumption. The fertilizer consumption in Haridwar, US Nagar is even higher than the national average. In rest of the district's the fertilizer use is negligible. Given the state's thrust towards promotion of organic farming and the premium associated with organic produce, near absent use of fertilizers in these districts could prove to be boon for the state.

Cooperatives: The objective of organizing the cooperatives in the state is the upliftment of weaker sections of the society by improving their economic status. The district cooperative banks along with its branches provide the people with the short-term, medium term and long term loans. The Primary Agriculture Credit Societies (PACS) constitute maximum number of cooperatives in Uttarakhand. They provide the farmers with inputs for agriculture like seed, fertilizers, plant protection equipment credit and other consumer non-durable. The central consumer stores and its branches make food grains and other items available to the urban as well as rural people at affordable prices. With the help of the cooperative societies the farmers are made available the required inputs according to their requirements. The *Bhesaj unions* are presently facilitating the production and trade of medicinal and aromatic plants in the hilly region of the state. They identify farmers who take up the cultivation of medicinal and aromatic herbs on their private land.

The number of active members is quite less in Uttarakhand and hence threatens the viability of the co-operative through reduced business. So there is a dire need to revive the cooperatives by increased business though increased member participation. Thus there is a big potential for increasing active membership so as to increase business operations & for making the PACS viable and better service centers.

Micro Credit : The spread of SHG bank linkage programme is most uneven and also has not made much progress in the State due to Bank's conservative approach. To speed up formation of SHGs, it is necessary to involve staff of different Govt. Department including of Aanganwari workers. Banks may include sensitization on Micro Credit in their regular training sessions to create awareness among various branch Managers of all banks.

The major recommendations on SHG promotion are as follows:-

- At present, the SHGs (outside SGSY) have to pay stamp duty on execution of documents with banks for credit linkage. Since members of SHGs belong to poor families, financing to SHGs may also be exempted from stamp duty on the lines of SGSY programme.

- The participation of bank branches is still not up to the desired extent although there is network of 1135 bank branches and 763 PACS in the State. The banker's conservative attitude, skepticism over the utility of micro finance as a business proposition, security orientation and reluctance to finance women SHGs must undergo change to upscale the SHG Bank Linkage Program.
- A large number of SHGs have been promoted by the DCCBs/ PACS in the State. The progress in credit linkage of these groups is yet to pick up. State Govt. may issue necessary instructions to the DCCBs/ PACS to provide credit facility to eligible groups.
- Keeping in view the limited outreach of the NGOs, it is necessary to involve other State govt. Department engaged in rural development activities and working at grassroots level to upscale the movement further. Department like Forest, Agriculture and Education, etc, with vast manpower functioning at village level can also be involved for associating with this movement. Some of these departments have also formed groups to implement their programs. These groups also can be co-opted into the movement by introducing savings and credit as add- on activities to their core functioning.
- The government may consider issuing necessary instructions to the women and Child Welfare Department to involve Aanganwari workers in promotion of SHG program in the State like in other States. An effort in this direction has been initiated in Nainital and Haridwar district.
- The banks may include the Micro credit and joint Liability Group concept in their regular training sessions.
- The progress of formation and credit linkage of SHGs as also the progress in the formation of farmers clubs may be reviewed in each and every district level meeting.
- The para–statal agencies/ NGOs which are promoting SHGs may also be selectively invited in the Distt./Block level meetings convened by LDMs.
- Non availability of data from Banks is an area of concern. The Management Information System (MIS) for Micro credit is yet to be developed by the banks.

- Rating of SHGs is an important requirement for embedding quality in the SHGs and to create consciousness of the same amongst the players in the movement. Partner agencies may develop their own norms or adopt the norms suggested by NABARD.
- All partners may ensure to suffix the name of the Self Help Promoting Institution (SHPI) at the end of the name of the SHGs so as to enable easier identification in the field and avoid duplication.
- Govt. should evolve system of grading of NGOs functioning in the State. The norms evolved by NABARD for NGO's grading can be replicated.
- RBI has directed all banks in the country to introduce 'No Frills Accounts' where the minimum balance could be zero or a very nominal amount with a view to making available basic banking to vast sections of poor population / SHGs. All banks are urged to give facility of such a 'No frills' accounts to SHGs.

Processing: In Uttarakhand, there exists the necessary political will and commitment for developing food-processing industry. As a flourishing Food Processing industry will be an important revenue generator for the state and also provide employment to the rural masses and restrict the out migration from the state. Uttarakhand has the raw material resources for developing a progressive and sustainable food processing industry. Presently the food processing industry is in a nascent stage, which requires to be developed with pro-active governmental facilitation.

Uttarakhand presently has very few medium and large-scale food processing units, most of the foods processing units are in the 'Village and Small Scale sector' and most of them are not doing well. There are many sick units as well, recently the government leased its food-processing factory in Ramgarh to NDDB. The state also has around 48 fruit and vegetable canning units in villages that are defunct; there are plans to rejuvenate nearly 24 units.

There are many schemes to promote the food-processing industry sector agencies like Kumaon Mandal Vikas Nigam, Garhwal Mandal Vikas Nigam, Khadi and Village Industry Board, Hiltron, Janjati Vikas Nigam etc. and some central government agencies promoting the food processing industry.

Marketing : Agriculture in the state is characterized by marginal holdings and small scale scattered production. Agriculture marketing comprises of all the operations involved in the movement of produce from the farm till it reaches the ultimate consumer. Several functions are involved in this process like assembling, sorting, grading, packaging, transporting, loading/unloading, storing/ warehousing, trading, processing, financing, risk bearing and retailing. Various intermediaries between the producers to the consumers handle these functions.

The biggest challenge that the state faces is in terms of transportation and logistics. The terrain makes it difficult to have proper and cost effective infrastructure like road, storage facilities, reefer vans, pack houses etc. The transportation costs are high and access is limited. The mode of transportation is ropeways, horse carts, trucks, tractors and costs of transportation are high rendering the products costly in the market place. The more inaccessible the markets the greater are the number of intermediaries and lower the share of the farmer in the consumer price.

Despite having abundant resources and production of high value horticultural, medicinal and aromatic crops much of it goes waste for lack of proper post harvest and marketing infrastructure, particularly in the hilly areas. This coupled with poor availability of market information and other support services like input supply and credit etc. makes the farmer dependent on intermediaries. Quite often the farmer is not able to realize his cost of production.

Action points that need to be considered for closing in on the present marketing gaps are:-

- Transportation is the major problem in hill regions. So, either procurement centre may be established in the area or some transportation subsidy may be introduced for improving profitability of the farmers.
- Presently only storage of potatoes is available as post harvest facilities. The awareness among farmers about other post harvest management aspects such as grading, processing etc. needs to be created by the concern departments.

- For planning of marketing strategies, a data base on consumer behavior market competitiveness, strategies of potential rivals in export market, income and price response needs to be developed in the State.
- Organization commodity specific growers' associations at village, market (AMC) and state level and integrating their functions in relation to market centric activity.
- Linking up villages to local market; local market to regional/ state markets and state markets to national and international markets duly network them online (e. marketing).
- Govt. of Uttarakhand may tap Rural Infrastructure Development Fund from NABARD for all the AMCs projects on a comprehensive basis (new as well as modernization).
- Involving Gram Panchayats to organize and manage markets at local level by undertaking remunerative schemes and improving their revenues.
- Village level processing should be encouraged by providing appropriate technology and by organizing the marketing of such processed products.

TECHNOLOGY/EXTENSION/ ADOPTION GAPS

Agriculture research has contributed immensely to agriculture growth. Future agriculture growth will depend a great deal on how appropriately the research priorities are determined with a state centric focus. The role of agriculture research and development in the state of Uttarakhand should be to identify problems faced by the farming community and to recommend solutions to these problems, which can be adopted by the farming community. At the same time the researchers in agriculture have to work to meet the increasing food demands of the society both in quality and quantity terms.

Agriculture research and development is vital for developing an economically remunerative and ecologically sustainable agriculture. Development of region specific modern packages of practices for different crops in different conditions should be the focus and development of new varieties of crops. The research activity should also focus on customizing research results to suit the local conditions for benefit of agriculture community.

Resources - Agri Research and Development**:** The state is fortunate to have a number of Research & Development Institutes. It has one of the best agriculture universities of the country, G. B. Pant University in Pantnagar. G. B. Pant University is one of the oldest Agriculture Universities in the country and is a forerunner in the field of agriculture research and development. Presently the university has nine colleges in different fields of agriculture.

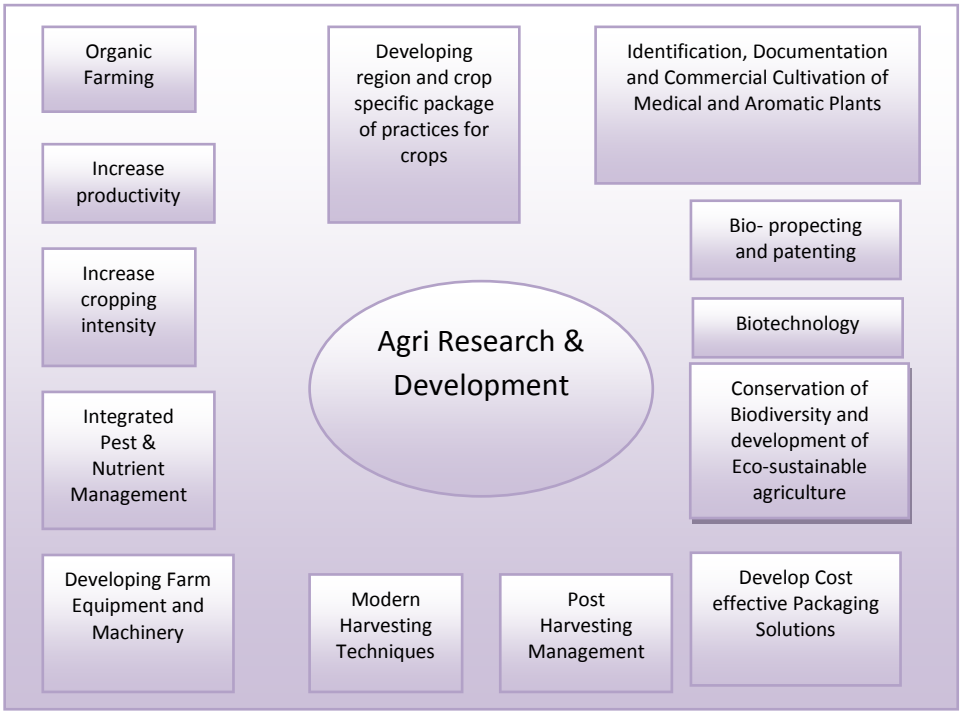
Other institutions in the field of research and development in Uttarakhand are:

1. Vivekanand Hill Laboratory, Almora
2. Defence Research Laboratory, Pitthoragarh; research stations at Auli, Harsil, Goraparao and Rainwala
3. Research and Training Institute, Chaubattia, Ranikhet
4. Central Medicinal and Aromatic Plants Institutes at Pantnagar and Purra
5. Forest Research Institute, Dehradun
6. Central Soil and Water Management and Training Institute Dehradun.
7. G. B. Pant Institute of Himalayan Environment and Development, Kosi-Katarmal
8. Research Stations of G. B. Pant University at Rani Chauri, Majhera, Sui & Pauri

These institutes have been working on various projects on development of Agriculture. They are equipped with large scientific human resources, laboratories and zonal research stations, which could contribute in a big way to the development of agriculture in the State. The scientists working in these institutes have developed resources and expertise in working with diverse agro climatic zones in the state. They are aware of the problems and issues in the development of agriculture of the state.

The state should utilize these resources to focus on the issues of development in the state. It should build their capacities, bring state centric research focus and facilitate the transfer of research & development done by these institutes to the farmers in a proactive mode.

Exhibit-3-VI- Focus issues in Agri Research & Development



Some of the major issues, which require focus, are as depicted in Exhibit above.

The challenge before the state is to supplement the conventional / traditional agricultural practices with inputs from 'Research and Development' to give agriculture eco-sustainable and remunerative solutions. The state needs to streamline the 'Lab to Land' transfer of technology to the farmers. In future, the state should propagate state centric research where farmers and private sector companies could bring their problems and issues for getting optimal solutions.

A large number of research projects are being carried out in the G. B. Pant University most of them are All India Coordinated Research Projects, NATP projects, State Government projects and other projects.

The Defence Agricultural Research Laboratory, Pithoragarh are also having intensive research programs at the institute and research stations.

Training and Development**:** The state has to identify and intensify its research activities to the focus areas in the field of agriculture beneficial to the state agriculture. The areas of immediate interest/concern are

- Horticulture
- Hill agriculture
- Conservation of states bio-diversity
- Integrated Pest Management
- Organic farming
- Biotechnology

The agriculture R&D of the state should work in the field of

1. Development of new varieties through genetic improvement of the crops.
2. In-Situ selection of superior clones from seedlings.
3. Development of hybrids in vegetables suited for diverse climatic condition of the state.
4. Development of new techniques in Agriculture which includes;
    - Package of practice for specific crops in specific regions.
    - Development of horticulture.
    - Identifying rootstocks good for hill horticulture.
    - Integrated Nutrient Management (through organic Farming).
    - Bio intensive integrated pest management.
    - Protected cultivation through use of plastic/poly houses.
    - Domestication of wild varieties and regional varieties to maintain the gene pool of the state.
    - Tissue culture to enhance the propagation practices.
5. Identification of medicinal and aromatic plants & their documentation and patenting.
6. Post harvest management of agriculture produce specially horticulture produce.

7. Developing of farm equipment /machinery for the hilly region.
8. Developing cost effective modern packaging solutions.

Agriculture Education: Agriculture industry is in constant need of capable professionals, more so in Uttarakhand where agricultural industry in on threshold of development. Agriculture Industry in the state is evolving and demands professionals with technological, scientific and business skills. New vistas of employment are opening in support areas such as plant/animal science, food science, processing, agribusinesses, etc. There is a growing need for quality agri education in the state.

Agriculture is the biggest employer of the State's workforce. Quality agri education will essentially form the foundation of vibrant agri businesses in the newly formed state. Hence it is imperative that it gives due importance to agricultural education.

Presently the state has:

1. G. B. Pant Agriculture and Engineering University at Pantnagar and its mountain campus at Ranichauri. G. B Pant University is incidentally one of the best agriculture education centers in the country.
2. H. M. Bahuguna Garhwal University, Srinagar.
3. College of Commercial Horticulture, Bharasar

Other research and educational institutions like Forest Research Institute, Dehradun, Rani Chauri hill campus of G. B. Pant University, Kumaon and Garhwal University are also providing academic training to students.

G. B. Pant University, Pantnagar has remained in the forefront of agri education, research as well as extension in the country. With the formation of Uttarakhand state it needs to have more focused approach by generating region specific knowledge and solutions in order to benefit the people of the state.

It would be desired that special provisions be made to teach agriculture to children in schools. The children's awareness and understanding of our food system is essential,

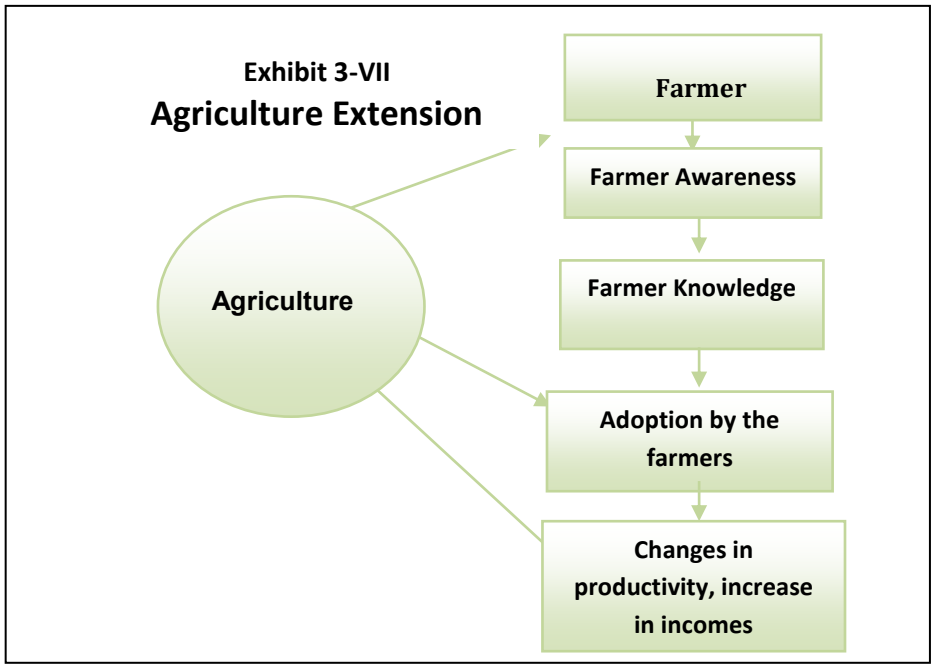
they must be exposed to the necessity of sustainable agriculture practices to ensure that the future of our food supply is secure.

Programs should be made to educate women in the state as they perform a substantial part of agricultural work. Even farmers must be encouraged to enroll themselves in the evening educational programs to know about the latest techniques and best package of practices. A forum could be created where farmers, scientists and students interact with each other on a regular basis and learn from each other. Farmers would get scientific help while academicians would learn the latest problems and undertake research on relevant and useful topics.

The state is bestowed with abundant natural resources in form of forests, water bodies and plants of rare kind. What it requires is focused application of skills and knowledge to make best use of it in a sustainable manner. G.B.PANT and other Agri institutions must help in bridging this gap and give a fillip to the state's agriculture by providing the requisite skills and technical assistance. There is a need today for more number of qualified agriculture professionals. Creation of new institutions imparting quality Agri education is required. But caution must be taken for a sustainable supply – demand pattern for agri graduates and scholars.

Agriculture Extension: Agriculture human resources play an important role in overall development of Agriculture. The whole chain in the agriculture development process (new technology development – awareness – knowledge – adoption – increased productivity) requires trained manpower at every stage to make the technology initiatives successful in achieving economic surplus.

Agriculture extension services play an important role in transfer of knowledge from the laboratory to the field and in developing agricultural human resources. It acts as a support in adoption process by the farmers and provides inputs at every stage of the farming process. It is an ongoing process, which maintains a close working relationship with the farmers.



If research and development is the engine of agriculture then Agriculture extension is the wheel of agriculture. It is said that even if the present techniques, that have already been developed, are transferred to all the farmers through efficient extension services then the production will take a quantum jump.

For the state wanting to boost its agriculture economy then its extension services have to be robust so as to reach the farmers in every nook and corner of the state. Bring to them efficient, quality and timely services and best practices. This has to be done through an integrated effort of all the agencies involved in extension services in the state.

Extension Services in the State : In Uttarakhand today, the extension activity in the state is carried out by various agencies.

- Government: Through it's Agriculture department, Horticulture department and various other agencies and NGO's.
- Universities: Through its extension department
- Multilateral and other organizations: Through NGO's

In addition to this there are two Krishi Vigyan Kendra in the Garhwal and Kumaun region. The extension machinery is supported by 5 Krishi Gyan Kendra's situated in different regions of the state.

Similarly the State Agriculture University also has under its preview to carry out its extension activity. The G. B. Pant University has an extension department, which is doing extension services in the state. It is presently providing extension services to 11 of the 13 districts of Uttaranchal. It uses its various research stations, KVK's and KGK's to extend extension services.

Even though the State University has an elaborate extension department, the results of their in Uttarakhand agriculture are yet to be seen. One of the reasons for this could be the University was earlier catering to the requirements of 28 districts entire Uttar Pradesh, hence could not devote special attention and focus required for Hill agriculture. The challenge before the state is to streamline the extension services expertise to the development of prosperous agriculture in Uttaranchal.

The state has to look into these constraints at priority and to augment the extension services provided by the University proactively and innovatively for the benefit of agriculture in the state.

NGO's in Agriculture : There are more than 250 active NGO's in the state, who have been working very closely with the rural population of the state. The NGO's have been instrumental in providing a crucial link to the rural masses of Uttaranchal. They also become well acquainted with the issues and needs of the rural masses.

They work on the specific projects and the achievements made by the end of the project are not sustainable in most of the cases. The requirement today is sustainability of the initiatives undertaken. The improvements and developments achieved by the particular projects should lead to sustainable improvements and development of the target group. The success stories should be replicated in other regions of the state. The state could utilize their services by broad banding the specific projects, streamlining and providing a focused approach to deliver sustainable development of rural masses and region. The state machinery should facilitate and augment their work with a proactive approach.

Even though such an infrastructure is available for extension services, still we find that Uttarakhand agriculture is at the subsistence level. Looking at the rate of technology transfer we may conclude that the present system is inefficient. The present system is unable to provide farmers with timely and practical solutions. The system at present is less responsive to the changing scenario. These activities are currently taken up as routine assignments and not as drivers of change.

Given the diverse agro climatic conditions of the state and the difficult terrain. The state needs to revamp the approach of extension to make it more action oriented and responsive to the needs of farming community. The state needs to take an area specific as well as focused approach.

INFRASTRUCTURAL AND INSTITUTIONAL GAPS

Importance of infrastructure in agriculture and rural development are well documented. It is estimated that 15% of crop produce is lost between the farm gate and the consumer because of poor roads and inappropriate storage facilities alone, thereby adversely influencing income of farmers (World Bank 1997). Improved infrastructure also leads to expansion of markets, economies of scale, and improvement in factor market operations. The development of rural infrastructure helps to enlarge markets with greater access to factors of production. Easier access to markets allows an expansion of the production of perishable and transport-cost- intensive products. It can also lead to a conversion of latent demand into effective commercial demand. These effects of infrastructure accentuate the process of commercialization in agriculture and rural sector (Jaffee and Morton 1995). Further, any investment that helps to increase rural production, income and employment also helps to reduce poverty.

Roads play an important role in the development of the economy. Bonney (1964) observed that there was a direct relationship between increase in acreage of export crop cultivation and the standard of road and distance from main commercial centers. There is enhanced entrepreneurial activity, sharp decline in freight and passenger charges and improved service as a result of investment on rural roads. While analyzing the socio-

economic impact of a new road, Elmondorf and Merrill (1977) found that road created inflow and outflow channels of transportation, communication and modernization as well as migration, both into and out of the community. In this sense, rural road act not only as a bridge between urban/ developed and poor/ rural/ underdeveloped areas, but also as agents of diffusion, contact and unification. Improvement in rural roads affects agricultural development followed by development of social services. It is observed that roads tend to have a greater initial impact on production where cash crops are grown, because food crops, grown by small farmers, have a lower price elasticity of supply than cash crops (USAID, 1972)

Rural Road Network in Uttarakhand State : Presently the state has a total length of road of 28512 kms (2006-07). The length of National Highways was 2229 km (7.8% of total length). The share of rural roads was 15968 km. (56%) and it is estimated at 253 kms/ lakh of rural population as against the All India average of 243 Kms / lakh population. The main issues related to Rural Roads and Bridge Project is as under:-

- Inclusion of Defect Liability Clause and its proper implementation: Due to burgeoning maintenance expenditure of the roads, it is highly necessary to incorporate a clause in the tender that the contractors / firms shall be responsible for the “Defect liability period” preferably for five years and in no case less than three years after the projects are commissioned/ completed. The same may be included and implemented in true spirit by the Department to ensure proper maintenance of the new roads and also to ensure the quality of the roads.
- Multiplicity of contractors : For effective implementation of Defect Liability clause the multiplicity of contractors in construction of roads may be avoided and this may also lead to improvement in road quality during construction.
- District wise analysis indicates that Tehri Garhwal, US Nagar, Pauri Garhwal, Haridwar, Dehradun and Almora districts are having road network equal to the State average whereas Chamoli, Pithoragarh, Uttarkashi, Rudraprayag, Nainital, Champawat and Bageshwar districts are having road network lesser than State average.

The maintenance of roads as per the norms of Indian Road Congress and construction, prioritization of areas in road network planning and effective implementation of Defect Liability clause, etc. are few aspects which may improve the connectivity of roads in long term.

Irrigation infrastructure (2006-07) in Uttarakhand State : The Covered Command Area under State canal was 2.88 lakh ha. and the total Net irrigated area in the State was 3.40 lakh ha.

Issues of irrigation sector

- Presently the level of utilization of created irrigation potential is around 62% in the State. It has been observed that due to absence of proper water distribution system, the mis-utilization of water and operating charges incurred are on higher side. There is a need to effectively implement the water distribution system through formation of WUAs.
- In Chamoli, Rudraprayag, Tehri Garhwal, Pauri Garhwal, Uttarkashi, Almora, Champawat and Bageshwar districts the irrigation facilities are very much on lower side than the State average and attention needs to be paid in these districts for increasing the area under irrigation.
- Despite of having huge discharge, the time taken for irrigation on per acre basis is on higher side (varied between 5.35 hrs. to 6.39 hrs.). This clearly indicates that the water distribution system needs to be revamped on priority basis for minimization of Operation & Maintenance charges.
- Popularization of water saving devices viz., Drip and Sprinkler system particularly in Horticultural crops among farmers needs to be promoted.

Availability of veterinary facilities : In addition to veterinary hospitals, AI centers and animal breeding farms may play an effective role in the development of Livestock sector in the State. The infrastructural gaps identified on animal husbandry and dairy development (particularly in hill regions) may be prioritized and accordingly some concrete steps may be taken up for the development of this sector.

Issues related to Animal Husbandry and Dairy development

- Refrigerators/bulk milk coolers in the societies or enroute are required.
- AI centers do not have proper mobility and coverage per unit is very large particularly in hilly regions.
- Intensive fodder development programme may be taken up in the treated Micro – watershed.

Horticultural infrastructure: Horticulture is one of the critical sector in the economy of the state. Horticulture provides the much needed opportunity for diversification in agriculture especially in the context of peculiar topography and agro – climatic conditions of the hill states where the scope for production of conventional field crops is limited. Horticulture development is an effective tool for accelerating development in the hills areas due to limited land available for cultivation, availability of cultivable waste lands and necessity of supplementary job and income opportunities.

Issues : Support and capacity building service such as nurseries, collection centers with grading and weighing facilities, fruit preservation centre's and training cum skill development centers need to be developed on a large scale in hill areas of the State.

Agriculture Finance has been recognized as one the crucial inputs to successful and rewarding agricultural activities in the country. Agricultural finance allows the farmer/processor to leverage his capacity to invest in the farming/processing activity, with a direct bearing on his capacity to produce at a higher scale, yield and quality. All kinds of agriculturists, whether in farming, allied activities or in processing, need to borrow, and the easy availability of adequate, timely and affordable credit remains the central objective of any system willing to facilitate agricultural growth.

Financing agriculture in India has not been very popular with Banks and Indian Financial Institutions. Given a number of structural constrains, both real and imagined, such as small land holdings, climatic uncertainty, unorganized nature of Indian agriculture, lack of account keeping systems (since there is no incidence of tax on agriculture and consequently no statutory compulsion to keep books), banks were reluctant to lend to

the agricultural sector. Professional and costly moneylenders were the only source of credit to agriculture till 1935.

With the passing of Reserve Bank of India Act 1934, District Central Co-op. Banks Act and Land Development Banks Act, agricultural credit received impetus. A powerful alternative credit distribution system agency came into being. Large-scale credit became available with reasonable rates of interest at easy terms, both in terms of granting loans and recovery. Both the Co-operative and Nationalized banks advanced credit mostly to agriculture. The former advanced short-term and medium term loans while the latter advanced long-term loans. The Reserve Bank of India as the Central bank of the country took lead in making credit available to agriculture through these banks by laying down suitable policies.

Although the co-operative banks started financing agriculture with their establishments in 1930's, significant growth happened only after Independence when suitable legislation was passed and policies were formulated. Thereafter, bank credit to agriculture made phenomenal progress by opening branches in rural areas and attracting deposits.

Fourteen major commercial banks were nationalized in 1969, co-operative banks were the main institutional agencies providing finance to agriculture. After nationalization, it was made mandatory for these banks to provide finance to agriculture as a priority sector. These banks undertook special programs of branch expansion and created a network of banking services throughout the country and started financing agriculture on large scale. Thus agriculture credit acquired a multi-agency dimension.

The procedures and amount of loans for various purposes have been standardized. Among the various purposes "Crop loans" (Short-term loan) has the major share. In addition, farmers get loans for purchase of electric motor with pump, tractor and other machinery, digging wells or boring wells, installation of pipe lines, drip irrigation, planting fruit orchards, purchase of dairy animals and feeds/fodder for them, poultry, sheep/goat keeping and for many other allied enterprises.

Banks across the country are however increasingly waking up the potential of agricultural credit, having realized that barring natural calamities and climatic vagaries, the Indian farmer is a reliable borrower. They have also realized that a more local and

area-specific approach where-in the banker understands the specific needs and situation of the farmer in a comprehensive manner is more efficient rather than a fragmented approach.

Role of Finance in Agro-Vision for Uttarakhand : Agriculture and Agri-business finance assumes an even more significant and catalytic role in the development of these sectors in Uttarakhand, given the high dependence of the State on agriculture and allied activities. For instance, Uttarakhand produces about 5.80 lakhs tons of fruits, 3.80 lakhs tons of vegetables and 4.28 lakhs tones of potato (1996-97). Out of this only about 1-2 percent is processed. Processing can lead to value addition. Higher margins for one's products cannot be obtained without value addition. Such value addition through processing, marketing, storage and production of required raw materials requires credit. Huge amount of credit needs to be pumped in to agriculture sector to provide support to farmers, which shall in turn give, thrust to agriculture and propel the State's economy.

As the agriculture moves from traditional to commercial, from subsistence to remunerative; importance of credit becomes more pronounced. Now that agriculture policy of the State is to stress on horticulture, floriculture, medicinal crops etc., the role of production technology, processing and marketing would be vital. These require investments from public and the private sector. Apart from production, private investment can be encouraged in storage, transportation and marketing of agricultural products. This shall increase the life of perishable commodities, enhance marketability and thus make agriculture more remunerative. It shall also have a spread effect on economy of the State as a whole.

In summation, the role of credit in Uttarakhand can be:

1. Provision of timely, adequate and easy institutional credit on affordable terms to the agriculturists in the state, be they small, large or marginal farmers.
2. Availability of Credit and/or financial assistance for allied activities such as animal husbandry, medicinal & aromatic plants, sericulture etc.
3. Facilities for availing credit on commercial /soft terms for agri-business activities such as food processing, agro-processing, organic farming, floriculture, horticulture etc.

CHAPTER - 4
MAJOR PROGRAMS / SCHEMES AND IMPACTS

MAJOR PROGRAMS/SCHEMES/PROJECTS OPERATIONAL IN THE STATE

Since 1980s many externally supported programs/schemes and major Government programs related to Watershed Development have been going on in the State. Drought Prone Area Program (DPAP), Integrated Wasteland Development Program (IWDP) and National Watershed Development Program for Rainfed Areas (NWDPRA) are the major centrally sponsored programs being implemented in the State by the Rural and Agricultural Departments **(Annexure Table 4.1, MAP-7- State Map showing MWS's treated by DPAP/IWDP/NWDPRA).**

Apart from this, Ram Ganga River Valley Project (RVP) and Flood Prone Area Project (FPAP) are the schemes being implemented by the Forest Department of the State which are centrally sponsored in Macro Mode by the Ministry of Agriculture. Ram Ganga Valley project was started in the year 1962. The main aim of the scheme was to protect the Dam constructed on the Ram Ganga River near Kalagarh from excessive siltation and to increase the life of the reservoir. The main works under the scheme are afforestation, pasture development treatment of the arable land, plantation of horticulture tree species, Drainage Line Treatment and Soil and Moisture Conservation works. The Flood Prone Area project is being implemented since the year 1981-82 under the scheme the Upper Ganga and Upper Yamuna basin above Tajewala has been taken up for treatment of Flood Prone areas. In this scheme plantation, soil and moisture conservation works, Drainage Line Treatment, Agro Forestry and Afforestation are the major works being carried out.

The Forest Department is also implementing catchment area treatment plans (CAT) in the areas forming catchment areas of the various Micro Hydel Projects which are under construction on various rivers of the State. These CAT plans are a part of the Compensatory Afforestation Plan of the various Land transfer proposals for these micro hydel projects. These plans are mainly being implemented in the forests areas of the catchments concerned. The major works being carried out are Drainage Line

Treatment, Afforestation, Soil and Moisture Conservation Works **(MAP-8- State Map showing the areas covered by CAT Plans)**

The Watershed Management Directorate since 1982 has been implementing externally aided watershed projects in various micro watersheds of the State. At present World Bank Aided Uttarakhand Decentralized Watershed Development Project (UDWDP) is being implemented the project period is from Sep 2004 to 2012. It proposes to cover 2348 sq. km. of area covering 76 MWS, 11 districts and 18 blocks. Till the start of this project 193 MWS covering an area of 7592 sq. km. had already been treated under various externally aided projects **(MAP-6-State map showing MWS's Treated by WMD)**

Drought Prone Area Program (DPAP) is one of the earliest area development program launched by the Central Govt. in 1973-74 to tackle the special problems faced by those fragile areas which are constantly affected by severe drought prone conditions. Till now, 117 MWS have been partly treated under this program and works in parts of 729 MWS is on-going. The major lacuna of this program has been that forest areas were not taken up for watershed treatments. Uttarakhand State being forest rich State as a result major areas have been left out.

Integrated Wastelands Development Program (IWDP), a Centrally Sponsored Program, has been under implementation since 1989-90, and was transferred to the erstwhile Department of Wasteland Development (now Department of Land Resources) along with the National Wasteland Development Board in July, 1992. From 1 April 1995, the program is being implemented through watershed approach. The development of wastelands and degraded lands under the program is expected to promote the generation of employment in the rural areas besides enhancing the participation of people at all stages leading to sustainable development of land and equitable sharing of the benefits. IWDP envisages the development of non-forests wastelands in the country. The basic approach in implementation of this program has been modified from 1.4.1995 when the Guidelines for Watershed Development through watershed approach came into force. Since then, projects for development of wastelands on micro

watershed basis are being sanctioned. From 1999-2000, new IWDP projects are prioritized for sanction in consultation with the State Governments.

The basic objective of the program is aimed at an integrated development of wastelands/degraded lands based on village/micro watershed plans. These plans are prepared by the Watershed Associations/ Watershed Committees with the technical guidance of the Watershed Development Teams of the Project Implementation Agencies (PIAs) after taking into consideration the land capability, site condition and local needs of the people. The Program aims at fulfillment of the following objectives:

Developing wastelands/degraded lands on watershed basis, keeping in view the capability of land, site conditions and local needs promoting the overall economic development and improving the socio-economic condition of the resource poor and disadvantaged sections inhabiting the program areas. Restoring ecological balance by harnessing, conserving and developing natural resources i.e. land, water, vegetative cover.

Encouraging village community for:

(a) Sustained community action for the operation and maintenance of assets created and further development of potential of the natural resources in the watershed.

(b) Simple, easy and affordable technological solutions and institutional arrangements that make use of, and build upon, local technical knowledge and available material. The main aim of the project is employment generation, poverty alleviation, community empowerment and development of human and other economic resources of the village.

In Uttarakhand State 134 MWS in all the 13 districts have been taken up for treatment. It is proposed that about 3 lakh ha. wasteland would be treated through this program.

NWDPRA is a centrally sponsored program for scientific land use through development of integrated farming system on the principles of watershed management in each mandal where the arable area under assured means of irrigation is less than 30%. The objectives of the program are: conservation, development and sustainable management

of natural resources including their use, to enhance agricultural productivity and production in a sustainable manner, restore ecological balance in the degraded and fragile rainfed eco-systems by greening these areas through appropriate mix of trees, shrubs and grasses, to reduce regional disparity between irrigated and rainfed areas and creation of sustained employment opportunities for the rural community including the land less.

In our State 403 MWS have been sanctioned for treatment in 71 Rainfed Blocks. Works in 230 MWS has been completed But again it has to be noted that only a part of arable area of these MWS have been treated and also forest areas of these MWS were not taken up for soil and water conservation measures.

Watershed Development supported by CAPART, Sir Ratan Tata Trust and other Donor Agencies: Several watershed development projects are also being implemented by NGOs funded by CAPART, Sir Ratan Tata Trust.

The various Watershed Development Schemes being implemented in the State with area covered Number of watershed sanctioned and completed has been depicted in **(Annexure Table-4.1).** Essentially DPAP, IWDP, NWDPRA and other major schemes are being implemented in the State. Apart from this, FPR, RVP and CAT Plan are being implemented by Forest Department MWS wise essentially for the treatment of forest areas. Externally Aided Projects being implemented by Watershed Management Directorate are being implemented mainly in the villages and the surrounding village community forests.

Rainfed Areas and degraded areas being treated through various schemes and projects has been depicted in the enclosing **(Maps 6, 7 and 8).** The Watershed Map the State with district boundaries is being depicted in **(MAP-3- State Map showing Sub Watershed and Microwatershed Boundaries).** The MWS proposed for treatment in the four plans is being depicted in **(MAP-9-** State Map showing the areas proposed for treatment under IWMP) and district wise maps showing MWS proposed for treatment are depicted in **(Maps 10 to 21)**

ANALYSIS OF VARIOUS PROGRAMS/ SCHEMES

The schemes implemented by the Department of Agriculture and Rural Development have not been analyzed on the basis of their impact on biophysical, social, economic and environmental aspects. The analysis of the various externally aided projects being implemented by the Watershed Management Directorate is as follows:-

Doon Valley Integrated Watershed Management Project

The Doon Valley Integrated Watershed Management project was prepared in 1990s as a participatory, process project. Project implementation started in mid–1993 and completed in December 2001. The main activities were centered on people and the implementation has been on a rolling year program of 3-4 years in each 300 villages in the Doon Valley, Bhagirathi and Bhimtal areas.

The project was perceived by many as having been a success. But “Success” can be measured in different ways. Conventionally, we look at the outputs against the objectives. However, different stakeholders may have different interpretations of the outputs and indeed, the relevance of the original objectives. A further parameter could be the sustainability and replicability of the processes and methods developed.

Some of the factors that helped to achieve this apparent success were:

Objectives: The objective of the project were:-

Primary objective

- Arrest, and as far as possible, reverse the ongoing degradation of the Doon Valley Environment
- Since people have been the agent of change in the process of degradation, they were placed centrally to the Project objectives and strategy.

Subsidiary objectives

- Involve the local population in all stages of planning, implementation and management of project activities.

- Improve the quality of life of rural people so as to enable them to remain in the rural areas and to be positively involved in the management of the environment.

The project particularly focused on women and the improvement of their situation by reducing their work loads and enabling them to generate income other activities.

Achievement of objectives

- The traditional watershed objectives of reducing degradation.
- Socio economic objective of improving the quality of life of villagers, especially of women, and to involve communities so that they will be able to better manage their own environment in future.

From a series of formal impact studies, conducted by the project staff and by the Technical Assistant Team (TA), using participatory methods, it was apparent that there had been overall success in meeting the objectives. Average scores of over 65% had been achieved for the overall impacts of project physical activities. Similarly, sectoral impact studies by the TA team had indicated significant success in meeting the objective in terms of forestry, fodder, agriculture, horticulture, livestock, irrigation and soil and water conservation.

In terms of socio- economic impacts, the project had been successful in involving people in the planning, implementation, maintenance and monitoring of interventions. Environmental awareness had been raised and women had become positively involved in decision making. Village organizations set up to manage watershed activities and, through reciprocal contributions had developed viable revolving funds for future maintenance of assets and loaning to members. The GAREMA's had achieved an encouraging degree of sustainability and many had formed "federations" (COREMA's) for mutual support. Moreover, the previous dependency syndrome, geared to government subsidies, largely had been replaced by a sense of self- reliance. This augured well for future management of the environment by the communities.

Although inputs were primarily land based, impact studies showed that some success had been achieved in targeting the "focus" group of poor, land–less and disadvantaged

people. Not all focus group members had been able to benefit and there had inevitably been some favoring of the elite. However, most communities themselves had become aware of such disadvantaged groups.

The project was therefore largely successful in meeting the socio- economic objectives and in involving people, especially women. Progress was undoubtedly made in arresting the on-going degradation of the Doon Valley environment. Mainly through efforts at village level to reduce pressure on the forests.

Integrated Watershed Development Project (Hills- II)

Project Period: 1999 to 2005

Principal Performance Ratings

Outcome:	Satisfactory
Sustainability:	Likely
Institutional Development Impact:	Substantial

Assessment of Development Objective and Design and Quality at Entry

Original Objective: The original development objective was to improve the productive potential of the Project area using evolving cost effective watershed treatment technologies and community participation approaches. The secondary objective was to assist the project state with institutional development and consolidate progress made under various programs

Assessment: The Shivalik area in Uttaranchal includes parts of 98 micro watersheds out of which at the start of the project 17 micro watersheds extending over 1237 sqkm. were selected. After the MTR the area was increased to include total 24 micro watersheds covering an area of 1573 sqkm. and covered 493 of 505 villages.

The Project Development Objectives (PDOs) were highly relevant to the development of mountainous region of the then UP later reorganized to Uttaranchal where the population is dependent on agriculture and on the natural resources in their vicinity, for

fulfilling requirement of fodder, fuel wood, minor forest produce. The area of Shivalik had low productive potential and was ravaged by vagaries of erosion of soil and loss of land due to stream, forest fire, bank erosion flash floods.

The project design followed the Shivalik watershed development strategy prepared for the state and subsequently establishing the Watershed Management Directorate (WMD) as the nodal agency in the state for planning and monitoring all watershed projects and project implementation agency had borne results not only in the Shivaliks, but also in other watershed projects in the state.

Prior to IWDP the WMD had implemented four externally aided watershed projects and was in the penultimate year of the fifth watershed project namely, Doon Valley Project financed by the European Union. The project design, the project appraisal documents and the safe guard policy of the Shivalik project were qualitatively and conceptually a large improvement. The WMD and also the Government of Uttaranchal benefited from the well structured project design and implementation arrangements.

The PDOs, were also in line with the state's strategy aimed at supporting rural development through generation of self-employment, (e.g. entrepreneurship, credit linkages, cost sharing in development initiatives) and institutional reforms (e.g. beneficiary participation, demand-driven funds, re-orientation of public sector functions). This were also consistent with national strategy for hill area development and also was framed to fulfill the Country Assistance Strategy (CAS) goal of attaining sustainable development of agriculture, water and rural areas as key to poverty alleviation. Further the project also handled the complexity in the targeted areas due to geographical spread, altitude, slope, aspect, soil, climate and land use which constitute serious inherent risks as well as anthropogenic differences between Garhwal and Kumaon Hills.

Revised Objective: The original development objective remained the core. But in view of the sector related Country Assistance Strategy (CAS), hierarchy of objectives in PAD, observations of Mid-Term Review Mission, the development and associated objectives given in the Project Implementation Plan (PIP), and the objectives set for M&E Consultants, the objectives got transformed with greater focus as under:

The overall aims and objectives of the project were to:

- Slow down and reverse the degradation of natural environment (using appropriate soil and moisture conservation technology);
- Conserve soil and water through in-situ moisture conservation, water harvesting and land management practices;
- Increase and improve the production and income from agriculture, horticulture, fodder, fiber, fuel wood and livestock (through the process of soil and water conservation and other inputs)
- Reduce flooding and devastation (caused by erosion of soil)

Briefly the main immediate objectives of the project were to:

- Improve the productive potential of the Shiwalik hills in Uttaranchal (using/appropriate watershed treatment technologies and participatory approaches);
- Assist institutional development;
- Generate and develop additional livelihood opportunities and
- Consolidate progress already made (in unifying approaches to watershed development/management among various programs operating in the Shiwalik hills).

Original Components : Broad and sub-component areas were:

Watershed Development (Protection and Restoration) Treatments for:

a) Natural resources conservation, development and management – on (i) Non-arable lands, (ii) Arable lands, (iii) Drainage lines through forestry, soil conservation and water sources development.
b) Improved and diversified farming system – covering agriculture, horticulture, trees on non-forest lands and vermin composting, organic farming and IPM, in other words, bio-fertilizers and bio-agents, livestock and poultry development.
c) Rural infrastructure development – road, bridle track, market and support permanent assets.

d) Strengthening and developing institution – such as VDC, SHGs, UGs – linkage through clusters, associations/federations to agencies that help improve marketing and return as well as procurement of inputs for farming and IG activities.

e) Human resource development by capacity building in technical and management skills, awareness, empowerment, etc.

f) Policy changes and strategic shifts and development – in cost sharing, reduced subsidy, implementing through community, marketing logistics, maintenance and repair, revolving fund, withdrawal, etc. and also on integration of activities at various levels.

Revised Components: Broad and sub-component areas remained same. However, within sub-component areas additional activities were introduced following Supervision Mission report and also targets were revised upward in many cases. Amongst the additional activities few important ones were as under:

- Arable land: Top working of mehal/pear, poly-house and poly tunnel demonstrations, bio-compost demonstration and community fruit plantations
- Non-arable land: Bamboo and agave plantations
- Livestock & Fodder: Plot border plantation of Napier on farm land, grass and fodder plants in strips /row, patches in existing forest areas, backyard poultry
- Social & Economic: Introduction of Social Funds
- Institutions: Associations/Federations and Linkages with marketing bodies, NGOs, etc.

Achievement of Objectives and Outputs

Outcome: Watershed Protection and Development

- Regenerating natural resources base: Satisfactory: Overall key project objectives have been achieved. Notwithstanding inherent severe risks due to altitude, slope, soil, land use and rainfall, the degradation processes have been substantially arrested on 16.5 percent of arable, 16.7 percent of non-arable land in drainage lines through a combination of soil and water conservation structures, vegetative treatments, planting by forest, forage and horticultural species and grasses.

Project objective of regenerating environment towards its natural state has been achieved reasonably by of way reduced soil loss, direct protection to 4453 ha from getting irreversibly lost and restoring some area to productive uses, creating green stock over large area that can absorb CO_2 and release O_2 in significant quantities, set processes for improving Source of Carbon Stock and hydrologic regeneration over extensive areas.

Similarly, conservation practices like plot border planting with terrace repair on-arable land and contour trenching on non-arable land for *in-situ* moisture conservation was achieved while water harvesting structures, ponds, irrigation tanks, roof rain water harvesting tanks numbering 6248, wells and lifts etc. created irrigation potential at micro-level over extensive area as the most effective input for diversification and higher productivity.

- Enhancement of Biomass Productivity: Satisfactory : Project succeeded to improve productive potential of both arable (crop lands) as well as non-arable lands significantly on the foundation treatments as mentioned above. Progress components like CAD, minikits, HVC coupled with improved inputs like irrigation, compost, better seeds etc. helped push the productivity to far higher level such as between 31 and 17% coverage for irrigated crops and between 29 and 17% for rainfed crops, cropping intensity to 191 percent and irrigation intensity to 174%. Horticulture had taken a long stride by both raising fruit plants on uncultivated land and cultivating vegetables on farms besides medicinal and aromatic plants which opened up new avenues for employment and high income.

Further by developing organic farming in 36 percent of project villages and stall feeding through 10010 mangers, modern agriculture could be put on course to be environment friendly. Whereas, massive planting on non-arable and *ex-situ* areas created high stake for areas with erstwhile low productivity as the planted areas have attained real potential of good to very good economic returns on 19490 ha.

- Improved Rural Infrastructure: Satisfactory**:** Improved infrastructure development in the form of village roads, bridle track and bridges has improved connectivity and

reduced time required for schooling, fetching fuel, fodder and water and other social travels in 441 villages. Similarly drinking water has been taken to benefit both human beings and animals of villages.

Outcome: Institutional and Social Changes

- CBOs, Community Participation: Highly Satisfactory**:** Through formation of VDC, SHG, User Groups and Van Panchayats, multi dimensional community participation could be obtained. Whereas, by building capacity through training, exposure visits and decentralized workshops in a variety of technical and management skill of beneficiaries, some of the project activities could be carried through them. These have benefited 39,737 villagers including 23,792 (60%) females and also 13,866 (47.5%) persons from BPL families.

- Economic and Social Empowerment: Satisfactory: Due to creation of revolving funds for VDCs (Rs.15.71 million), saving funds for SHGs (Rs. 8.06 million) and operational funds for User Groups (Rs. 2.48 million), they could take many initiatives in implementing the project plan, in undertaking IG activities and for collection and marketing of produces with higher income. A total of 24,405 villagers including 71% women and 33% persons from BPL families were trained in 795 skill improvement courses, while 5420 persons were sensitized through exposure visits in five major areas concerning social and economic sustainability. Consequently live cases became available of technical and financial empowerment through additional income from IG activities, better farming and project activities especially amongst women and BPL families.

- Economic Viability and Sustainability: Satisfactory**:** Economic analysis for eight major component areas and project as a whole (excluding cost on administration/coordination) revealed an Economic Rate of Return (ERR) of 19.9% and with cost on coordination included ERR was 18%. These values were higher than those given in PAD. Project implementation has been an economically viable one as a whole and also individually crop cultivation, horticulture, livestock, forest plantations, infrastructure development, institutional and social changes and soil

conservation. Similarly, analysis of project outcomes, if these have contributed to sustainability, carried out separately for all three broad PAD sets namely, watershed protection and development, institutional and social development and finally economic and financial viability, revealed that institutional and social development contributed handsomely towards sustainability, and interventions for improving production potential also contributed quite reasonably but those for watershed protection did so only in fair degree. Thus project as a whole could be rated good or fairly strong or as likely sustainable.

Uttarakhand Decentralized Watershed Development Project

Project period 2004-2011, Project at a glance till 2008

- A World Bank funded community based Integrated Watershed Project.
- Project cost is about $89.35 million with State share of about 18.6% and beneficiary contribution as 3.5%.
- Commencement of Project since September, 2004 with a Project period of seven years.
- The Project area is 2348 sq. km. spread over 76 selected Micro watersheds in middle Himalayas at an altitude of 700 mt. to 2000 mt.
- The Project operates in 18 blocks of 11 districts of the State.
- The Project aims to treat about 468 selected Gram Panchayats with Gram Panchayat as planning, implementing and monitoring agency at the Panchayat level.
- Project activities initiated in 467 GPs and at different phases of Project implementation.
- 616 Farmers Interest Groups (FIGs) have been constituted.
- 466 Gram Panchayat Watershed Development Plans (GPWDPs) have been finalized by March, 2009 and are under different stages of implementation.
- Under farming system improvement, improved varieties of crops have been demonstrated in 560 ha. under compact area demonstration and various varieties of off-season vegetables were demonstrated in 378 ha of area.

- Under horticulture activities 416 orchard development and 344 ha. high value crops and medicinal/aromatic plants were demonstrated
- Under livestock activity fodder crop demonstration in 183 ha. and pasture development in 271 ha. have been carried out.
- Under Capacity building 408 staff members and 69442 community members including PRI members have been imparted training during the year.
- Under GPWDP, 46322 m^3 agriculture terrace repair, 2052 ha. Agriculture & vegetable minikits demonstration were carried out.
- Under drainage line treatment in 118580 m^3 soil conservation structures were built during the year.
- Under GPWDP, 48 Km. irrigation channel, 393 irrigation tank, 2589 roof water harvesting tank and 88 village pond were carried out.
- Expenditure details- During this year the total expenditure was 71.9062 crores, thus having a cumulative expenditure of 189.3016 crores since the inception of the Project excluding beneficiary contribution. So far the Project has received a total beneficiary contribution of about 14.3698 crores since the inception of the Project.
- First round of Participatory Monitoring and Evaluation (PME) in 342 GPs, second round in 242 GPs, third round in 118 GPs and forth round in 42 GPs were carried out.

Mid Term Review impact as reported by The Energy Resources Institute (TERI), New Delhi

1. Social mobilization has resulted in formation of community institutions viz. 447 WWMC, 930 RVC, 585 FIGs.
2. Approx. 70% of target households were found to be involved in preparation of GPWDP.
3. The women focus in the project has resulted in high participation of women in project activities.
4. Up to 52% benefits found to be flowing to ‘C’ category household which constitute the vulnerable groups in the project.

5. The number of people provided labour from the vulnerable group for works has been found to range from 60%to100%.
6. Demonstrations of improved varieties have resulted in crop diversification as well as enhancement of productivity of crops.
7. The aggregate increase in area under improved varieties is found to be 7%.
8. Increase in area under improved varieties of paddy is 5.07%, wheat 8.52%, Madua 10.92%, maize 14.14%, Tomato 332.88% and Cauliflower 189% in sampled GPs.
9. Increase is seen in productivity of agriculture and horticulture crops due to adoption of improved varieties. Productivity increase of 15.61% in paddy, 10% in wheat, 24.5% in Madua, 13.03% in maize, 14.10% in tomato, 10% in cauliflower was observed.
10. Adoption of improved farming techniques by the farmers in the project area is observed.
11. Under Agribusiness, approx. 5368.5 tons of vegetable produce has been marketed from the project area. The gross returns have been to the extent of Rs. 444.8 Lakhs.
12. Market linkages with Mother Dairy and other local and outside Mandies are established.
13. Increase in income from project intervention is approx. 12% in sampled villages (After adjusting for inflation).
14. Increase in fodder availability across all categories is about 3%.
15. Shelters and Mangers have increased the usage of stall feeding practices.
16. Extent of irrigated agricultural land has increased by 10% in sampled GPs. Relative contribution of sources is as follows: Canal/ Gul- 54%, Tank- 23% and water harvesting structure- 1%.
17. PME has evolved as a forum and process for involving stakeholders in monitoring the project implementation progress (quality and quantity). It is also turning out to be an important feedback mechanism from the stakeholder to the project.
18. Leadership building amongst community members in the project area observed. About 66 community members associated with the project as motivator, assistant

accountant, members of RVC, VG, FIG and SHG have been elected as Gram Pradhan or ward member in the Panchayat elections held in Sept. 2008.

19. About 94% of the families in the sampled GPs were found to be aware of the project objectives while 87% of families were aware of content of respective GPWDPs.
20. Up to 55% increase in frequency of Gram Sabha meetings has been observed in sampled GPs. Further increase in attendance is up to 60% while participation of women and vulnerable group members is 91% and 72% respectively.
21. 92% of sampled GPs report enhancement in capacity to maintain accounts. The annual audit of GP account by a firm of Chartered Accountants empanelled with CAG has been conducted in all the GPs up to 2006-07.
22. An average increase of 101% in number of project related GP meetings was observed in sampled GPs while increase in attendance was found to be up to 39%.
23. Administrative capacity of staff has also increased.
24. Action taken on 84% of monitoring reports (that needed action)
25. About 72.49 lakh mandays have been generated in the project since inception of the project.

CHAPTER - 5
ISSUES AND CHALLENGES

The state of Uttarakhand is a region of outstanding natural beauty with tremendous potential for sustainable growth and development. The northern region of the State is part of the Great Himalayan Range, covered in snow and glaciers. Other parts of Uttarakhand are covered in dense forest making up the bulk of its natural resources base. The largely mountainous nature of the state endows it with a unique ecosystem that is home to a large number of flora and fauna. Two of the Indian subcontinents most important rivers - the Ganga and Yamuna also originate from the glaciers of Uttarakhand.

After attaining statehood in 2000, the economic progress of Uttarakhand has been rapid, with its economic growth rate increasing from just over 3% per annum to 11% per annum. However, this rapid growth has been accompanied by adverse impacts on the local ecology, thus making the incorporation of sustainable development practices into the State's overall development strategy an imperative.

Water, agriculture, forestry and energy, among other issues, are central to the State's inclusive strategy for future growth. Most of the people of this state are dependent on their natural environment, with over three-fourths of the total population dependent on agriculture for their livelihood. Also, with over fifteen important rivers and over a dozen glaciers in the State, Uttarakhand is a valuable fresh water reserve. There are also about 200 large and medium sized hydro-projects and therefore hydroelectricity continues to be a prime source of capital for the local economy. Forests cover a large percentage of the land area with many industries being forest based.

CHALLENGES FOR FOOD SECURITY

Subsistence agriculture is the prime source of livelihood and employment of more than seventy percent of the population in Uttarakhand. It accounts for about thirty-seven percent of the Net Domestic Product of the state. Agriculture in Uttarakhand is very complex and is interlinked with crop husbandry, animal husbandry and forestry

to form a production system. Inaccessibility, environmental heterogeneity and ecological fragility have favoured evolution of subsistence production system in the hill state. Presently about twelve percent of the geographic area is under cultivation in the state.

The total geographic area of Uttarakhand has been divided in to four physiographic zones on basis of mean altitude from the sea level. *Tehri, Bhawar*, and low lying valley up to 1000m (Zone A) have hot and humid climate and support crops like paddy wheat, litchi, pulses etc. The Subtropical Zone lies in between the altitude of 1000m to 1500m and is capable of growing a diverse range of crops including horticulture crops. The area lying in the altitude of 1500m to 2400m classify as Temperate region, and hence support a large number of temperate fruit cultivation, floriculture as well as medicinal plants. The region above the altitude of 2400m is further classified as Sub-Alpine as well as Alpine Zones. This region is not fit from agriculture point of view and is used as pasturelands and is a store house of medicinal herbs. The diverse agro-climatic condition of the state gives it a unique advantage as well as a competitive edge over other states in production of vegetables (offseason vegetables in context of plains) that fetch high value in the market. The challenge before the state is to identify crops suitable for each zone depending on the climatic conditions, soil texture so as to have a focussed approach in development of the agriculture in the state.

As most of the area is under forests and wastelands this leaves behind only a small amount of land (about 12 percent) for cultivation. Among the cultivated land about 50 percent of the landholding is submarginal and further 21 percent of the land is between 0.5-1 hectare. Thus we find that about 70 percent of land holding are less than 1 hectare in size and cover about 27 percent of the area under cultivation. While about 26 percent of land holdings are between 1 to 4 hectares in size covering about 51 percent of the total cultivated area. Also just over 3 percent of land holdings are above 4 hectares in size and cover about 22 percent of the total cultivated area. As large number and area is under small and marginal holdings, scale of economies cannot be availed of, and so the input cost per unit of output is higher. Therefore it becomes all the more difficult task to make agriculture a profitable occupation.

Thus the main issues which need to be addressed are:-

- Untapped diversity;
- Identifying niche areas for developing specific crops;
- Acidic & shallow soils in Hills due to soil erosion;
- Decreasing humus content in soils in plains due to high use of chemicals;
- Social inequalities as there are fragmented and scattered land holdings and there are limited opportunities of diversifying the crops due to smallholdings;
- Area under Pulses and Oilseeds are currently low;
- Productivity of the hills very low;
- Gender inequality as women workforce in agriculture constitutes to about 80 percent;
- Agriculture in the state is rainfed;
- Very high transportation cost for agricultural marketing.

CHALLENGES FOR WATER SECURITY

The annual rainfall in Uttarakhand is 1700 mm (NABARD 2004); however the total number of rainy days is about 100; and most (95%) of the precipitation that falls in the catchment area as surface water, is lost due to steep slopes and mountainous terrain. The total annual requirement of the human population, animal population, agriculture and industry is estimated to be around 3% of the annual precipitation received.

The state has about 0.55 million ha of un-irrigated land and the majority of it falls in the hilly areas of the state, which is also home to the poorer sections of the populace. 47.42% of persons in the state are Below Poverty Line (Planning Commission 2006) and the most vulnerable sections are living in the hilly areas of the state.

Given the dependence on glacial melts for water the state's vulnerability to water resources has increased with fast receding glacial melts and the consequent

changing hydrological patterns. Hydrological studies over the last decade corroborate that water resources in the state are decreasing and there is an impending crisis, which can be illustrated by.

- receding glaciers in the Great Himalayan Zone;
- long term decreasing trend of stream discharges;
- dwindling capacities of lakes;
- increasing surface runoff on the hillsides ;
- an increase in floodwater and decrease in base flow water in channels and rivers;
- extensive soil erosion and landslips have become a recurring phenomenon in the region.

These changes at the state and national level would impact the community adversely as the pressure on natural resources and environment would compound; water availability in the rivers would be affected; crop yields could decrease, therefore raising concerns on food security in the long run; and health concerns due to floods and droughts are expected to rise in the country due to projected changes in the hydrological cycle.

The Human Development Report also highlights the complexity of climate change patterns with respect to projections for India. The changing rainfall pattern would also affect agriculture and one factor that will shape the profile of winners and losers is the adaptive capacity of the farmers to the changing precipitation levels. Hence, there is a need to build capacities of the farmers to adapt to these variations. Risk would especially be skewed towards producers who depend on rainfall and lack assets to adapt through investment Strategies for mitigating risk for farmers and providing better facilities need to be worked upon.

Country level estimates of the ‘water stress’ indicator, also indicates that India falls in the category of water stressed countries. In India, the demand for water resources has increased manifold with urbanization, agriculture expansion, increasing population. Concurrently, there has also been a change in cropping pattern, land use pattern and over exploitation of water resources to meet the needs of the growing population in the urban and rural areas; this has affected the hydrological cycles in many regions in the country. There is not much data available which indicates the

possible impacts on natural resources due to climate change; hence, the need to do extensive research to study these impacts. For instance, there is not enough work on the impact of hydroelectric power on local and regional climate. Research on various aspects is also essential to take informed decisions or precautionary steps for sustainable development of natural resources to mitigate negative impacts.

National Water Policy 2002: The NWP 2002 emphasizes an appropriate reorientation/re-organization of institutional structures and mechanisms to initiate a participatory approach to water resource management by involving beneficiaries and other stakeholders in the project planning stage itself. However, the policy does not indicate how such participation and local water initiatives could be put into practice and is weak on conceptualization of community involvement and management.

Draft Water Policy of Uttarakhand (dated: 3rd November' 2005): Given the national context, the draft state water policy of Uttarakhand in its vision statement declares water as a basic human right; emphasizes on the need for conservation and development of water resources to achieve developmental goals (sustainable agriculture development, harnessing potential hydropower and industrial development); and envisages the participation of all tiers of Government in management and use of water resource. The water allocation priorities in the state water policy are in sync with the NWP 2002. However, the policy also states that the local self-government institutions could modify these priorities of water use as per actual needs. The draft water policy also asserts that priority shall be given to identification and rejuvenation of traditional water resources like *Naula, Dhara, Guls*, Ponds, etc in the state.

CHALLENGES FOR FEED AND FODDER SECURITY

Serious constraints in the availability of feed and fodder in the country has forced the government to study the "economics of fodder" for devising a strategy to deal with the crisis which may adversely impact the agricultural growth in the country. Unless we ensure the availability of feed and fodder, the productivity of livestock would not increase. The livestock sector would play a major role in tackling the problem of food security in coming years. The estimates by many researchers during the last few

years have indicated that the supply of green fodder in 2003 was only 389.81 million tonnes (mt), while the demand was 1,025 mt, a huge deficit of 61.96%.

According to Ministry of Agriculture, contribution of livestock to total GDP has increased from 4.8% during 1980-81 to about 6.5% during 2002-03 and is currently 5.3%. The contribution of livestock to agriculture GDP has gone up from 13.8% in 1981 to 23.8% during 2002-2003

In rural areas there is the crisis of fodder for livestock. In rural India, domestic animals are engines that drive the economy. They provide resilience and wealth people cope with adverse conditions because of their livestock. But no policy exists on how to feed these 500 million or so animals. Areas today aren't fodder-secure, and the grim reality is that food security in this country is not possible without fodder security.

Animals survive by foraging on available land and on agricultural residues. But the productivity of our common lands-forest and revenue land - are pathetic; grass yields on these are mostly illusionary. Sheer grazing pressure ensures animals literally nibble away a pasture's productivity, suppressing regeneration of grasses and tree fodder. Add to these the fact that agricultural production is stagnating, or that farmers are shifting to crops that do not yield fodder.

This crisis of fodder security is of a great magnitude as first, it concerns the very poor that depend on livestock to survive another tomorrow. Second, it relates to the country's most neglected lands: common forests. Third, it is about neglected animals.

The villagers maintain poor quality of livestock which have very low milk yields and the problem is also that animals with higher milk yields - the crossbred cows our planners are fond of-need better quality fodder. These animals do not forage on degraded land; they require stall-feeding. Improving the animal economy, then, demands on improving the quality and quantity of fodder available to livestock. But this has simply not been planned for, or done.

The fact is that the fodder crisis is part of the larger land and water crisis of rural India. Better agricultural productivity on private lands is a sure-shot source of additional fodder. But this productivity is limited by the non-availability of water to irrigate crops. That is why the villagers need to take their animals to graze in forestlands. Part of the problem is there is no water to grow crops, and so, no agricultural residues for animals to eat. Water then becomes the first enabling tool. It is, therefore, imperative that we link fodder security to water security - building water recharge structures for irrigation.

The third concern relates to the largest grazing lands-the common lands-degraded through sheer pressure. It is understood these lands ought to be regenerated. But what needs to be further understood is that such regeneration is not possible without factoring in the animal economy. Building boundary walls to keep grazing animals out will not succeed; the pressure is too great. Planting of fodder yielding species is required in the common lands to meet the fodder demand. Thus, here the fodder security for livestock is linked with forest security - replanting and regenerating our vast common lands.

CHALLENGES FOR ENVIRONMENTAL SECURITY

'*Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period of decades or longer* (IPCC, 2001). The United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as "*a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods*".

As per Chapter 13 Mountains: Fragile Ecosystems in Peril of Agenda 21 highlights, "*mountains are important sources of water, energy, minerals, forest and agricultural products and areas of recreation. They are storehouses of biological diversity, home to endangered species and an essential part of the ecosystem*". Mountain ecosystems having unique climatic and biophysical conditions house rare species of flora and fauna as compared to those habiting lowland areas with widespread

ecological niches. Mountain ecosystems also constitute an important element of the hydrological cycle hence both influencing climatic conditions and being impacted them. Sudden changes in critical variables such as temperature and precipitation can adversely impact the snow and ice cover, glacial flows and hence impact life and livelihoods of communities downstream.

Thus the State of Uttarakhand having immense natural resource endowments in the form of forest and water resources, high livelihood dependency on a climate-sensitive sector such as agriculture and with about 36.5% of the population below poverty line, is at high vulnerability to climate change.

Impact on Water resources: The Himalayas constitute one of the most important glaciers systems in the world and contribute to 69% of India's freshwater. The Gangotri glacier in the Uttarkashi district of Uttarakhand has been receding at the rate of 20-22 m annually, with grave implications for water availability downstream and hydropower generation. Glacial melting can lead to formation of GLOFs (Glacial Lake Outburst Floods) and heavy flows initially followed by dry spells. Precipitation is the main source of water in Uttarakhand, accumulating as snow on the mountain slopes in the Trans and Great Himalayan region. There are four major river systems in the state, viz. the Bhagirathi – Alaknanda, Ganga, the Yamuna-Tons and the Kali constituting nearly 900 glaciers, in addition to other sources of water such as lakes, streams, rivulets and springs. The state has witnessed a long-term decreasing trend of stream discharges, decline in capacities of the lakes, increase in surface runoff on hillsides, increase in floodwater, decrease in base flow water in channels and rivers, and recurrent soil erosion and landslips.

Impact on agriculture: Variations in climatic factors can affect crop yields either directly via changes in temperature, precipitation and/or CO_2 concentrations or indirectly via changes in soil properties and distribution of pests. Variability in precipitation has implications both for the economic growth of agriculture-based economies and for the food security of the nation. In India, it is estimated that a temperature rise of 2°C could lower the yields of staple crops such as wheat and rice by 10% and reduce farm revenues (DFID, 2006). Nearly 78% of the population in Uttarakhand is dependent on agriculture for livelihood. Agriculture in Uttarakhand is

already constrained due to mountainous terrain, low temperatures and short growing seasons, with climate change compounding these factors.

Impact on energy supply and demand: With over a billion people, India today only produces 660 billion KWh of electricity and over 600 million Indians, a population equal to the combined population of USA and EU, have no access to electricity, and limited access to other clean, modern fuels such as LPG and kerosene (GoI, 2007). The expansion needed in the energy systems, in a climate-constrained world, represents an enormous challenge for the country but also an opportunity to promote sustainable development. Renewable energy options existing in Uttarakhand are primarily micro hydro, solar energy, biomass for electricity generation, bio-energy, especially bio-fuels for transport sector and biogas for cooking.

Impact on forests and biodiversity: Changes in climate could alter the configuration and productivity of the forests ecosystems. Rising temperature, changes in availability of water, and enriched CO_2 are expected to bring significant changes in species composition in approximately one third of the forests worldwide. Nearly 200,000 villages in India depend on forests for their livelihood. Climate change is likely to affect forest biodiversity and cause a shift in forest boundaries thereby impacting the supply of forest products and consequently forest-based livelihoods.

Forest ecosystems in Uttarakhand are already subjected to socio-economic pressures leading to forest degradation and climate change can significantly affect the availability of forest goods and services in terms of quality and quantity. Production of several indigenous herbs and forest species in the state is likely to be severely impacted by these changes. Many Non-Wood Forest Products (NWFPs) are likely to be more vulnerable to changes in climate system than timber and fuel wood production and hence would have a more serious impact on NWFP-dependent forest communities.

Impacts on human health: Climate change can directly impact human health due to mortality and morbidity related to extreme events such as droughts, floods, cyclones, temperature extremes, etc. or indirectly due to change in transmission

pathways of disease agents such as pathogens and pests by creating favorable conditions for their survival and propagation. Pathways by which climate change affects human health would also include factors that are embedded in the environmental and socio-economic conditions of regions exposed to climatic extremes. Mountain regions such as Uttarakhand are vulnerable to direct health impacts of climate change due to floods and GLOFs and consequent health outcomes due to impacts on drinking water supply and sanitation and spread of water-borne diseases. Furthermore the occurrence of certain vector-borne diseases such as malaria has also been projected to shift towards higher altitudes with changes in the climate.

CHALLENGES FOR LIVELIHOOD SECURITY

Majority of population of Uttarakhand lives in rural areas and its dependence on agriculture almost as an exclusive source of livelihood. The efforts therefore have been directed towards sustainable development of rural economy by way of provision of non-farm employment opportunities, safe drinking water, empowering women and equipping them with skills, tools and finances for around economic development, promoting weaker sections of society and creating self-employment opportunities for rural youth.

In future, agricultural and other land-based activities, in the long run, even with the high and diversified rate of growth will not be able to ensure employment to all the rural workers at adequate levels of income. Technological advancement coupled with institutional changes in agriculture sector will lead to further shrinking of employment potential and also conversion of a substantial number of those under employed in agriculture into openly unemployed seeking work elsewhere. Given the fact that some of them will be able to get employment in urban areas; still it is necessary that the rural economy gets diversified into non-farm activities to provide productive employment to rural labor force. This will also help in arresting migration from rural areas to urban areas.

The state policy seeks improvement of quality of life, generation of productive employment and removal of regional disparity. Therefore, the focus of employment

strategies has to be shifted towards creating conditions not only to expand employment opportunities but also to achieve better living and working conditions.

Agriculture will continue to play an important role in providing employment. It is necessary that the rural economy gets expanded and diversified into non-farm activities towards providing productive employment to the growing labor force. Such diversification and expansion of the rural economy is possible through promotional policies and efforts. The success of these policies will largely depend on the ability to do away with some of the inherent weaknesses of the delivery system and the ability to design appropriate strategies as some are suggested below:

- ☞ Given the high incidence of underemployment and increasing casual labor, a primary objective of the state policy should be to generate productive work opportunities in sectors which are more labor-intensive.
- ☞ It is not enough to merely create employment opportunities, but also to provide the people with the human capital which will enable them to take advantage of these opportunities. Education and skill development are the prerequisites for such empowerment. Special programs should be implemented to develop skills, enhance technological levels and provide marketing channels for people engaged in traditional occupations.
- ☞ There is a tendency to implement many schemes with similar objective targeting the same population. Convergence of related schemes across sectors will help obviate any duplication of effort and depletion of resources as well as reduce the overhead cost of programs.
- ☞ A long-term perspective of development, reinforced by a consistent state policy, is crucial to successful implementation of programs.
- ☞ Isolated successful interventions cannot make any perceptible impact on social and economic development. Yet, these micro level experiments represent the seeds of change and need to be multiplied on a wider scale towards the realization of the development goals. As a result, institutionalization of the process and methods adopted in these experiments are necessary.
- ☞ The essence of success stories is “people’s participation”. The essential ingredients of people’s participation in the development process are assessment of local resources, local level planning, people development, and establishment

of local organizations as an umbrella support mechanism to facilitate people's actions. These processes will need to be institutionalized and sustained through the PRIs, which should be strengthened with greater devolution of central powers and functions.

In the ultimate analysis, growth generating productive employment will be an outcome of efficient institutions which implies good governance.

CHAPTER - 6
VISION AND MISSION

Uttarakhand State is well endowed with forest and water resources. More than 12,000 glaciers and 8 major river catchments act as the lifeline for the entire hydrological system of Indo-Gangetic plain. The Himalayan Watersheds are under constant threat of mass wasting and erosion caused by depletion of forest cover, unscientific agronomic practices, hydrologic imbalances and natural calamities. The ever increasing population, the need to provide a better quality of life to the people and the pressure on natural resources is further compounding the problem. Considering the magnitude of the problems, the Uttarakhand Govt. has realized the significance of taking up watershed based planning. A total of about 8 watersheds, 116 sub watersheds and 1110 Micro Watersheds have been identified in the state which are being taken up for regeneration and sustainable development, in phased manner.

"Our Common Future" the Brundtland Commission Report 1987 developed the concept of Sustainable Development. The main frame of the report is around sustainability, the report narrates the kind of development that "*meets the need of the present without compromising the ability of the future generation to meet their own needs*". Further, it is a process of change in which exploitation of the resources, direction of investment, the reorientation of the technology development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations. Keeping these tenets in mind our vision for Watershed Development in rainfed areas has been developed.

In the state, thrust has been given to Integrated Watershed Development Programs. A separate Directorate- Watershed Management Directorate (WMD) has been established as a nodal agency for coordination, monitoring and implementation of integrated watershed development programs in the state. With this objective in mind the State Level Nodal Agency has been formulated according to the Common Guidelines 2008 and has been anchored with the Watershed Management Directorate.

VISION OF WATERSHED MANAGEMENT DIRECTORATE

'To improve the productive potential of natural resources and increase incomes of rural inhabitants in degraded watersheds of the state through socially inclusive, institutionally and environmentally sustainable approaches.'

MISSION STATEMENT

Holistic development of the degraded and rain-fed areas of the state through integrated management of natural resources on participatory basis to achieve ecological balance, income enhancement through increased livelihood opportunities, poverty alleviation, welfare of vulnerable groups including women and landless, equity in benefit sharing and institutional strengthening through capacity building.

CHAPTER -7
PERSPECTIVE

NEED FOR PERSPECTIVE PLAN

The Himalayan watersheds are under constant threat of mass wasting and erosion caused by depletion of forest cover, unscientific agronomic practices and hydrologic imbalances. The ever increasing population, the need to provide a better quality of life to the people and the pressure on natural resources is further compounding the problem. The total of 7.66 lakh ha. cultivated area in the State 4.21 lakh ha. area is rainfed. An insight into the rainfed regions reveals a grim picture of poverty, water scarcity, rapid depletion of ground water table and fragile ecosystem. Land degradation due to soil erosion by wind and water, low rainwater use efficiency, high population pressure, acute fodder shortage, poor livestock productivity, under investment in water use efficiency, lack of assured and remunerative marketing opportunities and poor infrastructure are important concerns of enabling policies. The challenge in rainfed areas, therefore, is to improve rural livelihoods through participatory watershed development with focus on integrated farming system for enhancing income, productivity and livelihood security in a sustainable manner.

A number of watershed management projects are being executed in the state under different schemes; the Micro watersheds where these schemes are being implemented have been selected more on the grounds of suitability of working areas to the Project Implementing Agency (PIA) than on the basis of any priority made in an objective manner.

For overall integrated development in the state, it is important to implement development activities in the untreated MWS on the basis of priority made in an objective manner. The criteria of selection of MWS to be taken up under the Common Guidelines were as follows:-

There are a number of projects/ schemes operational in the State which is implementing MWS treatments. Keeping these schemes in view only the untreated MWS were shortlisted for the above project.

- Of the total of 1110 MWS delineated in the State**.** Out of the 537 untreated MWS, 124 micro watersheds have been identified above 3200 mt. altitude comprising a total area of 14,25,750 ha. This is the area with little to no human habitation, snow bound glacier, rocky and forest covered area. The status of this land is mainly Reserve Forest under the jurisdiction of the Forest department. The High altitude National Parks/Sanctuaries such as the Nanda Devi National Park, Gangotri National Park, Kedarnath Wildlife Sanctuary and Askot Wild Life Sanctuary lie in this zone. Besides, this area is also home to the some of the places of great religious significance such as Badrinath, Kedarnath, Gangotri and Yamunotri.

Micro watersheds in this zone are land slide prone areas having slopes greater than 30 degrees gradient. Besides, these areas are also facing tremendous pressure and degradation of their natural resource due to high tourist and pilgrim inflow.

The Micro watersheds - Badrinath, Jumagard & Dhauliganga (District Chamoli) are home to Internationally famous places of religious and ecological significance viz Badrinath shrine and Valley of Flowers National Park (A world heritage site) .Due to large number of pilgrims visiting Badrinath shrine and tourist pressure at Valley of Flower National Park, the above Micro-watershed are facing degradation. The Micro watershed Kedarnath (District Rudrapryag) has the world famous religious shrine *Kedarnath.* It is under pressure from high number of pilgrims and trekkers visiting the area. The Micro watershed Gangotri and Yamnotri (District Uttrarkashi) are home to Gangotri and Yamnotri both places of great ecological, religious and tourism importance. Similarly Harikidoon is also facing degradation due to pressure from tourists and pilgrims.

Any watershed treatment required in this zone (> 3200mt) will be undertaken as convergence projects requiring special interventions by the concerned departments.

- Out of the 537 untreated MWS, 409 micro watersheds have been identified below 3200 mt. altitude comprising a total area of 18,11,887 ha. and additionally 1,20,000 ha. of area from Haridwar district have been prioritized for treatment (MWS have not been delineated in Haridwar district). These MWS would be taken up for treatment on the basis of prioritization made in the manner given below. All the 409 MWS lying below 3200mts altitude have been prioritized for every district. The total area available for treatment under the plan has also been calculated for every district **(Annexure Table 7.1).**

  The criteria and weightage for selection of MWS has been done on the following criterion.

(Table 7-a.) Criteria and weightage for selection of MWS

S.No	Criteria	Max.	Ranges and Scores			
1.	% of SC/ST population	10	More than 40% (10)	20 to 40% (5%)	Less than 20% (3)	
2.	Actual wages	5	Actual wages are significantly lower than minimum wages (5)	Actual wages are equal to or higher than minimum wages (0)	In the State actual wages are equal and higher than minimum wages (0)	
3.	% of small and marginal farmers	10	More than 80% (10)	50 to 80% (5)	Less than 50% (3)	
4.	Area under assured irrigation	15	Less than 10% (15)	10 to 20% (10)	20 to 30% (5)	Above 30% (Reject)
5.	Degraded land	15	High–above 20% (15)	Medium – 10 to 20% (10)	Low- less than 10% of TGA (5)	
6.	Contiguity to another watershed that has already been developed/ treated	10	Contiguous to previously treated watershed and contiguity within the MWS in the project (10)	4 to 6 MWS in cluster (10)	2 to 4 MWS in cluster (5)	
7.	Cluster approach in the plains (more than one contiguous MWS in the project)	15	Above 6 MWS in cluster (15)	4 to 6 MWS in cluster (10)	2 to 4 MWS in cluster (5)	
	Total scores	**80**				

From a total of a 537 untreated MWS 409 MWS would be taken up for treatment in this project. The details of MWS of each districts with its weightage criteria is annexed with (**Appendix Table 7.(I to XII))**

These MWS could also be taken up under various convergence schemes. Amongst the various convergence schemes specific projects designed by various Line Departments like Forest, Agriculture, Rural Development can be taken up. Any Externally Aided Project working on Watershed Guidelines could also prove to be a good convergence project. Within these projects also NREGS could also be used as an effective convergence tool.

PROJECT AREA

The entire state of Uttarakhand comprising thirteen districts will be the project area. However actual work will be carried out only in selected prioritized untreated MWS shown in **(Map-9 - State Map showing the areas proposed for treatment under IWMP)**

Keeping the Common Guidelines for Watershed Management in mind a Perspective Plan of Integrated Watershed Management is envisaged which aims at sustainable utilization and management of natural resources like water, land and vegetation. It will also address the issue of sustainable farming system and rural livelihood opportunities with the participation of local communities for ensuring long term ecological and economic security. As per the common guidelines the plan has been based on the following principles.

1. **Inclusiveness**: The poor, small and marginalized farmers, household landless women, shepherd and SC, ST persons would be mobilized to form SHGs it shall be ensured that these groups are dependent on the watershed areas for livelihood. These SHGs would be provided revolving fund and capacity building in various income generating activities would also provided. Gender budgeting would also implemented.
2. **Decentralization**: Within the framework of Panchayati Raj Institution Watershed Committees shall be constituted along with Self Help Groups, User Groups and individual beneficiaries. The Watershed Committee formed would be given

financial autonomy in implementing the project. These empowered committees would plan and implement and monitor the plan at the Gram Panchayat level.

3. **Social mobilization**: The project functionaries will have shift in roles from controller and regulators to facilitators. For this purpose professional team including voluntary organization would be selected for social mobilization, community organization. Capacity building of communities shall be done for planning and implementing the project.
4. **Community Participation**: All the stakeholders would be involved in planning, budgeting, implementing and monitoring of the projects. To inculcate sense of ownership amongst the stakeholder's community contribution in the form of water development fund would be there to ensure the sustainability after the withdrawal of the project. The project would give special emphasis on the vulnerable groups of the community.

The main project components would be:

a) Participatory Watershed Development and Management
b) Enhancing Livelihood Opportunities
c) Institutional Strengthening

a. Participatory Watershed Development and Management :
    - ♣ Promotion of Social Mobilization and Community Driven Decision Making
    - ♣ Natural Resource Management
b. Enhancing Livelihood Opportunities :
    - ♣ Farming System Improvement
    - ♣ Income Generating Activities for the SHGs
    - ♣ Value Addition and Marketing Support
c. Institutional Strengthening
    - ♣ Capacity Building of Gram Panchayat, Watershed Committees
    - ♣ Information, Education and Communication
    - ♣ Monitoring, Evaluation and Learning System

Within these components the following activities would be undertaken:

SOIL AND MOISTURE CONSERVATION MEASURES

The soil and moisture conservation treatment in arable and non arable areas are separate. In arable lands soil and moisture conservation measures can be broadly classified into two categories, viz; i. Biological, and ii. Mechanical and Engineering

i. **Biological** or Vegetative measures are preferred in watershed development programs as they are eco friendly, sustainable and cost effective. These measures are normally adopted on lands having milder slopes, less run off and sediment flow. These can be adopted singly or in combination with mechanical measures depending upon the intensity of soil erosion problem. Commonly used biological measures consist of vegetative barriers, alley cropping, strip cropping, contour farming, tillage and mulching.

ii. **Mechanical and Engineering measures:** In situations where biological measures only are insufficient to check erosion toward desirable level due to high velocity of run off or discharge, mechanical measures are needed. These measures not only check erosion but also conserve moisture for crop growth. Basically these measures constitute a series of mechanical barriers constructed a cross the slope to reduce or break the length of slope only or both the length and degree of slope to dissipate the energy of flowing water. Mechanical measures like bunding, terracing, leveling etc. are adopted in arable lands on relatively moderate to steep slopes.

Non arable lands are those lands which are generally unsuitable for cultivation of agricultural crops due to one or more limitation of slope, erosion, stoniness, shallowness, wetness, flooding, climate etc. these wasted lands are formed due to misuse, over exploitation and non adoption of suitable conservation measures quite often, establishment of vegetation on these highly degraded lands is difficult due to higher run off / debris movement, lack of moisture and absence of fertile soil. Engineering or mechanical measures are, therefore, often needed before undertaking re-vegetation program to stabilize the slopes and create conditions conducive for plant growth by arresting fine soil and improving moisture status. For this purpose diversion drain, contour trenching, stone wall, half moon terracing, wattling followed by vegetation measures help control erosion.

Drainage line treatment is essential for a watershed as drainage lines carry run off and sediment flow. These drainage lines may have different forms such as drainage channel, gullies, natural/ artificial water ways, streams, rivers or torrents. Network of these drainage lines, quite often suffers from degradation due to uncontrolled run off and may go on extending and render and adjoining lands degraded. Drainage line treatment can be done through check dams which may be vegetative, temporary and gabion, Torrents also known as *raos* may be trained by construction of spurs, protection wall, embankments and bio fencing etc.

WATER HARVESTING TECHNIQUES

Various system of water harvesting depending upon the source of water supply may be implemented like (a) in-situ rain water harvesting can be done through bunding and terracing, contour farming, mulching etc. (b) rain water / direct surface run off harvesting through roof top collection, dug out ponds, storage tank, diversion bunds / channel etc. (c) Stream flow or run off harvesting through nala bunding, water harvesting dam, percolation tank/ ponds, (d) Sub surface flow harvesting.

FORESTRY

Afforestation means raising of forest crop on lands which are not already covered with the forests. Besides, production of fuel, fodder, fiber, fruits and timber, forests serve the important purpose of preservation of environment and conservation of soil and water. Although, existing vegetation gives a clear indication of the suitable species but the choice of the species depends upon various factors. Fast growing, top feed and drought resistant tree species capable of growing under adverse condition should be preferred for afforestation purposes. Species like *Grewia optiva, Morus alba, Bauhinia, Salix alba, Robinia pseudoacacia, Eucalyptus, Populus spp.* etc. could be taken up for plantation.

Pasture or grassland management is forage production from all kinds of natural vegetation edible to livestock, mostly grasses and herbs, on the non- arable lands. Pasture or grasslands require management by initial range improvement measures, especially reseeding and planting, and kept in a state of optimum productivity by

proper grazing system with different kinds of livestock for different periods and periodic improvement. The forage may be utilized either in situ by grazing or by stall feeding or both. Poor and fair common property lands can be stocked by selected high forage yielding perennial grass species by reseeding and / or planting of rooted slips. Some of the most important species are *Dichanthium annulatum, Sehima nervosum, Chrysopogon fulvus* etc.

AGRICULTURE:

In rainfed regions agriculture is the livelihood of a large section of our population which meets their food, fiber and energy requirements. In the rainfed areas, an ideal cropping system involves sequential cropping of a cereal followed by legume, shallow rooted, by deep rooted crop, fertility depleting by fertility restoring crops, soil degrading by soil regenerating crop, and the crops demanding heavy inputs by those that can survive on low inputs. Following points are important for in and efficient integrated crop management program:

- Timely sowing is a must;
- Introduction of suitable of suitable high yielding varieties matching the rainfall pattern;
- Inclusion of a legume component to build – up soil fertility and saving on fertilizer use ;
- Stable, productive and remunerative intercropping system;
- Double cropping systems, where feasible;
- Inclusion of fodder component;

Farming System improvement is possible through integrated crop management strategy. Integrated crop management is a holistic approach for overall management of cropping systems from seed to seed for obtaining potential yield. Integrated crop management comprises four important components. They are:

- Integrated plant nutrient management (IPNM)
- Integrated moisture management (IMM)
- Integrated weed management (IWM)

- Integrated pest & disease management (IPDM)

IPNM is dependent on IWM, IPDM is dependent on IPNM. Likewise all the four components are interdependent and supplementary to each other.

IPDM without IPNM, IWM and IMM will not produce potential yield. Hence, all training's, field trials and demonstrations proposed under the project shall combine IPNM, IMM, IPDM and IWM judiciously aiming at Farming System improvement.

Integrated Plant Nutrient Management (IPNM)

Integrated nutrient management is a system / an approach; where in the overall nutrient requirement of a crop is assessed / estimated on the basis of Soil Test Crop Response (STCR), accordingly the nutrients are supplied. In the absence of IPNM it is impossible to assess the exact nutritional requirement of a given crop. If IPNM is not followed there will imbalance in the application of nutrients, as a result there will be either excess or deficit in the availability of nutrients, and it also reduces the plant's ability to utilize nutrients from the soil and leads to improper metabolism of nutrients. This may result in the reduction of immunity of the plants, which may attract pests and diseases, resulting in poor yields. IPNM is invariably practiced in the degraded shallow, soils resulting in poor crop yields. IPNM has to be planned on scientific basis, from the first day of land preparation, sowing to harvesting. IPNM can be practiced by sensitizing area groups, creating awareness to farmers through publicity propaganda, organizing communities and training's. Demonstrations can be conducted on the lines of Farmers Field School (FFS). Application of nutrients based on STCR results. All decisions are taken by farmers in the fields with the help of extension staff, during the period of demonstration from pre sowing to post harvest (seed-to seed). Farmers can actively be involved in the field and they record all the observations and maintain the records during demonstration period.

Integrated Moisture Management: Moisture retention is central to farming system improvement; this can be possible through contour farming. It is an easy, effective and low cost method of controlling erosion, conserving moisture and improving crop yields. Carrying out farm operations such as ploughing, seeding, planting and inter-culturing along the contour lines result in creation of furrows which act as miniature

reservoirs to hold the excess runoff, dissipate the energy of flowing water and provide increased opportunity time for runoff absorption. Tillage, mulching and residue management practices are helpful in reducing erosion losses and increasing in situ moisture conservation in the soil profile. Tillage influences physical characteristics of soil and infiltration of rain water; whereas mulching and residue management practices check evaporation losses of water and also help in improvement of soil fertility.

Integrated Weed Management

Weeds are integral part of cropping system. Weeds are naturally selected and have the ability to survive under adverse condition. No-single method in the past has proved effective against weeds. IWM is a combination of mechanical, cultural, manual, biological and chemical method of weed control. Potential yields of any crop can be obtained only when the weeds are properly managed. Weeds compete for moisture, nutrients, space and they acts as hosts for many pests and disease. Therefore IWM is imperative. Unlike IPNM the source of weeds are innumerable, for example weed can spread through FYM, soil, wind, water along with crop seeds and by birds. Therefore to manage the weeds we must select well-decomposed weed seed free compost. Before sowing, after sowing, during crop period and after harvesting, weeds shall be controlled. Only certified seeds / planting materials, seeds shall be used. Creating awareness among the farmers (users groups) by publicity, propaganda, and organizing communities. IWM shall be practiced through demonstrations on the lines of farmer field demonstrations.

Integrated Pest & Disease Management

IPDM is a management tool for pests and disease management, where in mechanical, cultural, biological, chemical, use of resistant varieties, and quarantine methods are carefully combined to keep pest & diseases at below economic injury levels to obtain optimum crop yields. The advantages of IPDM are:

- IPDM is Eco & farmer friendly.
- Environmentally safe.
- Cost effective.

- If reduces the application of pesticides.
- Results are assured.

IPDM can be practiced from seed to seed, which includes pre- sowings to post harvesting of the crop. The first step involved in IPDM planning is to sensitize the facilitators i.e. extension staff and the farmers in the watershed areas. This can be done by organizing Farmers Field demonstration. Farmers' Field demonstration has proved as the best way to demonstrate IPM. It is a non-formal type of educational learning situation wherein the participants will be able to acquire the skills and knowledge of integrated pest management through the integrated adoption of production technology in raising a healthy crop. At the end of the training farmers will:–

1. Become experts in their own field for arriving at right decision for pest management.
2. Be able to conserve the defenders (natural enemies) in their field.
3. Observe the crop regularly.
4. Be able to grow healthy crop.

HORTICULTURE

Rainfed Horticulture has assumed greater attention now days due to better economic returns. Fruit trees provide better substitute and offer alternative opportunities in areas where cropping may not be possible due to non availability of irrigation. Selection of suitable hardy variety resistant to drought, adverse weather condition, diseases and pest and use of local or other hardy root stock for raising fruit trees is of utmost importance for the success of conservation horticulture. The fruit crop selected should be such that their maximum growth takes place during the period of maximum water availability in the soil and low- pressures deficit in the atmosphere. The most part of the reproductive cycle i.e., period from flowering to fruiting should also fall during this period and fruit ripening should be completed before the onset of dry summers. It is essential that nurseries should be stocked with high yielding good varieties of fruit plants at the local level.

Medicinal and Aromatic Plants

At present, our agricultural system is dominated by a certain group of crops as more than 80% of our food comes from about 10 species only. Under such circumstances, crop diversification will be a boon from ecological as well as nutritional point of view. Concept of diversification is need based as well as economically viable. It is helpful in ensuring better soil health, better utilization of resources, nutrient recycling, efficient nutrient use, aversion of risk and uncertainty, decreased weed infestation etc. Inclusion of medicinal and aromatic plants, ornamental flowers with fruit trees and fuel and fodder trees may be remunerative cropping system.

The high biodiversity by different climatic zones of Uttarakhand hold immense potential for enhancing livelihoods through medical and aromatic crop cultivation. The variations in microclimate over short distance, increases the potential for agro diversity and range of the natural resource produce.

Uttarakhand supports a large number of medicinal plants, which are extensively used by the pharmaceutical industry for preparation of drugs used in Indian System of Medicine. These plants are either used as single (e.g. SHATAVARI from *Asparagus racemosus*) or multi-herb products (e.g. CHYAWANPRASH containing amla fruit and several herbs). The degree of threat to natural populations of such medicinal plants has increased because more than 90% of medicinal plant raw material for herbal industries in India and for export is drawn from natural habitats. In this context, medicinal plants of Uttarakhand can open avenues of economic growth in the emerging world market.

The State Government has taken initiative to promote medicinal and aromatic plant cultivation through involvement of public and private sector in nurseries/planting material, establishment of herbal mandies and processing/distillation units, simplified transit rules. State Government has prioritized 26 potential species of medicinal and aromatic plant for promotion of cultivation.

Due to non tradition of cultivation of medicinal, aromatic and dye plants, these were rarely tested and tried for domestication and for propagation and mainstream cultivation for marketing and livelihood promotion or as a supplementary income

source of the people. The project has great potential to take up this challenge and provide opportunity to the people to its project area for a sustainable livelihood program. The following table gives details of the potentially recommended medicinal plants and culinary herbs for promotion in the project area. More number of the species of crops, plants and herbs of different medicinal values has been provided for the final choice for selection and also maintaining biodiversity and risk of failure of any mono crop from farmers point.

Table 7-b List of medicinal and aromatic plants for cultivation purposes

Sl. No.	Name of Crops /Plant/Herbs	Botanical Name	Altitude (ft.)
CROP SPECIES			
1.	Satavari	*Asparagus racemosus*	2500-5500
2.	Chirayata	*Swertia chirayita*	5500-7000
3.	Aswagandha	*Withania Somnifera*	2500-4500
4.	Giloy	*Tinospora Cordifolia*	2500-5000
5.	Meethi Tulsi	*Stevia repaudiana*	Upto 3000
PLANT SPECIES			
1.	Reetha	*Sapindus mukorossi*	Upto 5000
2.	Baheda	*Terminalia Bellirica*	Upto 4000
3.	Harar	*Terminalia chebula*	Upto 4000
4.	Amla	*Emblica officinalis*	Upto 6000
CULINARY HERB SPECIES			
1.	Thyme	*Thymus valgaris*	Upto 4000
2.	Rosemary	*Rosmarinus officinalis*	Upto 4000
3.	Oregano	*Oreganum valgare*	Upto 4500
4.	Sweet Marjoram	*Origanum marjorana*	Upto 3000
5.	Mint	*Mentha piperita*	Upto 3500

Floriculture: Uttarakhand has special advantage to grow different kinds of flowers crops around the year because it is endowed with conducive agro-climatic conditions, cheap labor, vast natural resources, low production cost etc. increase awareness about the potential of this sector will encourage many progressive growers and entrepreneurs to take up floriculture as a commercial enterprise.

Flowers like Marigold, Gladioli, carnations and orchids, lilies etc. can be grown in the hills of Uttarakhand.

LIVESTOCK BASED PRODUCTION SYSTEM

Livestock based production system is an integral component of agriculture in rural economy. Nearly 70% of the population residing in rural areas is engaged with traditional systems of animal husbandry. However, to improve production and generate livelihood support to the rural poor for upliftment of their economy, scientific ways of animal based production systems need to be intensified.

Cattle based production system: Cattle rearing are an integral part of farming activity. Buffalos are generally preferred to cows because of high price of milk, being versatile, draft and resistance to diseases. But buffalo rearing has its own disadvantages. Therefore, it is recommended that farmers should have viable unit of three cows (cross bred and two to three buffalos).

Some of the important points for effective cattle management are :

- Follow proper housing, ventilation, disease control and feeding management.
- Animal should be milked 45 days after calving.
- Animals should be de-wormed 15 days prior to calving.
- Treat the navel cord of calf to prevent illness.
- Feed the calf 22-31 cholestrum per day.
- Start feeding concentrate at 4 weeks age, if the calf is not getting sufficient milk.
- Dehorn the calf at 2-4 weeks age.
- Proper vaccinations and health care should be done.
- Cross bred should conceive by about 90 days after calving, if not, then test for fertility.

Goat / sheep based production system: Goat / sheep rearing are traditionally and widely practiced across the country. A viable unit / family comprises of 50 local improved sheep (Ewes) including 1-2 raw or 30 local improved goats (bucks) including one doc. Goats and sheep are commonly fed by open grazing. However,

stall-fed goats consume any fodder, are resistant to diseases and fetch good market value.

Backyard poultry: The backyard poultry farming exists in rural areas involving mostly well adapted indigenous or cross–bred chicken to which minimum inputs are used from local resources for their management. The production potential of these birds is around 80-100 eggs per bird per annum. As a secondary enterprise in backyards, 10-20 cross – bred birds can be maintained as broilers or layers.

INCOME GENERATING ACTIVITIES

The State of Uttarakhand has high degree of agro-climatic diversity and economic backwardness**.** The economic deprivation in region is not only because of small land holdings but also because of unproductive land use due to rain fed and operational constraints faced due to harsh physical conditions. Major operational constraints include undulating nature of farm holding coupled with inequitable agrarian structure, absence of land consolidation, poor infrastructure for storage, processing, value addition and marketing of agricultural products, and most importantly the ecological handicaps incidental to mountainous area. Due to all the above constraints, the people of the tract are forced to look for alternative avenues to augment their income and daily needs, thus the rate of seasonal and permanent migration is very high with males and women has to bear the entire workload of the household. The situation is more acute for the women from landless and small marginal landholders. In order to tackle this pressing problem of land degradation as an indirect consequence of low productivity and poverty, there is a need to evolve strategies for income enhancement of local population within the village itself.

To wean away people from making unsustainable use of natural resources and to improve their economic status, some alternative means of livelihood need to be provided to them. This would be achieved through viable and potential livelihood activities designed under the project.

Since landless and women have very limited resources and they are not secure on the financial front, specific support is needed for starting an income generating activity. With this background, to put the income generating activities on a sound

footing, acquisition of necessary skills and working capital are proposed under IGA strategy for vulnerable groups. It will enhance the capacity of women, the poor, SC/ST, to increase their income- levels. In this way, it will focus and assist those sections of village communities who will receive very little benefits from the watershed treatment activities.

Objectives

1. Organization of Self Help groups for sustainable productivity enhancement.
2. Build and enhance the capacity of Self Help group for livelihood.
3. Promotion of micro- enterprises through entrepreneurship development program

The overall objective of this component is the socio-economic upliftment of women, poor, SC/ST, by the expansion of income earning options through on farm & off farm employment and sustainable and efficient use of natural resources. Some key preconditions are needed for this:

- Availability of infrastructure both physical and institutional at local level.
- Access to support services (e.g. credit, inputs, training and information).
- Access to markets and knowledge.
- Safeguards against ecological problems (e.g. land degradation, overexploitation of natural resources and endangered bio-diversity).

Identification of potential income generating activities is the most important and very crucial step to meet the above objectives. Inaccessibility, thin spread of resources and materials, lack of forward and backward linkages and deficiencies in infrastructure and service render commercial production very risky. Therefore provision of infrastructure and institutional and organizational mechanism for supply of inputs and for marketing, with a view to ensuring a minimum scale of operations, has become essential for the survival and growth of IGA.

The major thrust area of the Income Generating Activities is to increase the productivity and income of rural habitants in the project area through sustainable management of natural resources. The reduction of poverty and enhanced livelihood

opportunities for vulnerable families and to improve skills and create alternate livelihood options for them are objectives of this proposed plan.

Providing skills and create alternate livelihood means to augment income, the unsustainable use of natural resources could be reduced. If the natural resources are used optimally, keeping in view their carrying capacity, the objective of the project to increase the productivity and income of rural habitants in the project area through sustainable management of natural resources could be achieved.

An indicative list of possible activities which can be taken up as individual /joint IGA which are also being implemented by Externally Aided Project of the Watershed Management Directorate are given below:

1. Horticulture - Vegetable production, Mushroom cultivation and Floriculture
2. Food processing , preservation, Pickle making, manufacture of soyabean by products and Bakery
3. Cultivation of medicinal plants
4. Fibre handicraft, Plate / rope making , carpet making
5. Livestock production (backyard poultry, goat/ sheep units), Dairy unit - processing plants
6. Fisheries
7. Beekeeping
8. Forest/ horticulture nurseries
9. Seri culture
10. Vermi culture
11. Tailoring with shared/ individual owned sewing machine, Setting up a Individual/ jointly owned shop or tea-stall and production of tools for artisan activities
12. Marriage band, Tent house and Stove/ catering unit

Self Help Group Fund Support: Since the marginalized groups are not secure on the financial front, specific action has to be taken to arrange the finances needed for starting an income generation activity. To meet and supplement the requirements of an Income Generation Activity, a SHGs fund support for capacity building and working capital assistance is provided at the GP level. It will serve the purpose of

promotion of micro- enterprises and will work as a Revolving Fund. The SHGs will utilize this fund either for a joint IGA or individual activities within a group.

Most of the proposed project interventions are land based, thus to provide benefits to the SHGs including poorest of poor, special activities have to be thought so that the project interventions do not profit only the landed and affluent sections of the community. This is also a mechanism to involve these people with the implementation of the project, who may otherwise remain indifferent.

Working capital will be used to assist identified groups for purchase of goods and equipment if required. This will be utilized jointly and individually as per the group's decision. Apart from this, adequate Entrepreneurship Development Trainings and skill trainings for production will be conducted. It will enable them to enhance their capacity for income generation programs.

Social Mobilization / formation of Community Group: This project aims at a multi dimensional approach for decentralized watershed development, catering to a major part of rural Uttarakhand. The theme of the project is to evoke and involve communities through PRIs, for the implementation of this project and its further sustenance.

The communities are actually the first vehicles or mode of contact with the watershed. The relationship of people and the natural resources are interwoven, integrating different components such as soil, water, biomass, livestock etc. on a day-to-day basis in order to sustain their lives. The status of a watershed at any point in time is a reflection of people's needs and their dependence on the land for their livelihood. Thus community members are prime stake holders in any watershed endeavor. The hilly communities have been managing their natural resources from time immemorial to fetch their needs within a framework of practices and wisdom and their economy is essentially thriving on watershed produces, therefore genuine involvement of local people in managing and improving the condition of the watershed is essential if their living conditions are to be positively improved.

This plan orients around the community, its wisdom, participation and harmonious use of existing natural resources. The community living in the micro watershed will be

encouraged, enabled and augmented with the technical inputs to fulfill the various objectives. The motivational inputs will be environmental awareness, introducing latest technologies for improving productive potential without deteriorating the prevailing eco-system. Introducing wide and viable options for improving economic as well as environmental status will further augment this. The proposed plan will enhance the capability and capacity of communities by providing them technical assistance in an integrated coordinated way. Communities will play central role, right from planning to the management of programs. They will be responsible for overall management of the watershed and it is expected as basis for all other inter connected relations and outcomes.

To achieve diverse project objectives and enable genuine community participation, the following approach is outlined.

Community Mobilization: The foremost step in community mobilization involves understanding of prevailing social structure and dynamics, clan patterns as well as the influential/ dominating clusters within the community. Establishment of close rapport with all the segments of the society from vulnerable to elite groups would require special understanding of social issues and knowledge of special tools and training. Special attention will be paid to involve and gain the confidence of women folk.

The IEC tools will play a significant role in the mobilization of community and these tools will be used for enabling them to understand the concept of the project as well their participatory role. With the assistance of various IEC tools suitable environment will be created for effective community participation.

The essential steps conducive for effective community mobilization will be given

(Table 7-c): steps for community mobilization

Step	Activity	Purpose
I	Informal village level discussions (in small homogenous groups)	• To collect basic information about the village, with the assistance of WDT • To understand the social structure and dynamics of the community. • Rapport building with the people, especially with women and vulnerable groups of the community

Step	Activity	Purpose
		• To know the traditional practices related to their livelihood and existing approach of community towards NRM. • To understand recent trends in usufruct pattern on public and common lands.
II	Introductory meeting with existing formal and non-formal groups and with the entire community	• Raising awareness in the community about the broader aspects of Integrated participatory Watershed development and NRM • To explain the broad concept, objective and working of project vis-a-vis effective role of the community. • Gathering information about existing village CBOs and PRIs setup
III	Selection of Village Motivator from each village through specially convened meeting with the assistance of WDT.	• To find a suitable communicator preferably from weaker sections/ Mahila Mangal Dal/ SHG existing in the village so as to encourage and mobilize communities, particularly the women folk for active involvement in the planning and implementation of different project activities.
	Appraising the selected motivator about his/her role in the implementation of the project along with duty chart and performance indicators	• To provide basic and trustworthy link with the community
IV	Formal and informal group meetings and awareness campaigns by WDT and village motivator for motivating and evoking amidst all segments of the society	• To mobilize community for collective decision making action • To spell out their needs and perception in shaping the project. • To stimulate them about their role in decision making with reference to Integrated Participatory watershed development.
V	Stake holder Analysis	• To identify the vulnerable sections of the society • The traditional practices related to their livelihood • Existing approach of community towards NRM

Dissemination of key information regarding the project : In order to disseminate clarity about the aim, object and methodology being adopting in the plan, it is necessary to impart key information among the community members. Awareness campaigns as well as hamlet and village level meetings will achieve this. Information package developed under IEC, including visual information on watershed will also be utilized, to inculcate better understating of the project theme among all the stake-

holder of the community. The following steps will be taken to bring out community participation in a planned and transparent manner.

(Table 7-d). Steps for community participation

Step	Activity	Purpose
I	Approaching Gram Pradhan by WDT staff for convening general meeting of Gram Sabha along with fixing date and venue	❖ Imparting key information regarding the project, its aim, objective and methodology, also for Disclosure Workshops
II	Performing Gram Sabha meeting	❖ To Disseminate the key information regarding the project ❖ To select the community organizer
III	Convening a special meeting to form and activate GPs Watershed committee at Gram Sabha level	❖ To select Secretary Watershed Committee and members of the Watershed Committee. ❖ To assist in preparation of village proposals, implementation and mgt. of Plan at village level

Participatory Watershed Planning at the village level with the involvement of all stake-holders and using the budget envelopment as the basis: The involvement of stakeholders at grass root level is a vital element of watershed management. It is of utmost importance to involve them in such a manner that they feel ownership of project at every step. The stakeholders so motivated, will provide relevant information about the natural resource prevailing within the watershed, their traditional practices in harnessing them as well as specific local wisdom and practice with in the community. The emerging trends of migration and consequent changing pattern of common property rights will also be put forth by them. They will also spell out their needs for improvement of their economic status by sustainable use of natural resources.

Participatory planning as envisaged above will not only entail determining felt needs through community level workshops and meeting PIA but more importantly will reach a common understanding among local actors and PIA staff regarding true problems and determining which of them can be realistically addressed through joint action.

This will also include identification of arable and non-arable land within the village so as to ascertain specific treatment measures required. Another crucial exercise required is identifying vulnerable section of the society and reorganizing their peculiar needs. During these exercises, community members, Panchayati Raj Representatives and other local players would be encouraged to voice their own perceptions of the problems at stake. Project staff and concerned NGO will facilitate this process through their expertise and dissemination of relevant information.

This will ultimately lead to a series of negotiations between local actors and technical staff regarding:

- The issues to be addressed ;
- Institutional promotion for facilitating smooth functioning
- The respective responsibilities of each partner; and
- The technical design of activities selected.

This will be achieved by WDT and with the support of social mobilizers. Technical input by the PIA staff will also be provided at this stage, to chalk out details of implementation procedures, time and work schedule and cost sharing will be negotiated and finalized with concerned group for a participatory take off.

Following steps will be involved in village level watershed planning.

(Table 7-e). Steps for participatory community planning of Watershed Projects

Step	Activity	Purpose
I	Base line data collection, participatory Rural Appraisal and Environment & Social Assessment	❖ Ascertaining the potential of natural/human resources and extent of people's reliance on them within village. ❖ Ascertaining the geographical distribution of land, its title, ownership, and usufruct rights, to delineate community's dependence on the resources and to understand the recent history of the community to understand emerging trends. ❖ Determining the current condition of the watershed. ❖ To assess the livelihood practices pursued by different groups. ❖ Establishing environmental baseline by blending and super imposition of villager's drawn resources map, the cadastral or revenue department map, Satellite imageries prepared by Remote Sensing agencies/GIS.

Step	Activity	Purpose
		❖ Finding an overview about the causes of degradation or enhancement of natural resources. ❖ Exploring local wisdom and identifying specific local technologies ❖ Taking stock of the needs of the community for viable economic development ❖ Ascertaining priorities regarding NRM and phasing out the activities ❖ Undertaking state of affairs and role of women vis-à-vis Gender's view point in the community ❖ Inclusion of marginal group's and vulnerable section's interest with right to access to common property resources
II	Identification of vulnerable sections of the society for ascertaining their peculiar needs and existing gaps through above mentioned exercises	❖ Formation of SHGs preferably homogeneous members. ❖ To prepare an IGA related Sub-plan for vulnerable groups to improve their livelihood status.
III	Identification of potential interventions for treatment of the watershed on arable and non-arable lands (This will be done by WDT with active cooperation of the community to determine the extent of degradation, topography, soil texture and scope of probable water harvesting options. Blending of area specific latest technical expertise with the traditional wisdom of the community so as to evolve suitable strategy for both arable and non-arable lands.)	❖ To devise ways and means for upgrading the soil structure and providing irrigation facilities as and where practicable by scientifically blended options with traditional local wisdom for enriching vegetational growth for catering local needs. ❖ Optimum utilization of land potential producing zone specific crops along with horti, fodder, fuel and timber species. Site selection of appropriate engineering as well as non-engineering measure to improve soil condition and check further erosion.
IV	Integration of Natural Resource Management into watershed committees proposals.	❖ Screening of activities as regards potential negative social and environmental impacts
V	Formation of the village plan with the application of NRM framework.	❖ Collection, documentation and compilation of relevant facts, data, and opinion, derived from the enumerated exercises so as to provide a comprehensive shape for implementation. ❖ Ensuring non-erosion of rights and interests of vulnerable sections, increasing their income generation avenues, along with safeguarding environment.

The exercise mentioned above will determine the scope and parameters of watershed development and the extent of community participation for a particular village. In order

to obviate the possibility of non-inclusion of certain hidden aspects, which may cast its shadow in proper planning, and implementation of the project, a thorough checking of the facts and figures gathered till now is necessary. The community as a whole will be motivated and persuaded to prepare need based and area specific feasible watershed development plan through a revision exercise.

The WDT will facilitate the overall process and if necessary will guide at every step of planning to the Watershed Committee Level/ Gram Panchayat level. Orientation and Capacity building inputs will be provided to the community with special emphasis on the representative of PRIs. Following steps will be taken to finalize Watershed Committee Proposals.

(Table 7-f) Steps for finalization of Watershed Committee Proposals

Step	Activity	Purpose
I	Revision of facts & figures derived through the above-mentioned exercise.	❖ To obviate chances of non-inclusion of certain basic facts and figures.
II	Convening "Agree to do" meeting for finalization of Watershed Committee proposals.	❖ Evolving final shape of the project, with the incorporation of vulnerable groups sub-plan, extent of community participation, cost sharing & its mechanism, budgetary provision and procedural formalities at revenue village level.
III	It will be mandatory to have at least 66% household representation of all hamlets with particular emphasis on equal and proportional women representation.	❖ Confidence building and inducing ownership feelings with overall transparency among the stake-holders. ❖ Approval of proposals by the village community

The mitigation measures for the negative impact of the proposed activities and monitoring indicators for the concerned activities have been tabulated below:-

(Table 7- g) - MITIGATION MEASURES FOR NEGATIVE IMPACTS AND MONITORING INDICATORS

Subprojects/ activities	Negative Impacts	Mitigation Measures	Monitoring indicators
Construction/ Infrastructure Induced Degradation 1. Drainage line treatment 2. Soil and water conservation Link road 3. Storage facilities 4. Marketing facilities	• Soil loss during the construction of engineering structures and quarrying for stone and other materials • Siltation of water bodies downstream during the construction of engineering measures. • Maintenance of the structures will require additional responsibilities to the stakeholders. • Low quality constructions may lead to failure and more hazards in downstream • Destabilization of the land and soil erosion/landslips along the road cuttings. • Siltation of water bodies downstream due to runoff. • Destruction of local flora during road construction and also along the roads. • Construction of the structures may cause some soil erosion. • Deterioration of cultural institutions (such as barter systems, helping attitude etc.)	• Treatment of the destabilized sites through vegetative measures, jute netting, etc. • Marginal groups should be given priority in the local employment generation. • Quality of constructions should be ensured to reduce the failure and more hazards in downstream. • Proper designing and planning for road construction/laying will stabilize the land and reduce soil erosion/landslips. • Bio-physical measures to rehabilitate disturbed land to check soil erosion. • Use of land not suitable for other productive purposes may be brought under infrastructure activities. • Preference to marginal groups in employment engraftation. • Incentive to ideal persons to promote and uphold the culture and strengthening of local institutions to deal with anti-social activities.	• Conservation of soil measured by stabilized erosivity, gullies etc. • Reduction/increase in the frequency of slope slippages , debris flow, swollen streams, flash flood in downstream • Increase/decrease in water yield in the downstream sources and duration of water discharge • Increase/decrease in number of link paths • Availability/non-availability in off-season food products • Increase / decrease Productive land use for infrastructure • Improvement in incomes of vulnerable groups (child labour) and leisure time. • Increase /decrease in nutrition and education levels
Water Harvesting 1. Village Pond 2. Irrigation Channel 3. Water Supply through	▪ More labour/money is required to maintain the water structures. ▪ Water logging due to improper drainage. ▪ Water pollution through deposition of waste materiel due to public use. ▪ Health impacts due to breeding of mosquitoes.	▪ Soil conservation measures around the structures (bio-engineering measures). ▪ Disposal of waste water away from the ponds and proper drainage ▪ Regular disinfections by chlorination and use of filters will reduce chances of water borne diseases.	• Increase/decrease in water use efficiency for all activities e.g., household consumption, irrigation, drinking, etc. • Increase/decrease in irrigated area

Pipelines 4. Roof Water Harvesting 5. Ground water harvesting (Digging of wells)	▪ Disputes over water sharing (domestic demand vs irrigation demand) may arise. ▪ Mud formation along the water distribution points ▪ Marginal farmers are deprived from the benefits as they have small holdings. • More chances of water borne diseases if the unclean water is consumed without treatment • Seepage/leakage in roof tops and under water tanks. • Drawing underground water may lead to shortage of water in other adjacent sources. • Deposition of excavated soil damages the surrounding vegetation • Conflicts among the users/owners of the land where the well is dug. • Due to freezing of water in winters, water pipes get damaged and water supply gets interrupted. • Difficult on the part of villagers to maintain / repair pipelines. • Loss of land	▪ Fish rearing to consume the mosquito eggs. ▪ Proper designing of the channel of size and site of channel should be ensured. ▪ Rules and regulations over sharing and rational use of water to be framed by the stakeholder communities. • Construction of smaller under ground tanks will reduce chances of leakage. • Use of ferro-cement for repairs of tanks will reduce chances of leakage. • Deep wells may not be dug to reduce drawing underground water. • Selection of site to dig the well as per the convenience and cooperation of stakeholders to reduce conflicts among users. • Compaction of the excavated soil in the dug pipelines • Installation / laying of pipelines deep in the ground will reduce freezing of water. • Skill development among villagers to repair / maintain pipelines	• Increase/decrease in crop production • Increase/decrease in water quality (colour, taste, odour) • Decrease/increase in time and distance per day put in for collection of water • Access to water by the marginalized groups • Alternate livelihood for those vulnerable whose land may be affected. • Access to transhumant to meet their water requirements.
Forestry **1. Afforestation** **2. Silvi-pasture**	▪ Introduction of exotic species. ▪ Proliferation / dominance of invasive / exotic species ▪ Conflict among uses over resource sharing • Conflict among uses over resource sharing • Shortage of grazing land during initial phase.	▪ Selection of high productive native species over exotic species. ▪ Plantation of mixed broadleaf species to supplement fodder. ▪ Strengthening of traditional institutions will help sort out conflict among users. • Equal sharing of resources among users by rules/regulation.	• Area covered under afforestation (ha) • Increase/decrease in fodder / fuelwood yield • Decrease/increase in women labour (days) for collection of fuel wood and fodder

	• Restrict rights of the people	• Provide alternative to meet the needs of the people	• Increase/decrease in number of Oak seedlings/sapling • Increase/decrease in forest crown cover/ canopy closure • Increase/decrease in soil moisture • Increase/decrease in forest floor vegetation and litter layer thickness • Reduction/increase in occurrence of fire incidences • Increase/decrease in forest wealth (resin, NTFPs, leaf litter layer, fodder etc.) • Increase/ decrease in the use of non- chemical applications e.g.,bio-pesticides, mechanical, cultural activities. • All receive benefits
AGRICULTURE **1. High Yielding Varieties** **2. Diversified Agriculture** **3. On-Farm Cultivation**	• Loss in soil moisture. • Loss in soil fertility (Nitrogen, Carbon, etc.). • Soil and water pollution due to use of pesticides. • More demand of water for irrigation and competing demands on surviving/existing sources which are used for drinking.	• High nutritional value traditional crops should not be totally replaced by high yielding varieties. • Rotation of crops and bringing the cultivated land under leguminous crops (pea, lentil etc.) will maintain soil fertility. • Use of bio-compost, organic mulch (Green manure) and vermi-compost will	• Damage to crops (resistance against diseases, frost, drought etc.) • Production of grain, straw and other plant products • Quality of production (taste, odour, colour, perishability etc.)

(Vegetables, spices and condiment) **4. Terrace Repairs** **5. Vegetative Boundary**	• Pressure on local forests/ vegetation for fodder for animals and packaging material. • Loss of traditional / indigenous practices of crop cultivation. • HYVs are labour intensive and bring more workload on women. • Marginal groups (landless farmers/labourers) will less benefit, since they do not have land to bring under HYVs • Due to monoculture chances of crop failure due to frost/fog, insect/pest and diseases. • Discontinuation of barter system and more dependency on external resources / agents and, therefore, loss of self-dependency. • Possibility of loss of local races/cultivars/gene pools/ crop varieties • Conflicts among the neighbouring farmers due to the shade caste from vegetative field boundary	result in lesser use of permissible chemical fertilizers and pesticides • Promotion of agro-forestry will maintain biological fertility of soil. • Planting of nitrogen fixing species on the crop field bunds will help maintain biological fertility of soil. • Selection of low water demanding crops and rain water harvesting; storage of surface water (of streams, nalla, etc.) through water storage ponds will help harvest more water for use in HYV cropping. • Plantation/protection of pest controlling plants (Marigold, etc.). • Levelling of crop fields and maintenance of terraces / bunds to check water runoff and soil loss • Plantation of fodder species in the unculturable wastelands will supplement fodder. • More participation of males in agricultural activities will reduce work load on women. • Rotation of crops periodically will restore the soil fertility. • Use of waste bio-products for packaging • Protected cultivation (use of polyhouse, polypit, polytrench, etc.) will reduce the chances of HYV crop failure.	• Increase/decrease in per unit land economic benefits • Changes in nature of soil (fertility, hardness, moisture, colour etc.) • Quantity of seeds produced • Reduction/increase of soil erosion and water runoff • Increase / decrease in work load on women • Number of local crop varieties grown and area under them • Increase/ decrease in the use of non- chemical applications e.g.,bio-pesticides, mechanical, cultural activities

HORTICULTURE **1. Fruit Crops** **2. Medicinal Plants** **3. Floriculture**	• Soil contamination due to use of chemical fertilizers and pesticides and herbicides. • Increase in water consumption, therefore depletion in water resources. • Increase in water pollution due to use of pesticides / fertilizers. • The marginal landholders will less benefit, as they may not have land to bring under horticulture. • Possible eruption/increase in anti-social practices such as drinking due flow of cash after harvest. • Health hazards due to more use of chemical fertilizers & pesticides	• Lesser use of permissible chemical fertilizers / pesticides (Tables 5 & 6) will reduce chances of soil contamination and water pollution. • Higher use of bio-fertilizers (bio-compost, vermicompost, microbial inoculants, etc.) and bio-pesticides will reduce chances of soil contamination and water pollution • Selection of crops with high efficiency in water utilization and high yield will reduce pressure on water use. • Rain water harvesting; storage of surface water (of streams, nalla, etc.) through water storage ponds will supplement to water needs in HYV cropping.. • Preference in employment (labour) to marginal groups.	• Increase or decrease of production of fruits and other plant products • Quality of production (taste, odour, colour, perishability etc.) • Increase / decrease in economic benefits per unit land • Damage of crops against diseases, frost, drought, etc. • Increase/ decrease in the use of non- chemical applications e.g.,bio-pesticides, mechanical, cultural activities
LIVESTOCK 1. Natural breeding 2. Artificial insemination 3. Use of Urea-Molasses blocks 4. Fodder management 5. Veterinary camps	• Introduction of exotic/alien species of grasses and fodder crops to meet the demand of fodder that dominate the local species. • Hybrid animals are more prone to diseases. • Hybrid animals require more provisions for health care. • Limited breeding facility (a bull can serve only 2 animals in a week) in case of hybrid animals. • Hybrid animals are more prone to	• Limited area should be brought under exotic species of grass plantation. • Timely assistance from the Animal Health Department (AHD) or WMD for health care provisions. • Control feeding of urea-molasses bricks will not result in poisoning. • Farmers training and awareness programmes to check the quality of the urea-molasses brick and poisoning. • Proper packing and storage of treated fodder will not result in poisoning.	• Reporting of animalcoverage • Non-occurrence of diseases/ disease outbreaks • Production of milk, meat enhancement • Overall improvement/deterioration in productivity of milk, meat etc. • Quantity of fodder saved/consumed. • Enhancement/decrease in fodder production

	diseases. • Hybrid animals require intensive care attention. • Loose/moisturised feeding of urea-molasses brick may lead to poisoning. • Improper treatment of grasses or straw might lead to food poisoning. • Dependency on professionals in the artificial insemination and other activities and in the absence of professionals quality of service will deteriorate. • Poor quality vaccination may increase the out-break of diseases.	• Veterinary camps may be sponsored from Central Kit. • Services should be provided by professionals. • Shelter for animals owned by transhumant.	• Increase/reduction in work load of women • Changes in animal type (animal composition). • Increase/ decrease in the use of drugs and pesticides • Facilities extended to transhumant
INCOME GENERATING ACTIVITIES (IGA) 1. NTFPS 2. Decorative items 3. Wood craft 4. Bamboo products 5. Nursery 6. Mushroom 7. Beekeeping 8. Integrated fish farming 9. Woollen products	• Conflict among the users over common resources • Chances of excessive harvest of a particular species / plant parts • Destabilization of stabilized slopes dug to remove soil for plant raising in the nursery • More demand for water for many IGA activities. • Risk of food poisoning due to unaware use of over grown / decayed mushroom. • Chances for economic risk due to death of fishes due to diseases. • Water pollution due to processing of wool for making products. • Possible occupational health hazards during wool processing.	• Strengthening of village resource management institutions to reduce conflicts among the users over common resources • Prohibited use of species to avoid over exploitation. • Use of Styrofoam tray to reduce soil loss in nursery activities. • Use of water saving techniques / water harvesting to meet demand of water in IGA activities. • Awareness among the users and proper training will help the users in mushroom and fish farming activities. • Processing of wool washing not be done directly in water sources. • Use of masks or nose cover (cloth) during wool processing.	• Number of plants of different species raised • Increase/decrease in productivity. • Increase/decrease in income of beneficiary • • Participation of vulnerable groups in decision making at the watershed level.

Social Mobilization / Formation of Community Groups			Maintenance of records for: • How many people of the Watershed Committee of GP (including Women, SC, ST, transhumant, BPL and other vulnerable and weaker sections) attended the meeting. • Number of beneficiaries (including Women, SC, ST, BPL and other vulnerable and weaker sections) • Whether every member of the beneficiary group is participating or not? • Increase/decrease in labour demand.

CHAPTER-8
IMPLEMENTATION STRATEGY

The major activities of the watershed development project would be sequenced into three phases

I. **Preparatory Phase** : The watershed development team (WDT) shall facilitate in the formation of the local level institutions, Watershed Committees (WC), Self Help Groups (SHG) and User Groups (UGs)

II. **Watershed works Phase** :

III. **Consolidation and withdrawal Phase** :

INSTITUTIONAL ARRANGEMENT

The principles of new common guidelines would be followed for implementation of Integrated Watershed Management Projects. An appropriate institutional arrangement would be made at various levels for effective decision making and professional management of the projects.

State level Institutional arrangement- STATE LEVEL NODAL AGENCY:

☞ Watershed Management Directorate in Uttarakhand has been declared as a nodal department and State Level Nodal Agency (SLNA) has also been constituted under the chairmanship of Additional Chief Secretary by the State Government to implement new Common Guidelines. The SLNA will be having an independent bank account. Central assistance for SLNA will be transferred directly to the account of SLNA. The SLNA will sign an MOU with the Departmental Nodal Agency setting out mutual expectations with regard to performance, timelines and financial parameters including conditions related to release of funds to SLNA. The SLNA will be required to review the programme and provide enabling mechanism to set up State Data Cell and ensure regular reporting to the Central Government/ Nodal Agency at the central level in the Department. There would be multidisciplinary professional support team at the State level to implement the programme. The State Level Nodal Agency is having a full-time CEO who is a serving Government officer and is also the Chief Project Director, Watershed Management Directorate, Uttarakhand.

- ☞ The SLNA consists of one representative from the NRAA, one representative from the Central Nodal Ministry, one representative from NABARD, one representative each from the State Department of Rural Development, Agriculture, Animal Husbandry and allied sector, one representative from Ground Water Board and one representative from an eminent voluntary organization and two professional experts from research institutes / academia of the state. There is also representation from NREGA and other related implementing agencies at the state level.
- ☞ The SLNA will sanction watershed projects for the State on the basis of approved state perspective and strategic plan as per procedure in vogue and oversee all watershed projects in the state within the parameters set out in these Guidelines.
- ☞ A Team of 4 to 7 professional experts nominated to assist the State Level Nodal Agency. This team is selected by the State Level Nodal Agency from the line departments. Their disciplines will, inter-alia, include agriculture, water management, capacity building, social mobilisation, information technology, administration and finance/ accounts, etc. A requisite number of administrative staff is deputed to support this team of experts.

The main functions of the SLNA will be to:

a) Prepare a perspective and strategic plan of watershed development for the state on the basis of plans prepared at the block and district level and indicate implementation strategy and expected outputs/outcomes, financial outlays and approach the Nodal Agency at the central level in the Department for appraisal and clearance.

b) Establish and maintain a state level data cell from the funds sanctioned to the States, and connect it online with the National Level Data Centre.

c) Provide technical support to District Watershed Development Units (DWDU) of the state.

d) Approve a list of independent institutions for capacity building of various stakeholders within the state and work out the overall capacity building strategy in consultation with NRAA/Nodal Ministry.

e) Approve Project Implementing Agencies identified/selected by DWDU/ District Level Committee by adopting appropriate objective selection criteria and transparent systems.

f) Establish monitoring, evaluation and learning systems at various levels (Internal and external/ independent systems).

g) Ensure regular and quality on-line monitoring of watershed projects in the state in association with Nodal Agency at the central level and securing feedback by developing partnerships with independent and capable agencies.

h) Constitute a panel of Independent Institutional Evaluators for all watershed projects within the state, get this panel duly approved by the concerned Nodal Agencies at the central level and ensure that quality evaluations take place on a regular basis.

i) Prepare State Specific Process Guidelines, Technology Manuals etc in coordination with the Nodal Ministry/ NRAA and operationalise the same.

District Level Institutional arrangements: DISTRICT WATERSHED DEVELOPMENT UNIT (DWDU)

- Uttarakhand State Government has issued orders to establish the District Watershed Development Unit (DWDU) in each district of the State under the chairmanship of concerning District Magistrate. The DWDU will oversee the implementation of watershed programme in each district and will have separate independent accounts for this purpose. DWDU will function in close co-ordination with the District Planning Committee. There will also be a representation in DWDU for NREGA implementing agencies at the district level.
- DWDU would function as a separate unit with full time Project Manager and 3 to 4 subject matter specialists on Agriculture/ Water Management / Social Mobilisation/ Management & Accounts appointed on the basis of their qualification and expertise on contract/deputation/transfer etc. The Chief Development Officer will act as a Project Manager, DWDU as per present arrangements. If open market recruitment is necessary, this will be done by the SLNA. In such cases, the Project Manager, DWDU will sign a contract (for a period not less than three years) with SLNA that will spell out well-defined annual goals, against which his/her performance will be consistently monitored.

The arrangements for setting up/ strengthening the DWDUs/District Data Cell will be financially supported by the Government of India after review of available staff, infrastructure and the actual requirement.

The main functions of DWDU will be as follows:

a) Identify potential Project Implementing Agencies (PIAs) in consultation with SLNA as per the empanelment process as decided by the respective state governments.
b) Take up the overall responsibility of facilitating the preparation of strategic and annual action plans for watershed development projects in respective districts.
c) Providing professional technical support to Project Implementing Agencies (PIAs) in planning and execution of watershed development projects.
d) Develop action plans for capacity building, with close involvement of resource organizations to execute the capacity building action plans.
e) Carry out regular monitoring, evaluation and learning.
f) Ensure smooth flow of funds to watershed development projects.
g) Ensure timely submission of required documents to SLNA / Nodal Agency of the Department at central level.
h) Facilitate co-ordination with relevant programmes of agriculture, horticulture, rural development, animal husbandry, etc with watershed development projects for enhancement of productivity and livelihoods.
i) Integrate watershed development projects/ plans into District Plans of the district planning committees. All expenditure of watershed projects would be reflected in district plans.
j) Establish and maintain the District Level Data Cell and link it to the State Level and National Level Data Centre.

Role of Panchayati Raj Institutions at district and intermediate levels:

☞ The full responsibility of overseeing the watershed program within the district will lie with the DWDU which will work in close collaboration with the District Planning Committee (DPC). The DPC will provide full governance support to the programme. The DPC will approve the perspective and annual action plans

relating to watersheds projects in the district. DPC will integrate the watershed development plans with over all district plans and also oversee its implementation. DWDU will help the DPC in providing oversight and ensuring regular monitoring and evaluation of the programme. The District Panchayat / Zilla Parishad will have an important role of governance in matters relating to the co-ordination of various sectoral schemes with watershed development projects, review of progress, settling disputes etc. Where the Panchayat system is not in operation, this role will be played by the DWDU/District Autonomous Councils.

- Similarly, Intermediate Panchayats have an important role in planning the watershed development projects at the intermediate level. They can also provide valuable support to PIAs and Gram Panchayats/ Watershed Committees in technical guidance with the help of their subject matter specialists.

Institutional Arrangements at Project Level: PROJECT IMPLEMENTING AGENCY (PIA)

- SLNA will select and approve the PIAs following appropriate mechanisms for Districts. These PIAs may include relevant line departments, autonomous organizations under State/ Central Governments, Government Institutes/ Research bodies, Intermediate Panchayats, Voluntary Organizations (VOs). However, the following criteria will be followed in the selection of the PIAs:
  - PIA should preferably have prior experience in watershed related aspects or management of watershed development projects.
  - PIA should be prepared to constitute dedicated Watershed Development Teams.
  - Voluntary Organizations (VOs): Voluntary Organizations will have an important role in the program and their services will be utilized substantively in the areas of awareness generation, capacity building, IEC and social audit among others. As far as direct implementation of the programme is concerned, Voluntary Organizations (VOs) with established credentials may be chosen as PIAs on the basis of detailed criteria as enumerated below.

The Voluntary Organizations (VOs) would need to satisfy the following criteria to be selected as PIA:

- ✓ Should be a registered legal entity of at least 5 years standing.
- ✓ Should have had at least 3 years of field experience in the area of community based Natural Resource Management and livelihood development.
- ✓ Should not have been blacklisted by CAPART or any other Department of Government of India or State Government.
- ✓ Should be equipped with a dedicated, multidisciplinary team with gender balance.
- ✓ Should furnish three years balance sheet, audited statement of accounts and income returns. All accounts of the organization should be up to date.
- ✓ Should furnish the profile of its Board of Directors.
- ✓ Should have successfully implemented projects independently.

It will be subjected to the following conditions:

(i) At any point of time, one VO cannot be assigned more than 10,000 ha area in a district.

(ii) At any point of time, one VO cannot be assigned more than 30,000 ha area in a State.

(iii) In any case, not more than 1/4th of the total Projects at a time in a State to be implemented by VOs.

☞ Selected PIAs will sign a contract/MOU with the concerned DWDUs/ District Level Committee. It will spell out well-defined annual outcomes, against which the performance of each PIA will be monitored each year and evaluated on a regular basis by institutional evaluators from a panel approved by the SLNA / Departmental Nodal Agency at the central level.

☞ Each PIA must put in position a dedicated watershed development team (WDT) with the approval of DWDU. The WDT will be hired on contract / deputation / transfer etc for a term not exceeding the project period. The composition of the WDT will be indicated in the contract/ MOU. No programme funds for DPR and watershed works under any circumstances should be released to either the PIA or Watershed Committee (WC) unless the composition of the WDT has been clearly indicated in the MOU/ contract and the team members are fully in place.

Roles and Responsibilities of the PIA: The Project Implementing Agency (PIA) will provide necessary technical guidance to the Gram Panchayat for preparation of development plans for the watershed through Participatory Rural Appraisal (PRA) exercise, undertake community organization and training for the village communities, supervise watershed development activities, inspect and authenticate project accounts, encourage adoption of low cost technologies and build upon indigenous technical knowledge, monitor and review the overall project implementation and set up institutional arrangements for post-project operation and maintenance and further development of the assets created during the project period.

The PIA, after careful scrutiny, shall submit the Action Plan for Watershed Development Project for approval of the DWDU and other arrangements. The PIA shall submit the periodical progress report to DWDU. The PIA shall also arrange physical, financial and social audit of the work undertaken. It will facilitate the mobilization of additional financial resources from other government programmes, such as NREGA, SGRY, National Horticulture Mission, Tribal Welfare Schemes, Artificial Ground Water Recharging, Greening India, etc.

WATERSHED DEVELOPMENT TEAM (WDT):

The WDT is an integral part of the PIA and will be set up by the PIA. Each WDT should have at least four members, broadly with knowledge and experience in agriculture, soil science, water management, social mobilisation and institutional building. At least one of the WDT members should be a woman. The WDT members should preferably have a professional degree. However, the qualification can be relaxed by the DWDU with the approval of SLNA in deserving cases keeping in view the practical field experience of the candidate. The WDT should be located as close as possible to the watershed project. At the same time, it must be ensured that the WDT should function in close collaboration with the team of experts at the district and state level. The expenses towards the salaries of the WDT members shall be charged from the administrative support to the PIA. DWDU will facilitate the training of the WDT members.

Roles and responsibilities of WDT: The WDT will guide the Watershed Committee (WC) in the formulation of the watershed action plan. An indicative list of the roles and responsibilities of the WDT would include among others, the following.

- Assist Gram Panchayat / Gram Sabha in constitution of the Watershed Committee and their functioning.
- Organizing and nurturing User Groups and Self-Help Groups.
- Mobilising women to ensure that the perspectives and interests of women are adequately reflected in the watershed action plan.
- Conducting the participatory base-line surveys, training and capacity building.
- Preparing detailed resource development plans including water and soil conservation or reclamation etc. to promote sustainable livelihoods at household level.
- Common property resource management and equitable sharing.
- Preparing Detailed Project Report (DPR) for the consideration of Gram Sabha.
- Undertake engineering surveys, prepare engineering drawings and cost estimates for any structures to be built.
- Monitoring, checking, assessing, undertaking physical verification and measurements of the work done.
- Facilitating the development of livelihood opportunities for the landless.
- Maintaining project accounts.
- Arranging physical, financial and social audit of the work undertaken.
- Setting up suitable arrangements for post-project operation, maintenance and future development of the assets created during the project period.

Local Level Institutions: WATERSHED COMMITTEE (WC)

- The Gram Sabha will constitute the Watershed Committee (WC) to implement the Watershed project with the technical support of the WDT in the village. The Watershed Committee (WC) has to be registered under the Society Registration Act, 1860. The Gram Sabha may elect/appoint any suitable person from the village as the Chairman of Watershed Committee. The secretary of the Watershed Committee (WC) will be a paid functionary of the Watershed Committee (WC). The Watershed Committee (WC) will comprise of at least 10

members, half of the members shall be representatives of SHGs and User Groups, SC/ST community, women and landless persons in the village. One member of the WDT shall also be represented in the Watershed Committee (WC). Where the Panchayat covers more than one village, they would constitute a separate subcommittee for each village to manage the watershed development project in the concerned village. Where a watershed project covers more than one Gram Panchayat, separate committees will be constituted for each Gram Panchayat. The Watershed Committee (WC) would be provided with an independent rented office accommodation.

- ☞ The Watershed Committee will open a separate bank account to receive funds for watershed projects and will utilise the same for undertaking its activities. The expenses towards the salaries of the WDT members and Secretary of Watershed Committee (WC) shall be charged from the administrative expenses under the professional support to the PIA.

Secretary, Watershed Committee: The Secretary of the Watershed Committee (WC) will be selected in a meeting of the Gram Sabha. This person would be an independent paid functionary distinct and separate from the Panchayat Secretary. He would be a dedicated functionary with no responsibilities other than the assistance to the Watershed Committee (WC) and would work under the direct supervision of the President of Watershed Committee (WC) and would be selected on the basis of merit and experience. The expenses towards the honorarium to be paid to Secretary of Watershed Committee (WC) will be charged from the administrative support to the PIA. The Secretary will be responsible for the following tasks:

- Convening meetings of the Gram Sabha, Gram Panchyat, Watershed Committee for facilitating the decision making processes in the context of Watershed Development Project.
- Taking follow-up action on all decisions.
- Maintaining all the records of project activities and proceedings of the meetings of Gram Panchayat, Watershed Committee (WC) and other institutions for Watershed Development Project.
- Ensuring payments and other financial transactions.

- Signing the cheques jointly with the WDT nominee on behalf of the Watershed Committee.

SELF HELP GROUPS (SHG): The Watershed Committee shall constitute SHGs in the watershed area with the help of WDT from amongst poor, small and marginal farmer households, landless/asset less poor agricultural labourers, women, shepherds and SC/ST persons. These Groups shall be homogenous groups having common identity and interest who are dependent on the watershed area for their livelihood. Each Self Help Group will be provided with a revolving fund of an amount to be decided by the Nodal Ministry.

USER GROUPS (UG): The Watershed Committee (WC) shall also constitute User Groups in the watershed area with the help of WDT. These shall be homogenous groups of persons most affected by each work/ activity and shall include those having land holdings within the watershed areas. Each User Group shall consist of those who are likely to derive direct benefits from a particular watershed work or activity. The Watershed Committee (WC) with the help of the WDT shall facilitate resource-use agreements among the User Groups based on the principles of equity and sustainability. These agreements must be worked out before the concerned work is undertaken. It must be regarded as a pre-condition for that activity. The User Groups will be responsible for the operation and maintenance of all the assets created under the project in close collaboration with the Gram

PANCHAYAT AND THE GRAM SABHA: The Gram Panchayat would perform the following important functions:

- Supervise, support and advise Watershed Committee from time to time.
- Authenticate the accounts/ expenditure statements of Watershed
- Facilitate the convergence of various projects/ schemes to institutions of watershed development project.
- Maintain asset registers under watershed development projects with a view to retain it after the watershed development project.
- Provide office accommodation and other requirements to Watershed Committee.
- Allocate usufruct rights to deserving user groups/ SHGs over the assets created.

The Uttarakhand State IWMP is based on joint relationship among three entities: (i) village communities and GPs; (ii) WMD/SLNA and (iii) PIA's. All these three stakeholders will fulfill their respective roles and responsibilities for the project to be successful. Specifically:

Village community and GP : Will plan and implement the project

WMD/SLNA: Provide overall coordination and assist the village communities & GPs

PIA: Carry out social mobilization, may provide technical assistance and undertake other activities as agreed to with GPs and WMD

ROLES AND RESPONSIBILITIES

A. Panchayat level Institutions (Table 8-a.)

S. No.	Institution	Composition	Role	Accountable to
1.	Gram Sabha	All adult voters of the Gram Panchayat	• To facilitate in the constitution of WC. • To elect/ appoint any suitable person from the village as the chairman of Watershed Committee. • Ensure inclusion of disadvantaged groups such as women, poor, SC/ST, transhumant. • To approve the DPRs. • To approve / pass the rules for WDF.	Village community
2.	Gram Panchayat	Gram Pradhan & Ward Members	• Supervise / support and advise Watershed Committee. • Authenticate the accounts / expenditure statements of WC and other institutions of Watershed Project. • Facilitate the conversion of various projects/schemes to IWMP. • Maintain assets registers under IWMP with a view to retain it after the project. • Provide office accommodation and other requirements to WC. • Allocate usufruct rights to deserving user groups / SHGs over the assets created. • To operate the WDF bank account.	Gram Sabha and WMDs
3.	Watershed Committee	Chairman of WC to be elected / appointed by Gram Sabha should have atleast 10 members half of the	• Assist in the preparation of DPRs. • Manage the SHGs Fund. • Manage the watershed development fund (WDF). • Implementation of the watershed project. • Maintain the accounts of the Watershed Project. • Prepare the rules for operation of WDF.	GP

S. No.	Institution	Composition	Role	Account able to
		members shall be representativ es of SHGs and user group, SC, ST community, women and landless. One member of WDT to be represented in the WC.	• Submit timely monthly and annual financial reports to WMD. • Ensure that the WC annual accounts are audited on a timely basis and submitted to the WMD	
4.	Van Panchayat	VP Sarpanch, VP Members	• Implement all plantation related activities under the project • Coordinate with concerned Forest Department office for technical and management issues.	GP
5.	Secretary Watershed Committee	An independent paid functionary selected by Gram Sabha	• Convening of all Mandatory and all required GP , Gram Sabha and WC meetings and upkeep of minutes of the meeting • Act as co-signatory along with WDT to operate the Watershed Development Project account • Assist in the procurement process by being designated as Secretary of the Procurement Committee • Maintain and safe custody of all records Accounts and cash • Timely submission of all returns , reports and utilization certificates • Timely and satisfactory Audit of GP accounts. • Maintain all accounts books related to the project • Make all vouchers & prepare cheques • Collect dues from beneficiaries & issue receipts • Ensure that records are maintained for all labor contributions from beneficiaries; • Prepare all financial documentation & reports as required b the project	GP for Project reporting system to DWDU.

B. Field level institutions (Table 8-b.)

S. No.	Institution	Composition	Role	Accountable to
1.	WDT	4-5 experts	• Assist GP / GS in constitution of the WC and their functioning. • Organizing and nurturing user groups and self help group. • Mobilize women to ensure that their perspective and interests are reflected	PIA & DWDU

S. No.	Institution	Composition	Role	Accountable to
			in the Watershed Plan. • Assist in conducting the participatory baseline surveys training and capacity building. • Preparing detailed resource development plans. • Common property resource mgt. and equitable sharing. • Undertake engineering surveys prepared drawing and cost estimates of any structures to be built. • Preparation of DPR. • Monitoring, checking, assessing, undertaking, physical verification and measurement of the works done. • Facilitating the development of livelihood opportunities. • Maintaining project accounts. • Arranging physical, financial and social audit of the works. • Setting up suitable arrangements for post project operation, maintenance and future development of the asset created.	
2.	Project Implementation Agency (PIA)	Appointed by the SLNA	• Provide technical guidance to the GP for preparation of the DPRs. • Undertake community mobilization and training of the village community. • Supervise watershed development activities. • Inspect and authenticate project accounts. • Encourage adoption of low cost technologies and build upon Indigenous Technical Knowledge. • Monitor and review the overall project implementation. • Set up institutional arrangements for post project operation. • Submit action plan for approval to DWDU. • Submit periodical progress report to DWDU. • Arrange physical, financial and social audit of the work undertaken.	DWDU and SLNA
3.	DWDU	Appointment by SLNA	• Identify potential PIAs in consultation with SLNA. • Facilitate the preparation of watershed development plan for the respective districts. • Provide professional, technical support to PIA in planning and execution of the projects. • Develop action plan for capacity	SLNA

S. No.	Institution	Composition	Role	Accountable to
			building. • Carry out regular monitoring, evaluation and learning. • Ensure smooth flow of funds to watershed development projects. • Ensure timely submission of required documents to SLNA. • Facilitate coordination with relevant programs of other line departments with the watershed development projects. • Integrate watershed development project/ plans into district plans of DPCs. • Established and maintain the district level data cell and link to national level data centre.	

C. State level institutions (Table 8-c.)

S. No.	Insti-tution	Composition	Role	Accoun-table to
1.	CEO, SLNA	Appointed by State Govt.	• Prepare a perspective and strategic plan of watershed development for the state. Indicating implementation strategy, expected output, financial outlay and approach central level nodal agency for appraisal and clearance. • Establish and maintain a state level data cell and connected with national level data centre. • Provide technical support to the DWDUs. • Approve and facilitate in building a state level consortium for capacity building for various stakeholders. • Approved PIAs identified / selected by DWDUs. • Establish monitoring, evaluation and learning system at various levels. • Ensure regular and quality on line monitoring of watershed projects. • Constitute a panel of independent institutional evaluators and get this panel approved by the Central Level Nodal Agency. • Prepared state specific process guidelines, technologies manuals etc.	SLNA
2.	State Steering Committee	Comprises Secretary level officers. Chaired by the Chief Secretary.	• Facilitate inter-departmental coordination • Overall approval to work plans of WMD	State Govt.

Conflict resolution: Every attempt should be made to resolve all conflicts within the Gram Sabha and Watershed Committees. The WDT will facilitate the villagers in this regard.

In case of conflict among GP, WC, WDT and PIAs, the DWDUs will act as the conflict resolution officer. If Gram Sabha so feels that it requires formal arbitration, a three-member committee will be set up for the purpose of arbitration. It shall comprise the PM, DWDU, a nominee of the Gram Sabha and a nominee of the WDT.

In the above case if either party is unsatisfied with decision of the DWDUs then they can Appeal to Additional Director, SLNA of the region. The decision of the committee at Additional Director, level shall be final and binding on all parties.

PREPARATION & PARTICIPATION PROCESS

I. Initial preparation by SLNA:

Who: SLNA and DWDU's

When: Before village entry

- Preparation of communication and information packages for GPs and village communities
- Training/Orientation of project functionaries (DWDU, PIAs) on the vision of the project, the processes, roles and responsibilities of each entity, and rules
- Training of project functionaries on how to work with GPs and village communities in preparing a Plan (focus on process, roles and responsibilities, rules, from where to seek what information).
- Development of training module for Secretary Watershed Committee.
- SLNA may seek external assistance to carry out training and communication activities. Some notable sources of the state government are Uttarkhand Academy of Administration, Nainital; Forest and Van Panchayat Training Institute, Haldwani; State Institute of Rural Development, Rudrapur; CSWRTI, Dehradun;

Garhwal University; Kumaon University; and GBP University of Agriculture and Technology, Pantnagar.

- Selection of PIAs by SLNA/ DWDUs.
- Formation of WDT by the PIA's.

II. Orienting communities and GPs to the project:

Who: PIA staff supported by communication activities

When:Soon after village entry

- Entry of WDT into village to give basic information on the project
- Consensus among communities and GP to participate in the project
- Signing of MOU between the WC and PIAs intent to participate in the project as per the project rules and guidelines for participation and implementation.
- Social mobilization, including PRA, at village and GP levels; facilitation by WDT.
- Use of communication tools such as print material, audio-visuals, folk performances to enhance awareness among the community
- Helped by WDT and community carry out Participatory Communication Needs Assessment (PCNA) to identify communication gaps and develop measure and process to address them
- Community receives detailed information on watershed management, concept of community-driven and process-led development, concept of ownership, and details of its contribution to the project
- Information on the project such as vision and objectives, rules, roles and responsibilities of each entity, process of participation and implementation
- Information sources such as posters and brochures
- Community receives complete information on financial allocation for its GP and details of the allocation formula

- Detailed information on how community will prepare the Watershed Development Plan and complete information on processes, rules and guidelines.

III. Selection and training of Secretary Watershed Committee :

Who: Selection by GP/ GS; training by DWDUs

When: After sharing complete project-related information with GP & community

- Secretary needed to help WC and individuals maintain proper accounts and records, and facilitate smooth transfer of funds.
- GP/GS/ WDT will be part of process to select Secretary.
- Basic criteria and qualifications for Secretary fixed by PIAs / DWDU
- The WC develops a set of roles and responsibilities for the Secretary WC in consultation with the WDT.
- The WDT will develop a list of three qualified persons from the GP/GS who are interested in working as the Secretary.
- The President WC will finalize the candidate from this list to work as the Secretary.
- The DWDU shall be responsible for providing adequate training to the selected candidate within four months.
- The Secretary will receive his/her honorarium directly from the PIA.
- The Gram Panchayat may terminate the services of a particular Secretary if Gram Sabha passes a resolution to this effect. The WDT shall then make search for another Secretary at the earliest in consultation with the Gram Panchayat.

Capacity Building Activities

- Sensitization and training of project staff (SLNA / DWDUs / PIAs) and GPs to facilitate the implementation of a community driven watershed project
- Comprehensive information, training and capacity building of individuals and CBOs in the village communities to participate effectively in the project
- Training of PIA staff, GPs and Watershed Committees, on the rules and regulations of the project
- Training of Secretary Watershed Committees to provide services to the Watershed Committees

IV Development of Village Watershed Proposal :

Who: Watershed Committee

When: After receiving complete information and initial training on the project

- The Watershed Committee of the Revenue Village is responsible for developing its proposal.
- Each member of the RV shall get the opportunity to present his/her views on what activities should be included in the Proposal
- The watershed committee and revenue village must thoroughly understand the rules and processes of the project.

V. Application of Environment and Social Economic Framework to Village Watershed Proposal :

Who: Watershed Committee

When: Upon selection of activities

- **Appendix -1** is applied to ensure that no activity on the negative list of the project is selected.
- Activities which clear **Appendix-1** are subjected to **Appendix-2**. Those falling under **Appendix-2** will need a limited ESA conducted by an outside agency. Only, then can they be selected for inclusion in the Village Watershed Proposal.
- A set of activities, after application of **Appendix -1and Appendix–2** are finalized which will comprise the Village Watershed Proposal.
- The Watershed Committee receives a firm commitment from the beneficiaries to contribute in terms of time, material and/or money as per the project guidelines.
- The Watershed Committee asks the following questions with regard to its Proposal:
  - ✓ Does the Proposal meet the vision and objectives of the project?

- ✓ Does it bring about social equity with regard to benefits being obtained by the village community?
- ✓ Was it finalized on the basis of the voice and preferences of women, poor, SC/ST and tribal/transhumant population?
- ✓ Have the WC planned for reducing negative impacts and incorporated mitigating measures to protect the environment?

- **Appendix–3** is used and filled up to ensure compliance with E&SA of the project. Completed copy of **Appendix-3** shall form part of the Village Watershed Plan. **Table 7-g** may be used for identifying mitigating measure for negative social and environmental impacts of an activity.
- Attention will also be paid to minimizing use of pesticides and use of pesticides only as per the Integrated Pest Management (IPM) Strategy for the project.
- Village Watershed Proposal is finalized by combining all selected activities and submitted to the WC.

VI Development of Gram Panchayat Watershed Development Plan (GPWDP):

Who: WC

- The WC receives Proposals from all its Revenue Villages.
- The WC shall integrate all the Proposals and form a combined plan known as Gram Panchayat Watershed Development Plan (GPWDP). The WDT will facilitate in the structured presentation of the GPWDP so that it makes easy consolidation of data regarding the contents of the GPWDP at the level of PIA to ensure provision of budget as well as monitor the progress of the activities towards project objectives. an indicative list is given in **Appendix – 4.**
- The GPWDP shall include an implementation plan over years and withdrawal strategy during the fourth year.

- The WC shall make sure that the GPWDP conforms to E&SA of the project and shall apply **Appendix- 1 & 2 and 3** to ensure the same. Completed copy of **Appendix 3** shall form part of the GPWDP. The WC may make any appropriate changes to ensure compliance with E&SA.

- Attention will also be paid to minimizing use of pesticides and use of pesticides only for the project.

- Simultaneously, the WC shall also make changes in the GPWDP to ensure that the proposed expenditure in its GPWDP does not exceed the financial ceiling set for the GP.

- The GP will do year-wise phasing of the amount of Budget Envelop in its GPWDP to help the DWDU/ SLNA to plan for provision of Funds in future years. These AWPs will be revisited in the last quarter of each financial year.

- The WC shall submit the GPWDP to the Gram Sabha for discussion and approval.

- The WC will submit the approved GPWDP to the concerned PIA / DWDU for review and appraisal.

- The DWDU office will appraise the GPWDPs for appraisal. After appraisal, the DWDU / PIA will convey proposed modifications and options to the GP.

VII Plan for Enhancing Livelihood Opportunities:

In this sub component such activities will be undertaken directly by the PIA to increase the productivity of land and other natural resources in the Gram Panchayat with the objective to increase income levels of the people. The arrangement of Funds for these activities is Budget envelope of GP. However the community/ individual beneficiary will make available contribution like land, manure which will not require direct cash contribution.

Who: WDT in consultation with WC.

When: After approval of the GPWDP.

The activities to be done under this component are:

- **Farming systems improvement:** The Objective of this sub component is to: (a) disseminate technologies and provide advisory services for agriculture, horticulture, silvi-pastoral treatments and animal husbandry; (b) provide quality seeds and seedlings; and (c) establish linkages between UGs and suppliers for processing and marketing of high value crops. The major emphasis will be the introduction of off- season vegetables and high value crops. The project will provide all the inputs (seed/seedlings, bio-agents and bio-fertilizers) of the subprojects, with the condition that the land, labor, irrigation and farm yard manure will be provided by farmers. In order to facilitate the production of marketable produce, formation of UGs will be introduced to facilitate the production, processing and marketing of high value crops. This subproject will demonstrate improvements in the productivity of crops already cultivated in the area and the introduction of new high value crops (new varieties of off-season vegetables, fruit crops, medicinal and aromatic plants will be introduced based on agro-climatic factors, demand and assured market). For this purpose the private sector and Institutions and Organizations specialized in the subject concerned can also be contracted by the DWDU. Training will also be provided in application of new technologies; storage techniques; etc.

    - ✓ Identify the farmers and the lands proposed for this activity
    - ✓ Identify the crops , farming system in which demonstration are required by GP

- **Value addition and marketing support*:*** This sub-component will support agribusiness development. The project will make investments that would: (i) identify potential niche market opportunities; (ii) establish links with entrepreneurs who could help in exploiting the market potential; (iii) disseminate appropriate information and technology to farmers to help them to enter into production; (iv) co-finance subprojects with UGs & SHGs (on a one-time subsidy basis); (v) co-finance subprojects with entrepreneurs (on a one-time subsidy basis) for storage, processing and or marketing infrastructure needed to exploit the market potential.

- **Income generating activities for vulnerable groups*:*** This is designed to finance small income generating micro-enterprises for vulnerable groups (women and landless), which will promote the project's objective of equity and sustainable NRM. These SHGs would be identified during the watershed planning process through a wealth/ asset ranking PRA methods). Training will be provided to vulnerable groups to encourage their entrepreneurial development. The Income Generating Activity proposals will be developed after the implementation of the Entrepreneurial Development Program (EDP) and the GPWDP will only reflect the overall envelope and the target groups. The funds will be disbursed through the GPs to the SHGs, who will manage them. The funds will be disbursed in two installments based on the implementation performance of the SHGs who are managing the income generating activities for which specific indicators have been included. The WDT's endorsement (sign off) will be required on each proposal to ensure that the E&SA has been applied.

- **Revolving Fund:** Revolving fund (RF) has been provided for marginalized groups, which are either left out or receive little benefits from the watershed treatment activities of the project. Most of the proposed watershed interventions are land-based and thus, to provide benefits to these groups, special activities have to be thought that the project does not profit only the landed and affluent sections of the village. In addition, this is a mechanism to involve these people with the implementation of the project, who may otherwise remain indifferent.

Since all income generation activities, from the selection of the activity to the final disposal of the product would be decided and executed by the Self Help Groups (SHGs) themselves, a participatory process methodology would serve best. This would not only result in poverty alleviation in tangible terms but also help marginalized section to organize themselves into sustainable SHGs. This would go a long way in meeting the goal of productivity enhancement of the project areas.

The overall objective of the RF is the socio-economic upliftment of women, poor, SC/ST and transhumant communities by the expansion of income earning options through on farm & off farm employment and sustainable and efficient use of natural resources. Some key preconditions are needed for this:

- ✓ Availability of infrastructure, both physical and institutional, at local level.
- ✓ Access to support services (e.g. credit, inputs, training and information)
- ✓ Access to markets and knowledge
- ✓ Safeguard against ecological problems (e.g. land degradation, overexploitation of natural resources and endangered bio-diversity)

- **Implementation Strategy for IGAs*:*** The implementation of the strategy for enhancing incomes of vulnerable groups will take place in seven steps:
  - ✓ Identification of vulnerable sections/individuals and their need assessment
  - ✓ Formation of SHGs of identified vulnerable groups/individuals and women
  - ✓ Entrepreneurship Development of the SHGs
  - ✓ Selection of the Income Generating Activity (IGA)
  - ✓ Formation of Sub Plan for RF
  - ✓ Implementation of Sub Plan for RF
  - ✓ Networking of Groups for the sustainability of IGA

VIII Identification of Vulnerable Groups and their Needs:

Who: WDT

When: After orientation of the GP & community to the project

- Help the communities understand the reasons for their poverty, what opportunities could reduce their poverty and how they can collectively act to make this happen.
- Conduct Participatory Rural Appraisal (PRA) for the identification of vulnerable groups/individuals
- Identification of vulnerable sections of the society, poorest of the poor, through the process of wealth ranking
- Ascertain their special needs and existing gaps

- Take stock of the needs of the community for viable economic development

IX Formation of SHGs:

Who: WDT

When: After identification of vulnerable groups/individuals

- SHGs of groups/individuals identified as part of the above-mentioned exercise and will be formed as per the NABARD guidelines. Economic homogeneity and emotional affinity will be key factors for formation of any SHG.
- They will function as credit and thrift groups. However, to promote Income Generation Activities from the beginning itself, commodity approach will be emphasized during the formation of SHG. This will enable to develop further linkages regarding IGAs at a cluster level.
- Other factors to be considered in formation of SHGs are:
  - Availability of resources, needs and demands of the community as regards taking up viable IGA in the project areas
  - Scenario of other ongoing IGA schemes and their beneficiaries
  - Members of those vulnerable groups, not covered under other ongoing schemes will be given priority during formation of SHGs under the project

X Capacity Building of SHGs:

Who: DWDU/SLNA

When:Upon identification of capacity building needs by the SHGs & PIA staff

- Prepare comprehensive capacity building plan in consultation with SHGs
- Training would cover the following areas:
  - Aspects including market analysis and trends, pricing, rights and rules, etc.
  - Production aspects of IGA including technical training
  - Value addition and storage

- Marketing
- Record keeping, bookkeeping and management of finances
- Follow up training to meet the ever-changing needs of the market
- Institutional development, cooperatives, federations

- The abovementioned subjects will be covered under two sub-components of capacity building program:

i) **Entrepreneurship Development Program (EDP):** The EDP will be conducted after the completion of basic modules to the SHGs and within first 18 months of the project. It will assist the SHG members in identifying a viable activity, which they can take up for the enhancement of their livelihood. Aspects such as market analysis, quality control, management of finance, establishing forward and backward linkages, pricing, rights and rules etc. will be covered through this training.

For the selection of members for EDP, priority will be given to poor dependent on occupation merely adequate for subsistent living. Groups who are graded '*Good*' will be eligible for this program.

ii) **Skill Training and Exposure program:** Skill training will be conducted for those members who have participated in the EDP. It is presumed that the SHG members who start IGA activities will be given skill training and exposure.

XI Selection of IGAs:

Who: SHGs

When:After completion of EDP

- Following factors may be considered for the selection of a specific IGA for a specific group. The ES&A will also be applied at the time of the selection of IGA.
  - Availability of resources
  - Existing skills and capacity such as carpet weaving, handicraft, etc. which can be converted into IGAs

- Quality and marketability of the product
- Sufficient demand of the product
- Risk taking capacities of the groups
- Financial inputs required
- Forward and backward linkages

XII Sub Plan for RF:

Who: WC Assisted by WDT

When:Upon receipt of IGA proposals for funding from SHGs

- Upon finalization of an IGA by the SHG, it will prepare a proposal for funding (See Attachment F-9 for format) and submit the same to WDT for appraisal. Through WC clearance by the WDT, will be submitted to WC which who shall incorporate a same into its annual sub plan for IGA activities.
- If a proposal is not viable, it will be sent back to the SHG for appropriate changes and resubmitted by the SHG to WDT for appraisal. The same shall then be submitted to the WC.

XIII Networking of Groups for the sustainability of IGAs:

Who: SHGs, Experts including WDT

When: Upon maturity of SHGs and starting of IGAs at a certain level

- Upon maturity of SHGs and reaching of IGAs to a certain level, the project would encourage the formation of Association and Federations of SHGs.
- These would be based on production, processing and marketing of the products.
- The activities of these institutions would include Input Management, Common Storage Facilities, Grading and Packaging, Group Marketing, Market Outlet Development, Joint Market Negotiation and Transport Organization.

XIV Utilization Mechanism for RF: Due to the limited saving capacity of SHGs, their savings amount may not be sufficient to undertake IGAs. Thus, under the project, it is proposed to provide working capital assistance to the SHGs engaged in IGAs. It will serve the purpose of promotion of micro- enterprises and will work as a Revolving Fund. This fund will be utilized by the SHG either for a joint IGA or for individual initiatives. For additional funds, SHGs will be linked to the banks.

At revenue village level a Sub Plan will be prepared by the vulnerable groups with the assistance of WDT. This plan will include the following:

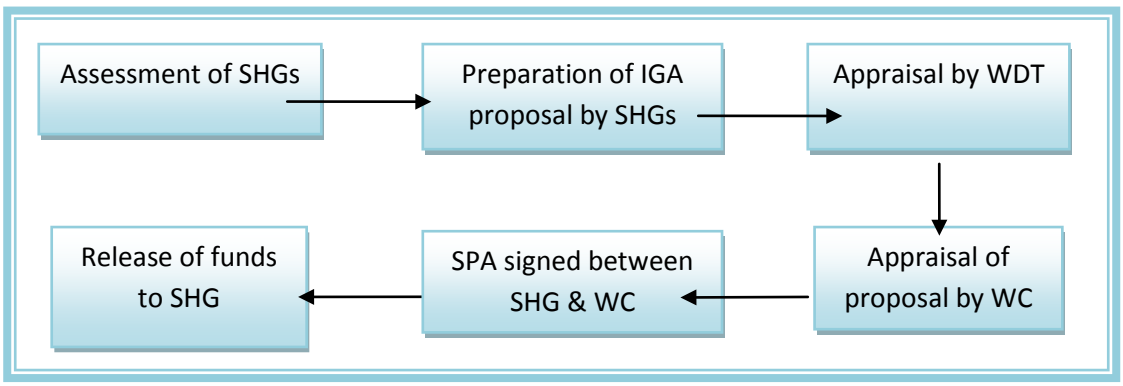
1. Prioritization of IGA for the Revenue Village based on their viability
2. Detail out the utilization and recovery mechanism of this Revolving Fund.

This evaluation will be done by WDT after EDP and skill development program. The indicators for the assessment of SHGs will be mainly as follows:

- Regularity of meeting and attendance
- Regularity of saving and common fund generated
- Bylaws formed and proceeding should be recorded
- Awareness about income generation activities
- Capacity building (EDP, skill development)

Further, the SHGs will carry out self-assessment to gauge their requirement of working capital and the availability of resources. On the basis of both these assessments, the grading of SHGs will be done and money from the Revolving Fund will be given to such groups which will fulfil the parameters. SHGs not receiving funding during the year will be reassessed the following year.

Fund Flow Mechanism



XV Review and appraisal of GPWDP:

Who: PIA & DWDU

When:After receiving proposed GPWDP from WC

- Receipt of the proposed GPWDP by DWDU
- Appraisal of the GPWDP by DWDU as per of E&SA
- If any shortcoming is found or if the GPWDP proposes to spend beyond the financial ceiling set for the GP, then DWDU will send it back to the WC with written observations and recommendations.
- The WC shall consider these observations and recommendations and may make appropriate changes in its GPWDP and if need be may again go to Gram Sabha for approval
- The final GPWDP shall be resubmitted to DWDU for further implementation..

XVI Payment to WC:

Who: DWDU

When:After approval of final GPWDP by GP & submission of AWP

- After approval of GPWDP by the Gram Sabha, the WC shall prepare a detailed Annual Work Plan (AWP) for the first year. This will contain details of activities to be funded and implemented, who shall implement them and when, who shall benefit from them, details of beneficiary contribution, and the cost to be incurred for each activity.
- 'On-account payment' amounting to 10% of the approved AWP amount will be transferred to WC account by the DWDU.
- The WC will need to maintain and submit books of accounts and other documents while claiming reimbursement.

XVII Process of 2nd and 3rd year AWPs:

Who: WC

When:After successfully implementing 1st year's AWP

- The WC shall make a detailed AWP for the second year upon near completion of activities listed out in the first year's AWP.
- This AWP will be submitted to the DWDU for information, MOU signed for its implementation, and transfer of due funds to the WC Account.
- Same process will be followed for AWP for the third year.

IMPLEMENTATION & FINANCIAL MANAGEMENT:

The WC will get funds for implementation from the project through their DWDU and will also have to collect the beneficiary contributions as agreed to with SLNA. The Funds made available to WC by the project will be of two kinds.

- Implementation Fund
- Revolving Fund

And the fund generated by the WC will be watershed Development Fund.

Implementation Fund: Implementation Fund will be the grant transferred to the WC for the implementation of Project activities. As such major amounts received by the WC will be under this head. This fund will be used only for the activities proposed in the Project. The amount will be received in a separate Bank Account i.e. **'Watershed Development Project Account'** which will be operated by Chairman and Secretary of WC jointly.

Revolving Fund: This fund relates to the amounts transferred to the WC for the purpose of enhancing equity and providing small loans to vulnerable groups in the village. The amount will be received by the WC in its '***Watershed Development Project Account***'.

I. Flow of Funds to the WC :

Initial On-Account Payment: On-Account payment to the extent of 10% of the Annual Work Plan shall be given at the beginning of the Project to the WC. It will be however adjusted on the completion of the GPWDP cycle.

Reimbursement of Cost of Works: During Implementation of the Project, reimbursement of expenditure on works shall be made on submission of monthly financial statements. All expenditures made as per the agreed work plan and GWDP, incurred during the month will be reimbursed by the DWDU. In the event that the money is completely spent before the end of the month, the WC can submit the financial statements before the end of the month and receive the reimbursement.

II. Estimates and Technical Sanction:

Who: WC and PIA

When:Before initiating any activity

- After preparation of detailed AWP and receipt of the initial On Account payment from the PIA the estimate for each activity to be initiated will be prepared by the WC with the help of the Technical Representative of the WDT in the format given vide **Appendix-5.**
- Technical member of the WDT will carry out the following functions in preparation of detailed cost estimate of activities earmarked to be undertaken in a village:
- The Technical Representative of WDT, along with a WC member shall take up survey of a particular work for preparing the estimates. For Departmental works, Respective Unit officer shall give technical approval. The design and the estimates need be discussed with the concerned members and finalized.
- Technical member of the WDT will carry out the following functions in preparation of detailed cost estimate of activities earmarked to be undertaken in a village:

  - Sanction of the Activity**:** A technical sanction will have to be obtained for each estimate prepared by the GP before initiating any activity. The format of Technical Sanction is given vide **Appendix- 6.**
  - The competent authority to accord technical sanction for watershed works are simplified as detailed in the table given below.

Technical sanction for watershed works (Table 8-d.)

Sanctioning Limit	Sanctioning Authority
Upto Rs 10,000	Should be passed in the meeting of WC. No sanction from PIA required. Copy will be sent to PIA for information.
Above Rs. 10,000	Sanction from PIA is required according to norms. The estimates prepared will be submitted to the WDT by WC for according sanction from the DWDU.

- Once sanction is granted, a 'technical sanction number.' shall be allotted for each activity.
- An Integrated Activity register shall be maintained by the Secretary at each WC.
- There will be no splitting of work/activity for the purpose of bypassing sanctioning requirement from PIA for activities above Rs. 10000.

III. Implementation Agency for Work:

- The WC will have the right to appoint anyone of the following Implementers for the implementation of the work:

➢ The **Gram Panchayat**

➢ The **Individual Farmer** (Beneficiary) for the work to be executed on his individual land. **(Individual** will work as a contractor, in the case.)

➢ **User Group/SHG** may be engaged for the activities to be implemented on common/ community/ village assets or on individual land or asset, should the beneficiary have no objection to this arrangement. Revenue Village Committee will also work as a contractor.

➢ The First Right of implementation of each work under the project rests with village-level entities such as the User Group, SHG or the Van Panchayat, individual farmer. If these options are not available then the WC itself may decide to execute the works. If all the above options do not work out only then the works will be awarded to independent contractors, However the WC will have to obtain in writing their inability to undertake the project activities before awarding the contract for the said work to an independent contractor.

- In case of special technical requirements for which the above mentioned village level institutions do not possess adequate capacities, and then the WC may outsource **a contractor** having past experience in specialized technical works. Such a Contractor will be appointed only after the Beneficiaries have deposited the full amount of their share of the cost of the said activity in advance with the Gram Panchayat.

Sub-Project Agreement between WC and Implementer: If the WC does not undertake to execute the work on its own, then for each activity a Sub-Project Agreement (SPA) shall be signed between the WC and the Implementer. The design and cost estimates prepared with the assistance of WDT Representative shall form part of the SPA. The major areas covered in the SPA will be as follows:

Objectives:

- Sub Contracting
- Implementation of Works
- Procurement of Material
- Responsibility of Damages
- Time Limit
- Schedule of Payment
- Duties and Responsibilities of the WWC
- Duties and responsibilities of the Implementer
- Settlement of Disputes
- Ownership and responsibility of maintenance post completion of works.

IV. Implementing the Work:

- Technical representative of the WDT will provide guidance to the Implementer and will monitor the work to ensure that the work is completed in time and as per the estimates and the designs prepared.
- Work must be completed in the sequenced manner as approved by the Gram Sabha.

- Technical Representative of the WDT team shall verify the progress of works at different stages and record in a Measurement Book (MB) after verification. The MBs however shall be kept in safe custody of the Secretary at each WC. The format of the MB, as prescribed by the State Financial Rules vide form nos. 16 and 17, should be followed**.**

V. Basis of Payment / Reimbursement:

- If the WC undertakes to implement the work on its own then the WC cannot spend more than the amount sanctioned, net of beneficiary contribution.
- In case the work is implemented by an Implementer other than WC, the total payment made shall not exceed the estimated unit cost (net of Beneficiary Contribution) as approved and adjusted proportionately for actual measurements.
- If there is any change in design with respect to original estimation, revised sanction should be sought in this regard.
- The above amounts will also be eligible for reimbursement to WC by DWDU.

Authorization: The bill received will have to be routed through the Secretary who, before making any payments, shall cross check with the Integrated Activity Register to verify the quantum of earlier payments made before getting it approved by the WC. All payments shall be authorized by the WC, which shall meet for the purpose at least once a week.

VI. Stages of payment:

- Bills for the work implemented by WC itself will be paid as soon as it is authorized by the WDT
- The payment to the Implementer (Individual/VP/UG/SHG) will be on the basis of running bills and subsequently on final bill supported by the Completion Certificate.

Advances: No advance payments shall be made to the Implementers. Following Table summarizes the fund flow from WC to Implementer.

(Table 8-e.)- Fund flow from WC to Implementer

Particulars		Types of Implementers		
		Individual Farmer	**VP/SHG/ UG/ Outside contractor**	**Gram Panchayat**
Basis of Work		On contract Basis	On contract Basis	On actual basis
Payment Timing		On the Basis Of running bill and / or Completion Bill	On the Basis Of running bill and / or Completion Bill	On presentation of bills for Material/ Labour etc
Basis of Reimbursement from DPD to GP		On the basis of Estimated Unit Cost. (Net of beneficiary)	On the basis of Estimated Unit Cost. (Net of beneficiary)	On actual cost to the extent of amount sanctioned, net of Beneficiary Contribution.
Certification of Running Bill / Completion Bill		To be prepared by Implementer and certified by Representative of RVC and MDT,		
Flow of Funds	Advance	Nil	Nil	Nil
	Against Running Bill cum Work done Certificate	80% of the amount certified as per the bill	80% of the amount certified as per the bill	On actual basis, upto the amount sanctioned, net of Beneficiary Contribution
	Against Final Bill cum Completion Certificate	Full payment as sanctioned, net of Beneficiary Contribution	Full payment as sanctioned, net of Beneficiary Contribution	

CAPACITY BUILDING STRATEGY

Capacity building has multiple roles to play in the project. It will enhance the skills and competence and bring about necessary orientation in the project staff to work in partnership with GPs and rural communities. Further, capacity building of Panchayati Raj Institutions (PRIs) and village communities will enable them to participate effectively in the project and take informed decisions. The capacity building activities shall be coordinated by the Human Resources Development Cell at WMD.

Objectives:

1. Develop conceptual understanding about integrated participatory watershed management including equity, and environmental and social sustainability among all the implementing agencies including PRIs as well as local communities.
2. Build necessary skills and competence among the project officials, PRIs, village communities, Community Based Organizations (CBOs) about planning,

implementation and management of various project activities, including income generation.

3. Develop understanding about the Environmental and Social issues, including the project's Environmental and Social Management Framework.
4. Build and enhance the capability of all stakeholders for the sustainability of programs initiated by the project.
5. Strengthen community participation and ensure their positive involvement in sustainably managing their common property resources.

Target Groups: An initial training needs assessment will be carried out to determine the training needs of various stakeholders in the project. The capacity building strategy will target:

1. Policy makers and executives of PRIs
2. PIA staff/ field functionaries
3. WC
4. CBOs and other community members
5. Panchayat Secretaries
6. Secretary of WC to be appointed under the project
7. Community-based resource persons
8. Transhumant communities

Training Modules: Each target group will be trained on multiple issues related to the project. Some of the key issues covered will be:

(Table 8-f.)- Key issues

Target Group	Capacity building issues
Policymakers, Project Staff	• Orientation & sensitization to community-driven projects • Concept of integrated watershed development • Project rules & regulations • Community mobilization • Application of ESMF to planning & implementation process • Tribal & transhumant strategy
GPs including WCs, Village Communities Secretary of WC, CBO's	• Concept of integrated watershed development • Project rules & regulations • Application of ESMF to planning & implementation process • Tribal & transhumant strategy • Financial management, procurement guidelines & maintenance of records • Technical skills in the areas of livestock, agriculture, horticulture, value addition to produce, water harvesting, livelihood improvement
SHGs	• EDP and skills development • Application of ESMF to planning & implementation process • Formation of associations & federations

Target Group	Capacity building issues
Transhumant communities	• Veterinary first aid • Fodder management • Hygienic milk production • Environment education

Capacity Building Tools: A variety of tools will be utilized to best achieve the objectives of capacity building in an efficient and effective manner. These will mainly be identified during the training needs assessment. Some of the key tools may be seminars, conferences, workshops, exposure visits, and on-site demonstrations. In addition, a number of communication tools such as print publications, audio-visuals, folk performances, mass media coverage, and games will also be employed.

Maximum number of trainings will be imparted through participatory field exercises, since this is a much more effective method of learning. All the training activities will be reviewed and evaluated intensively, so that the approach, design, methodology and organizational set up may be redesigned according to the training needs.

DISTRICT WISE AREA PROPOSED FOR TREATMENT

The zone wise and district wise area to be treated and number of MWS which would be taken up for treatment have been annexed in (**Table 8.1).** A total of 19.31 lakh ha. area would be taken up for treatment in all the districts of the State. Of the 537 untreated MWS 409 have been shortlisted for the Integrated Watershed Management Project (IWMP).

Physical and financial implications of the project

The plan wise phasing of the physical and financial program of watershed development has been depicted in **(Annexure Table 8.2 a).** Uttarakhand State being predominantly a hill state with difficult terrain a financial outlay of Rs. 15000 per ha. has been taken for the hill district and for the plain districts of Udhamsingh Nagar, Haridwar and some part of Nainital districts financial outlay of Rs. 12000 per ha. has been taken. Thus a total plan outlay of Rs. 2742.52 crores has been projected for a period of 18 years. The financial provision required for the 11th plan is Rs. 621 crores for the 12th Plan, it is Rs. 624 crores, for the 13th Plan Rs. 660 crores and for the 14th Plan it is 858.52 crores.

The annual plan for the remaining 11th Plan showing the Watershed areas planned for treatment and financial provision year wise has been depicted district wise in **(Annexure Table-8.2 b).** A total of 86 MWS covering an area of 4.3 lakh ha. would be taken up for treatment in the 11th plan period.

The component wise breakup of the estimated budget for the 11th Plan has been depicted in **(Annexure Table -8.2 c)**. In the 11th Plan, it is proposed that a total 86 MWS would be taken for treatment in 12 districts of the State for Haridwar district 30000 ha. of area would be taken up for treatment. The maximum area to the tune of 50,000 ha. would be treated in Udhamsingh Nagar District. A maximum of 17 MWS would be covered in Uttarkashi District. The Matrix of conversions of watershed programs with other ongoing schemes is depicted in **(Annexure Table 8.3).** As Watershed Management Directorate has a past history of undertaking externally aided Watershed Projects from time to time, the remaining MWS would be taken up through these projects.

CHAPTER -9
OUTPUT AND OUTCOME INDICATORS

Watershed Management works entail considerable amount of budget and hence a proper monitoring and impact evaluation is desired to assess the benefits accrued out of the expenditure incurred. Thus, to monitor the achievement of our defined project objectives certain output indicators have been designed which will help in quantifying the objectives any change in achievement of objectives will help in flagging our procedural shortcomings like ineffective community mobilization, poor PRA process improper prioritization of natural resource management objectives etc.

RESULTS FRAMEWORK AND MONITORING OF IWMP

Results Frameworks (Table 9.a)

Objective	Outcome Indicators	Use of outcome Information
To improve the productive potential of natural resources and increase incomes of rural inhabitants in selected watersheds through socially inclusive, institutionally and environmentally sustainable approaches.	• 10% increase in household Income (over baseline) in targeted villages (disaggregated) by Gender and socio- economic class. • 10% increase in Vegetative and biomass index of treated watersheds • 15% increase availability of water over baseline for domestic and/or agriculture use. • 20% improvement in administrative capacity of GPs as measured by performance indicators	• Lack of achievement may flag: • Tariff and subsidy structure inhibits viability of farming systems improvements • Poor participatory process • Inadequate prioritization of NRM investments • Inadequate capacity building of GPs and other local institutions.
Intermediate Results (One per component)	**Results Indicators for each component**	**Use of Results monitoring**
Component One **(a)**Communities are mobilized and prioritize their own mix of watershed development technologies by actively involving all households.	**Component One** • 80% of households are included in preparation of the plan. • 60% of activities in IWMP address soil conservation measures, water resource management, forest fuelwood and/or fodder management identified during PRA exercise	**Component One** • Low level may flag either poor mobilisation of community or poor inclusion of all socio-economic households in decision taking in village. • Low level may flag poor understanding of project objectives or weak PRA processes.

Objective	Outcome Indicators	Use of outcome Information
(b) Gram Panchayats directly implement the mix of watershed treatments and village development investments using appropriate User Groups/sub-committees at revenue village levels (if necessary)	• More than 50% of GPs have treated > 80% of area proposed for treatment in the approved IWMP Plan.	• Low level may flag either poor strength or capacity of WC to implement the project activities or administrative and legal hurdles in treating the area or poor availability of technical guidance for treatment of area.
Component Two **(a)**New high value crop, horticulture and livestock technologies are adopted by farmers and/or herders.	**Component Two** • 10% increase in (over baseline) of improved varieties and High Value crops and fruit trees. • 20% increase (over baseline) in fodder production • 1% increase (over baseline) in number of improved breed animals.	**Component Two** • Low level may flag either inappropriate technologies proposed; poor strength of WC to implement project activities; or natural disaster like drought/flood caused lowering in productivity.
(b) Appropriate technologies for processing, storage and market linkages have been adopted by farmers to increase the value of their produce.	• 15% increase in net value of produce realized by farmers adopting these technologies	• Low level may flag either inappropriate techniques or incorrect assessment of market and marketing strategies or change in tariff structure
(c) Vulnerable groups (including women) establish Self-Help Groups (SHGs) and implement income generating activities.	• 30% increase in number of functioning SHGs. • 60% of loans repaid to SHG by borrowers • 50% of enterprises still active after two years	• Low level may flag insufficient level of capacity building and training of SHG • Inappropriate identification of enterprises
Component Three **(a)** WC and other relevant local institutions have developed sufficient capacity to design, prioritize, implement, operate and maintain watershed treatments.	**Component Three** • At least 50% attendance in statutory Gram Sabha meetings • 50% increase over baseline in proportion of GP Constituents aware of annual budget and expenditure of GP • 80% of GPs targeted under project having satisfactory annual audit report	**Component Three** • Low level may flag lack of understanding o productivity of project objectives of non-responsive GP • Low level may flag either poor capability of GPs or lack of interest on part of constituents. • Low level may flag that capacity building support is inadequate and institutional strength is weak

Objective	Outcome Indicators	Use of outcome Information
(b) All stakeholders are informed and educated about key design and participation features of the project using targeted messages evolved through a comprehensive communications strategy.	• 50% of target households aware of project objectives, activities and methodologies	• Low level may flag inadequacy of IEC activities
(c) Effective and efficient project coordination, management, monitoring and evaluation systems are established and operational.	• 90% of monitoring reports submitted and action taken on 80% • 90% staff deployment as per agreed schedule	• Late or non submission of reports will flag either poor systems; weak understanding of roles and responsibilities; lack of sufficient personnel for the job • Low level of staff deployment may indicate insufficient incentive to work in project area or insufficient number of qualified government staff available.

The time frame for monitoring of the results have been tabulated as follows:

Arrangements for results monitoring (Table 9.b.)

Target Values								
		Target Values					Data Collection and Reporting	
Outcome Indicators	**Baseline YR1**	**YR2**	**YR3**	**YR4**	**YR5**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection**
• 10% increase in household Income (over baseline) in targeted villages (disaggregated) by Gender and socio-economic class.	Baseline information will be collected during the first year of stratified sample	Increase not measurable	5% (over baseline) by Mid Term	Not measured	Not measured	Baseline, pre Midterm and Final Year Survey to be carried out in May-June	Formats will be evolved by contracted consultants	External consultants in sample villages under supervision of WMD
• 10% increase in Vegetative and biomass index of treated watersheds	Baseline collected by remote sensing and also by field transects	Increase not measurable	4% increase expected at MTR	Increase will not be measured	Increase will not be measured	Baseline, Midterm and end of project	Remote sensing field survey by Scientific institutions	External consultants under supervision of WMD
• 15% increase availability of water over baseline for domestic and/or agriculture use.	Baseline collected using PRA methods and field survey	Data will be collected	5% increase expected	Data will be collected	Data will be collected	Assessments at baseline, midterm and end of project. Data collected annually in lean period May-June	Field monitoring devices and by PRA techniques	WDT under supervision of WMD

Target Values								
		Target Values					Data Collection and Reporting	
Outcome Indicators	**Baseline YR1**	**YR2**	**YR3**	**YR4**	**YR5**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection**
• 20% improvement in administrative capacity of WC	Baseline will be collected during first year.	Not measured	5% increase expected at Mid term	Not measured	Not measured	Baseline, midterm and end of project	Format developed by contracted consultants using WC performance indicators from Deptt. of Panchayati Raj	Contracted consultants under supervision of WMD.
Component One :								
a. • 80% of households are included in preparation of Plan	No baseline because planning process in WC will commence	Average of 80% of target households involved in preparation of Plan	Average of 80% of target households involved in preparation of Plan	Not measured because all Plan will have been prepared	Not measured because all Plan will have been prepared	Annually during period ending March	Proceedings Register of Gram Panchayat meeting	WDTs and external M&E consultants during Mid Term and end of Project
• 60% of activities in Plan address soil conservation measures, water resource mgt., forest fuelwood and/or fodder management identified during PRA exercise	Not measured because Plan will be under preparation	50% of GP plans produced should include about 60% of these activities	60% of GP plans produced should include about 60% of these activities	80% of GP plans produced should include about 60% of these activities	80% of GP plans produced should include about 60% of these activities	Annually during period ending March	From approved plans	WDTs for reach village

Target Values								
		Target Values					Data Collection and Reporting	
Outcome Indicators	**Baseline YR1**	**YR2**	**YR3**	**YR4**	**YR5**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection**
b. • More than 50% of GPs have treated > 80% of area proposed for treatment in the approved Plan	No baseline because planning process will have just started	25% of area proposed undertaken for treatment in target villages	50% of proposed area undertaken for treatment in target villages	65% of proposed area undertaken for treatment in target villages	>80% of proposed area undertaken for treatment in target villages	Annually during period ending March	WDTs will review by field observations	WDTs in each village
Component Two								
a. • 10% increase in (over baseline) of improved varieties and High Value crops and fruit trees.	Baseline will be obtained for project area	Not measured	5% increase in area at Midterm	Not measured	Not measured	Baseline, MTR and Final evaluation	Formats to be developed by contracted consultant	Contracted consultant
• 20% increase (over baseline) in fodder production	Baseline will be obtained for project area	Not measured	10% increase over baseline at Midterm	Not measured	Not measured	Baseline, MTR and Final evaluation	Formats to be developed by contracted consultant	Contracted consultant
• 1% increase (over baseline) in number of improved breed animals.	Baseline will be obtained for project area	Measured in absolute value but no significant increase expected	0.4% increase over baseline	Measured in absolute value	Measured in absolute value	Annually period ending	Head Counts	MDT

Target Values								
		Target Values					Data Collection and Reporting	
Outcome Indicators	**Baseline YR1**	**YR2**	**YR3**	**YR4**	**YR5**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection**
b. • 15% increase in net value of produce realized by farmers adopting these technologies	Baseline information collected	Not measured	4% increase over baseline	Not measured	Not measured	Baseline, Midterm, Final evaluation	Formats developed by external consultants	External Consultants
c. • 30% increase in number of functioning SHGs.	Baseline information collected	5% increase	15% increase	25% increase	30% increase	Annual monitoring reports	Formats developed by external consultants	External Consultants
• 60% of loans repaid to SHG by borrowers	Baseline information collected	20% of loans repaid	30% of loans repaid	50% of loans repaid	60% of loans repaid	Annual monitoring reports	Formats developed by external consultants	External Consultants
• 50% of enterprises still active after two years	Baseline information collected	Not measured	20% of enterprises established in previous two years still active	Not measured	Not measured	Baseline, Midterm, Final evaluation	Formats developed by external consultants	External Consultants
Component three								
a. At least 50% attendance in statutory GS meeting	Baseline information collected	15% attendance	25%	40%	50%	Annual Monitoring reports	GP proceedings register	WDTs and GP in each village

Target Values								
		Target Values					Data Collection and Reporting	
Outcome Indicators	**Baseline YR1**	**YR2**	**YR3**	**YR4**	**YR5**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection**
• 50% increase over baseline in proportion of GP Constituents aware of annual budget and expenditure of GP	Baseline information collected	Not measured	25% increase	Not measured	Not measured	Baseline MTR and Final Evaluation	Formats developed by external consultants	External Consultants
• 80% of GPs targeted under project having satisfactory annual audit report	Baseline information collected	15%	30%	60%	70%	Annual Reports	Panchayati Raj Deptt. records/Project Monitoring Reports	WDT and Finance Officer of WMD
b. • 50% of target households aware of project objectives, activities and methodologies	No baseline as project would have just begun	Baseline collected	30%	Not measured	Not measured	Baseline in Yr 3, Midterm, Final evaluation	Formats developed by external consultants	External Consultants
c. • 90% of monitoring reports submitted and action taken on 80%	Not measured	50% compliance on each	100% compliance on each	100% compliance on each	100% compliance on each	Annual & Half yearly reports	Status reports and Annual Work Plans	WDTs and GPs

ANNEXURES

Annexure Table 2.1: General Information of the State

Sl.No.	General			Population (As per the 2001Census)					
	Districts	No. of Blocks	Area (Ha.)	Male	Female	Total	S.C.	S.T.	% Pop.BPL
1	Almora	11	465858	293848	336719	**630567**	140430	878	39%
2	Bageshwar	3	213542	118510	130952	**249462**	64524	1943	42%
3	Chamoli	9	847580	183745	186614	**370359**	67539	10484	52%
4	Rudraprayag	3	235421	107535	119904	**227439**	40311	186	37%
5	Champawat	3	235388	111084	113458	**224542**	38098	740	37%
6	Dehradun	6	368944	679583	602560	**1282143**	173448	99329	32%
7	Haridwar	6	231076	776021	671166	**1447187**	313976	3139	18%
8	Naintal	8	406475	400254	362655	**762909**	148184	4961	31%
9	Pauri Garhwal	15	673431	331061	366017	**697078**	106653	1594	27%
10	Pithoragarh	8	410638	227615	234674	**462289**	106449	19279	31%
11	Tehri Garhwal	10	485766	295168	309579	**604747**	87325	691	20%
12	Udham Singh Nagar	7	279234	649484	586130	**1235614**	162782	110220	20%
13	Uttarkashi	6	812414	152016	142997	**295013**	67467	2685	69%
	Total	**95**	**5665767**	**4325924**	**4163425**	**8489349**	**1517186**	**256129**	

Source : 1. Planning Commission. Uttarakhand
2. Agriculture Department, Uttarakhand

Annexure Table 2.2: Agro-climatic zones of the State

Sl.no.	Name of the ACZ	Area (Ha.)	Districts	Major Soils	Rainfall	Major Crops
1	9	465858	Almora	Brown Forest Soil, Red to Dark, Black Clay	1192.35	Wheat,Paddy,Ragi
2	9	213542	Bageshwar	Brown Forest Soil, Red to Dark, Black Clay	912.19	Wheat,Paddy,Ragi
3	9	847580	Chamoli	Brown Forest Soil, Red to Dark, Black Clay	1047.00	Wheat,Paddy,Ragi
4	9	235421	Rudraprayag	Brown Forest Soil, Red to Dark, Black Clay	1159.86	Wheat,Paddy,Ragi
5	9,14	235388	Champawat	Brown Forest Soil, Red to Dark, Black Clay	1262.00	Wheat,Paddy,Ragi
6	9,14	368944	Dehradun	Alluvial, Sandy, Residual, Brown Forest Soil, Red to Dark	1631.10	Wheat,Paddy,Ragi,Sugarcane
7	9,14	231076	Haridwar	Alluvial, Sandy, Residual, Brown Forest Soil, Red to Dark	826.16	Wheat,Paddy,Ragi,Sugarcane
8	9	406475	Naintal	Alluvial, Sandy, Residual, Brown Forest Soil, Red to Dark	1574.00	Wheat,Paddy,Ragi,Sugarcane
9	9	673431	Pauri Garhwal	Brown Forest Soil, Red to Dark, Black Clay	1057.09	Wheat,Paddy,Ragi
10	9	410638	Pithoragarh	Brown Forest Soil, Red to Dark, Black Clay	842.51	Wheat,Paddy,Ragi
11	9	485766	Tehri Garhwal	Brown Forest Soil, Red to Dark, Black Clay	1039.32	Wheat,Paddy,Ragi
12	9,14	279234	U S Nagar	Alluvial, Sandy Soil, Residual Sandy Loam	1459.53	Wheat,Paddy,Ragi,Sugarcane
13	9	812414	Uttarkashi	Brown Forest Soil, Red to Dark, Black Clay	1153.96	Wheat,Paddy,Ragi
		5665767			**1165.93**	

Source : Agriculture Deptt. Uttarakhand

Annexure Table 2.3: Normal rainfall (monthly, mm) Year 2007

Sl.no.	Districts	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug	Sept	Oct	Nov	Dec	Total
1	Almora	4.00	135.90	129.70	34.70	86.65	154.00	117.40	257.00	262.70	5.30	0.00	5.00	1192.35
2	Bageshwar	4.20	66.71	86.35	30.00	25.00	185.00	249.00	183.00	71.60	7.00	0.00	4.33	912.19
3	Chamoli	0.00	35.00	37.00	16.00	46.00	186.00	247.00	386.00	76.00	16.00	2.00	0.00	1047.00
4	Rudraprayag	0.00	107.20	84.10	60.60	62.10	215.70	152.50	258.20	153.50	39.00	2.06	24.90	1159.86
5	Champawat	0.00	190.00	177.00	36.00	59.00	143.00	162.00	282.00	187.00	16.00	0.00	10.00	1262.00
6	Dehradun	2.00	112.00	26.00	15.00	12.00	109.00	594.10	458.00	303.00	0.00	0.00	0.00	1631.10
7	Haridwar	0.00	132.90	47.26	29.30	0.00	77.00	211.30	303.30	25.10	0.00	0.00	0.00	826.16
8	Naintal	2.34	124.00	80.17	35.13	41.00	167.28	299.67	484.56	325.85	14.00	0.00	0.00	1574.00
9	Pauri Garhwal	3.25	0.00	0.00	0.50	0.87	111.27	208.54	297.38	286.78	81.27	0.00	67.23	1057.09
10	Pithoragarh	0.00	95.86	0.00	0.00	0.00	0.00	272.44	473.00	0.00	0.00	1.21	0.00	842.51
11	Tehri Garhwal	0.00	0.00	67.63	15.08	42.22	34.55	296.90	424.48	151.22	7.24	0.00	0.00	1039.32
12	Udham Singh Nagar	0.00	100.00	23.83	9.70	10.16	211.66	226.66	437.00	440.52	0.00	0.00	0.00	1459.53
13	Uttarkashi	0.00	153.36	160.60	69.80	76.20	111.00	296.80	113.80	156.80	15.60	0.00	0.00	1153.96
	Average Rainfal	**1.21**	**96.38**	**70.74**	**27.06**	**35.48**	**131.19**	**256.49**	**335.21**	**187.70**	**15.49**	**0.41**	**8.57**	**1165.93**

Source : Agriculture Department, Uttarakhand

Annexure Table 2.4: Status of Degraded Land in the State - Area in 000' ha.

Sl. no.	Districts	Gullied Land	Land With or Without scrubs	Water logged/ marshy land	Saline and alkaline area	Degraded notified forest land	Degraded pasture/ grazing land	Degraded land under plantation	Sand/ Coastal Land	Mining/ Industrial area	Barren rocky area	Steep slping area	Snow/ glacier area	Total wastelands/degraded land	Geographical area	% of the total geographical area
1	**2**	**3.00**	**4.00**	**5.00**	**6.00**	**7.00**	**8.00**	**9.00**	**10.00**	**11.00**	**12.00**	**13.00**	**14.00**	**15.00**	**16.00**	**17**
1	Almora	0.00	1.16	0.00	0.00	1.94	0.19	0.00	0.00	0.00	1.60	1.99	0.74	**7.62**	313.40	6%
2	Bageshwar	0.00	0.05	0.00	0.00	1.58	0.28	0.00	0.00	0.00	1.31	1.82	50.38	**55.43**	225.00	4%
3	Chamoli	0.00	1.03	0.00	0.00	12.12	4.19	0.00	0.00	0.00	1.84	6.19	423.89	**449.26**	912.50	17%
4	Rudraprayag	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0%
5	Champawat	0.00	0.90	0.00	0.00	7.41	0.44	0.18	0.00	0.00	0.26	0.29	1.55	**11.02**	176.60	3%
6	Dehradun	0.06	12.12	0.00	0.00	14.03	0.00	0.00	0.00	0.00	0.00	39.93	0.00	**66.14**	308.80	6%
7	Haridwar	1.52	3.96	2.99	0.00	28.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**37.08**	199.50	4%
8	Naintal	0.00	1.91	0.22	0.00	14.68	0.06	0.41	0.00	0.00	0.38	1.13	0.56	**19.34**	421.60	8%
9	Pauri Garhwal	0.00	0.02	1.17	0.00	5.55	2.42	0.00	0.00	0.00	0.67	14.61	0.27	**24.72**	544.00	10%
10	Pithoragarh	0.00	0.09	0.00	0.00	2.06	1.67	0.00	0.00	0.00	27.22	7.14	375.93	**414.11**	709.10	13%
11	Tehri Garhwal	0.00	0.99	0.02	0.00	6.42	0.44	0.00	0.00	0.00	2.80	10.49	34.89	**56.04**	442.10	8%
12	Udham Singh Nagar	0.00	1.55	2.37	0.00	6.34	0.00	0.43	0.00	0.00	0.00	0.00	0.00	**10.69**	257.90	5%
13	Uttarkashi	0.00	0.24	0.00	0.00	8.05	1.96	0.00	0.00	0.00	4.72	13.04	428.43	**456.43**	801.60	15%
	Total	**1.59**	**24.02**	**6.76**	**0.00**	**108.81**	**11.64**	**1.02**	**0.00**	**0.00**	**40.79**	**96.62**	**1316.64**	**1607.88**	**5312.10**	**100%**

Source - Watershed Atlas of India (2000). Dept of land Resource and NRSA

Annexure Table 2.5: Extent of Soil Erosion in the State

Class	Range of Soil loss (t/ha/yr.)	Area (Lakh ha.)	Area (%)
Very Slight	< 5	2.80	
Slight	5 - 10		5
Moderate	10 - 15	8.39	16
Severe	20 - 40	16.45	31
Very Severe	40 - 80	11.92	22
Extremely severe	> 80	1.51	3
		41.07	77
Snow Covered		5.70	11
Rockey		4.09	8
Not Serveyed		2.43	5
	GRAND TOTAL	**53.29**	

Source : Land Survey Directorate, Uttarakhand

Annexure Table 2.6: Developmental Indicators of the State (As on 31-03-2006)

Sl. No	Development Indicators	State.	National
1	Per Capital Income (Rs.) 2005-06	24870	25956
2	Poverty Ratio (2004-05)	31.8	21.8
3	Contribution of Agril. To State GDP (%)	18.47	17
4	HDI	NA	NA
5	Infrastructure Development Index	NA	NA
6	Literacy (%)	71.6	64.8
7	Cooperative Credit (Rs./ha.)	6149	NA
8	Bank Credit (Rs./ha.)	28349	NA

NA - Not Available
* - Based on National Sample Survey

Annexure Table 2.7: Source wise Income Distribution in the State and ACZ/Divisions

Farmers Typology	State as a whole (Absolute value in Rs. And % in parenthesis)					
	Agriculture i.e. Crops including	Animal Husbandry and Dairying	Fishery	Wages	Non-farm income	Others
Marginal						
Small						
Medium						
Large						
Share Croppers						
Land less						

* Similarly for different ACZ/Divisions (If possible)

Annexure Table 2.8: Land Utilisation Statistics (Preceeding 3 years average) Lakhs ha.

Districts	Geogra phical area	Forest Area	Land under Non-agril. Use	Cultivable waste	Permanent pastures	Land under miscellaneon s tree crops and groves	Curreut Fallows	Other Fallows	Net Sown area	Area Sown more than once	Net Irrigated Area	Gross cropped area	Cropping intensity (%)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Almora	4.659	2.362	0.126	0.424	0.305	0.272	0.009	0.078	0.826	0.487	0.050	1.313	158.906
Bageshwar	2.135	1.102	0.047	0.169	0.275	0.207	0.020	0.031	0.217	0.175	0.040	0.392	180.403
Chamoli	8.476	5.061	0.080	0.481	0.498	0.405	0.005	0.011	0.349	0.179	0.016	0.528	151.324
Rudraprayag	2.354	1.799	0.030	0.080	0.043	0.116	0.007	0.007	0.200	0.115	0.026	0.314	157.334
Champawat	2.384	1.323	0.047	0.152	0.191	0.265	0.029	0.068	0.254	0.164	0.024	0.418	164.402
Dehradun	3.690	2.018	0.218	0.640	0.003	0.151	0.077	0.075	0.470	0.265	0.209	0.735	156.495
Haridwar	2.311	0.724	0.267	0.021	0.001	0.008	0.026	0.039	1.202	0.535	1.072	1.736	144.502
Naintal	4.064	2.983	0.093	0.268	0.000	0.178	0.033	0.030	0.466	0.333	0.280	0.799	171.499
Pauri Garhwal	6.729	3.851	0.155	0.385	0.352	0.561	0.078	0.182	0.807	0.428	0.077	1.235	153.091
Pithoragarh	4.107	2.052	0.101	0.406	0.533	0.269	0.013	0.044	0.481	0.395	0.040	0.876	182.204
Tehri Garhwal	4.858	3.221	0.053	0.781	0.006	0.001	0.071	0.058	0.613	0.380	0.085	0.992	162.014
Udham Singh Nagar	2.811	0.937	0.253	0.033	0.000	0.013	0.025	0.029	1.511	1.079	1.484	2.590	171.452
Uttarkashi	8.124	7.217	0.052	0.023	0.083	0.044	0.024	0.032	0.274	0.144	0.051	0.417	152.553
	56.701	**34.651**	**1.522**	**3.863**	**2.289**	**2.490**	**0.417**	**0.684**	**7.667**	**4.678**	**3.452**	**12.345**	**161.014**

Source : Agriculture Department Uttarakhand

Annexure Table 2.9: Land holdings (Agriculture Census) 2000-01 Year

Sl.no	Districts	Marginal Farmers		Small Farmers		Semi-med. Farmers		Medium Farmers		Large Farmers		Total		Landless
		No.	Area in ha.	No.	Area in ha.	No.	Area in ha.	No.	Area in ha.	No.	Area in ha.	No.	Area in ha.	No.
1	Almora	94273	39424.45	21798	29645.71	5734	14609.96	501	2560.82	16	385.57	122322	86626.51	
2	Bageshwar	49798	16399.55	4673	6136.92	761	1970.44	68	379.15	3	40.64	55303	24926.70	
3	Chamoli	26399	8944.34	7607	10880.72	3848	10364.02	810	4222.36	19	394.92	38683	34806.36	
4	Rudraprayag	25466	9351.42	4726	6538.56	1347	3480.94	168	919.35	6	78.64	31713	20368.91	
5	Champawat	26890	10735.97	6444	8776.96	2106	5485.63	371	1954.49	27	466.39	35838	27419.44	
6	Dehradun	50419	17286.83	8460	12085.28	5225	14429.73	1740	9535.25	140	2999.13	65984	56336.22	
7	Haridwar	78690	31608.91	20981	28636.77	12034	33193.13	4462	24347.21	177	2928.51	116344	120714.53	
8	Naintal	32733	10625.50	8362	11902.64	6196	17091.15	2371	13515.89	261	5604.35	49923	58739.53	
9	Pauri Garhwal	43839	20440.42	24412	34965.14	14627	39355.50	3552	19111.13	129	1773.10	86559	115645.29	
10	Pithoragarh	75256	27419.91	9663	12946.77	1898	4838.96	164	855.91	14	275.64	86995	46337.19	
11	Tehri Garhwal	56053	23470.97	17927	24896.66	6206	16426.47	875	4521.50	18	269.27	81079	69584.87	
12	Udham Singh Nagar	43908	19421.59	17055	24235.70	14014	39007.85	8009	44718.39	584	20078.41	83570	147461.94	
13	Uttarkashi	24543	7380.87	6294	9077.73	4418	12130.50	1072	5559.07	27	334.43	36354	34482.60	
	Total	**628267**	**242510.73**	**158402**	**220725.56**	**78414**	**212384.28**	**24163**	**132200.52**	**1421**	**35629.00**	**890667**	**843450.09**	

Table : Less than 1 ha-marginal farmers, 1-2 ha-smal farmers, 2-4 ha semi-med. Farmers, 4-10 ha medium farmers and more than 10 ha - large farmers.
Source : Agriculture Department Uttarakhand

Annexure Table 2.10: Area, Production and Yield of Major Crops in Irrigated / Rainfed Conditions during Kharif Season

Crops	Area (ha.)					Production (q)					Yield (q/ha.)		
	Irrigated	%	Rainfed	%	Total	Irrigated	%	Rainfed	%	Total	Irrigated	Rainfed	Average
Cereals	172381	34%	334622	66%	**507003**	3689560	43%	4920250	57%	**8609810**	21.40	14.70	16.98
Pulses	1560	4%	37604	96%	**39164**	10390	3%	334120	97%	**344510**	6.66	8.89	8.80
Oilseeds	6812	40%	10033	60%	**16845**	106000	53%	93720	47%	**199720**	15.56	9.34	11.86
Others	821	25%	2449	75%	**3270**	6660	40%	9980	60%	**16640**	8.11	4.08	5.09
Total	**181574**	32%	**384708**	68%	**566282**	**3812610**	42%	**5358070**	58%	**9170680**	21.00	13.93	16.19

Source : Agriculture Department Uttarakhand

Annexure Table 2.11: Area, Production and Yield of Major Crops in Irrigated / Rainfed Conditions during Rabi Season

Crops	Area (ha.)					Production (q)					Yield (q/ha.)		
	Irrigated	%	Rainfed	%	Total	Irrigated	%	Rainfed	%	Total	Irrigated	Rainfed	Average
Cereals	170194	40%	251252	60%	**421446**	5583470	66%	2819540	34%	**8403010**	32.81	11.22	19.94
Pulses	9197	41%	13410	59%	**22607**	91810	62%	56060	38%	**147870**	9.98	4.18	6.54
Oilseeds	6929	48%	7444	52%	**14373**	61190	69%	27610	31%	**88800**	8.83	3.71	6.18
Others	12986	100%	0	0%	**12986**	429900	100%	0	0%	**429900**	33.10	0.00	33.10
Total	**199306**	42%	**272106**	58%	**471412**	**6166370**	68%	**2903210**	32%	**9069580**	30.94	10.67	19.24

Source : Agriculture Department Uttarakhand

Annexure Table 2.12: Area, Production and Yield of Major Horticulture Crops

Sl.no	Districts	Crops	Area (ha.)					Production (tonnes)					Yield (q/ha.)		
			Irrigated	%	Rainfed	%	Total	Irrigated	%	Rainfed	%	Total	Irrigated	Rainfed	Average
1	Almora	Fruits	0	0	23864	100	23864	0	0	178707	100	178707	0.00	74.89	74.89
	Almora	Vegetables	4055	100	0	0	4055	41645	100	0	0	41645	102.70	0.00	102.70
	Almora	Potato		0		0	2386	0	0		0	52874	0.00	0.00	221.60
2	Bageshwar	Fruits	0	0	3377	100	3377	0	0	17065	100	17065	0.00	50.53	50.53
	Bageshwar	Vegetables	1303	100	0	0	1303	11145	100	0	0	11145	85.53	0.00	85.53
	Bageshwar	Potato		0		0	1005		0		0	19940	0.00	0.00	198.41
3	Chamoli	Fruits	0	0	13021	100	13021	0	0	93929	100	93929	0.00	72.14	72.14
	Chamoli	Vegetables	2710	100	0	0	2710	24311	100	0	0	24311	89.71	0.00	89.71
	Chamoli	Potato		0		0	2380		0		0	36535	0.00	0.00	153.51
4	Rudraprayag	Fruits	0	0	2700	100	2700	0	0	8495	100	8495	0.00	31.46	31.46
	Rudraprayag	Vegetables	865	100	0	0	865	7700	100	0	0	7700	89.02	0.00	89.02
	Rudraprayag	Potato		0		0	600		0		0	10400	0.00	0.00	173.33
5	Champawat	Fruits	0	0	10695	100	10695		0	18649	100	18649	0.00	17.44	17.44
	Champawat	Vegetables	3529	100	0	0	3529	23745	100	0	0	23745	67.29	0.00	67.29
	Champawat	Potato		0		0	2314		0		0	38644	0.00	0.00	167.00
6	Dehradun	Fruits	0	0	25176	100	25176	0	0	38601	100	38601	0.00	15.33	15.33
	Dehradun	Vegetables	8533	100	0	0	8533	84842	100		0	84842	99.43	0.00	99.43
	Dehradun	Potato		0		0	2274		0		0	52120	0.00	0.00	229.20
7	Haridwar	Fruits	0	0	13415	100	13415	0	0	96463	100	96463	0.00	71.91	71.91
	Haridwar	Vegetables	3244	100	0	0	3244	49696	100	0	0	49696	153.19	0.00	153.19

Sl.no	Districts	Crops	Area (ha.)					Production (tonnes)					Yield (q/ha.)		
			Irrigated	%	Rainfed	%	Total	Irrigated	%	Rainfed	%	Total	Irrigated	Rainfed	Average
	Haridwar	Potato		0		0	1410		0		0	28510	0.00	0.00	202.20
8	Naintal	Fruits	0	0	25120	100	25120	0	0	87401	100	87401	0.00	34.79	34.79
	Naintal	Vegetables	8130	100	0	0	8130	75267	100	0	0	75267	92.58	0.00	92.58
	Naintal	Potato		0		0	2471		0		0	55350	0.00	0.00	224.00
9	Pauri Garhwal	Fruits	0	0	19838	100	19838	0	0	30699	100	30699	0.00	15.47	15.47
	Pauri Garhwal	Vegetables	4623	100	0	0	4623	42025	100	0	0	42025	90.90	0.00	90.90
	Pauri Garhwal	Potato		0		0	1190		0		0	16330	0.00	0.00	137.23
10	Pithoragarh	Fruits	0	0	15032	100	15032	0	0	36748	100	36748	0.00	24.45	24.45
	Pithoragarh	Vegetables	4916	100	0	0	4916	49098	100	0	0	49098	99.87	0.00	99.87
	Pithoragarh	Potato		0		0	2080		0		0	47048	0.00	0.00	226.19
11	Tehri Garhwal	Fruits	0	0	19513	100	19513	0	0	25299	100	25299	0.00	12.97	12.97
	Tehri Garhwal	Vegetables	6276	100	0	0	6276	50120	100	0	0	50120	79.86	0.00	79.86
	Tehri Garhwal	Potato		0		0	2357		0		0	49690	0.00	0.00	210.82
12	Udham Singh Nagar	Fruits	0	0	6141	100	6141	0	0	36206	100	36206	0.00	58.96	58.96
	Udham Singh Nagar	Vegetables	5142	100	0	0	5142	57154	100	0	0	57154	111.15	0.00	111.15
	Udham Singh Nagar	Potato		0		0	2473		0		0	53332	0.00	0.00	215.66
13	Uttarkashi	Fruits	0	0	12794	100	12794	0	0	66899	100	66899	0.00	52.29	52.29
	Uttarkashi	Vegetables	2883	100	0	0	2883	43694	100	0	0	43694	151.56	0.00	151.56
	Uttarkashi	Potato		0		0	2004		0		0	48062	0.00	0.00	239.83
	Total		**56209**	**20.68**	**190686**	**70.15**	**271839**	**560442**	**31.06**	**735161**	**40.74**	**1804438**	**99.71**	**38.55**	**66.38**

Source : Horticulture Department of Uttarakhand

Table 2.12

Annexure Table 2.13: Irrigation Status (Area in lakh ha)

Districts	Net Cultivated Area	Net Irrigated Area	Gross Cultivated Area	Gross Irrigated Area	Net Irrigated (%)	Rainfed Area (%)	
						(Ha.)	(%)
Almora	0.83	0.05	1.31	0.10	6	0.78	94
Bageshwar	0.22	0.04	0.39	0.08	18	0.18	82
Chamoli	0.35	0.02	0.53	0.03	5	0.33	95
Rudraprayag	0.2	0.03	0.31	0.05	13	0.17	87
Champawat	0.25	0.02	0.42	0.04	10	0.23	90
Dehradun	0.47	0.21	0.74	0.34	44	0.26	56
Haridwar	1.2	1.07	1.74	1.50	89	0.13	11
Naintal	0.47	0.28	0.80	0.40	60	0.19	40
Pauri Garhwal	0.81	0.08	1.24	0.14	10	0.73	90
Pithoragarh	0.48	0.04	0.88	0.07	8	0.44	92
Tehri Garhwal	0.61	0.09	0.99	0.16	14	0.52	86
US Nagar	1.51	1.48	2.59	2.48	98	0.03	2
Uttarkashi	0.27	0.05	0.42	0.09	19	0.22	81
Total	**7.67**	**3.45**	**12.35**	**5.49**	**45**	**4.22**	**55**

Source : Agriculture Department Uttarakhand

Annexure Table 2.14: Source wise Area Irrigated (Latest data) (Area in Hectares)

Districts	Canals (Area)	Tanks		Open Wells		Tube/Bore wells		Lift Irrigationn		Other Sources		Total	
		No.	Area	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area
Almora	3178	0	0	0	0	0	0	0	0	0	1840	0	5018
Bageshwar	4633	0	0	0	0	0	0	0	0		1176		5809
Chamoli	841	0	0	0	0	0	0	0	0		991		1832
Rudraprayag	1403	0	0	0	0	0	0	0	0		772		2175
Champawat	1325	0	0	0	0		655	0	0		197		2177
Dehradun	13997	0	0	0	72		3237	0	0		5181		22487
Haridwar	15080	0	0	0	136		90073	0	0		2064		107353
Naintal	21363	0	0	0	0		4577	0	0		152		26092
Pauri Garhwal	3037	0	21	0	0		476	0	0		4504		8038
Pithoragarh	1255	0	0	0	0	0	0	0	0		2915		4170
Tehri Garhwal	778	0	0	0	0	0	0	0	0		6913		7691
Udham Singh Nagar	25250	0	313		10516		103838	0	0		5679		145596
Uttarkashi	3468	0	0	0	0	0	0	0	0		1506		4974
	95608	**0**	**334**	**0**	**10724**	**0**	**202856**	**0**	**0**	**0**	**33890**	**0**	**343412**

Source : Agriculture Department Uttarakhand

Annexure Table 2.15 (a): Groundwater Status

Districts	Over Exploited		Critical		Semi Critical		Safe	
	No. of Blocks	% Area	No. of Blocks	% Area	No. of Blocks	% Area	No. of Blocks	% Area
Dehradun (Doiwala)							1	5.27
Dehradun (Sahaspur)							1	6.53
Haridwar (Bahadrabad)					1	71.54		
Haridwar (Bhagwanpur)	1	133.41						
Haridwar (Narsen)					1	82.47		
Haridwar (Roorkee)					1	87.02		
Haridwar (Khanpur)							1	67.39
Naintal (Ramnagar)							1	32.08
Naintal (Haldwani)							1	24.67
USNagar (Gadarpur)							1	72.74
USNagar (Sitarganj)							1	69.60
USNagar (Rudrapur)							1	86.77
USNagar (Jaspur)							1	77.09
USNagar (Bazpur)							1	84.70
USNagar (Kashipur)							1	84.28
USNagar (Khatima)							1	82.52

Rest of nine districts including Hilly Development Block of above four districts Total 78 Dev Blocks are :

Source : Central Ground Water Board

Annexure Table 2.15 (b): Details of Water Bodies

Districts	Command Area up to 20 ha		Command Area 20-100 ha		Command Area > 100 ha	
	No.	Total Area (ha)	No.	Total Area (ha)	No.	Total Area (ha)
Almora						
Bageshwar						
Chamoli						
Rudraprayag						
Champawat						
Dehradun						
Haridwar						
Naintal						
Pauri Garhwal						
Pithoragarh						
Tehri Garhwal						
Udham Singh Nagar						
Uttarkashi						
Total						

Data not available

Annexure Table 2.16: Livestock Population

Sl. No	Districts	Area under fodder (ha)		Cattle (Nos.)			Buffaloes (Nos)			Sheep (No.)			Goats (No.)			Poultry (Nos.)			Other (No.)	Total (No.)
		Fodder Crops	Grazing Land	Cross Bred	Indigenous	Total	Improved	Indigenous	Total	Improved	Indigenous	Total	Improved	Indigenous	Total	Boiler	Layer	Ducks		
1	Almora	0	30461	9874	227869	237743	3326	106402	109728	180	4710	4890	0	171732	171732	17689	44878	2	2333	526426
2	Bageshwar	0	27486	1339	119782	121121	774	41476	42250	9294	10689	19983	0	81105	81105	4973	9751	0	1799	266258
3	Chamoli	0	49808	15367	173088	188455	6489	48664	55153	8070	37581	45651	0	78162	78162	3932	14932	0	5394	372815
4	Rudraprayag	0	4308	2262	100166	102428	946	36276	37222	675	14961	15636	0	39726	39726	2521	3085	0	1811	196823
5	Champawat	131	19078	12411	87226	99637	1236	36385	37621	25	33	58	0	48492	48492	31672	24652	0	1799	187607
6	Dehradun	2884	329	39791	148117	187908	22781	48904	71685	1339	20837	22176	0	116672	116672	288968	70322	155	11338	409779
7	Haridwar	21105	51	25714	102354	128068	83374	185161	268535	125	2145	2270	0	21265	21265	39202	23999	51	17766	437904
8	Naintal	1873	0	27208	143375	170583	13840	109266	123106	31	147	178	0	63207	63207	115711	101018	75	5006	362080
9	Pauri Garhwal	92	35179	9356	348197	357553	5426	60946	66372	2680	31283	33963	0	150575	150575	12410	55147	10	4936	613399
10	Pithoragarh	1	53326	17299	223449	240748	2359	84518	86877	7378	25426	32804	0	145173	145173	35454	15024	7	2537	508139
11	Tehri Garhwal	0	593	2279	120881	123160	5062	109988	115050	7155	7656	14811	0	101981	101981	8234	21159	0	7129	362131
12	U Singh Nagar	10889	46	53595	70356	123951	60828	115077	175905	70	2087	2157	0	44514	44514	905037	76823	1068	4276	350803
13	Uttarkashi	0	8279	11119	95708	106827	3643	35047	38690	53131	48137	101268	0	95593	95593	8841	30588	0	6787	349165
	Total	**36975**	**228944**	**227614**	**1960568**	**2188182**	**210084**	**1018110**	**1228194**	**90153**	**205692**	**295845**	**0**	**1158197**	**1158197**	**1474644**	**491378**	**1368**	**72911**	**4943329**

Source : Livestock Department, Uttarakhand

Annexure Table 2.17: Milk Population

Parameters	State	National
a) Total production (litre/day)	**3345205**	**276353424658**
b) A.V.Production (litre/household/day)	**2.35**	**1.47**
c) Means of marketing	**Co-oparatives,Dairy,SHG**	**Co-oparatives,Dairy,SHG**

Source : Livestock Department Uttarakhand

Annexure Table 2.18: Status of Aquaculture (As on 2007-08)

Sl.No	Districts	Water Spread Area (ha)				Yield (t/ha)	Production (t)
		Ponds/Tanks		Reservoirs			
		No.	Area	No.	Area		
1	Almora	88	2.362	0	0	2.92	6.905
2	Bageshwar	52	1.43	0	0	2.92	4.181
3	Chamoli	84	2.53	0	0	2.92	7.396
4	Rudraprayag	31	0.545	0	0	2.92	1.593
5	Champawat	95	1.49	0	0	2.92	4.356
6	Dehradun	107	42.656	0	0	2.92	124.705
7	Haridwar	431	348.783	0	0	2.92	1019.667
8	Naintal	49	2.73	0	0	2.92	7.981
9	Pauri Garhwal	87	1.74	0	0	2.92	5.087
10	Pithoragarh	100	2.516	0	0	2.92	7.356
11	Tehri Garhwal	78	3.042	0	0	2.92	8.893
12	Udham Singh Nagar	241	191.75	7	20075	0.079	1605.581
13	Uttarkashi	102	2.56	0	0	2.92	7.484
	Total	**1545**	**604.134**	**7**	**20075**	0.136	**2811.185**

Source : Fisheries Department, Uttarakhand

Annexure Table 2.19: Detials of Credit Institutions in the State (As on 31-03-2006)

Sl.no.	Name of Districts	No. of Institutions					Total
		Commercial Banks	RRBs	Cooperative	PACs	Others	
1	Almora	50	19	22	80	6	**177**
2	Bageshwar	12	12	4	18	4	**50**
3	Chamoli	24	10	16	54	0	**104**
4	Rudraprayag	16	5	5	37	0	**63**
5	Champawat	12	4	7	22	5	**50**
6	Dehradun	176	15	16	39	11	**257**
7	Haridwar	105	1	14	42	5	**167**
8	Naintal	54	19	25	53	12	**163**
9	Pauri Garhwal	64	34	19	134	1	**252**
10	Pithoragarh	28	21	15	112	1	**177**
11	Tehri Garhwal	55	23	24	87	24	**213**
12	Udham Singh Nagar	85	8	24	34	12	**163**
13	Uttarkashi	23	3	13	44	0	**83**
	Total	**704**	**174**	**204**	**756**	**81**	**1919**

Source : Department of Rural Department, Uttarakhand

Annexure Table 2.20: Service Centres in the District (Agriculture and Allied Sectors)

Sl.no.	Name of Districts	No. of Centres	Classification of centres				
			Seed/Fertilizer supply	Farm equipments and machinery	Agriculture consultancy	Diagnostic services provided	Agro-processing units (Type and Nos.)
1	Almora	108	12/96		109.00		
2	Bageshwar	15	3/12		40.00		
3	Chamoli	63	9/54		50.00		
4	Rudraprayag	41	3/38		32.00		
5	Champawat	41	4/37		30.00		
6	Dehradun	79	8/71		48.00		
7	Haridwar	215	6/209		54.00		
8	Naintal	132	12/120		109.00		
9	Pauri Garhwal	157	16/141		136.00		
10	Pithoragarh	88	8/80		74.00		
11	Tehri Garhwal	121	10/111		86.00		
12	Udham Singh Nagar	653	1/652		37.00		
13	Uttarkashi	51	7/44		34.00		
	Total	**1764**			**839.00**		

Source : Department of Agriculture, Uttarakhand

Annexure Table 2.21: Basic Marketing Infrastructure for Agriculture Produce (Post Harvest Management)

Sl.no.	Districts	Classification of centres				Market (Numbers)	
		Rural Godowns		Cold Storage		Main Market	Sub Market
		Nos.	Capacity (MT)	Nos.	Capacity (MT)		
1	Almora	0	0	0	0	1	0
2	Bageshwar	0	0	0	0	0	0
3	Chamoli	0	0	0	0	1	0
4	Rudraprayag	0	0	0	0	0	0
5	Champawat	1	3000	0	0	1	3
6	Dehradun	0	0	0	0	4	3
7	Haridwar	1	1000	5	43394.6	4	9
8	Nainital	2	2000	0	0	2	8
9	Pauri Garhwal	0	0	0	0	1	1
10	Pithoragarh	0	0	0	0	1	0
11	Tehri Garhwal	0	0	0	0	1	0
12	Udham Singh Nagar	21	20200	7	35298.1	8	9
13	Uttarkashi	0	0	0	0	1	0
	Total	25	26200	12	78692.7	25	33

Source : Mandi Parishad, Uttarakhand

Annexure Table 3.1: Extent of Rainfed Area

Sl.no	Districts	Rainfed Area (ha)				Total
		Agriculture	Horticulture	Forest	Others	
1	Almora	86348	30305	236179	113026	465858
2	Bageshwar	22802	5685	110160	74895	213542
3	Chamoli	34871	18111	506100	288498	847580
4	Rudraprayag	18732	4165	179895	32629	235421
5	Champawat	32709	16538	132337	56794	238378
6	Dehradun	41358	35983	201831	89821	368993
7	Haridwar	19501	18069	72431	121109	231110
8	Naintal	24924	35721	298336	47452	406433
9	Pauri Garhwal	99048	25651	385099	163054	672852
10	Pithoragarh	49748	22028	205239	133677	410692
11	Tehri Garhwal	65569	28146	322051	70000	485766
12	Udham Singh Nagar	8120	13756	93738	165456	281070
13	Uttarkashi	27891	17681	721661	45182	812415
	Sub Total	**531621**	**271839**	**3465057**	**1401593**	**5670110**

Source: Agriculture Deptt. Uttarakhand

Annexure Table 4.1: Watershed Development schemes in the State

	DDP	DPAP	IWDP	IWMP	CDP	NWDPRA	OTHERS	TOTAL
Area sanctioned so far for treatment (Ha.)	0	423000	304526	0	0	275735	996000	1999261
Amount sanctioned(Rs.in Crore)	0	230.90	180.29	0	0	198.87	810.42	1420.48
No. of watershed sanctioned (No.)	0	102	143	0	0	27	267	539
Area treated so far (Ha.)	0	58500	0	0	0	199765	761200	1019465
Amount Utilised(Rs.in Crore)	0	97.98	99.02	0	0	106.76	408.42	712.18
Watershed completed (No.)		8	0	0	0	27	190	225
Ongoing watershed (No.)	0	94	143	0	0	0	77	314

Source: 1.Agriculture Deptt. Uttarakhand
2. Rural Development. Uttarakhand
3. WMD. Uttarakhand

Annexure Table 7.1. : Proposed Area and Watersheds to be developed over 18 Years period
Plan-wise phasing of physical (area in ha) & financial (Rs. in Crore) targets of IWMP

S.No	District	Remaining period of XI Plan (2009-10 to 2011-12)		XII Plan (2012-13 to 2016-17)		XIII Plan (2017-18 to 2021-22)		XIV Plan (2022-23 to 2026-27)		Total for 18 years	
		Phy. (ha.)	Fin. (Rs. Crores)	Phy. (ha.)	Fin. (Rs. Crores)	Phy. (ha.)	Fin. (Rs. Crores)	Phy. (ha.)	Fin. (Rs. Crores)	Phy. (ha.)	Fin. (Rs. Crores)
1	Almora	35000	52.50	45000	67.50	50000	75.00	23585	35.38	153585	230.38
2	Bageshwar	40000	60.00	45000	67.50	50000	75.00	61947	92.92	196947	295.42
3	Chamoli	25000	37.50	20000	30.00	20000	30.00	4323	6.48	69323	103.98
4	Rudraprayag	20000	30.00	20000	30.00	12000	18.00	2462	3.69	54462	81.69
5	Champawat	20000	30.00	20000	30.00	20000	30.00	6387	9.58	66387	99.58
6	Dehradun	25000	37.50	15000	22.50	12000	18.00	1072	1.61	53072	79.61
7	Haridwar	30000	36.00	30000	36.00	30000	36.00	30000	36.00	120000	144.00
8	Naintal	40000	60.00	30000	45.00	50000	60.00	110934	133.12	230934	277.12
9	Pauri Garhwal	35000	52.50	35000	52.50	50000	75.00	123787	185.68	243787	365.68
10	Pithoragarh	30000	45.00	40000	60.00	50000	75.00	81780	122.67	201780	302.67
11	Tehri Garhwal	40000	60.00	50000	75.00	40000	60.00	64261	96.39	194261	291.39
12	Udham Singh Nagar	50000	60.00	40000	48.00	40000	48.00	36780	44.14	166780	200.14
13	Uttarkashi	40000	60.00	40000	60.00	40000	60.00	60569	90.85	180569	270.85
	TOTAL	**430000**	**621.00**	**430000**	**624.00**	**464000**	**660.00**	**607887**	**858.52**	**1931887**	**2742.52**

Area proposed as per selection criteria of DoLR

Source : Land Survey Directorate, Uttarakhand and cost norms according to Common Guidelines-2008

Table 8.1: Agro-Climatic zone wise area to be treated under Watershed programmes

Sl.no	District	Agro-climatic zone	Area to be treated (ha)	No. of Watersheds	Name of the scheme (IWMP, NWDPRA etc.)
1	Almora	9	153585	44	IWMP
2	Bageshwar	9	196947	32	IWMP
3	Chamoli	9	69323	14	IWMP
4	Rudraprayag	9	54462	15	IWMP
5	Champawat	9	66387	14	IWMP
6	Dehradun	9,14	53072	24	IWMP
7	Haridwar	9,14	120000	0	IWMP
8	Naintal	9	230934	25	IWMP
9	Pauri Garhwal	9	243787	71	IWMP
10	Pithoragarh	9	201780	42	IWMP
11	Tehri Garhwal	9	194261	66	IWMP
12	Udham Singh Nag	9,14	166780	7	IWMP
13	Uttarkashi	9	180569	55	IWMP
	TOTAL		**1931887**	**409**	

Source : Land Survey Directorate, Uttarakhand

Annexure Table-8.2.a: Year-wise phasing of physical (area in '000 ha) & Financial (Rs. in lakh) targets of IWMP for remaining period of XI Plan *:

1	2	3																			
S. No	**District**	**Remaining period of XI Plan**																			
		2009-10					**2010-11**					**2011-12**					**Total**				
		Phy.				**Fin.**	**Phy.**				**Fin.**	**Phy.**				**Fin.**	**Phy.**				**Fin.**
		No. of projects		**Area**			**No. of projects**		**Area**			**No. of projects**		**Area**			**No. of projects**		**Area**		
		H&D	O	H&D	O		H&D	O	H&D	O		H&D	O	H&D	O		H&D	O	H&D	O	
1	Almora	3	0	15	0	**2250**	2	0	10	0	**1500**	2	0	10	0	**1500**	7	0	35	0	**5250**
2	Bageshwar	3	0	15	0	**2250**	3	0	15	0	**2250**	2	0	10	0	**1500**	8	0	40	0	**6000**
3	Chamoli	2	0	10	0	**1500**	2	0	10	0	**1500**	1	0	5	0	**750**	5	0	25	0	**3750**
4	Rudraprayag	2	0	10	0	**1500**	1	0	5	0	**750**	1	0	5	0	**750**	4	0	20	0	**3000**
5	Champawat	2	0	10	0	**1500**	1	0	5	0	**750**	1	0	5	0	**750**	4	0	20	0	**3000**
6	Dehradun	2	0	10	0	**1500**	2	0	10	0	**1500**	1	0	5	0	**750**	5	0	25	0	**3750**
7	Haridwar	0	2	0	10	**1200**	0	2	0	10	**1200**	0	2	0	10	**1200**	0	6	0	30	**3600**
8	Naintal	3	0	15	0	**2250**	3	0	15	0	**2250**	2	0	10	0	**1500**	8	0	40	0	**6000**
9	Pauri Garhwal	3	0	15	0	**2250**	2	0	10	0	**1500**	2	0	10	0	**1500**	7	0	35	0	**5250**
10	Pithoragarh	2	0	10	0	**1500**	2	0	10	0	**1500**	2	0	10	0	**1500**	6	0	30	0	**4500**
11	Tehri Garhwal	3	0	15	0	**2250**	3	0	15	0	**2250**	2	0	10	0	**1500**	8	0	40	0	**6000**
12	U S Nagar	0	4	0	20	**2400**	0	4	0	20	**2400**	0	2	0	10	**1200**	0	10	0	50	**6000**
13	Uttarkashi	3	0	15	0	**2250**	3	0	15	0	**2250**	2	0	10	0	**1500**	8	0	40	0	**6000**
	TOTAL	**28**	**6**	**140**	**30**	**24600**	**24**	**6**	**120**	**30**	**21600**	**18**	**4**	**90**	**20**	**15900**	**70**	**16**	**350**	**80**	**62100**

H&D- Hilly & Difficult area; O- Others

Area proposed as per selection criteria of DoLR keeping in view regional balance

Table 8.2(b): Annual Plan /Cost Table for three years of XIth plan

Sl.No.	District	Watersheds Area Planned for treatment (ha)				Project Cost (Rs. Crores)			
		2009-10	2010-11	2011-12	3 yrs Total	2009-10	2010-11	2011-12	3 yrs Total
1	Almora	15000	10000	10000	35000	22.5	15	15	52.5
2	Bageshwar	15000	15000	10000	40000	22.5	22.5	15	60
3	Chamoli	10000	10000	5000	25000	15	15	7.5	37.5
4	Rudraprayag	10000	5000	5000	20000	15	7.5	7.5	30
5	Champawat	10000	5000	5000	20000	15	7.5	7.5	30
6	Dehradun(Hills)	10000	10000	5000	25000	15	15	7.5	37.5
7	Haridwar(Plain)	10000	10000	10000	30000	12	12	12	36
	Nainital(Hills)	15000	15000	10000	40000	22.5	22.5	15	60
9	Pauri Garhwal	15000	10000	10000	35000	22.5	15	15	52.5
10	Pithoragarh	10000	10000	10000	30000	15	15	15	45
11	Tehri Garhwal	15000	15000	10000	40000	22.5	22.5	15	60
12	U S Nagar(Plain)	20000	20000	10000	50000	24	24	12	60
13	Uttarkashi	15000	15000	10000	40000	22.5	22.5	15	60
	Total	**170000**	**150000**	**110000**	**430000**	**246**	**216**	**159**	**621**

Area proposed as per selection criteria of DoLR

Table 8.2(c): Component-wise breakup of the Extimated Budget for the First Five Years

Sl.no	District	Proposed		Budget Components (Rs.in Lakhs)										
		Area (000 ha)	Nos.	Admn. Cost	Monitoring	Evaluation	EPA	Inst. And Capacity Building	DPR Preparation	Watershed Development Works	Livelihood Activities	Prod. System and Micro Enterprise	Cosolidation Phase	Total
1	Almora	35	12	525	52.5	52.5	210	262.5	52.5	2625	525	682.5	262.5	5250
2	Bageshwar	40	11	600	60	60	240	300	60	3000	600	780	300	6000
3	Chamoli	25	4	375	37.5	37.5	150	187.5	37.5	1875	375	487.5	187.5	3750
4	Rudraprayag	20	7	300	30	30	120	150	30	1500	300	390	150	3000
5	Champawat	20	7	300	30	30	120	150	30	1500	300	390	150	3000
6	Dehradun	25	15	375	37.5	37.5	150	187.5	37.5	1875	375	487.5	187.5	3750
7	Haridwar	30	nd	360	36	36	144	180	36	1800	360	468	180	3600
8	Naintal	40	13	600	60	60	240	300	60	3000	600	780	300	6000
9	Pauri Garhwal	35	11	525	52.5	52.5	210	262.5	52.5	2625	525	682.5	262.5	5250
10	Pithoragarh	30	8	450	45	45	180	225	45	2250	450	585	225	4500
11	Tehri Garhwal	40	21	600	60	60	240	300	60	3000	600	780	300	6000
12	Udham Singh Nagar	50	3	600	60	60	240	300	60	3000	600	780	300	6000
13	Uttarkashi	40	17	600	60	60	240	300	60	3000	600	780	300	6000
	Total	**430**	**129**	**6210**	**621**	**621**	**2484**	**3105**	**621**	**31050**	**6210**	**8073**	**3105**	**62100**

EPA: Entry Point Activities
DPR: Detailed Project Report

Area proposed as per selection criteria of DoLR

Annexure Table 8.3: Details of Schemes to enable Convergence

Sl.no	District	Name of Schemes and Fund allocation									
		NREGS		BRGF	RKVY	NFSM	NHM	MoWR Schemes	NAP	Total	
		2008-09	2009-10 (Proposed)							2008-09	2009-10 (Proposed)
1	Almora	724.261	2848.225	-	-	-	-	-	-	724.261	2848.225
2	Bageshwar	727.384	1551.275	-	-	-	-	-	-	727.384	1551.275
3	Chamoli	2469.370	7164.775	-	-	-	-	-	-	2469.370	7164.775
4	Rudraprayag	380.693	576.975	-	-	-	-	-	-	380.693	576.975
5	Champawat	989.220	1535.800	-	-	-	-	-	-	989.220	1535.800
6	Dehradun	1578.730	1973.475	-	-	-	-	-	-	1578.730	1973.475
7	Haridwar	978.821	1842.250	-	-	-	-	-	-	978.821	1842.250
8	Naintal	374.661	609.318	-	-	-	-	-	-	374.661	609.318
9	Pauri Garhwal	1491.940	3510.925	-	-	-	-	-	-	1491.940	3510.925
10	Pithoragarh	1303.220	1857.125	-	-	-	-	-	-	1303.220	1857.125
11	Tehri Garhwal	4428.839	9317.575	-	-	-	-	-	-	4428.839	9317.575
12	U S Nagar	1126.200	2819.343	-	-	-	-	-	-	1126.200	2819.343
13	Uttarkashi	962.694	1714.250	-	-	-	-	-	-	962.694	1714.250
	Total	**17536.033**	**37321.311**	-	-	-	-	-	-	**17536.033**	**37321.311**

EPA: Entry Point Activities

DPR: Detailed Project Report

Source : Department of Rural Development, Uttarakhand

APPENDICES

APPENDIX - 1

Criteria for exclusion of sub-projects/activity
Screening Guidelines on Environment and Social safeguards

S. No.	Criteria
I	**Forests / biodiversity**
1	Activities likely to cause damage to wildlife, or likely to cause damage to a sanctuary by setting fire, injuring wildlife, or involving indiscriminate felling of trees or indiscriminate removal of plant, animal or mineral produce from a sanctuary
II	**Dams**
2	Activity that involves a dam (existing or new) of 10 metres high or more
III	**Farming System**
3	Agricultural activities that intend to use banned pesticides, agrochemicals in WHO classes IA, IB and II
4	Activities that involve manufacture or sale, stocking or exhibiting for sale or distribution of any insecticide, pesticide, medicine without a license
5	Activities that totally eliminate indigenous races of food crop
6	Activities that spread of Vector of diseases of livestock
IV	**Land**
7	Activities that can cause risk of floods and damage to downstream resources
8	No constructions related to common activities to be taken up on land owned by vulnerable groups.
9	Activity that have any adverse impact on the indigenous people/ vulnerable families in terms of displacement or their livelihoods being affected
10	Activity that introduce/promote child labour?
11	Activity that exclude the vulnerable from the benefits?
12	Activity that involve production, storage and consumption of tobacco, drugs, alcohol, etc.
13	Activity that cause damage to places of religious importance and historical monuments and cultural property.

APPENDIX - 2

Criteria for Limited ESA of Sub-Projects/Activity

S. No.	Criteria
1	Construction of water impounding structures/ earth work with a height of more than 5 metre and less than 10 metre.
2	Construction of roads, bridge, civil works etc. that may cause destabilization of lands.
3	Activity that limit the traditional/legal rights of indigenous people on common property resources.
4	Activity that involve on private land causes loss of livelihood.

APPENDIX - 3

ENVIRONMENTAL AND SOCIAL ASSESSMENT FOR WC AND GP

To be filled up by WC being facilitated by WDT for selecting sub-projects/activities.
Put X for negative impacts and √ for positive or no negative impacts.

Sl. No	Project activities	Possible environmental impacts																			Possible social impacts													Inter activity impact	Inter area impact	Mitigative measures*	Justification for decision
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	Z1	Z2	Z3	Z4	Z5				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
	Land																																			
	Arable land																																			
	Agriculture																																			
1	Cultivation of HYVs,																																			
	On-farm cultivation (cash crops / vege.)																																			
2	Spices & condiments																																			
3	Medicinal plants																																			
4	Organic farming																																			
5	Diversified agriculture																																			
6	Terrace repairs																																			
7	Vegetative field boundaries																																			
	Horticulture																																			
8	Horticultural crops-fruits, flowers, aromatic & medicinal plants																																			
9	Homesteads																																			
10	Essential oils - Geranium, Rose, Marigold, Lemon grass																																			
11	Orchard devel.																																			
12	Rejuvenation of old orchards																																			
	Non-Arable land																																			
13	***Forest***																																			

Sl. No	Project activities	Possible environmental impacts																		Possible social impacts												Inter activit	Inter area	Miti-gative	Justi-fication
14	Strengthening of Van Panchayat																																	
15	Afforestation																																	
16	Bamboo plantation																																	
17	Soil and water conservation works																																	
18	Assisted natural regeneration																																	
	Silvi-pasture																																	
19	Plantation of fodder trees/shrubs/grasses																																	
20	Fodder development																																	
21	Rotational grazing																																	
	Water Harvesting																																	
22	Maintenance of existing water source/structure																																	
23	Water harvesting																																	
	Livestock & animal husbandry																																	
24	Breed improvement																																	
25	Stall feeding																																	
26	Nutrition management																																	
27	Disease control & health, veterinary facilities																																	
28	Stray animal castration																																	
	Natural hazards mitigation																																	

Sl. No	Project activities	Possible environmental impacts																		Possible social impacts												Inter activit	Inter area	Miti-gative	Justi-fication
30	Small landslides control																																	
31	Drainage line treatment																																	
	Income generating activities																																	
32	NTFPs																																	
33	Seed production and nursery raising																																	
34	Crop processing and preservation																																	
35	Mushroom cultivation																																	
36	Bee keeping																																	
37	Knitting and weaving																																	
38	Fibre production																																	
	Infrastructure development																																	
39	Storage facilities																																	
40	Transport facilities & connectivity																																	
41	Market linkage																																	
42	Rural credit facilities																																	
Transhumant																																		
43	Temporary shelter																																	
44	Water facility																																	
45	Animal health care																																	
46	Fodder																																	
47.	Migratory path																																	

ID	Environment Impacts	ID	Social Impacts
A	Surface Water (Quality/Quantity)	P	Loss of Species of Medicinal Importance - ENV
B	Ground Water (Quality/Quantity)	Q	Generation of Solid Waste/ Wastewater - ENV
C	Siltation of Water Bodies	R	Require Chemical Fertilizers/Pesticides - ENV
D	Agricultural Productivity (Grain/Fodder)	S	Loss of (danger of extinction) to the Local Gene Pool (Plants/Crops) - ENV
E	Soil Quality	T	Workload (particularly on women)
F	Soil Erosion/Gully Formation	U	Loss of Nutritious Food
G	Soil Moisture	V	Dislocation of People
H	Instability of Hill Slopes/Landslides		Loss of livelihood
		W	Loss to SC/ST and Other Marginalized Groups, transhumants.
I	Air / Noise Pollution		Benefits to the vulnerable
J	Pressure on Surrounding Trees and Vegetation		Legal rights of the people protected
K	Forest Fire	X	Use of Child Labour
			Benefits to the nomads
L	Loss of Biodiversity (Flora/Fauna)	Y	Increase in Insect Pest and Wildlife Attacks
M	Loss of Aquatic Life	Z	Unemployment to Local Labour
N	Invasion of Exotic Species	Z1	Damage of Places of Religious/Historical Importance/Monuments
O	Loss of Rare, Threatened & Endangered Species	Z2	Increased Social Conflicts (benefit sharing)
		Z3	Adverse Effect on Human Health
		Z4	Adverse Effect on Cultural/Ethical/Aesthetic Values

APPENDIX -4

Format for
Gram panchayat watershed development plan

1. Name of Gram Panchayat (GP) :
2. Area of GP :
3. Population of GP :
4. Name of Revenue Villages (RVs) in GP :
5. Name of MWS :
6. Name of Development Block :
7. Name of District :
8. Demography of GP :

Name of RV	**No. of Households**			**Population**			
	Total	**SC**	**ST**	**Total**		**Out of which SC/ST**	
				Male	**Female**	**Male**	**Female**
Total							

9. Livestock Population

Name of RV	**Cow**		**Buffalo**		**Goat & Sheep**	**Mule & Horses**	**Poultry**	**Others**
	Male	**Female**	**Male**	**Female**				
total								

10. Landuse (Revenue Villagewise)

Name of RV	**Total Geographic Area in ha**	**Agriculture land in ha**		**Pasture and Barren Land in ha**	**Common land under forest in ha**	**River bed in ha**	**Culturable Waste land in ha**
		Irrigated	**Unirrigated**				
Total							

11. Available Water Resources in the Revenue Village

Name of RV	**Type of Water Resource and the availability of water from water source in months**						
	Spring	Naula	**Gul**		Well	Handpump	Stand Post
			Kaccha	Pucca			

12. Availability of Fuel and Fodder

12.1 Sources of Fuel - Sources Period *

Forest	-
LPG	-
Biogas	-
Kerosene Stove	-
Solar Energy	-
Others	-

* Period Fuel available for - 3 months/6 months/9 months/whole year

12.2 Sources of Fodder - Sources Period *

Agriculture land	-
Pasture land	-
Forests	-

* Period Fuel available for - 3 months/6 months/9 months/whole year

13. Road Accessibility and Market availability : Name of market and the distance in Km. – Kuccha Road, Metalled Road, Bridle and Mule Track etc.

14. Revenue Villagewise Socio-economic Status of Households

Income Groups	No. of Households
1. Poor	-
2. Medium	-
3. Upper	-

(Through PRA Exercise)

15. Need Assessment through PRA Plans
16. Identified activities for Watershed Development
17. Vulnerable Group Plan :
18. Phasing of Activities (Physical and Financial)

Activity	Unit Cost	I yr		II yr		III yr		IV yr		V yr		Total	
		Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin

19. MoU for Cost Sharing and Maintenance of Assets should be enclosed in GPWDP

APPENDIX -5

FORMAT FOR PREPARATION OF ESTIMATES BY WC FOR EACH ACTIVITY

Gram Panchayat_____
Estimate for Activities

Activity Name : …….

Price of Activity : ……..

Units/ Physical Measurement: ……..

S.No	Sub Activity Name	Units of Measurement	Units	Material Costs				Labour					Total LabourCost (Rs.)	Total Cost	Unit Cost
				Type of Material	Quantity required (Units)	Unit cost (Rs.)	Total Material cost (Rs.)	Type of Labour work	Estimated man days for stipulated work		Wage rate as per Govt. norms				
									Skilled labour (No.)	Unskilled/ semi skilled labour(No.)	Skilled (Rs.)	Unskilled/ semi skilled (Rs.)			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15=8+14	16=15/4
													TOTAL		

Less Beneficiary Share
Project Share:

Prepared By:

Appendix -6

FORMAT FOR TECHNICAL SANCTION FOR EACH ACTIVITY

Gram Panchayat_____

Technical Sanction

Activity Name:_____ **Sanction No. _____**

Units / Physical Measurement _____ **Total Cost as per estimate: _____**

Place of Work: _____ **Beneficiary Share: _____**

Date of Start: _____ **Project Share: _____**

Date of Completion: _____

Summary of Estimated Expenditure, Sub-activity wise

S.No	Sub Activity Name	Unit of Measurement	Units	Rate per Unit	Total Cost
Total					

Less: Beneficiary contribution: _____

Project Share: _____

Sanctioning Authority
Name:
Signature:
Date:

Appendix Table 7-(i)

MWS of Almora district with its weightage criteria

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Contiguty	Degraded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil
1	Almora	Kuchgad	Garsari	15	10	15	5	10	15	0	70	14
2	Almora	Kuchgad	Gaunchhil Gadhera	15	10	10	5	10	15	0	65	1
3	Almora	Badangarh Nayar	Khatron Nala	15	10	10	3	10	15	0	63	45
4	Almora	Bino Nadi	Gaya Gadhera	15	10	10	3	10	15	0	63	10
5	Almora	Kuchgad	Kotila	15	10	15	5	3	15	0	63	10
6	Almora	Dhikala	Jakh Gadhera	15	10	15	3	3	15	0	61	14
7	Almora	Kuchgad	Korar	15	10	15	3	3	15	0	61	17
8	Almora	Gagas	Jam Gadhera	15	10	10	5	5	15	0	60	56
9	Almora	Gagas	Mawar	15	10	10	5	5	15	0	60	7
10	Almora	Jaigan Nadi	Kirori Ganga	15	10	10	5	5	15	0	60	32
11	Almora	Kuchgad	Karkhet	15	10	10	5	5	15	0	60	9
12	Almora	Kuchgad	Dungari	15	10	10	5	5	15	0	60	10
13	Almora	Gagas	Makron	15	10	10	5	3	15	0	58	9
14	Almora	Uttari Koshi	Khulgad	15	10	10	5	3	15	0	58	22
15	Almora	Gagas	Mallagad	15	10	10	5	3	15	0	58	28
16	Almora	Kuchgad	Bajina	15	10	10	5	3	15	0	58	38
17	Almora	Badangarh Nayar	Nayar Nadi	15	10	10	3	5	15	0	58	44
18	Almora	Panar	Sidiyagad	15	10	10	5	3	15	0	58	44
19	Almora	Maigar Khansar	Adigram	15	10	10	3	5	15	0	58	17
20	Almora	Jaigan Nadi	Galli Gad	15	10	10	5	3	15	0	58	17
21	Almora	Panar	Kotgad	15	10	10	5	3	15	0	58	7
22	Almora	Jaigan Nadi	Kunkhet	15	10	10	5	3	15	0	58	17
23	Almora	Purvi Nayar	Bungdhar Talla	15	10	10	3	5	15	0	58	13
24	Almora	Dhikala	Gabhini Gadhera	15	10	10	5	3	15	0	58	8
25	Almora	Panar	Khanigad	15	10	10	5	3	15	0	58	7
26	Almora	Panar	Kutargad	15	10	10	3	5	15	0	58	30
27	Almora	Bino Nadi	Tamadhaun	15	10	10	3	5	15	0	58	15
28	Almora	Jaigan Nadi	Ghuniyoligad	15	10	10	5	3	15	0	58	8
29	Almora	Uttari Koshi	Kuraligad	15	10	10	5	3	15	0	58	6
30	Almora	Jaigan Nadi	Begarh	15	10	10	3	5	15	0	58	8
31	Almora	Gagas	Kaligad	15	10	10	3	3	15	0	56	12
32	Almora	Jaigan Nadi	Naini	15	10	10	3	3	15	0	56	16
33	Almora	Maigar Khansar	Mansi	15	10	10	3	3	15	0	56	28
34	Almora	Badangarh Nayar	Kalsori Gadhera	15	10	10	3	3	15	0	56	53
35	Almora	Badangarh Nayar	Badangarh Nadi	15	10	10	3	3	15	0	56	93
36	Almora	Maigar Khansar	Khachyar Gadhera	15	10	10	3	3	15	0	56	14
37	Almora	Bino Nadi	Chauna	15	10	10	3	3	15	0	56	20
38	Almora	Jaigan Nadi	Manogad	15	10	10	3	3	15	0	56	8
39	Almora	Jaigan Nadi	Phalalgad	15	10	10	3	3	15	0	56	7
40	Almora	Kuchgad	Panyali Gad	15	10	10	3	10	5	0	53	2
41	Almora	Uttari Koshi	Baldi Gad	5	10	10	5	5	15	0	50	8
42	Almora	Maigar Khansar	Tyarka Gadhera	15	10	10	5	3	5	0	48	25
43	Almora	Gagas	Gagas Nadi	5	10	10	5	5	10	0	45	24
44	Almora	Maigar Khansar	Trag Gadhera	5	10	10	3	3	5	0	36	20

Appendix Table 7-(ii)

MWS of Bageshwar district with its weightage criteria

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil
1	Bageshwar	Jaigan Nadi	Bhatkhola	15	10	10	10	3	15	0	63	51
2	Bageshwar	Godigad	Dalaurgad	15	10	10	5	5	15	0	60	30
3	Bageshwar	Gomti	Phatagali	15	10	10	5	5	15	0	60	3
4	Bageshwar	Sarju	Ratdhar	15	10	10	5	3	15	0	58	22
5	Bageshwar	Gomti	Bageswar	15	10	10	5	3	15	0	58	27
6	Bageshwar	Sarju	Saran Gadhera	15	10	10	3	5	15	0	58	4
7	Bageshwar	Gomti	Kalirao	15	10	10	5	3	15	0	58	12
8	Bageshwar	Pinder Upper	Ghatiyagad	15	10	10	5	3	15	0	58	2
9	Bageshwar	Pinder Upper	Talkori	15	10	10	3	5	15	0	58	3
10	Bageshwar	Pinder Upper	Bauragad	15	10	10	3	5	15	0	58	3
11	Bageshwar	Pinder Upper	Kaphnigad	15	10	5	10	3	15	0	58	2
12	Bageshwar	Ramganga Purvi	Chanoli	15	10	10	3	3	15	0	56	2
13	Bageshwar	Sarju	Ravati Ganga	15	10	10	3	3	15	0	56	5
14	Bageshwar	Ramganga Purvi	Leti Rauli	15	10	10	3	3	15	0	56	5
15	Bageshwar	Sarju	GasonGad	15	10	10	3	3	15	0	56	3
16	Bageshwar	Ramganga Purvi	Lamagarh	15	10	10	3	3	15	0	56	5
17	Bageshwar	Godigad	Badhargad	15	10	10	5	5	10	0	55	69
18	Bageshwar	Godigad	Kulurgad	15	10	10	5	10	5	0	55	33
19	Bageshwar	Gomti	Chhira Raula	15	10	10	5	5	10	0	55	10
20	Bageshwar	Gomti	Dhatoli Nala	15	10	10	5	3	10	0	53	25
21	Bageshwar	Godigad	Kararіyagaon	15	10	10	5	3	10	0	53	33
22	Bageshwar	Sarju	Bamsera	15	10	10	5	3	10	0	53	3
23	Bageshwar	Sarju	Loharkhet	15	5	10	5	3	15	0	53	22
24	Bageshwar	Golasukhi	Katna Nadi	15	10	5	3	3	15	0	51	73
25	Bageshwar	Pinder Upper	Surag	15	5	10	3	3	15	0	51	1
26	Bageshwar	Pinder Upper	Sunderdhonga	15	10	5	3	3	15	0	51	1
27	Bageshwar	Sarju	Joshigaon	15	10	10	5	3	5	0	48	10
28	Bageshwar	Sarju	Swajgad	15	10	10	5	3	5	0	48	7
29	Bageshwar	Sarju	Andherigad	15	10	10	5	3	5	0	48	11
30	Bageshwar	Sarju	Dharamghar	15	10	10	3	3	5	0	46	15
31	Bageshwar	Gomti	Garurganga	5	10	10	3	3	10	0	41	34
32	Bageshwar	Golasukhi	Sukhi Nadi	15	10	5	3	3	5	0	41	36

Appendix Table 7-(iii)

MWS of Chamoli district with its weightage criteria

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil
1	Chamoli	Nagoigad	Balasuit	15	10	10	5	5	15	0	60	21
2	Chamoli	Budhi Ganga	Taraktal	5	10	10	5	10	15	0	55	8
3	Chamoli	Nandakini	Bhoriyagadhera	5	10	10	3	10	15	0	53	1
4	Chamoli	Sarswati	Neelganga	5	10	10	10	3	15	0	53	2
5	Chamoli	Nandakini	Mokhgad	5	10	10	5	5	15	0	50	8
6	Chamoli	Lower Pinder Right	Chorgad	5	10	10	5	5	15	0	50	2
7	Chamoli	Lower Pinder Right	Nakot	5	10	10	3	5	15	0	48	17
8	Chamoli	Atagad	Karanprayag	5	10	10	3	5	15	0	48	17
9	Chamoli	Nandakini	Molagad	5	10	10	5	3	15	0	48	8
10	Chamoli	Sarswati	Khirganga	5	10	5	10	3	15	0	48	1
11	Chamoli	Nandakini	Gulari	5	10	10	3	3	15	0	46	4
12	Chamoli	Maigar Khansar	Syunigad	5	10	10	3	3	15	0	46	7
13	Chamoli	Kail Ganga	Ghes	5	10	10	3	3	15	0	46	1
14	Chamoli	Plus	Sarmola	5	10	10	3	5	10	0	43	19

Appendix Table 7-(iv)

MWS of Rudraprayag district with its weightage criteria

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil	MWS Area (ha.)	Cumi. Area
1	Rudraprayag	Mandakini	Mandani Ganga	15	10	10	3	10	15	0	63	6	11150	11150
2	Rudraprayag	Plus	Chamak	15	10	10	5	5	15	0	60	23	1719	12869
3	Rudraprayag	Madhya Maheshwar	Setgad	15	5	10	5	10	15	0	60	2	2213	15082
4	Rudraprayag	Badiyargad	Utyasu	15	10	10	3	5	15	0	58	3	1031	16113
5	Rudraprayag	Plus	Khurar	15	10	10	3	3	15	0	56	8	744	16857
6	Rudraprayag	Augustmuni	Rampur	15	10	10	3	3	15	0	56	16	2125	18982
7	Rudraprayag	Madhya Maheshwar	Kyargad	15	10	10	3	3	15	0	56	14	5326	24308
8	Rudraprayag	Madhya Maheshwar	Anphalgad	15	10	10	3	3	15	0	56	9	3696	28004
9	Rudraprayag	Mandakini	Kaliganga	15	10	10	3	3	15	0	56	6	6500	34504
10	Rudraprayag	Badiyargad	Bhardargad	15	5	10	3	5	15	0	53	17	3472	37976
11	Rudraprayag	Rudraprayag	Ratura	15	10	15	3	3	5	0	51	28	3288	41264
12	Rudraprayag	Lastargad	Kwila(plus)	15	10	10	3	3	10	0	51	19	2500	43764
13	Rudraprayag	Plus	Dungri	15	10	10	3	3	10	0	51	17	1244	45008
14	Rudraprayag	Lastargad	Barsari	15	10	10	3	3	10	0	51	19	2229	47237
15	Rudraprayag	Badiyargad	Sera	15	5	10	3	5	5	0	43	25	7225	54462
													54462	

Appendix Table 7-(v)

MWS of Champawat district with its weightage criteria

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil
1	Champawat	Panar	Serigad	15	10	10	3	10	15	0	63	12
2	Champawat	Lohawati	Dara	15	10	10	3	10	15	0	63	7
3	Champawat	Panar	Kotkigad	15	10	15	5	3	15	0	63	3
4	Champawat	Lohawati	Lohawati Nadi	15	10	10	3	5	15	0	58	14
5	Champawat	Ladhiya	Sungaon	15	10	5	3	10	15	0	58	14
6	Champawat	Ladhiya	Kuirala River	15	10	5	3	10	15	0	58	9
7	Champawat	Lohawati	Champawat	15	10	10	3	3	15	0	56	25
8	Champawat	Panar	Siprahgad	15	10	10	3	3	15	0	56	6
9	Champawat	Lohawati	Daura	15	10	10	3	3	15	0	56	4
10	Champawat	Ladhiya	Dhamisaun	15	10	5	5	5	15	0	55	18
11	Champawat	Cheera	Lupra	5	10	15	3	5	15	0	53	4
12	Champawat	Ladhiya	Nadkuli	15	10	5	3	5	15	0	53	20
13	Champawat	Ladhiya	Amkhola	15	10	5	3	3	15	0	51	11
14	Champawat	Purnagiri	Purnagiri	10	10	5	5	5	15	0	50	34

Appendix Table 7-(vi)

MWS of Dehradun district with its weightage criteria

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil	MWS Area (ha.)	Cumi. Area
1	Dehradun	Amtiargad	Gharatgad	15	10	15	10	10	15	0	75	6	1607	1607
2	Dehradun	Amtiargad	Gariyargad	15	10	15	10	5	15	0	70	8	1587	3194
3	Dehradun	Amtiargad	Aragad	15	10	15	10	5	15	0	70	8	2123	5317
4	Dehradun	Benalgad	Abankhand	15	10	15	10	5	15	0	70	4	1657	6974
5	Dehradun	Amtiargad	Bagnigad	15	5	15	10	10	15	0	70	2	834	7808
6	Dehradun	Rikhnargad	Kota	15	10	15	10	10	10	0	70	3	2029	9837
7	Dehradun	Tons ABCD	Sitkigad	15	10	15	10	3	15	0	68	1	767	10604
8	Dehradun	Khutnugad	Saiya	15	10	15	10	3	15	0	68	4	1734	12338
9	Dehradun	Tons ABCD	Anu	15	10	15	10	3	15	0	68	1	985	13323
10	Dehradun	Khutnugad	Kotuwagad	15	10	15	10	10	5	0	65	6	2368	15691
11	Dehradun	Amlawa Seligad	Kata Pathar*	15	10	10	5	10	15	0	65	6	2007	17698
12	Dehradun	Amlawa Seligad	Kalsi	15	10	15	10	3	10	0	63	15	2439	20137
13	Dehradun	Tons ABCD	Sainj	15	10	10	10	3	15	0	63	5	1395	21532
14	Dehradun	Tons Left	Sangargad	15	10	10	10	3	15	0	63	2	900	22432
15	Dehradun	Tons ABCD	Chandinigad	15	10	10	10	3	15	0	63	6	3531	25963
16	Dehradun	Benalgad	Mashak	15	10	10	10	3	15	0	63	2	1988	27951
17	Dehradun	Tons Left	Chattagad	15	10	10	10	3	15	0	63	2	2084	30035
18	Dehradun	Tons Left	Dharmigad	15	10	10	10	3	15	0	63	4	4094	34129
19	Dehradun	Benalgad	Silli	15	10	15	10	3	10	0	63	2	3073	37202
20	Dehradun	Daragad	Jakheragad	15	10	10	10	3	15	0	63	2	5751	42953
21	Dehradun	Benalgad	Ghtai	15	10	10	10	3	15	0	63	4	2978	45931
22	Dehradun	Tons ABCD	Atal	15	10	15	10	5	5	0	60	3	1820	47751
23	Dehradun	Amtiargad	Jamrad	15	10	15	10	3	5	0	58	3	2227	49978
24	Dehradun	Amlawa Seligad	Kata Pathar	15	10	10	10	3	5	0	53	6	3094	53072
													53072	

Appendix Table 7-(vii)

MWS of Nainital district with its weightage criteria

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil	MWS Area (ha.)	Cumi. Area
1	Nanital	Ramgad	Sirsa	15	10	15	10	5	10	0	65	19	1595	1595
2	Nanital	Lebar	Kumia Nadi	10	5	15	10	10	15	0	65	2	2825	4420
3	Nanital	Suyal	Kwarab	15	10	15	5	5	15	0	65	6	1549	5969
4	Nanital	Ramgad	Bhandarpani Sot	15	10	10	5	10	15	0	65	3	3105	9074
5	Nanital	Suyal	Sanchutiya	15	10	10	10	3	15	0	63	9	2506	11580
6	Nanital	Ramgad	Manarsa	15	10	10	5	3	15	0	58	23	3387	14967
7	Nanital	Ramgad	Bhowali Nala	15	10	10	5	3	15	0	58	12	3537	18504
8	Nanital	Kalsa Gola	Kanyali	15	10	15	3	5	10	0	58	7	2856	21360
9	Nanital	Ramgad	Dhona	15	10	10	5	3	15	0	58	11	4121	25481
10	Nanital	Kalsa Gola	Tandigad	15	10	10	5	3	15	0	58	21	9106	34587
11	Nanital	Ramgad	Khaula Nadi	15	10	10	5	3	15	0	58	1	2152	36739
12	Nanital	Ramgad	Kataliya Sot	15	5	10	3	10	15	0	58	1	2268	39007
13	Nanital	Ramgad	Basgaon	15	10	15	3	3	10	0	56	14	1006	40013
14	Nanital	Kuchgad	Dabarbari	15	10	15	5	3	5	0	53	11	1800	41813
15	Nanital	Dhara Phika	Phika Nadi	15	5	10	3	3	15	0	51	71	22498	64311
16	Nanital	Ramgad	Ramgad	15	10	10	3	3	10	0	51	23	7368	71679
17	Nanital	Kuchgad	Amdanda	15	5	5	5	3	15	0	48	47	19267	90946
18	Nanital	Lebar	Nanaksagar	10	5	10	5	3	15	0	48	5	6625	97571
19	Nanital	Ramgad	Kanuchiyasot	15	10	10	5	3	5	0	48	5	2993	100564
20	Nanital	Lebar	Deoha Nadi	10	10	5	5	3	15	0	48	12	17750	118314
21	Nanital	Bhakra	Bhakra Nadi	15	10	10	3	3	5	0	46	68	18299	136613
22	Nanital	Dhela	Rattapani Rao	15	5	10	5	3	5	0	43	86	22231	158844
23	Nanital	Dhela	Dhela	15	5	5	5	3	10	0	43	32	23162	182006
24	Nanital	Ramgad	Babliya Sot	15	10	5	5	3	5	0	43	18	7275	189281
25	Nanital	Baur	Kaladhungi	15	10	5	5	3	5	0	43	91	41653	230934
													230934	

Appendix Table 7-(viii)

MWS of Pauri Garhwal district with its weightage criteria

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ ST	SM& Mg Farmer	Assured Irrgatio	Actual Wages	Total Weight	No. of Vil	M_PRIOR	AG_TOTAL	MWS Area (ha.)	SumOfNO_HH	SumOfTOT_P	SumOfP_SC	SumOfP_ST	SumOfTOT_IRR	SumOfUN_IRR	SumOfMGWK_F	Pop Dens	Cumi. Area
1	Pauri	Purvi Nayar	Pasolgad	15	10	10	5	10	15	0	65	50	14	2195	4781	1144	5428	1344	0	72.14	990.7	956	1.14	4781
2	Pauri	Paschimi Nayar	Bhawani	15	10	10	3	10	15	0	63	25	15	984	2025	1032	4630	849	0	13.994	679.977	1111	2.29	6806
3	Pauri	Paschimi Nayar	Baligad	15	10	10	3	10	15	0	63	25	18	1557	4230	1292	6548	1281	0	51.59	764.38	1077	1.55	11036
4	Pauri	Paschimi Nayar	Ghatgad	15	10	15	5	3	15	0	63	49	21	1596	3853	1265	5592	1245	0	67.7	1473.81	528	1.45	14889
5	Pauri	Paschimi Nayar	Syotigad	15	10	10	3	10	15	0	63	24	11	826	4150	1095	5709	758	0	29.81	480.32	999	1.38	19039
6	Pauri	Randigad	Saldanggad	15	10	15	5	3	15	0	63	58	23	1293	4531	1421	5973	1714	0	25.23	1094.17	233	1.32	23570
7	Pauri	Nayar Left	Chandol	15	10	15	3	5	15	0	63	33	25	1399	2738	831	3594	624	0	75.02	675.228	594	1.31	26308
8	Pauri	Purvi Nayar	Chanchariya Gad	15	10	10	3	10	15	0	63	15	16	719	2063	411	2096	269	0	3.001	391.42	356	1.02	28371
9	Pauri	Bino Nadi	Masangari Nadi	15	10	10	3	10	15	0	63	25	15	1744	5225	973	5194	679	0	20.65	859.55	814	0.99	33596
10	Pauri	Srinagar	Nadalgad	15	10	15	5	3	15	0	63	33	19	1440	3946	787	3529	726	0	36.49	458.3	71	0.89	37542
11	Pauri	Purvi Nayar	Byasigad	15	10	15	3	3	15	0	61	7	21	718	2206	890	4494	683	3	23.87	373.29	253	2.04	39748
12	Pauri	Paschimi Nayar	Maithana	15	10	15	3	3	15	0	61	13	19	758	2358	671	3493	499	3	75.383	264.683	135	1.48	42106
13	Pauri	Purvi Nayar	Jiwai	15	10	15	3	3	15	0	61	10	21	445	1471	402	1750	218	0	0.9	327.1	96	1.19	43577
14	Pauri	Randigad	Kotagad	15	10	15	3	3	15	0	61	25	21	1161	2664	579	2246	437	1	42.85	263.42	124	0.84	46241
15	Pauri	Paschimi Nayar	Tiloli	15	10	15	3	3	15	0	61	7	20	524	1616	282	1303	139	0	15.6	216.33	25	0.81	47857
16	Pauri	Machlad	Silogi	15	10	10	5	5	15	0	60	68	14	2413	4400	2020	8906	1846	0	17.81	1615.44	1122	2.02	52257
17	Pauri	Nayar Right	Kangad	15	10	10	5	5	15	0	60	77	16	3630	6176	2037	8777	2672	0	123.4	2406.53	1474	1.42	58433
18	Pauri	Nayar Right	Thangad	15	10	10	5	5	15	0	60	48	16	2083	4175	1259	5299	1623	3	33.825	1528.75	686	1.27	62608
19	Pauri	Srinagar	Nakotgad	15	10	10	5	3	15	0	58	59	18	1531	2737	1633	7163	1911	0	11.17	1705.84	631	2.62	65345
20	Pauri	Paschimi Nayar	Patisain	15	10	10	3	5	15	0	58	53	17	1826	2544	1441	6125	1138	0	36.46	1228.58	1149	2.41	67889
21	Pauri	Paschimi Nayar	Irgad	15	10	10	5	3	15	0	58	80	14	3447	6164	3382	14786	3013	3	71.44	2105.63	952	2.40	74053
22	Pauri	Paschimi Nayar	Khargad	15	10	10	5	3	15	0	58	76	16	2906	5271	2593	10745	2935	3	42.76	2207.38	785	2.04	79324
23	Pauri	Hiyunl_Pauri	Sar	15	10	10	3	5	15	0	58	35	13	1824	2567	1153	4939	757	0	80.35	1249.93	763	1.92	81891
24	Pauri	Paschimi Nayar	Sirgad	15	10	10	3	5	15	0	58	73	16	2539	4849	1973	8776	1548	0	217.4	1406.61	1337	1.81	86740
25	Pauri	Paschimi Nayar	Bachheli	15	10	10	3	5	15	0	58	46	17	2027	3071	1204	5190	883	0	80.375	1515.42	899	1.69	89811
26	Pauri	Paschimi Nayar	Tarpalisain	15	10	10	3	5	15	0	58	20	18	1623	4500	1372	7525	878	0	24.639	847.36	705	1.67	94311
27	Pauri	Srinagar	Dewanigad	15	10	10	5	3	15	0	58	50	17	1462	3832	1482	6088	1236	0	11.865	1256.39	205	1.59	98143
28	Pauri	Randigad	Nalagad	15	10	10	5	3	15	0	58	37	14	1503	4550	1290	5532	1156	0	29.641	1006.7	499	1.22	102693
29	Pauri	Bino Nadi	Binonadi	15	10	10	3	5	15	0	58	38	11	2075	6250	1115	6351	813	0	52.971	649.691	621	1.02	108943

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgatio	Actual Wages	Total Weight	No. of Vil	M_PRIOR	AG_TOTAL	MWS Area (ha.)	SumOfNO_HH	SumOfTOT_P	SumOfP_SC	SumOfP_ST	SumOfTOT_IRR	SumOfUN_IRR	SumOfMGWK_F	Pop Dens	Cumi. Area
30	Pauri	Randigad	Jwaragad	15	10	10	5	3	15	0	58	34	14	1552	2875	707	2891	678	0	4.12	744.36	109	1.01	111818
31	Pauri	Hiyunl_Pauri	Chopra	15	10	10	3	5	15	0	58	12	11	1115	1271	222	1025	52	0	6.55	148.96	128	0.81	113089
32	Pauri	Kandi	Rudragad	15	10	10	3	5	15	0	58	7	10	906	1762	243	1004	38	1	5.2	248.71	185	0.57	114851
33	Pauri	Purvi Nayar	Udiyar Gad	15	10	10	3	5	15	0	58	5	10	592	3224	229	1094	195	0	4.934	147.89	151	0.34	118075
34	Pauri	Purvi Nayar	Gwarigad	15	10	10	3	5	15	0	58	5	14	303	3225	240	1084	50	0	5.17	325.87	127	0.34	121300
35	Pauri	Paschimi Nayar	Dhuijuli	15	10	10	3	3	15	0	56	13	18	732	1711	687	3654	723	0	24.62	246.384	169	2.14	123011
36	Pauri	Machlad	Bhaligaon	15	10	10	3	3	15	0	56	20	11	438	1250	614	2641	415	0	5.02	422.53	270	2.11	124261
37	Pauri	Paschimi Nayar	Kutti	15	10	10	3	3	15	0	56	34	11	1005	3819	1766	7847	1497	0	32.725	674.88	461	2.05	128080
38	Pauri	Paschimi Nayar	Choya	15	10	10	3	3	15	0	56	29	12	1239	3119	1350	6198	958	0	24.293	963.2	529	1.99	131199
39	Pauri	Purvi Nayar	Gairigad	15	10	10	3	3	15	0	56	37	17	1477	2700	1120	5354	593	0	55.51	813.5	334	1.98	133899
40	Pauri	Machlad	Kandali Nadi	15	10	10	3	3	15	0	56	41	13	1597	3900	1480	6518	1301	0	17.47	1084.09	482	1.67	137799
41	Pauri	Srinagar	Devalgad	15	10	10	3	3	15	0	56	31	16	1556	2612	921	4011	632	0	29.36	601.22	416	1.54	140411
42	Pauri	Machlad	Chargad	15	10	10	3	3	15	0	56	31	12	1987	6600	2190	9918	1284	0	0	1352.65	927	1.50	147011
43	Pauri	Paschimi Nayar	Talgad	15	10	10	3	3	15	0	56	14	12	645	2188	716	3246	590	0	17.23	345.68	299	1.48	149199
44	Pauri	Paschimi Nayar	Chakisain	15	10	10	3	3	15	0	56	17	18	896	3050	862	4348	607	0	22.3	442.71	110	1.43	152249
45	Pauri	Paschimi Nayar	Sidoli	15	10	10	3	3	15	0	56	14	14	852	3119	957	4176	313	0	4.17	379.37	60	1.34	155368
46	Pauri	Purvi Nayar	Chorkanda	15	10	10	3	3	15	0	56	18	18	1357	3487	993	4476	720	0	27.22	1048.27	295	1.28	158855
47	Pauri	Purvi Nayar	Thalsaingad	15	10	10	3	3	15	0	56	14	16	1238	3937	964	4979	734	0	19.92	700.91	359	1.26	162792
48	Pauri	Srinagar	Gadurgad	15	10	10	3	3	15	0	56	33	17	1100	3842	1068	4649	867	0	58.41	710.67	386	1.21	166634
49	Pauri	Purvi Nayar	Rasiya gad	15	10	10	3	3	15	0	56	14	12	835	2981	690	3437	425	0	12.652	354.337	158	1.15	169615
50	Pauri	Srinagar	Chilgarh	15	10	10	3	3	15	0	56	30	15	1375	2541	694	2921	578	1	9.791	535.427	115	1.15	172156
51	Pauri	Hiyunl_Pauri	Amsain	15	10	10	3	3	15	0	56	10	10	461	2385	532	2456	249	0	19.73	542.84	126	1.03	174541
52	Pauri	Paschimi Nayar	Kaligad	15	10	10	3	3	15	0	56	13	14	663	3844	711	3323	511	0	12.204	336.87	247	0.86	178385
53	Pauri	Purvi Nayar	Khandgaon	15	10	10	3	3	15	0	56	15	11	1140	4237	641	3490	444	0	27.34	638.17	236	0.82	182622
54	Pauri	Bino Nadi	Basolagad	15	10	10	3	3	15	0	56	22	13	2469	5119	566	3346	350	0	4.1	751.39	249	0.65	187741
55	Pauri	Purvi Nayar	Kalagal	15	10	10	3	3	15	0	56	20	13	1320	5281	720	3248	604	1	0.121	907.485	179	0.62	193022
56	Pauri	Srinagar	Rudraprayag	15	10	10	3	3	15	0	56	8	16	454	4344	412	2048	114	1	7	221	160	0.47	197366
57	Pauri	Srinagar	Bargad	15	10	10	3	3	15	0	56	5	12	247	1853	161	774	49	0	0	86.6	20	0.42	199219
58	Pauri	Srinagar	Bachangad	15	10	10	3	3	15	0	56	7	13	2200	5895	335	1633	181	0	2	256.67	116	0.28	205114
59	Pauri	Paschimi Nayar	Khand	15	10	10	3	3	15	0	56	5	9	316	5025	256	1273	234	0	7.5	154.74	87	0.25	210139
60	Pauri	Purvi Nayar	Panchard	15	10	10	3	5	10	0	53	7	16	581	2650	477	2264	372	0	76.9	244.45	364	0.85	212789

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ ST	SM& Mg Farmer	Assured Irrgatio	Actual Wages	Total Weight	No. of Vil	M_PRIOR	AG_TOTAL	MWS Area (ha.)	SumOfNO_HH	SumOfTOT_P	SumOfP_SC	SumOfP_ ST	SumOfTOT_IRR	SumOfUN_IRR	SumOfMGWK_F	Pop Dens	Cumi. Area
61	Pauri	Hiyunl_Pauri	Maungad	15	10	5	5	3	15	0	53	4	8	609	1269	142	687	214	0	16.506	122.85	45	0.54	214058
62	Pauri	Srinagar	Srinagar	15	10	10	3	3	10	0	51	67	13	1180	2220	2491	10653	2099	2	207.11	1348.65	785	4.80	216278
63	Pauri	Purvi Nayar	Bhakhand	15	10	15	3	3	5	0	51	23	19	976	1650	968	4342	734	0	254.13	810.83	387	2.63	217928
64	Pauri	Paschimi Nayar	Pingad	15	10	10	3	3	10	0	51	25	16	854	3500	1038	4513	759	0	143.41	631.619	453	1.29	221428
65	Pauri	Tal Nadi	Bidasni Nadi	15	10	5	3	3	15	0	51	28	8	2386	5312	916	4225	589	0	205.24	1286.48	405	0.80	226740
66	Pauri	Hiyunl_Pauri	Bhaggadhera	15	10	5	3	3	15	0	51	6	8	548	950	117	553	67	0	1.79	216.32	45	0.58	227690
67	Pauri	Hiyunl_Pauri	Jogyana	15	10	5	3	3	15	0	51	7	7	352	2460	233	1015	126	0	27.36	107.99	2	0.41	230150
68	Pauri	Hiyunl_Pauri	Toli	15	10	10	3	5	5	0	48	10	10	499	1270	446	2330	326	0	103.31	206.14	287	1.83	231420
69	Pauri	Srinagar	Gostugad	15	10	10	3	5	5	0	48	30	12	832	2704	559	2526	455	0	217.7	453.889	348	0.93	234124
70	Pauri	Purvi Nayar	Machhigad	15	10	10	3	3	5	0	46	38	14	1504	3675	1524	6675	985	16	312.26	986.84	407	1.82	237799
71	Pauri	Mandal Nadi	Katora Raula	5	10	10	3	3	10	0	41	42	11	1807	5988	1041	5367	877	0	290.73	599.298	492	0.90	243787
															2E+05									

Appendix Table 7-(ix)

MWS of Pithoragarh district with its weightage criteria

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil	MWS Area (ha.)	Cumi. Area
1	Pithoragarh	Gori Ganga	Painagad	15	10	10	10	10	15	0	70	8	9312	9312
2	Pithoragarh	Ramganga Purvi	Gurghatiya	15	10	10	5	10	15	0	65	63	5188	14500
3	Pithoragarh	Gori Ganga	Patmoligad	15	10	10	5	10	15	0	65	2	3150	17650
4	Pithoragarh	Ramganga Purvi	Ranikhet	15	10	10	5	10	15	0	65	12	3846	21496
5	Pithoragarh	Gori Ganga	Bherigad	15	10	10	10	5	15	0	65	3	3750	25246
6	Pithoragarh	Gori Ganga	Dogrigad	15	10	10	3	10	15	0	63	2	2478	27724
7	Pithoragarh	Gori Ganga	Ghosigad	15	10	10	3	10	15	0	63	1	8450	36174
8	Pithoragarh	Ramganga Purvi	Simgad	15	10	15	5	10	5	0	60	12	2608	38782
9	Pithoragarh	Gori Ganga	Dhuratoli	15	5	15	5	5	15	0	60	12	2468	41250
10	Pithoragarh	Ramganga Purvi	Dhaulgad	15	10	10	10	5	10	0	60	11	2308	43558
11	Pithoragarh	Ramganga Purvi	Jhiniyagad	15	5	15	5	5	15	0	60	4	1200	44758
12	Pithoragarh	Gori Ganga	Rajgari	15	5	10	10	5	15	0	60	4	2462	47220
13	Pithoragarh	Godigad	Dauligad	15	10	10	10	3	10	0	58	17	1406	48626
14	Pithoragarh	Ramganga Purvi	Lakrigad	15	10	10	3	5	15	0	58	11	1988	50614
15	Pithoragarh	Ramganga Purvi	Patligad	15	10	10	3	5	15	0	58	8	2980	53594
16	Pithoragarh	Gori Ganga	Madkani River	15	10	10	5	3	15	0	58	9	20013	73607
17	Pithoragarh	Gori Ganga	Kwirigad	15	5	10	3	10	15	0	58	2	4950	78557
18	Pithoragarh	Ramganga Purvi	Gadiyar Nadi	15	5	10	3	10	15	0	58	2	6948	85505
19	Pithoragarh	Dharchula	Dharchula	15	10	10	3	3	15	0	56	2	5500	91005
20	Pithoragarh	Ramganga Purvi	Gogina	15	5	15	3	3	15	0	56	9	18500	109505
21	Pithoragarh	Gori Ganga	Khetargad	15	10	15	5	5	5	0	55	25	8206	117711

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil	MWS Area (ha.)	Cumi. Area
22	Pithoragarh	Ramganga Purvi	Jajar Rauli	15	10	10	5	10	5	0	55	4	1921	119632
23	Pithoragarh	Kutti	Sirkha	5	10	10	10	5	15	0	55	10	8556	128188
24	Pithoragarh	Kutti	Jiuntigad	5	10	10	10	5	15	0	55	4	3356	131544
25	Pithoragarh	Gori Ganga	Sungariya Gadhera	15	10	10	10	3	5	0	53	7	1237	132781
26	Pithoragarh	Gori Ganga	Tumariya Gadhera	15	5	10	3	5	15	0	53	4	2525	135306
27	Pithoragarh	Ramganga Purvi	Bhujgad	15	5	10	3	3	15	0	51	10	8868	144174
28	Pithoragarh	Gori Ganga	Jonligad	15	5	10	3	3	15	0	51	1	1544	145718
29	Pithoragarh	Ramganga Purvi	Nargoli	5	10	10	5	10	10	0	50	22	2554	148272
30	Pithoragarh	Dharchula	Chuagad	15	10	10	5	5	5	0	50	2	3700	151972
31	Pithoragarh	Gori Ganga	Ghungargad	15	5	15	5	5	5	0	50	8	3232	155204
32	Pithoragarh	Ramganga Purvi	Chamungad	5	10	10	5	5	15	0	50	22	3950	159154
33	Pithoragarh	Gori Ganga	Senargad	15	5	10	10	5	5	0	50	7	2950	162104
34	Pithoragarh	Gori Ganga	Dharanti	15	5	10	10	3	5	0	48	31	1925	164029
35	Pithoragarh	Ramganga Purvi	Barargad	15	10	10	5	3	5	0	48	56	6469	170498
36	Pithoragarh	Ramganga Purvi	Kaligad	5	10	10	5	3	15	0	48	33	3380	173878
37	Pithoragarh	Gori Ganga	Bhadoligad	15	5	10	10	3	5	0	48	13	1656	175534
38	Pithoragarh	Gori Ganga	Pachhugad	5	10	5	10	3	15	0	48	5	7019	182553
39	Pithoragarh	Ramganga Purvi	Silgad	15	5	10	3	3	10	0	46	10	4385	186938
40	Pithoragarh	Kutti	3	5	10	5	5	5	15	0	45	4	4955	191893
41	Pithoragarh	Jhulaghat	Ghatgad	5	10	10	5	3	10	0	43	27	3362	195255
42	Pithoragarh	Gori Ganga	Laspa Badligad	5	5	5	10	3	15	0	43	4	6525	201780
													201780	

Appendix Table 7-(x)

MWS of Tehri Garhwal district with its weightage criteria

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil	MWS Area (ha.)	Cumi. Area
1	Tehri	Jalkurgad	Bagi	15	10	15	5	10	15	0	70	5	739	739
2	Tehri	Nagungad	Jaspur	15	10	10	5	10	15	0	65	12	1275	2014
3	Tehri	Ghonti	Banchurigad	15	10	10	5	10	15	0	65	6	2474	4488
4	Tehri	Jalkurgad	Kyarkigad	15	10	10	3	10	15	0	63	13	1868	6356
5	Tehri	Jalkurgad	Piplogi	15	10	10	3	10	15	0	63	10	1718	8074
6	Tehri	Bhilangna Upper	Chakar Gaon	15	5	15	3	10	15	0	63	11	1038	9112
7	Tehri	Aglar	Maind	15	10	15	5	3	15	0	63	5	950	10062
8	Tehri	Aglar	Dewangarh	15	10	15	3	5	15	0	63	8	1986	12048
9	Tehri	Aglar	Ringaligad	15	10	10	3	10	15	0	63	9	2221	14269
10	Tehri	Dangchaura	Takoli	15	10	15	3	3	15	0	61	23	2819	17088
11	Tehri	Aglar	Bichu	15	10	15	3	3	15	0	61	9	2036	19124
12	Tehri	Dangchaura	Jakhand	15	10	10	5	5	15	0	60	19	2325	21449
13	Tehri	Bhilangna Upper	Porgad	15	5	10	5	10	15	0	60	10	1906	23355
14	Tehri	Bhilangna Upper	Gawana	15	5	10	5	10	15	0	60	2	1250	24605
15	Tehri	Bhilangna Upper	Bajiya	15	5	10	3	10	15	0	58	9	813	25418
16	Tehri	Jalkurgad	Dharkot	15	10	10	3	5	15	0	58	31	3168	28586
17	Tehri	Jalkurgad	Ongad	15	5	10	3	10	15	0	58	22	3462	32048
18	Tehri	Ghonti	Barkot	15	10	10	3	5	15	0	58	14	2304	34352
19	Tehri	Ghonti	Gadoliyagad	15	10	10	5	3	15	0	58	15	2832	37184
20	Tehri	Badangaon	Rindol	15	10	10	3	5	15	0	58	13	2613	39797
21	Tehri	Balganga	Aragad	15	10	10	3	5	15	0	58	20	3370	43167
22	Tehri	Dangchaura	Mundoli	15	10	10	5	3	15	0	58	12	1338	44505
23	Tehri	Aglar	Jokhnigad	15	10	10	3	5	15	0	58	8	1457	45962
24	Tehri	Badangaon	Siloli	15	5	10	3	10	15	0	58	11	2518	48480
25	Tehri	Nagungad	Seansugad	15	10	10	3	5	15	0	58	47	7813	56293
26	Tehri	Aglar	Gochugad	15	10	10	3	5	15	0	58	19	4566	60859
27	Tehri	Aglar	Paligad	15	10	10	5	3	15	0	58	21	5972	66831
28	Tehri	Balganga	Gongad	15	10	10	5	3	15	0	58	10	5025	71856
29	Tehri	Bhilangna Upper	Lata	15	5	10	3	10	15	0	58	1	719	72575
30	Tehri	Bhilangna Upper	Sankri	15	5	10	3	10	15	0	58	3	1969	74544
31	Tehri	Dangchaura	Jakhi	15	10	10	5	3	15	0	58	3	1931	76475
32	Tehri	Bhilangna Upper	Chandoli	15	5	10	3	10	15	0	58	5	2500	78975

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil	MWS Area (ha.)	Cumi. Area
33	Tehri	Bhilangna Upper	Payankgad	15	5	10	3	10	15	0	58	1	1063	80038
34	Tehri	Nagungad	Mal Deota	15	10	10	3	3	15	0	56	29	2087	82125
35	Tehri	Southbhagirathi B	CHANDRBHAGA GAD	15	10	10	3	3	15	0	56	90	6777	88902
36	Tehri	Southbhagirathi B	GARGAD	15	10	10	3	3	15	0	56	10	1885	90787
37	Tehri	Badiyargad	Namigad	15	10	10	3	3	15	0	56	6	1512	92299
38	Tehri	Badiyargad	Jakhni	15	10	10	3	3	15	0	56	8	1406	93705
39	Tehri	Nagungad	Dang	15	10	10	3	3	15	0	56	21	2806	96511
40	Tehri	Bhilangna Upper	Jakhnoli	15	10	10	3	3	15	0	56	29	9188	105699
41	Tehri	Southbhagirathi B	Palethi	15	10	10	3	3	15	0	56	55	7112	112811
42	Tehri	Aglar	Diuligad	15	10	10	3	3	15	0	56	16	3187	115998
43	Tehri	Badiyargad	Dhundsirgad	15	10	10	3	3	15	0	56	21	4812	120810
44	Tehri	Aglar	Tunetha	15	10	10	3	3	15	0	56	14	2378	123188
45	Tehri	Ghonti	Dwarigad	15	10	10	3	3	15	0	56	8	2400	125588
46	Tehri	Aglar	Belgar Nadi	15	10	10	3	3	15	0	56	7	2382	127970
47	Tehri	Aglar	Kharsugad	15	10	10	3	3	15	0	56	5	1546	129516
48	Tehri	Aglar	Patalgad	15	10	10	3	3	15	0	56	2	1565	131081
49	Tehri	Nagungad	Koti	15	10	10	3	3	15	0	56	11	6456	137537
50	Tehri	Balganga	Tungri	15	5	10	3	5	15	0	53	20	2690	140227
51	Tehri	Bhilangna Upper	Geonli	15	5	10	5	3	15	0	53	18	1850	142077
52	Tehri	Bhilangna Upper	Jolagad	15	5	10	5	3	15	0	53	35	8938	151015
53	Tehri	Bhilangna Upper	Phalanda	15	5	10	3	5	15	0	53	2	656	151671
54	Tehri	Bhilangna Upper	Saur	15	5	10	3	5	15	0	53	4	1500	153171
55	Tehri	Bhilangna Upper	Doni	15	5	10	5	3	15	0	53	3	1950	155121
56	Tehri	Bhilangna Upper	Gairgad	15	5	10	3	5	15	0	53	2	1406	156527
57	Tehri	Balganga	Kot	15	5	10	5	3	15	0	53	3	4600	161127
58	Tehri	Bhilangna Upper	Sanrigad	15	5	10	3	5	15	0	53	1	2406	163533
59	Tehri	Badangaon	Dungmandargad	15	5	10	3	3	15	0	51	30	5196	168729
60	Tehri	Balganga	Kapol Gaon	15	5	10	3	3	15	0	51	24	4600	173329
61	Tehri	Balganga	Madhgad	15	5	10	3	3	15	0	51	13	3625	176954
62	Tehri	Balganga	Toli	15	5	10	3	3	15	0	51	7	3650	180604
63	Tehri	Balganga	Chasyala	15	5	10	3	3	15	0	51	8	2300	182904
64	Tehri	Balganga	Pinswar	15	5	10	3	3	15	0	51	3	4400	187304
65	Tehri	Balganga	Ghangroli	15	5	10	3	3	15	0	51	1	4500	191804
66	Tehri	Badiyargad	Bhimpanisera	15	10	10	3	3	5	0	46	16	2457	194261
													194261	

Appendix Table 7-(xi)

MWS of Udham Singh Nagar district with its weightage criteria

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil	MWS Area (ha.)	Cumi. Area
1	US Nagar	Lebar	Khakra Nadi	10	10	10	10	5	5	0	50	32	12593	12593
2	US Nagar	Baur	Baur Nadi	15	10	10	5	3	5	0	48	83	32147	44740
3	US Nagar	Dabka	Ghuga Nala	15	10	5	3	3	5	0	41	53	12500	57240
4	US Nagar	Bhakra	Mahabir Nagar	15	5	10	3	3	5	0	41	22	10569	67809
5	US Nagar	Tanda	Pantnagar	15	10	5	3	3	5	0	41	154	42900	110709
6	US Nagar	Bhakra	Kagarsen	15	5	10	3	3	5	0	41	27	19532	130241
7	US Nagar	Lebar	Khatima	10	5	5	10	3	5	0	38	64	36539	166780

Appendix Table 7-(xii)

MWS of Uttarkashi district with its weightage criteria

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil	MWS Area (ha.)	Cumi. Area
1	Uttarkashi	Tons Right	Chaubegad	15	10	15	10	10	15	0	75	1	2138	2138
2	Uttarkashi	Rupin	Istergad	15	10	10	10	10	15	0	70	3	6091	8229
3	Uttarkashi	Jalkurgad	Mukhyalgaon	15	10	15	3	10	15	0	68	4	1600	9829
4	Uttarkashi	Rikhnargad	Kamra	15	10	15	10	3	15	0	68	2	1344	11173
5	Uttarkashi	Supin Tons	Dangergaon	15	10	15	5	5	15	0	65	1	1506	12679
6	Uttarkashi	Jalkurgad	Nakurgad	15	10	15	3	5	15	0	63	22	3225	15904
7	Uttarkashi	Indrawati Dhanarigad	Kyara	15	10	10	3	10	15	0	63	6	1344	17248
8	Uttarkashi	Yamuna Middle	Kuwa	15	10	15	5	3	15	0	63	7	1284	18532
9	Uttarkashi	Yamuna Upper	Kuthnaurgad	15	10	10	10	3	15	0	63	1	2550	21082
10	Uttarkashi	Indrawati Dhanarigad	Thiyara	15	10	15	3	3	15	0	61	8	1618	22700
11	Uttarkashi	Yamuna Upper	Than	15	10	15	3	3	15	0	61	7	1336	24036
12	Uttarkashi	Supin Tons	Kunara	15	10	15	3	3	15	0	61	1	3178	27214
13	Uttarkashi	Kamolagad	Malegad	15	10	10	10	5	10	0	60	5	3236	30450
14	Uttarkashi	Tons Left	Miyangad	15	10	10	5	10	10	0	60	7	4495	34945
15	Uttarkashi	Yamuna Upper	Baligad	15	10	10	5	5	15	0	60	3	3568	38513
16	Uttarkashi	Rupin	Kanoligad	15	5	10	5	10	15	0	60	1	2389	40902
17	Uttarkashi	Jalkurgad	Mandenagad	15	10	10	3	5	15	0	58	26	2780	43682
18	Uttarkashi	Tons Left	Deora	15	10	15	5	3	10	0	58	4	1034	44716
19	Uttarkashi	Yamuna Upper	Chaptari	15	10	10	5	3	15	0	58	7	3083	47799
20	Uttarkashi	Syalamgad	Khurmolagad	15	10	10	5	3	15	0	58	26	9100	56899
21	Uttarkashi	Yamuna Middle	Tharsun	15	10	10	5	3	15	0	58	11	4332	61231
22	Uttarkashi	Yamuna Middle	Duink	15	10	10	5	3	15	0	58	5	2172	63403
23	Uttarkashi	Yamuna Middle	Serigad	15	10	10	3	5	15	0	58	20	4794	68197
24	Uttarkashi	Yamuna Upper	Rajgarthi	15	10	10	5	3	15	0	58	5	2665	70862
25	Uttarkashi	Yamuna Middle	Kaslana	15	10	10	5	3	15	0	58	12	3729	74591
26	Uttarkashi	Tons Right	Bansukhal	15	10	15	5	3	10	0	58	5	2705	77296
27	Uttarkashi	Yamuna Middle	Tiyan	15	10	10	5	3	15	0	58	5	1764	79060
28	Uttarkashi	Rupin	Khanna	15	5	15	5	3	15	0	58	2	1380	80440

Sl. No.	DISTRICT	SWS	MWS	Clust Appro	Conti-guty	Degra-ded	SC_ST	SM& Mg Farmer	Assured Irrgation	Actual Wages	Total Weight	No. of Vil	MWS Area (ha.)	Cumi. Area
29	Uttarkashi	Tons Right	Dhumraligad	15	10	10	10	3	10	0	58	1	2671	83111
30	Uttarkashi	Yamuna Upper	Paunti-A	15	5	15	3	5	15	0	58	5	4618	87729
31	Uttarkashi	Syalamgad	Uttarkashi	15	10	10	3	3	15	0	56	7	1379	89108
32	Uttarkashi	Yamuna Upper	Barkot	15	10	10	3	3	15	0	56	6	1519	90627
33	Uttarkashi	Yamuna Upper	Poltha	15	5	15	3	3	15	0	56	5	3460	94087
34	Uttarkashi	Yamuna Upper	Kansera	15	10	10	3	3	15	0	56	1	1742	95829
35	Uttarkashi	Kaldigad	Ginsigad	15	10	10	3	3	15	0	56	5	10219	106048
36	Uttarkashi	Tons Right	Salragad	15	5	15	3	3	15	0	56	1	2631	108679
37	Uttarkashi	Kharmolagad	Banwatigad	15	10	10	3	3	15	0	56	1	2621	111300
38	Uttarkashi	Kamolagad	Thadunga	15	10	10	5	5	10	0	55	4	2697	113997
39	Uttarkashi	Yamuna Upper	Naugaon	15	10	10	5	3	10	0	53	17	2814	116811
40	Uttarkashi	Kamolagad	Saundari	15	10	10	5	3	10	0	53	9	2935	119746
41	Uttarkashi	Rikhnargad	Lamgad	15	10	15	5	3	5	0	53	3	1550	121296
42	Uttarkashi	Yamuna Upper	Bhansarigad	15	10	10	5	3	10	0	53	4	3790	125086
43	Uttarkashi	Rupin	Doni	15	5	10	5	3	15	0	53	6	4398	129484
44	Uttarkashi	Kharmolagad	Gari	15	10	10	5	3	10	0	53	3	1612	131096
45	Uttarkashi	Kamolagad	Purola	15	10	10	5	3	10	0	53	2	1562	132658
46	Uttarkashi	Yamuna Upper	Paligad	15	5	10	5	3	15	0	53	2	5096	137754
47	Uttarkashi	Jalkurgad	Chandaligad	15	10	15	3	3	5	0	51	4	1568	139322
48	Uttarkashi	Kaldigad	Utro	15	10	10	3	3	10	0	51	1	2243	141565
49	Uttarkashi	Yamuna Upper	Rana	15	5	10	3	3	15	0	51	2	3914	145479
50	Uttarkashi	Kaldigad	Ashiganga	15	5	10	3	3	15	0	51	1	2695	148174
51	Uttarkashi	Tons Left	Sarugad	15	10	10	5	3	5	0	48	10	7135	155309
52	Uttarkashi	Kamolagad	Bhangerugad	15	10	10	5	3	5	0	48	5	3306	158615
53	Uttarkashi	Kaldigad	Gajoli	15	5	10	5	3	10	0	48	2	4470	163085
54	Uttarkashi	Jalkurgad	Jalkurgad Upper	15	10	10	3	3	5	0	46	8	4934	168019
55	Uttarkashi	Yamuna Upper	Yamuna Nadi	5	5	10	5	3	15	0	43	5	12550	180569
													180569	

MAPS

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MAP-17 Pithoragarh district Map Showing the areas proposed under IWMP

MAP-18 Rudraprayag district Map Showing the areas proposed under IWMP

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MAP-20 Udhamsingh Nagar district Map Showing the areas proposed under IWMP

MAP-21 Uttarkashi district Map Showing the areas proposed under IWMP

Uttarakhand
Districts & Development Blocks

HIMACHAL PRADESH

TIBET AUTONOMOUS REGION (CHINA)

NEPAL

Uttar Pradesh

Uttarkashi

Tehri

Dehradun

Chamoli

Rudraprayag

Pithoragarh

Haridwar

Pauri

Bageshwar

Almora

Champawat

Nainital

Udham Singh Nagar

State Boundary
District Boundary
Development Block Boundary

Block Boundries are not accurate

Prepared at GIS Lab, Watershed Management Directorate, Dehradun, Uttaranchal

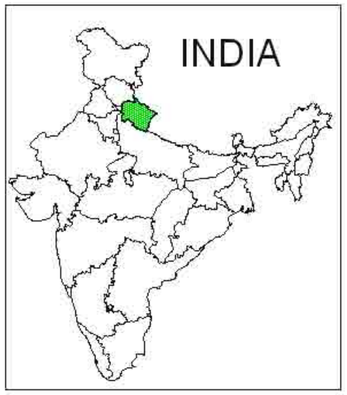
Forest Cover Map of Uttarakhand

N
W E
S

Uttarkashi
Chamoli
Rudraprayag
Tehri
Dehradun
Pithoragarh
Bageshwar
Hardwar
Pauri
Almora
Nainital
Champawat
US Nagar

	Water	
	Non Forest	< 10%
	Scrub	10 - 40%
	Open FOrest	40 - 70%
	Dense Forest	> 70%

UTTARAKHAND
Districts, Subwatersheds & Microwatersheds



HIMACHAL PRADESH

TIBET AUTONOMOUS REGION (CHINA)

NEPAL

UTTAR PRADESH

Uttarkashi

Chamoli

Rudraprayag

Tehri

Dehradun

Pithoragarh

Haridwar

Bageshwar

Pauri

Almora

Nainital

Champawat

Udham Singh Nagar

State Boundary
District Boundary
Sub watershed boundary

N

Scale 1:8,00,000

20 0 20 40 Kilometers

Prepared at GIS Lab, Watershed Management Directorate, Dehradun, Uttaranchal - Jan 2003

UTTARAKHAND
District, Important Towns & Major Rivers

Uttarkashi
Chamoli
Rudraprayag
Tehri
Dehradun
Pithoragarh
Bageshwar
Almora
Champawat
Nainital
Udham Singh Nagar
Haridwar
Pauri

Barkot
Uttarkashi
Chakrata
Badarinath
Joshimath
Mussoorie
Dehradun
Tehri
Rudraprayag
Gopeshwar
Karnaprayag
Srinagar
Devaprayag
Pauri
Rishikesh
Kotdwara
Lansdowne
Roorkee Cant
Manglore
Dwarahat
Bageshwar
Didihat
Munsiyari
Ranikhet
Almora
Pithoragarh
Kalagarh
Ramnagar
Bhowali
Nainital
Bhimtal
Kalaadhungi
Jaspur
Kashipur
Haldwani
Lohaghat
Champawat
Banbasa
Tanakpur
Baipur
Lalkua
Gadarpur
Rudrapur
Kichha
Khatima

N

U T T A R A K H A N D
Map Showing Altitude Zones

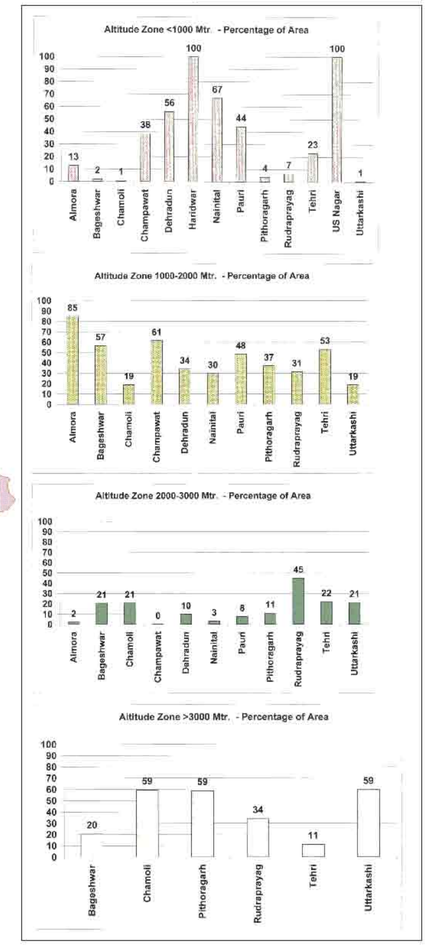
HIMACHAL PRADESH

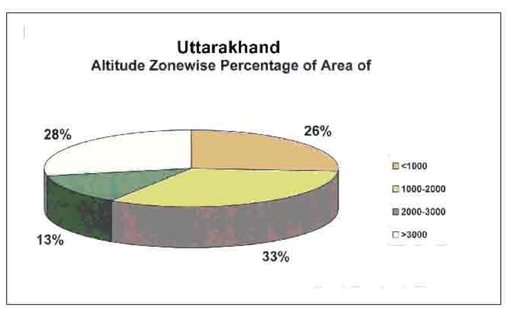
Uttarkashi
Rudraprayag
Chamoli
Tehri
Dehradun
Haridwar
Pauri
Pithoragarh
Bageshwar
Almora
Nainital
Champawat
Udham Singh Nagar

UTTAR PRADESH

NEPAL

Mori
Purola
Chakrata
Naugaon
Dunda
Kalsi
Chinyali Saur
Jaunpur
Thauldhar
Pratap Nagar
Vikas Nagar
Sahaspur
Raipur
Chamba
Jakhni Dhar
Kirti Nagar
Narendra Nagar
Deoprayag
Khirsu
Kot
Pauri
Pabo
Bhatwari
Joshimath
Ukhimath
Bhilangana
Jakholi
Dasholi
Agastmuni
Pokhri
Ghat
Karnaprayag
Munsyari
Dharchula
Tharali
Dewal
Kapkot
Narayan bagad
Thalisain
Gairsain
Kaljikhal
Chandkot
Pokhra
Dhangu
Bironkhal
Garur
Chaukhutia
Syaldeh
Lansdowne
Rikhnikhal
Nainidanda
Bhikiyasain
Dwarahat
Takula
Bageshwar
Berinag
Didihat
Kanalichina
Bhainsiyachana
Gangolihat
Pithoragarh
Munakot
DhaulaDevi
HawalBag
Salt
Tarikhet
Duggada
Khanpur
Betalghat
Ramgarh
Lamgara
Barakot
Dhari
Pati
Lohaghat
Okhalkanda
Bhimtal
Ramnagar
Kotabag
Jaspur
Kashipur
Champawat
Bajpur
Haldwani
Gadarpur
Rudrapur
Sitarganj
Khatima
Dowala
Bhagwanpur
Roorkee
Bahadarabad
Yamkeshwar
Narsan
Laksar





District Boundary
State Boundary
Block Boundary

Altitude Zones
- > 3000 meters
- > 2000 meters and < 3000 meters
- > 1000 meters and < 2000 meters
- Up to 1000 meters

N W E S

Scale 1: 8,00,000

50 0 50 Kilometers

Prepared at GIS Lab, Watershed Management Directorate, Dehradun, Uttaranchal

Uttarakhand

Area Covered by WMD Projects

Uttarkashi

Rudraprayag

Chamoli

Pithoragarh

Dehradun

Tehri

Bageshwar

Haridwar

Pauri

Almora

Nainital

Champawat

Udham Singh Nagar

N
W
E
S

1:1,650,000

25 12.5 0 25 Kilometers

Legend

- District Boundary
- Microwatershed

WMD Projects

- Bhimtal
- DVP
- Him-IWMP
- IWDP
- SB-I
- SB-II
- UDWDP

Uttarakhand

Area Covered by DPAP, IWDP & NWDPRA

Uttarkashi

Rudraprayag

Chamoli

Dehradun

Tehri

Pithoragarh

Bageshwar

Haridwar

Pauri

Almora

Nainital

Champawat

Udham Singh Nagar

N
W
E
S

1:1,650,000

25 12.5 0 25 Kilometers

Legend

- District Boundary
- Microwatershed

RD Schemes

- DPAP
- IWDP
- NWDPRA

Uttarakhand

Area Covered by CAT Plans of Hydro Projects

Uttarkashi

Rudraprayag

Chamoli

Dehradun

Tehri

Pithoragarh

Bageshwar

Haridwar

Pauri

Almora

Nainital

Champawat

Udham Singh Nagar

N
W
E
S

1:1,650,000

25 12.5 0 25 Kilometers

Legend

- District Boundary
- Microwatershed
- CAT of Hydro Projects

Uttarakhand

Area Proposed for Treatment - IWMP

Uttarkashi

Rudraprayag

Chamoli

Dehradun

Tehri

Pithoragarh

Bageshwar

Haridwar

Pauri

Almora

Nainital

Champawat

Udham Singh Nagar

N
W
E
S

1:1,650,000

25 12.5 0 25 Kilometers

Legend

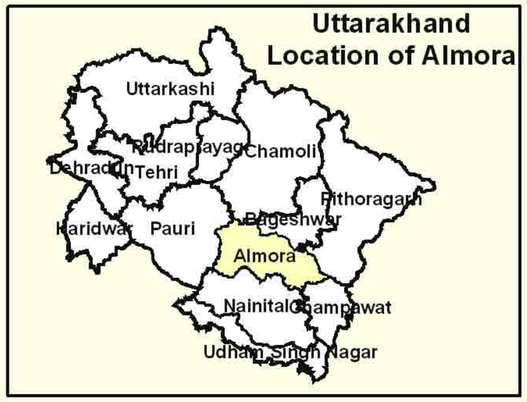
- District Boundary
- Microwatershed

Area Proposed for treatment in

- Remaing Period of XI Plan
- XII Plan
- XIII Plan
- XIV Plan

Almora District

Area Proposed for Treatment - IWMP



Legend

- District Boundary
- Microwatershed

Area Proposed for treatment in

- Remaing Period of XI Plan
- XII Plan
- XIII Plan
- XIV Plan

Khachyar Gadhera
Chaunar
Gaya Gadhera
Bungdhar Talla
Tyarka Gadhera
Tamadhaun
Adigram
Khatron Nala
Mansi
Trag Gadhera
Gagas Nadi
Kalsori Gadhera
Nayar Nadi
Badangarh Nadi
Mallagad
Mawar
Kaligad
Makron
Jam Gadhera
Dungari
Karkhet
Khulgad
Jakh Gadhera
Gabhini Gadhera
Bajina
Kuraligad
Panyali Gad
Garsari
Kotila
Korar
Gaunchhil Gadhera
Baldi Gad
Kunkhet
Begarh
Phalalgad
Ghuniyoligad
Naini
Kirori Ganga
Galli Gad
Sidiyagad
Manogad
Khanigad
Kotgad
Kutargad

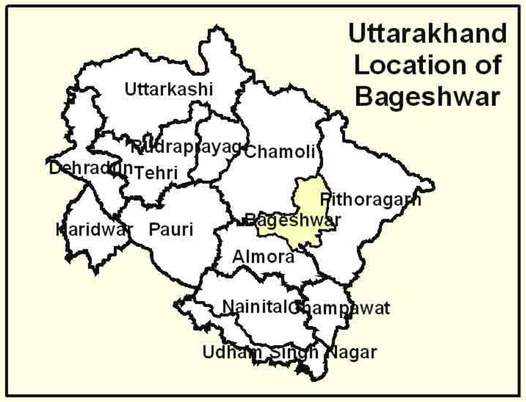
N
W
E
S

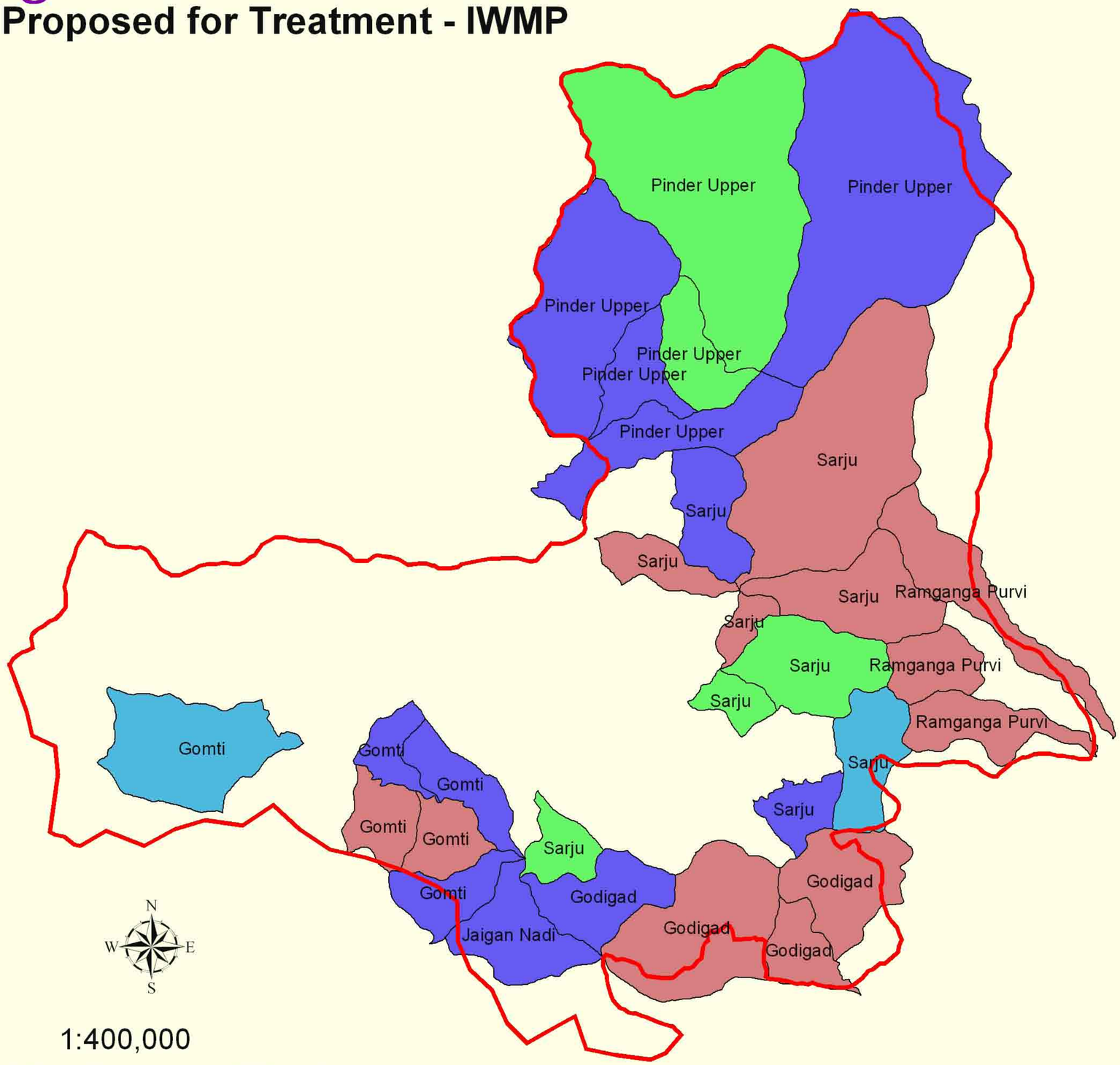
1:450,000

7 3.5 0 7 Kilometers

Bageshwar District

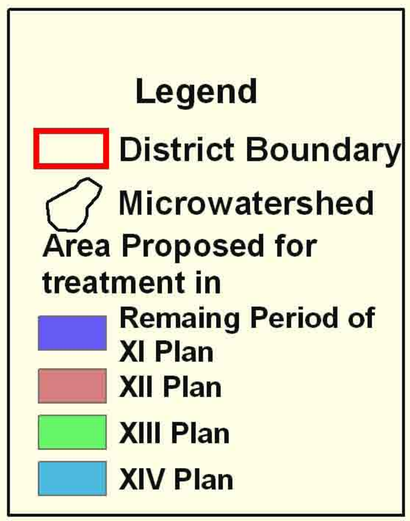
Area Proposed for Treatment - IWMP





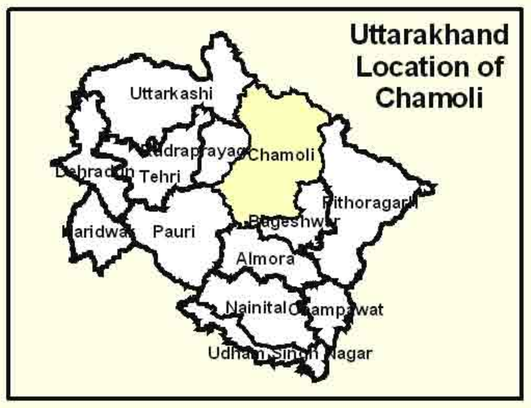
1:400,000

9 4.5 0 9 Kilometers



Chamoli District

Area Proposed for Treatment - IWMP



Sarswati

Sarswati

Nagoigad

Budhi Ganga

Nandakini

Plus

Lower Pinder Right
Atagad

Nandakini

Nandakini

Nandakini

Lower Pinder Right

Kail Ganga

Maigar Khansar

N
W
E
S

1:650,000

7 3.5 0 7 Kilometers

Legend

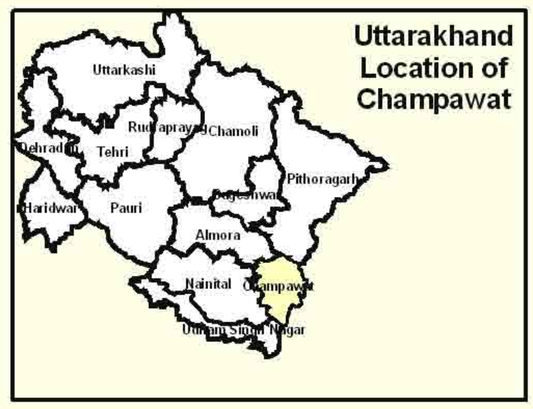
- District Boundary
- Microwatershed

Area Proposed for treatment in

- Remaing Period of XI Plan
- XII Plan
- XIII Plan
- XIV Plan

Champawat District

Area Proposed for Treatment - IWMP



Panar
Panar
Panar
Cheera
Lohawati
Ladhiya
Lohawati
Lohawati
Ladhiya
Ladhiya
Lohawati
Ladhiya
Ladhiya
Ladhiya
Purnagiri

N
W
E
S

1:300,000

3 1.5 0 3 Kilometers

Legend

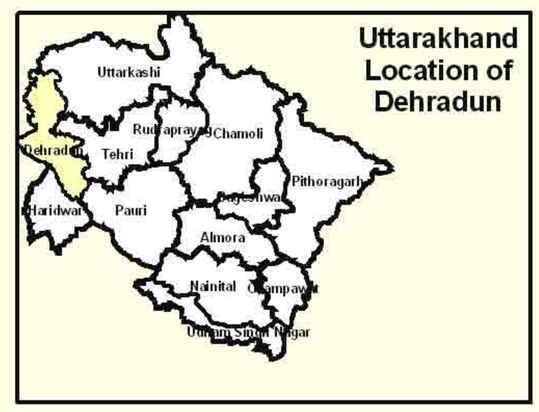
- District Boundary
- Microwatershed

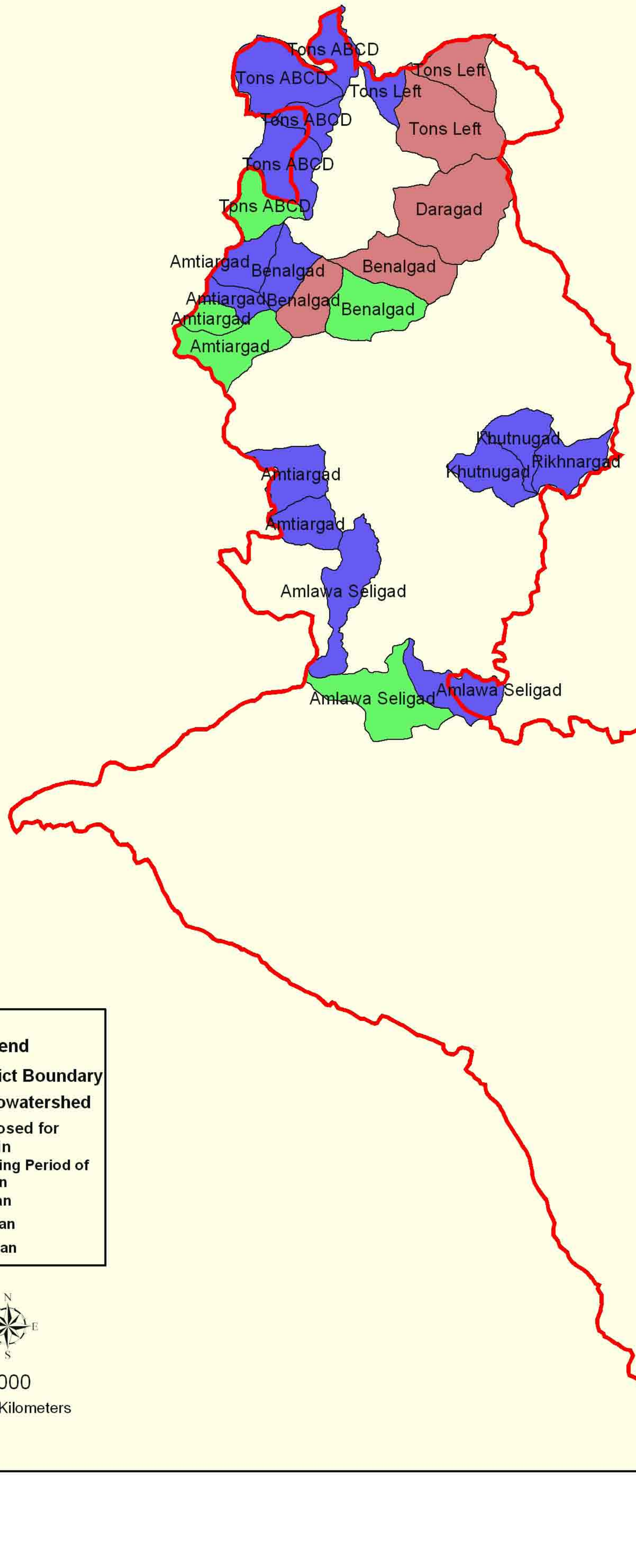
Area Proposed for treatment in

- Remaing Period of XI Plan
- XII Plan
- XIII Plan
- XIV Plan

Dehradun District

Area Proposed for Treatment - IWMP





Legend

- District Boundary
- Microwatershed

Area Proposed for treatment in

- Remaing Period of XI Plan
- XII Plan
- XIII Plan
- XIV Plan

N
W E
S

1:500,000

5 2.5 0 5 Kilometers

Nainital District

Area Proposed for Treatment - IWMP

Kuchgad
Ramgad
Ramgad
Ramgad
Ramgad
Ramgad
Ramgad
Ramgad Suyal
Ramgad
Ramgad
Ramgad
Ramgad
Suyal
Kalsa Gola
Kalsa Gola
Ramgad
Dhara Phika
Dhela
Dhela
Kuchgad
Baur
Bhakra
Lebar
Lebar
Lebar

Legend

- District Boundary
- Microwatershed

Area Proposed for treatment in

- Remaing Period of XI Plan
- XII Plan
- XIII Plan
- XIV Plan

1:500,000

4 2 0 4 Kilometers

Pauri District

Area Proposed for Treatment - IWMP

Srinagar
Paschimi Nayar
Randigad
Nayar Right
Nayar Left
Hiyunl_Pauri
Kandi
Tal Nadi
Purvi Nayar
Machlad
Bino Nadi
Mandal Nadi

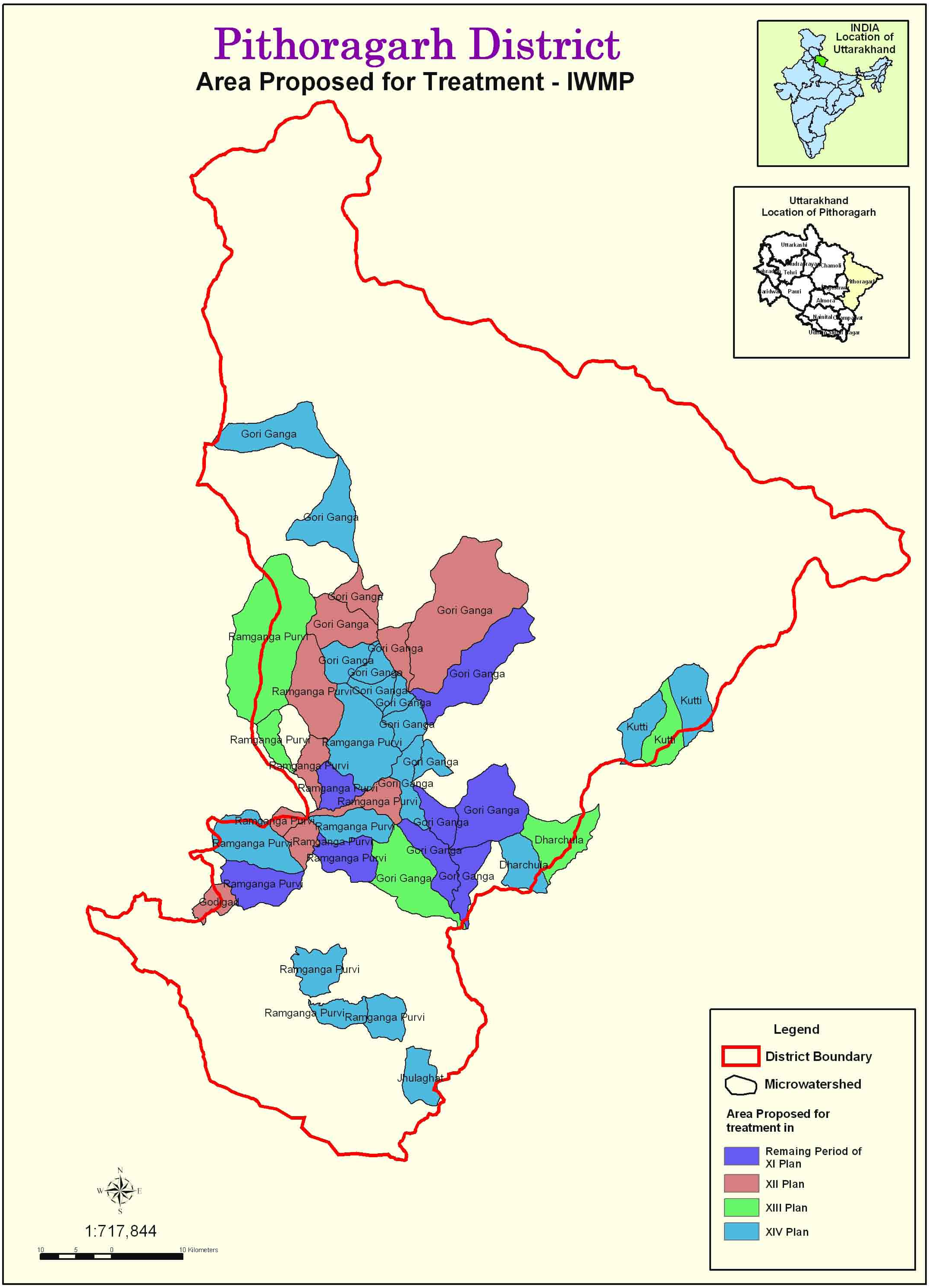
1:500,000
4 2 0 4 Kilometers

Legend

- District Boundary
- Microwatershed

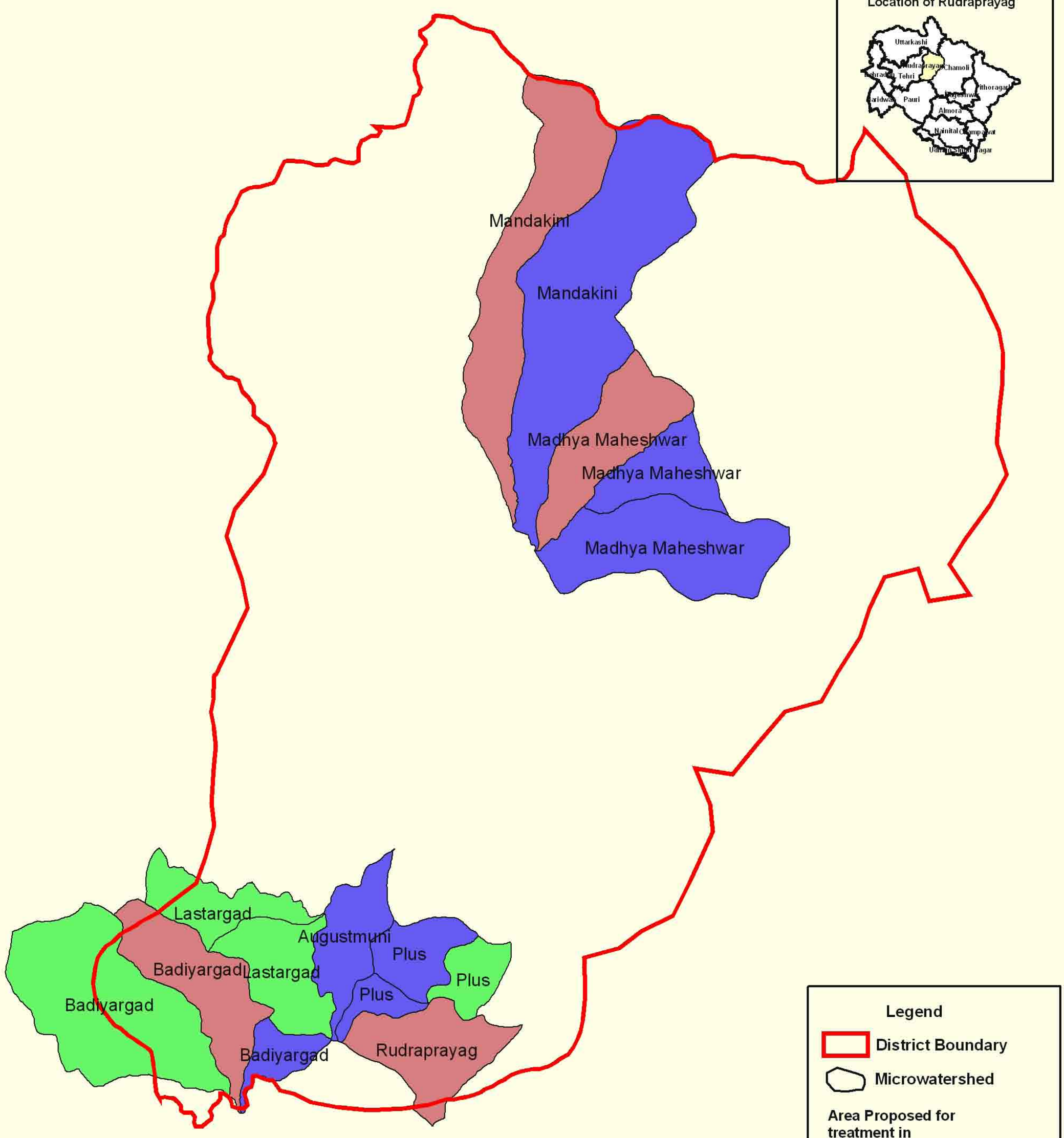
Area Proposed for treatment in

- Remaing Period of XI Plan
- XII Plan
- XIII Plan
- XIV Plan


Pithoragarh District
Area Proposed for Treatment - IWMP
INDIA
Location of
Uttarakhand
Uttarakhand
Location of Pithoragarh
Uttarkashi
Chamoli
Tehri
Pauri
Almora
Nainital
Pithoragarh
Gori Ganga
Ramganga Purvi
Kutti
Dharchula
Godigad
Jhulaghat
N
S
E
W
1:717,844
10
5
0
10 Kilometers
Legend
District Boundary
Microwatershed
Area Proposed for treatment in
Remaing Period of XI Plan
XII Plan
XIII Plan
XIV Plan

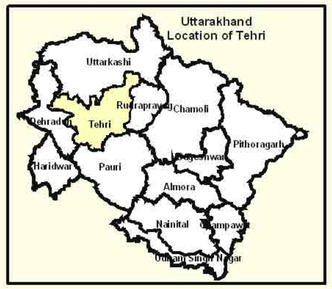
Rudraprayag District

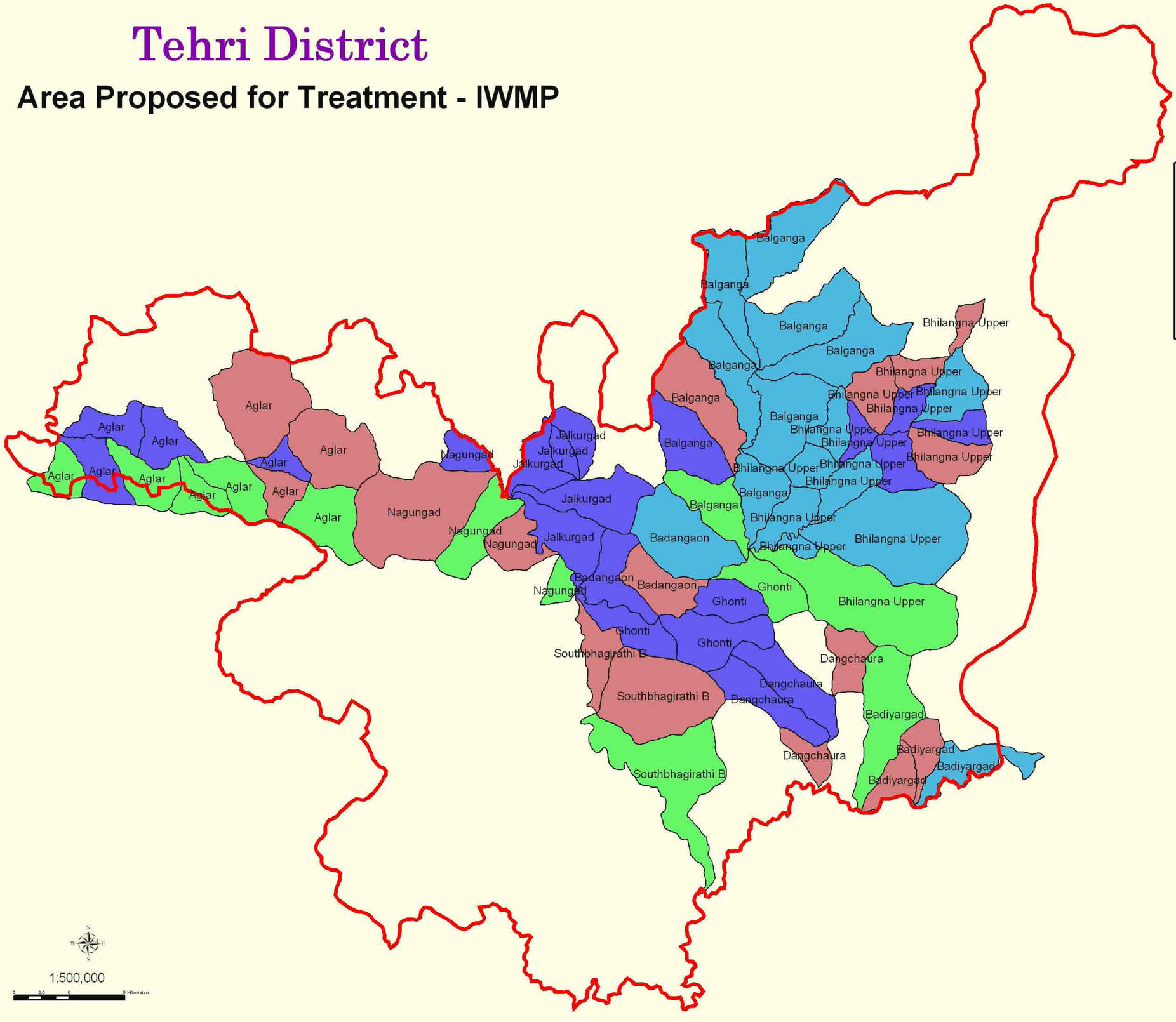
Area Proposed for Treatment - IWMP



Tehri District

Area Proposed for Treatment - IWMP





1:500,000

5 2.5 0 5 Kilometers

Legend

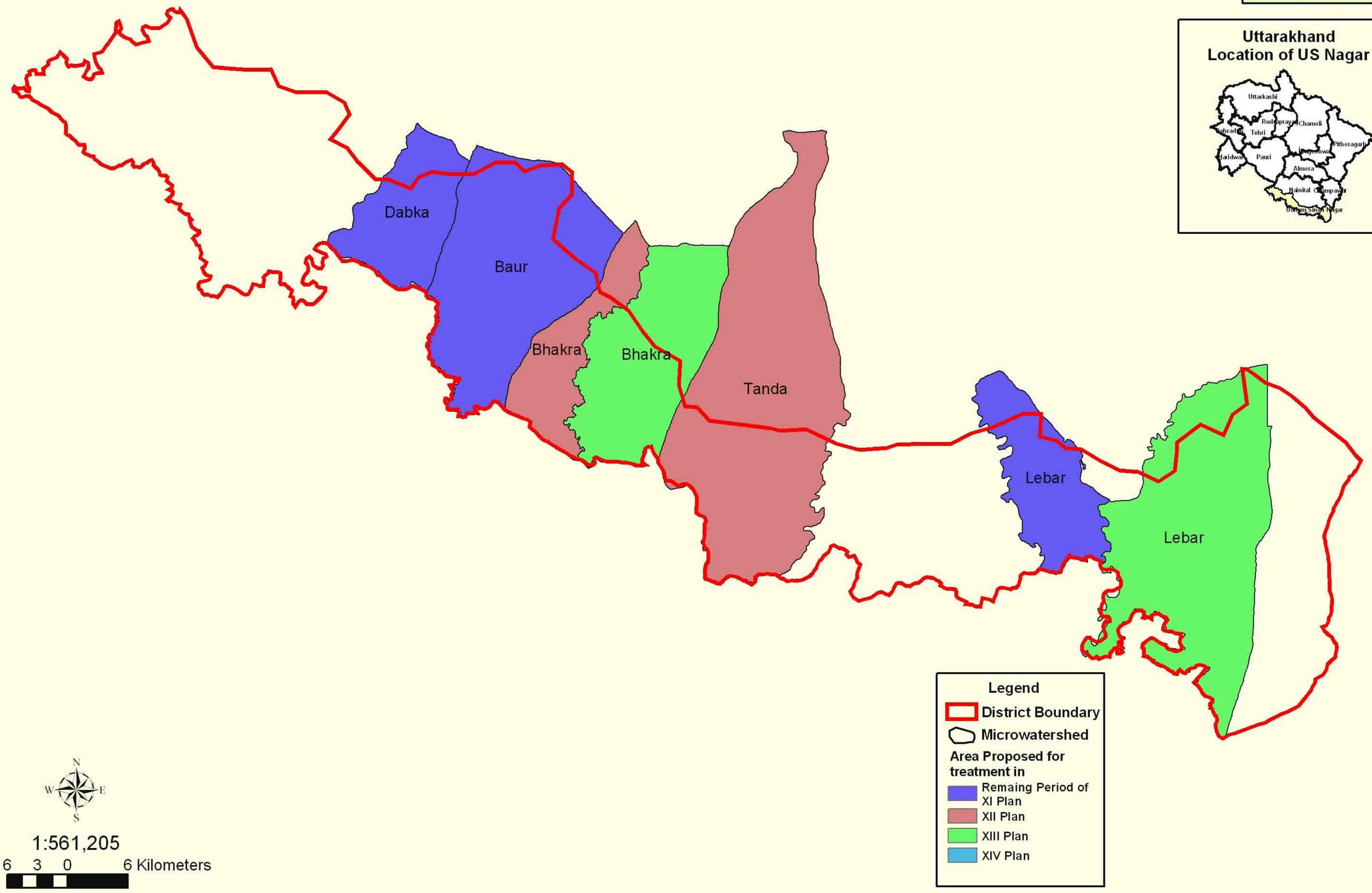
- District Boundary
- Microwatershed

Area Proposed for treatment in

- Remaing Period of XI Plan
- XII Plan
- XIII Plan
- XIV Plan

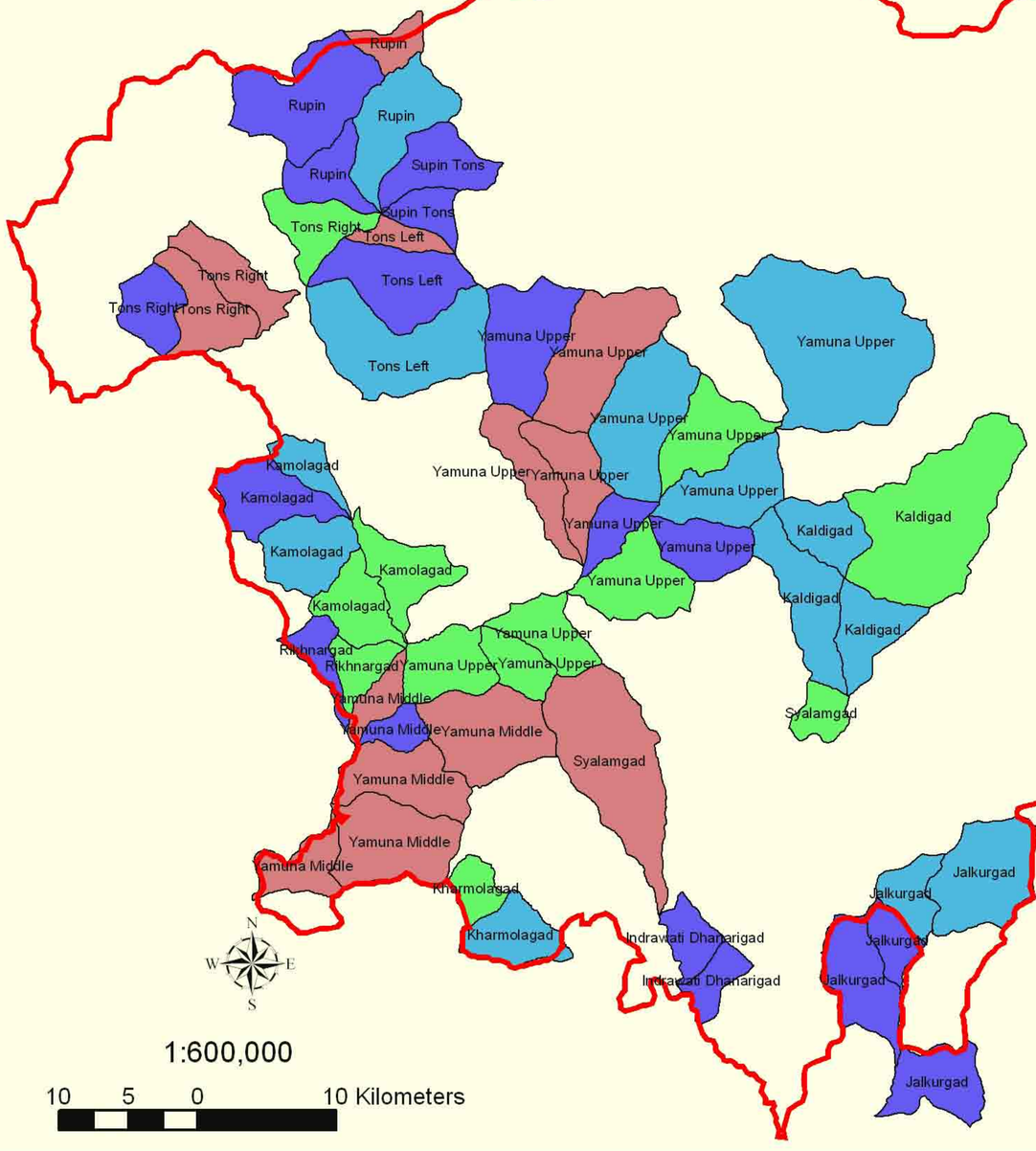
Udhamsingh Nagar District

Area Proposed for Treatment - IWMP



Uttarkashi District

Area Proposed for Treatment - IWMP



1:600,000

10 5 0 10 Kilometers

Legend

- District Boundary
- Microwatershed

Area Proposed for treatment in

- Remaing Period of XI Plan
- XII Plan
- XIII Plan
- XIV Plan

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Watershed Management Directorate Dehradun

WATERSHED MANAGEMENT DIRECTORATE
UTTARAKHAND

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Email : uttarakhandslna@gmail.com, wmd-ua@nic.in
Website : www. uttara.in/watershed/ intro.html