Detailed Project Report

Integrated Watershed Management Programme–V

Year 2010–2011

(IWMP–V)

Department of Land Development and Water Resources, Uttar Pradesh

Project Implementing Agency

Bhoomi Sanrakshan Adhikari

(L.D.W.R.), Moth, Jhansi, U.P.

CERTIFICATE

This is to be certified that the proposed Project (IWMP-V) comprising eight micro-watersheds of district Jhansi, Uttar Pradesh has been selected for its sustainable development on watershed basis under Integrated Watershed Management Programme. The land is physically available for proposed interventions and is not overlapping with any other schemes. It will be developed as per Common Guidelines for Watershed Development Project-2008, GOI, New Delhi. The significant results will be achieved through proposed interventions on soil and water conservation, ground water recharge, availability of drinking and irrigation water, agricultural production systems, live stock, fodder availability, livelihoods of asset less, capacity building, etc. The proposed **Detailed Project Report** of **IWMP-V, 2010-11** is approved for its implementation.

Soil Conservation Officer
IWMP-V
Dept. of LDWR, Moth, Jhansi, UP

Deputy Director
LDWR, Jhansi, UP

Project Director
DRDA, Jhansi, UP

Chief Development Officer
Distt.-Jhansi, UP

EXECUTIVE SUMMARY

All the micro-watersheds of IWMP-V, 2010-11 are situated in Bamaur block of District Jhansi, Uttar Pradesh. The project consists of nine micro-watersheds namely Maletha (2c2A6b2a), Kudri (2C2A6b1b), Dundi-I (2C2A6a1e), Dundi-II (2C2A6a1f), Kurentha (2C2A6a2a), Dakhaneswar (2C2A6a2b), Garhawai (2C2A6a2c), Pahra (2C2B1a1c) and Dhanaura (2C2B1a1d) with total geographical area of 7136.92 ha, out of which 5970.00 ha is treatable with total outlay of Rs. 716.40 lakh under Integrated Watershed Management Programme. The Project Implementing Agency (PIA) is Bhumi Sanrakshan Adhikari, Department of Land Development and Water Resources, Moth, Jhansi, Uttar Pradesh.

All micro-watershed falls in agro-climatic zone of Central Plateau Hill Region representing a transitional zone of tropical sub-humid to semi-arid and comes under hot moist semi-arid ecological sub-region. The dominant slope category in the micro-watershed were 0-3 per cent followed by 3-5 per cent. According to Strahler's system of stream ordering, the natural drainage system of the different micro-watershed was classified.

To achieve the sustainable development, all kinds of activities related to natural resource management, production systems and livelihood options for asset less people are described in Chapter-5. The total cost of the project is Rs. 1238.52 lakh. The deficit of Rs. 522.12 lakh will be made through convergence of different development schemes sponsored by Central and State Govt.

Major crops of the watershed were urd, mung, sorghum, til and pigeon pea during *kharif* and lentil, chickpea, field pea, durum wheat, wheat, linseed and mustard during *rabi*. The productivity of these crops is significantly lower than the national and state average. The cropping intensity during *kharif* is significantly lower than the *rabi*. The pre-dominant tree species were Neem *(Azadirachta indica),* Babool (*Acacia nilotica)*, Palas and Ber (*Zizyphus* spp.).

Participatory Rural Appraisal (PRA) exercise was conducted to understand the people's needs and problems. The exercise brought out pressing needs and preferences of people for water harvesting structures through pucca checkdams on ephemeral streams, earthen bunding to protect soil erosion from agricultural fields along with field drainage structure, crop varieties with improved package of practices, agroforestry interventions and improved cultivation of fodder production, etc.

The Watershed Committee (WC) and SHGs have been constituted and registration of Watershed Committees were done under Societies Registration Act XXI, 1860. Active participation and co-operation of community will be ensured by building their capacities through exposures and trainings.

The overall B C Ration, including crops and animals, is 2.62 as compared to the 2.16 in the pre project scenario.

CHAPTER - 1

INTRODUCTION AND BACKGROUND

1. Project Background

Maletha (2c2A6b2a), Kudri (2C2A6b1b), Dundi-I (2C2A6a1e), Dundi-II (2C2A6a1f), Kurentha (2C2A6a2a), Dakhaneswar (2C2A6a2b), Garhawai (2C2A6a2c), Pahra (2C2B1a1c) and Dhanaura (2C2B1a1d) Watershed project is situated in Bamaur block of District Jhansi. The project area is consisting twenty two villages as per detailed mentioned in the following table with total geographical area of 7136.92 ha, out of which 5970.00 ha. area is under treatment of Integrated Watershed Management Programme (IWMP –V) starting year 2010-11.

Table-1: Details of village wise treatable area in the IWMP –V

Name of microwatershed	Code of microwatershed	Total geographical area (ha)	Treatable area (ha)
Maletha	(2c2A6b2a)	987.68	825.00
Kudri	(2C2A6b1b)	868.62	725.00
Dundi-I	(2C2A6a1e)	693.9	580.00
Dundi-II	(2C2A6a1f)	697.51	585.00
Kurentha	(2C2A6a2a)	713.97	595.00
Dakhaneswar	(2C2A6a2b)	790.77	660.00
Garhawai	(2C2A6a2c)	563.57	475.00
Pahra	(2C2B1a1c)	690.77	575.00
Dhanaura	(2C2B1a1d)	1130.13	950.00
Total		**7136.92**	**5970.00**

1.2 Need and Scope for Watershed Development

Bundelkhand region was in a grip of severe drought continuously from 2004 to 2007. In the region, more than 85 per cent of open wells were dried up due to deficit rainfall. Cattle were abandoned due to shortage of water and fodder. Most part of the region was dependent on drinking water supply through tanker. Therefore, management of natural resources on watershed basis is urgent need of the region. Watershed project was selected on the basis of criteria mentioned in Table 1.2 and composite ranking was developed on the basis of these parameters. The seventeen criteria was taken with total of 205 weightage points. The criterion taken are availability of drinking water, irrigation, degree of soil erosion, water holding capacity, area under rainfed agriculture, status of field bund/contour bund / graded bund, presence of hard rock below the land, options for livelihood, percentage of small and marginal farmers, degraded land, ground water status, status of technical knowledge for improved farming systems, weather conditions, poverty index (% of poor population), virginity of land, productivity potential of land and soil organic carbon status. The IWMP –V micro-watershed scores 91.64 per cent weightage points (Table 1.3).

Over exploitation of existing vegetation, expansion of agricultural activities on degraded lands without due care of soil and water resources and faulty cultural practices on medium to shallow soils has aggravated the situation as resulted in wide spread erosion and land degradation. In many of the areas the parent rock is exposed. Even most of the agricultural land has been converted to wasteland. Due to reduction in vegetal cover and no provision for surface water storage, all the rain water runs along with soil particles. Ground water recharge is negligible on account of rocky sub strata causing slow growth of trees and low yield of crops. This situation can certainly be corrected by *in-situ* water harvesting and planting of trees in agricultural fields, on bunds and wastelands. To achieve sustainable development, IWMP –V micro-watershed is proposed to be developed with following long term objectives:

Long Term Objectives:

- To optimize productivity of the land
- To restore ecological balance in degraded and fragile eco-system
- To narrow down the disparity between rainfed and irrigated areas
- To create sustained employment opportunities

Table 1.2: Criteria and weightage for selection of watershed

S. No.	Criteria	Maximum Score	Range & Score			
1	Drinking water	15	**Very poor** Dependence on water supply through tanker (15)	**Poor** Partial availability within the periphery of 3-4 km (10)	**Good** Round the availability within the periphery of 3-4 km (5)	**Very Good** Round the year availability in watershed (0)
2	Irrigation	10	No irrigation (10)	Life saving irrigation (7.5)	Partial life saving irrigation (5)	Fully covered (0)
3	Degree of soil erosion	10	Severe (10)	Medium (7.5)	Low (5)	No erosion (0)
4	Water holding capacity	10	Very poor (10)	Poor (7.5)	Good (5)	Very Good (0)

5	Area under rainfed agriculture	15	More than 90% (15)	80 to 90 % (10)	70 to 80 % (5)	Below 70% (Reject) (0)
6	Status of field bund/contour bund / graded bund	10	Below 20 % (10)	50 to 20 % (7.5)	80 to 50% (5)	Above 80% (2.5)
7	Presence of hard rock below the land	15	Hard rock starts from 5 to 20 feet (15)	Hard rock starts from 21 to 50 feet (10)	Hard rock starts from 51 to 100 feet (5)	Deep soil depth (0)
8	Options for livelihood	10	Very poor (10)	Poor (7.5)	Good (5)	Very Good (0)
9	% of small and marginal farmers	10	More than 80% (10)	50 to 80 % (5)	Less than 50% (3)	
10	Degraded land	15	High above 50% (15)	Medium 25 to 50% (10)	Low less than 10 – 25 % (5)	Very low Less than 10% (0)
11	Ground water status	10	Very poor (10)	Poor (7.5)	Good (5)	Very Good (0)
12	Status of Technical Knowledge for improved farming systems	10	Very poor (10)	Poor (7.5)	Good (5)	Very Good (0)
13	Weather condition	15	Uncertain weather condition / Continuous drought for three years (15)	Drought comes one in five years (10)	Drought comes one in ten years (5)	Normal weather condition (0)
14	Poverty index (% of poor population)	10	Above 80% (10)	80 to 50 (7.5)	50 to 20 % (5)	Below 20 % (2.5)
15	Virginity (No treatment /intervention in last five years)	10	Above 80% (10)	80 to 50 (7.5)	50 to 20 % (5)	Below 20 % (2.5)
16	Productivity potential of land	15	Lands with low production & where productivity can be significantly enhanced	Lands with moderate production & where productivity can be enhanced with	Lands with high production & where productivity can be marginally enhanced	-

			with reasonable efforts (15)	reasonable efforts (10)	with reasonable efforts (5)	
17	Organic carbon status	15	Very low (15)	Low (10)	Medium (5)	Normal (0)

Table 1.3: Weightage of the project

S. No.	Criteria	Weightage points
1	Drinking water	10
2	Irrigation	10
3	Degree of soil erosion	10
4	Water holding capacity	7.5
5	Area under rainfed agriculture	15
6	Status of field bund/contour bund / graded bund	10
7	Presence of hard rock below the land	10
8	Options for livelihood	10
9	% of small and marginal farmers	10
10	Degraded land	15
11	Ground water status	10
12	Status of Technical Knowledge for improved farming systems	10
13	Weather condition	15
14	Poverty index (% of poor population)	10
15	Virginity	10
16	Productivity potential of land	10
17	Organic carbon status	15
	Total Weightage (Out of total 205)	**187.5**
	Weightage Percentage	**91.46**

1.3 General Description of the Watershed

Table 1.4: Project at a Glance

S. No.	Particulars	Details
1.	Name of State	Uttar Pradesh
2.	Name of Project	IWMP –V
3.	Name of District	Jhansi
4.	Name of Block	Bamaur
6.	Four Major reasons for selection of watershed	Erosion

		Nutrient loss Water scarcity Low productivity
8.	Catchment	Betwa River
9.	Name, Address of PIA	Bhumi Sanrakshan Adhikari, Deptt. of Land Development & Water Resource, IWMP –V, Moth, Jhansi
10.	Area of the Project (ha)	7136.92
11	Area proposed to be treated (ha)	5970.00
12	Year of Sanction	2010-11
13	Duration of Project	4 yrs
14	Project Cost (Rs. In Lakh)	716.40

1.4 Details of ongoing watershed programme

Presently, no watershed development programme is going on in the micro-watershed.

CHAPTER - 2

GENERAL DESCRIPTION OF PROJECT AREA

2.1 Location: The IWMP –V micro-watershed is located in Bamaur block of Jhansi district. It is about 85 km from Jhansi on Jhansi to Gursarain to Bamaur road. The details of location of each micro-watershed are given below:

Maletha	Longitude	
	Latitude	
Kudri	Longitude	79^0 13' 9.48" - 79^0 16' 18.88" E
	Latitude	25^0 45' 21.32" – 25^0 47' 46.77" N
Dundi-I	Longitude	79^0 14' 15.95" - 79^0 15' 42.21" E
	Latitude	25^0 44' 31.75" – 25^0 46' 22.58" N
Dundi-II	Longitude	79^0 12' 57.52" - 79^0 15' 3.94" E
	Latitude	25^0 44' 23.23" – 25^0 46' 2.21" N
Kurentha	Longitude	79^0 13' 0.00" - 79^0 15' 30.00" E
	Latitude	25^0 43' 30.00" – 25^0 44' 30.0" N
Dakhaneswar	Longitude	79^0 12' 24.80" - 79^0 14' 40.74" E
	Latitude	25^0 40' 51.71" – 25^0 43' 34.49" N
Garhawai	Longitude	79^0 12' 4.46" - 79^0 13' 26.55" E
	Latitude	25^0 40' 40.32" – 25^0 42' 33.05" N
Pahra	Longitude	
	Latitude	
Dhanaura	Longitude	79^0 12' 4.46" - 79^0 13' 26.55" E
	Latitude	25^0 40' 40.32" – 25^0 42' 33.05" N

2.2 Area and Landuse: The total geographical area of the all micro-watershed is 7136.92 ha, out of which 5970.00 ha. is the treatable. The entire watershed is rainfed and about 10 per cent area has life saving irrigation mainly through open shallow dug wells. General topography of the watershed is mild to gentle (<1%). It has the general appearance of a plain dotted with isolated low and undulated area. The details of each MWS in respect of land use is depicted in Table 2.1:

Table 2.1: Details of land use IWMP –V Project (Area in ha)

S. No.	Name of Village	Total Geographical Area	Rainfed Area	Waste Land	Total Treatable Area (ha)	Settlement and Road	Area under assured irrigation (ha)	
							Water Bodies	Dug/Bore wells
1.	Maletha	987.68	152.625	672.38	825	35.35	48.15	79.18
2	Kudri	868.62	141.375	583.63	725	48.26	36.88	58.48
3	Dundi-I	693.9	124.7	455.30	580	39.48	30.19	44.23
4	Dundi-II	697.51	90.68	494.33	585	32.84	31.52	48.15
5	Kurentha	713.97	113.05	481.95	595	36.18	30.41	52.38
6	Dakhaneswar	790.77	114.18	545.82	660	40.13	40.19	50.45
7	Garhawai	563.57	89.30	385.70	475	25.96	21.35	41.26
8	Pahra	690.77	106.38	468.63	575	30.96	34.18	50.63
9	Dhanaura	1130.13	147.25	802.75	950	51.16	58.86	70.11
	Total	7136.92	1079.53	4890.47	5970	340.32	331.73	494.87

2.3 Physiography:

The IWMP –V watersheds is situated at an elevation of some 103 to 185 m above mean sea level and has relief from 28 to 60 m. The watershed has a general slope of less than 1 per cent. General topography of the watershed is mild to gentle. The recharge of wells is very slow as it depends on perched water. Most of the area is mono-cropped due to lack of irrigation facilities. In the absence of effective field/contour/graded bunding area is affected by severe soil erosion along with nutrient loss. Heavy erosion in the absence of bunds is the major reason for the development of multi-directional slopes in the watershed. The details of Digital Elevation Model, slope and drainage pattern of the micro-watershed are described in subsequent section.

2.3.1 Digital Elevation Model (DEM): A DEM is a digital file of terrain elevations for ground positions. It is a raster representing the elevations of the ground and objects. Besides providing a source of elevation, the DEM may be used for topographic information, flow pattern, flood risk areas identification and to determine accessibility. The DEM of IWMP –V micro-watershed is shown in map section. Outlet of the watershed was located at 103 m above msl, whereas land elevation varied from 103 to 185 m in the watershed.

Elevation

Name of MWS	Minimum	Maximum	Relief
Maletha			
Kudri	103	163	60
Dundi-I	128	162	34
Dundi-II	136	170	34
Kurentha	141	169	28

Dakhaneswar	151	181	30
Garhawai	157	185	28
Pahra			
Dhanaura	130	163	33

2.3.2 Slope Map Slope and aspect of a region are vital parameters in deciding suitable land use, as the degree and direction of the slope decide the land use that it can support. Slope is also very important while determining the land irrigability and land capability classification and has direct bearing on runoff.

Spatial distribution of different slope classes was prepared using Arc GIS and is shown in map section. Slope was divided into three classes viz. 0-3, 3-5, and more than 5 per cent. Per cent areal extent of different slope classes in IWMP –V micro-watershed is shown in Table 2.2. The dominant slope category in the micro-watershed were 0-5 per cent (80%) followed by 5-8 per cent (15.50%). It was also noticed that slope of major area of agricultural land varied from 0-8 per cent.

Table 2.2. Areal extent of various slope classes in the micro-watershed

Slope categories (%)	Area (ha)	Percent of total area
MWS-	**Maletha**	
0-3		50.18
3-5		34.26
5-8		10.42
> 8		5.14
Total		**100.00**
MWS-	**Kudri**	
0-3	430.14	49.52
3-5	282.56	32.53
5-8	90.77	10.45
> 8	65.15	7.50
Total	**868.62**	**100.00**
MWS-	**Dundi-I**	
0-3	292.48	42.15
3-5	333.00	47.99
5-8	39.41	5.68
> 8	29.01	4.18
Total	**693.90**	**100.00**
MWS-	**Dundi-II**	
0-3	146.48	21.00
3-5	362.71	52.00

5-8	111.60	16.00
> 8	76.73	11.00
Total	**697.51**	**100.00**
MWS-	**Kurentha**	
0-3	504.60	70.68
3-5	174.64	24.46
5-8	28.32	3.97
> 8	6.41	0.90
Total	**713.97**	**100.00**
MWS-	**Dakhaneswar**	
0-3	332.12	42.00
3-5	205.60	26.00
5-8	173.97	22.00
> 8	79.08	10.00
Total	**790.77**	**100.00**
MWS-	**Garhawai**	
0-3	293.06	52.00
3-5	118.35	21.00
5-8	90.17	16.00
> 8	61.99	11.00
Total	**563.57**	**100.00**
MWS-	**Pahra**	
0-3		
3-5		
5-8		
> 8		
Total		
MWS-	**Dhanaura**	
0-3	867.36	76.70
3-5	231.64	20.48
5-8	29.52	2.61
> 8	2.40	0.21
Total	**1130.92**	**100.00**

2.3.3 Drainage Map

Drainage of the watershed was digitized in GIS environment (Fig. 2.1). Maximun order of micro-watersheds varied from II to IVth. The detailed description of the drainage network are gven in section 2.5.

2.4 Climate:

The annual rainfall of the Bundelkhand region varies from 800 to 1300 mm, about 90% of which is received during South-West monsoon period (Singh *et al*. 2002). The major part of the rainfall is received during the month of July and August. The length of growing season in Bundelkhand ranges between 90 to 150 days depending upon rainfall and temperature regimes. The winter rains are erratic, occasional, meager and uncertain. The total rainy days/year vary from 30-45 in the region with an average of 37. The distribution of rainfall is very erratic. Low rainfall and drought are common features. Long dry spells during rainy season are also experienced often, which adversely affect the crops. It has been observed that in a cycle of 5 years, 2 are normal, 2 drought years and 1 is excessive rainfall year (Tiwari *et al*. 1998). Further, with the analysis of fifty years (1946-1995) rainfall data of Jhansi it was observed that 18 % of the years were drought, 68% normal and 14% were surplus years, implying that there is likelihood of one drought year in 5 year span (Singh *et al*. 2002). However, since last 9 years, 7 were drought years (2002, 2004, 2005 2006, 2007, 2009, 2010), out of which, 4 years (2004-2007) were severe drought. This phenomenon is likely to be recurrent in view of rise in temperature due to global warming. This acute drought led to heavy out migration to the extent of 48% of total population towards big cities in search of livelihood in 2007-08 (Anonymous 2008a). A long term 64 years of rainfall and rainy days (Fig. 2.3) analysis of Jhansi indicates a declining trend. However, a slight increase in average maximum temperature during Nov.-Feb. months (Table 2.6) and a slight decrease in average temperature during Jan. and Feb. (Table 2.5) was observed.

The climate of Jhansi is characterized by a hot dry summer and cold winter and is marked for high variability of rainfall year to year. There are primarily four seasons: – Dry Summer season – from March to May i.e. before advent of monsoon, moist summer season – from June to September (Monsoon) transition period - in October and November, which is the post monsoon period, and winter season – from December to February The coldest months in the year are December and January.

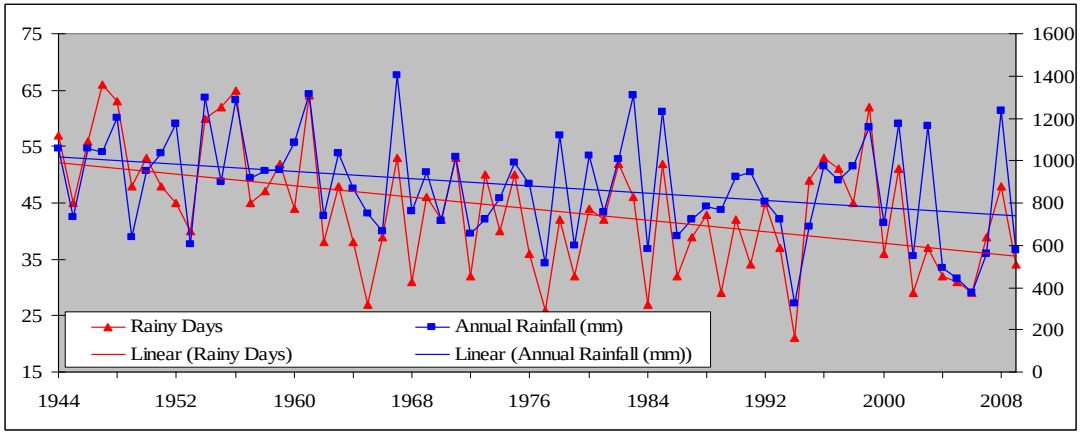


Fig. 2.3: Annual rainfall and rainy days during last 64 years at Jhansi*

Table 2.3: Cumulative yearly rainfall, average maximum and minimum temperature at Jhansi, (1975-2009)*.

Year	Rainfall (mm)	Avg. maximum temp. (^{0}C)	Avg. minimum temp. (^{0}C)
1975	875.4	32.0	17.2
1976	1104.3	32.1	17.2
1977	859.5	32.5	17.5
1978	1066.9	31.7	17.4
1979	632.5	32.5	17.8
1980	1236.7	33.0	19.0
1981	712.7	33.0	18.3
1982	1193.3	31.3	17.4
1983	1268.8	32.2	16.8
1984	769.4	32.5	16.3
1985	1137.9	33.5	18.3
1986	867.6	32.1	17.7
1987	855.2	34.6	18.5
1988	815.9	33.6	18.2
1989	610.5	32.5	17.2
1990	1097.4	31.8	17.4
1991	944.0	31.7	16.1
1992	806.4	32.2	16.6
1993	722.8	32.1	16.4
1994	559.8	32.2	16.8

1995	778.9	32.3	16.4
1996	965.7	31.8	17.1
1997	907.7	30.4	16.9
1998	971.6	32.1	18.0
1999	1159.8	32.6	17.5
2000	705.6	32.4	16.8
2001	1173.7	32.1	16.6
2002	546.3	33.2	17.6
2003	1163.3	32.1	17.8
2004	491.3	32.5	17.5
2005	-	-	-
2006	375.2	31.4	17.1
2007	558.1	-	-
2008	1238.3	-	-
2009	578.0		

Table 2.4: Dynamics of rainfall and rainydays*

Parameters	**1944-2009**	**1944-2000**	**2001-2009**
Average rainfall (mm)	877.4	900.8	729.4
Average rainydays	44	45	37

Table 2.5: Dynamics of average minimum temperature (Degree Celsius)*

Period	**Nov.**	**Dec.**	**Jan.**	**Feb.**
1975-84	**11.6**	**7.0**	**6.5**	**8.8**
1985-94	**11.1**	**6.4**	**6.1**	**8.7**
1995-2006	**11.4**	**7.0**	**5.8**	**8.6**

Table 2.6: Dynamics of average maximum temperature (Degree Celsius)*

Parameters	Nov.	Dec.	Jan.	Feb.
1975-84	29.5	24.1	23.2	26.5
1985-94	29.4	24	23.5	26.6
1995-2006	29.9	24.7	21.6	25.9

**Source: Indian Grassland and Fodder Research Institute, National Research Centre for Agroforestry, Jhansi and IMD, Pune)*

The average rainfall of Jhansi district is 877.4 mm (1944-2009) with average rainy days of 44. Out of 66 years, 35 years received less than the average rainfall. In spite of the fairly decent average rainfall of the districts, its uncertainty and erratic behavior leads to dry spells causing droughts. There has been severe drought, a famine like situation from 2004 until 2007. The uncertainty in the rainfall is the main reason of poor agriculture yield. Rain is also received in a very small amount during November to May, but this rain is very important for agriculture in this region. This rain is called "Mahawat" in the vernacular language. The brief account of drought since 2004 in the region is depicted in Table 2.7.

Table 2.7: Details of drought in the project area

Sr. No.	Particular	Villages	Years	Intensity
1.	Drought	IWMP –V	2004-05	Severe
			2005-06	Severe
			2006-07	Severe
			2007-08	Severe
			2008-09	Normal
			2009-10	severe

2.5 Watershed Characteristics

The analysis was achieved through the measurement of linear, areal and relief aspects of the basin using Arc GIS. The characteristics were studied micro-watershed wise and presented in subsequent section:

Maletha micro-watershed

A. Linear aspects

Stream order	Number of streams (N_u)	Stream length (L_u) (km)	Mean stream length (L_{sm}) (km)	Stream length ratio (R_L)		Bifurcation ratio (R_b)	
				II / I	III / II	I / II	II / III
1	2	3	4	5		6	
I	6	3.303	0.551	1.99	-	3.00	-
II	2	6.58	3.290				

Linear aspects cotnd…

Mean bifurcation ratio (R_{bm})	Length of the overland flow (L_g) (km)	Basin length (L_b) (km)	Basin perimeter (P) (km)	Fineness ratio (R_{fn})	Length of main channel (L_m) (km)
7	**8**	**9**	**10**	**11**	**12**
3.00	0.565	3.548	13.902	0.26	4.232

B. Areal aspect

Drainage/ basin area, A (km^2)	Drainage density, D (km/km^2)	Constant of channel maintenance, C	Stream frequency, F_s	Circulatory ratio, R_c
1	**2**	**3**	**4**	**5**
11.1623	0.89	1.13	0.72	0.73

Areal aspect contd…

Elongation ratio, R_e	Form factor, R_f	Unity shape factor, R_u	Watershed shape factor, W_s	Drainage texture ratio, R_t
6	**7**	**8**	**9**	**10**
1.06	0.89	1.06	1.12	0.58

C. Relief aspect

Total relief, H (m)	Relief ratio, R_h	Relative relief, R_p	Ruggedness number, R_n
1	**2**	**3**	**4**
27	0.0076	0.002	0.02

Kudri micro-watershed

A. Linear aspects

Stream order	Number of streams (N_u)	Stream length (L_u) (km)	Mean stream length (L_{sm}) (km)	Stream length ratio (R_L)		Bifurcation ratio (R_b)	
				II / I	III / II	I / II	II / III
1	**2**	**3**	**4**	**5**		**6**	
I	34	13.902	0.409				
II	11	8.14	0.740				
III	1	3.199	3.199	0.59	0.39	3.09	11.00

Linear aspects cotnd…

Mean bifurcation ratio (R_{bm})	Length of the overland flow (L_g) (km)	Basin length (L_b) (km)	Basin perimeter (P) (km)	Fineness ratio (R_{fn})	Length of main channel (L_m) (km)
7	**8**	**9**	**10**	**11**	**12**
7.05	0.172	3.124	17.549	0.18	5.761

B. Areal aspect

Drainage/ basin area, A (km^2)	Drainage density, D (km/km^2)	Constant of channel maintenance, C	Stream frequency, F_s	Circulatory ratio, R_c
1	**2**	**3**	**4**	**5**
8.69	2.91	0.34	5.30	0.35

Areal aspect contd…

Elongation ratio, R_e	Form factor, R_f	Unity shape factor, R_u	Watershed shape factor, W_s	Drainage texture ratio, R_t
6	**7**	**8**	**9**	**10**
1.06	0.89	1.06	1.73	2.62

C. Relief aspect

Total relief, H (m)	Relief ratio, R_h	Relative relief, R_p	Ruggedness number, R_n
1	**2**	**3**	**4**
60	0.0192	0.003	0.17

Dundi-I micro-watershed

B. Linear aspects

Stream order	Number of streams (N_u)	Stream length (L_u) (km)	Mean stream length (L_{sm}) (km)	Stream length ratio (R_L)			Bifurcation ratio (R_b)		
				II/I	III/ II	IV/III	I/II	II/III	III/IV
1	**2**	**3**	**4**	**5**			**6**		
I	12	4.556	0.380						
II	3	3.71	1.237						
IV	1	3.336	3.336	0.81	0.00	0	4.00	0	0.00

Linear aspects cotnd…

Mean bifurcation ratio (R_{bm})	Length of the overland flow (L_g) (km)	Basin length (L_b) (km)	Basin perimeter (P) (km)	Fineness ratio (R_{fn})	Length of main channel (L_m) (km)
7	**8**	**9**	**10**	**11**	**12**
0	0.420	2.76	9.59	0.29	4.088

B. Areal aspect

Drainage/ basin area, A (km^2)	Drainage density, D (km/km^2)	Constant of channel maintenance, C	Stream frequency, F_s	Circulatory ratio, R_c
1	**2**	**3**	**4**	**5**
6.94	1.19	0.84	2.16	0.95

Areal aspect contd…

Elongation ratio, R_e	Form factor, R_f	Unity shape factor, R_u	Watershed shape factor, W_s	Drainage texture ratio, R_t
6	**7**	**8**	**9**	**10**
1.08	0.91	1.05	1.37	1.56

C. Relief aspect

Total relief, H (m)	Relief ratio, R_h	Relative relief, R_p	Ruggedness number, R_n
1	**2**	**3**	**4**
34	0.0123	0.004	0.04

Dundi-II micro-watershed

A. Linear aspects

Stream order	Number of streams (N_u)	Stream length (L_u) (km)	Mean stream length (L_{sm}) (km)	Stream length ratio (R_L)		Bifurcation ratio (R_b)	
				II / I	III / II	I / II	II / III
1	**2**	**3**	**4**	**5**		**6**	
I	16	6.703	0.419				
II	6	5.453	0.909				
III	1	0.338	0.338	0.81	0.06	2.67	6.00

Linear aspects cotnd…

Mean bifurcation ratio (R_{bm})	Length of the overland flow (L_g) (km)	Basin length (L_b) (km)	Basin perimeter (P) (km)	Fineness ratio (R_{fn})	Length of main channel (L_m) (km)
7	**8**	**9**	**10**	**11**	**12**
4.33	0.286	2.868	10.418	0.28	2.073

B. Areal aspect

Drainage/ basin area, A (km^2)	Drainage density, D (km/km^2)	Constant of channel maintenance, C	Stream frequency, F_s	Circulatory ratio, R_c
1	**2**	**3**	**4**	**5**
7.14	1.75	0.57	3.22	0.83

Areal aspect contd…

Elongation ratio, R_e	Form factor, R_f	Unity shape factor, R_u	Watershed shape factor, W_s	Drainage texture ratio, R_t
6	**7**	**8**	**9**	**10**
1.05	0.87	1.07	0.69	2.21

C. Relief aspect

Total relief, H (m)	Relief ratio, R_h	Relative relief, R_p	Ruggedness number, R_n
1	**2**	**3**	**4**
34	0.0119	0.003	0.06

Kurentha micro-watershed

A. Linear aspects

Stream order	Number of streams (N_u)	Stream length (L_u) (km)	Mean stream length (L_{sm}) (km)	Stream length ratio (R_L)		Bifurcation ratio (R_b)	
				II / I	III / II	I / II	II / III
1	**2**	**3**	**4**	**5**		**6**	
I	23	10.601	0.461				
II	6	4.804	0.801				
III	1	1.624	1.624	0.45	0.34	3.83	6.00

Linear aspects cotnd…

Mean bifurcation ratio (R_{bm})	Length of the overland flow (L_g) (km)	Basin length (L_b) (km)	Basin perimeter (P) (km)	Fineness ratio (R_{fn})	Length of main channel (L_m) (km)
7	**8**	**9**	**10**	**11**	**12**
4.92	0.203	2.016	12.821	0.16	4.293

B. Areal aspect

Drainage/ basin area, A (km^2)	Drainage density, D (km/km^2)	Constant of channel maintenance, C	Stream frequency, F_s	Circulatory ratio, R_c
1	**2**	**3**	**4**	**5**
6.9077	2.47	0.41	4.34	0.53

Areal aspect contd…

Elongation ratio, R_e	Form factor, R_f	Unity shape factor, R_u	Watershed shape factor, W_s	Drainage texture ratio, R_t
6	**7**	**8**	**9**	**10**
1.47	1.70	0.77	1.45	2.34

C. Relief aspect

Total relief, H (m)	Relief ratio, R_h	Relative relief, R_p	Ruggedness number, R_n
1	**2**	**3**	**4**
28	0.0139	0.002	0.07

Dakhaneswar micro-watershed

A. Linear aspects

Stream order	Number of streams (N_u)	Stream length (L_u) (km)	Mean stream length (L_{sm}) (km)	Stream length ratio (R_L)		Bifurcation ratio (R_b)	
				II / I	III / II	I / II	II / III
1	**2**	**3**	**4**	**5**		**6**	
I	11	6.406	0.582				
II	5	4.253	0.851				
III	1	1.861	1.861	0.66	0.44	2.20	5.00

Linear aspects cotnd…

Mean bifurcation ratio (R_{bm})	Length of the overland flow (L_g) (km)	Basin length (L_b) (km)	Basin perimeter (P) (km)	Fineness ratio (R_{fn})	Length of main channel (L_m) (km)
7	**8**	**9**	**10**	**11**	**12**
3.60	0.316	4.523	15.65	0.29	3.268

B. Areal aspect

Drainage/ basin area, A (km^2)	Drainage density, D (km/km^2)	Constant of channel maintenance, C	Stream frequency, F_s	Circulatory ratio, R_c
1	**2**	**3**	**4**	**5**
7.908	1.58	0.63	2.15	0.41

Areal aspect contd…

Elongation ratio, R_e	Form factor, R_f	Unity shape factor, R_u	Watershed shape factor, W_s	Drainage texture ratio, R_t
6	**7**	**8**	**9**	**10**
0.70	0.39	1.61	1.03	1.09

C. Relief aspect

Total relief, H (m)	Relief ratio, R_h	Relative relief, R_p	Ruggedness number, R_n
1	**2**	**3**	**4**
30	0.0066	0.002	0.05

Garhawai micro-watershed

A. Linear aspects

Stream order	Number of streams (N_u)	Stream length (L_u) (km)	Mean stream length (L_{sm}) (km)	Stream length ratio (R_L)	Bifurcation ratio (R_b)
				II / I	**I / II**
I	6	2.946	0.491	0.74	6.00
II	1	2.174	2.174		

Linear aspects cotnd…

Mean bifurcation ratio (R_{bm})	Length of the overland flow (L_g) (km)	Basin length (L_b) (km)	Basin perimeter (P) (km)	Fineness ratio (R_{fn})	Length of main channel (L_m) (km)
6.00	0.550	3.45	9.631	0.36	2.719

B. Areal aspect

Drainage/ basin area, A (km^2)	Drainage density, D (km/km^2)	Constant of channel maintenance, C	Stream frequency, F_s	Circulatory ratio, R_c
5.636	0.91	1.10	1.24	0.76

Areal aspect contd…

Elongation ratio, R_e	Form factor, R_f	Unity shape factor, R_u	Watershed shape factor, W_s	Drainage texture ratio, R_t
0.78	0.47	1.45	1.01	0.73

C. Relief aspect

Total relief, H (m)	Relief ratio, R_h	Relative relief, R_p	Ruggedness number, R_n
28	0.0081	0.003	0.03

Pahra micro-watershed

A. Linear aspects

Stream order	Number of streams (N_u)	Stream length (L_u) (km)	Mean stream length (L_{sm}) (km)	Stream length ratio (R_L)		Bifurcation ratio (R_b)	
				II / I	III / II	I / II	II / III
1	**2**	**3**	**4**	**5**		**6**	
I	14	7.896	0.564				
II	3	2.497	0.832				
III	1	1.385	1.385	0.32	0.55	4.67	3.00

Linear aspects cotnd…

Mean bifurcation ratio (R_{bm})	Length of the overland flow (L_g) (km)	Basin length (L_b) (km)	Basin perimeter (P) (km)	Fineness ratio (R_{fn})	Length of main channel (L_m) (km)
7	**8**	**9**	**10**	**11**	**12**
3.83	0.284	3.74	11.842	0.32	2.995

B. Areal aspect

Drainage/ basin area, A (km^2)	Drainage density, D (km/km^2)	Constant of channel maintenance, C	Stream frequency, F_s	Circulatory ratio, R_c
1	**2**	**3**	**4**	**5**
6.69	1.76	0.57	2.69	0.60

Areal aspect contd…

Elongation ratio, R_e	Form factor, R_f	Unity shape factor, R_u	Watershed shape factor, W_s	Drainage texture ratio, R_t
6	**7**	**8**	**9**	**10**
0.78	0.48	1.45	1.03	1.52

C. Relief aspect

Total relief, H (m)	Relief ratio, R_h	Relative relief, R_p	Ruggedness number, R_n
1	**2**	**3**	**4**
31	0.0083	0.003	0.05

Dhanaura micro-watershed

A. Linear aspects

Stream order	Number of streams (N_u)	Stream length (L_u) (km)	Mean stream length (L_{sm}) (km)	Stream length ratio (R_L)			Bifurcation ratio (R_b)		
				II/I	III/II	IV/III	I/II	II/III	III/IV
1	**2**	**3**	**4**	**5**			**6**		
I	8	4.666	0.583						
II	3	6.142	2.047						
III	2	3.765	1.883						
IV	1	0.202	0.202	1.32	0.61	0.05	2.67	1.50	2.00

Linear aspects cotnd…

Mean bifurcation ratio (R_{bm})	Length of the overland flow (L_g) (km)	Basin length (L_b) (km)	Basin perimeter (P) (km)	Fineness ratio (R_{fn})	Length of main channel (L_m) (km)
7	**8**	**9**	**10**	**11**	**12**
2.06	0.388	4.17	17.859	0.23	8.42

B. Areal aspect

Drainage/ basin area, A (km^2)	Drainage density, D (km/km^2)	Constant of channel maintenance, C	Stream frequency, F_s	Circulatory ratio, R_c
1	**2**	**3**	**4**	**5**
11.31	1.29	0.78	1.15	0.45

Areal aspect contd…

Elongation ratio, R_e	Form factor, R_f	Unity shape factor, R_u	Watershed shape factor, W_s	Drainage texture ratio, R_t
6	**7**	**8**	**9**	**10**
0.91	0.65	1.24	2.22	0.73

C. Relief aspect

Total relief, H (m)	Relief ratio, R_h	Relative relief, R_p	Ruggedness number, R_n
1	**2**	**3**	**4**
33	0.0079	0.002	0.04

2.6 Soil and Land Capability Classification

The total area of the project is 7136.92 ha, out of which 5970.00 ha. is under treatment. Most of the soil is black (*Mar, Kabar* & *Mar Kabar* mixed). The nutritional health of soil is very poor due to severe erosion from the watershed. The nutrient status of the micro-watershed is depicted in Table 2.8. The land capability classification of each micro-watershed was also studied and presented in individual DPR of micro-watershed.

Table 2.8: Nutrient status of soils in IWMP –V project

S. No.	Name of Village	Type of Soil	pH	Organic Carbon %	Available Phosphorus kg/ha	Available Potash kg/ha
1	Maletha	Mar/Kabar mixed	7.1	0.20	15.60	258.35
		Purwa	7.2	0.23	16.35	262.90
2	Kudri	Mar/Kabar mixed	7.3	0.33	22.52	279.00
		Mar	7.5	0.36	23.50	284.80
3	Dundi-I	Kabar	7.1	0.21	17.50	278.35
		Purwa	7.2	0.24	18.25	275.90
4	Dundi-II	Mar	7.4	0.27	19.20	280.50
		Kabar	7.2	0.34	22.32	260.00
5.	Kurentha	Mar/Kabar mixed	7.7	0.25	23.00	285.80
		Purwa	6.9	0.20	9.35	256.90
6	Dakhaneswar	Kabar	7.0	0.22	11.30	261.50
		Mar/Kabar mixed	7.2	0.25	13.60	272.35
7.	Garhawai	Mar/Kabar mixed	7.3	0.30	15.52	279.00
		Purwa	7.5	0.35	16.50	284.80
8	Pahra	Purwa	7.2	0.22	17.60	277.35
9	Dhanaura	Mar/Kabar mixed	7.3	0.33	22.52	261.00

CHAPTER – 3

BASELINE SURVEY AND PARTICIPATORY RURAL APPRAISAL

Participatory rural appraisal (PRA) is a tool to appraise the socio-economic conditions along with all kind of resources available in the watershed through the active participation of the villagers. There are several tools and techniques of PRA. The PRA of Maletha, Kudri, Dundi-I, Dundi-II, Kurentha, Dakhaneswar, Garhawai, Pahra and Dhanaura micro-watershed was conducted and described in the subsequent sections.

3.1. Social-Economic Analysis

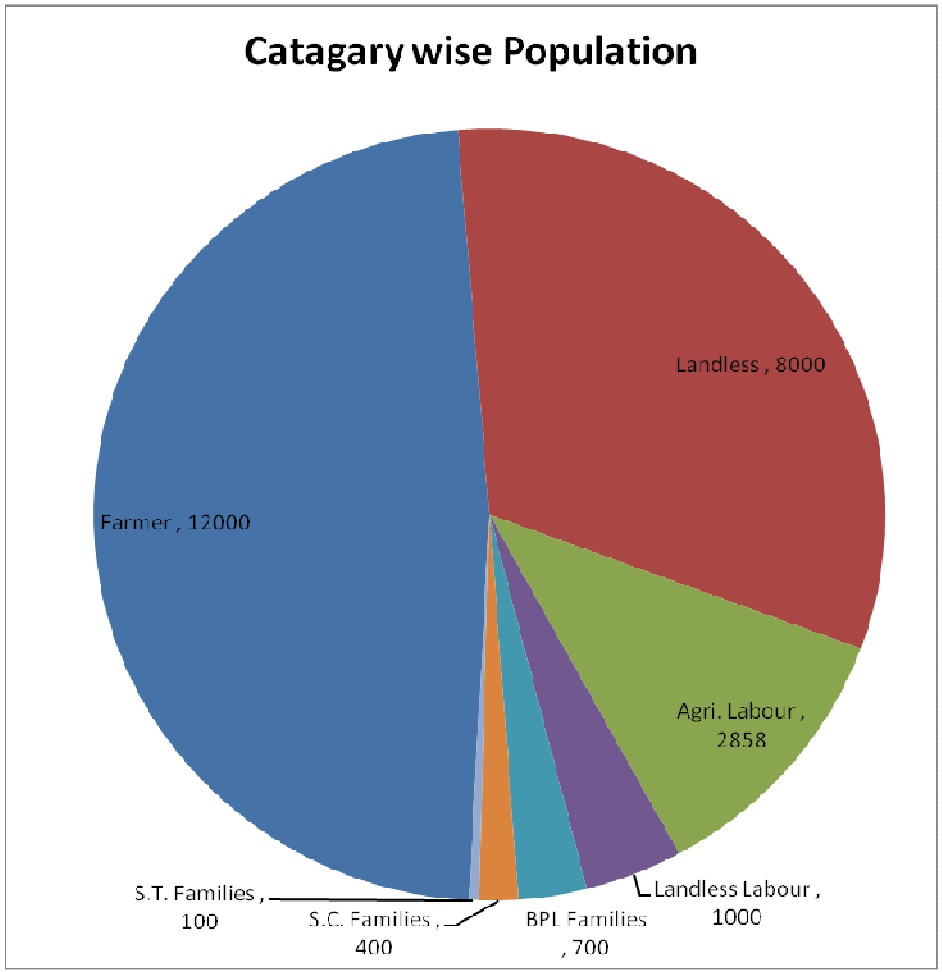
The Maletha, Kudri, Dundi-I, Dundi-II, Kurentha, Dakhaneswar, Garhawai, Pahra and Dhanaura micro-watershed mainly dominated by OBC and schedule caste.

Table 3.1: Demographic pattern of IWMP-V Project

S.No	Name of MWS	Population				Total Family no.
		Male	Female	Children	Total	
1	Maletha	800	700	1800	3300	550
2	Kudri	750	605	1585	2940	490
3	Dundi-I	780	640	1115	2535	390
4	Dundi-II	700	610	1290	2600	400
5	Kurentha	720	660	1090	2470	380
6	Dakhaneswar	700	620	1508	2828	435
7	Garhawai	510	420	1085	2015	310
8	Pahra	700	640	935	2275	345
9	Dhanaura	1135	980	1980	4095	630

It is apparent from the social profile that the micro-watershed is inhabited by different caste and class. In the micro-watershed, big and medium farmers have their pucca house while majority of marginal and small farmers have kachha houses. There was no definite pattern of settlement based on housing structure. The watershed dwellers get drinking water from hand pumps and face severe scarcity during summer. It was observed that the small and marginal farmers are not conscious about the education of children. The literacy of the MWS villages is very low.

The main occupation of the MWS dwellers is agriculture and animal husbandry; the landless families generate income for their livelihood mainly from labour. Category wise population and no. of families were depicted in Fig 3.1, however, migration from the project is depicted in Table 3.2.



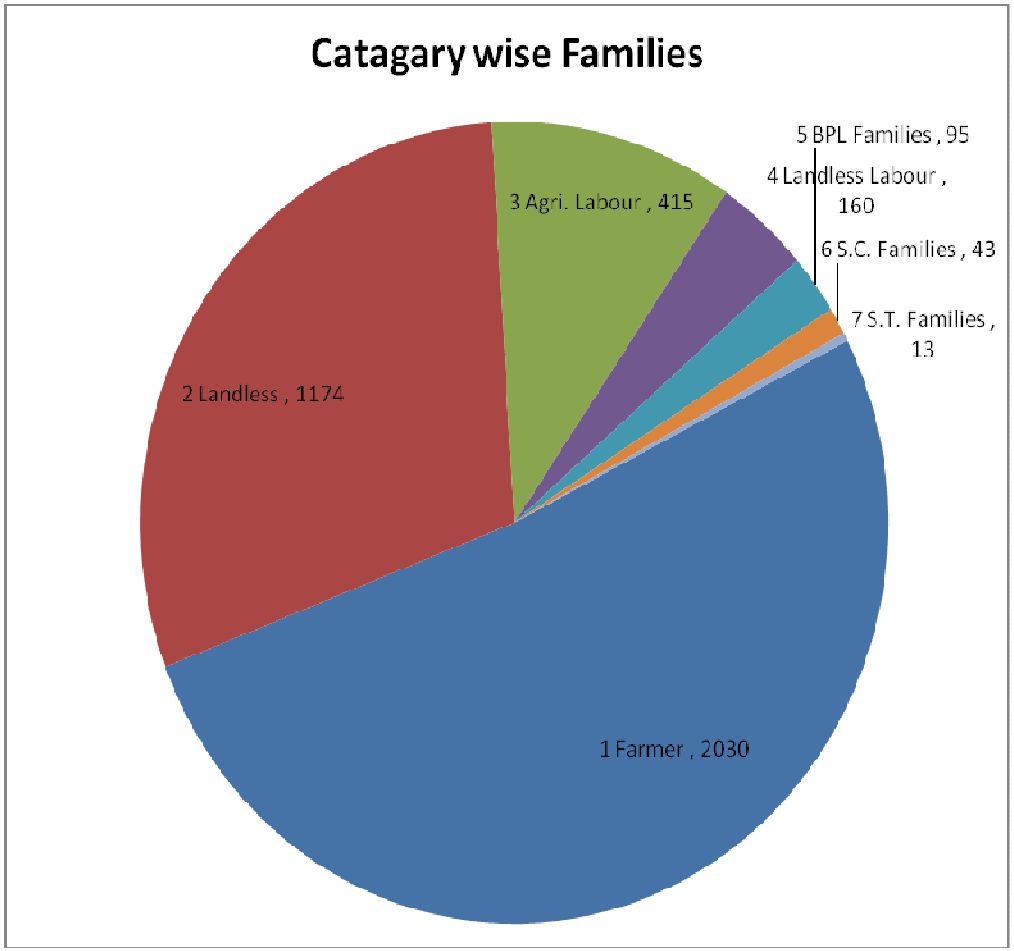


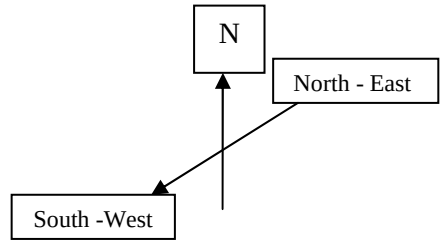
Fig 3.1: Category wise population and no. of families

Table 3.2: Migration status in the watershed during 2010-11

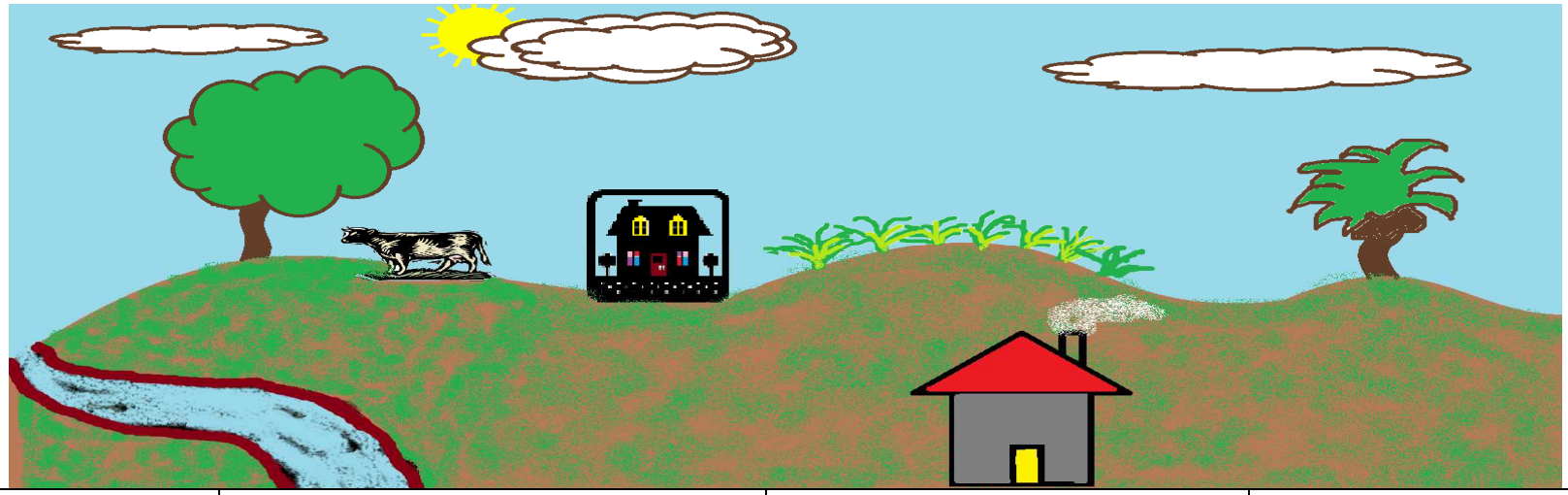
Sr. No.	Name of village	Total population	Migration			Migration Days			Reason for migration	Income during migration / month/head
			Male	Female	Total	<3 months	3-5 months	>5 months		
1	Maletha	3300	130	55	185	105	45	35	Due to drought	4800 to 5500
2	Kudri	2940	120	58	178	75	55	48	Due to drought	4800 to 5500
3	Dundi-I	2535	60	32	92	32	35	25	Due to drought	4800 to 5500
4	Dundi-II	2600	75	36	111	54	30	27	Due to drought	4800 to 5500
5.	Kurentha	2470	90	40	130	65	43	21	Due to drought	4800 to 5500
6.	Dakhaneswar	2828	92	40	132	60	50	32	Due to drought	4800 to 5500
7.	Garhawai	2015	80	42	122	62	35	25	Due to drought	4800 to 5500
8	Pahra	2275	110	53	163	75	65	23	Due to drought	4800 to 5500
9	Dhanaura	4095	150	70	220	95	75	50	Due to drought	4800 to 5500

3.2 Transect Walk

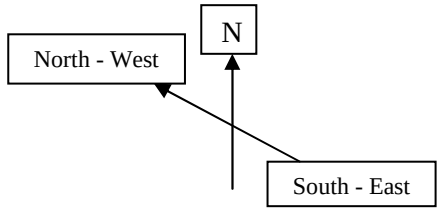
The main objective of the transect is to understand the major land uses, terrain, water resources, natural vegetation and different ecological zones by observing, interacting and discussing with the key informants, while walking in the different directions in all micro-watersheds. Two transect walk was taken with the key informants and the zone wise information are as follows:



First Transect Walk



Particulars	**Zone I (Low Land)**	**Zone II (Plain Land)**	**Zone III (Up land)**
Land	Kabar+Mar	Purwa	Raker
Animal	Buffalo	Goat, Cow	Goat
Trees	Palas, Kardhai, Mahua, Neem	Neem, Babool, Peepal, Sheesham	Desi Ber, Babool,
Dug Well / Bore Well	Not Sufficient Water 45-60 feet	Present (Almost dry)	-
Crops (Rabi)	Wheat and Mustard	Chickpea and Field Pea	Lentil
Kharif (Through discussion)	Moong and Urd	Urd and Jawar+Arhar,	Til
Water Bodies	Drain, Dug well	Drain starting, Dug well	-



second Transect Walk

Particulars	Zone I (Up land)	Zone II (Plain Land)	Zone III (Low Land)
Land	Purwa with kankar	Purwa	Kabar+Mar
Animal	Goat	Goat, Cow	Buffalo,Cow
Trees	Desi Ber, Babool,	Neem, Peepal Semal, Sheesham	Palas, Kardhai, Mahua, Neem
Dug Well / Bore Well	-	Present (Almost dry)	Not SufficientWater 40-45 feet
Crops (Rabi)	Lentil, chickpea	Chickpea, Field Pea, Linseed	Wheat, Barley
Kharif (Through discussion)	Til	Til, Urd, Jawar+Arhar,	Moong/Urd, Sorghum + Arhar
Water Bodies	- Dug well (Almost Dry)	Drain starting, Dug well	Drain, Dug well

Fig. 3.3: Severe erosion in the watershed

Fig. 3.2: Deep water table in open shallow dug well in the watershed

Fig. 3.2: Deep water table in open shallow dug well in the watershed

Fig. 3.3: Severe erosion in the watershed

3.3 Time Line Analysis

3.3.1 General time line

In IWMP –V Prpject development of major temporal events were as follows:

Sr. No.	Development Activity	Year
1	Establishment of Maletha, Kudri, Dundi-I, Dundi-II, Kurentha, Dakhaneswar, Garhawai, Pahra and Dhanaura	Around 15th to 18th Century
2	Opening of Primary school and Junior High school	1982 to 1990
3	Introduction of Tractor	1995
4	First Tube well	1987
5	First Motor cycle	1986
6	T.V. & D.V.D. player introduced	2003
7	Electricity in the villages	2007
8	Introduction of Mobile phone	2008

3.3.2 Agriculture and animal husbandry time line

Sr. No.	Particular	Year
	Agriculture	
1	Growing of pulses and Oilseeds	Since starting
2	Durum wheat	Since starting
3	Growing of wheat	1980
4.	Introduction of mixed cropping	1985
	Animal Husbandry	
1	Milking animals	Since starting
2	Introduction of cross-breed cows	1990
3	Goat	1992
4	Attack of diseases in animals	1994

3.4 Seasonality

3.4.1 Climate: The climate of IWMP –V Project is characterized by a hot dry summer and cold winter and is marked for high variability of rainfall year to year. There are primarily four seasons: – Dry Summer season – from March to May i.e. before advent of monsoon, moist summer season – from June to September (Monsoon) transition period - in October and November, which is the post monsoon period, and winter season – from December to February. August is the wettest month followed by July.

3.4.2 Crop and cropping pattern: The major crops cultivated in the micro-watershed area are lentil, chickpea, durum wheat, field pea and wheat and linseed mixed with mustard in *rabi* season. Out of total cultivated area of micro-watershed pulses alone occupied 79 per cent area. Rest of the area is occupied by wheat and oilseed crops.

3.4.3 Crop rotation: The following major crop rotation are being followed/

Sorghum + Arhar (duration 250 days)
Urd – Durum wheat
Urd/Moong - Field pea
Moong/Urd – Lentil + Linseed (Mixed)
Til - Chickpea / filed pea
Moong/urd – Wheat (Mustard mixed)

3.4.4 Pulses production calendar: Pulse crops cover maximum area in IWMP –V. During *kharif* season urd and moong are major pulse crop sown during monsoon season and entirely depends on rain. During *Rabi* season major pulses are lentil, chickpea and field pea which was grown by the farmers on conserved moisture during rainy season. The performance of *rabi* crops entirely depends on winter rains as the irrigation by open shallow dug wells is limited due to several factors. Farmers start preparation for *rabi* crop from the month October.

Crop calendar of Lentil at IWMP –V

	Rabi					***Kharif***				***Rabi***		
Crop cutting & Threshing		⟷						⟷				
Plant Protection	No											No
Irrigation	No										No	No
Weed Management												No
Tillage _ Nirai & Gudai												No
Land treatment										No		
Seed Treatment										No		
Sowing						⟷				⟷		
Use Fertilizer						⟷						
Land Preparation						⟷			⟷	⟷		
	January	February	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.

3.5 Availability of Fodder

Animal condition in IWMP –V Project was not found good due to unavailability of enough green fodder. It was observed that farmers of micro-watershed do not grow green fodder except sorghum in between the arhar crop during *kharif* season. During monsoon period animals freely grazed on the fields and in winter they fed on dry stems of sorghum and wheat straw (Annapratha).

3.6 Demand of Energy for Agriculture

Maximum energy is required in agriculture for land preparation and for life saving irrigation followed by harvesting and threshing. Maximum fuel requirement is observed in the month of October followed by February and March. For preparation of food and other domestic preparation farmers use cow dung (upla) and fuel wood of different trees as well as stem of pigeon pea. Some rich families also use LPG gas for food preparation.

3.7 Labour Requirement

Labour requirement was highest for agriculture operations in the month of February and March followed by September and October. Minimum labour was required in the month of August, December, January, May and June. Due to mono-cropping less labour requirement is observed in the micro watershed.

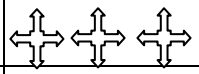
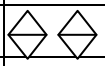
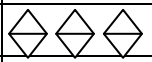
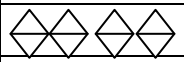
Expenditure was relatively highest in the month of October followed by February and March with the corresponding increase in demand of agriculture production activities viz. fuel for agriculture, fertilizers, seeds and labour credit need.

3.8 Changing Trends

The analysis of changing trend revealed that the population, number of crops, fertilizer application follow increasing trend, while cropping intensity, water availability and milk production are in decreasing trend mainly due to deficit rainfall and low water holding capacity of soil in the watershed. Detailed trend for past, present and future is depicted in the Table 3.4.

Table 3.3 Changing trends in the micro-watershed

Particulars	Past	Present	Future
Population	***	*****	******
Water Availability	00000	00	00000
Number of crops	###	#####	########
Use of fertilizers	@@	@@@@	@@
Use of Bio fertilizers	Nil	Nil	++++
Cropping Intensity	$$$	$$	$$$$
Food Quality	✧✧✧	✧✧	✧✧✧
Agriculture Production	△ △ △	△ △	△ △ △
Problems of Crops	○○	○○○○	○○○○
No. of Animals	***	****	*****
Milk Production	✧ ✧✧	✧✧	✧✧✧✧

Milk availability	△△△△	△ △	△△△△△
Electricity	-	**	****
Technical Knowledge Availability	-		
No. of Tractor	⊕	⊕⊕⊕	⊕⊕⊕⊕
Employment			
Orchards	-	-	#####
Vegetable Production		△	△△△
Grass Land/Fodder cultivation	+++++++	+++	++++

3.9 Family Livelihood Analysis

Livelihood analysis is a helpful tool to analyse farmer's aptitude and deciding their future plan. In our study we have categorised the farmers in the four groups on the basis of their income generated from different sources. The major source of income of big farmers is agriculture and few members of such family are also employed and generated extra income to his family kitty. For second groups 80 per cent income came from agriculture and rest 20 per cent from animal husbandry and other enterprises. Likewise the poor groups arranged their livelihood through *batai* by big farmers (50%) and rest 50% came from their own agriculture and animal husbandry specially goat rearing. However, very poor groups arranged their livelihood mainly from wages.

3.10 SWOT Analysis for Watershed Development Programme

Strength	
1.	Community are willing to make joint efforts for the development
2.	Average land holding is high i.e. 2.0 ha
3.	Average animal population per family is 5. It indicates greater possibilities of organic farming.
4.	Sufficient work force is available locally.
Weakness	
1	Less vegetative cover resulted into high runoff, soil and nutrient loss
2	Crisis of water for drinking and irrigation due to dependency on perched water

3	Very poor cropping intensity (30-40%) during *kharif* season
4.	Health of the soil is poor to very poor due to severe erosion.
5.	High frequency of irrigation due to low water holding capacity
6.	Multidirectional slopes creates hurdles in applying conservation techniques
7.	Majority of the farming community are laggard in adopting new technologies
8.	Grazing / browsing of crops by stray cattle / goat (*Annapratha*).
Opportunities	
1.	Opportunity for increasing cropping intensity during *kharif* season
2.	Scope for diversification and alternate land use which provides regular employment
3.	High opportunity of breed improvement and organic farming
	Presence of extensive ephemeral drain provides opportunity for water harvesting
4.	Greater scope of increasing water use efficiency by adopting micro irrigation as majority of the farmers have their own well and pumping system
5.	Sufficient availability of forest as well as community lands and traditional knowledge of goatary provides opportunity of livelihoods for landless families
6.	Opportunity of dairy industry
Threats	
1.	Non availability of markets
2.	Presence of granite at a depth of 10 to 100 feet provides less opportunity of water storage and it may creates chaos if water resources not managed properly
3.	High incidences of theft for all kinds of tools and machineries related to agriculture

3.11 Village – Institution Linkages

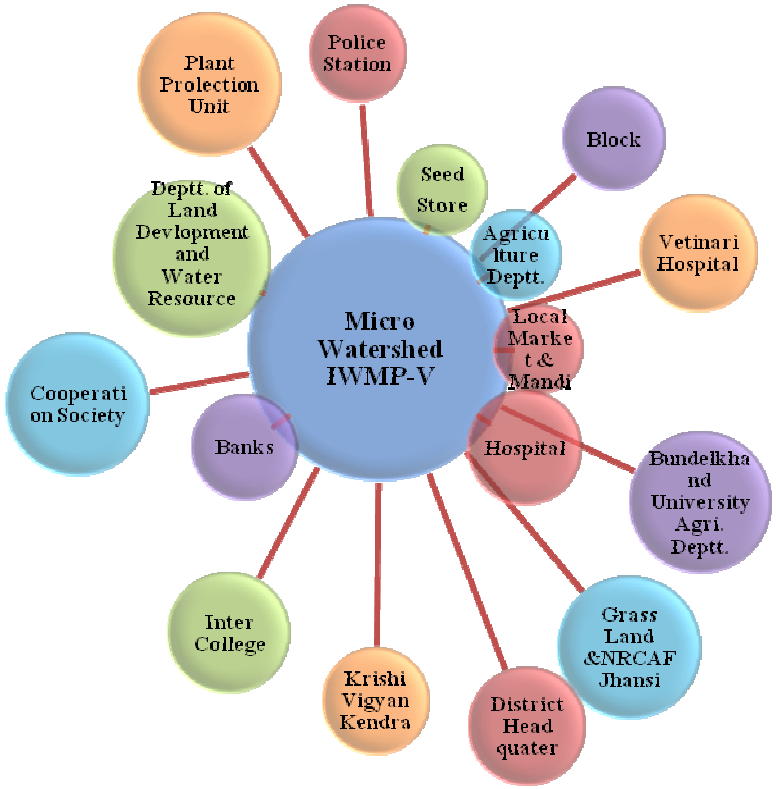
3.11.1 Mobility analysis

The institution visited by the farmers frequently for their different enterprises are cooperative societies for fertilizers, Block Development Office, plant protection unit, veterinary hospital, electricity department, police station and agriculture department etc. The distances of different institution are given as follows:

Mobility Analysis

3.11.2 Venn Diagram

Venn diagram shows the presence of institution within and outside of micro-watershed and services given by these institutions to the farmers of micro watershed. The micro-watershed has good linkage with bank, market, mandi and department of Land Development and Water Resource. Though the farmers considered agriculture extension provider and hospital as an important institution but their services are relatively poor. Institution like seed store, development block, registration of societies, agriculture department are less important to the farmers but they are providing better services than police station and veterinary hospital. Other institution like Bundelkhand University, Krishi Vigyan Kendra, National Research Centre for Agro forestry, Indian Grassland and Fodder Research Institute, Jhansi and Minor Irrigation can play significant role than tehsil and block.



Venn Diagram

3.12 Decision Analysis

3.12.1 Matrix ranking

Choice and priority of farmers can be analyzed by matrix ranking. Farmers are cultivating different types of crops viz. lentil, chickpea, field pea, durum wheat, wheat, linseed and mustard/rai in *rabi* season and urd, moong, arhar + sorghum, til and sorghum in *kharif* season. Lentil crop was ranked first in *rabi* season followed by chickpea and field pea, while in *kharif* season arhar + sorghum have the second ranking followed by sesame as fourth ranking. Mustard and linseed crop grown by farmers as mixed with other crop. Lentil crop was preferred by the farmers of micro-watershed due to the black soil which yields better under the conserved moisture. Farmers are cultivating local varieties of lentil called *Malka.* Second preferred crop was chickpea due to black soil with totally depend on rain. The promising varieties of chickpea were *Radhey* and *Awarodhi*. Wilt is the main problem of lentil and chickpea crop in the command area. However, arhar + sorghum preferred by the farmers as second crop in the rotation. It is clear from the analysis that the farmers don't take risk of growing crops as single crop.

Women of the micro-watershed show their priority to knitting, weaving and tailoring. Among the different criterion for deciding suitable enterprises, easily salable items ranked first followed by self dependency and low cost, less labour requiring.

Rural youth of the micro-watershed show their priority to goat rearing followed by poultry, dairy and seed production, organic farming, rabbit, vermi compost unit and nursery unit respectively. Among the different criterion for deciding suitable enterprises, less time taking ranked first followed by self dependency, more marketable and less labour requiring.

Priority of crops (Maximum ranking is 10 points)

Crop / Standard	Lentil	Chickpea	Field Pea	Durum Wheat	Wheat	Arhar + Sorghum	Sesamum	Mustard / Rai	Linseed
More Profit	5	7	7	6	4	6	6	4	5
Suitability for rainfed condition	9	8	8	5	3	8	4	6	7
Less Insect/Pest & diseases	6	6	5	6	4	7	7	7	6
Less risk	8	8	7	5	5	8	9	5	5
Less labour	9	7	7	8	6	7	8	4	6
Less weeds	8	6	6	7	5	9	7	5	5
No Irrigation required	9	7	5	6	3	8	6	6	6
Total	54	49	45	43	30	53	47	37	40
Rank	I	III	V	VI	IX	II	IV	VIII	VII

Livelihood interest of farm women (Max. 10 point)

Livelihood options / Standard	Tailoring Stitching Weaving	Agarbatti / Candle & Dona Pattal, Rope making	Preservation Fruit & vegetable	Goat rearing	Poultry	Nursery	Organic Manure	Rabbit farming	Ranking
Self dependency	6	6	7	7	7	3	5	6	**III**
More sellable	8	4	7	5	8	7	7	7	**I**
Less Labour	6	5	6	6	5	4	6	8	**IV**
Low cost	8	7	6	7	6	6	5	6	**II**
Less Time taking	5	5	4	6	5	5	5	5	**V**
Ranking	**I**	**VI**	**IV**	**III**	**III**	**VII**	**V**	**II**	

Livelihood interest of rural youth (Max. 10 point)

Livelihood options / Standard	Vermi unit	Seed production / Bank	Dairy (Cow Buffaloes)	Goat rearing	Poultry	Nursery	Organic Manure	Rabbit farming	Ranking
Self dependency	6	7	7	8	7	5	6	6	**II**
More marketable	7	6	7	6	8	4	4	5	**III**
Less Labour	5	5	6	8	5	6	5	4	**IV**
Low cost	4	7	4	7	7	5	3	5	**V**
Less Time taking	7	6	7	9	8	4	7	7	**I**
Ranking	**VI**	**III**	**III**	**I**	**II**	**VII**	**IV**	**V**	

3.13 Rural People's Knowledge

Major occupation of the micro-watershed is agriculture and animal husbandry and several indigenous technical know how had been practiced by the villagers of micro-watershed which are listed below. Wide scale adoption of the ITKs in a participatory mode will help to increase and stabilize production in the micro-watershed.

A. In-situ moisture conservation practices

Indigenous/Local knowledge	Technical specification/ Improvements
• Summer ploughing is generally done • Summer ploughing with desi plough.	• Summer ploughing is generally done across the slope of the field and sometimes along the slope in the month of April and May for increasing porosity and creating mini surface structure like ridge and furrows • There is less runoff and soil loss due to more infiltration and less evaporation due to breaking of the capillaries and pulverization of soil. • Availability of plant nutrients increases due to decomposition of crop residues, weeds etc. • The summer ploughing with either *desi* plough (99%) or tractor drawn cultivator (1%) is one of the most common practices in rainfed farming areas of the micro watershed.
• *Kulying* is very common during rabi season: tillage operation by *kuly* for field preparation of *rabi* crops like chickpea, lentil etc. *Kulying* is started in *kharif* fallow land just after the recession of monsoon.	• *Kuly* is a bullock drawn blade harrow with blade of 75-90 cm length and weight of 15-20 kg. It can cover 1.5 ha land per day and has service life of 8 to 10 years. It carried out at a depth of 5-7 cm at 8-10 days interval at least 5 to 6 times prior to sowing of *rabi* crops. • Due to repetitive ploughing, the soil is maintained good tilth and weeds are controlled. • *Kulying* reduces evaporation losses and maintains soil moisture level by breaking the capillaries and pulverization of soil.
• *Kulphaing* is a common inter-culture operation carried out by *kulpha* in *kharif* crops cultivated in black series soils.	• *Kulphaing* is generally done once or twice during crop growing season, when there is a dry spell. • *Kulpha* is modified form of *kuly* for intercultural operation and operated by a pair of bullocks. Generally, two *kulphas* are operated simultaneously to cover more area per unit time. • The working depth varies from 3-5 cm depending upon the soil condition at the time of operation. It can be manufactured by village artisans and weighs 15-20 kg.
• Criss-cross ploughing done twice, firstly along the slope and secondly across the slope.	• The main objectives of criss-cross ploughing is to leave no part of field unploughed, as unidirectional ploughing often leaves some unploughed land between two adjacent furrows, and create a number of criss-cross mini surface water storage structure, which help in increasing the intake opportunity time of water infiltrate into the soil, improve soil moisture and reduce runoff from the field. • At the time of ploughing, farmers deivides the whole field into a number of small blocks. The number and size depends upon the size of field and number of ploughs working in the field. • The ploughing is started from the border of field and goes towards centre till a block/field is covered. • Criss-cross ploughing is a very old indigenous tillage practice in the region, which helps in reducing runoff and soil loss.
• *Bundhi* (Earthen bund): formerly farmers	• These structures are generally used to retain upslope water and silt. Retention of water behind

of MWS area were doing this work, now this is not in working	the *bundhi* increases infiltration in the field by enhancing opportunity time, increase soil moisture regime and reduces runoff and soil loss. • If *bundhi* is intact, there is deposition of silt behind the *bundhi* due to retension of surface runoff, which converts undulating field into nearly plain/level land, and the reclaimed land becomes more fertile. • *Bundhies* must be strengthened with grasses and legumes having good soil binding capacity like *Dichanthium annulatum, Cenchrus ciliaris, Cynodon dectylon, Stylosanthes hamata, etc.* These plants apart from stabilizing the bundhies are also very good source of fodder for the cattle.
• *Pucca Bandha* (Stone): Old pucca *bandhas* were visible in the area with poor condition, now this is not in working	• MWS programme IWMP will executes this work. • Like *bundhies, bandhas* retain water and silt, enable uniform distribution of rainwater, which increases infiltration in the field by enhancing opportunity time, increases soil moisture regime, reduces runoff and soil loss, converts undulating field into nearly plain/level land, and makes the land fertile. • Most of these structures are unscientifically constructed, which has resulted in side cutting and damage.

B. Runoff management practices

Indigenous/Local knowledge	**Technical specification/ Improvement / Interventions**
• Talab (Pond) • Talab is an embankment type pond of various sizes (smaller ponds called *talai*) constructed near human settlements or at depression site of village.	• The structure harvested huge amount of surface runoff, otherwise going waste, and thereby reduces soil loss and increases ground water recharge down below the open/tube well, and meets the water demand for irrigation, animal and domestic consumptions. • Bed silt of the *talabs/talais* can be used for soil fertility improvement and construction/repair/maintenance of mud houses by the farmers.
• *Sagar* (Submergence bund) are large submergence bunds constructed as a barrier across the slope of catchment with a provision of *nikas* (sluice) for removing excess water.	• The harvested runoff from catchment is retained during the monsoon season behind the bund to recharge the soil profile. The harvested water is either lost through seepage and evaporation or it is drained out by September/October for sowing of *rabi* crops in the submerged area. • Deposition of fertile soil and increase in moisture regime gives 70-80% higher *rabi* crop yields as compare to adjoining land without submergence bund. • MWS programme IWMP will executes this work.

C. Crop production practices and animal husbandry

Indigenous/Local knowledge	Technical specification/ Improvement / Interventions
• Mixed cropping: lentil, chickpea, durum wheat and wheat crop sown mixed with linseed and mustard in *rabi.* • Sorghum and Arhar mixed crop in *kharif.*	• Crops area growing under set row system without any scientific approach. • Crops should be grown under row system. • An optimum plant density of different crops should be maintained.
• Use of *Ghurey ki khad* (un-decomposed FYM)	• Farmers were using un-decomposed farm yard manure, which spread the weeds, insects/pest and disease incidence on the crop. • Use of Vermi-compost, NADEP compost, green manuring etc. should be encouraged.
• Shaking of plant (Pigeonpea)	• During attack of *H. armigera* farmers shaking the plant.
• Use of Neem leaf & Kernel suspension	• During the attack of different insect/pest on crops they use suspension of neem leaf and kernel as well.
• Use of neem leaf in the storage of pulses and cereals	• Neem leaf suspension 10 kg leaf + 20 lit. water boiled when water remains 10 kg. This suspension used to treat the bags, room, windows and door where grains to be stored. Leaf of neem stored in shed for 10-15 days and used for grain storage approximate 50 to 100 gm per quintal of grain. • Grains should be fully dry and have only 10-12% moisture in it.
• Animal husbandry - Use of 8 Badi Ilaichi for adult buffaloes and cow for curing of fever. - Rapeseed/Mustard seed used with curd/matha for gas/aphara in animals	• They use 8 badi ilaichi (large cardamum) with 100 gm gur and give two doses, one in the morning and one in the evening. • 100 gm Rapeseed/Mustard seed crushed with stone and mixed in 2 lit. curd and matha for aphara and gas problem.

3.14 Problem Identification

During the process of collecting the important information related to the micro-watershed village's socio-economic status and different enterprises practiced by the villagers, certain problems which have adverse effect both directly and indirectly on their economy are identified after having detailed discussion with participatory farmers groups.

3.14.1 Prioritization of problems

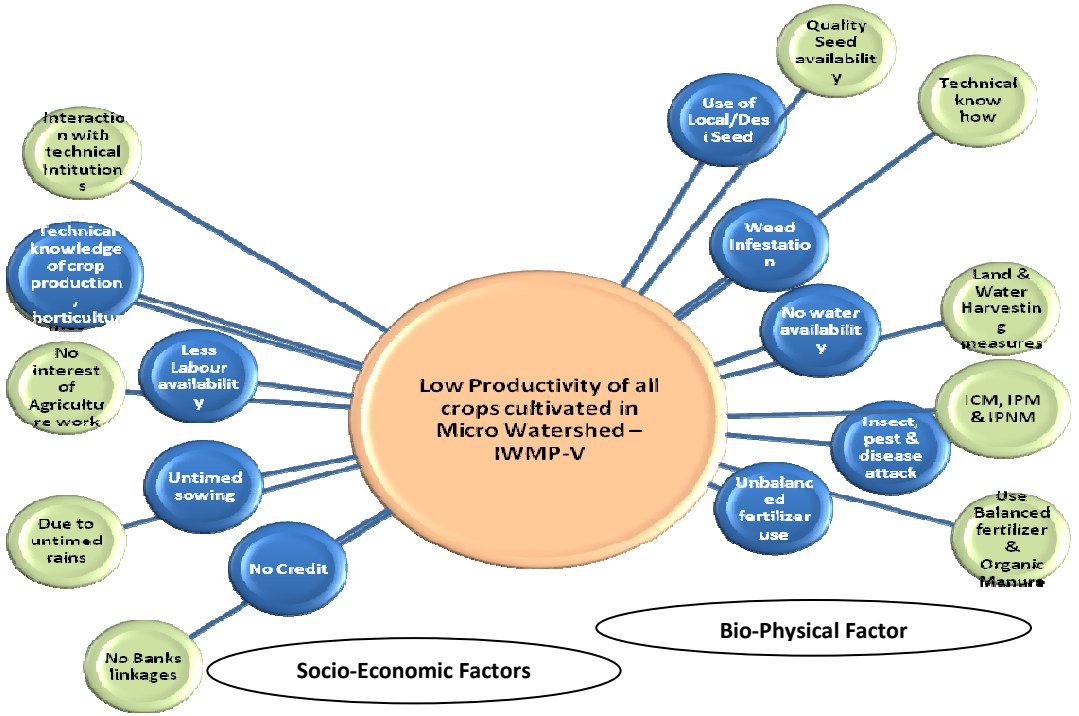
Major factor responsible for low yield of all crops of micro-watershed

1. Less water availability
2. Undulating topography
3. Low fertility due to severe water erosion
4. Uncertain and erratic rainfall

5. Low water holding capacity of soils
6. Heavy weed problem at initial stage of crop growth particularly in *kharif*
7. Insect, pest and disease problem
8. Imbalance use of fertilizers
9. Use of local and desi varieties
10. Rat problem at maturity stage

3.14.2 Problem – cause analysis

Lentil is the major crop of the micro-watershed and as such cumulative pulses covers about 79 per cent area. During discussion it was narrated by the farmers of the area that production of lentil and other pulse crops gradually reduced due to the low water availability. Problem mentioned by the farmers were heavy weed infestation at initial stage, wilt problem in all pulses, use of local varieties, insects and pest, imbalance use of fertilizers, etc. Amongst these factors, low water availability is mainly responsible for low yield of all crops. There could be many more problems as mentioned above but of less significance.



Problem Cause Analysis

3.14.3 Area, production and productivity of kharif/ rabi/ summer season Crop

Area, production and productivity of different crops in the watershed is shown in Table 3.1.

Table 3.4: Area, production and productivity of *kharif*/*rabi*/summer season crops

S.No.	Name of Crop (Season wise)	Area (ha)	Production (quintal)	Productivity q/ha
1	Til (Sesamum)	760.00	1292.00	1.7
2	Urd	660.00	2244.00	3.4
3	Moong	460.00	1426.00	3.1
4	Arhar	270.00	1701.00	6.3
5	Jawar	300.00	1440.00	4.8
6	Jawar + Arhar	350.00	2660.00	7.6
	Total	**2800.0**	10763.00	
1	Lentil	1110.00	6271.50	5.65
2	Field Pea	940.00	6815.00	7.25
3	Chickpea	870.00	5533.20	6.36
4	Wheat	1440.00	27000.00	18.75
5	Barley	170.00	2924.00	17.2
6	Linseed + Chickpea (Mixed)	220.00	1727.00	7.85
7	Linseed + Lentil (Mixed)	270.00	1741.50	6.45
8	Mustard / Rai	310.00	1395.00	4.5
	Total	**5330.00**	**53407.20**	
	Single crop Area	3770.00		
	Double crop area	2180.00		
	Cropping Intensity		114.55	
3.	Summer Season	Nil	Nil	Nil
4	Home Stead Plantation of Vegetables for domestic use	Round the year some domestic vegetable growing habit present among the farmers		
	(Cucurbits, Cole crops, Egg Plant, Tomato, Potato etc)	45.00	3200.00	71.11

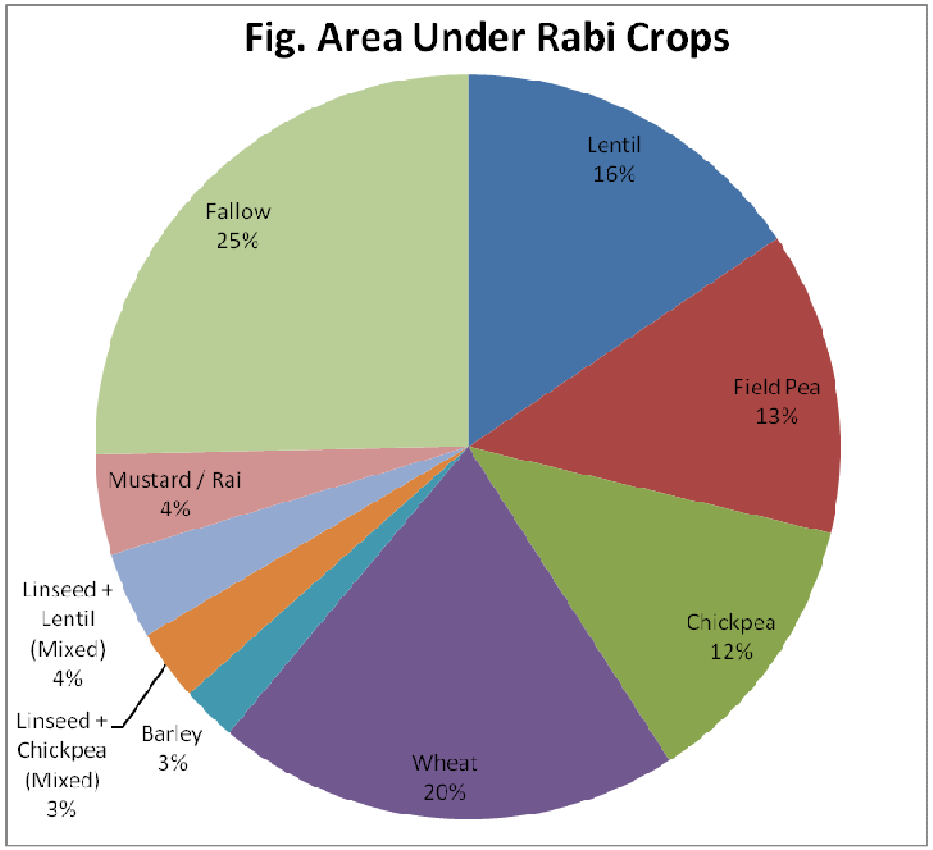


Fig. Area Under Rabi Crops
Lentil
16%
Field Pea
13%
Chickpea
12%
Wheat
20%
Barley
3%
Linseed + Chickpea (Mixed)
3%
Linseed + Lentil (Mixed)
4%
Mustard / Rai
4%
Fallow
25%

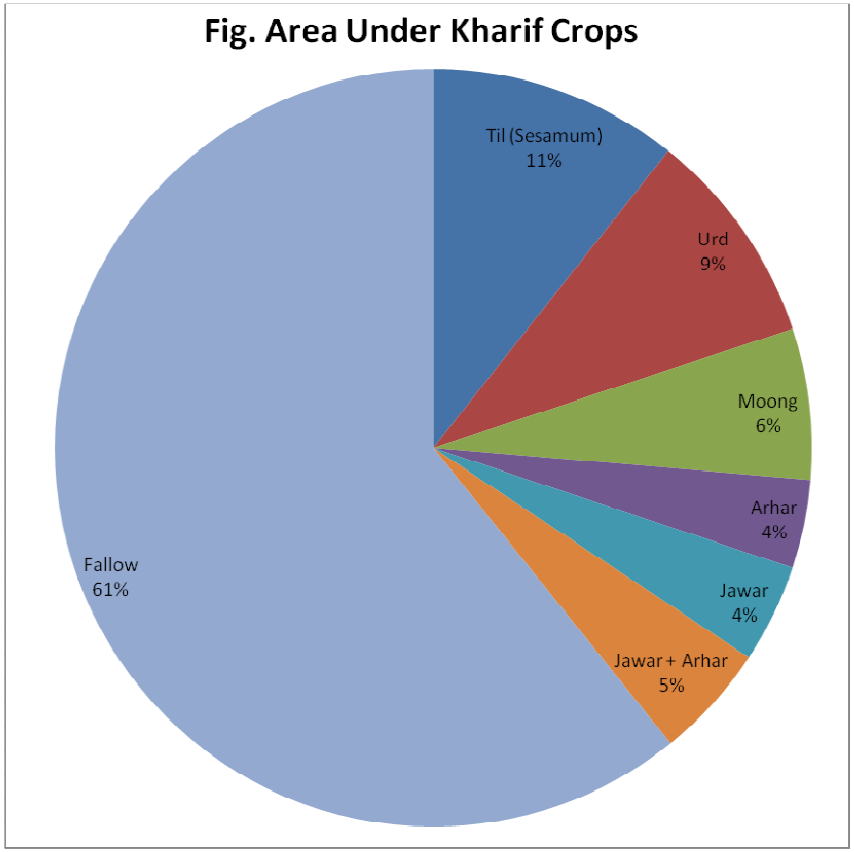


Fig. Area Under Kharif Crops
Til (Sesamum)
11%
Urd
9%
Moong
6%
Arhar
4%
Jawar
4%
Jawar + Arhar
5%
Fallow
61%

3.15 Analysis of Problem

Table 3.5: Analysis of Problems with Regard to Existing Farming System (EFS)

Sl. No.	Type of enterprises/ commodities	Combi-nation of enter-prises in EFS (P/S/T)	Specific problems with each enterprise	No. of affected persons (%)	Proposed solution	Reasons for non-adoption of proposed solution	Action
1.	**Agricultural crops** ***- Irrigated*** Wheat ***- Rainfed*** Wheat Durum Wheat Lentil Field Pea Linseed Mustard Arhar Sorghum Urd Moong Til	P	Less water availability Low nutrient status affect all crop production Use of old varieties Disease/Insect pest infestation Weed infestation	95	Improved method of crop production & resource conservation	Lack of Interest, Lack of Resource Management	Training & demonstration, Organizing of field days for improved varieties and cultivation practices
2.	**Horticultural crops** - Orchards - Vegetables - Floriculture	S	No Planned Orchards / Vegetable / Floriculture	-	-	-	Need Intensification
3.	**Animal husbandry** - Cows - Buffalows - Sheep	S S	Breed degradation, Anestrous problem, and low productivity of animals and fodder	80	Breed improvement through AI, feeding of	Lack of Interest Lack of Resource Management	Training & demonstrations

	- Goat - Pigs	S			minerals mixture, Fodder cultivation		
4.	Fisheries	-	-	-	-	-	-
5.	Sericulture	-	-	-	-	-	-
6.	Poultry	-	-	-	-	-	-
7.	Bee keeping		-	-	-	-	-
8.	Duckeries	-	-	-	-	-	-
9.	Agriculture labour	T	Unskilled labour depends on Agriculture land	-	-	-	-
10.	Any other	-	-	-	-	-	-

P= Primary, S = Secondary, T = Tertiary

CHAPTER – 4

INSTITUTIONAL BUILDING AND PROJECT MANAGEMENT

4.1 Project Implementing Agency

The Project Implementing Agency (PIA) is Soil Conservation Officer, Department of Land Development and Water Resources, IWMP, Moth, Jhansi. The PIA was given responsibility to develop the micro-watershed by District Watershed Development Unit (DWDU) and State Level Nodal Agency (SLNA) considering its vast experiences in handling land and water management issues in the region. The PIA has well experienced, trained and sufficient staff to handle the watershed management programme efficiently. Most of the staff of PIA has exposure of several watershed projects including Garhkundar-Dabar watershed, which is successfully implemented by NRCAF, Jhansi in Tikamagarh district of Bundelkhand region and identified by Govt. of India as one of the most successful model of watershed in the country. In addition the PIA has access for technical backstopping from the ICAR viz. IGFRI, NRCAF and KVK located at Jhansi. Details of PIA are presented in subsequent section.

Table- 4.1: Details of Project Implementing Agency

Sr. No.	Particulars of PIA	
1	Name of organization	Department of Land Development and Water Resources, Uttar Pradesh
2	Designation & Address	Bhoomi Sanrakshan Adhikari, IWMP –V District -Jhansi
3	Telephone/Mobil No.	BSA- 09450067749 JE - 09458208143
4	Fax	NA
5	E-mail	NA

Table- 4.2.: Details of Staff at Project Implementing Agency

Sr. No.	Name	Designation	Experience (Years)
1	Shri Radhey Ram	B.S.A.	28
2	Shri Moti Singh	Junior Engineer	26
3	Shri Baburam Verma	Accountant	25
4	Shri Suresh Singh	Draftman	26
5	Shri Rajpal Singh	Tracer	25
6	Shri Ramakant Pandey	Jiledar	25

7	Shri Vijay Veer	Munsi	20
8	Shri Shyam Manohar Pandey	A.S.C.I.	20
9	Shri Mathura Prasad Dixit	A.S.C.I.	22
10	Shri Prakash Narayan Yadav	Sheenchpal Supervisor	20
11	Shri Rajesh Babu Sachan	Sheenchpal	22
12	Shri Jiya Lal	Sheenchpal	20
13	Shri Rajendra Singh	Sheenchpal	7
14	Shri Anil Kumar Chaturvedi	Sheenchpal Supervisor	20
15	Shri Shiv Lal Pal	Sheenchpal	17
16	Shri Man Singh Yadav	Sheenchpal	20

Table 4.3: Details of Watershed Development Team (WDTs)

Sr. No.	Name of the PIA	Names of WDT members	M/F#	Age	Qualification / Experience
1.	BSA, LDWR, Moth, Jhansi	Radhey Ram	M	55	Diploma In Civil Engg.
		Dr. Dharm Dev Singh	M	45	Ph. D. (Ag. Economics)
		Mr. Kuldeep Rajput	M	28	M. Sc. (Agroforestry)
		Mr. Amit Vyas	M	32	M.S.W.
		Mrs. Alka Verma	F	26	M.A. (Sociology)
		Mr. M. S. Verma	M	48	Diploma in Ag. Engg.

M – Male, F - Female

4.2 Watershed Committee

The Maletha, Kudri, Dundi-I, Dundi-II, Kurentha, Dakhaneswar, Garhawai, Pahra and Dhanaura micro-watershed will be developed in participatory mode. For the purpose of true participation of community, Watershed Committee (WC) has been elected in general meeting of Gram Sabha. Gram Sabha elected President and Secretary of the committee for smooth function. The By Laws of the WC had been prepared and registration is done under Societies Registration Act XXI, 1860. The WC will follow the By Laws in taking different interventions in the watershed for its sustainable development. SHGs of landless people were also constituted to take up different micro-enterprises. The constitution of watershed committee is under process The details of SHGs are presented in Table 4.4.

Table- 4.4: Details of self help groups (SHGs) in the project area

Maletha

Sr. No.	Name of the villages	Details of the SHGs	
		No. of SHGs	Major Activity
1	Maletha	08	Goat, Dairy, Seed Production, Organic Complex, Poultry, Mani Dal Mill, Goat Rearing And Organic Cultivation
Total		**08**	

Kudri

Sr. No.	Name of the villages	Details of the SHGs	
		No. of SHGs	Major Activity
1	Kudari	06	Goat Rearing, Vermi-compost, Mini Dal Mil, Organic Complex, Masala Making Unit, Rope Making Unit
2	Dudi	01	Seed Production Unit
3	Maletra	02	Masala Making Unit, Rope Making Unit
4	Gokul	01	Seed Production
Total		**10**	

Dundi-I

Sr. No.	Name of the villages	Details of the SHGs	
		No. of SHGs	Major Activity
1	Dundi	05	Masala Making Unit, Goat Rearing, Vermi-Compost, Mini Dal Mil, Organic Complex
2	Kudari	02	Seed Production Unit, Mini Dal Mil
3	Gokul	03	Goat, Dairy, Seed Production, Vermi-compost
Total		**12**	

Dundi-II

Sr. No.	Name of the villages	Details of the SHGs	
		No. of SHGs	Major Activity
1	Dundi	05	Seed Production, Rope Making Unit, Goat, Dairy, Organic Complex
2	Kurentha	01	Seed Production Unit
3	Ahraura	01	Goat Rearing
4	Maletha	01	Masala Making Unit
Total		**8**	

Kurentha

Sr. No.	Name of the villages	Details of the SHGs	
		No. of SHGs	Major Activity
1	Kurentha	05	Seed Production Unit, Vermi-compost, Mini dal mil, Organic complex, Goat Keeping
2	Dundi	01	Goat Keeping
3	Andaul	01	Dairy
4	Ahraura	01	Masala Making Unit
5	Dakhaneswar	02	Goat Rearing, Seed Production
Total		**10**	

Dakhaneswar

Sr. No.	Name of the villages	Details of the SHGs	
		No. of SHGs	Major Activity
1	Dakhneshwar	06	Goat, Dairy, Seed Production, Vermi-compost, Rope Making Unit, Goat Rearing, Organic Complex
2	Singar	02	Seed Production Unit, Mini Dal Mil
3	Garhawai	03	seed Production, Vermi-compost, Mini Dal Mil
4	Kurentha	02	Goat Rearing, Poultry
Total		**13**	

Garhawai

Sr. No.	Name of the villages	Details of the SHGs	
		No. of SHGs	Major Activity
1	Garhwai	04	Seed Production Unit, Vermi-compost, Mini Dal Mil, Organic Complex
2	Singar	05	Masala Making Unit, Rope Making Unit, Goat, Dairy, Seed Production, Vermi-compost
3	Sutta	02	Goat Rearing, Seed Production
Total		**11**	

Pahra

Sr. No.	Name of the villages	Details of the SHGs	
		No. of SHGs	Major Activity
1	Pahra	08	Goat, Dairy, Seed Production, Organic Complex, Rope Making Unit, Mini Dal Mil, Goat Rearing and Vermi-compost
Total		**08**	

Dhanaura

Sr. No.	Name of the villages	Details of the SHGs	
		No. of SHGs	Major Activity
1	Dhanoura	06	Seed production unit, Vermi-compost, Mini dal mil, Organic complex, Goat keeping, Dairy
2	Gokul	01	Masala making unit
3	Kuretha	02	Goat rearing, Seed production
Total		**9**	

4.3 Central/State sponsored schemes

Several programmes are running in the area which are sponsored by Central and State Govt. and could be converged with watershed programmes. Some of them are listed in Table 4.6.

Table 4.5: List of Central/State sponsored schemes

S.No.	Name of Programme	Implementing Agency	Objectives of the Programme	Project Cost
1	Seed Distribution Programme (Pulse Development & ISOPAM)	U.P. Agriculture Deptt.	To increase seed replacement ratio for higher productivity	25,000/ year/village
2	Pump set Distribution (Food Security Mission)	Agriculture Deptt.	Providing irrigation	10,000 per farmer
3	Training Programme	Agriculture Deptt., KVK	Capacity building of the farmers	-
4	HDPE pipe	Agriculture Deptt.		-
5	National Horticulture Mission (NHM)	Horticulture Deptt.	Increasing the area under fruits and vegetables	-
6	Sanitation Programme	Gram Vikash	To make hygienic condition in the rural areas	-
7	Mid Day Meal	Gram Panchayat (DSO)	To provide education to all children without hunger	-
8	MGNERGA (Bunding, Farm Pond, Adarsh Jalashay, Blast well, Chakroad, etc.)	Gram Panchayat	To provide work to the all village personnel under the rojgar guarantee yojana	-
9	ATMA	U.P. Ag. Deptt.	Horizonal spread of improved technologies	-

CHAPTER - 5

MANAGEMENT/ACTION PLAN

5.1 Preparatory Phase

Over exploitation of existing vegetation, expansion of agricultural activities on non-arable lands without due care of soil and water conservation and faulty cultural practices on medium to shallow deep black soils have resulted in wide spread erosion and land degradation. In many of the areas the parent rock is exposed. Even most of the agricultural lands have been converted to wasteland. Due to reduction in vegetal cover and no provision for surface water storage, all the rain water goes off, as such, ground water recharge is negligible causing slow growth of trees and low yield of crops. This situation can certainly be corrected by *in-situ* water harvesting and planting of trees on field bunds and wastelands. Thus, not only degradation process can be checked but also sustainable development can be achieved.

Watershed development has been agreed as the best approach for natural resource management through out the world. However, in the past certain watershed based development projects did not yield desired benefits because of partial treatments in catchments. This project envisages investigating location specific technologies for successful rehabilitating degraded lands in Bundelkhand region.

Integrated approach of development involving diverse societies through active people's participation has been visualized as key to success in overall development of rural society. Following principles have been taken into account before preparing technical plan:

- Land capability classes and agro-climate of the region
- Measures to arrest land degradation
- Maximizing opportunity time for rain drops to facilitate deep infiltration into soil for better moisture conservation *in-situ* and ground water recharge.
- Rain water harvesting and surface storage of rain water
- Safe disposal of excess water
- Ensuring permanent vegetal cover as ultimate saviour of land and water and ensuring availability of fruit, fodder, fuel and small timber from the watershed
- Crop diversification and increasing cropping intensity.
- Maximizing productivity through improved package of practices
- Generation of employment
- Increasing economic returns
- Encouraging participatory rural approach and improvement in existing know-how of farmers
- Encouraging agro-based, house hold and self employment programmes so as to benefit landless people
- Cost effective and low input requiring technology
- Technology giving early dividends
- Suitable distribution of selected technology among the beneficiaries

The details of Preparatory Phase, Works Phase and Convergence planning are described in subsequent section

5.1.1 Entry Point Activities (EPA)

Entry point activities were executed with the consent of stake holders and it helped in winning the confidence of the villagers for moving ahead the other programmes of watershed. In total 18 EPA activities were executed in the project area which costed Rs. 2865600.

5.1.2 Institutional and Capacity Building

The details are available in Chapter 6.

5.2 Works Phase

Runoff

Design of any erosion measures is mainly dependent on runoff from a catchment. Therefore, estimation of probable runoff from any catchment is the first step towards designing and construction of soil and water conservation measures. Runoff is drainage of precipitation from a catchment, which flows out through its natural drainage system. After the occurrence of infiltration and other losses from the precipitation, the excess rainfall flows out through the small natural channels on the land surface to the main drainage channel. Such types of flows are called surface flows. A part of the infiltrated rainwater moves parallel to land surface as subsurface flow, and reappears on the surface at certain other points. Such flows are called interflows. The other part of the infiltrated water percolates downwards to ground water, and moves laterally to emerge in depressions and rivers, and joins the surface flow. This type of flow is called the subsurface flow or ground water flow.

Runoff is a rainfall driven process and depends upon biophysical characteristics of the catchments. Runoff estimation includes its volume and peak rate of flow volume. In designing spillways and outlets or waterways, peak rate of runoff is required while for assessing the storage in earthen dam, tanks and ponds etc. the estimates of runoff volumes are required. Another important variable of interest in drainage line treatment is the flow velocity that is required for determining scour pattern in the river bed and along the banks. In this way, various characteristics parameters of runoff are required for the design of soil and water conservation structures.

Methods of Runoff Computation

There are many methods available for runoff estimation. The most commonly adopted methods are the Curve Number method of the Soil Conservation Service of the USDA for estimation of both excess runoff volume and peak flow rate and the Rational method for the peak flow rate. Many empirical relationships are also widely used for estimation of flow rates. Runoff of the watershed was estimated using Curve Number Method.

Curve number method

The Curve Number method was developed for the determination of the rainfall excess of agricultural watersheds, on per storm basis.

$$Q = \frac{(p - 0.2S)^2}{P + 0.8S}$$

Where, Q= direct runoff, mm

P= storm rainfall, mm

S= a parameter for surface retention

The parameter S is defined as

$$S = \frac{25400}{CN} - 254$$

Where, CN = an arbitrary curve number varying from 0 to 100

The amount of rainfall (P) is also affected by duration. For design considerations, maximum runoff volume is required. It is established that minimum storm duration for flood estimation can be taken as 6 hours. But in certain conditions design rainfall for greater durations can also be taken.

Estimation of Runoff from the Watershed

Runoff from the watershed is estimated by Curve Number method of the Soil Conservation Service of the USDA using 18 years data (1990-2009) with a gap of 2005 and 2006). It is estimated that runoff potential of the project area is 141 mm, equivalent to 17 per cent of average annual rainfall. On the basis of runoff estimated, engineering measures were designed. The works related to natural resource conservation, production system and livelihoods are described in subsequent sections:

5.2.1 Natural resources conservation (Soil and moisture conservation measures, rain water harvesting and water resource development)

To control the damaging runoff which is a cause of erosion from agricultural as well as non agricultural lands, structural measures are required. Following measure are recommended for watershed development in arable and non arable land. The estimate and detailed design of all kinds of interventions are given in Chapter 10. However, summary of physical and financial requirement of different activities is given at the end of this chapter and its yearwise phasing has been given in Chapter 7.

5.2.1.1 Engineering measures for degraded agricultural lands

- Contour bund/field bunds/graded bunds with suitable surplusing arrangements are proposed to prevent erosion of natural resources and improved the moisture regime of having slope 0-3 per cent.
- Marginal/peripheral/submergence bunds with suitable surplusing arrangements are proposed to prevent erosion of natural resources from agricultural lands having slope in the range of 3 to 5 per cent.
- Earthen checkdams/gully plugs /water harvesting bund with suitable weir structures are proposed to conserve runoff and prevent erosion.
- In the lower reach of the watershed, vegetative bunds of vetiver, munj, and other locally available grasses will be taken up.
- Excess runoff will be disposed off safely from the fields though grassed water ways and suitable structures.
- Well recharging units
- Field drainage structures

5.2.1.2 Agronomical measures for agricultural lands

Agronomical measures like contour farming, crop geometry, mulching, deep ploughing, strip, mixed and intercropping, crop rotation and residue management will be taken care in the watershed development programme.

5.2.1.3 Conservation measures for wastelands/ degraded lands/forest areas

To rehabilitate the wasteland/degraded lands/forest areas, vegetative barriers, all types of gully pluggings including drop spillways, installation of gabions, etc. are describes in subsequent section.

- **Vegetative barriers:** It will be introduced to prevent soil erosion.

- **Gully plugging**

It has been observed that the plugging of gullies is very much effective in grade control and gully stabilization as well as ground water recharge. Gully plugs which are categorized as temporary, semi-permanent and permanent will be constructed in the watershed.

The watershed is having number of wells, which is ultimate source of drinking and irrigation water supply. These shallow open dug wells' recovery is dependent on perched water. The ephemeral streams of the watershed offer an opportunity to check and store surface water. By checking these streams, wells in the down slope get recharged faster and ultimately more and more area can be brought under irrigation. Following structures have been proposed in the scheme to augment water resources.

- **Gabion**

NRCAF, Jhansi has demonstrated the effectiveness of the gabion for soil and water conservation at Garhkundar-Dabar watershed in Teekamgarh district of M.P. in Bundelkhand region. The Centre has also imparted trainings for fabrication/installation of gabions to the NGOs. Gabions are being widely used for construction of soil conservation structures now a days. Gabion is large mesh boxes of different sizes, generally rectangular in shape and filled with stones larger than the mesh openings. Galvanized iron wire of 8-10 gauge thickness is used in the fabrication of wire nets and the mesh size is generally kept 10-15 cm. Gabion structures have long life (20-25 years) almost similar to cement permanent structures.

Gabions constructions have the following advantages over the cement ones :

1. Flexibility: In uneven sinking foundation gabions can be bending without breaking, whenever there is some unequal settlement in the foundation. These structures do not collapse like rigid structure.
2. Permeability: Gabion structure is highly permeable and act as self draining units. Seepage or base flow is easily drained off by them and thus structure is safer against hydrostatic pressure.
3. Stability: A gabion is a heavy gravity unit, able to withstand earth thrust.
4. Economy: Gabion structures are comparatively cheaper than concrete structure.

Fabrication of a gabion of 3 cum requires about 28-30 kg of GI wire and its fabrication and installation in the field may be done by 8 semi skilled labours. The details are given in Table 5.1.

Table 5.1: Estimate for fabrication of a gabion (3 m^3) and its installation in the watershed

S. No.	Material	Quantity	Rate (`)	Amount (`)
1.	G.I.Wire 8-10 gauge	30 kg	45.00/kg.	1350.00
2.	Stone / Boulders	4.5 cum	700.00/cum	3150.00
3.	Labour for fabrication and its laying	8 Semi Skilled	150.00/mandays	1200.00
	Total			**5700.00**

The detailed technical design and estimates of these structures are given in Chapter 11. Capacity survey of the sites of weir structures was conducted and analyzed for water storage and submergence area using software Surfer. The details of the study are presented in Chapter 7.

5.2.2 Production System Interventions

To improve the production and productivity of different crops in the project area, first of all analysis of gaps in the production technologies for cereals, pulses and oilseeds have to be identified. Following gap analysis has been worked out for different catagories of crops.

Gap analysis in cultivation of Pulses (Urd, Moong and Arhar): Kharif Season

Sl. No.	Items of package	Recommended practice	Existing practice	Gap in adoption (F/P/N) (*)	Specific reasons for the gap (**)	Farmer proposed strategy (***)
01	Varieties	Improved variety as per recomendetion	Old seeds	P	1& 2	1 & 2
02	Seed rate (per ha.)	As per crop wise recomendation	As per crop wise recomendation	N	N	N
03	Seed treatment	According to problem as fungicides and rizobium	-	F	1	1 & 2
04	Organic manure (tons /ha)	FYM 150-200 NADEP compost – 60-70 Vermicompost – 25-30	Use undecomposed matter	F	1	1 & 2
05	Fertilizer / nutrient (kg/ha) - Basal (N+P+S) - Top dress (N)	20:40:40(N:P:K) (Use SSP for P)	N	F F	1, 2 & 5	1, 2, 3 & 5
06	Micro nutrient (specify) :		-	-	-	-

	- Dose (kg/ha) - Method of application	2-3 kg wittable sulphur or 2q zypsum				
07	Pest management	IPM	Only chemical	P	1	1 & 2
08	Disease management	IPM	Only chemical	P	1	1 & 2
09	Weed management - Mechanical - Herbicide	 Hand weeding Pedimethaline 3.3 lit /ha	 No hand weeding -	 F	 1	 1&2
10	Any other	-	-	-	-	-
11	Average Yield (Q / ha.) - Grain - Timber	 16- 30 q/ha 15 q/ha	 9.10 q/ha Burning	 F F	 1 1	 1&2 1 & 2

(*) F = Full P = Partial N = Nil

** Code for specific reasons for gap in adoption

1- Lack of knowledge about appropriate practices

2- Lack of organic carbon in the soil

3- Lack of knowledge about plant protection measurer

4- Lack of appropriate varieties according to climatic zone.

5- Non-availability of inputs.

*** Code for farmer proposed extension strategy

1- Training of appropriate soil fertility management

2- Demonstration of balance fertilizer, use of biofertilizer, Use of micro nutrients and new seeds

3- Linkage with credit societies.

1- Exposure visit same climatic zone institute as Jabalpur Indore.

5- Availability of inputs zinc sulphate, MOP.

Gap Analysis in cultivation of Pulses (Pea, Gram and Lentil)- Rabi Season

Sl. No.	Items of package	Recommended practice	Existing practice	Gap in adoption (F/P/N) (*)	Specific reasons for the gap (**)	Farmer proposed strategy (***)
01	Varieties	Improved variety as per recomendetion	Old seeds, Awarodhi	P	1& 2	1 & 2
02	Seed rate (per ha.)	80 kg	100 kg	P	1	1
03	Seed treatment	According to problem as fungicides and rizobium	-	F	1	1 & 2
04	Organic manure (tons /ha)	FYM 150-200 NADEP compost – 60-70	Use undecomposed matter	F	1	1 & 2

		Vermicompost – 25-30				
05	Fertilizer / nutrient (kg/ha) - Basal (N+P+K) - Top dress (N)	20 : 60 : 40 2% foliar spray of Urea	100 kg DAP	F F	1, 2 & 5	1, 2, 3 & 5
06	Micro nutrient (specify) : - Dose (kg/ha) - Method of application	Use of sulphur (2q zypsum or 3kg wittable sulphur)	Nil	F	1	1 & 2
07	Pest management	IPM	Only chemical	P	1	1,2&5
08	Disease management	IPM	Only chemical	P	1	1,2&5
09	Weed management - Mechanical - Herbicide	Hand weeding Pedimethaline 3.3 lit /ha	No hand weeding -	F	1	1&2
10	Water management : - Number of irrigations - Method of irrigation	 01 Check, basin, sprinkler	 Nil -	P	3 & 4	1 & 2
11	Method of harvesting	Manual	Manual	N	N	N
12	Any other	-	-	-	-	-
13	Average Yield (Q / ha.) - Grain - Fodder/ Bio- Moss	 20-25 q/ha 15 q/ha	 9.10 q/ha Burning	 F F	 1 1	 1&2 1 & 2

Gap analysis in cultivation of Oilseeds (Soybean, Groundnut and Til): - Kharif Season

Sl. No.	Items of package	Recommended practice	Existing practice	Gap in adoption (F/P/N) (*)	Specific reasons for the gap (**)	Farmer proposed strategy (***)
01	Varieties	Improved variety as per recomendetion in Bundelkhand (zone 6)	Old seeds	F	1& 2	1 & 2
02	Seed rate (per ha.)	As per crop wise recomendation	As per crop wise recomendation	Nil	Nil	Nil
03	Seed treatment & Soil treatment	Thirum 2.5 gm / kg of seed Azatobactor + PSB	No No	F F	1	1 & 2

04	Organic manure (tons /ha)	FYM 150-200 NADEP compost – 60-70 Vermicompost – 25-30	Use undecomposed matter	F	1	1 & 2
05	Fertilizer / nutrient (kg/ha) - Basal (N+P+K) - Top dress (N)	 80 : 60 : 40 Use SSP for P	 As mixed crop (No fertilizer)	 F F	1, 2 & 5	1, 2
06	Micro nutrient (specify) : - Dose (kg/ha) - Method of application	Use of sulphur (2q zypsum or 3kg wittable sulphur)	Nil	F	1	1 & 2
07	Pest management	IPM	Only chemical	F	1	1 & 2
08	Disease management	IPM	Only chemical	F	1	1 & 2
09	Weed management - Mechanical - Herbicide	Hand weeding	No hand weeding -	F	1	1
10	Any other	Intercropping line (1 : 3)	No	F	1	1
11	Average Yield (Q / ha.) - Grain - Fodder/ Bio- Moss	 18-20 q/ha 5 q/ha	 9.10 q/ha -	 F F	 1 1	 1 1

Gap analysis of Oilseeds (Rai, Mustard and Toria): Rabi Season

Sl. No.	**Items of package**	**Recommended practice**	**Existing practice**	**Gap in adoption (F/P/N) (*)**	**Specific reasons for the gap (**)**	**Farmer proposed strategy (***)**
01	Varieties	Improved variety as per recomendetion	Old seeds	F	1& 2	1 & 2
02	Seed rate (per ha.)	As per crop wise recomendation	As per crop wise recomendation	Nil	Nil	Nil
03	Seed treatment & Soil treatment	Thirum 2.5 gm / kg of seed Azatobactor + PSB	No No	F F	1	1 & 2
04	Organic manure (tons /ha)	FYM 150-200 NADEP compost – 60-70	Use undecomposed matter	F	1	1 & 2

		Vermicompost – 25-30				
05	Fertilizer / nutrient (kg/ha) - Basal (N+P+K) - Top dress (N)	80 : 60 : 40 Use SSP for P	As mixed crop (No fertilizer)	F F	1, 2 & 5	1, 2
06	Micro nutrient (specify) : - Dose (kg/ha) - Method of application	Use of sulphur (2q zypsum or 3kg wittable sulphur)	Nil	F	1	1 & 2
07	Pest management	IPM	Only chemical	F	1	1 & 2
08	Disease management	IPM	Only chemical	F	1	1 & 2
09	Weed management - Mechanical - Herbicide	Hand weeding	No hand weeding -	F	1	1
10	Any other	Intercropping line (1 : 3)	No	F	1	1
11	Average Yield (Q / ha.) - Grain - Fodder/ Bio- Moss	18-20 q/ha 5 q/ha	9.10 q/ha -	F F	1 1	1 1

Gap analysis in cultivation of Cereals (Jowar, Bajra and Maize):-Kharif Season

Sl. No.	Items of package	Recommended practice	Existing practice	Gap in adoption (F/P/N) (*)	Specific reasons for the gap (**)	Farmer proposed strategy (***)
01	Varieties	Improved variety as per recomendetion in Bundelkhand (zone 6)	Old seeds	F	1& 2	1 & 2
02	Seed rate (per ha.)	As per crop wise recomendation	As per crop wise recomendation	Nil	Nil	Nil
03	Seed treatment & Soil treatment	Thirum 2.5 gm / kg of seed Azatobactor + PSB	No No	F F	1	1 & 2
04	Organic manure (tons /ha)	FYM 150-200 NADEP compost – 60-70 Vermicompost – 25-30	Use undecomposed matter	F	1	1 & 2

05	Fertilizer / nutrient (kg/ha) - Basal (N+P+K) - Top dress (N)	 80 : 60 : 40 Use SSP for P	As mixed crop (No fertilizer)	F F	1, 2 & 5	1, 2
06	Micro nutrient (specify) : - Dose (kg/ha) - Method of application	Use of Zinc suphate (25kg)	Nil	F	1	1 & 2
07	Pest management	IPM	Only chemical	F	1	1 & 2
08	Disease management	IPM	Only chemical	F	1	1 & 2
09	Weed management - Mechanical - Herbicide	Hand weeding	No hand weeding -	F	1	1
10	Average Yield (Q / ha.) - Grain - Fodder/ Bio- Moss	 25-30 q/ha 150 q/ha	 9-10 q/ha 100 q/ha	 P P	 1 1	 1 1

Gap analysis in cultivation of cereals (Wheat and Barley):-Rabi Season

Sl. No.	**Items of package**	**Recommended practice**	**Existing practice**	**Gap in adoption (F/P/N) (*)**	**Specific seasons for the gap (**)**	**Farmer proposed strategy (***)**
01	Varieties	Improved variety as per recomendetion in Bundelkhand (zone 6)	Old seeds	F	1& 2	1 & 2
02	Seed rate (per ha.)	As per crop wise recomendation	2 time seed used	P	2	2
03	Seed treatment & Soil treatment	Thirum 2.5 gm / kg of seed Azatobactor + PSB	No No	F F	1	1 & 2
04	Organic manure (tons /ha)	FYM 150-200 NADEP compost – 60-70 Vermicompost – 25-30	Use undecomposed matter	F	1	1 & 2
05	Fertilizer / nutrient (kg/ha) - Basal (N+P+K)	 120:60:40	 100:40:00	P	1, 2 & 5	1, 2

	- Top dress (N)	Half dose of N		F		
06	Micro nutrient (specify) : - Dose (kg/ha) - Method of application	Use of Zinc suphate (25kg)	Nil	F	1	1 & 2
07	Pest management	IPM	Only chemical	F	1	1 & 2
08	Disease management	IPM	Only chemical	F	1	1 & 2
09	Weed management - Mechanical - Herbicide	Hand weeding	No hand weeding -	F	1	1
10	Average Yield (Q / ha.) - Grain - Fodder/ Bio- Moss	 25-30 q/ha 150 q/ha	 9-10 q/ha 100 q/ha	 P P	 1 1	 1 1

Crop improvement programme will be taken up on farmer's field with participatory approach on pulses, oilseeds, cereals, etc. Improved package of practices will be demonstrated on farmer's fields. Application of recommended doses of fertilizers, pesticides, weedicides and other practices to the crops was not practiced in the area and farmers rarely use these practices in integrated and balanced manner. For the improvement of productivity integrated crop management, integrated pest management and integrated nutrient management demonstrations should be included in the programme. To improve the productivity following should be followed:

- Placement of basal dose of fertilizers at 8-10 cm depth in the root zone
- Application of multi-nutrient fertilizers to supplement the need of sulphur and other nutrients.
- Intercropping: Recommended intercropping systems like sorghum + pigeon pea, pigeon pea + black gram and soybean + pigeon pea are promising only under normal monsoon condition. Their productivity declines significantly if the monsoon gets delayed up to first week of August. Castor + green gram intercropping is an efficient intercropping system for delayed monsoon condition in black soil. Following intercroppings can be tried to improve the productivity of the system.

Sorghum + Pigeon pea Intercropping

- Sorghum is one of the prominent *kharif* crops of this rainfed MWS
- As the rooting pattern and date of maturity between the sorghum and pigeon pea differ, the two crops show good compatibility when grown together. Sorghum is harvested after 100 to 110 days while pigeon pea matures in 230 to 240 days.
- The legume crop of pigeon pea helps in maintaining soil fertility.
- Sorghum + pigeon pea intercropping is the most promising cropping system for normal monsoon rainfall and even under aberrant weather condition in Bundelkhand region in black soil series.
- The crop should be sown in 1:1 row ratio during last week of June to first week of July as per monsoon occurrence.
- The intercropping system is suitable for rainfed farming in Jhansi district as well as for Micro-watershed of black soil series.

Pigeon pea + black gram Intercropping

- Pigeon pea and black gram are the prominent *kharif* crops of this rainfed MWS
- As the rooting pattern and date of maturity between the black gram and pigeon pea differ, the two crops show good compatibility when grown together. Black gram is harvested after 90 to 100 days while pigeon pea matures in 230 to 240 days.
- Both the legume crop of pigeon pea and black gram helps in maintaining soil fertility.
- Pigeon pea + black gram intercropping is the most promising cropping system for normal monsoon rainfall and even under aberrant weather condition in Bundelkhand region in black soil series.
- The crop should be sown in 1:2 row ratios during last week of June to first week of July as per monsoon occurrence.
- The intercropping system is suitable for rainfed farming in Jhansi district as well as for micro-watershed of black soil series.

Soybean + Pigeon pea Intercropping

- Soybean is the new *kharif* crops for this areas where soil is black and has moisture and life saving irrigation near the water harvesting structures.
- As the rooting pattern and date of maturity between the soybean and pigeon pea differ, the two crops show good compatibility when grown together. Soybean is harvested after 110 to 120 days while pigeon pea matures in 230 to 240 days.
- The crop should be sown in 2:1 & 3:1 row ratios during last week of June to first week of July as per monsoon occurrence.

Castor + green gram intercropping

- Castor + green gram intercropping is an efficient intercropping system for delayed monsoon condition as emerged in last five years.
- Castor is a long duration (220-230 days) non-edible crop which grows well under rainfed condition with little effect on its productivity due to delayed sowing upto first week of August than other crop in the area.
- Unlike castor, green gram (*Mung bean)* is a fast growing (65-70 days duration) legume, which escapes competition with castor and is suited well for delayed monsoon conditions.
- Castor and green gram should be sown in separate rows across the slope in 1:2 ratio i.e. 30 cm apart so that the distance between two castor rows remains 60 cm. This would minimize erosion hazard under field conditions.
- This system provides excellent vegetative cover on the ground and reduces runoff and soil loss and improving soil fertility status. It provides employment for 93-95 man-days.

Vegetables and spices

Vegetables and spices were not being grown on commercial scale in the watershed villages. Therefore, it is decided to promote cultivation of onion, garlic, tomato, brinjal, cucurbits, chilies, turmeric and isabgol in areas for income and nutritional security.

Fodder cultivation

Scarcity of fodder in the area emerged as one of the major concern of the watershed community during PRA exercise. Therefore, in addition to the development of community pasture land, fodder cultivation in agricultural fields will be taken up extensively to meet the fodder demands of animals as revealed in fodder requirement analysis.

Replacement of old varieties

Farmers were not aware of high yielding varieties of crops. Certified seeds were rarely used in the area. Therefore, the efforts will be made to replace the prevailing varieties by new high yielding varieties, having wider adaptability against adverse climatic condition. Varieties of urd, moong, sesamum, sorghum

and pearl millet in *kharif* season while durum wheat, wheat, lentil, field pea, chickpea, linseed and mustard/rai in *rabi* season will be introduced on farmers field.

5.2.2.2 ON Farm Test

Productivity of different crops in the region is significantly low, therefore, following On Farm Tests are proposed in the project area:

OFT – 01

1. Crop : Chickpea
2. Problem identified : Low yield of chickpea
3. Title : Evaluation of high yielding varieties
4. Farmers practice : Use of local varieties
5. Details of technologies selected for assessment and refinement
   Treatments : T1 - Farmers Practice (local variety)
   : T2 - KWR-108
   : T3 - JG-315
6. Farming situation : Rainfed
7. No. of farmers : 05
8. Initial input : Seed of high yielding varieties

1) No. of pods/plant
2) Yield (q/ha)
3) C:B ratio

9. Area : 4000 Sq. Meter
10. Cost of input : Rs. 4000
11. Total cost : Rs. 20000

OFT – 02

1. Crop: : Lentil
2. Problem identified: : Low yield of Lentil (using local varieties)
3. Title: : Evaluation of high yielding varieties
4. Farmers practice : Use of local varieties
   Treatment: : T1 - Farmers practice (local variety)
   : T2 - DPL-62
   : T3 - DPL 54
5. Farming situation : Rainfed
6. No. of farmers : 05

7. Initial input : Seed
8. Performance indicators
: 1) Yield (q /ha)
: 2) C B Ratio
9. Area : One Acre
10. Cost of input : Rs. 2000
11. Total cost : Rs. 10000

OFT – 3

1. Crop : Linseed
2. Problem identified : Mixed crop with chickpea and lentil (Low yield)
3. Title : Screening of high yielding
4. Farmers practices : Sowing of mixed
5. Details of technologies selected for assessment and refinement
   Treatment : T1 - Farmers Practice
   : T2 - Padmini
   : T3 - Parwati
6. Farming situation : Rainfed
7. No. of farmers : 05
8. Sources of Technology : C. S. A. University of Ag., & Tech., Kanpur
9. Initial input : Seed
10. Performance indicators : 1) Yield (q/ha)
    : 2) C B ratio
11. Area : One acre per location
12. Cost of input : Rs. 1500
13. Total cost: : Rs. 7500

OFT – 4

1. Crop / Enterprises : Til
2. Problem identified : Low yield of sesamum
3. Title : Selection of high yielding varieties
4. Farming situation : Rainfed
5. Farmers practice : Local varieties
6. Details of technologies selected for assessment/refinement

Treatment : T1 - Farmers Practice
: T2 - Shekhar
: T3 - Pragati

7. Sources of technology : C. S. A. University of Agric. & Tech., Kanpur
8. No. of farmers : 10
9. Critical input : Seed
10. Performance indicators :
: 1) Yield (q/ha)
: 2) C:B ratio
11. Area : One acre
12. Cost of input : Rs. 250
13. Total cost : Rs. 2500

OFT – 5

1. Crop / Enterprises : Arhar (Pigeon pea)
2. Problem Identified : Long duration crop with mixed with sorghum

3. Title : Introduction of short duration pigeon pea varieties
4. Farming situation : Rainfed
5. Farmers practice : Long duration varieties
6. Details of technologies selected for assessment/refinement
7. Treatment : T1- Farmers Practice
: T2- UPAS 150
: T3- Malviya 13
8. No. of farmers : 05
9. Critical input : Seed
10. Performance indicators : 1) Yield (q/ha)
3) C.B.ratio
11. Area : One acre per location
12. Cost of input : Rs. 1500
13. Total cost : Rs. 7500

OFT – 6

1. Crop/Enterprises : Animal Husbandry
2. Problem identified : High mortality due to the endoparasites
3. Title : Effect of deworming practices on mortality in kids.
4. Details of technologies selected for assessment and refinement :

Treatment: : T1- Farmers Practice (No Deworming)
: T2-First deworming at 10 days deworming with cubazin
- Second deworming at one month age with piperazine
- Third deworming at two month age with Nelwarm
- Fourth deworming at three month age with Zenil flue drench or Destrodin tab.

5. No. of kids : 05 herds (Each herds containing 10-15 kids)
6. Sources of Technology : IVRI, Bareilly
7. Initial input : Deworming
8. Production system and thematic area : Disease Management
9. Performance indicators : 1) Kid mortality
2) Body weight gain (at 3 and 6 month age)
: 3) Occurrence of other associated health problems, if any
: 4) C: B ratio
10. Cost of input : Rs. 1500
11. Total cost : Rs. 7500

OFT- 7

1. Crop : Durum Wheat
2. Problem identified : Low Yield
3. Title : Assessment of durum wheat varieties in local condition
4. Farmers practices : Local varieties
5. Details of technologies selected for assessment and refinement
6. Treatment: T1 : Farmers practice (Local varieties)
T2 : Malav Shakti
T3 : Malav Ratan
7. Farming situation : Rainfed
8. No. of location : 05
9. Sources of Technology : Indore Ag. University

10. Initial input : Seed
11. Area : One acre
12. Performance indicators : Yield (q/ha)
C:B ratio
14.Cost of input : Rs 2000 / location
15.Total of cost : Rs. 10000

OFT- 8

1. Crop : Wheat
2. Problem identified : Low Yield
3. Title : Screening of low water requirement varieties.
4. Farmers practices : Use of isoproturan 50% @ 1.5 kg / ha
5. Details of technologies selected for assessment and refinement
6. Treatment: T1 : Farmers practice (WH-147 Old)
T2 : Maldakani
T3 : Raj 3765
7. Farming situation : Three irrigation
8. No. of location : 05
9. Sources of Technology : C. S. A. University of Ag. Tech., Kanpur
10. Initial input : Seed
11. Area : One acre / location
12. Performance indicators : Yield (q/ha)
C:B ratio
13. Cost of input : Rs 2000 / location
14. Total of cost : Rs. 10000

5.2.2.3 Crop Demonstrations: Following crop demonstrations are proposed to bridge the productivity gap.

A. Pulses:- Kharif season

Name of Crop			**Urd, Moong and Arhar**	
Area under each Demonstration			0.50 ha	
Total Area of Demonstration			5.00 ha	
Number of Demonstration			10	
Situation			Rainfed	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate (Rs)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	Given below	75.00		
2. Sowing Time	25 July to August			
3. Required Seed	12-15 kg	15 X 75	1200.00	600.00
4. Land Preparation				By user
5. Sowing Bullock/Seed drill	Line sowing	600	600.00	300.00
6. Intercultural Operation	One manually	900	900.00	450.00
7. Use Weedicide (IPM)	3.3 lit / ha Pendimethalin at pre emergence/ Total	450/lit	1485.00	743.00
8. Use of organic manure as FYM or NEDAD or Vermicompost	100 q/ha or 60 q/ha or 30 q/ha	60/q 150/q 300/q	6000.00 9000.00 9000.00	3000.00 4500.00 4500.00
9. Bio Fertilizers/Bio-agents (IPNM)				
i) Rhizobium + PSB (IPNM)	1.50 kg /ha (Soil treatment)	136.00	204.00	102.00
ii) Trichoderma (IPM)	Soil 3 kg /ha in Manure	130.00	390.00	195.00
10. Recommended dose of fertilizers (IPNM)				
25:60:30 NPK	130 kg	10	1300	650
i) DAP	375 kg	5	1875	938
ii) SSP	In case of SSP 54 kg Urea applied	6	324	162
iii) Urea		7	350	175
iv) MOP				
11. IPM	At 15 days interval (10 kg)	30	300	150
Spray of Neem Seed Kernal	15 + 15 + 15 + 15 + 2 kg/Lit Water, Neem leave, Cow dung, Cow urine and Gur (62 kg/lit)	2	124	62

Mataka Khad	NA			
Insecticides/Fungicides				
ICM	**Total**		**33052.00**	**16527.00**
Demonstrations on IPM, IPNM, Improved Seed and Technology can be done according to the problem and choice of user				
Variety				
Urd	Shekhar 1, Shekhar 2, Shekhar 3, Azad 1, Azad 2 (Green) & 3			
Moong	T 44, K 851, PDM 11, 54 139			
Arhar	Early- Paras, U.P.A.S.120, Pusa 992, Type 21 Late – Amar, Bahar, Narendra Arhar -1, Azad, Pusa 9, Malviya Vikash, Chamtkar			

Rabi

Name of Crop			**Lentil, Chickpea and Field Pea**	
Area under each Demonstration			0.5 ha	
Total Area of Demonstration			5 ha	
Number of Demonstration			10	
Situation			Un-irrigated	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate(Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	Given below			
2. Sowing Time	IInd week of October			
3. Required Seed				
Gram and Pea	100 kg/ha	70.00	7000.00	3500.00
Lentil	40 kg / ha (F1,F2, Certified)	80.00	4000.00	2000.00
4. Land Preparation	By User		-	By User
5. Sowing Bullock/Seed drill	By User		-	By User
6. Intercultural Operation	By User		-	By User
7. Use Weedicide	Pendimethalin 3.3 li/ha (Pre emergence)	465.00	1535.00	767.00
8. Use of organic manure as FYM or NEDAD or Vermicompost	100 q/ha or 60 q/ha or 30 q/ha	60/q 150/q 300/q	6000.00 9000.00 9000.00	3000.00 4500.00 4500.00
9. Bio Fertilizers / Bio-agents	24 pkt	7	168	84

i) Rhizobium + PSB	5 Pkt + 5 Pkt = 10 Pkt @ Rs	7.50	75.00	37.50
ii) Trichoderma	1.50 kg /ha (Soil treatment)	136.00	204.00	102.00
10. Recommended dose of fertilizers				
25:60:30 NPK				
i) SSP	375 kg /ha	5	1875	938
ii) Urea	In case of SSP 50 kg Urea applied	6	300	150
iii) MOP	50 kg / ha	7	350	175
11. IPM				
Spray of Neem oil and leaf extrect	At 15 days interval (10 kg)	30	300	150
Mataka Khad	15 + 15 + 15 + 15 + 2 kg/Lit Water, Neem leave, Cow dung, Cow urine and Gur (62 kg/lit)	2	124	62
ICM			**39931.00**	**19965.50**
Demonstrations on IPM, IPNM, Improved Seed and Technology can be done according to the problem and choice of user				
Variety				
Lentil	Narendra Masoor-1, DPL-15, L-4076, Pusa Vaibhav Late- IPL-81, K-75			
Chickpea	KWR-108, KGD 1168, JG 315, Pusa 256,			
Field Pea	PJ 885, Indra, Jai, Late – Adarsh			

B. Oilseeds: Kharif season

Name of Crop			**Til, Groundnut and Soybean**	
Area under each Demonstration			0.50 ha	
Total Area of Demonstration			3.00 ha	
Number of Demonstration			6	
Situation			Rainfed	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate(Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	Given below			
2. Sowing Time	June last to July last			
3. Required Seed				

Til	5 kg./ ha			
Groundnut	95 kg./ha			
Soybean	80 kg			
4. Land Preparation	By user			
5. Sowing Bullock/Seed drill	Line sowing	410 / hr	615	308
6. Intercultural Operation	Thinning and Digging of plant at raining	2 Labour 120/day	240	120
7. Use Weedicide	-	-	-	-
8. Use of organic manure as FYM or NEDAD or Vermicompost	100 q/ha or 60 q/ha or 30 q/ha	60/q 150/q 300/q	6000.00 9000.00 9000.00	3000.00 4500.00 4500.00
1. Bio Fertilizers/Bio-agents				
i) Azatobactor + PSB (Til & Groundnut)	With 1 q vermi compost / NADEP 10 Pkt + 10 Pkt in one ha	300 + 7	450	225
ii) Rhizobium + PSB (Soybean)	20 Pkt	7	140	70
12. Recommended dose of fertilizers				
30 : 15 : 25 N : P : Zn NPK				
i) SSP	275 kg	5	1375	688
ii) Urea	55 kg	5	275	140
iii) Zn	25 kg	10	250	125
13. IPM				
Spray of Neem oil and leaf extrect	At 15 days interval (10 kg)	30	300	150
Mataka Khad	15 + 15 + 15 + 15 + 2 kg/Lit Water, Neem leave, Cow dung, Cow urine and Gur (62 kg/lit)	2	124	62
Insecticides/Fungicides				
ICM			**27769**	**13888**
Demonstrations on IPM, IPNM, Improved Seed and Technology can be done according to the problem and choice of user				

Variety

Til	Shekhar, Pragati
Groundnut	Prakash, Amber
Soybean	P.S.564, P.K.416

Name of Crop	**Castor (On earthen bunds)**
Area under each Demonstration	1.5 X 600 Meter = 900 sq. M or 1000 sq.m.
Total Area of Demonstration	10 ha
Number of Demonstration	10 X 10 = 100
Situation	Rainfed

Detail of Demonstration	**Intervention / Technology Adopted**	**Rate(Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	Type -3, Tarai-4, Kalpi 6,			
2. Sowing Time	15 July to 15 August			
3. Required Seed	15 / ha	70	1050	105
4. Land Preparation	-	-	-	-
5. Sowing Bullock/Seed drill	Digging by hand on Bunds	4 labour @ Rs 120 / day	480	48
6. Intercultural Operation	-	-	-	-
7. Use Weedicide	-	-	-	-
8. Use of FYM	-	-	-	-
9. Use of Vermi-compost	-	-	-	
10. Use of NEDAP Compost	-	-	-	-
11. Bio Fertilizers/Bio-agents	-	-	-	-
i) Azatobactor + PSB	-	-	-	-
ii) Rhizobium + PSB	-	-	-	-
iii) Trichoderma	-	-	-	-
12. Recommended dose of fertilizers	-	-	-	-
50:25:15 NPK				
i) DAP	45 kg	10	450	45
ii) SSP	-	-	-	-
iii) Urea	80 kg	5	400	40
iv) MOP	25 kg	5	125	13
13. IPM				
Spray of Neem oil and leaf extrect	-	-	-	-
Mataka Khad	-	-	-	-
Insecticides/Fungicides	-	-	-	-
Total			**2505**	**251**

Rabi Season

Name of Crop			**Mustard/Rai**	
Area under each Demonstration			0.50 ha	
Total Area of Demonstration			5.00	
Number of Demonstration			10	
Situation			Rainfed	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate(Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	Maya, Kranti, Basanti			
2. Sowing Time	September last to Last October			
3. Required Seed	5 kg /ha	150	750	375
4. Land Preparation	By user			
5. Sowing Bullock/Seed drill	Line sowing	-	-	-
6. Intercultural Operation	Topping at the time of before flowering	2 Labour @ 120/day	240	120
7. Use Weedicide	NA			
8. Use of organic manure as FYM or NEDAD or Vermicompost	100 q/ha or 60 q/ha or 30 q/ha	60/q 150/q 300/q	6000.00 9000.00 9000.00	3000.00 4500.00 4500.00
9. Bio Fertilizers/Bio-agents				
i) Azatobactor + PSB	20 Pkt Soil Treatment	7	140	70
10. Recommended dose of fertilizers				
80:60:40 NPK				
i) DAP	120 kg	10	1200	600
ii) SSP	-	-	-	-
iii) Urea	100 kg	5	500	500
iv) MOP	80 kg	5	400	200
11. IPM				
Spray of Neem oil and leaf extrect	At 15 days interval (10 kg)	30	300	150
Mataka Khad	15 + 15 + 15 + 15 + 2 kg/Lit Water, Neem leave, Cow dung, Cow urine and	2	124	62

	Gur (62 kg/lit)			
Insecticides/Fungicides	Melathion/ Indosulphan		700	350
ICM			**28354.00**	**14427.00**
Name of Crop			**Toriya**	
Area under each Demonstration			0.50	
Total Area of Demonstration			4.00	
Number of Demonstration			8	
Situation			Irrigated / Rainfed	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate(Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	T. 9, Bhawani, PT – 303, PT 30			
2. Sowing Time	September			
3. Required Seed	4 kg	150	600	300
4. Seed treatment	2 thirum + 1 gm Carbendazim / kg seed		150	75
5. Sowing Bullock/Seed drill	Line sowing	-	-	-
6. Intercultural Operation	-	-	-	-
7. Use Weedicide	-	-	-	-
8. Use of FYM	By user			
9. Use of Vermi-compost	By user	-	-	-
10. Use of NEDAP Compost	By user	-	-	-
11. Bio Fertilizers/Bio-agents	-	-	-	-
i) Azatobactor + PSB	-	-	-	-
ii) Rhizobium + PSB	-	-	-	-
iii) Trichoderma	-	-	-	-
12. Recommended dose of fertilizers	-	-	-	-
50:30:30 NPK				
i) DAP	60 kg	10	600	300
ii) SSP	-	-	-	-

iii) Urea	100 kg	5	500	250
iv) MOP	50 kg	5	250	125
13. IPM				
Spray of Neem oil and leaf extrect	At 15 days interval (10 kg)	30	300	150
Mataka Khad	15 + 15 + 15 + 15 + 2 kg/Lit Water, Neem leave, Cow dung, Cow urine and Gur (62 kg/lit)	2	124	62
Insecticides/Fungicides	NA	-	-	-
Total			**2524**	**1262**

Name of Crop			**Linseed**	
Area under each Demonstration			0.50	
Total Area of Demonstration			5.00	
Number of Demonstration			10	
Situation			Rainfed	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate(Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	Parwati, Padmini, rashmi etc			
2. Sowing Time	Full October			
3. Required Seed	30 kg	75	2250	1125
4. Seed Treatment	2 thirum + 1 gm Carbendazim / kg seed		150	75
5. Sowing Bullock/Seed drill	Line sowing	410 /hr	820	410
6. Intercultural Operation	-	-	-	-
7. Use Weedicide	-	-	-	-
8. Use of FYM	By User	-	-	-
9. Use of Vermi-compost	-	-	-	-
10. Use of NEDAP Compost	-	-	-	-
11. Bio Fertilizers/Bio-agents	-		-	-
i) Azatobactor + PSB	-	-	-	-
ii) Rhizobium + PSB	-	-	-	-

iii) Trichoderma	-	-	-	-
12. Recommended dose of fertilizers				
50:40:40 NPK				
i) DAP	80 kg	10	800	400
ii) SSP	-	-	-	-
iii) Urea	65kg	5	325	162
iv) MOP	80	5	400	200
13. IPM				
Spray of Neem oil and leaf extrect	At 15 days interval (10 kg)	30	300	150
Mataka Khad	15 + 15 + 15 + 15 + 2 kg/Lit Water, Neem leave, Cow dung, Cow urine and Gur (62 kg/lit)	2	124	62
Insecticides/Fungicides	NA			
Total			**5169**	**2584**

C. Cereals and Millets
Kharif season –

Name of Crop			**Sorghum, Bajra and Maize**	
Area under each Demonstration			0.50	
Total Area of Demonstration			5.00	
Number of Demonstration			10	
Situation			Rainfed	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate(Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties				
2. Sowing Time	June last week			
3. Required Seed				
Sorghum	12 kg /ha			
Bajra	5 kg/ha			
4. Seed treatment	2 thirum + 1 gm Carbendazim / kg seed		150	75
5. Sowing Bullock/Seed drill	Line sowing		900	450
6. Intercultural Operation	-	-	-	-

7. Use Weedicide	Atragene 50% 1.5 kg /ha	235/ acre	588	294
8. Use of organic manure as FYM or NEDAD or Vermicompost	100 q/ha or 60 q/ha or 30 q/ha	60/q 150/q 300/q	6000.00 9000.00 9000.00	3000.00 4500.00 4500.00
9. Bio Fertilizers/Bio-agents				
i) Azatobactor + PSB	20 Pkt Soil Treatment	7	168	84
ii) Trichoderma	1.5 kg/ha (Soil treatment)	136	204	102
10. Recommended dose of fertilizers				
80:40:30 NPK				
i) DAP	100 kg/ha	9	900	450
ii) SSP				
iii) Urea	150 kg/ha	6	900	450
iv) MOP	50 kg/ha	7	350	175
11. IPM		175	350	175
Spray of Neem oil and leaf extrect	At 15 days interval (10 kg)	30	300	150
Mataka Khad	15 + 15 + 15 + 15 + 2 kg/Lit Water, Neem leave, Cow dung, Cow urine and Gur (62 kg/lit)	2	124	62
Insecticides/Fungicides	NA			
14. Harvesting			2000	1000
15. Threshing /Weighing			3500	1750
16. Storage			200	100

Variety	
Sorghum	Varsha, CSV 13, 15 Late – Vjeta, Bundela
Bajra	Raj-171, ICTP-8203, ICMB-155 Late-WCC-75
Maize	Ganga-11, Sartaj, Prakash, Dakan 107 Late-HQPM-5

Rabi Season

Name of Crop	**Barley, Wheat (*aestivum*) and Durum Wheat**
Area under each Demonstration	0.50 ha
Total Area of Demonstration	3.00 ha

Number of Demonstration			06	
Situation			Rainfed	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate(Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	Azad, K-141, Geetajali, Upasna			
	Late- DWR-28, Lakhan			
2. Sowing Time	Oct last week			
3. Required Seed	100 kg/ha			
Barley				
Wheat (*aestivum*) and Durum Wheat	125kg/ha			
4. Land Preparation	By User		900	450
5. Sowing Bullock/Seed drill	By User		450	225
6. Intercultural Operation	By User			
7. Use Weedicide	Total 2.5 Pkt	450/acre	1125	563
8. Use of organic manure as FYM or NEDAD or Vermicompost	100 q/ha or 60 q/ha or 30 q/ha	60/q 150/q 300/q	6000.00 9000.00 9000.00	3000.00 4500.00 4500.00
9. Bio Fertilizers/Bio-agents	24 Pkts	7	164	84
i) Azatobactor + PSB	12 Pkt + 12 Pkt	7	168	84
ii) Trichoderma	2.5 kg/ha (Soil treatment)	136	340	170
10. Recommended dose of fertilizers				
25:60:30 NPK				
i) DAP	100 kg/ha	9	900	450
ii) SSP				
iii) Urea	150 kg/ha	6	900	450
iv) MOP	50 kg/ha	7	350	175
v) Zinc Sulphate	20 kg/ha	40	800	400
11. IPM		175	350	175
Spray of Neem oil and leaf extrect	At 15 days interval (10 kg)	30	300	150
Mataka Khad	15 + 15 + 15 + 15 + 2 kg/Lit Water,	2	124	62

	Neem leave, Cow dung, Cow urine and Gur (62 kg/lit)			
Insecticides/Fungicides	NA			
14. Harvesting			2500	1250
15. Threshing /Weighing			5000	2500
16. Storage			500	250

Variety	
Barley	Azad, K-141, Geetajali, Upasna Late- DWR-28, Lakhan
Wheat (*aestivum*)	K-8027, C-306, LOK-1, HD-2888, Raj-1555 Late-Marviya-234, UP-2425
Durum Wheat	Malav Shri, Shakti, Ratan

5.2.2.4 Demonstrations on fodder and grass cultivation

Name of Crop			**Stylo hamata (on bund)**	
Area under each Demonstration			0.50 ha	
Total Area of Demonstration			10.00 ha	
Number of Demonstration			20	
Situation			Rainfed	
Seed Requirement			250 kg	
Seed Amount			7500	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate (Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	Malav Shri, Shakti, Ratan			
2. Sowing Time	Oct to mid Nov			
3. Required Seed	125 kg/ha	20	2500	1250
4. Land Preparation				
5. Sowing Bullock/Seed drill	Line Sowing	-	-	-
6. Intercultural Operation	-	-	-	-
7. Use Weedicide	-	-	-	-
8. Use of FYM	By User (Training)	600	3600	1800

9. Use of Vermi-compost	By User (Training)	150	3000	1500
10. Use of NEDAP Compost	By User (Training)	100	3000	1500
11. Bio Fertilizers/Bio-agents	24 Pkts	7	164	84
i) Azatobactor + PSB	12 Pkt + 12 Pkt	7	168	84
ii) Rhizobium + PSB				
iii) Trichoderma	2.5 kg/ha (Soil treatment)	136	340	170
12. Recommended dose of fertilizers				
25:60:30 NPK				
i) DAP	100 kg/ha	9	900	450
ii) SSP				
iii) Urea	150 kg/ha	6	900	450
iv) MOP	50 kg/ha	7	350	175
	20 kg/ha	40	800	400
13. IPM		175	350	175
Spray of Neem Seed Kernal	At 15 days interval (10 kg)	30	300	150
Mataka Khad	15 + 15 + 15 + 15 + 2 kg/Lit Water, Neem leave, Cow dung, Cow urine and Gur (62 kg/lit)	2	124	62
Insecticides/Fungicides	NA			
14. Harvesting			2500	1250
15. Threshing /Weighing			5000	2500
16. Storage			500	250

Name of Crop			**Berseem**	
Area under each Demonstration			0.50 ha	
Total Area of Demonstration			2.00 ha	
Number of Demonstration			4	
Situation			Irrigated	
Seed Requirement			30 kg	
Seed Amount			4500	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate (Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**

1. Name of Varieties	Malav Shri, Shakti, Ratan			
2. Sowing Time	Oct to mid Nov			
3. Required Seed	125 kg/ha	20	2500	1250
4. Land Preparation				
5. Sowing Bullock/Seed drill	Line Sowing	-	-	-
6. Intercultural Operation	-	-	-	-
7. Use Weedicide	-	-	-	-
8. Use of FYM	By User (Training)	600	3600	1800
9. Use of Vermi-compost	By User (Training)	150	3000	1500
10. Use of NEDAP Compost	By User (Training)	100	3000	1500
11. Bio Fertilizers/Bio-agents	24 Pkts	7	164	84
i) Azatobactor + PSB	12 Pkt + 12 Pkt	7	168	84
ii) Rhizobium + PSB				
iii) Trichoderma	2.5 kg/ha (Soil treatment)	136	340	170
12. Recommended dose of fertilizers				
25:60:30 NPK				
i) DAP	100 kg/ha	9	900	450
ii) SSP				
iii) Urea	150 kg/ha	6	900	450
iv) MOP	50 kg/ha	7	350	175
	20 kg/ha	40	800	400
13. IPM		175	350	175
Spray of Neem Seed Kernal	At 15 days interval (10 kg)	30	300	150
Mataka Khad	15 + 15 + 15 + 15 + 2 kg/Lit Water, Neem leave, Cow dung, Cow urine and Gur (62 kg/lit)	2	124	62
Insecticides/Fungicides	NA			
14. Harvesting			2500	1250
15. Threshing /Weighing			5000	2500
16. Storage			500	250

Name of Crop			**Sudan Grass**	
Area under each Demonstration			0.50 ha	
Total Area of Demonstration			5.00 ha	
Number of Demonstration			10	
Situation			Irrigated	
Seed Requirement			60 kg	
Seed Amount			4500	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate (Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	SSG (Pro-agro)/pioneer			
2. Sowing Time	March to July			
3. Required Seed	20 kg/ha	80	1600	800
4. Land Preparation				
5. Sowing Bullock/Seed drill	Line Sowing	-	-	-
6. Intercultural Operation	-	-	-	-
7. Use Weedicide	-	-	-	-
8. Use of FYM	By User (Training)	600	3600	1800
9. Use of Vermi-compost	By User (Training)	150	3000	1500
10. Use of NEDAP Compost	By User (Training)	100	3000	1500
11. Bio Fertilizers/Bio-agents				
i) Azatobactor + PSB	12 Pkt + 12 Pkt	7	168	84

ii) Rhizobium + PSB				
iii) Trichoderma				
12. Recommended dose of fertilizers				
25:60:30 NPK				
i) DAP	100 kg/ha	9	900	450
ii) SSP				
iii) Urea	150 kg/ha	6	900	450
iv) MOP	50 kg/ha	7	350	175
13. IPM		175	350	175
Spray of Neem Seed Kernal				
Mataka Khad				
Insecticides/Fungicides	NA			

Name of Crop			**Lucerne**	
Area under each Demonstration			0.50 ha	
Total Area of Demonstration			2.00 ha	
Number of Demonstration			4	
Situation			Irrigated	
Seed Requirement			24 kg	
Seed Amount			2900	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate (Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	As per annexure-II			
2. Sowing Time	Oct to mid Nov			
3. Required Seed	15 kg/ha	100	1500	750
4. Land Preparation				

5. Sowing Bullock/Seed drill	-	-	-	-
6. Intercultural Operation	-	-	-	-
7. Use Weedicide	-	-	-	-
8. Use of FYM	By User (Training)			
9. Use of Vermi-compost	By User (Training)			
10. Use of NEDAP Compost	By User (Training)			
11. Bio Fertilizers/Bio-agents				
i) Azatobactor + PSB	12 Pkt + 12 Pkt	7	168	84
ii) Rhizobium + PSB				
iii) Trichoderma				
12. Recommended dose of fertilizers				
i) DAP	100 kg/ha	9	900	450
ii) SSP				
iii) Urea	50 kg/ha	6	900	450
iv) MOP	50 kg/ha	7	350	175
	20 kg/ha	40	800	400
13. IPM		175	350	175
Spray of Neem Seed Kernal				
Mataka Khad				
Insecticides/Fungicides				

5.2.2.5 Demonstrations on medicional and aeromatic plants

Name of Crop			**Aloe-Vera**	
Area under each Demonstration			0.50 ha	
Total Area of Demonstration			1.00 ha	
Number of Demonstration			2	
Situation			Irrigated	
Rhizomes			35000	
Amount			70000	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate (Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	Rhizomes			

2. Sowing Time	July			
3. Required Seed	30000 Rhizomes	0.50	15000	7500
4. Land Preparation				
5. Sowing Bullock/Seed drill	Line Sowing	-	-	-
6. Intercultural Operation	-	-	-	-
7. Use Weedicide	-	-	-	-
8. Use of FYM	By User (Training)	600	3600	1800
9. Use of Vermi-compost	By User (Training)	150	3000	1500
10. Use of NEDAP Compost	By User (Training)	100	3000	1500
11. Bio Fertilizers/Bio-agents				
i) Azatobactor + PSB	12 Pkt + 12 Pkt	7	168	84
ii) Rhizobium + PSB				
iii) Trichoderma	2.5 kg/ha (Soil treatment)	136	340	170
12. Recommended dose of fertilizers				
i) DAP	100 kg/ha	9	900	450
ii) SSP				
iii) Urea	150 kg/ha	6	900	450
iv) MOP	50 kg/ha	7	350	175
	20 kg/ha	40	800	400
13. IPM		175	350	175
Spray of Neem Seed Kernal	At 15 days interval (10 kg)	30	300	150
Mataka Khad	15 + 15 + 15 + 15 + 2 kg/Lit Water, Neem leave, Cow dung, Cow urine and Gur (62 kg/lit)	2	124	62
Insecticides/Fungicides	NA			
14. Harvesting			2500	1250
15. Threshing /Weighing			5000	2500
16. Storage			500	250

Name of Crop			**Tulsi**	
Area under each Demonstration			0.50 ha	
Total Area of Demonstration			1.00 ha	
Number of Demonstration			2	
Situation			Irrigated	
Seed Requirement			15 kg	
Seed Amount			3750	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate (Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	Kali Tulsi			
2. Sowing Time	June to July			
3. Required Seed	5 kg/ha	500	2500	1250
4. Land Preparation				
5. Sowing Bullock/Seed drill	Line Sowing	-	-	-
6. Intercultural Operation	-	-	-	-
7. Use Weedicide	-	-	-	-
8. Use of FYM	By User (Training)	600	3600	1800
9. Use of Vermi-compost	By User (Training)	150	3000	1500
10. Use of NEDAP Compost	By User (Training)	100	3000	1500
11. Bio Fertilizers/Bio-agents				
i) Azatobactor + PSB	12 Pkt + 12 Pkt	7	168	84
ii) Rhizobium + PSB				

iii) Trichoderma	2.5 kg/ha (Soil treatment)	136	340	170
12. Recommended dose of fertilizers				
i) DAP	100 kg/ha	9	900	450
ii) SSP				
iii) Urea	150 kg/ha	6	900	450
iv) MOP	50 kg/ha	7	350	175
	20 kg/ha	40	800	400
13. IPM		175	350	175
Spray of Neem Seed Kernal	At 15 days interval (10 kg)	30	300	150
Mataka Khad	15 + 15 + 15 + 15 + 2 kg/Lit Water, Neem leave, Cow dung, Cow urine and Gur (62 kg/lit)	2	124	62

Name of Crop			**Turmeric**	
Area under each Demonstration			0.50 ha	
Total Area of Demonstration			2.00 ha	
Number of Demonstration			4	
Situation			Irrigated	
Rhizomes			15 q	
Amount			37500	
Detail of Demonstration	**Intervention / Technology Adopted**	**Rate (Rs/kg/ Pkt)**	**Cost per ha (Rs)**	**Demonstration Cost (Rs)**
1. Name of Varieties	Rhizomes			
2. Sowing Time	June to July			
3. Required Seed	5 q	3000	15000	7500

4. Land Preparation				
5. Sowing Bullock/Seed drill	Line Sowing	-	-	-
6. Intercultural Operation	-	-	-	-
7. Use Weedicide	-	-	-	-
8. Use of FYM	By User (Training)	600	3600	1800
9. Use of Vermi-compost	By User (Training)	150	3000	1500
10. Use of NEDAP Compost	By User (Training)	100	3000	1500
11. Bio Fertilizers/Bio-agents				
i) Azatobactor + PSB	12 Pkt + 12 Pkt	7	168	84
ii) Rhizobium + PSB				
iii) Trichoderma	2.5 kg/ha (Soil treatment)	136	340	170
12. Recommended dose of fertilizers				
i) DAP	100 kg/ha	9	900	450
ii) SSP				
iii) Urea	150 kg/ha	6	900	450
iv) MOP	50 kg/ha	7	350	175
	20 kg/ha	40	800	400
13. IPM		175	350	175
Spray of Neem Seed Kernal	At 15 days interval (10 kg)	30	300	150
Mataka Khad	15 + 15 + 15 + 15 + 2 kg/Lit Water, Neem leave, Cow dung, Cow urine and Gur (62 kg/lit)	2	124	62

5.2.2.6 Horticulture/agroforestry development

. Growing of crops in combination with woody perennial on same piece of land is called agroforestry and it is economically viable and way out to increase the permanent vegetal cover. The estimates for aonla, guava, lemon, bael, ber and silvi-pastoral systems are presented in Table 11.4 to 11.9.

Table 5.2: Estimate for development of aonla based agroforestry systems (100 trees/ha)

S.N.	Work items	Cost/unit (Rs.)	Amount (Rs./ha)
1.	Digging of pits of 0.75x0.75x0.75 m3	25.00	2500.00
2.	Average of cost of planting material	20.00	2000.00
3.	Carriage charges from nursery to the planting site	2.50	250.00
4.	Cost of planting+1st watering	4.00/plant	400.00
5.	Cost of raising agricultural crops @ Rs. 15,000.00 ha-1 yr-1	15000.00	15000.00
6.	Miscellaneous	Lump sump	2000.00
		G. Total	22150.00

Table 5.3: Estimate for development of guava based agroforestry systems (100 trees/ha)

S.N.	Work items	Cost/unit (Rs.)	Amount (Rs./ha)
1.	Digging of pits of 0.75x0.75x0.75 m3	25.00	2500.00
2.	An average of cost of planting material	15.00	1500.00
3.	Carriage charges from nursery to the planting site	2.50	250.00
4.	Cost of planting+1st watering	4.00/plant	400.00
5.	Cost of raising agricultural crops @ Rs. 15,000.00 ha-1 yr-1	15000.00	15000.00
6.	Miscellaneous	Lump sump	2000.00
		G. Total	21650.00

Table 5.4: Estimate for development of lemon based agroforestry systems (150 trees/ha)

S.N.	Work items	Cost/unit (Rs.)	Amount (Rs./ha)
1.	Digging of pits of 0.75x0.75x0.75 m3	25.00	3750.00
2.	Average of cost of planting material	7.00	1050.00
3.	Carriage charges from nursery to the planting site	2.50	375.00
4.	Cost of planting+1st watering	4.00/plant	600.00
5.	Cost of raising agricultural crops @ Rs.	15000.00	15000.00

	15,000.00 ha-1 yr-1		
6.	Miscellaneous	Lump sump	2500.00
		G. Total	23275.00

Table 5.5: Estimate for development of bael based agroforestry systems (100 trees/ha)

S.N.	Work items	Cost/unit (Rs.)	Amount (Rs./ha)
1.	Digging of pits of 0.75x0.75x0.75 m3	25.00	2500.00
2.	Average of cost of planting material	10.00	1000.00
3.	Carriage charges from nursery to the planting site	2.50	250.00
4.	Cost of planting+1st watering	4.00/plant	400.00
5.	Cost of raising agricultural crops @ Rs. 15,000.00 ha-1 yr-1	15000.00	15000.00
6.	Miscellaneous	Lump sump	2000.00
		G. Total	21150.00

Table 5.6: Estimate for development of ber based agroforestry systems (150 trees/ha)

S.N.	Work items	Cost/unit (Rs.)	Amount (Rs./ha)
1.	Digging of pits of 0.75x0.75x0.75 m3	25.00	3750.00
2.	Average of cost of planting material	10.00	1500.00
3.	Carriage charges from nursery to the planting site	2.50	375.00
4.	Cost of planting+1st watering	4.00/plant	600.00
5.	Cost of raising agricultural crops @ Rs. 15,000.00 ha-1 yr-1	15000.00	15000.00
6.	Miscellaneous	Lump sump	2500.00
		G. Total	23725.00

Table 5.7: Estimate for development of silvopastoral systems (400 trees/ha)

S.N.	Work items	Cost/unit (Rs.)	Amount (Rs./ha)
1.	Digging of pits of 0.6x0.6x0.6 m3	13.00	5200.00
2.	Average of cost of planting material	7.00	2450.00
3.	Carriage charges from nursery to the planting site	2.50	1000.00
4.	Cost of planting+1st watering	3.00/plant	1200.00
5.	Cost of raising pasture @ Rs. 25,000.00 ha-1 yr-1 (About 38000 slips of different grasses will be required)	25000.00	25000.00
6.	Miscellaneous	Lump sump	3000.00
		G. Total	38200.00

5.3 Livelihood Option for Village Groups / Community

1. Vermi-compost unit

Capacity – 100 metric tonn per year

S. No.	Head of Expenditure	Unit	Quantity	Rate (Rs.)	Total Amount (Rs.)
1.	Land	Sq. Meter	4000	50000.00	50000.00
2.	Platform	Sq. Meter	240	-	40000.00
3.	Shed (Angle iron & Asbestos Sheet)		240	-	120000.00
4.	Hand pump / Well	-	01	-	40000.00
5.	Dung	Metric ton	100	500	50000.00
6.	Red worms (*Eisinia fetida)*	Quintal	01	25000	25000.00
7.	Chhanna (Manual)	-	01	8000	8000.00
8.	Weight/Kanta	-	01	-	4000.00
9.	Implements- Spade, Tasala, Hajara etc.	-	-	-	2000.00
10.	Other Expenses & Labour	-	-	-	25000.00
	Total				**364000.00**

Farmers share is 1- Land, 2- Plate form, 4- Hand pump/Well, 5- Dung & 10- Labour i.e Rs. 50000.00 + 40000.00 + 40000.00 + 50000.00 + 25000.00 = 205000.00 (Rs. Two lakh five thousand only). Remaining amount Rs. 1,59000.00 (Rs. One lakh fifty nine thousand only) will be provided by the project. Term and condition is applied that vermicompost unit will run in participatory mode by the Groups i.e. made by farming community for their livelihood improvement.

Farmers share – 205000.00
Project Share - 159000.00
Total (Rs.) 364000.00

2. Nursery unit

S. No.	Head of Expenditure	Unit	Quantity	Rate (Rs.)	Total Amount (Rs.)
1.	Land	Acre	1/2	90000.00	45000.00
2.	Fencing				
a.	Barbed wire	Quintal	1.5	6600.00	9900.00
b.	Concrete polls	No.	53	275.00	14575.00
c.	Lobour	No.	20	100.00	2000.00
3.	Boring / Well	No.	01	40000.00	40000.00
4.	Beds preparation, irrigation channels etc.	-	-	-	10000.00
5.	Low cost poly house (Bareja)	No.	01	-	5000.00
6.	Implements- khurpi, Spade, hajara etc.	-	-	-	2000.00
7.	Polythene begs	Kg	150	100.00	15000.00
8.	Manure (FYM)	Ton	2	1500.00	30000.00
9.	Chemicals	-	-	-	1000.00
	Total				**174475.00**

Farmers share is 1- Land, 2- Labour, 3- Boring/Well, 5- Bed & irrigation channels i.e Rs. 45000.00 + 2000.00 + 40000.00 + 10000.00 = 97000.00 (Rs. Ninety seven thousand only). Remaining amount Rs. 77475.00 (Rs. Seventy seven thousand four hundred seventy five only) will be provided by the project. Term and condition is applied that Nursery unit will be run in participatory mode by the Groups i.e. made by farming community for their livelihood improvement.

Farmers share – 97000.00
Project Share - 77475.00
Total 174475.00

Month Wise Plan of Nursery Raising

Nursery development work takes six months to one year and monthly work for raising of plants is fixed. Here we detailed the plants in village condition of district Lalitpur (UP)

Months	Details of Plants & work
January	Collect the seeds of Sirash, Khair, Aonla, Teak, Bakain, Acacia, Amaltash plant from Forest Deppt. or other reliable sources
February	Seed Sowing – Bamboo, Shisham, Sirash, Gulmohar & Seed Treatment of Teak seed by Lime in pit
March	Plant Germinated Root Trainer in Polythene Bags for Shisham, Vilayati Babool and Aonla
April	Seed sowing should be done of Khair, Aonla, Bamboo and Arjun
May	Collect seeds of Kangi, Shemal and Gulmohar
June	One year or more old plant of Jamun, Kangi, Arjun and Shisham ready for the sale
July	For the next year Germination Plot should be prepared for the Ber, Gulmohar, Khair, Kathal, Jamun, Kangi, Neem etc. and germinated plants of two to three leaves should be transferred in to the Polythene bags
August	Sown seed in July transferred into the Polythene bags plots and Neem Seed should be cleaned from flesh and sown in the germinated plots.
September	Sowing of Neem, Kachnar, Acacia seeds etc. Polythene bags filling and collect seeds of Gauva
October	Polythene filling, Watering etc.
November	Polythene filling, Watering etc.
December	Polythene filling, Watering etc.

***Seed collection and arrangement*:**

Months	Plants
January	Teak, Kagzi Neebu, Guava, Khair
February	Teak, Kagzi Neebu, Guava, Khair, Cutting of Teak, Aonla
March	Teak, Kagzi Neebu, Guava, Khairm Cutting of Teak, Aonla
April	Khair, Aonla, Bamboo and Arjun
May	Collect seeds of Kangi, Shemal and Gulmohar
June	Subabool, Babool, Shemal, Bamboo, Neem, Sheesham,
July	Neem, Vilayati Babool, Sesbania

3. Goat kids project

Shed Cost : Made by locally available material

S.No.	Particulars	Amount
1.	Thatch Structure / Khapparel Shed (Size: 15 X 300 Feet) with partition for one male	
	1. Khapperrel / Bamboo	4000.00
	2. Thatch, Puwal etc.	1000.00
	3. Rope Band & Patera	500.00
	4. Periphery boundary Kacchi / Stone / Pacca	3000.00
	5. Miscellaneous	1500.00
	Total	**10000.00**

Input Involved

S.No.	Particulars	Amount
1.	Kids goat No.- 20 @ 1000 / female	20000.00
2.	Adult Male	3000.00
	Total	**23000.00**

Recurring Cost

S.No.	Particulars	*Amount*
1.	Labour- Grazing of Goat (Mandays yearly: One person /day @ Rs. 100 / day	36000.00
2.	Feed Cost (@ Rs 4000 / month Annually –)	48000.00
	Barley & Wheat under size	
	Chickpea under size	
	Green fodder (Leaf of subabool, lobia, grasses, legumes etc)	
	Wheat Straw	
3.	Medicines & Health care (FMD, Deworming & Vaccinations) annually charges and Training	6000.00
4.	Insurance (annually)	1200.00
	Total	**91200.00**
	Total Expenditure	**124200.00**

Farmers share is 1- Shed, 2- Labour, 3- Feed cost i.e Rs. 10000.00 + 36000.00 + 48000.00 = 94000.00 (Rs. Ninety four thousand only). Remaining amount Rs. 30200.00 (Rs. Thirty thousand and two hundred only) will be provided by the project. Term and condition is applied that Goat unit will be run in participatory mode by the Groups i.e. made by farming community for their livelihood improvement.

Farmers share – 94000.00

Project Share - 30200.00

Total 124200.00

4. Goat rearing project

Goats create employment to the rural poor including effective utilization of unpaid family labour. Goat rearing is going on in Bundelkhand with traditional grazing system; these include grazing on non-cultivated land, grazing on community land close to the villages. In this system animals are housed at night and let loose for grazing in the daytime with no supplementation with concentrate mixture. The production per animal is low but margin of profit is high as no investment is involved on feeding. Growing habits of grasses, development of pasture on non-cultivated lands is essential in participatory mode. Intensive production system where no grazing land is available the goats are reared on stall feeding. Under this system there is no risk of parasite infestation, maximum protection from adverse weather conditions, however, some space is provided for exercise. When sufficient grazing area is not available supplementary feeding is done in form of concentration mixture or green and dry fodder.

The integration of livestock with crop production is a means of establishing sustainable system that aim to optimize resources use. The realization of such aims will maximize the degree of self-reliance of the system, since a variety of products will be obtained with minimum inputs to maintain soil fertility. The varied activities on the integration farm create employment opportunities for all members of the extended family. Use of native pasture, crop residue and fibrous agro products supplementary feeding whenever necessary for efficient rumen fermentation and high animal productivity. The tree crops are highly appropriate for this region. They capture a large amount of solar enery and they produce sustainable yield of biomass. They reduce erosion, improve soil structure and fertility and plant with shallow roots can be grown under the trees.

Structures

Made by locally available material

S.No.	**Particulars**	**Amount**
1.	Thatch Structure / Khapparel Shed (Size: 15 X 300 Feet) with partition for one male	
	1. Khapperrel / Bamboo	4000.00
	2. Thatch, Puwal etc.	1000.00
	3. Rope Band & Patera	500.00
	4. Periphery boundary Kacchi / Stone / Pacca	3000.00
	5. Miscellaneous	1500.00
	Total	**10000.00**

2. Input involved

S.No.	**Particulars**	**Amount**
1.	Adult Female No.- 10 @ 3000 / female	30000.00
2.	Adult Male	3000.00
	Total	**33000.00**

3. Recurring Cost

S.No.	Particulars	*Amount*
1.	Grazing of Goat (Mandate yearly: One person /day @ Rs. 100 / day	36000.00
2.	Feed Cost (@ Rs 4000 / month Annually –)	
	Barley & Wheat under size	
	Chickpea under size	48000.00
	Green fodder (Leaf of subabool, lobia, grasses, legumes etc)	
	Wheat Straw	
3.	Medicines & Health care (FMD, Deworming & Vaccinations) annually charges	6000.00
4.	Insurance (annually)	1200.00
	Total	**91200.00**

Total Expenditure 1, 2 & 3 = 134,200.00

Output / Receipts from Goat Rearing Project

S.No.	Particulars	*Amount*
	i. Milk Production:	
1.	Milk Production (10 Goat) (5 Month @ 1 lit / day / Goat = 1500 lit Sale @ Rs. 15/lit	22500.00
2.	Milk Production (4 Month) = 1200 lit @ Rs. 15/lit	18000.00
	Total	**40,500.00**
	B. Selling of Goat Kids (From six Month to 12 year)	
3.	First Production (after six month from starting) Average two kids (Assumed that ratio of male & female is 50:50) 10 male to be sale @ Rs. 1800 / kid 10 Female kids retain for next rearing (Rate calculated for next unit)	 18000.00 30000.00
4.	Second Production (Av. two kids/ goat) 10 Old Stock Production – 20 kids (assumed that ratio of male & female is 50:50) a. 10 Male sale @ Rs. 1500 / kid b. 10 Female kids for next rearing @ 2000 / kid	 15000.00 20000.00
	Total	**83000.00**
	C. Goat Manure	

5.	After one year 50 q (if not grazed) if grazing is going on then vermi-compost / NADEP Unit is compulsory with each unit	**15000.00**
	D. Permanent Parent Stock	
6.	11 Parent - one unit @ Rs. 4000 / Goat	**44000.00**
	Total	**182500.00**

Note:

1. Two Unit of Goat will be separated from this Unit after 14 months that input cost is included in lower side in respect of rates, which are prevailing in the market.
2. Next Two units will be further distributed to the Participatory groups.
3. One Acre of waste land will produce complete feed for one unit by the growing of Subabool (*Luceana leucocephala*) and grasses (Dhabroo, Dinanath etc.)
4. Growing of grasses and legumes on earthen work is compulsory (*Stylosanthes hamata*, Dina Nath, Dhabroo, *Cenchrus ciliaris*, etc.)
5. Farmers share is 50% of above cost

Net Return from Goat Rearing Project: 182,500 – 134200 = 48,300.00

Feeding cost should be included in net return if complete watershed approach adopted, so this return will be just double.

Information related to the Goat Rearing

1. **Research Institute:**
   Central Goat Research Institute,
   Farah, Makdoom,
   Mathura U.P.
2. **Local Market for Parent Materials: Jamunapari & Barberi**
   1. Chaura, Kalpi, Jalaun U.P.
   2. Kosi, Mathura
   3. Pukhranya, Kanpur, Dehat

.

5. Project on Cultivation of Medicinal & Aromatic Plants:

Name of Crop: Ashwaganda, Sarpgandha, Allovera (Gvarpatha)

Unit Economics:

Land Requirement: Five ha (Participatory)

Machinery & Apparatus: Spade, Bucket, Moter (Pump) etc. – 30,000.00

Input required:

a. Seed & Planting material - 15,000.00
b. Manure - 20,000.00

c. Miscellaneous - 5,000.00

Total **40,000.00**

Recurring Cost:

Electric / Pump set (Diesel etc.) 15,000.00

Worker & Labours

S. No.	Particulars	No.	Amount (Rs)
1.	Full time Labour	01 @ Rs. 100 / day	2600.00
2.	Casual Labour	05 for 20 days @ Rs. 100 / day	10000.00
	Total		12600.00

Other Expenditure:

a. Transportation - 10,000.00

b. Maintenance & Storage etc. - 10000.00

c. Stationary & Poster etc. - 5000.00

Total **25000.00**

Total Unit Cost

1. Machinery - 30,000.00
2. Input - - 40,000.00
3. Worker & labour - 12600.00
4. Other Expenditure - 25000.00

Total Expenditure 107600.00

Unit Profit

Total production from one ha is about Rs. 250,000.00

Yearly Income from Unit 142400.00

Address for Seed & Other Material used in Unit

1. Central Institute of Medicinal & Aromatic Plants (CIMAP)

P.O. – Ram Sagar, Mishara Nagar , Lucknow

6. Masala Grinding Project

1. Land Requirement; 1000 Sq Feet Rent Rs. 1500.00 per Month

2. Capacity: 300 working days

6480 kg Chilly Powder

6000 kg Coriander Powder

6960 kg Haldi

1200 kg Garam Masal
Job Work

3. Machinery Required

S.No.	Particulars	No.	Rate	Total Amount (Rs)
1.	Pulverizer (5 horse power)	01	37000.00	37000.00
2.	Packaging Machine	01	12000.00	12000.00
3.	Taraju, Bant etc	01	4500.00	4500.00
4.	Electrification	01	3500.00	3500.00
	Total			**57000.00**

Working Capital / Month

4. Raw Material

S. No.	Items	Quantity	Rate	Amount (Rs)
1.	Chilly	540 kg	40 / kg	21600.00
2.	Haldi	580 kg	30 kg	17400.00
3.	Coriander	500 kg	35	17500.00
4.	Jeera	20 kg		5500.00
5.	Badi Ilaichi	30 kg		3500.00
6.	Kali Mirch	40 kg		9500.00
7.	Dal Chinni	30 kg		5000.00
8.	Laong	20 kg		2800.00
9.	Packaging Material	12.00		2500.00
	Total			**85300.00**

Workers & Labours

1. Skilled Labour 01 @ Rs. 185 / day 5550.00
2. Helper 02 @ Rs. 100 / Day 6000.00

Total **11550.00**

5. Utilities Expenditure per Month

1. Electricity Expenditure 1000.00
2. Water etc. 1000.00

Total **2000.00**

6. Other Expenditure per Month

1. Rent 1500.00
2. Postage / Stationary Expenditure 500.00
3. TA. Transportation etc. 2000.00

4. Insurance 500.00
5. Administrative expenses 1200.00
Total **5700.00**

Capital Required per Month

1. Raw Material 85300.00
2. Worker & Labour 11550.00
3. Utilities Exp. 2000.00
4. Other Exp 5700.00
Total **104550.00**

Total Project Cost

A. Machinery & Tools 57000.00
B. Capital Running 104550.00
Total **161550.00**

Entrepreneur Share – 50 %
Implementing agency share - 50 %
Assumed Profit

Particulars	**Quantity**	**Rate**	**Amount (Rs)**
Coriander Powder	6000 kg	Rs 60 / kg	360000.00
Michi Powder	6480	Rs 65 / kg	421200.00
Haldi Powder	6960 kg	55 / kg	382800.00
Garam Masal	1200	165 / kg	192000.00
Job work			150000.00
	Total		**1506000.00**

7. Oil Expeller Project

1. Land Requirement; 1250 Sq Feet Rent Rs. 1200.00 per Month
2. Capacity: 300 working days
50 kg Mustard / hour
40 % Job Work

3. Machinery Required

S.No.	Particulars	No.	Rate	Total Amount (Rs)
1.	Oil Expeller (6 Volt Ave. 50 kg / hr) 7 HP Motor	01	48000	48000.00
2.	Filter Press	01	15000.00	15000.00
3.	Shaft, Patta etc.	-	7500.00	7500.00
4.	Electrification & furniture	-	15000.00	15000.00
	Total			**85500.00**

Working Capital / Month

4. Raw Material

S. No.	Items	Quantity	Rate	Amount (Rs)
1.	Mustard	4500 kg	18 / kg	81000.00
	Total			**81000.00**

5. Workers & Labours

1. Skilled Labour 01 @ Rs. 185 / day	5550.00	
2. Helper 01 @ Rs. 100 / Day	2600.00	
Total		**8150.00**

6. Utilities Expenditure per Month

1. Electricity Expenditure	3500.00
2. Water etc.	1000.00
Total	**4500.00**

7. Other Expenditure per Month

1. Rent	1200.00	
2. Postage / Stationary Expenditure		500.00
3. TA. Transportation etc.		2000.00
4. Insurance		500.00
5. Administrative expenses		1200.00
Total		**5400.00**

8. Capital Required per Month

1. Raw Material	81000.00	
2. Worker & Labour		8150.00
3. Utilities Exp.		4500.00
4. Other Exp		5400.00

Total **99050.00**

Total Project Cost

A. Machinery & Tools 85500.00

B. Capital Running 99050.00

Total **184550.00**

Entrepreneur Share – 50 %

Implementing agency share - 50 %

Assumed Profit

Particulars	**Quantity**	**Rate**	**Amount (Rs)**
Mustard Oil	19440	Rs 60 / kg	1166400.00
Cake	34590	Rs15 / kg	518850.00
Job Work	-	-	550000.00
	Total		**2235250.00**

8. Papad Making Unit

1. Land Requirement; 1000 Sq Feet Rent Rs. 1000.00 per Month

2. Capacity: 300 working days
6960 kg urd Papad
4620 kg Moong Papad

3. Machinery Required

S.No.	**Particulars**	**No.**	**Rate**	**Total Amount (Rs)**
1.	Papad Making Machine (with ¼ HP motor)	01	28000.00	28000.00
2.	Aata mixing machine (with motor)	01	25000.00	25000.00
3.	Loi making Machine (with motor)	01	27000.00	27000.00
4.	Loi Pressing Machine hand running	01	3500.00	3500.00
5.	Other Pans & Apparatus	-	-	5000.00
6.	Electrification	-	-	7500.00
7.	Furniture & Other	-	-	7500.00
	Total			**103500.00**

Working Capital / Month

4. Raw Material

S. No.	Items	Quantity	Rate	Amount (Rs)
1.	Moong Aata	350 kg	30 kg	10500.00
2.	Urd Aata	495 kg	35 kg	17352.00
3.	Jeera	20 kg	55 kg	1100.00
4.	Papad Khar	33 kg	20 / kg	660.00
5.	Salt	33 kg	10 / kh	330.00
6.	Hing	1 kg		150.00
7.	Lal Mich, Kali Mirch,			2000.00
8.	Other packing material			5000.00
	Total			**37092.00**

Workers & Labours

1. Skilled Labour 01 @ Rs. 185 / day 5550.00
2. Helper 02 @ Rs. 100 / Day 5200.00

Total **10750.00**

5. Utilities Expenditure per Month

1. Electricity Expenditure 750.00
2. Water etc. 1000.00

Total **1750.00**

6. Other Expenditure per Month

1. Rent 1000.00
2. Postage / Stationary Expenditure 500.00
3. TA. Transportation etc. 2000.00
4. Insurance 500.00
5. Administrative expenses 1200.00

Total **5200.00**

7. Capital Required per Month

1. Raw Material 37092.00
2. Worker & Labour 10750.00
3. Utilities Exp. 1750.00
4. Other Exp 5200.00

Total **54792.00**

Total Project Cost

A. Machinery & Tools 103500.00

B. Capital Running 54792.00

Total **158292.00**

Entrepreneur Share – 50 %

Implementing agency share - 50 %

Assumed Profit

Particulars	**Quantity**	**Rate**	**Amount (Rs)**
Moong Papad	4620 kg	Rs 66 / kg	304920.00
Urd Papad	6960 kg	Rs75 / kg	522000.00
	Total		**826920.00**

9. Wooden Furniture Unit

1. Land Requirement; 40 X 20 Feet Rent Rs. 2000.00 per Month
2. Capacity: 300 working days
3. Machinery Required

S.No.	**Particulars**	**No.**	**Rate**	**Total Amount (Rs)**
1.	Aari , Rabdha, Hammer, etc.	-	-	18000.00
2.	Small Aara Machine (1/2 HP Motor)	01	38000.00	38000.00
4.	Other Pans etc.	-	-	5000.00
	Total			**61000.00**

Working Capital / Month

4. Raw Material

S. No.	**Items**	**Quantity**	**Rate**	**Amount (Rs)**
1.	Sheesham, Teak wood etc.	-	-	150000.00
2.	Keel, Pench, Primar, etc.	-	-	12000.00
3.	Favicole, Ply wood, Sun Mica eyc.	-	-	25000.00
	Total			**248000.00**

5. Workers & Labours

1. skilled Karigar @ 250 / Day 7500.00
2. Labour 02 @ Rs. 100 / Day 5200.00

Total **12700.00**

6. Other Expenditure per Month

1. Rent 2000.00

2. Postage / Stationary Expenditure 500.00
3. TA. Transportation etc. 2000.00
4. Insurance 500.00
5. Administrative expenses & Sale Rapper etc. 2500.00
Total **7500.00**

7. Capital Required per Month

1. Raw Material 248000.00
2. Worker & Labour 12700.00
3. Other Exp 7500.00
Total **268200.00**

Total Project Cost

A. Machinery & Tools 61000.00
B. Capital Running 268200.00
Total **329200.00**

Entrepreneur Share – 50 %
Implementing agency share - 50 %

Assumed Profit

Particulars	**Quantity**	**Rate**	**Amount (Rs)**
Furniture made	-	Per month	2,62000.00
	300 days / Years		2620000.00
	Total		**800000.00**

10. Mini Dal Mill Unit

1. Land Requirement; 1250 Sq Feet Rent Rs. 1200.00 per Month
2. Capacity: 300 working days
10 quintal / day
40 % Job work (Community Basis)

3. Machinery Required

S.No.	**Particulars**	**No.**	**Rate**	**Total Amount (Rs)**
1.	Mini Dal Mill (IIPR Kanpur)	01	42000	42000.00
2.	Other Utensils	-	-	5000.00
3.	Shaft, Patta etc.	-	7500.00	7500.00
4.	Other (electric etc.)	-	-	3000.00
	Total			**57500.00**

Working Capital / Month

4. Raw Material

S. No.	Items	Quantity	Rate	Amount (Rs)
1.	Urd, Moong, chickpea, Pea	100 q	2500 / q	250000.00
	Total			**250000.00**

5. Workers & Labours

1. Skilled Labour 01 @ Rs. 185 / day	5550.00	
2. Helper 01 @ Rs. 100 / Day	2600.00	
Total		**8150.00**

6. Utilities Expenditure per Month

1. Electricity Expenditure		3500.00
2. Sailling 7 Drying etc	7500.00	
Total		**11000.00**

7. Other Expenditure per Month

1. Rent	1200.00	
2. Postage / Stationary Expenditure		500.00
3. TA. Transportation etc.		2000.00
4. Insurance		500.00
5. Administrative expenses		1200.00
Total		**5400.00**

8. Capital Required per Month

1. Raw Material	250000.00	
2. Worker & Labour		8150.00
3. Utilities Exp.		11000.00
4. Other Exp		5400.00
Total		**274550.00**

Total Project Cost

A. Machinery & Tools	57500.00	
B. Capital Running		274550.00
Total		**332050.00**

Entrepreneur Share – 50 %

Implementing agency share - 50 %

Assumed Profit

Particulars	Quantity	Rate	Amount (Rs)
Dal of different kind	1500 q	Rs Ave 3000 / q	4500000.00
Job Work	-	-	500000.00
	Total		**5000000.00**

11. Small Dairy Farm Unit

1. Land Requirement;

5 Buffaloes/Cows Unit Requires: 400 Sq Feet covered area (thatched) made by local material and Approximately 1000 sq feet open area

Rent Rs. 2000.00 per Month

2. Capacity: 5 Animal Unit

3. Live Stock & Machinery Required

S.No.	Particulars	No.	Rate	Total Amount (Rs)
1.	Buffaloes / Cows (Murra/ Tharparkar)	05/05	30000 / animal	150000.00
2.	Milk Can	06	500	3000.00
3.	Balty	10	150	1500.00
4.	Chaff cutter (with Motor)	01	3500	3000.00
5.	Other pans etc.	-	-	2000.00
	Total			**159500.00**

Working Capital / Month

4. Raw Material

S. No.	Items	Quantity	Rate	Amount (Rs)
1.	Bhusa / month	20 quintal	180 / q	3600.00
2.	Green Fodder / Concentrate Feed etc.	6 kg/ Buffalo & 4 kg / Cow Appro. 1000 kg	10 kg	10000.00
	Total			**13600.00**

5. Workers & Labours

1. Skilled Labour 01 @ Rs. 185 / day 5550.00
2. Helper 02 @ Rs. 100 / Day 2600.00

Total **8150.00**

6. Other Expenditure per Month

1. Rent 2000.00
2. Postage / Stationary Expenditure 500.00
3. TA. Transportation etc. 2000.00

4. Insurance 1200.00
5. Administrative expenses 1200.00
Total **6900.00**

7. Capital Required per Month

1. Raw Material 13600.00
2. Worker & Labour 8150.00
3. Other Exp 6900.00
Total **28650.00**

Total Project Cost

A. Live Stock & Machinery/Tools 159500.00
B. Capital Running 28650.00
Total **188150.00**

Entrepreneur Share – 50 %
Implementing agency share - 50 %

Assumed Profit

Particulars	**Quantity**	**Rate**	**Amount (Rs)**
Milk sale (peak)	9000 lit	Rs 15 / lit.	135000.00
Dry Spell	4500 lit	Rs. 15 / lit	67500.00
	Total		**202500.00**

12. Small Poultry Unit

A. Capital Investment

1. Broiler House Tubular Structure
Approximately 1000 sq @ Rs 100 / sq feet = 1,00,000.00
2. Broiler Apparatus
a. Adult Feeder 25 Nos. @ Rs. 250 / No. 6250.00
b. Chick Feeder 25 Nos. @ 75 / No. 1875.00
3. Brooder Automatic 03 Nos. @ Rs. 1250 / No. 3750.00
4. Electric Fitting etc. 7500.00
Total **119375.00**

B. Working Capital:

1. 1000 chicks one day old @ 12 / Chick 12000.00
2. Balanced Broiler Feed for 45 days @ 2.5 gm/ chick Rs. 6.00 / kg 15,000.00
3. Poultry Liter (wooden Powder) 2500.00
4. Medicines 2000.00

5. Transport 1000.00
6. Working Staff & labour 5500.00
7. Other Expenses 5000.00

Total **43000.00**

Total Unit Cost

1. Capital Investment – 119375.00
2. Working Capital - 43000.00

Total **162375.00**

Entrepreneur Share – 50 %
Implementing agency share - 50 %

Returns

1. Broiler 1000 Birds (Live weight –1.30 kg) @ Rs. 70 / Bird 70000.00
2. Poultry Manure 1500.00
3. Feed Blank Gunny Bags 2500.00

Total **74000.00**

Total Five Crops will made in a year, So Net Return = 3,70,000.00

13. Motor Mechanic Workshop

1. Land Requirement; 1250 Sq Feet Rent Rs. 1200.00 per Month
2. Capacity: 300 working days

Moror Bike, Tractor, Diesel Engine etc

3. Machinery Required

S.No.	Particulars	No.	Rate	Total Amount (Rs)
1.	Instruments			50000.00
2.	Shed etc	-	-	50000.00
	Total			**100000.00**

4. Workers & Labours

1. Skilled Labour 01 @ Rs. 185 / day 5550.00
2. Helper 01 @ Rs. 100 / Day 2600.00

Total **8150.00**

5. Utilities Expenditure per Month

1. Electricity Expenditure 3500.00

6. Other Expenditure per Month

1. Rent 1200.00
2. Postage / Stationary Expenditure 500.00
3. TA. Transportation etc. 2000.00

4. Insurance 500.00
5. Administrative expenses 1200.00
Total **5400.00**

7. Capital Required per Month

1. Worker & Labour 8150.00
2. Utilities Exp. 3500.00
3. Other Exp 5400.00
Total **17050.00**

Total Project Cost

A. Machinery & Tools 100000.00
B. Capital Running 17050.00
Total **117050.00**

Entrepreneur Share – 50 %
Implementing agency share - 50 %

Assumed Profit

Particulars	**Quantity**	**Rate**	**Amount (Rs)**
Job work	Rs. 20000/Month		240000.00
	Total		**240000.00**

14. Barber Shop

1. Shop area / rent ; Rs. 100.00 per Month
2. Capacity: 300 working days
3. Machinery Required

S.No.	**Particulars**	**No.**	**Rate**	**Total Amount (Rs)**
1.	Instruments & Mirrors etc.			50000.00
2.	Shed etc	-	-	50000.00
	Total			**100000.00**

4. Workers & Labours

1. Skilled Labour 01 @ Rs. 185 / day 5550.00

5. Utilities Expenditure per Month

1. Electricity Expenditure 3500.00

6. Other Expenditure per Month

1. Rent 1000.00

4. Insurance 500.00

Total **1500.00**

7. Capital Required per Month

1. Worker & Labour 5550.00
2. Utilities Exp. 3500.00
3. Other Exp 1500.00

Total **10550.00**

Total Project Cost

A. Machinery & Tools 100000.00
B. Capital Running 10550.00

Total **110550.00**

Entrepreneur Share – 50 %
Implementing agency share - 50 %

Assumed Profit

Particulars	**Quantity**	**Rate**	**Amount (Rs)**
Job work	Rs. 1500/Month		180000.00
	Total		**180000.00**

15. Rope making Unit (Linseed)

1. Land Requirement; ½ acre
2. Capacity: 300 working days
3. Machinery, raw material & Building Required

S.No.	**Particulars**	**No.**	**Rate**	**Total Amount (Rs)**
1.	Rope making machine	01	35000	35000.00
2.	Decomposing structure	01	25000	25000.00
3.	Shed cum office	01	25000	25000.00
4.	Raw material (linseed stem)	20 ton	6000/ton	60000.00
	Total			**145000-00**

4. Workers & Labours

1. Skilled Labour 01 @ Rs. 185 / day 5550.00
2. Helper 01 @ Rs. 100 / Day 2600.00

Total **8150.00**

5. Utilities Expenditure per Month

1. Electricity Expenditure 3500.00

6. Other Expenditure per Month

1. Rent	1200.00	
2. Postage / Stationary Expenditure		500.00
3. TA. Transportation etc.		2000.00
4. Insurance		500.00
5. Administrative expenses & marketing		1800.00
Total		**6000.00**

7. Capital Required per Month

1. Worker & Labour		8150.00
2. Utilities Exp.		3500.00
3. Other Exp		6000.00
Total		**17650.00**

Total Project Cost

A. Machinery & Tools	145000.00	
B. Capital Running		17650.00
Total		**162650.00**

Entrepreneur Share – 50 %
Implementing agency share - 50 %

Assumed Profit

Particulars	**Quantity**	**Rate**	**Amount (Rs)**
Rope	15 ton rope / yr	12000 / ton	180000.00
Job work	-		50000.00
	Total		**230000.00**

16. Organic Product Unit

S. No	Particulars	Description
1	Cereals	Duram Wheat – as grown by the local growers on small groups basis
2	Pulses	Chickpea, pea, lentil, Urd, Moong and Arhar
3	Fruits	Aonla

Above crops to be identified according to the Agro climatic situation (Land, situations, irrigations etc)

Work Plan

1. Identification of commodities groups
2. Informations of groups and their land and farming system approach
3. Certification process
4. Practices for organic growing

Certification Charges For Five Years

S.No.	Details of Certification	Amount (Rs)
1	1st year – Travel & Inspection 7000 / day	49000.00
	Report Preparation	5000.00
	Certification	5000.00
	Others (Stationary etc)	1000.00
	Total	60000.00
2.	2nd year	60000.00
3	3rd year	60000.00
4	4th Year	60000.00
5	5th year	Self by the groups
	Total	240000.00
	PIA Share – 50 %	120000.00
	Group Share – 50 %	120000.00

17. Seed Production and Seed Bank

Existing Problem: Seed replacement

S. No.	Particulars	Analysis of Problem	
1.	Quality of Seed	Very poor	Low Yield of Crops
2.	Availability of Seed	Untimely	Effect the Yield of crops
3.	Seed Rate (at the time of sowing)	Higher 1.5 to 2.0 times then recommendation	Money loss
4.	Productivity	Very Low	Lack of awareness about seed and ICM
5.	Replacement rate of Seed	Nil	Low productivity

Objectives:

1. To improve the quality of uncertified seed (farmer's seed) or Truthful seed at village level.
2. To increase the production and productivity.
3. To create awareness among the farmers about quality seed, seed rate and method of sowing.
4. To generate employment for unemployed rural youth.
5. To save grain for extra use and income.

6. Multiplication of seed of newly released varieties suitable for microclimate.

Work Plan:

1. Formation of advisory committees
2. Selection of farmers for seed production in groups.
3. Selection of land according to crops requirement.
4. Arrangement of seed before the main season from different universities / states.
5. Field visits of farmers for truthful seed and for certification by certified agencies
6. Marketing of seed by groups or e marketing.

Seed Multiplication Table

S. No.	Crop	Required seed (q/ha)	Productivity q/ha	Area sown (ha)	Required seed (q)
1.	Durum Wheat	1.00	18.00	40	40.00
2.	Chickpea	1.00	12.00	20	20.00
3.	Field Pea	1.00	12.00	20	20.00
4.	Lentil	0.60	11.00	20	12.00
5.	Urd	0.50	4.00	10	5.00
6.	Moong	0.50	4.00	10	5.00

Input Required

1. Seed:

S. No.	Crop	Required seed (in quintal)	Approximately Rate of Seed (Rs./q)	Amount (Rs.)
1.	Durum Wheat	40.00	2500	100000
2.	Chickpea	20.00	6500	130000
3.	Field Pea	20.00	5400	108000
4.	Lentil	12.00	6000	72000
5.	Urd	5.00	5500	27500
6.	Moong	5.00	5600	28000
	Total			**465500**

2. Cost of Cultivation: From sowing to harvesting all activities should be done by the individual farmer under the Self help group.
3. Drying, Sorting & Cleaning at village level:
   10 Labour Rs. @ 100 for one day for each crop for one ha produce for wheat
   5 labour Rs. @ 100 for one day for each crop for one ha produce for pulses

Crop	Area (ha)	Labour for one ha	Amount (Rs.)
Durum Wheat	40.00	1000	40000.00
Chickpea	20.00	500	10000.00
Field Pea	20.00	500	10000.00
Lentil	12.00	500	6000.00
Urd	5.00	500	2500.00
Moong	5.00	500	2500.00
Total	**102**		**71000.00**

4. Registration Fees (@ Rs 450 /ha 45900.00
5. Packaging (hand Sieving machine) **5500.00**
6. Jute Bags (bags of 40 kg Total No. 3430) **51450.00**
7. Transportation & services charges etc. 20000.00

Total **122850.00**

Income from one Unit & Area Expansion with good productivity

S. No.	Crop	Production	Rate / q	Total Amount (Rs.)	Area can be sown
1.	Durum Wheat	720	2000	1440000	720
2.	Chickpea	240	5000	1200000	240
3.	Field Pea	240	4500	1080000	240
4.	Lentil	132	4500	594000	220
5.	Urd	20	4000	80000	40
6.	Moong	20	4200	84000	40
	Total	**1372**		**4478000**	**1500**

- At least 2 units will be established in the whole cluster of watershed by the self help groups.
- Interested SHGs will be preferred and village community work for seed bank and deposit seeds for higher production and increasing the area of the watershed under the cluster approach.
- The production from seed production unit will be used as seed bank by SHGs and other villagers of productivity enhancement. The SHGs will get money from other farmers on behalf of their seed and the benefited farmers will take an oath to spread these seed for higher productivity in the watershed to other farmers.

Outcomes from Seed Production & Seed Bank programme

S. No.	Crop	Production	Total Amount (Rs.)	Two unit in cluster	Area can be sown (ha)
1.	Durum Wheat	720	1440000	2880000	1440
2.	Chickpea	240	1200000	2400000	480
3.	Field Pea	240	1080000	2160000	480
4.	Lentil	132	594000	1188000	440
5.	Urd	20	80000	160000	80
6.	Moong	20	84000	168000	80
	Total	**1372**	**4478000**	**8956000**	**3000.00**

- It is very clear from the production of seed and their bank which will run in participatory mode in the watershed

CHAPTER - 6

CAPACITY BUILDING PLAN

The capacity building of various stake holders will be given very high priority as the watershed is to be developed in participatory mode. Capacity building initiative plays very important role in human resource development of model watershed to replicate and train other watershed resource persons. The capacity building initiatives include training to NARS, government officials, CBOs, farmers and PIAs through field days, hands-on trainings, exposure visits to successful watersheds, training materials and etc. Need-based specialized training courses will be conducted. The details of the training is summarized in Table 6.1.

Table- 6.1: List of probable training institutes for capacity building

Sr. No.	Name of the Training Institute	Full Address with contact no, website & e-mail	Designation of the Head of Institute	Type of Institute	Area(s) of specialization
1.	Krishi Vigyan Kendra	Bharari, P.O.- Bhojla, Jhansi	Programme Coordinator	Ag. University	Extension
2.	National Research Centre for Agro-Forestry	Gwaliar Road, Jhansi *www.nrcaf.ernet.in*	Director	ICAR (GoI)	Agro-Forestry/ Watershed Research and management
3.	Indian Grass Land & Fodder Research Institute	Gwaliar Road, Jhansi	Director	ICAR (GoI)	Grass Land & Fodder Research
4.	Bundelkhand University (Agriculture Division)	Kanpur Road, Jhansi	Head (Agronomy)	State University	Teaching & Training
5.	Govt. Agriculture School	Chirgaon, Jhansi	DD (Ag.)	State Govt.	Training to Farmers
6.	Govt. Poly-technique	Gwaliar Raod, Jhansi	Principal	State Govt.	Draft man training
7.	ITI	ITI, Colony, Jhansi	Principal	State Govt.	Draft man training

Table- 6.2: Training to stakeholders on participatory watershed management

Sl. No.	Client Group	Title of the Programme/Duration/ Time	Objectives	Coverage/Topics	Training Methodology	Training Institutions
1.	Watershed Committee Members / Watershed Secretaries /Presidents / Field Staff etc	Participatory watershed management Duration : 2 days on each topics	To familiarize the participants with various aspects of participatory management of watershed	Watershed concept, Salient features of guidelines, Organizing people's groups, Conducting meetings, Recording of proceedings, Office Management, Accounting Procedures, Book keepings and accounts, Maintenance of accounts and records, Participatory Planning, Preparation of schemes and estimates for SHGs, Implementation of works and activities, Assisting execution and recording of works, Effecting timely payments Awareness creation	Lectures on LCD Case discussion Group exercises CDs & LCD Show	KVK/ Research institutes/ NGOs

Table 6.3: Title of trainings to be organized for members of WC /WDT/field staff

Durum wheat and low water requiring wheat varieties screening and ICM Interest of groups identification and implementation in collective manner. Applied Vermi-culture, NADEP and composting technologies for livelihood Advance vegetable production techniques Fish culture in water harvesting structures Post harvest and value addition
Advance oilseed production techniques. Cultivation of medicinal and aromatic Plants. Low cost feeding of milch animals Integrated pest management in *kharif* and *rabi* pulses
Goatary, Dairy, rabbit farming and poultry development.

Integrated crop management in pulses and oilseeds
Advance pulse and oilseed production techniques Advance extension skills and use of GIS and GPS in watershed Training on information technology Computer in agriculture marketing (internet) Fabrication of gabion Construction of low cost checkdam, well recharging unit Monitoring and evaluation of impact of watershed management Preparation of reports, leaflets, bulletins, etc. Documentation of success stories Development of nursery tech.

Table 6.4: Title of trainings to be organized for members of WC/SHGs/UGs/AGs/WDT at local level

Title of the Programme & Duration	Objectives	Coverage/Topics	Training Institutions/Methodologies
Orientation Program on Participatory Planning and Management	• To enhance the technical and managerial capability of participants	• Watershed concept, need and program • Salient features of guidelines • Roles and Responsibilities • Leadership building • Conducting meeting • Farming systems approach • Participatory planning for developments • Preparation of group plan and Action Plan • Group Formation and Management • Conservation and Production measures • Management of CPR • Post Project Management of created assets • Financial Arrangements • INM,IPM Practices • Benefit sharing	KVK/ Research institutes/ NGOs • Lecture-cum-discussions • Practical exercise • Demonstration • Video film show Field visit

Capacity building programme will be continuous. For the sake of convenience each year may divided in two halves and training may be organized on

the topics mentioned in table 6.5.

Table 6.5: Title of trainings to be organized for stakeholders

First half yearly programme

- Integrated Crop Management (ICM) of oilseeds and pulses of winter
- Integrated Crop Management (ICM in winter vegetables.
- Small Scale Dairy, goatary and poultry unit development for livelihood as option.
- Skill training on preservation of rural products (locally available) under household condition.
- Composite Fish Culture
- Production of Organic Mannure & their marketing
- Integrated pest management of wilt in pulses and gram pod borer in gram, yellow vein mosaic disease of urd and moong.
- Durum wheat and low water requiring wheat varieties screening and ICM
- Interest groups identification and implementation of units in collective manner.
- Applied Vermi-culture NADEP and composting technologies for livelihood and for sustainable development
- Integrated crop management in Groundnut and soybean
- Layout & plantation techniques of Aonla, Ber & Guava.
- Fodder production in *Kharif*
- Safe storage of grain and pulses
- Layout and construction / Rejuvenation of fishpond.

Second half yearly programme

- Integrated crop management in oilseed crops of *kharif* & *rabi* season
- Integrated crop management in vegetables of *kharif* season
- Green Fodder production in *Rabi*.
- Seed treatment and method of sowing in *Rabi* crops.
- Application of organic and inorganic fertilizers in fish culture ponds
- Soil and water conservation measures
- Control of collar rot disease in groundnut through seed treatment
- Integrated crop management in *Rabi* pulses.
- Integrated crop management in *Rabi* vegetables.
- Feeding technique of milch animals
- Balance use of feed fro fish production
- Low cost balanced feed for milch animals.
- Identification and eradication of weeds and predatory fish from pond.
- Seed treatment with bio-fertilizers

- Major disease and insect of mustard crop and their management

Table 6.6 Income and employment generating training programs for SHGs

Seed production technologies for pulses, cereals and oilseed
Preparation of organic manures
Off season vegetable growing
Back yard poultry farming
Seasonal fruit (Guava, Ber, Aonla) and vegetables (Tomato, Cauliflower, Pea) preservation, packing and marketing
Composite fish farming
Bee keeping management techniques
Value addition in pulses, oilseed, durum wheat (small scale)
Use of computer and communication technology for agriculture marketing.
Seed production of groundnut.
Vegetable nursery management.
Goatary management.
Mini dal mill
Value addition of different types of masala making, packing and marketing
Integrated fish culture cum horticultural crops

CHAPTER - 7

PHASING OF PROGRAMME AND BUDGETING

7.1 Finanacial phasing including administrative cost

Financial Phasing – IWMP –V, (MWS-09)

Sr. No.	Particulars	1st Year	2nd Year	3rd Year	4th Year	Total
1	Administrative Cost-10%	17.91	17.91	17.91	17.91	71.64
2	Monitering-1%	1.79	1.79	1.79	1.79	7.16
3	Evalution-1%	1.79	1.79	1.79	1.79	7.16
4	Entry Point Activity-4%	28.66	-	-	-	28.66
5	Institution & Capacity Building-5%	14.33	14.33	7.16	-	35.82
6	DPR-1%	7.16	-	-	-	7.16
7	Watershed Dev. Work-50%	71.64	107.46	107.46	71.64	358.20
8	Livelihood Activity-10%	57.31	7.16	7.16	-	71.64
9	Production System & Micro enterprises-13%	18.63	55.88	18.63		93.13
10	Consolidation-5%	-	3.58	3.58	28.66	35.82
	Total	**219.22**	**209.91**	**165.49**	**121.79**	**716.40**

7.2 Monitoring and Evaluation

Monitoring of the project will be done at each stage and it will be carried out for both, process and outcome. Some community members will be trained and will be involved in participatory monitoring of various parameters and processes and the crop yields. The interventions, expenditure and other information will be displayed in the watershed Micro-watershed through wall writings. Besides trained community members, PIA/DWDU will also monitor the physical and financial progress of watershed development programme. Frontier technologies viz. GIS and Remote Sensing techniques will be used by the PIA/DWDU for monitoring and evaluation. The PIA shall submit quarterly progress reports (countersigned by the Watershed Committee (WC) President) to the DWDU for further submission to the SLNA. Sustainable and unbiased monitoring will be ensured by involving an independent agency. About 1 per cent of the total budget will be used on this activity.

7.2.1Plan for Evaluation

Watershed development activities bring about both tangible and intangible benefits. In order to quantify the benefits, impact analysis has been proposed.

Theme

It is presumed that as a consequence of watershed development activities there will be noticeable change in socio-economic status of inhabitants, cropping intensity, ground water recharge, crop diversification, fuel, fodder and small timber availability, livestock composition and milk production, etc. These indicators can be gauged over bench mark data both at the beginning and at the end of the project within the watershed.

Observations

The following indicators will be taken into account for quantitative and qualitative assessment. For the purpose, detailed questionnaires will be prepared and field observations will be carried out.

- Duration of availability of drinking water/irrigation and groundwater recharge
- Irrigation frequency and area under irrigation
- Changes in cropping pattern and cropping systems in the farmers fields along with productivity and incomes
- Soil health
- Satellite monitoring for vegetation cover and other parameters
- Fuel, fodder and small timber availability
- Livestock composition and productivity
- Periodic pest and disease monitoring will be done in major crops
- Socio-economic aspects including resource inventory
- Following indices will also be worked out as qualitative indicators of the watershed development:
- Land Improvement Index (LII)

- Crop Diversification Index (CDI)
- Cultivated Land Utilization Index (CLUI)
- Crop Fertilization Index (CFI)
- Induced Watershed Eco-Index (IWEI)

The concurrent and post-project monitoring and evaluation would be conducted to assess the status of watershed related interventions. It will be done by an independent agency having similar experiences. About 1 per cent of the total budget will also be used on evaluation.

7.3 Physical and Financial-Targets and Outlays

S. No.	Activities	Nos./area	Amount (Rs. In Lakh)
1	**Preparatory Phase**		
	Entry Point Programme	-	28.66
	Institution & Capacity building	As per details in chapter 6	35.82
		Total	**64.48**
2	**Watershed Works Phase**		**358.20**
	Field/Contour /Graded Bunds (FB/CB/GB)	1885	113.37
	Marginal Bunds (MB), Peripheral Bunds (PB), Submerged Bunds (SB)	3167	190.77
	Earthen Check Dam (CD)/ Gully plug/ Water harvesting bunds (WHB)	918	55.57
	Checkdam/Drop Structure	36	203.67
	Drop spillway	18	83.25
	Field drainage structures	900	68.40
	Gabion	900	51.30
	Well recharge unit	90	9.00
	Through PIA		358.20
	Through Convergence*		**417.13**
		Total	**780.70**
3	**Livelihood Activities**	As per details in chapter 7	**71.64**
4	**Production System**		**93.13**
	Agriculture Production system		
	Demonstration**	360	14.40
	On Farm Testing**	270	6.75
	Seed Multiplication by community	180 ha	9.00
	Vegetable production	180 ha	4.50

	Horticulture		0.00
	Demonstration	36	14.40
	Orchard/Planatation (Fruit tree/Forest seedlings)	45 ha	4.50
	Animal Husbandry		0.00
	Animal camps	18	2.70
	Local Tharparkar / Gir Bull Breeding	9	4.50
	Feed and fodder utilization	90 ha	2.25
	Agroforestry		0.00
	Aonla based	90 ha	19.94
	Guava based	90 ha	19.49
	Lemon based	90 ha	20.94
	Bael based	90 ha	19.04
	Ber based	90 ha	21.35
	Silvi pastural system	90 ha	34.38
	Through PIA		93.13
	Convergence*		**104.99**
	Production System		**198.13**
	Project Cost		**1109.57**
	Preparatory Phase		64.48
	Administrative Cost-10%		71.64
	Evalution-1%		7.16
	DPR-1%		7.16
	Monitoring - 1%		7.16
	Consolidation-5%		35.82
	Activities under IWMP		**522.97**
	Total PIA		**716.40**
	Total Convergence*		**522.12**
	Total Project Cost	`	**1238.52**
***Convergence under MNREGA, NHM, FSM, ATMA etc**			

7.4 Year wise phasing of interventions/activities for development of watershed

Physical Target for Watershed Works			Year				
Activity			2010-11	2011-12	2012-13	2013-14	Total
Land Development	Agro-forestry	ha	112.50	112.50	225.00	0.00	450.00
	Horticulture	ha	22.50	22.50	45.00	0.00	90.00
	Agriculture	ha	247.50	247.50	495.00	0.00	990.00
	Pasture	ha	22.50	22.50	45.00	0.00	90.00
Soil Moisture Conservation (SMC)	Contour Farming/Contour Bunding/ Graded Bunding/ Field Bunding	ha	377.00	754.00	377.00	377.00	1885.00
Engineering Measures	Earthen Checks	cu.m.	91590.26	137385.38	137385.38	91590.26	457951.28
	Gully Plugs	cu.m.	15844.56	23766.84	23766.84	15844.56	79222.81
	Gabion Structures	No	180.00	270.00	270.00	180.00	900.00
	Field Drainage Structures	No	180.00	270.00	270.00	180.00	900.00
	Drop Spill Way / Checkdam	No	22.50	22.50	9.00	0.00	54.00
	Well Recharge Unit	No	22.50	45.00	22.50	0.00	90.00
			MWS	No/Area	Total (ha)	per ha cost	Total
Livelihood	No. of on farm activates	No	19	19	37	0	75
	No. of beneficiaries	No	225	225	450	0	900
	No. of off-farm activities	No	14	14	27	0	54
	No. of beneficiaries	No	23	23	45	0	90
Production System	Area	ha	457	914	457	457	2286
	No. of beneficiaries	No	1143	2286	1143	1143	5715

7.5 Year wise financial phasing of interventions/activities for development of watershed

Financial Target for Watershed Works			**Unit**	**Year**				**Rs in lacs**
Activity		**Quantity**		**2010-11**	**2011-12**	**2012-13**	**2013-14**	**Total**
Land Development	Agroforestry	450.00	Ha	24.75	24.75	49.50	0.00	99.00
	Horticulture	9.00	Ha	0.45	0.45	0.90	0.00	1.80
	Agriculture	990.00	Ha	9.90	9.90	19.80	0.00	39.60
	Pasture	90.00	Ha	0.90	0.90	1.80	0.00	3.60
Soil Moisture Conservation (SMC)	Contour Farming/Contour Bunding/ Graded Bunding/ Field Bunding	1885.00	Ha	22.62	45.24	22.62	22.62	113.10
Vegetative and	Earthen Checks	457951.28	cum	37.75	56.63	56.63	37.75	188.77
Engineering Measures	Gully Plugs	79222.81	cum	11.11	16.67	16.67	11.11	55.57
	Gabion Structures	900.00	No.	9.72	14.58	14.58	9.72	48.60
	Field Drainage Structures	900.00	No.	13.68	20.52	20.52	13.68	68.40
	Drop Spill Way / Checkdam	54.00	No.	70.20	70.20	35.10	0.00	175.50
	Well Recharge Unit	90.00	No.	2.25	4.50	2.25	0.00	9.00
	To tal			**203.34**	**264.34**	**240.37**	**94.89**	**802.94**
Livelihood	No. of on farm activates		No	11.21	11.21	22.41	0.00	44.82
	No. of beneficiaries		No	-	-	-	-	-
	No. of off-farm activities		No	6.75	6.75	13.50	0.00	27.00
	No. of beneficiaries		No	-	-	-	-	-
Production System	Area		ha	18.29	36.58	18.29	18.29	91.44
	No. of beneficiaries		No	-	-	-	-	-
	Total			**36.24**	**54.53**	**54.20**	**18.29**	**163.26**

7.6 Plan of Convergence

Several schemes viz. MGNREGS, ATMA, Food Security Mission, NHM, etc. of Central and State Govt. are running in project area. To make the watershed programme successful, convergence of different schemes is necessary as the budgetary provision made under IWMP is not sufficient to saturate the watershed. In this case the convergence of Rs. 485.16 lakh s will be made through converegence of different schemes under different activities which details are as follows:

7.6.1 Year wise phasing of interventions/activities for development of watershed under convergence

Physical Target for Watershed Works			**Year**				
Activity			**2010-11**	**2011-12**	**2012-13**	**2013-14**	**Total**
Land Development	Agro-forestry	ha	22.50	22.50	45.00	0.00	90.00
	Horticulture	ha	4.50	4.50	9.00	0.00	18.00
Soil Moisture Conservation (SMC)	Contour Farming/Contour Bunding/ Graded Bunding/ Field Bunding	ha	377.00	754.00	377.00	377.00	1885.00
Engineering Measures	Earthen Checks	cu.m.	66166.00	99249.00	99249.00	66166.00	330830.00
	Gabion Structures	No	27.00	40.50	40.50	27.00	135.00
	Field Drainage Structures	No	27.00	40.50	40.50	27.00	135.00
	Drop Spill Way / Checkdam	No	3.75	3.75	1.50	0.00	9.00
Production System	Area	ha	524	1048	524	524	2619
	No. of beneficiaries	No	1310	2619	1310	1310	6548

7.6.2 Year wise financial phasing of interventions/activities for development of watershed under convergence

Financial Target for Watershed Works		**Quantity**	**Unit**	**Year**				**Rs in lacs**
Activity				**2010-11**	**2011-12**	**2012-13**	**2013-14**	**Total**
Land Development	Agroforestry	90.00	Ha	4.95	4.95	9.90	0.00	19.80
	Horticulture	18.00	Ha	0.90	0.90	1.80	0.00	3.60
Soil Moisture Conservation (SMC)	Contour Farming/Contour Bunding/ Graded Bunding/ Field Bunding	1885.00	Ha	22.62	45.24	22.62	22.62	113.10
Vegetative and	Earthen Checks	330830.00	cum	46.77	70.15	70.15	46.77	233.83
Engineering Measures	Gabion Structures	135.00	No.	1.46	2.19	2.19	1.46	7.29
	Field Drainage Structures	135.00	No.	2.05	3.08	3.08	2.05	10.26
	Drop Spill Way / Checkdam	9.00	No.	11.70	11.70	5.85	0.00	29.25
	To tal			**90.45**	**138.20**	**115.58**	**72.90**	**417.13**
Production System	**Area**		ha	20.95	41.90	20.95	20.95	104.76
	No. of beneficiaries		No	-	-	-	-	-
	Total			**38.91**	**59.86**	**56.86**	**20.95**	**176.58**

7.7 Benefit Cost Analysis:

Crop outcomes

Pre Project Scenerio

S.No.	Name of Crop (Season wise)	Area (ha)	Production (quintal)	Productivity q/ha	Cost/ ha	Rate Rs/q	Gross Return Rs	Total Cost Rs	Net Return	Net Return /ha	B:C Ratio
1	Til (Sesamum)	760.00	1292.00	1.70	5500	6500	8398000	4180000	4218000	5550	2.0
2	Urd	660.00	2244.00	3.40	7500	4200	9424800	4950000	4474800	6780	1.9
3	Moong	460.00	1426.00	3.10	7750	4600	6559600	3565000	2994600	6510	1.8
4	Arhar	270.00	1701.00	6.30	9580	4350	7399350	2586600	4812750	17825	2.9
5	Jawar	300.00	1440.00	4.80	4500	1400	2016000	1350000	666000	2220	1.5
6	Jawar + Arhar	350.00	2660.00	7.60	8544	3250	8645000	2990400	5654600	16156	2.9
	Total	**2800.00**	**10763.00**								
1	Lentil	1110.00	6271.50	5.65	8850	3850	24145275	9823500	14321775	12903	2.5
2	Field Pea	940.00	6815.00	7.25	7520	3200	21808000	7068800	14739200	15680	3.1
3	Chickpea	870.00	5533.20	6.36	7985	3150	17429580	6946950	10482630	12049	2.5
4	Wheat	1440.00	27000.00	18.75	11250	1275	34425000	16200000	18225000	12656	2.1
5	Barley	170.00	2924.00	17.20	9850	1025	2997100	1674500	1322600	7780	1.8
6	Linseed + Chickpea (Mixed)	220.00	1727.00	7.85	9845	3650	6303550	2165900	4137650	18808	2.9
7	Linseed + Lentil (Mixed)	270.00	1741.50	6.45	8954	3860	6722190	2417580	4304610	15943	2.8
8	Mustard / Rai	310.00	1395.00	4.50	9586	3650	5091750	2971660	2120090	6839	1.7
	Total	**5330.00**	**53407.20**								
	Single crop Area	**3770.00**									
	Double crop area	**2180.00**									

	(Cucurbits, Cole crops, Egg Plant, Tomato, Potato etc)	45	3200	71.11	13000	500	1600000	585000	1015000	22556	2.7
							162965195	69475890	93489305		2.35
	Total No. of families	3930	Per family Net Return from Agriculture		23789						
	Total cultivable area in MWS		7136.92		Over All B:C		2.35				
	Cropping Intensity	114.55	%								

Post Project Scenario

S.No.	Name of Crop (Season wise)	Area (ha)	Production (quintal)	Productivity q/ha	Cost/ ha	Rate Rs/q	Groos Return Rs	Total Cost Rs	Net Return	Net Return /ha	B:C Ratio
1	Til (Sesamum)	950.00	1852.50	1.95	5800	6500	12041250	5510000	6531250	6875	2.2
2	Urd	825.00	3011.25	3.65	7600	4500	13550625	6270000	7280625	8825	2.2
3	Moong	575.00	2081.50	3.62	7800	4950	10303425	4485000	5818425	10119	2.3
4	Arhar	337.50	2193.75	6.50	10350	4450	9762188	3493125	6269063	18575	2.8
5	Jawar	375.00	1950.00	5.20	6500	1650	3217500	2437500	780000	2080	1.3
6	Jawar + Arhar	437.50	3412.50	7.80	9544	3890	13274625	4175500	9099125	20798	3.2
	Total	**3500.00**	14501.50								
1	Lentil	1276.50	7378.17	5.78	9105	4560	33644455	11622533	22021923	17252	2.9
2	Field Pea	1081.00	7891.30	7.30	7842	3360	26514768	8477202	18037566	16686	3.1
3	Chickpea	1000.50	7103.55	7.10	8023	3275	23264126	8027012	15237115	15230	2.9
4	Wheat	1656.00	33384.96	20.16	12620	1450	48408192	20898720	27509472	16612	2.3
5	Barley	195.50	3968.65	20.30	10236	1250	4960813	2001138	2959675	15139	2.5
6	Linseed + Chickpea	253.00	2082.19	8.23	10236	3750	7808213	2589708	5218505	20627	3.0

	(Mixed)										
7	Linseed + Lentil (Mixed)	310.50	2285.28	7.36	9456	4012	9168543	2936088	6232455	20072	3.1
8	Mustard / Rai	356.50	1942.93	5.45	9541	3785	7353971	3401210	3952761	11088	2.2
	Total	**6129.50**	**66037.03**								
	Single crop Area	**4411.92**									
	Double crop area	**2725.00**									
	(Cucurbits, Cole crops, Egg Plant, Tomato, Potato etc)	70	7714	110.20	15260	650	5014100	1068200	3945900	56370	4.7
							228286793	87392935	140893859		2.61
	Total No. of families	3930	Per family Net Return from Agriculture		35851						
	Total cultivable area in MWS		7136.92		Over All B:C		2.61				
	Cropping Intensity	135.91	%								

Animal outcomes
Pre Project Scenerio

Particulars	**Cows**	**Buffaloes**	**Goat**	**Bullocks**
Total Animals in Micro watershed Area	6000	5400	13000	1100
Milking Animals	2800	2500	3500	
Average Milk Production Lit. / day	3640	520.8	140	
Average Milk Production /Animal/ day	1.3	3.5	0.4	
Sale of Milk per day (Rs) @ Rs 15/Lit	54600	7812	2100	

Average 150 day milking days & Goat 90 days in a year (Total Rs)	**8190000**	**78120**	**12600**	
Meat Animals			7500	
Average rate of one kids Rs			2500	
Total Sale in a year Rs			**18750000**	
Working Animals (Bullocks)				1100
One year work one agriculture fields 180 days @ 200/ day (One pair)				36000
Total Work value of all working animals				**19800000**
Total value earned by animals in a year				**46830720**
Total INCOME/FAMILY	3930			11916.21
Total Expenditure / family				6020
B:C Ratio				1.98

Post Project Scenario

Particulars	**Cows**	**Buffaloes**	**Goat**	**Bullocks**
Total Animals in Micro watershed Area	7200	7020	18200	1320
Milking Animals	3600	3500	5000	
Average Milk Production Lit. / day	5760	12600	2500	
Average Milk Production /Animal/ day	1.6	3.6	0.5	
Sale of Milk per day (Rs) @ Rs 15/Lit	86400	189000	37500	
Average 150 day milking days & Goat 90 days in a year (Total Rs)	**12960000**	**1890000**	**225000**	
Meat Animals			12000	
Average rate of one kids Rs			2800	
Total Sale in a year Rs			**33600000**	
Working Animals (Bullocks)				1320
One year work one agriculture fields 180 days @ 200/ day (One pair)				36000
Total Work value of all working animals				**23760000**
Total value earned by animals in a year				**72435000**
Total INCOME/FAMILY	3930			18431.30
Total Expenditure / family				7000
B:C Ratio				2.63

Net Income / Family	Pre Project Scenerio	Post Project Scenario
Agriculure	23789	35851
Animal Husbandry	11916	18431
Total (Ag+AH)	**35705**	**54282**
Over All B:C of MWS	**Pre Project Scenerio**	**Post Project Scenario**
Agriculure	2.35	2.61
Animal Husbandry	1.98	2.63
Over All B: C MWS	**2.16**	**2.62**

CONSOLIDATION AND WITHDRAWAL STRATEGY

9. Consolidation and Withdrawal Strategy

Success of any program depends on sustainability of the various watershed interventions and sustainability can only be achieved through active participation of community. Active participation and cooperation of community can be ensured by building their capacities through exposures and trainings. From the beginning emphasis will be on capacity building and empowerment of stakeholders. The Watershed Committee, SHGs, Area Groups, Users Group and other CBOs will be established, trained, and strengthened to continue development after withdrawal of PIA. By building economic activities through CBOs community participation will be sustained. The PR&D approach along with demand driven interventions will reduce dependency on subsidies. Contributions from the community will be ensured for the entire activities to develop sense of belongingness and these contributions will be deposited to the account of Watershed Development Fund. Watershed Development Fund will also be strengthening through donations from the individual and institutions and the CBOs will be trained to run watershed as business model on sustainable basis. The tangible economic benefits along with empowerment and hand holding by PIA will empower the CBOs to develop and sustain the watershed activities after withdrawal of the PIA. Community organizations will withdraw the money from the WDF to maintain the asset created during the implementation phase. The consolidation phase will also include writing of project completion report, documentation of success stories, making films, leaflets, bulletins and the lessons learnt. The expenditure will be done as per the Common Guidelines for Watershed Development Projects 2008.

CHAPTER - 9

EXPECTED PROJECT OUTCOME

9.1 Employment Generation and Checking Migration

There had been very heavy migration from Bundelkhand region. During drought years, It is as high as 39% against an average migration rate of 11%, in other regions of Uttar Pradesh towards northern part of the country, specially the states of Delhi, Punjab and Haryana, as agriculture labours, factory workers, rickshaw pullers etc. The major reason attributed to high rate of migration is continuous drought in the region and absence of any other alternate livelihood opportunity, in spite of several anti-poverty programmes.

Due to watershed management the cropping intensity will be increased by around 21 per cent, in turn acreage in agricultural activities will be increased by about 1275 ha. Therefore, an additional employment of about 1, 27,500 man days will be generated annually. Therefore, no migration in search of livelihoods is expected after implementation of watershed programme.

9.2 Other Expected Outcome*

The following tangible benefits are expected after implementation of the project:

- Runoff will be reduced by about 30 per cent, however soil and nutrient loss may be reduced up to 40 per cent from the watershed.
- Irrigation intensity may be increased to 40 per cent from present 20 per cent life saving irrigation.
- Surface water in nallah may be available for more than 10 months against 4-5 months at present.
- Average ground water recharge of about 4 m may be easily obtained after implementation of the programme
- Productivity of crops may be increased by about 30 per cent
- Significant saving of seeds may be obtained through crop demonstration with improved package of practices
- During implementation phase about 1,90,000 mandays will be created through the soil and water conservation measures and crop/agroforestry interventions.
- The over all B C ratio of the project is estimated to be 2.62 as compared to the 2.16 in pre project scenario (detailed analysis is given in Chapter 7)

***Above mentioned outcomes are based on the meta analysis of 636 watershed projects throughout the country done by ICRISAT, Hyderabad and practical experience of watershed management in Bundelkhand region.**

9.3 Questions to be answered

This project will answer the following questions :

1. Will the measures taken for water harvesting sufficient enough to recharge the perched water table?
2. Will the soil and water conservation practices be helpful in combating drought?
3. Will alternate land use such as agroforestry land use system result in self reliance/prosperity in drought prone areas?
4. Can the strategies based on watershed basis yield fruitful results?
5. Response of the villagers towards the project and their participation in sustaining developed resources after whithdrawal of the project?
6. Will the formation of SHGs will help in savings and generation of self employment?

7. Will the watershed programmes improve the socio-economic conditions of the stake holders?
8. Will the watershed programme helps in capacity building of the stake holders for dissemination of various activities of watershed programme?
9. Will it sustain after project withdrawal?

9.4 Problems that could be solved as a results of this project/study

Following problems can be tackled in the proposed watershed :

1. Solving the problems of shortage of fuel, fodder, fruit and small timber requirement of villagers.
2. Creating water resources for ground water recharge availability of surface water for animal drinking and nistar purposes.
3. Increasing fertilizer consumption and improving NPK consumption ratio.
4. Optimizing crop productivity by putting more area under HYV and irrigation.
5. Increasing cropping intensity.
6. Promoting dairying through increased fodder availability.
7. Improving basic amenities and facilities like health, education, drinking water etc.
8. Increasing per capita income and thereby standard of living of farming community.
9. Increasing co-operative membership.
10. Increasing self employment.
11. Improving living standard of society.

CHAPTER - 10

DESIGN AND ESTIMATES OF ACTIVITIES

Design of Checkdam/Drop structure						
HYDROLOGIC DESIGN						
Area (ha)	125					
slope	0					
K	7.5					
a	0.2					
b	0.8					
n	1					
Time of Concentration						
		Le.77	Se-0.385			
L (m)	700	**155.14**				
S	0		**6.702847**			
		hour	Tc + b		(tc+b) power n	
Tc	**20**	0.3374	1.087442		1.0838	
Intensity						
		Tr power a				
Tr	15	1.5847				
I		10.922				
Discharge						
			Taken			
	c	0.5	Coeff			
	I	109.22	mm/hr			
	A	125	ha			
	Q	18.962			Cumec	

HYDRAULIC DESIGN							
	Length of crest weir (m)		**8.6**				
	Weir height (m)		h				
		Q = 1.71*L*h power (3/2)					
		h power 3/2	1.2894				
		h	1.1845	**1**	h1		
		h + free board	1.3029	**1.3**			
	Depth of gulley		3				
	Height of water drop (H)		1.7		Say	**1.7**	

STABILITY ANALYSIS										
	Let			**Top width (m)**	t	**1**				
				Bottom width (m)	T	**1.6**				
	Weight of dam per unit length (kg)				W	4862		W square	**2E+07**	
	Horizontzl water pressure (Kg)				P	1445		P square	**2E+06**	
	Uplift pressure (kg)				U	(T*w*H)/2	**1360**			
	Net downword force (kg)				Wn	W-U	**3502**	Wn Square	**1E+07**	
	Resultant (kg)				R				**3788.4**	
					H	1.7				
					Xbar		**0.661538**			
					Z		**0.283607**			
	Point of Resultant (xbar+Z)						**0.945146**			
					EA		0.938462			
					P*H/3		818.8333			
					W*EA		4562.8			
					b/6		0.266667			

						b/2		0.8		
		e = xbar+Z-b/2				e (OF)		0.145146		
		fmax = Wn/b(1+6*e/b)				fmax		3380.078		
A Safety against sliding										
					(mu*W)/P			1.211765		
B Safety against overturning					(W*EA)/(P*H/3)			2.011773		
C Safety against Tension					e<b/6 or b/6-e should be +ive			0.121521		
D Safety against Crushing				Permiss comp Stress kg/sqm			say	10000		
				PCS-fmax should be +ive				6619.922		
Depth of Foundation										
			Normal scour depth, dn			0.473[Q/f]power1/3				
				Q (cumec)	18.962					
				Q (Cusec)	669.122					
				f is silt factor, take=		2				
				[q/f]		334.561				
				[q/f] power1/3		6.94211				
				dn (ft)		3.28362				
				dn (m)		1.0011				
			Maximum scour depth, dm			1.5*dn	**1.50166**			
									Technical Specification	
			Foundation depth, D			1.33 dm	**1.9972**		**2.00**	
Minimum length of headwall extension (m)					E=3h+0.6 or 1.5F whichever is greater					
				F is net drop from top of transverse sill to crest						
				St= height of transverse sill= h/3				0.433333	**0.45**	
				F (m)	1.25					
				E (m)	4.5	or	1.875	say	**4.50**	
Length of Basin Lb										

			Lb (m)= F(2.28*h/F+0.52)		3.614		say	**3.50**	
Height of the sidewall at end sill is taken to be minimum 1.5h1,but more than H/2									
				J (m)	1.5h1	1.5	more than H/2	0.85	**1.50**
Height of the sidewall at the weir end									
				Equal to gully depth	3				**3.00**
				M (m)	2(F+1.33h-J)			2.958	**3.00**
				K (m)	Lb+.1-M			0.642	**1.10**
Length of Wing wall (WL)									
				WL = 2.25h				2.925	**3.00**
Depth of Toe Wall									
				h1+0.1				1.1	**1.20**

WORK ABSTRACT							
Sl. No.	**Item**	**Specification (m)**			**Quantity (cum)**		
		Length	**Breadth**	**Depth**			
1	**Clearing of site (Removal of trees, shrubs and bushes)**	15.00	15.00				
2	**Earth work**						
	a) in hard soil Headwall Foundation	8.60	2.40	1.20	24.77	Effective depth will be 1.0 m	
	b) in hard soil RHS of Headwall extension	4.50	2.40	3.20	34.56	Effective depth will be 1.0 m	
	c) in hard soil LHS of Headwall extension	4.50	2.40	3.10	33.48	Effective depth will be 1.0 m	
	d) in hard soil cutoff wall	17.60	1.20	1.00	21.12		
	e)in hard soil side wall on both side	8.20	1.80	4.00	59.04	Effective depth will be 1.50 m	
	f) in hard soil Toe wall	8.60	1.60	1.40	19.26	Effective depth will be 1.20 m	

	g) in hard soil Wing wall on both side	6.00	1.80	4.50	48.60	Effective depth will be 1.50 m
	h) Apron	3.50	8.60	0.50	15.05	
				Total	**255.88**	
3	**Cement concrete**					
	Cement Concrete (1:2:4)					
	a) cutoff wall	17.60	0.60	1.00	10.56	
	b) Head wall coping	8.60	1.20	0.05	0.52	
	c) Apron	3.50	8.60	0.05	1.51	
	d) Transverse sill coping	8.60	0.60	0.05	0.26	
				Total	**12.84**	
	Cement Concrete (1:4:8)					
	e) Cutoff wall	17.60	0.80	0.15	2.11	
	f) Toe wall	8.60	1.00	0.15	1.29	
	g) Apron	3.50	8.60	0.15	4.52	
	h) Side wall on both side	8.20	1.40	0.15	1.72	
	i) Wing wall on both side	6.00	1.20	0.15	1.08	
	j)Headwall and Headwall Extension	17.60	1.20	0.15	3.17	
				Total	**13.89**	
4	**Requirement of sand to nullify the impact of cracks**					
	a) Below cutoff wall	17.60	0.80	0.10	1.41	
	b)Below Headwall and headwall extension	17.60	1.20	0.10	2.11	
	c) Below side wall on both sides	8.20	1.40	0.10	1.15	
	d) Below wing wall on both side	6.00	1.20	0.10	0.72	
	e) Below apron	3.50	8.60	0.10	3.01	
	f) Below Toe wall	8.60	1.00	0.10	0.86	
				Total	**9.26**	
5	**Stone Masonary in CM 1:4**					

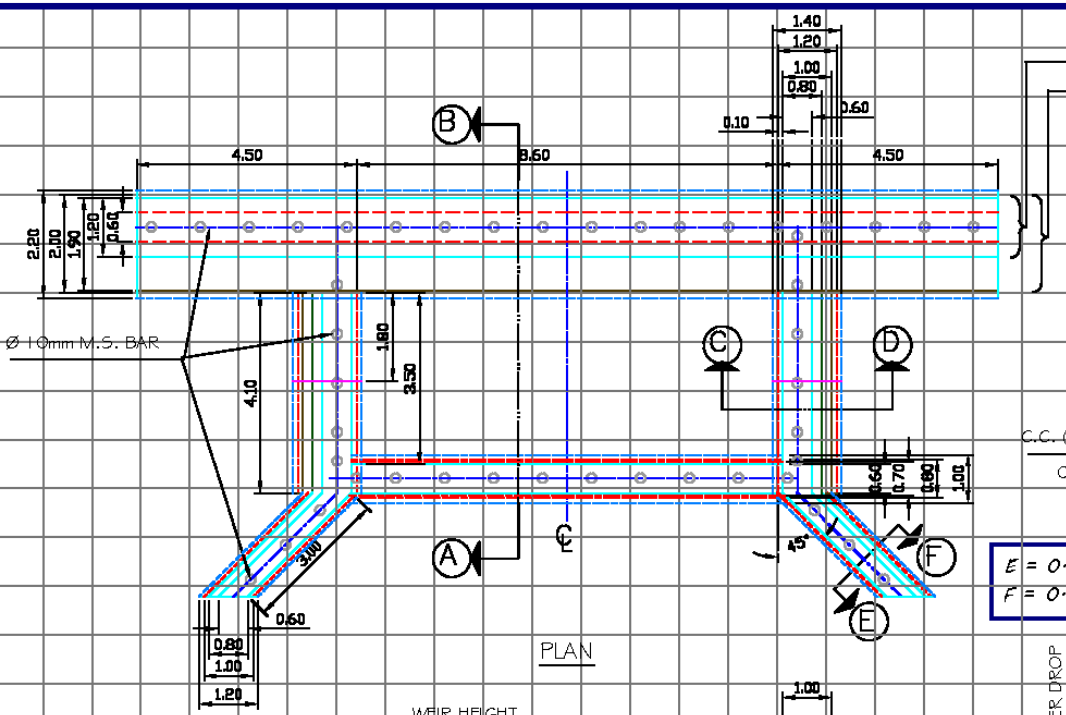
	a) Headwall and Headwall Extension on both side-Foundation	17.60	1.60	1.00	28.16			
	b) Headwall+ Headwall Extension on both side above gully bed-super structure	17.60	1.30	1.70	38.90	Width=(1+1.6)/2= 1.70 m		
	c) Headwall Extension on both the side above crest	9.00	1.20	1.30	14.04			
	d) Foundation for side wall on both side	8.20	1.20	1.50	14.76			
	e) Side wall on both side -super structure (K Part)-I	2.20	1.00	1.50	3.30			
	f) Side wall on both side-above part-I mentioned in (e): (K Part)-II	2.20	0.80	1.00	1.76			
	g) Side wall on both side above part-II mentioned in (f): (K Part)-III	2.20	0.60	0.50	0.66			
	h) Side wall on both side-Super structure (M Part)-I	6.00	1.00	1.50	9.00			
	i) Side wall on both side above Part-II mentioned in (i): (M Part)-III	6.00	0.80	0.75	3.60	Avg. ht. of triangle portion=		0.75
	j) Foundation for wing wall on both side	6.00	1.00	1.50	9.00			
	k) Wing wall on both side-Super structure-Part- I	6.00	0.90	0.75	4.05			
	l) Wing wall on both side-Above Part-I mentioned in (l): Part -II	6.00	0.80	0.38	1.82	Avg. ht. of triangle portion=		0.38
	m) Toe wall: Part I	8.60	0.80	0.80	5.50			

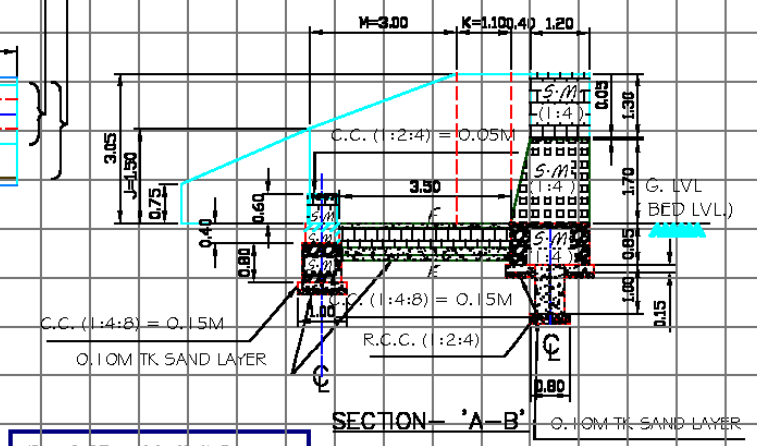
	n) Toe wall: Part II	8.60	0.70	0.40	2.41			
	o) Transverse Sill	8.60	0.60	0.60	3.10			
	p) Apron	3.50	8.60	0.40	12.04			
				Total	**152.10**			
6	**M S Bar (10 mm, q)**				**3.00**			
7	**Providing rough stone pitching in u/s (both side)**	34.00	3.00	0.25	**25.50**			
8	**Cement pointing to stone masonary in CM 1:3 (sqm)**							
	a) Headwall both side	14.40		1.70	24.48			
	b) Side wall both side (RHS and LHS)-Part I	8.20		1.50	12.30			
	c) Side wall both side (RHS and LHS)-Part II	2.20		1.50	3.30			
	d) Side wall both side (RHS and LHS)-Part-III	6.00		0.75	4.50	Avg. ht. of triangle portion=		0.75
	e) Wing wall both side-Part I	6.00		0.75	4.50			
	f) Wing wall both side-Part I	6.00		0.38	2.28	Avg. ht. of triangle portion=		0.38
				Total	**51.36**			
9	**Filling of black clay soil in the up stream (free from any kind of gravel)**				**6.00**	trolly		

MATERIAL ABSTRACT											
						Required Quantiy						
						Quantiy,cum	Cement,bags	Sand,cum	Conc ,cum	Khanda (cum)	Boulder(cum)	MS Bar (q)
1	Cement Concrete mix for cut-off wall (1:2:4): 12 mm conc.					12.84	82.17	5.78	11.56			
2	Cement Concrete mix for cut-off wall (1:4:8); 20 mm conc.					13.89	47.22	6.53	13.05			
3	Stone Maspnary in CM 1:4					152.10	380.25	51.71		152.10		
4	MS Bar for reinforcing											3.00
5	Boulder for pitching					25.50					25.50	
6	Cement pointing to stone masonary in CM 1:3 (sqm)					51.36	3.18	0.32				
7	Black clay soil (gravel free)					6.00						
8	Requirement of sand to nullify the impact of cracks in black soil							9.26				
					Total		**512.81**	**73.60**	**24.61**	**152.10**	**25.50**	**3.00**

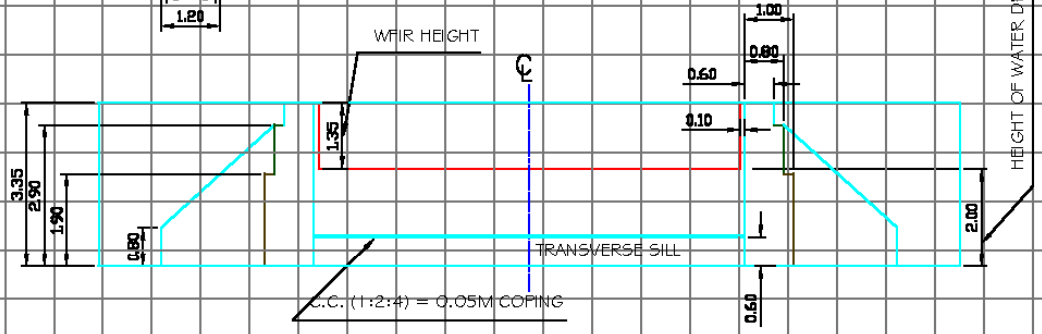
COST ABSTRACT

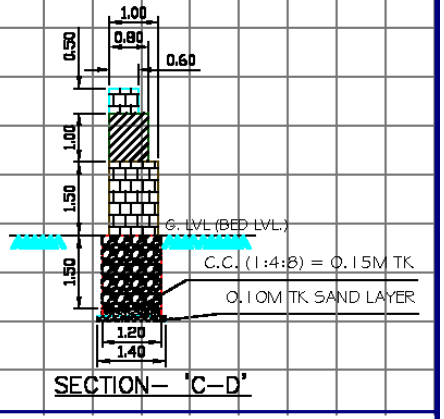
	Sl. No.	Item	Quantity	Unit	Rate (Rs./Unit)	Amount (Rs.)
A	1	Cement	513	Bag	235.00	120511.46
	2	Sand	73.60	m^3	750.00	55199.50
	3	Concrete-12 mm	11.56	m^3	1300.00	15021.63
	4	Concrete-20 mm	13.05	m^3	1150.00	15011.85
	5	Khanda	152	m^3	1200.00	182517.60
	6	M S Bar (10 mm Saria)	3.00	q	4000.00	12000.00
	7	Boulder	25.50	m^3	700.00	17850.00
	8	Filling of black clay soil in the up stream (free from any kind of gravel)	6.00		1500.00	9000.00
					Total	**427112.03**
B	9	Water supply through tanker @ 3 % of material cost				12813.36
C	10	Labour Charges @ 25%				106778.01
					Total (A+B+C)	**546703.40**
	11	Misc. @ 3%				16401.10
					G. Total	**563104.50**
		Say Rs. 563000/- (Rs.Five lakh sixty three thousand only)				
Note: The cost of materials is inclusive of all taxes and transportation to site. It may vary with respect to time						

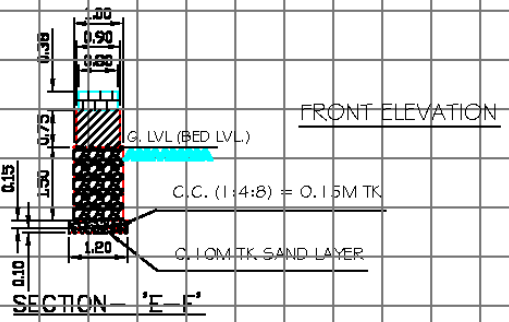




E = 0·15m CC (1:4:8)
F = 0·10m CC COPING (1:2:4)







DESIGN OF CHECKDAM / DROP STRUCTURE WITH RECTANGULAR WEIR AT IWMP-V PROJECT

- RCC OF 0·6M WIDTH STARTS AT 1·0M BELOW GROUND LEVEL AND GOES UPTO 2·2M BELOW GROUND LEVEL·
- ALL DIMENSION ARE IN METRE·
- SCALE - 1 CM = 1 METRE

DESIGNED BY –
DR· RAMESH SINGH
Sr. SCIENTIST (SOIL & WATER CONS. ENGG.)
NRCAF, JHANSI (U.P.)

DRAWN BY –
BOADS, OFFICE 0510 2446222

Table 10.1: Cross section of different size of contour/graded/field bund under 0-3 per cent slope

Area under Treatment (ha)	Top width	Height	Bottom width	Cross Section (m2)
1883	0.50	0.75	2.75	1.22
	0.50	0.80	2.90	1.36
	0.50	0.90	3.20	1.67
	0.50	1.00	3.50	2.00
	0.60	0.80	3.00	1.44
	0.60	0.90	3.30	1.76
	0.60	1.00	3.60	2.10
	0.45	0.75	2.70	1.18
	0.45	0.80	2.85	1.32

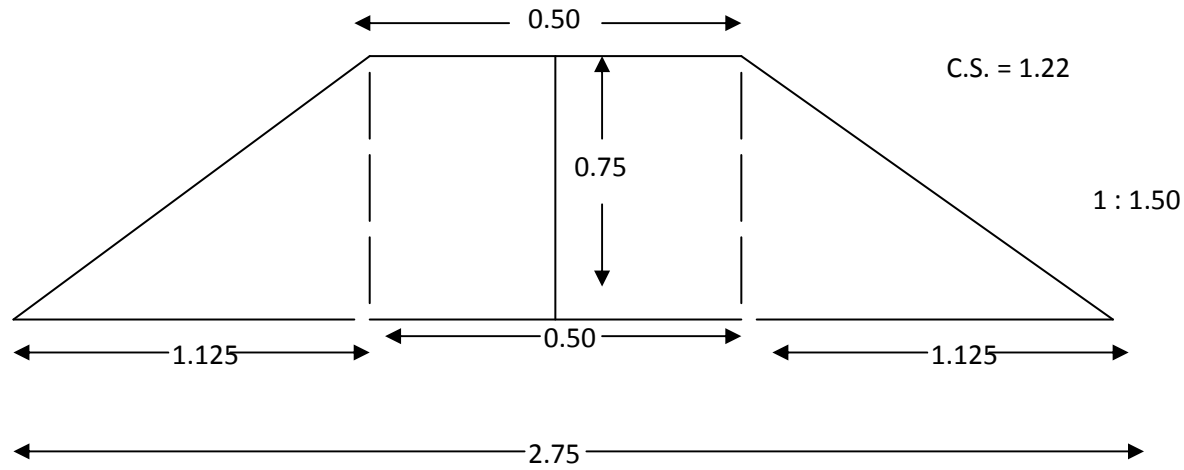


Fig. 1 Field Bunds: Cross Section – 1.22 (Not to Scale)

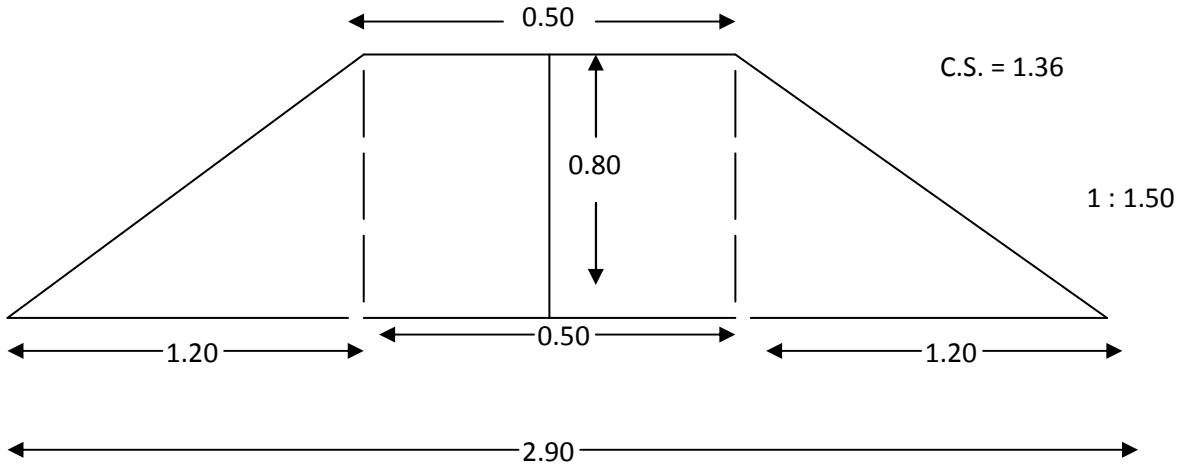


Fig. 2: Field Bunds: Cross Section – 1.36 (Not to Scale)

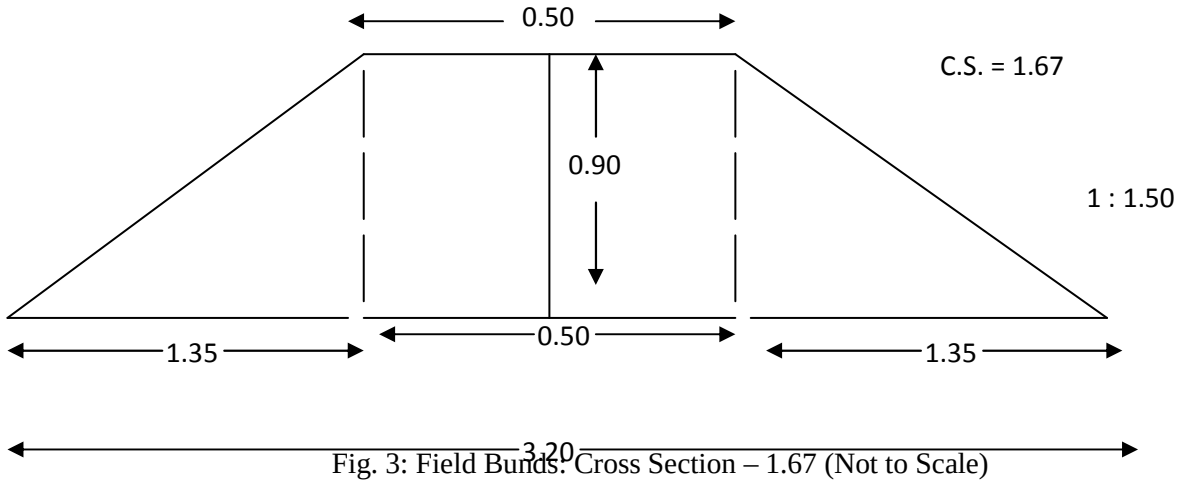


Fig. 3: Field Bunds: Cross Section – 1.67 (Not to Scale)

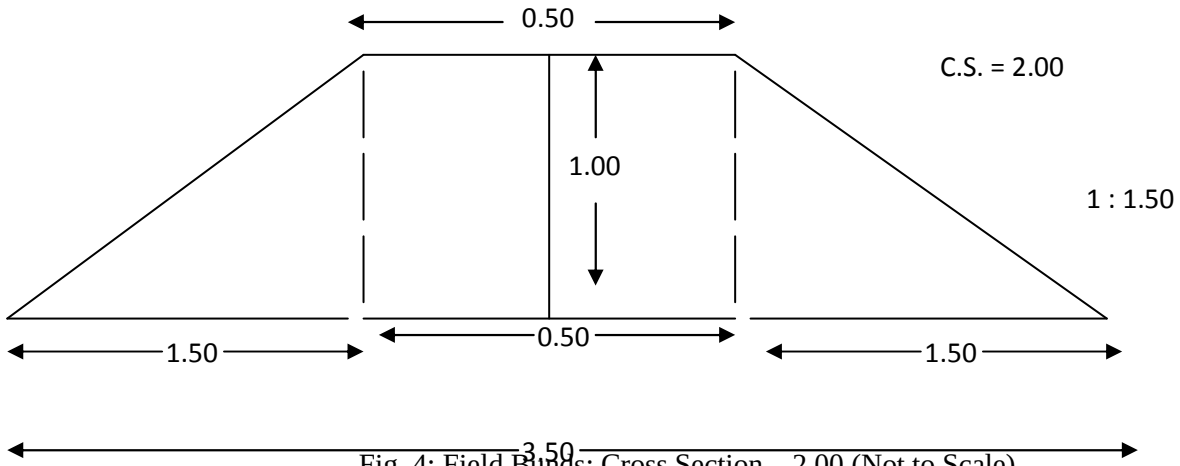


Fig. 4: Field Bunds: Cross Section – 2.00 (Not to Scale)

Table 10.2 Cross section of different size of earthen checkdam/water harvesting bund under more than 5 per cent slope

Area under Treatment (ha)	Items	T	H	B	CS
734	Core wall	0.50	3.00	6.50	10.50
	Earthen Bund	3.00	3.50	22.25	44.19
	Stone Pitching		1.00	0.25	0.25
	Total (CD1)				
	Core wall	0.50	2.50	5.50	7.50
	Earthen Bund	3.00	3.00	19.50	33.75
	Stone Pitching		1.00	0.25	0.25
	Total (CD2)				
	Core wall	0.50	3.00	6.50	10.50
	Earthen Bund	3.00	3.50	22.25	44.19
	Stone Pitching		1.00	0.25	0.25
	Total (WHB1)				
	Core wall	0.50	2.50	5.50	7.50
	Earthen Bund	3.00	3.00	19.50	33.75
	Stone Pitching		1.00	0.25	0.25
	Total (WHB2)				
	Core wall	0.50	2.50	5.50	7.50
	Earthen Bund	3.00	3.00	19.50	33.75
	Stone Pitching		1.00	0.25	0.25
	Total (WHB3)				
	Core wall	0.50	2.50	5.50	7.50
	Earthen Bund	3.00	3.00	19.50	33.75
	Stone Pitching		1.00	0.25	0.25
	Total (WHB4)				

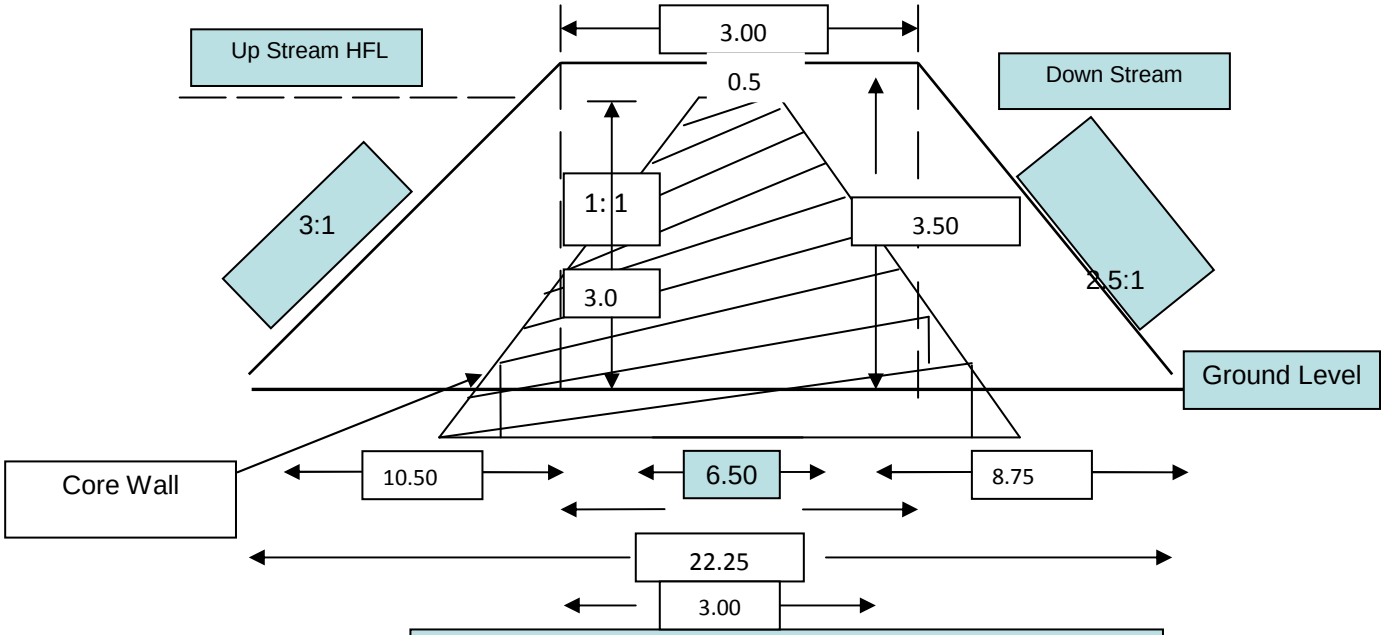


Fig. 39. Design of Earthen Checkdam (WHB_1)

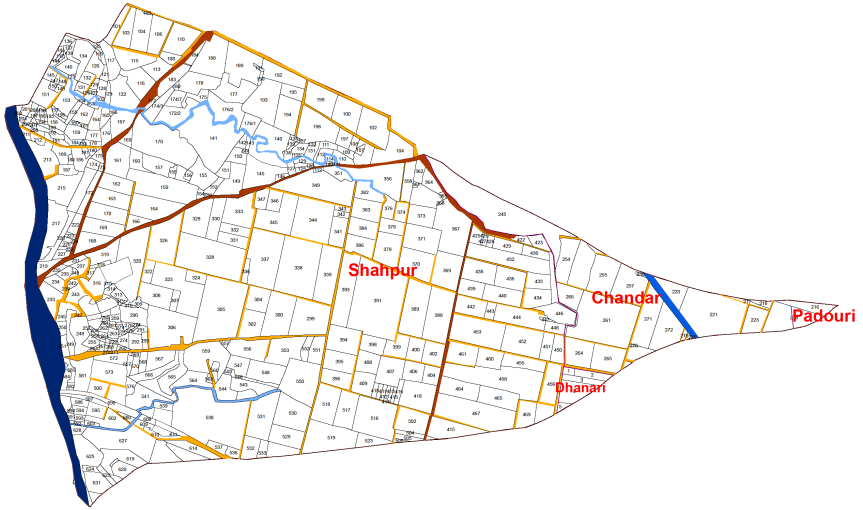
Not to scale

MAPS

CADASTRAL MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Chandar
Microwatershed Code : 2C3A4m1a

N



Legend

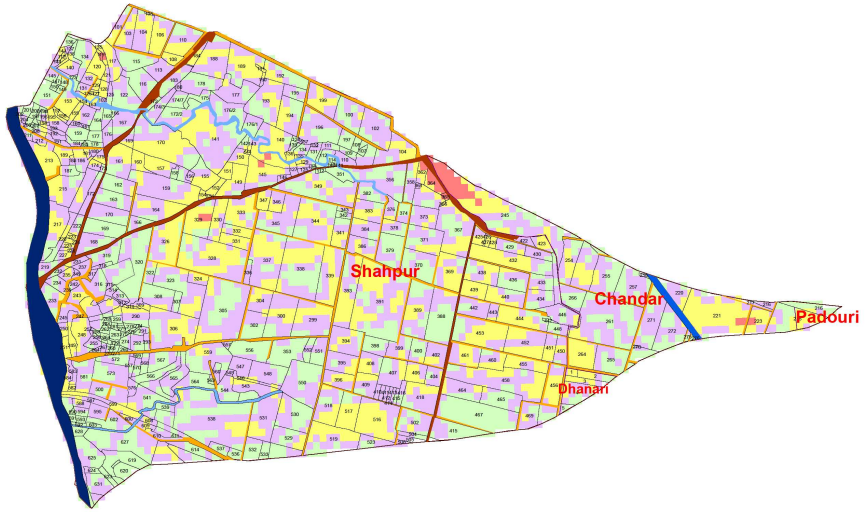
- Village Boundary
- Field
- Pucca Road
- Kachha Road
- Drain
- Canal
- River
- Microwatershed Boundary

0.6 0.3 0 0.6 Kilometers

SLOPE MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Chandar
Microwatershed Code : 2C3A4m1a

N



Legend

- Village Boundary
- Field
- Pucca Road
- Kachha Road
- Drain
- Canal
- River
- Microwatershed Boundary

slope

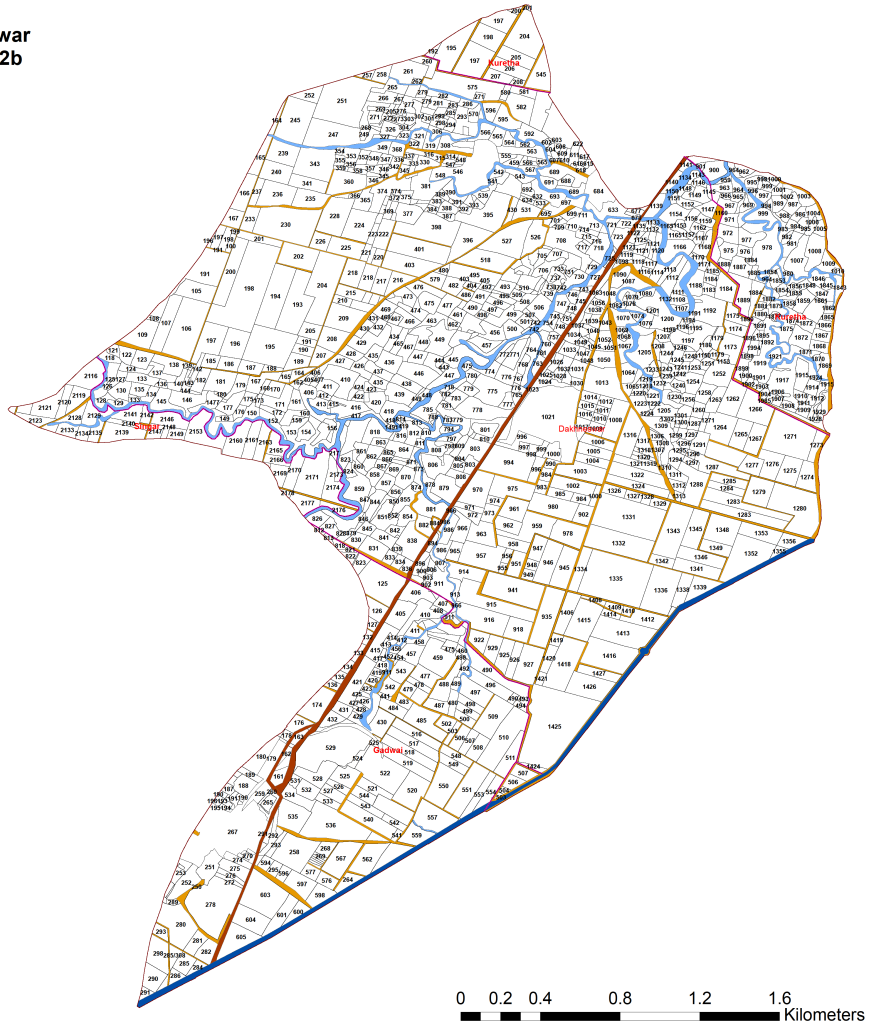
<VALUE>

- 0-3%
- 3-5%
- 5-8%
- >8%

0.6 0.3 0 0.6 Kilometers

CADASTRAL MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Dakneswar
Microwatershed Code : 2C2A6a2b



Legend

- Village Boundary
- Microwatershed Boundary
- Field
- Pucca Road
- Kaccha Road
- Drain/ River
- Canal

SLOPE MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Dakneswar
Microwatershed Code : 2C2A6a2b

Legend

- Village Boundary
- Microwatershed Boundary
- Field
- Pucca Road
- Kaccha Road
- Drain/ River
- Canal

slope

<VALUE>

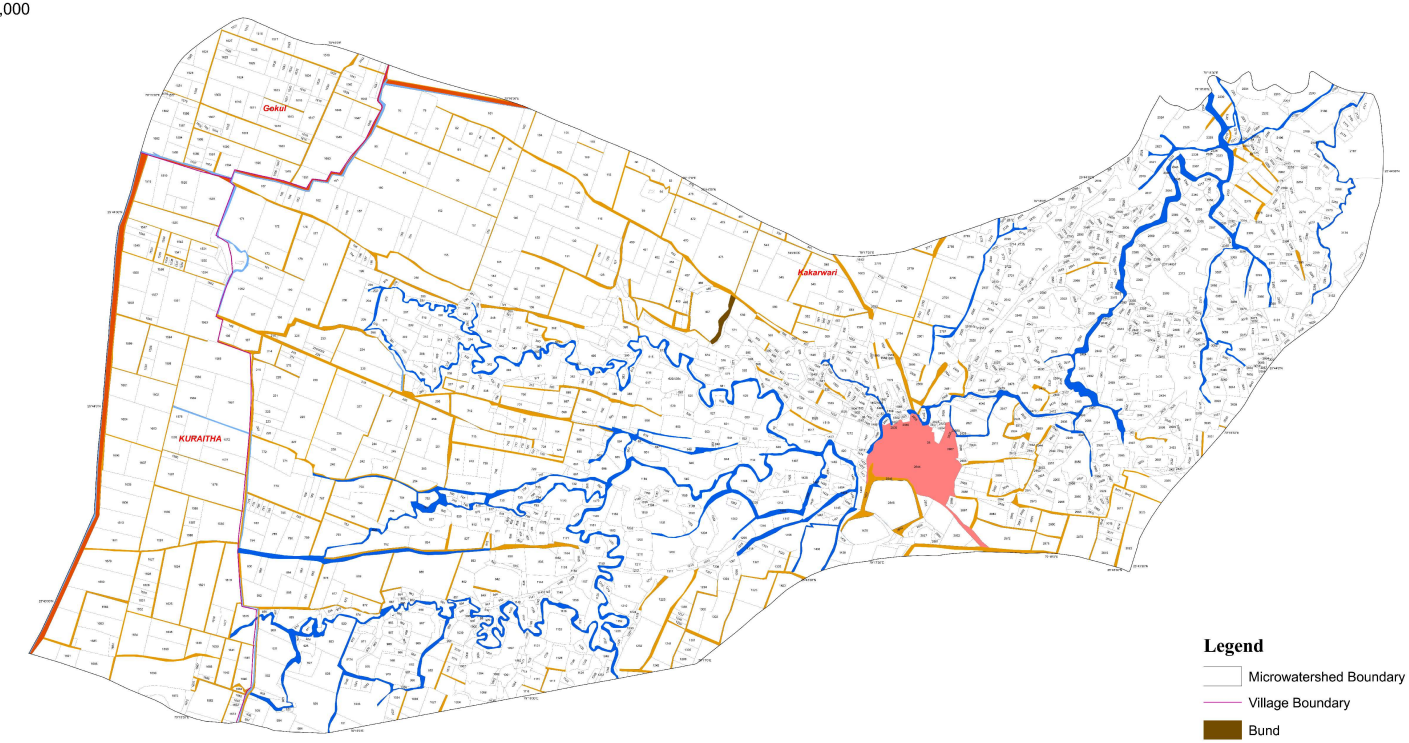
- 0-3%
- 3-5%
- 5-8%
- >8%

CADASTRAL MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Dhanoura
Microwatershed Code : 2C2B1a1d

0 0.375 0.75 1.5 Kilometers

1:4,000



N

Legend

- Microwatershed Boundary
- Village Boundary
- Bund
- Drain
- Habitation
- Kaccha R
- Nali
- Pacca Road

CONTOUR MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Dhanoura
Microwatershed Code : 2C2B1a1d

0 0.2 0.4 0.8 Kilometers

1:4,000

N

Legend

Microwatershed Boundary

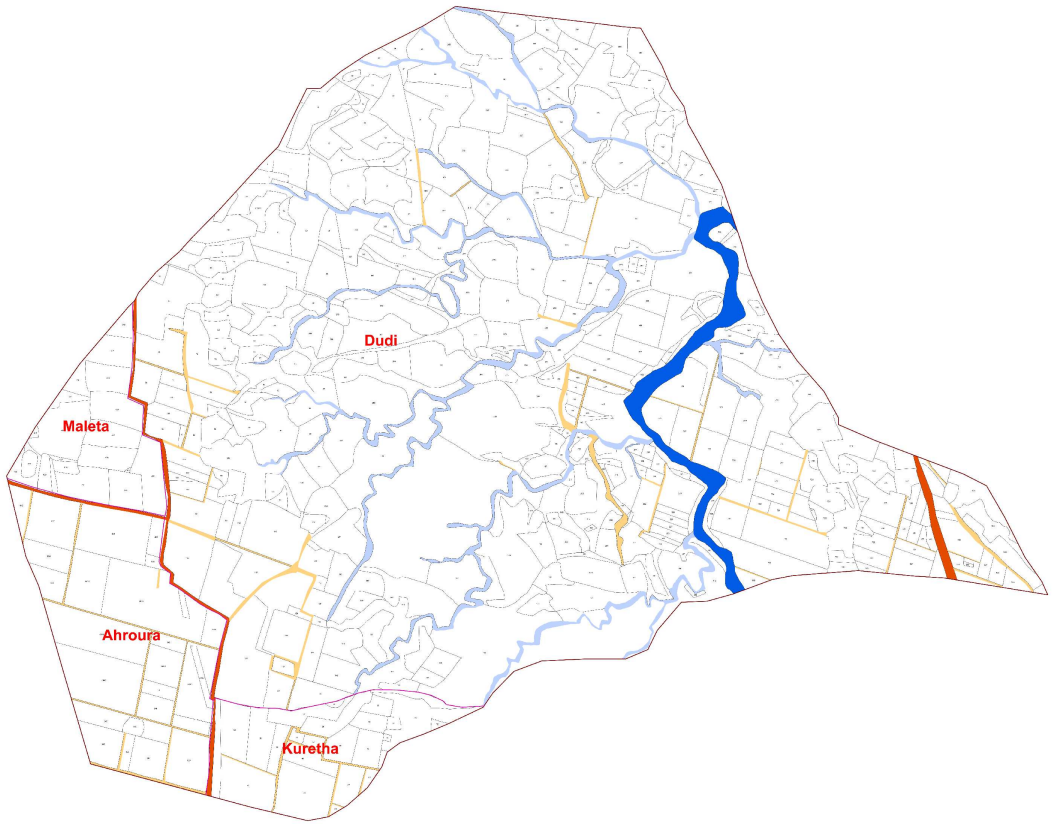
CONTOUR(1 m Interval)

130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162

Derived from : 30 m ASTER DEM

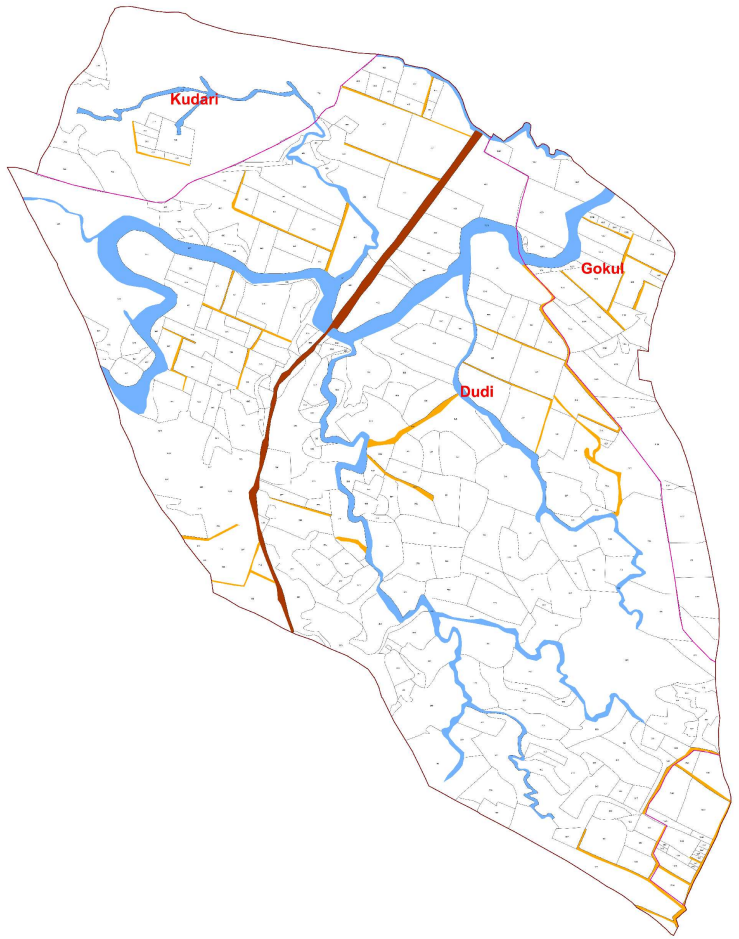
CADASTRAL MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Dundi-II
Microwatershed Code : 2C2A6a1f



CADASTRAL MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Dundi
Microwatershed Code : 2C2A6a1e

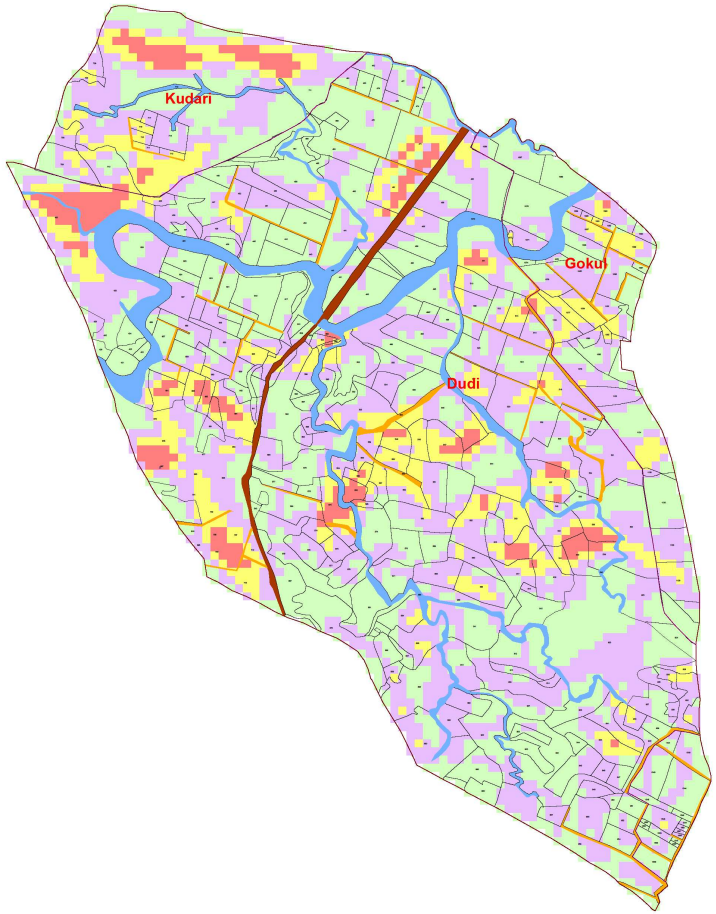


Legend

- Village Boundary
- Microwatershed Boundary
- Field
- Pucca Road
- Kachha Road
- Drain/River

SLOPE MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Gokul
Microwatershed Code : 2C2A6a1e



N

Legend

- Village Boundary
- Microwatershed Boundary
- Field
- Pucca Road
- Kachha Road
- Drain/River

slop

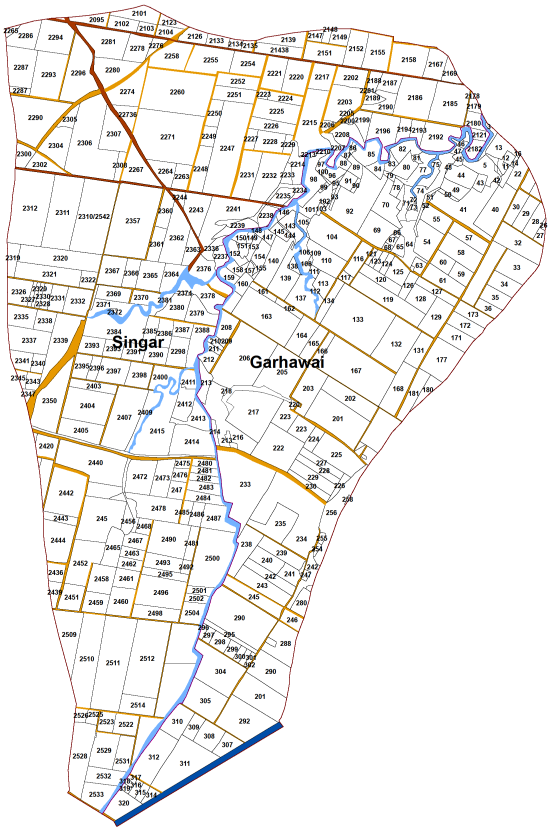
<VALUE>

- 0-3%
- 3-5%
- 5-8%
- >8%

0.6 0.3 0 0.6 Kilometers

CADASTRAL MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name :Garhawai
Microwatershed Code : 2C2A6a2c



N

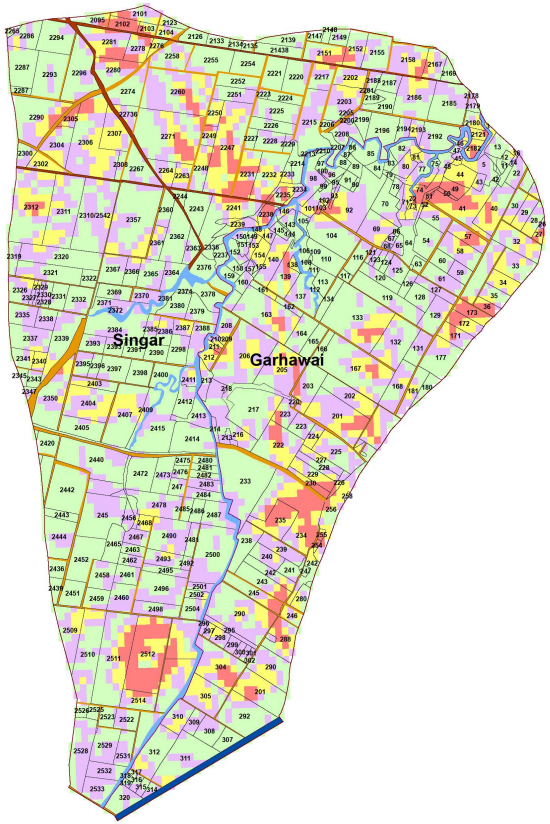
Legend

- Village Boundary
- microwatershed Boundary
- Field
- Pucca Road
- Kachha Road
- Drain/River
- Canal

0 0.2 0.4 0.8 1.2 1.6 Kilometers

SLOPE MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name :Garhawai
Microwatershed Code : 2C2A6a2c



N

Legend

- Village Boundary
- microwatershed Boundary
- Field
- Pucca Road
- Kachha Road
- Drain/River
- Canal

slope

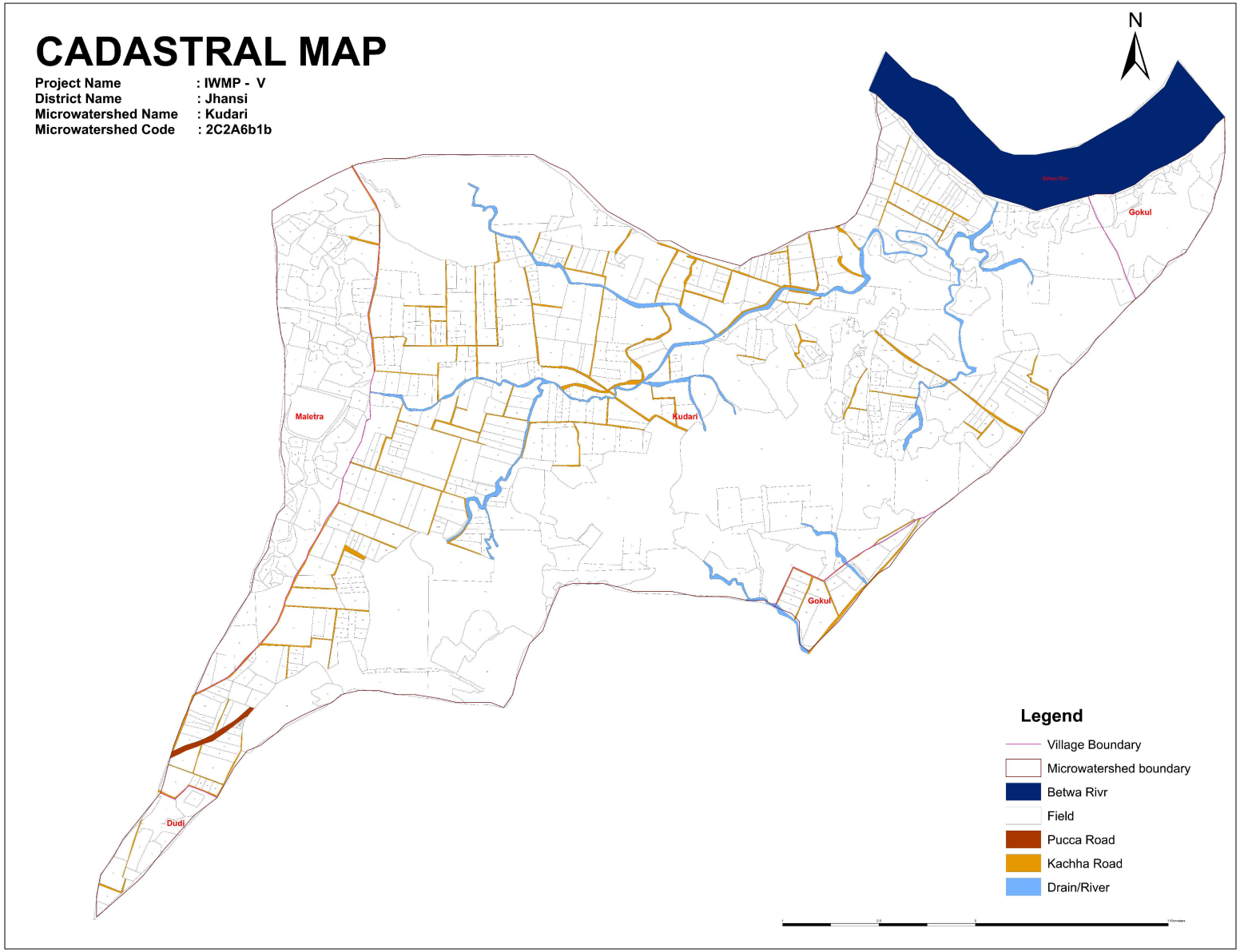
<VALUE>

- 0-3%
- 3-5%
- 5-8%
- >8%

0 0.2 0.4 0.8 1.2 1.6 Kilometers

CADASTRAL MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Kudari
Microwatershed Code : 2C2A6b1b

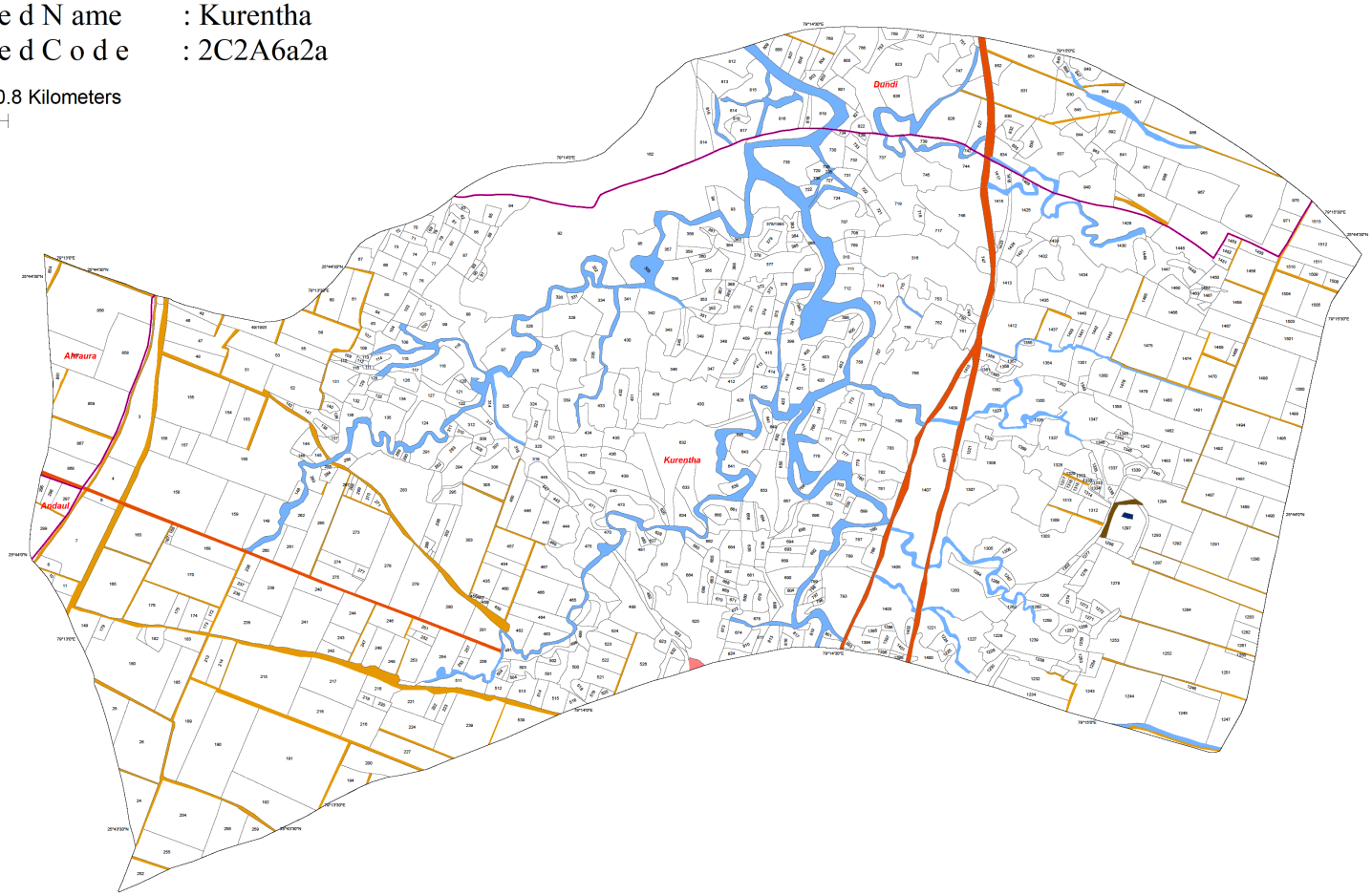


CADASTRAL MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Kurentha
Microwatershed Code : 2C2A6a2a

0 0.2 0.4 0.8 Kilometers

1:4,000



Legend

- Microwatershed Boundary
- Village Boundary
- Bund
- Drain
- Habitation
- Kaccha Road
- Pucca Road
- Tank

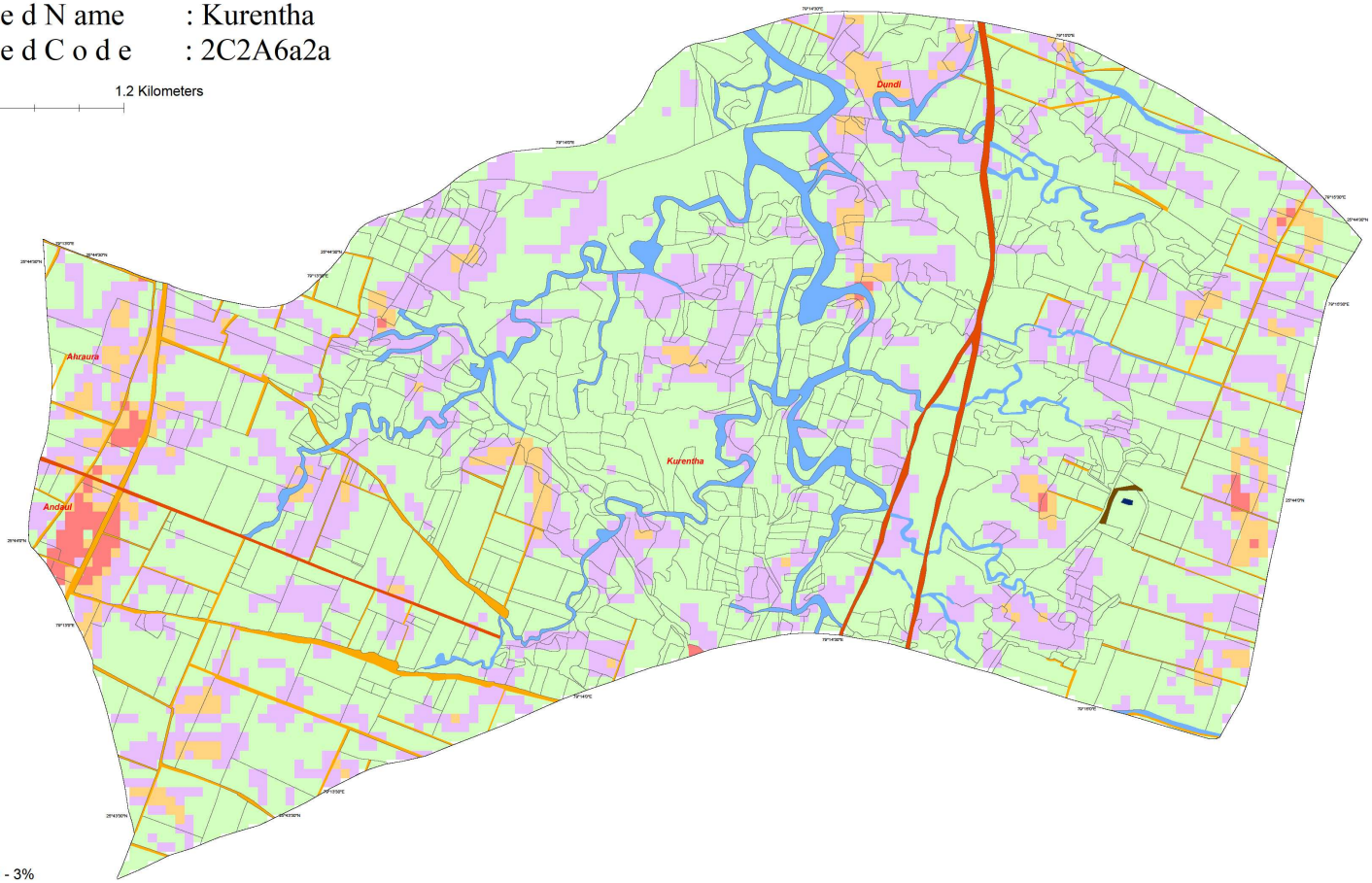
SLOPE MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Kurentha
Microwatershed Code : 2C2A6a2a

0 0.3 0.6 1.2 Kilometers

1:4,000

N

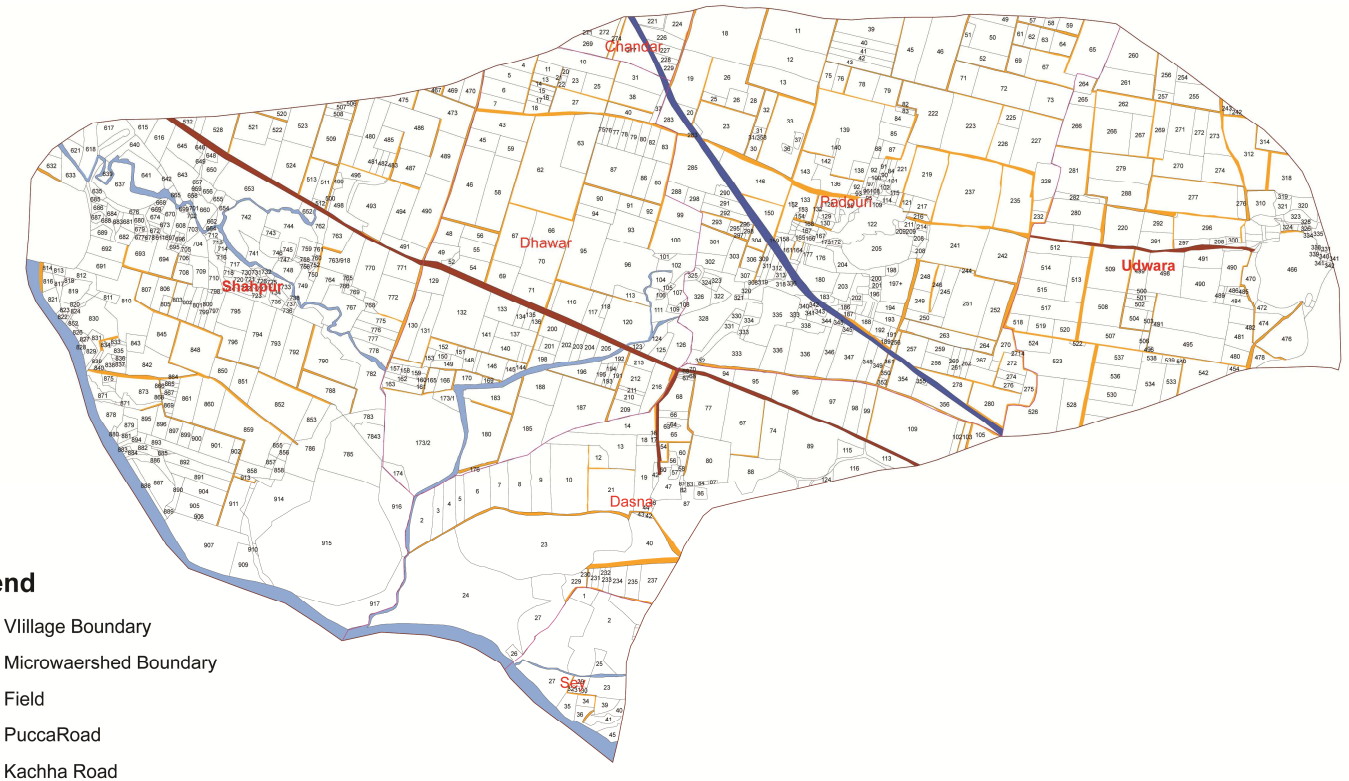


Legend

- Microwatershed Boundary
- Village Boundary
- Bund
- Drain
- Habitation
- Kaccha Road
- Pucca Road
- Tank
- 0 - 3%
- 3.1 - 5%
- 5.1 - 8%
- 8.1 - 23.8%

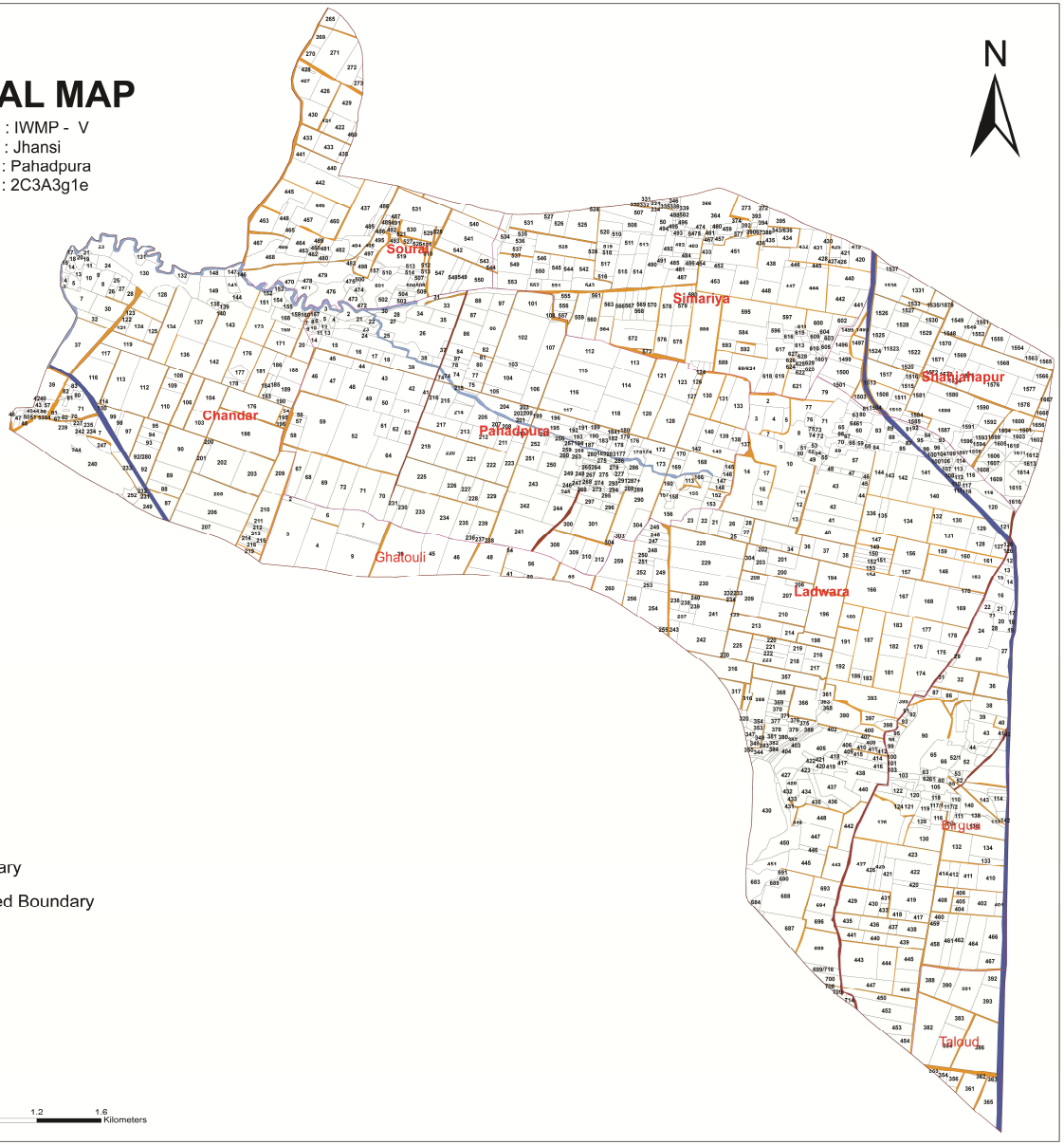
CADASTRAL MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Padari
Microwatershed Code : 2C3A4m1b



CADASTRAL MAP

Project Name : IWMP - V
District Name : Jhansi
Microwatershed Name : Pahadpura
Microwatershed Code : 2C3A3g1e



Legend

- Village Boundary
- Microwatershed Boundary
- Field
- Pucca Road
- Kachha Road
- Drain/River
- Canal

0 0.2 0.4 0.8 1.2 1.6 Kilometers

REFERENCES

Anonymous. 2008. Harmonization of wasteland/degraded lands datasets of India. Wasteland News, XXIII, No. 4, pp. 50-53.

Dhruva Narayana, V.V. (1993). Soil & Water Conservation Research in India. ICAR, New Delhi.

Dhyani, S. K.; Sharda, V. N. and Jual G.P. 2007. Training Manual: Soil Conservation and Watershed Management, Vol. III, CSWCR&TI, Dehradun, PP. 315.

Das, G. 2004. Hydrology and Soil Conservation Engineering. Prentice-Hall of India, New Delhi, pp. 489.

Gottschalk, L. C. 1964. Reservoir sedimentation. *In: V. T. Chow (edition), Handbook of Applied Hydrology. McGraw Hill Book Company, New York, section 7-I.*

Grewal, S.S. 1993. *Agroforestry systems for soil and water conservation in Shivaliks*.In: Agroforestry in 2000 AD for the semi arid and arid tropics. NRC for Agroforestry, Jhansi, 82-85

Horton, R. E. 1932. Drainage basin characteristics. *Transaction American Geophsics Union*, 13 : 350-361.

Horton, R. E. 1945. Erosional development of streams and their drainage basins; Hydrological approach to quantitative morphology. *Geological Society of American Bulletin*, 56 : 275-370.

Jual, G.P.; Katiyar, V.S. and Arya, R. K. Gabions for soil conservation works. Indian Farmers' Digest. XXVI (1):10-13

Miller, V. C. 1953. A quantitative geomorphic study of drainage basin characteristics in the clinch mountain area, *Technical report-3*, Columbia. University department of Geology.

Mohan, S. C.; Samra, J. S.; Srivastava, A. K. and Sharda, V. N. 2007. Training Manual: Soil Conservation and Watershed Management, Vol. I-Soil, Agronomy & Socio-economic Aspects, CSWCR&TI, Dehradun, PP. 330.

Ram Babu; Tejwani, K.G.; Agarwal, M.C. and Bhushan, L.S. 1979. Rainfall intensity-duration-return period equations and nomographs of India, Bulletin No.3, CSWCRTI, Dehradun.

Samra, J.S. and Dhyani, S. K. 2001. *Role of trees in watershed development*. In: Agroforestry (Eds. Sunil Puri *et al*.), ICAR, New Delhi

Samra, J.S. and Narayan, Pratap. 1998. *Soil and Water Conservation*. In: 50 Years of Natural Resource Management Research (Eds. G. B. Singh and B. R. Sharma), ICAR, New Delhi, pp. 145-176.

Schumn, S. A. 1956. Evolution of drainage systems and slopes in Badlands at Perth Amboy, New Jersey. *Geological Society of American Bulletin*, 67, 597-646.

Schwab, G.O., Frevert, R. K.; Edminster, T. W. and Barnes, K. K. 1981. Soil and Water Conservation Engineering, John Wiley, N. York.

Sharda, V.N. and Juyal, G.P. Water harvesting techniques, design of small dams and hydraulic complements. pp. 1-26.

Singh, Anupam K.; Nestmann, Franz and Eldho, T. I. 2004. Estimating hydrological parameters for Anas catchment from watershed characteristics. *In: International conference on Advanced Modelling Technique for Sustainable Management of water Resources, 28-30 Jan 2004* : pp 30-33.

Singh, Ramesh; Rizvi, R.H.; Dadhwal, K. S.; Kareemulla, K. and Yadav, R. S. 2002. Rainfall pattern and crop planning in Bundelkhand region of central India. *Asian J. Microbiology, Biotechnology & Environmental Sciences* 4: 555-560.

Singh, Ramesh; Rizvi, R.H.; Kareemulla, K.; Dadhwal, K.S. and Solanki, K. R. 2002. Rainfall analysis for investigation of drought at Jhansi in Bundelkhand region. *Indian J. Soil Cons* 30: 117-121.

Singh, S. and Singh, M. C. 1997. Morphometric analysis of Kanhar river basin. *National Geographical Journal of India*. 43 (1) : 31-43.

Strahler, A. N. 1952. Quantitative analysis of watershed geomorphology. *Transaction of American Geophysics Union,* 38 : 913-920.

Strahler, A. N. 1964. Quantitative geomorphology of drainage basins and channel networks. *In: V. T. Chow (edition), Handbook of Applied Hydrology, McGraw Hill Book Company, New York, section 4-II.*

Tideman, E.M. 1999. *Watershed Management – Guidelines for Indian Conditions*. Omega Scientific Publishers, New Delhi.

Tiwari, A. K.; Sharma, A. K.; Bhatt, V. K. and Srivastav, M. M. 1998. Drought estimation through rainfall analysis for Bundelkhand region. *Indian J. Soil Cons.* 26(3): 280-283.

Tyagi, R. K. 1997. Grassland and Fodder Atlas of Bundelkhand IGFRI, Jhansi, pp 178.

ACKNOWLEDGEMENTS

The **Detailed Project Report (DPR)** of **IWMP–V including Micro-watershed Maletha, Kudri, Dundi-I, Dundi-II, Kurentha, Dakhaneswar, Garhawai, Pahra and Dhanaura , Maigaon in Block- Bamaur of District- Jhansi** is prepared by Bundelkhand Organic Agriculture Development Society (BOADS), Jhansi. BOADS is an NGO registered under Societies Registration Act XXI, 1860 (Registration No. 103/2006 dated 25.05.2006). It is working in Bundelkhand region since 2006 for the sustainable development of agriculture through management of natural resources by organic farming and watershed approach. It is also engaged in advisory/disseminating technology to the end users in the region through the group of eminent scientists, agricultural technicians and workers.

Technical assistance/guidance received from Dr. Ramesh Singh, Sr. Scientist (Soil and Water Conservation Engg.), National Research Centre for Agroforestry, Jhansi is gratefully acknowledged. Dr. Ramesh Singh is associated with the Project titled "**Model watershed project on Natural Resource Management through agroforestry interventions at Garhkundar, Tikamgarh (M.P.)"** which is successfully implemented by NRCAF (ICAR), Jhansi.

Thanks are also due to Sri V. K. Sachan, Agronomist, Dept. of Agriculture and Sri A. K. Solanki, Expert (Soil and Water Conservation), CSAU&T, Kanpur for their kind co-operation and contributions in preparing DPR.

The team of BOADS also extends its sincere gratitude towards Dr. S. K. Dhyani, Director, National Research Centre for Agroforestry (NRCAF), Jhansi and Dr. H. C. Sharma, Dean, College of Tech., GBPUA&T, Pantnagar, Udham Singh Nagar, Uttarakhand for their guidance and timely suggestions in preparation of DPR.

BOADS also extends its gratitude to Dr. P. De, Co-ordinator, Science, Dehradun for his contribution in preparing different layers using GIS and Remote Sensing.

Thanks are also due to Er. Yogesh Raudal, Expert (Watershed Management), Gujrat State Watershed Mangement Agency, Er. Sudheer Kumar Tiwar, Mr. Anil Kumar Shukla, Mr. Babloo Sharma, Mr. P K Singh, Mr. Vikas Kushwaha and Mrs. Pooja Lohiya BOADS, Jhansi for their assistance in collecting GPS points, soil samples, capacity survey, preparing contour maps, suitability analysis of the structures proposed in the DPR.

For any information/clarification/modification contact to:

Secretary,
BOADS, 93-4/A, Civil Lines, Jhansi
Ph. No. 0510-6450745, 2446222