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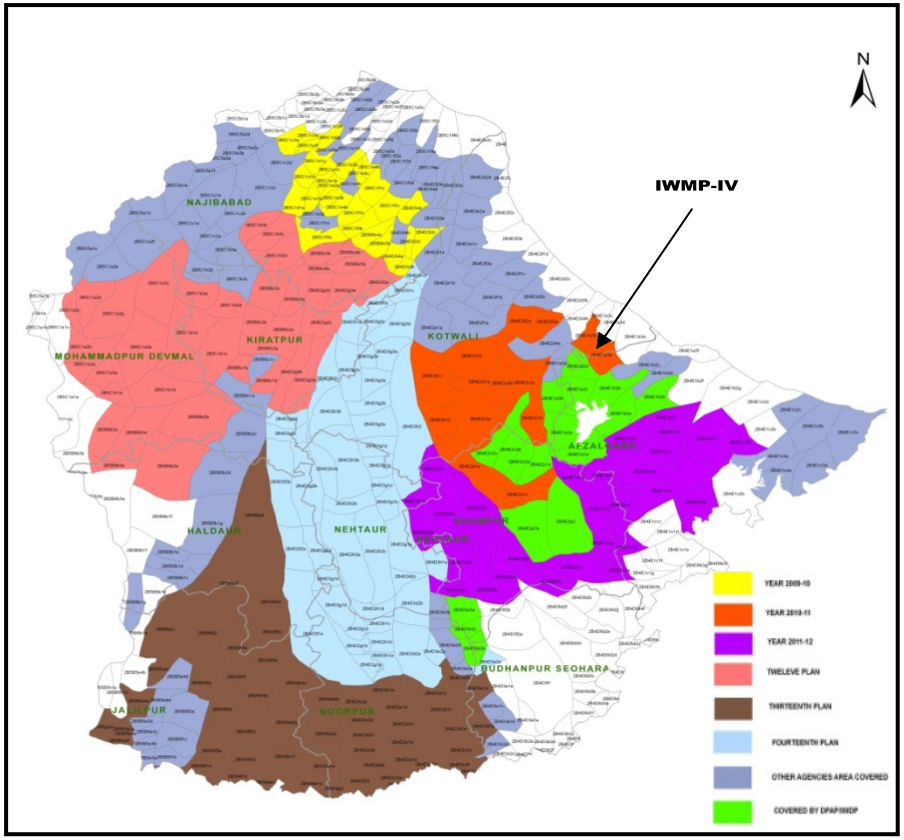
IWMP-IVth (2010-11) District-BIJNOR

Name of Project	Weightage	No. of MWS	Geographical Area(Ha)	Rainfed Area(Ha)	Treatable area(Ha)
IWMP-IV (2010-11)	92.5	6	10061.11	7235	5643



Project at a Glance

1.	Name of Block	Kotwali
2.	No. of Gram Panchayats	18
3.	Four reasons for selection of Watershed	1.Poverty Index is 82.5% 2.High persantage of rainfed area 3.Condition to previously treated 4.Acuteness of Drinking water Scarcity
4.	Date of approval of watershed Development Plan by DRDA/DPC	19-10-2010
5.	Area proposed to be treated (Ha.)	5643
6.	Date of sanction of PPR & Date of release of Ist Installment	10-03-2010 & 15-06-2010
7.	Project duration	2010-2011 to 2013-2014
8.	Project Cost (in lac.)	677.16
9.	Proposed mandays	272218

EXECUTIVE SUMMARY

BRIEF ABOUT AREA

Most of the Asian countries are rapidly coming to the recognition that land degradation is reaching serious proportions, causing damage to the national economy and lowering living standards. The consequences of inappropriate cultivation practices and other exploitative forms of land use are becoming manifest in the form of deep erosion gullies, bare and eroded grazing lands, over-clearing of vegetation, rising water tables, salinized soils and the movement and accumulation of sediment and erosion debris in streams and river channels.

The effects of land degradation are cumulative and far-reaching. Not only do they affect rural communities, but they also affect urban populations. Reduced agricultural productivity is often accompanied by an increase in the impact of water-related natural disasters which devastate rural and urban and communities alike.

Land degradation control is essential if future rural production is to be maintained and improved. Land restoration measures, involving soil erosion control, enhanced vegetative cover and water run-off management will help to preserve the remaining soil and vegetation resources and assist in mitigating the severity of natural disasters. However, much of the land degradation is already irreparable and no amount of effort can overcome the existing damage. Any productive soil which is already lost through erosion has already permanently left the system. If land degradation is to be checked, there is a need for careful planning in the approach to the development and use of the land. Land and water are the two prime resources which are mainly responsible for the development of an area. If these are managed properly and judiciously, then sustainable development could be achieved in that particular area.

The watershed is located in the northern part of Bijnor district. It lies between 29° 19’ 33’’to 29° 31’ 57’’ Latitude and 78° 25’ 17’’ to 78° 39’21’’ Longitude having Code No**. 2B4E1a3a, 2B4E2c1b, 2B4E2b1c, 2B4E2c3a, 2B4E2a1c, 2B4E1a3b**. Its altitude ranges from 151 to 294 metres above mean sea level (MSL). The total area of watershed is 10061.11 (Ha). This watershed has been identified by the state department under NWDPRA scheme by proper prioritization of different parameters for watershed selection criteria.

The Khoh river watershed area comprises of 158 villages of Block Kotwali, Bijnor District of Uttar Pradesh namely Aurangpur, Bhoapatpur, Charandas Bairagi, Dhakariya, Dhoal Khand, Garhi Madhosingh, Sau Khandpur, Madhowala, Alinagar, Aurangpur, Birbhanwala, Garhi Madhosingh, Garhi Mukand, Madhowala, Madhpuri, Narpatpur, Parbatpur, Prempuri, Saharawala, Sau Khandpur, Ahmadpur Gorua Bila Ahatm,Ahmadpur Gorva Ahatmali,Dhampur Nusanpur,Fatehpur Lal Ahatmali,Fatehpur Lal Bila Ahatmal,Firozpur Amrol Bila Ahatm, Gajrola Bila Ahatmali, Huma1Unpur Chandrapal Aha, Humayunpur Chandrapal Bil, Kati1A Ahatmali, Kati1A Bila Ahatmali, Kodupura, Machmar, Mohammad Pur Sultan, Mohmadpur Sada Ahatmali, Nangli Ladan, Rosanpur Raju, Salar Pur Ahatmali, Salarpur Bila Ahatmali, Sarai Bhikan, Savantpura, Shahalipur Gokal, Shekhpur Bhawra, Sherkot (MB), Tarkolimadan, Umarpur Bangar Bila Ahatm, Umarpur Bangar Ahatmali, Ajampur Parma, Allehdadpur, Amichandpur, Asdullapur Pirthi, Asratpur Raghao, Aurangjebpur Hardas, Aurangjebpur Mohan Ahatma, Bajeedpur Pancha1An, Bharamalpur Harnath, Bhogli Ahatmali, Bhogli Bila Ahatmali, Biharipur, Burawala Ahatmali, Burawala Bila Ahatmali, Chak Telawali, Chater Bhojpur, Haibatpur Puru, Haji Hasainpur, Hajipur Bhikkhan, Haqiqatpur Mathura, Haqiqatpur Panchnam, Haqiqatpur Raijada, Hasan Alipur Muthra, Hasanalipur Harey, Jahangirpur Bura, Jahangirpur Khas, Jalalpur Raghao, Kajipur Imma, Kajipur Machdu, Kamalpur Bhoga, Kasba Bajiaft, Khijarpur ,Khairullapur, Khijarpur Jaggu Bila Ahat, Khushhal Nagar Urf Garhi, Khushhalpur Sadik, Kuna Khera, Maheshpur, Malakpur Lakhman Ahatmali, Malakpur Sahsu, Mathrapur Urf Kaluwala, Medawala Ahatmali, Medawala Bila Ahatmali, Mirapur Khadar, Moh.Ashikpur Kamalnain, Mohiuddinpur, Nagina (MB),Naimpur Govardhan, Noor Mohmmadpur Ahatmali, Noormoh.Pur Bila Ahatmali, Noorsarai Nizamsarai, Pirthipur Bila , Ahatmali, Rampur Chhajmal, Rasheedpur Satidas, Roshanpur Ijrola, Sah Begampur Ibrahim Urf, Sahab Begampur Fazil, Shah Alipur Heera, Shah Mujaffarpur , Bila Aha, Shahalipur Ramchandar, Shaheb Begampur Ibrahim, Shahpur Mujaffarpur Ahatm, Shahpur Sidharu, Vajidpur Bhikkan, Sufipur Angad, Sulema, Shikohpur Khanda, Takipur Tulsi, Sharifull Malakpur, Chaharwala, Inayatpur, Islampur

Kutub,Jafarpur,Jagjiwanpur,Manauwarpur Said,Shahalipur Nichal Bila Ah, Tigri Anoopsingh, Aba Bakarpur, Adampur Takhawali, Ajampur Thansingh, Alhaidadpur Khajwa, Anduwala, Benipur, Wazir Pur Bhagwana, Burawala Ahatmali, Burawala Bila , Ahatmali, Chak Alamshah Khan Ahatma, Chak Alamshah Khan Bila A, Chatar Ka Nagla, Fatahpur Ahatmali, Fatehpur Bila Ahatmali, Hamjapur Kathair, Hasan Alipur Dharma, Imampur Tigri, Jagannathpur Mehru, Jamalpur Khadar Ahatmali, Jamalpur Khadar Bila Ahat, Khanpur Manak Ahatmali, Khanpur Manak Bila Ahatma, Khijarpur Jaggu Ahatmali, Khijarpur Jaggu Bila Ahat, Kishanpur Kunda, Kopa Bila Ahatmali, Mahapur Moh.Ali, Medawala Ahatmali, Mirjalipur Chauhar, Naglan Nensi Bila Ahatmal, Nangal Nensi Ahatmali, Palpur, Shah Alipur Ahatmali, Shahalipur Bila Ahatmali, Shahalipur Chatru, Shaheb Begampur Ibrahim, Shahev Begampur Ibrahim 2, Shahjahanpur, Teli Rampur, Tibri, Tukhmapur Harbansh , Ahatma,Tukhmapur Harbash Bila Ah, Umarpur Dariapur, Vazidpur Lala, Bhagwanpur.

The climate of the region is characterized as tropical with average annual rainfall of 1019 mm annually, with an average of 41 days, out of which about 90 percent is received during the monsoon season from July to September. The area receives very less rainfall in the winter season. Temperature ranges from as high as 40°C in the May-June to as low as 8^0C during December-January. The trend of rainfall is highly erratic and maximum (62%) water goes as runoff.

The watershed area is a level plane with small differences in elevation and depression crossed by the numerous streams and tributaries. The soils of the area are mainly sandy, silty loam, loamy and clayey. These soils are dark grey brown to pale olive in colour and are high in fertility status. Soil texture is clay loam particularly in depression and loam in the elevated portion.

Agriculture is the main source of income of the farmers of the watershed. In Kharif the main crops are Paddy, Jowar, Pulses, Oil seed and Maize. In Rabi the main crop is Wheat and Sugarcane

Natural vegetation of the watershed is medium to poor. The forest vegetation is predominant with palas, followed by Bamboo, mahua etc. There are occasional occurrence of Neem plants (Azadirachta indica) and Shisham (Dalbergia sissoo). There is no grass land in the watershed but bushy shrubs can be seen throughout watershed.

Fodder shortage, lack of inputs and market facility are some of the major constraints being experienced by the farmers. For this area mango, guava, jack fruit, tomato, potato and lemon are suitable to motivate the farmers to adopt the agro horticulture in practice.

It is expected that the implementation of different watershed management activities will bring down the run off and soil loss by 70% and 80% of their present level respectively. It is envisaged to increase the water and land utilization index though adoption of bio-engineering measures and improve the eco-development index. The proposed plan will improve the crop diversification index, productivity of existing crops and thereby will lead to self-suffering in food with nutritional security. The different enterprises of various sectors and the project as a whole have been found to be economically viable with sound rate of internal return and less payback period.

The agricultural land will be treated with bunding along with minor levelling. Fallow land/Waste land will be treated with the engineering measures like staggered trenches and a forestation etc. Green Manuring is proposed to minimize the runoff and to maintain the soil fertility of the soil.

INSTITUTIONAL ARRANGEMENT

The proposed watershed area has been identified by the state department under NWDPRA scheme by proper prioritization of different parameters for watershed selection criteria. The SLNA has nominated Bhoomi Sanrakshan Adhikari, Bijnor, as P.I.A

for the afforesaid project. The area of watershed is proposed to be taken by Bhoomi Sanrakshan Adhikari, Department of land development & water resources, Bijnor, for integrated watershed management programme (IWMP) starting from the year 2010-11. The project will be completed in the year 2014-15.

SALIENT PROJECT ACTIVITIES

Watershed Development works including proposed engineering structures

	Total (Lakhs) Amount	
(A) (i)Construction of bunds (Field Bund,Contour Bund, Submergence Bund, Marginal Bund and Peripheral Bund,Levelling)	338.58	50%
(B) (i)Construction and renovation of Water Harvesting Structure/ Bundhi ,Farm Pond		
(ii) Drainage line treatment(Pucca structure/ Check Dam)		
(C) Agroforestry & Horticululture (i) Rainfed horticulture with fencing		
(ii) Rainfed horticulture without fencing		
(iii) Afforestation & development of Silvi_pastoral system		
Total	**338.58**	**50%**

Livelihood Activities (community Based)

Component	Total (Lakhs) Amount	% of the bugdet
(a) Goat farming	67.72	10%
(b) Diary Work		
(c) Nadaf compost		
(d) General merchant shop		
(e) Live stock development Activities		
Total	**67.72**	**10%**

YEAR WISE PHASING PHYSICAL & FINANCIAL ITEM WISE –I.W.M.P.-IV, OF BIJNOR (U.P.)

S. No.	Item	1st Year (2010-11)		IInd Year (2011-12)		IIIrd Year (2012-13)		1Vth Year (2013-14)		Total	
		Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.
1	Administrative 10%	13.54		17.61		18.96		17.61		67.72	
2	Monitoring 1%	1.35		1.35		1.35		2.71		6.77	
3	Evaluation 1%	2.03		1.19		1.19		2.37		6.77	
4	Entry Point Activity 4%	27.09		0.00		0.00		0.00		27.09	
5	Institutional and Capacity building 5%	20.31		5.08		5.08		3.39		33.86	
6	D.P.R Preparation 1%	6.77		0.00		0.00		0.00		6.77	
7	Watershed Dev. Works 50%	50.79	846.45	116.98	1949.66	108.85	1814.22	61.96	1032.67	338.58	5643.00
8	Livelihood & Income Generating 10%	6.77		27.09		27.09		6.77		67.72	
9	Production System development 13%	6.77		33.86		40.63		6.77		88.03	
10	Consolidation Phase 5%	-		-		-		33.86		33.86	
	Total	**135.43**		203.15		**203.15**		**135.43**		677.16	

S.N.	Budget Component	Total (lakhs)
A.	**1.Administrative** **2. Monitoring** **3. Evaluation**	**67.72** **6.77** **6.77**
B.	**Preparatory Phase** **1. Entry Point Activities** **2. Institution and capacity building** **3. Detailed Project Report(DPR)**	**27.09** **33.86** **6.77**
C.	**WATERSHED WORKS PHASE** **1. Watershed development works** **2. Livelihood activities for the asset less persons** **3. Production system and micro enterprises**	**338.58** **67.72** **88.03**
D.	**CONSOLIDATION PHASE**	**33.86**
	GRAND TOTAL	**677.16**

TREATMENT AREA AND DETAILS

The main objectives of the project area are: to control damage by run-off, to manage and utilize run-off for useful purpose or soil conservation and to increase infiltration of rain water.

The main problem in a watershed is the soil erosion by rainfall. The run off water transport the sediments which may block the channel head, dam, reservoir and storage structures are the major problems faced in the project area and attempts made so far to overcome them. The other main problems in the selected watershed are: lack of awareness amongst the villagers about the deteriorating environmental condition of the area, 75% of the run off water makes it away to way towards Khoh river through Taraina carrying fertile soil which has nutrients and this decreases soil fertility, there is a decline in the productivity of cereals, pulses and vegetable crops, dependency of farmers on the rain water. Therfore it is an urgent need, that rainwater should be harvested for crops and re-charged to improve the quality of the water.

WATERSHED WISE GEOGRAPHICAL AREA

S. No.	Watershed Code	Total Area (ha)
1	2B4E2b1c	2531.50
2	2B4E2c1b	1286.04
3	2B4E1a3b	1156.87
4	2B4E1a3a	583.75
5	2B4E2c3a	2861.50
6	2B4E2a1c	1641.44
	Total	**10061.11**

FACE SHEET ABOUT BENCH MARK INDICATORS

Area Under Various LCC Classes

LCC class	Area ha
I	596.00
II	7110.00
III	2355.11
Total	**10061.11**

ACTION PLAN AT A GLANCE

The main points , involved in the preparation of detailed project report are: collection of data (spatial- non spatial) from gram panchayat and block lavel office have been done during field survey; Meetings were conducted between gram pradhan,and farmers of the project area ; Different groups for social mobilization like users group, Self help group, have been formed with the consultation of the members of watershed development team ; PRA exercises to be done for the detailed survey of the village assets have been done.The following activities are taken up for implementation in the project area.

Watershed Development works including proposed engineering structures

	Total (Lakhs) Amount	
Field Bund,Contour Bund, Submergence Bund, Marginal Bund and Peripheral Bund,Levelling, Construction and renovation of Water Harvesting Structure/ Bundhi ,Farm Pond, Drainage line treatment(Pucca structure/ Check Dam), Rainfed horticulture with fencing, Rainfed horticulture without fencing, Afforestation & development of Silvi_pastoral system	338.58	50%
Total	**338.58**	**50%**

Livelihood Activities

Component	Total (Lakhs) Amount	% of the bugdet
Goat farming, Diary Work, Nadaf compost, General merchant shop, Live stock development Activities	67.72	10%
Total	**67.72**	**10%**

Entry Point Activities

Component	Total (Lakhs) Amount	% of the bugdet
Kharanja, Krishak Vikas Munch, Approach Road (Brick Soling), Primary & Junior School Boundary Wall & Earth Work, Earth Work in Sub-roads	67.72	10%
Total	**67.72**	**10%**

CHAPTER-1

INTRODUCTION AND BACKGROUND

PROJECT BACKGROUND

The Indo-gangetic plains of U.P. have undergone stress for natural resources, which are witnessing degradation at an alarming rate. With the growing urge for decentralizing the practice of planning, it has become necessary to have a fresh look and scientific attitude for natural resources management. The watershed approach has conventionally aimed at treating degraded lands with the help of low cost and locality accessed technologies such as in-situ soil and moisture conservation measures, afforestation etc. and through a participatory approach that seeks to secure close involvement of the user communities. The broad objective was the promotion of the overall economic development and improvement of the socio-economic conditions of the resource poor sections of people inhabiting the programme areas. A comprehensive programme named Integrated Watershed Management Programme (IWMP-IV) has been implemented under Common Guidelines on Watershed Development in 2008.

The main objectives of the IWMP-IV are to restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water. The outcomes are prevention of soil run-off, regeneration of natural vegetation, rain water harvesting and recharging of the ground water table. This enables multi-cropping and the introduction of diverse agro-based activities, which help to provide sustainable livelihoods to the people residing in the watershed area. In addition, there is a Scheme of Technology Development, Extension and Training (TDET) is being implemented to promote development of cost effective and proven technologies to support watershed management.

The Geographical area of Khoh river watersheds, with code No. **(2B4E1a3a, 2B4E2c1b, 2B4E2b1c, 2B4E2c3a, 2B4E2a1c, 2B4E1a3b)** having area of 10061.11 ha is located in northern part of Bijnor District of U.P.. The watershed is located in Kotwali block of Bijnor District (U.P.) comprises of 158 villages. It lies between 29^0 19’ 33’’to 29^0 31’ 57’’ Latitude and 78^0 25’ 17’’ to 78^0 39’21’’ Longitude Total Area of the watershed is 10061.11 Ha (Treatment Area is 5643 Ha). Elevation ranges from ranges from 151 to 294 metres above mean sea level. Most of the land comes under agriculture. The area in the watershed is relatively flat plain with shallow river-valleys. The soils are mainly sandy, silty loam, loamy and clayey.

The area of watersheds is proposed to be taken up by Bhoomi Sanrakshan Adhikari, Department of land development & water resources, Bijnor district for integrated watershed management program me (IWMP) starting from the year 2010-11. The project will be completed by 2014-15.

BASIC PROJECT INFORMATION

Name of the project	Villages	Gram Panchayat	Block	District	Total area of the project	Area proposed to be treated	Total project cost(Rs in Lac)	PIA
I.W.M.P. – IV	Aurangpur, Bhoapatpur, Charandas Bairagi, Dhakariya, Dhoal Khand, Garhi Madhosingh, Sau Khandpur, Madhowala, Alinagar, Aurangpur, Birbhanwala, Garhi Madhosingh, Garhi Mukand, Madhowala, Madhpuri, Narpatpur, Parbatpur, Prempuri, Saharawala, Sau Khandpur, Ahmadpur Gorua Bila Ahatm,Ahmadpur Gorva Ahatmali,Dhampur Nusanpur,Fatehpur Lal Ahatmali,Fatehpur Lal Bila Ahatmal,Firozpur Amrol Bila Ahatm, Gajrola Bila Ahatmali, Huma1Unpur Chandrapal Aha, Humayunpur Chandrapal Bil, Kati1A Ahatmali, Kati1A Bila Ahatmali, Kodupura, Machmar, Mohammad Pur Sultan, Mohmadpur Sada Ahatmali, Nangli Ladan, Rosanpur Raju, Salar Pur Ahatmali, Salarpur Bila Ahatmali, Sarai Bhikan, Savantpura, Shahalipur Gokal, Shekhpur Bhawra, Sherkot (MB), Tarkolimadan, Umarpur Bangar Bila Ahatm, Umarpur Bangar Ahatmali, Ajampur Parma, Allehdadpur, Amichandpur, Asdullapur Pirthi, Asratpur Raghao, Aurangjebpur Hardas, Aurangjebpur Mohan Ahatma, Bajeedpur Pancha1An, Bharamalpur Harnath, Bhogli Ahatmali, Bhogli Bila Ahatmali, Biharipur, Burawala Ahatmali, Burawala Bila Ahatmali, Chak Telawali, Chater Bhojpur, Haibatpur Puru, Haji Hasainpur, Hajipur Bhikkhan, Haqiqatpur Mathura, Haqiqatpur Panchnam, Haqiqatpur Raijada, Hasan Alipur Muthra, Hasanalipur Harey, Jahangirpur Bura, Jahangirpur Khas, Jalalpur Raghao, Kajipur Imma, Kajipur Machdu, Kamalpur Bhoga, Kasba Bajiaft, Khijarpur ,Khairullapur, Khijarpur Jaggu Bila Ahat, Khushhal Nagar Urf Garhi, Khushhalpur Sadik, Kuna Khera, Maheshpur, Malakpur Lakhman Ahatmali, Malakpur Sahsu, Mathrapur Urf Kaluwala, Medawala Ahatmali, Medawala Bila Ahatmali, Mirapur Khadar, Moh.Ashikpur Kamalnain, Mohiuddinpur, Nagina	Fatehpur,Kuraini,Mujeda Sakaru, Kalyanpur, Kishanpur Kunda, Bhagwanpur, Bainipur, Allahadadpur Khajua, Inayatpur, Khaishalpur Deewan, Gopi wala, Bhogpur, Harbanspur Dharam, Alipur, Smilepur Daimi, Islamabad, Kahuwal Gosai Wala, Kayan Nagar Dodrajpur	Kotwali	Bijnor	10061.11 (Ha)	5643 (Ha)	677.16	B.S.A., LDWR

	(MB),Naimpur Govardhan, Noor Mohmmadpur Ahatmali, Noormoh.Pur Bila Ahatmali, Noorsarai Nizamsarai, Pirthipur Bila , Ahatmali, Rampur Chhajmal, Rasheedpur Satidas, Roshanpur Ijrola, Sah Begampur Ibrahim Urf, Sahab Begampur Fazil, Shah Alipur Heera, Shah Mujaffarpur , Bila Aha, Shahalipur Ramchandar, Shaheb Begampur Ibrahim, Shahpur Mujaffarpur Ahatm, Shahpur Sidharu, Vajidpur Bhikkan, Sufipur Angad,Sulema ,Shikohpur Khanda,Takipur Tulsi,Sharifull Malakpur, Chaharwala,Inayatpur,Islampur Kutub,Jafarpur,Jagjiwanpur,Manauwarpur Said,Shahalipur Nichal Bila Ah, Tigri Anoopsingh, Aba Bakarpur, Adampur Takhawali, Ajampur Thansingh, Alhaidadpur Khajwa, Anduwala, Benipur, Wazir Pur Bhagwana, Burawala Ahatmali, Burawala Bila , Ahatmali, Chak Alamshah Khan Ahatma, Chak Alamshah Khan Bila A, Chatar Ka Nagla, Fatahpur Ahatmali, Fatehpur Bila Ahatmali, Hamjapur Kathair, Hasan Alipur Dharma, Imampur Tigri, Jagannathpur Mehru, Jamalpur Khadar Ahatmali, Jamalpur Khadar Bila Ahat, Khanpur Manak Ahatmali, Khanpur Manak Bila Ahatma, Khijarpur Jaggu Ahatmali, Khijarpur Jaggu Bila Ahat, Kishanpur Kunda, Kopa Bila Ahatmali, Mahapur Moh.Ali, Medawala Ahatmali, Mirjalipur Chauhar, Naglan Nensi Bila Ahatmal, Nangal Nensi Ahatmali, Palpur, Shah Alipur Ahatmali, Shahalipur Bila Ahatmali, Shahalipur Chatru, Shaheb Begampur Ibrahim, Shahev Begampur Ibrahim 2, Shahjahanpur, Teli Rampur, Tibri, Tukhmapur Harbansh , Ahatma,Tukhmapur Harbash Bila Ah, Umarpur Dariapur, Vazidpur Lala, Bhagwanpur							

NEED AND SCOPE FOR WATERSHED DEVELOPMENT

MAIN OBJECTIVES

a. Restoration of health of watershed through reducing the volume and velocity of run-off water so that soil erosion can be checked.
b. To increase per capita availability of drinking water through increased ground water level by insito conservation measures, water harvesting structure and planting work in watershed ground water recharge through in situ conservation measures, water harvesting structures and plantations in watershed.
c. Conservation, development and sustainable management of natural resources including their uses.
d. To ensure foods security through increased agricultural production and productivity by popularizing improved varieties, INM, IPM and improved agricultural implements.
e. Restoration of ecological balance in the degraded and fragile ecosystem through forestation.
f. To discourage migration of villagers/rural community by creating sustainable employment opportunities for livelihood security in the watershed villages.

MAIN PROBLEM IN WATERSHED AREA

Food sufficiency, economic growth and environmental security were identified as the major issues to be addressed in the watershed area. The area has flat topography hence highly prone to soil erosion. Lack of irrigation water is the greatest problem experienced by the people followed by low function of field crops, lack of fodder availability and low animal productivity.

WEIGHTAGE FOR SELECTION OF WATERSHED

Problem Identification and Prioritization

Soil and water conservation, Poor sufficiency, economic growth and environmental security has identified as the major issues to be addressed in the watershed area. The area has moderate to steep slope hence prone to soil erosion.

Problems identified and prioritized the transect walk and PRA exercise in all 158 villages namely Aurangpur, Bhoapatpur, Charandas Bairagi, Dhakariya, Dhoal Khand, Garhi Madhosingh, Sau Khandpur, Madhowala, Alinagar, Aurangpur, Birbhanwala, Garhi Madhosingh, Garhi Mukand, Madhowala, Madhpuri, Narpatpur, Parbatpur, Prempuri, Saharawala, Sau Khandpur, Ahmadpur Gorua Bila Ahatm,Ahmadpur Gorva Ahatmali,Dhampur Nusanpur,Fatehpur Lal Ahatmali,Fatehpur Lal Bila Ahatmal,Firozpur Amrol Bila Ahatm, Gajrola Bila Ahatmali, Huma1Unpur Chandrapal Aha, Humayunpur Chandrapal Bil, Kati1A Ahatmali, Kati1A Bila Ahatmali, Kodupura, Machmar, Mohammad Pur Sultan, Mohmadpur Sada Ahatmali, Nangli Ladan, Rosanpur Raju, Salar Pur Ahatmali, Salarpur Bila Ahatmali, Sarai Bhikan, Savantpura, Shahalipur Gokal, Shekhpur Bhawra, Sherkot (MB), Tarkolimadan, Umarpur Bangar Bila Ahatm, Umarpur Bangar Ahatmali, Ajampur Parma, Allehdadpur, Amichandpur, Asdullapur Pirthi, Asratpur Raghao, Aurangjebpur Hardas, Aurangjebpur Mohan Ahatma, Bajeedpur Pancha1An, Bharamalpur Harnath, Bhogli Ahatmali, Bhogli Bila Ahatmali, Biharipur, Burawala Ahatmali, Burawala Bila Ahatmali, Chak Telawali, Chater Bhojpur, Haibatpur Puru, Haji Hasainpur, Hajipur Bhikkhan, Haqiqatpur Mathura, Haqiqatpur Panchnam, Haqiqatpur Raijada, Hasan Alipur Muthra, Hasanalipur Harey, Jahangirpur Bura, Jahangirpur Khas, Jalalpur Raghao, Kajipur Imma, Kajipur Machdu, Kamalpur Bhoga, Kasba Bajiaft, Khijarpur ,Khairullapur, Khijarpur Jaggu Bila Ahat, Khushhal Nagar Urf Garhi, Khushhalpur Sadik, Kuna Khera, Maheshpur, Malakpur Lakhman Ahatmali, Malakpur Sahsu, Mathrapur Urf Kaluwala, Medawala Ahatmali, Medawala Bila Ahatmali, Mirapur Khadar, Moh.Ashikpur Kamalnain, Mohiuddinpur, Nagina (MB),Naimpur Govardhan, Noor Mohmmadpur Ahatmali, Noormoh.Pur Bila Ahatmali, Noorsarai Nizamsarai, Pirthipur Bila , Ahatmali, Rampur Chhajmal, Rasheedpur Satidas, Roshanpur Ijrola, Sah Begampur Ibrahim Urf, Sahab Begampur Fazil, Shah Alipur Heera, Shah Mujaffarpur , Bila Aha, Shahalipur Ramchandar, Shaheb Begampur Ibrahim, Shahpur Mujaffarpur Ahatm, Shahpur Sidharu, Vajidpur Bhikkan, Sufipur Angad,Sulema ,Shikohpur Khanda,Takipur Tulsi,Sharifull Malakpur, Chaharwala,Inayatpur,Islampur Kutub,Jafarpur,Jagjiwanpur,Manauwarpur Said,Shahalipur Nichal Bila Ah, Tigri Anoopsingh, Aba Bakarpur, Adampur Takhawali, Ajampur Thansingh, Alhaidadpur Khajwa, Anduwala, Benipur, Wazir Pur Bhagwana,

Burawala Ahatmali, Burawala Bila , Ahatmali, Chak Alamshah Khan Ahatma, Chak Alamshah Khan Bila A, Chatar Ka Nagla, Fatahpur Ahatmali, Fatehpur Bila Ahatmali, Hamjapur Kathair, Hasan Alipur Dharma, Imampur Tigri, Jagannathpur Mehru, Jamalpur Khadar Ahatmali, Jamalpur Khadar Bila Ahat, Khanpur Manak Ahatmali, Khanpur Manak Bila Ahatma, Khijarpur Jaggu Ahatmali, Khijarpur Jaggu Bila Ahat, Kishanpur Kunda, Kopa Bila Ahatmali, Mahapur Moh.Ali, Medawala Ahatmali, Mirjalipur Chauhar, Naglan Nensi Bila Ahatmal, Nangal Nensi Ahatmali, Palpur, Shah Alipur Ahatmali, Shahalipur Bila Ahatmali, Shahalipur Chatru, Shaheb Begampur Ibrahim, Shahev Begampur Ibrahim 2, Shahjahanpur, Teli Rampur, Tibri, Tukhmapur Harbansh , Ahatma,Tukhmapur Harbash Bila Ah, Umarpur Dariapur, Vazidpur Lala, Bhagwanpur. have pooled and list of 9(nine) problems representing the whole watershed was prepared. Problems have ranked as per their total weightage in the 158 villages. Lack of drinking water is the greatest problem experienced by the people followed by, lack of irrigation water, lack of agricultural management, medical and health care facilities etc.

PROBLEM IDENTIFICATION AND PRIORITIZATION IN THE WATERSHED

S. No.	Problem	Rank
1.	Low production of crops	5
2.	Lack of drinking water	1
3.	Lack of irrigation water	2
4.	Lack of fodder availability	7
5.	Non-availability of fuel wood	6
6.	Lack of inputs like quality seeds, fertilizer, pesticides etc.	4
7.	Lack of medical, educational and transportation facilities	3
8.	Medical and Health care facilities for and low animal productivity.	8

STRENGTH, WEAKNESS, OPPORTUNITY AND THREAT (SWOT) ANALYSIS

A SWOT analysis of IWMP-IV, watershed is presented as below

Strength (S)	Weakness(W)
1- Cooperative work culture is traditional activities 2- Close ethnic tier 3- Hard working man power 4- Honesty 5- Awareness of farmers about watershed management programmes 6- Social outlook of the community towards developmental works 7- Less pollution of agro ecosystem 8- Rich biodiversity	1- Poor water management 2- Resource poor farmers 3- Migration of rural youth 4- Low and erratic rain fall 5- Fragile geography 6- Fragmented land holdings. 7- Heavy infestation of wild animals 8- Problem of fuel and fodder 9- Deforestation
Opportunities(O)	**Threats (T)**
1- Better scope for pulses and oilseeds crop production 2- Scope of regular employment opportunity to check out migration 3- Conductive climate for rain fed crop diversification 4- Good scope for agro forestry and dry land horticulture. 5- Good scope for medicinal crop cultivation	1- Prone to adverse climate like drought 2- High market risk 3- Weak coordination among line departments. 4- Lack of expertise of implementing agencies in different aspect of WSM. 5- Avoidance of rural people regarding the maintenance and proper use of water bodies

WEIGHTAGE OF THE PROJECT

District	Name of the Project	No. of micro-watersheds proposed to be covered	Proposed project area (Ha)	Type of project(Hilly/ Desert/ Others)	Proposed cost (Rs. In lakh)	Weightage													
Bijnor	IWMP-IV	6	10061.11	Others	677.16	i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	xiii	xiv
						7.5	10	5	10	0	0	5	5	10	10	10	15	0	87.5

CRITERIA AND WEIGHTAGE FOR SELECTION OF WATERSHED

S.No.	Criteria	Maximum Score	Ranges & Scores			
i	Poverty index (% of poor to population)	10	Above 80 % (10)	80 to 50 % (7.5)	50 to 20 % (5)	Below 20 % (2.5)
ii	% of SC/ ST population	10	More than 40 % (10)	20 to 40 % (5)	Less than 20 % (3)	
iii	Actual wages	5	Actual wages are significantly lower than minimum wages (5)	Actual wages are equal to or higher than minimum wages (0)		
iv	% of small and marginal farmers	10	More than 80 % (10)	50 to 80 % (5)	Less than 50 % (3)	
v	Ground water status	5	Over exploited (5)	Critical (3)	Sub critical (2)	Safe (0)

vi	Moisture index/ DPAP/ DDP Block	15	-66.7 & below (15) DDP Block	-33.3 to -66.6 (10) DPAP Block	0 to -33.2 (0) Non DPAP/ DDP Block	
vii	Area under rain-fed agriculture	15	More than 90 % (15)	80 to 90 % (10)	70 to 80% (5)	Below70 % (Reject)
viii	Drinking water	10	No source (10)	Problematic village (7.5)	Partially covered (5)	Fully covered (0)
ix	Degraded land	15	High – above 20 % (15)	Medium – 10 to 20 % (10)	Low- less than 10 % of TGA (5)	
x	Productivity potential of the land	15	Lands with low production & where productivity can be significantly enhanced with reasonable efforts (15)	Lands with moderate production & where productivity can be enhanced with reasonable efforts (10)	Lands with high production & where productivity can be marginally enhanced with reasonable efforts (5)	
xi	Contiguity to another watershed that has already been developed/ treated	10	Contiguous to previously treated watershed & contiguity within the micro watersheds in the project (10)	Contiguity within the micro watersheds in the project but non contiguous to	Neither contiguous to previously treated watershed nor contiguity within the micro	

				previously treated watershed (5)	watersheds in the project (0)	
xii	Cluster approach in the plains (more than one contiguous micro-watersheds in the project)	15	Above 6 micro-watersheds in cluster (15)	4 to 6 micro watersheds in cluster (10)	2 to 4 micro watersheds in cluster (5)	
xiii	Cluster approach in the hills (more than one contiguous micro-watersheds in the project)	15	Above 5 micro-watersheds in cluster (15)	3 to 5 micro watersheds in cluster (10)	2 to 3 micro watersheds in cluster (5)	
	Total	**150**	**150**	**90**	**41**	**2.5**

WATERSHED INFORMATION

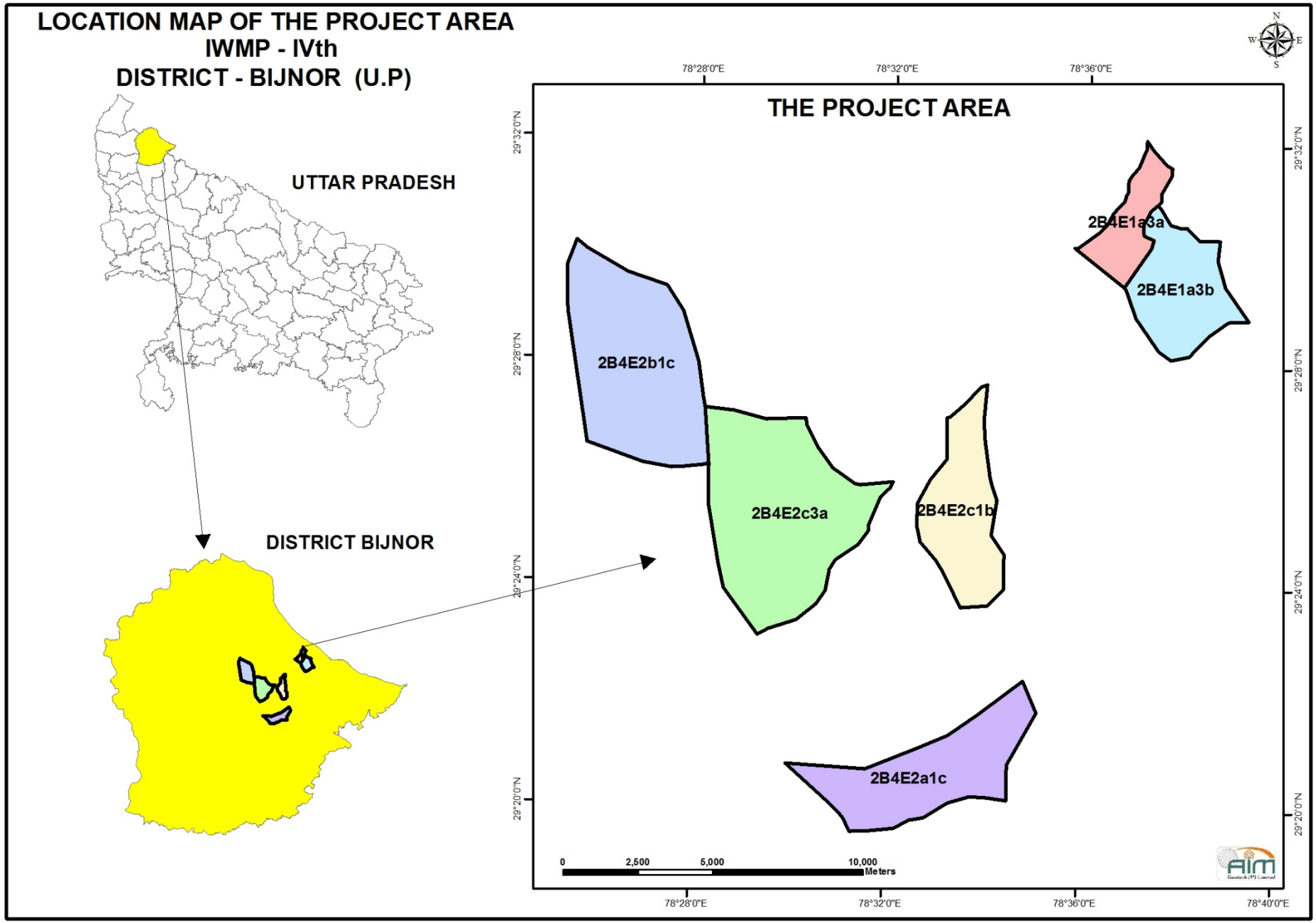
Name Of the Project	No. of water sheds to be treated	Watershed Code	Watershed regime/type/order
IWMP-IV, Bijnor	6	**2B4E1a3a, 2B4E2c1b, 2B4E2b1c, 2B4E2c3a, 2B4E2a1c, 2B4E1a3b**	Micro Watershed

OTHER DEVELOPMENTAL PROJECTS/SCHEMES RUNNING IN THE VILLAGES

These villages being very backward have been on top priority for a number of developmental projects. These programmes are Swarnajayanti Gram Swarojgar Yojana (SGSY) and Indira Awas Yojana (IAY) . Integrated Watershed Management Programme in other areas of the district is under operation in the department of Agriculture.

CHAPTER – 2

GENERAL DESCRIPTION OF PROJECT AREA


LOCATION MAP OF THE PROJECT AREA
IWMP - IVth
DISTRICT - BIJNOR (U.P)
UTTAR PRADESH
DISTRICT BIJNOR
THE PROJECT AREA
2B4E1a3a
2B4E1a3b
2B4E2b1c
2B4E2c3a
2B4E2c1b
2B4E2a1c
78°28'0"E
78°32'0"E
78°36'0"E
78°40'0"E
29°32'0"N
29°28'0"N
29°24'0"N
29°20'0"N
0
2,500
5,000
10,000
Meters
N
S
E
W

PROJECT AREA AND ITS LOCATION

The study area of IWMP-IV Project is situated in Kotwali block of District Bijnor. The Block Kotwali is approximately 24 km away from district head quarter and the project area is situated with minimum distance of 10-15 km from Block head quarter as well as from about 6-15 km. from tahsil.

The study area of IWMP-IV Project is situated in Kotwali block of District Bijnor. It lies between 29^0 19' 33''to 29^0 31' 57'' Latitude and 78^0 25' 17'' to 78^0 39'21'' Longitude. Total Area of the watershed is 10061.11 Ha (Treatment Area is 5643 Ha). Elevation ranges from ranges from 151 to 294 meters above mean sea level (MSL).

The 3/4 th of the total cultivated area is rain fed therefore, farmers of the project area have to dependent on rainwater for their crop production, although limited quantity of water remains available for crop production during Rabi but that's too comes through the water bodies completely fed by rain water. Owing to these limitations total grain production and the productivity of project area is low.

AREA

LANDUSE PATTERN OF THE PROJECT AREA

S. No	Name of District	No. of MWS	No. of Villages	Geographical Area	Rainfed Area	Built-Up Land	Wasteland all types	Agriculture	Water Bodies	Fallow land	Plantation	Forest
1	Bijnor	06	158	10061.11	7235.00	339.21	452.46	7104.92	359.86	79.69	598.14	1126.83

AGRO-CLIMATE CONDITIONS

The Agro-Climate Condition of the project area including the Agro-Climate Zone of the project area, soil type, rainfall, major crops etc., of Bijnor district is briefly described below:

S. No.	Name of Project	Name of Agro-climate Zone covered	Rainfed Area (Ha)	No. of the Villages	Major Soil Type (Ha)		Topography	Average Rainfall (mm)	Major crops	
					Type	Area (ha)			Name	Area (ha)
1	IWMP -IV, Bijnor	Middle western zone	7235	158	Sandy Loam	5788	Undulating	1019	Wheat, Pulses, Oil Seeds, Jwar, Bajra	7125

PHYSIOGRAPHY

The study area has precipitous slopes and drains into the river Khoh. The top of the watershed exhibits extremely precipitous and manifesting moderate to severe erosion class. The lower portion of the watershed has moderate slopes. At the outlet of the watershed small gullies are noticed, covered with sparse vegetation. Most of the agricultural land is dependent on monsoon. The plains form a level tract which slopes gently from north-west to south-east. Higher elevations appear at places where the general flat surface is broken by irregular ranges of sand hills. The valleys of the larger rivers are not only depressed well below the general level of the country but are of considerable breadth. Thus there is a wide area of low land which is inundated in years of heavy rainfall.

ELEVATION RANGE, LATITUDE LONGITUDE, RELIEF HEIGHT DIFFERENCE ETC

S. No.	Details of the watershed	Settlement	Location		Elevation of watershed from Mean Sea level		
			Latitude (N)	Longitude (E)	Highest in Meters	Lowest in Meters	Relief Height Difference
1	2B4E2b1c	Ajampur Parma, Allehdadpur, Amichandpur, Asdullapur Pirthi, Asratpur Raghao, Aurangjebpur Hardas and others	29^0 26' 06'' to 29^0 30' 05''	78^0 25' 17'' to 78^0 28' 10''	250	228	22
2	2B4E2c3a	Aba Bakarpur, Adampur Takhawali, Ajampur Thansingh, Alhaidadpur Khajwa, Anduwala, Benipur, Wazir Pur Bhagwana, and others	29^0 23' 06'' to 29^0 27' 07''	78^0 28' 17'' to 78^0 32' 01''	251	217	34
3	2B4E2c1b	Chaharwala,Inayatpur,Islampur Kutub, Jafarpur, Jagjiwanpur, Manauwarpur Said, and others	29^0 23' 39'' to 29^0 27' 35''	78^0 32' 34'' to 78^0 34' 10''	270	229	41
4	2B4E2a1c	Ahmadpur Gorua Bila Ahatm, Ahmadpur Gorva Ahatmali, Dhampur Nusanpur, Fatehpur Lal Ahatmali, Fatehpur Lal Bila Ahatmal, and others	29^0 19' 33'' to 29^0 22' 13''	78^0 30' 02'' to 78^0 35' 07''	240	151	89
5	2B4E1a3a	Aurangpur, Bhoapatpur, Charandas Bairagi, Dhakariya, Dhoal Khand, and others	29^0 29' 31'' to 29^0 32' 02''	78^0 35' 52'' to 78^0 37' 38''	294	242	52
6	2B4E1a3b	Alinagar, Aurangpur, Birbhanwala, Garhi Madhosingh, Garhi Mukand, Madhowala, and others	29^0 28' 08'' to 29^0 30' 50''	78^0 36' 48'' to 78^0 39' 21''	282	217	65

CLIMATE

The project area experiences three distinct seasons: summer, monsoon and winter. Typical summer months are from March end to June, with maximum temperatures ranging from 33 °C to 40 °C. Contrary to most of the Himalyan Plateau where June is the warmest month, the warmest months in project area is May. The area, starts receiving heavy thundershowers with sharp downpours in Mid June. Though the temperatures plunge in this month, the summer heat accompanied by high humidity can be occasionally quite oppressive.

Monsoon winds blowing from the south India are a welcome relief in mid of June, bringing with them heavy showers in July, August. The area receives excessive rainfall in the month of August & September, with an annual rainfall of 1019 mm, mainly between June and September as the result of southwest monsoon. August is the wettest month of the year. The spells of continuous rainfall may stretch to many days or even a few weeks.

As the monsoon winds recede, the day temperatures starts decline in October with cooler nights signalling the onset of winter. The project area experiences winter from November to February. It experience pleasant windy days, clear skies and cool nights in the month of November till February ends, which makes it the most enjoyable time of the year. The day temperature hovers around 14 °C while night temperature is below 8 °C. On particularly cold days, wind may appear to be very chilly due to the dryness of air. Rain is very expected in month of February.

WATERSHED CHARACTERISTICS

Shape and Size

The watershed shape (IWMP - IV) is more or less triangle in shape. The direction of the slope in the project area is north-west to south- east. The maximum length and width of IWMP – IV, watershed, are 23558 m and 19538 m, respectively with the length: width ratio 1.20/1

SHAPE AND SIZE OF WATERSHED

S. N.	Micro watershed Code	Area (ha)	Shape	Approximate size in meter		Ratio Length: width
				Length	Width	
1	2B4E2b1c	2566.61	Square	6672	4047	1.64:1
2	2B4E2c3a	2911.46	Traingle	6653	6118	1.08:1
3	2B4E2c1b	1355.99	Elongate	6917	2561	2.07:1
4	2B4E2a1c	1689.20	Elongate	7801	2041	3.82:1
5	2B4E1a3a	606.90	Elongate	4264	1836	2.32:1
6	2B4E1a3b	1206.84	Square	4306	3299	1.30:1

GEOMORPHOLOGY

The area lies in the northern part of the District- Bijnor of Khoh River Basin. The soil is mainly sandy loam soil which is easily transportable after detaching causing soil erosion by water erosion and wind erosion. Topography is moderate and undulating.

DETAIL OF SOIL EROSION (I.W.M.P-IV) BIJNOR

S. No.	Name of the Project	Water Erosion (Ha)				Run-Off (mm/year)	Average Soil Loss in tons/ha/yr	Wind Erosion
		Sheet	Rill	Gully	Total			
1	IWMP - IV	5064	1808	363	7235	621	16 to 20	N.A.

SOILS

In the watershed area mainly four types of soil named sandy, loam, Clay, clay loam, these are the main soil type of Tarai region. Main crops are Sugarcane, Maize which need more Nitrogen, Zinc & phosphorous. Therefore deficiency of Zinc occurs in this area.

DRAINAGE

Due to moderate to steep slopes and presence of a number of drainage lines, drainage is adequate. The watershed forms part of the Khoh River.

CHAPTER-3

BASE LINE SURVEY

A detailed baseline survey of the project area was conducted to the study major socio-economic and biophysical constraints to sustainable crop production. The following information was collected.

SOCIO-ECONOMIC ANALYSIS OF THE PROJECT

In the proposed watershed management plan of Khohbasin, proper blending of bio- engineering measures will be applied. Based on the results of studies conducted in this region, it is expected that the Implementation of different watershed management activities will bring down the run off and soil loss by 70% and 80% of their present level respectively. It is envisaged to increase the water and land utilization index through adoption of bio-engineering measure and improve the eco-development index. The proposed plan will improve the crop diversification index, productivity of existing crop and thereby will lead to self-suffering in food with nutritional security. The different enterprises of various sectors and the project as a whole have been found to be economically viable with sound rate of internal return and less payback period.

ECONOMIC ANALYSIS

Economic analysis of the project was carried by taking direct benefits and costs considering 10 years of project life at 10 per cent discount rate. For this purpose of economic analysis, whole watershed development plan was divided into three sector namely, agriculture, horticulture and forest/Fuel wood plantation. Benefit Cost ratio (B C ratio) criteria was employed to judge the economic efficiency of each enterprise and sector. At present agriculture is being done on well maintained field, however, rainfed during project period partially irrigated agriculture field is likely to be increased up to 1200 hectares therefore, the development cost can be recovered within few year, further, agriculture is primary source of livelihood in the watershed so, therefore, maximum benefit cost ratio to the tune of 1.94:1 have been proposed for this sector followed by agro-forestry (1.71:1) and horticulture (157:1) with overall benefit cost ratio of 1.74:1. Horticultural plantations of dry land fruit will be done on 50 Ha of land with a proposed BC ratio of 1.57:1. Agro- forestry which is not practiced in the watershed

area will be promoted on 115 Ha land with a proposed BC ratio of 1.71:1. Proposed BC ratio for agriculture, horticulture and agro-forestry have been calculated as following.

MIGRATION PATTERN

Labour migration in search of gainful employment is one of the major problems in the remote watershed in particular. People migrate during summer season to different parts of the state as daily wagers, agricultural labours and construction workers. The detail is given below.

DETAILS OF MIGRATION (I.W.M.P-I) BIJNOR

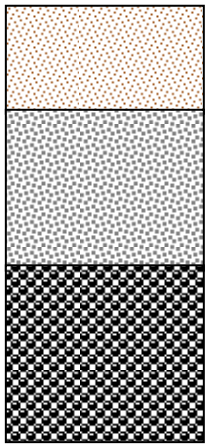
S.No.	No. of the villages	No. of persons migrating	No. of days per year of migration	Main reason for migration	Expected reduction in no. of persons migrating
1	158	362	209	Unemployment & Low Wages	148

SOIL AND LAND CAPABILITY CLASSIFICATION

Soil Morphology:_ The study area is situated in the northern part of District-Bijnor. The entire watershed is topographically divided into three major land forms. Accordingly, the soils of watershed have been grouped in the three major categories.

1- Plain land
2- Moderate sloppy land
3- Strong

Soil Profile: A Representative Soil Profile



1-1.5 (Heavy texture clay-soil yellowish Brown in color)

1-1.5 (Heavy texture clay-soil Blackish Brown in color)

5 -8m (Locally called "Clay")

7 –8 m(Sandy Clay)

MORPHOLOGY OF TYPICAL SOLID PROFILE OF WATERSHED

Horizon	Depth(Cm)	Morphology
A	0-150	Yellowish brown mottlings, clay content > 80%, soft and easily erodible when moist, hard when dry, high elasticity, Cracks occur when dried.
B	150-800	whitish brown in colour, very hard when dry, clay content > 60%
C	>800	Single grain,pale olive colour,few lime concretions of irregular shape and vigorous effervescence with dilute HCL.

SOIL CHARACTERISTICS AND FERTILITY STATUS

Four types of soils are in the watershed area. The fertility status is about normal range due to production of major pulses crops. There is scarcity of phosphorus due to continuous growing of pulses. The four soil samples of each village, three for nutrients analysis and one for sulphur and micro nutrients analysis have been send to laboratory. After receiving the analysis report effort will be made to motivate the farmers to use nutrients and micronutrients according to the any analysis report. This demonstration of crop in Kharif and Rabi both seasons have been proposed under agriculture production activity.

LAND CAPABILITY CLASSIFICATION (LCC)

Land capability classification is an interpretative grouping of lands made to show their relative suitabilities for various crops, pasture, forestry and wildlife and recreation. The inherent characteristics, limitations and risk of damage to the soils and also their response to management are taken into consideration for classifying them under various land capability classes.

Land capability class is the broadest category in the land capability classification system. Class codes I, II, III, IV, V, VI, VII, and VIII are used to represent arable and non-arable land as defined below.

Class I lands have slight limitations that restrict their use.

Class II lands have moderate limitations that reduce the choice of plants or require Land capability classification is an interpretative grouping of lands made to show their relative suitability’s for various crops, pasture, forestry and wildlife and recreation. The inherent characteristics, limitations and risk of damage to the soils and also their response to management are taken into consideration for classifying them under various land capability classes.

Land capability class is the broadest category in the land capability classification system. Class codes I, II, III, IV, V, VI, VII, and VIII are used to represent arable and non-arable land as defined below.

Class I lands have slight limitations that restrict their use.

Class II lands have moderate limitations that reduce the choice of plants or require moderate conservation practices

Class III lands have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Class IV lands have very severe limitations that restrict the choice of plants or require very careful management, or both.

Classes V to VII cover lands that are unsuitable for agriculture but suitable for pasture.

Class VIII lands are suitable neither for agriculture nor for forestry and are best left for wildlife and recreation.

Land capability classes are divided into land capability subclasses, groupings of soils that have the same kind of limitations for agricultural use. Subclass codes used are e, w, s and c.

‘e’ represents susceptibility to erosion by water or wind,

‘w’ represents drainage difficulties including wetness or overflow,

‘s’ represents soil limitations for plant growth and

‘c’ represents climatic limitations.

Land capability subclasses are subdivided into land capability units that are groupings of one or more individual soil map units having similar limitations or hazards. They are denoted by appending a numeral from 0 to 9 to the land capability subclass to specify the kind of limitation. The specific limitations are

– stony or rocky (0),

– erosion hazard/slope (1),

– coarse texture (2),

– fine texture (3),

– slowly permeable subsoil (4),

Land capability classification(LCC) is crucial for appropriate land use planting consisting of practiced like choice of vegetation /crops, tillage practices, use of scientific method of cultivation and desirous conservation practices, Detailed LCC Survey carried out in the watershed brought out the prevailing LCC classes as II, IV, V.

CONCLUSION

The land capability classification of the IWMP – IV, Bijnor watershed provides reasonable good information with regard to capability of soil that could be used for agriculture and agri-horticulture. Under class II, successful crop production can be carried out regularly if adequate plant cover will be maintained.The landform coming under class IV, which give an idea that agriculture production in such land is no more profitable because cultivation can cause soil erosion if not managed properly, therefore forestry should be promoted. Soils under class V can be used once in 5-6 years because continuous cultivation of crops can cause severe erosion, agro-forestry will be proper approach of land utilization for this class. Under class V, crop production with crop rotation, water control systems or special tillage practices to control soil erosion, should be practiced. Further the productivity of these lands could be enhanced by adaption of simple soil & water conservation measures like contour bunding, in-situ moisture conservation techniques. In class II, submergence bund, marginal and peripheral bund are planned and in class IV, gully plugging structures, earthen check dam, and water harvesting bunds are proposed with permanent Pucca Drop Spill structures and Pucca Check Dams.

SLOPE ANALYSIS

The Project area has an uneven terrain with higher elevations on the north- West side of the watershed. Since slope is the most important terrain characteristic and plays a vital role in geomorphological and runoff processes, soil erosion and land use planning, it is very important to have an understanding of the spatial distribution for the development and management of both land and water resources. The general slope of the watershed is towards south - East. In the present study Seven (7) Slope classes were identified through the analysis of Aster Digital Elevation Model. One such map of Slope of the watershed is shown in Annexure Map.

PRESENT LAND USE IN THE WATERSHED

Spatial information on land use/land cover is a necessary prerequisite in planning, utilizing and management of natural resources. In the current days context of development planning, information on land use/land cover and the changes over a period of time attain prominence because of its primary requirement in all the planning activities. The present watershed falls in the left bank of Khohriver the varied present land/use land cover and area under different categories in watershed is shown in table below. One such map of land use/ land cover of the watershed is shown in Annexure Map.

THE LAND UNDER DIFFERENT CATEGORIES WITHIN WATERSHED

S. N.	Watershed Code	Name of villages falling in the watershed	Built-Up Land	Wasteland all types	Agriculture	Water Bodies	Fallow land	Plantation	Forest	Total
1	2B4E2b1c	Ajampur Parma, Allehdadpur, Amichandpur, Asdullapur Pirthi, Asratpur Raghao, Aurangjebpur Hardas, Aurangjebpur Mohan Ahatma, Bajeedpur Pancha1An, Bharamalpur Harnath, Bhogli Ahatmali, Bhogli Bila Ahatmali, Biharipur, Burawala Ahatmali, Burawala Bila Ahatmali, Chak Telawali, Chater Bhojpur, Haibatpur Puru, Haji Hasainpur, Hajipur Bhikkhan, Haqiqatpur Mathura, Haqiqatpur Panchnam, Haqiqatpur Raijada, Hasan Alipur Muthra, Hasanalipur Harey, Jahangirpur Bura, Jahangirpur Khas, Jalalpur Raghao, Kajipur Imma, Kajipur Machdu, Kamalpur Bhoga, Kasba Bajiaft, Khijarpur ,Khairullapur, Khijarpur Jaggu Bila Ahat, Khushhal	224.19	-	2090.87	15.30	13.71	222.54	-	2566.61

		Nagar Urf Garhi, Khushhalpur Sadik, Kuna Khera, Maheshpur, Malakpur Lakhman Ahatmali, Malakpur Sahsu, Mathrapur Urf Kaluwala, Medawala Ahatmali, Medawala Bila Ahatmali, Mirapur Khadar, Moh.Ashikpur Kamalnain, Mohiuddinpur, Nagina (MB),Naimpur Govardhan, Noor Mohmmadpur Ahatmali, Noormoh.Pur Bila Ahatmali, Noorsarai Nizamsarai, Pirthipur Bila , Ahatmali, Rampur Chhajmal, Rasheedpur Satidas, Roshanpur Ijrola, Sah Begampur Ibrahim Urf, Sahab Begampur Fazil, Shah Alipur Heera, Shah Mujaffarpur , Bila Aha, Shahalipur Ramchandar, Shaheb Begampur Ibrahim, Shahpur Mujaffarpur Ahatm, Shahpur Sidharu, Vajidpur Bhikkan, Sufipur Angad,Sulema ,Shikohpur Khanda,Takipur Tulsi,Sharifull Malakpur,								
2	2B4E2c3a	Aba Bakarpur, Adampur Takhawali, Ajampur Thansingh, Alhaidadpur Khajwa, Anduwala, Benipur, Wazir Pur Bhagwana, Burawala Ahatmali, Burawala Bila , Ahatmali, Chak Alamshah Khan Ahatma, Chak Alamshah Khan Bila A, Chatar Ka Nagla,	57.03	226.70	2099.44	159.95	19.36	73.09	-	2635.57

		Fatahpur Ahatmali, Fatehpur Bila Ahatmali, Hamjapur Kathair, Hasan Alipur Dharma, Imampur Tigri, Jagannathpur Mehru, Jamalpur Khadar Ahatmali, Jamalpur Khadar Bila Ahat, Khanpur Manak Ahatmali, Khanpur Manak Bila Ahatma, Khijarpur Jaggu Ahatmali, Khijarpur Jaggu Bila Ahat, Kishanpur Kunda, Kopa Bila Ahatmali, Mahapur Moh.Ali, Medawala Ahatmali, Mirjalipur Chauhar, Naglan Nensi Bila Ahatmal, Nangal Nensi Ahatmali, Palpur, Shah Alipur Ahatmali, Shahalipur Bila Ahatmali, Shahalipur Chatru, Shaheb Begampur Ibrahim, Shahev Begampur Ibrahim 2 Shahjahanpur, Teli Rampur, Tibri, Tukhmapur Harbansh , Ahatma,Tukhmapur Harbash Bila Ah, Umarpur Dariapur, Vazidpur Lala, Bhagwanpur								
3	2B4E2c1b	Chaharwala,Inayatpur,Islampur Kutub, Jafarpur, Jagjiwanpur, Manauwarpur Said, Shahalipur Nichal Bila Ah, Tigri Anoopsingh	16.97	93.28	1002.32	1.36	14.05	27.49	200.52	1355.99
4	2B4E2a1c	Ahmadpur Gorua Bila Ahatm, Ahmadpur Gorva Ahatmali, Dhampur Nusanpur, Fatehpur Lal Ahatmali,	18.50	86.48	1228.78	51.59	32.57	271.28	-	1689.20

		Fatehpur Lal Bila Ahatmal,Firozpur Amrol Bila Ahatm, Gajrola Bila Ahatmali, Huma1Unpur Chandrapal Aha, Humayunpur Chandrapal Bil, Kati1A Ahatmali, Kati1A Bila Ahatmali, Kodupura, Machmar, Mohammad Pur Sultan, Mohmadpur Sada Ahatmali, Nangli Ladan, Rosanpur Raju, Salar Pur Ahatmali, Salarpur Bila Ahatmali, Sarai Bhikan, Savantpura, Shahalipur Gokal, Shekhpur Bhawra, Sherkot (MB), Tarkolimadan, Umarpur Bangar Bila Ahatm, Umarpur Bangar Ahatmali								
5	2B4E1a3a	Aurangpur, Bhoapatpur, Charandas Bairagi, Dhakariya, Dhoal Khand, Garhi Madhosingh, Sau Khandpur, Madhowala	-	31.99	-	37.69	-	-	537.22	606.90
6	2B4E1a3b	Alinagar, Aurangpur, Birbhanwala, Garhi Madhosingh, Garhi Mukand, Madhowala, Madhpuri, Narpatpur, Parbatpur, Prempuri, Saharawala, Sau Khandpur	22.52	14.01	683.51	93.97	-	3.74	389.09	1206.84
	Total		339.21	452.46	7104.92	359.86	79.69	598.14	1126.83	10061.11

PRESENT LANDUSE/LANDCOVER OF THE PROJECT AREA

S. No	Landuse	Area (ha)	%
1	Built-up land	339.21	3.37
2	Waste Land	452.46	4.73
3	Water Bodies	359.86	3.57
4	Plantation	598.14	5.84
5	Agricultural Land	7104.92	70.61
6	Fallow Land	79.69	0.79
7	Forest	1126.83	11.09
Total		**10061.11**	**100**

DESCRIPTION

The present LU/LC map has been depicted through the satellite data of January, 2010 (Google). A total no. of 7 major categories of LU/LC has been mapped.

BUILT-UP LAND

All the major settlement areas have been mapped under this category and the total area under category is 339.21 Hectare which is 3.28 % of the total mapped area. Under this category road network and other built-up area has also been included.

WASTE LAND

Land which is deteriorating for lack of appropriate water and soil on account of natural causes comes under this category. The total area under this category comes about 452.46 Hectare which is 4.73% of the total mapped area. The sub categories are like Salt affected land, Gullied/Ravinous Land, Scrub Land etc.

WATER BODIES

This category comprises area with surface water either impounder in the form of ponds, lake & reservoirs. The total area under this category comes about 359.86 Hectare which is 3.57 % of the total mapped area.

PLANTATION

These areas are separable from crop land especially with the data acquired during rabi/zaid season. Plantations appear with different size and regular and sharp edges indication the presence of a fence around it. Depending on the location, they exhibit a disbursed or contiguous pattern. The total area under this category comes about 598.14 Hectare which is 5.84 % of the total mapped area.

AGRICULTRAL LAND

These are the lands primarily used for farming and for production of food; it includes land under the (irrigated and un-irrigated). Areas with standing crop as on the date of satellite overpass. Cropped areas are in varying shape and size in a contiguous and non contiguous pattern. They are widely distributed in different terrains; prominently appear in the irrigated areas irrespective of the source of irrigation. The study area is predominantly paddy producing area being its flatness in 2007-08 maximum production of paddy recorded in this region under the double crop area. It is important to know that the project area has maximum **two crop areas** i.e. **Kharif and Rabi**. The total area under this category comes about 7104.92 Hectare which is 70.61% of the total mapped area.

FALLOW LAND

The current Fallow land has been mapped in the study area as viewed in the satellite scene. Actually the above category is a part of agriculture land which has left for sowing due to some reason by the faemers. The total area under this category comes about 79.69 Hectare which is 0.79% of the total mapped area.

FOREST

There are areas predominantly of trees and other vegetation types in the project area (within the notified forest boundary,).This deciduous type of forest, composed of species, which shed their leaves once a year, especially during summer. The total area under this category comes about 1126.83Hectare which is 11.09% of the total mapped area.

AGRICULTURE

Various agriculture land uses in the watershed are extended to diversified land capabilities starting from marginal to good class IInd lands. The watershed distinctly has three types of land i.e. levelled, sloping and degraded and undulating. The

agriculture is practised on all these soil types though the productivity considerable varies. The water (both for irrigation and drinking) is most scarce natural resource in the watershed. The operation of tube wells for irrigation of agricultural crops frequently leads to the drinking water problem to the farmers for watershed.

The agricultural soils in the watershed have diversified texture i.e. clay, silty clay, sand mixed with gravel and loam which are located in patches throughout the watershed. Four types of sandy, loam, Clay, clay loam are the main soil of district-Bijnor. The heavy soils are almost kept fallow during rainy season. The irrigation water is conveyed in earthen channels and surface irrigation methods following mainly border method of free flooding method of irrigation by farmers in the watershed. The factors substantially reduce the water use efficiency of limited available and valuable irrigation water in the watershed. To test the quality of irrigation water samples of water of each selected village has sent to laboratory for testing.

Crop Rotation

Single Cropping: Sugarcane, Paddy

CROP PRODUCTIVITY

Food crop production is a major land based activity in the watershed. Traditional cultivation practices, coupled with poor quality seeds and long duration crops varieties result in low crop yields. Crops are taken under rainfed as well as irrigated conditions. The yield levels of rainfed crops are particularly very poor. Large variation has been noticed in productivity of wheat (14-20Qu./ha) and Paddy (8-8.5 Qu/ha.) under rainfed and irrigation, condition respectively. At present level of rainfed farming. The total produce from Rabi and Kharif crops obtained by a medium size of holding owning family can meet food requirements for upto 6 to 7 months only.The farmers also do not have suitable cropping systems to deal aberrant weather. Weeds impose considerable constrant in producing of both Kharif and rabi crops under irrigation as well as rain-fed production system. Use of weedicide is rare in the watershed.

The mixed cropping is in practice in limited area with Kharif crops like Sugarcane, Maize+Arhar but it is not only irrational but also unscientific and beset with low productivity. Subsequent rabi crops in general are raised on residual soil

moisture under rain-fed production system during past monsoon season. Imbalanced use of fertilizers is common in not only Rabi and Kharif crops but also in rain fed and irrigated production system. The recommended deep ploughing for enhanced in situ residual soil moisture conservation and higher production is also not followed in the watershed. The shallow ploughing tractors drawn tillage implements are available with the farmers in the watershed but deep ploughing implements yet need to be introduced.

The soil fertility/health restoration practices like green manuring, crop rotations and intercropping specially with legumes, use of FYM/compost, vermi-compost , bio-fertilizers , soil and water conservation measures, use of brought up or in situ mulches are widely lacking in the watershed. The soil and water conservation measures are limited to mechanical/earthen measures created by the state Govt. agencies. Conservation agronomical measures like seeding and ploughing across the slope, weed mulching, agro-forestry, vegetative barriers etc. also completely lack in the watershed.

MAJOR CROPS GROWN AND THEIR PRODUCTIVITY IN THE PROJECT AREA

S. No.	Names of the crop		Current status		Expected Post-Project Status	
			Area (Ha)	Productivity (Kg/ha)	Area(Ha)	Productivity(Kg/ha)
1	Kharif (Jowar, Bajra)		3617	800	3275	859
2	Rabi	Wheat	366	1415	622	2050
		Pulses & Oil	1805	800	3150	1135
3	Zaid/Other season		167	-	184	-

INDIGENOUS TECHNOLOGICAL KNOWLEDGE: (I.T.K.)

Agriculture is an old age occupation which farmers have practiced and improved in their own manner to earn livelihood under the condition of area. The villagers have their traditional village ponds, practice of field bunding, production of Arhar crop on the bunds in paddy area which typically constitute agriculture related ITKs in the watershed. The indigenous farming technology in the watershed is observed to cover a vast spectrum of activities involving tillage, implement crop selection, storage of produce and value condition. Seed drill, seed comfort drills are used with tractor and Nai/chonga with indigenous plough. These ITKs are eco-friendly, cost effective and involve use of local materials with farmers own wisdom. These techniques equip farmers with skills and strength to adapt to the prevailing adverse conditions.

HORTICULTURE

Though no organized orchards are present in the watershed, homestead horticulture plantations of mango, guava and jack fruit, tomato, potato and lemon has been practiced by farmers. The sub-tropical fruits and vegetable have very good potential in the watershed. Organized orchard, commercial vegetable cultivation, horti-agriculture and other system of agro-forestry etc. are lacking but have good potential in the watershed.

AGRO-FORESTRY

Sawgaon trees are 90% planted by farmers. The argo-forestry interventions comprising of guava, bail, sagwan popular etc. may be applied for benefit of the farmers under rain-fed production systems on level to sloppy and marginal agriculture using proper planting techniques and termite control measures. The multipurpose trees may also help in supplementing fire wood and fodder demands of the rural communities in the watershed and may be planted as hedge rows on rain-fed, marginal and degraded lands.

HUMAN POPULATION

The detail of population of each watershed is given below:

HUMAN POPULATION

Name of Tehsil		Total No. of Household	Total Population	Total Population Males	Total Population Females	Total Population SC	Total Population SC (Males)	Total Population SC (Females)
Nagina	Total	96121	625366	328558	296808	134807	71690	63117
Nagina	Rural	79110	508175	267091	241084	126600	67421	59179
Nagina	Urban	17011	117191	61467	55724	8207	4269	3938
Dhampur	Total	117583	761462	400584	360878	155415	82075	73340
Dhampur	Rural	87718	547212	288001	259211	144515	76344	68171
Dhampur	Urban	29865	214250	112583	101667	10900	5731	5169

LIVESTOCK POPULATION

Cow is preferred as milch animal but milk yield is very low. Goats are the other source of milk production but kept mainly for the meat purposes. Homestead poultry rearing is common among marginal farmers. The details of village-wise live stock population is given in table below.

LIVELIHOOD

Income generating activities through Self Help Group, landless and marginal farmers like farming, poultry farming, bee keeping, livestock development activities, rope & basket making etc. will be executed in the villages of watershed through the involvement of Krishi Vigyan Kendra, Bijnor. Training of farmers, women, landless rural youth and field level workers for

Food processing & preservation, Pappad & pickle making, Livestock production etc will be given at Krishi Vigyan Kendra, Bijnor.

SUMMARY OF LIVLIHOOD

No. of Villages	Existing livelihood activities	Possible livelihood intervation under the project	Current status of migration (No. of people)	Main reason of migration
158	Agriculture Works, Animal Husbandary, Labour	Agriculture, Labour, Horticulture, Animal Husbandry	362	Poverty, Unemployment

LAND HOLDINGS

Majority of the watershed farmers are in category of marginal (< 1 ha) and small (1-2 ha). These small land holding are further scattered in different places which makes cultivation very difficult. Size of land holding of the farm families is being given below

INFRASTRUCTURE SOCIAL FEATURES

The watershed has moderate communication facilities and all 158 villages and Concern majra are approachable through motorable road. Mostly villages are electrified and have TV & telephonic connection. Nearest small market is about 8-15 km and nearest big market is about 12-15 km from the watershed. Religious and ritual features are almost common as in other part of the U.P. Small land holding (average less than0.46 ha) with large family size (average 7 person) and more than 25 % of the labour force of the total population living below poverty line indicate poor socio economic status of the watershed community. However, strong community spirit among the villager's show positive indication for the success of any programmed to be implemented in participatory mode. Traditionally the entire village community participates in the individual works, map of the watershed villages drawn by villagers themselves, depicting various village features.

IMPORTANCE OF DEVELOPMENT INSTITUTION

Farmer's perception was recorded for importance and role of different development institutions is relation to infrastructure development in the villages. Importance has been depicted with the size of the circle and role with distance from the village circle.

DEPENDENCY ON FOREST FOR FUEL WOOD AND FODDER

a) Fuel wood

Some villagers of the selected village are using LPG to meet their cooking energy requirements. The main source of fuel is form cow dung cake, woody stem of Arhar crop and Mustard. About 65 to 70 percent of the domestic energy requirement is met from the Agro By-Product and cow dung cake. Rest is met out from the forest outside the village and watershed boundary.

b) Fodder:

Fodders shortage lack of input and market facility are some of measure constant being experience by the farmers. For this area Guava, Ber, Mango fruit plants are suitable. This also leads to low productivity. There is a lot of ignorance about the use of new farming methods and technologies such as multiple cropping. They don't use FYM and other input in a proper way; that is why they don't get 100% output. So these factors contribute to low productivity.

LACK OF ADEQUATE FARM MACHINERY

Even today a large number of farmers in water shade area use wooden ploughs and bullocks. They don't have adequate machinery like seed drill. So, old machineries take more time in tillage practices.

LACK OF GOOD QUALITY SEEDS AND FERTILIZERS

Good quality seed, fertilizer and pesticide are important factor in agriculture productivity. The use of good quality leads to higher land productivity. In watershed, however, there are two limitations in the use of fertilizer. First these fertilizers are most useful in irrigated condition. But in watershed 100 per cent of land depend on rainfall. Moustly farmers use nitrogenous fertilizers especially urea. This has resulted in disproportionate use of fertilizer depleting the quality of land.

LACK OF OTHER FACILITIES SUCH AS STORAGE AND MARKETING

5-10% of agriculture product damage after harvesting due to scarcity of proper storage and proper market for sale. So they sell to local traders at the low prices. Farmers mainly face proper means of transportation and roads. And second problem is farmers don't have proper storage facilities.

HYDROLOGY AND WATER RESOURCES

Water resources are divisible into two distinct categories: the surface-water resources & the ground-water resources. Each of these categories is a part of the earth's water circulatory system, called the hydrologic cycle, & is ultimately derived from precipitation, which is rainfall plus snow. They are interdependent & frequently the loss of one is the gain of the other. The brief description of the run-off cycle, which is a part of the hydrologic cycle, will help us to understand the origin & the interdependence of these two categories of water resources.

The precipitation that falls upon land & is the ultimate source for both the categories of water resources is dispersed in several ways. A sizeable portion is intercepted by the vegetal cover or temporarily detained in surface depressions.Most of it is later lost through evaporation. When the available interception or the depression storage are completely exhausted & when the rainfall intensity at the soil surface exceeds the infiltration capacity of the soils, the overland flow begins.Once the overland flow reaches a stream channel, it is called surface run-off, which together with other components of flow, forms the total run-off.

Part of the water that infiltrates into the surface soil may continue to move laterally at shallow depth as interflow owing to the presence of relatively impervious lenses just below the soil surface & may eventually reach the stream channel when it is

called the sub-surface runoff. A part of the sub-surface run-off may enter the stream promptly, whereas the remaining part may take a long time before joining the stream flow.

A second part of the precipitation which infiltrates is lost through evapo-transpiration via plant roots & thermal gradients just below the soil surface. A third part may remain above the water table in the zone of unsaturated flow.A fourth remaining part percolates deeply into the ground-water.Part of this ground-water may eventually reach the stream channel & become the base flow of the stream. This portion is termed ground-water run-off or ground-water flow.

Apart from infiltrated rain-water, the seepage from canals, ponds, tanks, lakes, irrigated fields, etc.is also dispersed & accounted for in the same manner.

The total run-off in the stream channel includes the snow-melt, the surface run-off the sub-surface run-off, the ground-water run-off & the channel precipitation, i.e. the precipitation falling directly on the water surface of streams, lakes, etc. It constitutes what is known as the surface-water resources. The portion of the precipitation which, after infiltration,reaches the ground-water-table, together with the contribution made to ground water from a neighbouring basin, influent rivers,natural lakes,ponds,artificial storage reservoirs,canals,irrigation,& constitutes the ground-water resources.That quantity of water in the ground-water reservoir, which is not annually replenishable, is not taken into account, as it is a sort of dead storage which cannot be used on a continuing basis from year to year.

The above phase of the run-off cycle pinpoints the inflow components for the surface-as well as for the ground-water resources. It has to be appreciated that there is always a balance between the inflow factors making up water resources of a region, whether surface or ground, & the outflow components. The surface water resource of a given basin in excess of the

withdrawal use is accounted for on the outflow side by one or more of the following factors:

*(i)*Stream outflow from the basin;

*(ii)*loss through evaporation;and

*(iii)*the influent recharge to the ground water.

Similarly, the unutilised ground-water resource of a basin is accounted for by the following outflow factors:

*(i)*Evapo-transpiration from the ground-water-table;

*(ii)*outflow to the neighbouring ground-water basin;

*(iii)*the effluent discharge to the streams;and

*(iv)*the addition to the ground-water storage.

The interrelationship between the surface-water & the ground-water resources is evident from the above analysis.The surface-water resources contribute to the ground-water recharge in various ways:

(i)by influent recharge from the streams;

(ii)by seepage from natural lakes,ponds,etc;

(iii)seepage from artificial storage reservoirs,canal systems,etc, &

(iv)return flow from irrigation. These factors presently contribute to about 25 percent of the country's total ground-water resources.

On the other hand, the bulk of the base-flow in the rivers, which represents the sustained fair-weather run-off is contributed by the ground-water resources. This contribution,presently, is roughly assessed at about 25 percent of the total surface-water resources of the country.

Factors Affecting Water Resources

The water resources of a region, conceived as a dynamic phase of the hydrologic cycle, are influenced by the following three major groups of factors:

1. **Climatic Factors**

A. Rainfall: its intensity, duration & distribution.

B. Snow

C. Evapo-transpiration

2. **Physiographic Factors**

A. Basic characteristics.

1. Geometric factors: drainage area, shape, slope & stream density.
2. Physical factors: land use, surface infiltration conditions,soil types,etc.

B. Channel characteristics: carrying capacity & storage capacity.

3. **Geological Factors**

A. Lithologic including composition, texture, sequenceof rock types & the thickness of rock formations.

B. Structural, including chief faults & folds that interrupt the uniformity of occurence of rock types or sequence of rock types also beds, joints, fissures, cracks,etc.

C. Hydrologic characteristics of the aquifers permeability, porosity, transmissivity, storability,etc

The physiographic features (including geological factors) not only influence the occurence & distribution of water resources within a region but these, particularly the orography, play a significant role in influencing rainfall & other climatic factors, such as temperature, humidity & wind. However, within a geographical location & physiographic framework, it is primarily the rainfall (its intensity, duration & distribution) & the climatic factors affecting evapo-transpiration that determine the totality of water resources in the region.

SOIL AND MOISTURE CONVERSATION AND EFFICIENT USE OF WATER

Water is essential for all life and is used in many different ways - for food production, drinking and domestic uses and industrial use. It is also part of the larger ecosystem on which bio diversity depends. Precipitation, converted to soil and groundwater and thus accessible to vegetation and people, is the dominant pre-condition for biomass production and social development in drylands. The amount of available water is equivalent to the water moving through the landscape. It also fluctuates between the wet and dry periods. Fresh water scarcity is not limited to the arid climatic regions only. Even in areas with good supply, the access to safe water is becoming a critical problem. Lack of water is caused by low water storage capacity, low infiltration capacity, large inter-annual and annual fluctuations of precipitation and high evaporative demand.

A variety of essential soil moisture and water conservation technologies must be adopted to reduce the cost of irrigation, extend it throughout and promote sustainable small-scale irrigation on a watershed basis. These technologies are essential especially in drought-prone areas. Even though drought is a purely natural calamity caused by the failure of (monsoon) rain, it can be minimized by careful planning and operation. During good rainy years, excess rainwater should be stored in the soil and

also underground using suitable soil moisture conservation measures and water harvesting structures on a watershed basis. This stored water can subsequently be used for irrigation.

Conceptual approach

Watershed development and management implies an integration of technologies within the natural boundary of a drainage area for optimum development of land, water and plant resources, to meet the people's basic needs in a sustained manner. A watershed is an area from which runoff resulting from precipitation flows past a single point into a large stream, river, lake or pond. Each watershed is an independent hydrological unit. It has become an acceptable unit of planning for optimum use and conservation of soil and water resources.

The concept of integrated watershed development refers to the development and management of the resources in the watershed to achieve higher sustainable production without deterioration in the resource base and any ecological imbalances. This concept requires the formulation and implementation of a package of programmes with activities for optimum resource use in the watershed without adversely affecting the soil and water base or life supporting system. The concept assumes more importance in the context of planning for sustained development. Watershed development aims at preventing watershed degradation resulting from the interaction of physiographic features. It eliminates unscientific land use, inappropriate cropping patterns and soil erosion, thereby improving and sustaining productivity of resources leading to higher income and living standards for the inhabitants in the watershed area. It therefore involves restoration of the ecosystem, protecting and utilizing the locally available resources within a watershed to achieve sustainable development.

Rainfall failure occurs once every 3 to 5 years and is usually below 50% of the average annual rainfall of the region. During periods of rainfall failure, the groundwater level lowers since fluctuations in the water table levels depend on the rainfall when both surface and groundwater availability becomes critical. Drought begins to prevail and there is difficulty to cope up with the water demand during this period. Similarly, in some locations or areas water shortage is observed just before the rainy season commences. These two situations can be managed if suitable soil and moisture conservation measures are systematically implemented on a small watershed basis.

There are always strong links between soil conservation and water conservation measures. Many actions are directed primarily to one or the other, but most contain an element of both. Reduction of surface runoff can be achieved by constructing suitable structures or by changes in land management. Further, this reduction of surface runoff will increase infiltration and help in water conservation.

Appropriate structures and their functions

To increase the period of water availability and overcome water scarcity in drought years, the following activities can be implemented in the field for a compact, viable watershed of about 200 - 500 ha.

Soil and water conservation can be approached through agronomic and engineering procedures. Agronomic measures include contour farming, off season tillage, deep tillage, mulching and providing vegetative barriers on the contour. These measures mainly prevent soil erosion but will also help in improving soil moisture availability in the watershed.

Soil and water conservation measures on a watershed basis

The engineering measures adopted differ with location, slope of the land, soil type, amount and intensity of rainfall. Depending on these parameters, the methods commonly used are contour trenching, contour stone walls, construction of temporary and permanent check dams and gully plugging structures. Additionally, percolation ponds, silt detention tanks and irrigation tanks are constructed to harvest water and recharge it to the groundwater for use in agriculture (irrigation). Farm ponds can also be constructed for every 4-5 ha in the watershed to provide protective/supplemental irrigation.

The above soil and water conservation management and water harvesting programme should be implemented in an integrated manner on a catchment/watershed basis.

Functions of the structures

Contour bunds, contour barriers (vegetative and stone), contour trenches and contour stone walls will not only prevent soil erosion but also obstruct the flow of runoff water. Consequently, the obstructed water will increase the soil moisture and recharge the groundwater in the area.

Check dams: This may be a temporary structure constructed with locally available materials. The various types are: Brush wood dam, loose rock dam and woven wire dam. The main function of the check dam is to impede the soil and water removed from the watershed. This structure is cheap, but lasts about 2-5 years. The cost of the structure depends on the materials used, the size of the gully and the height of the obstruction (dam). A permanent check dam can be constructed using stones, bricks and cement. Small earth work is also needed on both sides. This water recharges the groundwater.

Percolation Pond: The percolation pond is a multipurpose conservation structure depending on its location and size. It stores water for livestock and recharges the groundwater. It is constructed by excavating a depression, forming a small reservoir or by constructing an embankment in a natural ravine or gully to form an impounded type of reservoir. The capacity of these ponds or tanks varies from 0.3 to 0.5 mcft (10 000 - 15 000 m^3). Normally 2 or 3 fillings are expected in a year (season) and hence the amount of water available in one year in such a tank is about 1 mcft to 1.5 mcft (30 000 - 45 000 m^3). This quantity of water, if it is used for irrigation, is sufficient to irrigate 4-6 hectares of irrigated dry crops (maize, cotton, pulse, etc.) and 2-3 hectares of paddy crop.

Irrigation Tank: The main function of this storage structure is irrigating crops. It is constructed below the above-mentioned structures in a watershed. Each tank can irrigates from 10 to 5 000 hectares. Earthen bunds are reinforced with masonry to collect and store rainwater for irrigation. The cost of this tank (dam) depends upon the size, location and site condition. Water from the tanks is normally used to grow paddy crop.

Apart from the above, to increase moisture availability to agricultural and tree crops, in situ moisture conservation techniques must be adopted in addition to the large scale soil and moisture conservation and water harvesting structures in the watershed.

The following are some of the *in situ* moisture conservation measures which can be practised in the watershed to increase production.

For agricultural crops, the measures adopted are forming ridges and furrows, broad bed and furrows, basins, tie ridging (random tie ridges) and water spreading.

For tree crops micro catchment, saucer basin, semi-circular bund, crescent shaped bunds, V ditch technology, catch pits and deep pitting can be practised.

In addition to the above measures and structures, small storage structures with a water storage capacity for an area of about 0.4 to 0.5 ha can be constructed in large numbers one for every 10 to 20 ha catchment or watershed at the foot hills slopes and hilly areas. These storage facilities would attenuate the floods during storms. These measures will also ensure soil moisture for good growth of trees grown down stream recharging the groundwater in the region and making available more water for drinking and irrigation water.

PROBLEMS AND NEEDS

The main problem in a watershed is the soil erosion by rainfall. The run off water transport the sediments which may block the channel head, dam, reservoir and storage structures are the major problems faced in the project area and attempts made so far to overcome them. The other main problems in the selected watershed are: lack of awareness amongst the villagers about the deteriorating environmental condition of the area, 75% of the run off water makes it away to way towards Khoh river carrying fertile soil which has nutrients and this decreases soil fertility, there is a decline in the productivity of cereals, pulses and vegetable crops, dependency of farmers on the rain water. Therfore it is an urgent need, that rainwater should be harvested for crops and re-charged to improve the quality of the water.

CHAPTER - 4

INSTITUTION BUILDING AND PROJECT MANAGEMENT

PARTICIPATORY RURAL APPRAISAL (PRA)

In order to realize these numerous benefits from multiple cycle archival data, judicious organization and management of the voluminous village level special database in the watershed that steadily grows with each year is very crucial. Recent state – of-the-art technology solutions and emerging trends contribute a great deal in designing and implementing highly functional geo-databases.

An attempt has been made to strengthen the planning of the study area. Remotely sensed data have been used for the mapping of various themes like landuse, drainage, base map etc. All the thematic layers have been converted into the GIS environment. All these layers could be overlaid on the base layer including village boundary. Various PRA techniques like resource mapping, social mapping and season calendar were used to understand the physical and social condition of the village in the project area.

PROJECT IMPLEMENTING AGENCY (PIA)

U.P. Government, Land Development And Water Resources Department Govt. of U.P. Lucknow has nominates as PIA to Soil Conservation Officer Land development and water resources Department DPAP Bijnor-IV at Kotwali, Bijnor vide letter no-667(11)/ 54-1-10-1(9)02008 Dated 28-05-2010.

DETAIL OF PIA STAFF

S.No.	Name	Designation	Qualification
1.	Shri R.K. Ram	B.S.A.	Agr. Engg Diploma
2.	Shri S.D. Goyal	Jr. Engg.	Civil Engg. Diploma
3.	Shri V.P. Singh	Jr. Engg.	Agr. Engg Diploma
4.	Shri P.K. Aggrawal	Accountant	M.com
5.	Shri K. K. Tiwari	Jr. Clerk	High School
6.	Shri Surendra Singh Punia	A.S.C.I.	Inter Mediate
7.	Shri Devendra Singh	A.S.C.I.	Agr. Diploma
8.	Shri R.K. Pathak	A.S.C.I.	Intermediate, Agr. Diploma
9.	Shri J.B. Jain	A.S.C.I.	M.A. Agr. Diploma
10.	Shri Aman Kumar	A.S.C.I.	M.Sc. Agriculture
11.	Shri Mohan Lal	Jile Dar	Intermediate, Canal Diploma
12.	Shri Gorelal	Irrigation Superviser	Intermediate
13.	Shri Chotelal	Patrol	B.Sc.
14.	Shri Avdhesh Kumar	Patrol	B.Com.
15.	Shri B.P. Sharma	Fourth Class	Class 8th (Junior Hingh School)
16.	Shri Brij Mohan Gupta	Forth Class	Class 8th (Junior Hingh School)
17.	Shri Ramji Lal	Forth Class	Class 8th (Junior Hingh School)

ROLES AND RESPONSIBILITIES OF THE PIA

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

The PIA, after careful scrutiny, shall submit the action plan for watershed development project for approval of the DWDU/DRDA and other arrangements. The PIA shall submit the periodical progress report to DWDU. The PIA shall also arrange physical, financial and social audit of the work undertaken. It will facilitate the mobilization of additional financial resource from other government programs, such as NREGA, BRGF, SGRY, National Horticulture Mission, Tribal Welfare Schemes, Artificial Ground Water Recharging, Greening India, etc.

WATERSHED DEVELOPMENT TEAM

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

As per new common guide line direction/Instruction given in Para 5.3 point 40 P.I.A. has been consituted watershed Development Team as given below:-

WATERSHED DEVELOPMENT TEAM

S. No.	Name of Member of WDT	Designation	Qualification
1.	Shri S.D. Goyal	Jr. Engg.	Civil Engg. Diploma
2.	Shri V.P. Singh	Jr. Engg.	Agr. Engg Diploma
3.	Shri Surendra Singh Punia	A.S.C.I.	Inter mediate
4.	Shri Devendra Singh	A.S.C.I.	Agr. Diploma
5.	Shri R.K. Pathak	A.S.C.I.	Intermediate, Agr. Diploma
6.	Shri J.B. Jain	A.S.C.I.	M.A. Agr. Diploma
7.	Shri Aman Kumar	A.S.C.I.	M.Sc. Agriculture

ROLES AND RESPONSIBILITIES OF WDT

The WDT will guide the watershed committee (WC) in the formulation of the watershed action plan. An indicative list of the roles and responsibilities of the WDT would include among other s, the following.

a. Assist Gram Panchayat /Gram Sabha in constitution of the watershed committee and their functioning.
b. Organizing and nurturing User Groups and Self-Help Groups.
c. Mobilizing women to ensure that the perspectives and interests of women are adequately related in the watershed action plan.
d. Conducting the participatory base –line surveys, training and capacity building.
e. Preparing detailed resource development plans including water and soil conservation or redamation etc. to promote sustainable livelihood at household level.
f. Common property resource management and equitable sharing.
g. Preparing Detailed Project Report (DPR) for the consideration of Gram Sabha.
h. Undertake engineering surveys, prepare engineering drawing and cost estimates for any structure to be built.
i. Monitoring, checking, accessing, and undertaking physical verification and measurement of work done.
j. Facilitating the development of livelihood opportunities for the landless.
k. Maintaining project accounts.

l. Arranging physical, financial and social audit of the work undertaken.

m. Setting up suitable arrangements for post-project operation, maintenance and future development of the assets created during the project period.

WATERSHED COMMITTEE (WC)-IV BIJNOR

Watershed committee has been constituted in all 6 nos. of micro watershed separately by W.D.T. & Gram Sabha village of micro watershed. Detail of W.C. is given below:-

S. No.	Name of Watershed Committee	Name of Chairperson	Name of Seceratary	No. of Member
1.	Fatehpur Lal	Sri Komal Singh S/o Balbeer Singh	Sri Gopi Singh S/o Lallu Singh	14
2.	Nak Chak Uday Chandra	Sri Lal Singh S/o Yani Singh	Sri Lakhan Singh S/o Mangu Singh	16
3.	Jaffarpur	Sri Vikram Singh S/o Pratap Singh	Sri Rajpal Singh S/o Chhote Singh	13
4.	Benipur	Sri Shoorvir Singh S/o Harpal Singh	Sri Chandra Pal S/o Budh Singh	14
5.	Kamalpur Bhoga	Sri Karam Singh S/o Chetram Singh	Sri Braham Pal Singh S/o Imrat Singh	14
6	Madhupuri	Sri Kashmir Singh S/o Puran Singh	Sri Harjinder Singh S/o Budh Singh	13

SELF HELP GROUPS

Self Help Groups are motivated, small homogenous groups organized together through credit and thrift activities. Self help group initiative especially for women help uplift their livelihood. Generally self help groups include landless and poor women. Before formation of the SHGs, during PRA activities, Focussed Group Discussions (FGDs) were held with the women, which came up with the following observations:

a) Lack of proper credit facilities due to low intervention of formal financial credit institution.

b) Excessive exploitation of weaker section by money lenders.

c) Lack of attitude for saving among poor people.

d) Lack of knowledge on credit and thrift activity and banking.

The constitution of self help groups have been constituted by W.C. in all micro watershed for generating Income & Improved their social status with the help & financial support through scheme by Technical support of P.I.A. Detail of SHGs is given below.

USER'S GROUP

The following user's groups are Identified & constituted in all micro watershed by watershed committee in presence of watershed Development team for Implementation of watershed work Proper use & management of all Engineering & Vegetative measure to be creating/constructing under watershed through scheme.

INSTITUTIONAL ARRANGEMENT AT PROJECT LEVEL

The SLNA would evolve appropriate mechanisms for selecting and approving the PIAs, who would be responsible for implementation of watershed projects in different districts. These PIAs may include relevant line departments, Autonomous organizations under State/Central Governments, Government Institutes/Research bodies, Intermediate Panchayats, Voluntary Organizations (VOS).

However, the following criteria may be observed in the selection of these PIAs:

1- They should preferably have prior experience in watershed related aspects or management of watershed development projects.
2- They should be prepared to constitute dedicated Watershed Development Teams.

Selected PIAs will sign a contract/MOU with the concerned DWSUs/District Level Committee as referred in para29 that will spell out well –defined annual outcomes, against which the performance of each PIA will be monitored each year and evaluated on a regular basis by institutional evaluators from a panel approved by the SLNA/Departmental Nodal Agency at the central level.

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

CHAPTER - 5

MANAGEMENT / ACTION PLAN

PROBLEM AND NEED OF THE AREA

Integrated Watershed Development Programme is aimed at the socio-economic upliftment of the dwellers of watershed area and to create trust about the programme to be implemented so that they can coordinate in participatory mode for success of the programme. As per the New Common Guidelines total financial outlay for entry point activities is 4% of the total project cost. To increase the per capita availability of drinking water, older wells of the village will be renovated as well as the chabootra will be constructed, to increase the irrigation water availability, older Bund which already exists but not functioning will be reconstructed/renovated. Repairing and maintenance of water bodies have been proposed on priority basis. Schools lies in the watershed area will be equipped with drinking water facility and extracurricular activities will be promoted among the children's of the water by supplying sport goods to the schools. For environmental purpose in the villages, tree planting will be done. Construction of bathrooms, renovation of ponds as well as hand pump will be completed. Total estimated cost for these activities is Rs. 27.08 Lakh.

ENTRY POINT ACTIVITY (EPA)

EPA activities are taken up under watershed projects to build a rapport with the village community at the beginning of the project; generally, certain important works which are in urgent demand of the local community are taken up. A group Discussion was conducted with watershed Development Committee regarding the EPA activity, it was conveyed to the WC that an amount of Rs. 27.08 Lacs was allotted for EPA activity, which was 4 per cent of total allocated budget. The villagers discussed various activities which they felt is important but after a brief discussion it was conveyed to them that only those activities can be taken, which revive the common natural resources. It was also taken into priority that there should be an instrument of convergence which will result in sustainability of activities

Integrated Watershed Development Programme is aimed at the socio-comic upliftment of the dwellers of watershed area and to create trust about the programme to be implemented so that they can coordinate in participatory mode for success of the programme. As per the New Common Guidelines total financial outlay for entry point activities is 4% of the total project cost. To increase the per capita availability of drinking water older wells of the village will be renovated as well as the *pucca jagat* will be constructed, to increase the irrigation water availability older Bund his which already exist but not functioning will be reconstructed/renovated. Repairing and maintenance of water bodies have been proposed on priority basis. Schools lies in the watershed area will be equipped with drinking water facility and extracurricular activities will be promoted among the children's of the water by supplying sport goods to the schools. To approach watershed villages construction and repairing of damaged *pulia* has also been proposed and construction of women bathrooms renovation of ponds. Beside hand pump are well. Total estimated cost for these activities is Rs. 27.08 Lacs.

Entry point activities (EPA) (All financial figures in lakh Rs.)

S.No.	Name of Micro-watershed	Amount earmarked for EPA in Lacs	Entry Point Activities Planned
1.	2B4E2b1c	27.09	(A) Kharanja (B) Krishak Vikas Munch (C) Approach Road (Brick Soling). (D) Primary& Junior School Boundary Wall & Earth Work (E) Earth Work in Sub-roads
2.	2B4E2c3a		
3	2B4E2c1b		
4	2B4E2a1c		
5	2B4E1a3a		
6	2B4E1a3b		

WATER HARVESTING STRUCTURES•WATER, ENERGY AND RESOURCE CONSERVATION

For soil and moisture conservation, water resource developments, horticulture, besides agro-forestry vegetation/plantation work, engineering structure have also been proposed under the project. Engineering structures are important components of soil and water conservation that can play a vital role in erosion control on arable land. Engineering measures usually involve creating mechanical barriers across the direction of flow of water and thus retard or retain runoff on the following principles:

- Increase the time of concentration.
- Break a long slope into several short ones.
- Protection of drainage channels against damage.
- Prevent excessive soil and water losses.

CONTOUR, MARGINAL AND PERIPHERAL BUND

Contour bunding is effective for erosion control and moisture conservation measures in dry areas having less than 2% slope to reduce the length of slope. Contour bund will be constructed against the slope in the treatment area. Marginal bund is the engineering structure to reduce the volume and speed of runoff. Those locations where their is a change in slope and soil texture. Peripheral bund will constructed along with the nala bank.

WATER HARVESTING STRUCTURE/CHECK DAM

These structure of built of masonry. Check dams have been proposed constructed in big gullies/ravines carrying relatively high run of and sediment load. Water stored in check dams will be utilized as source of irrigation water during post Monsoon season.

AGRO FORESTRY

Land will be taken from the waste land falling in the class-VII category in the watershed. The Eucalyptus and Sagon plants planted by the farmers.

DRY LAND HORTICULTURE

Lawn will be taken for the plantation of fruit trees like Guava, Mango will be planted at suitable spacing in the watershed.

AREA TREATMENT PLAN

Integrated watershed development program envisage treatment of proposed area with soil & water conservation works along with development of Horticulture, Afforestation & development of silvi pastoral system in denuded land unfit for cultivation, following works are proposed under watershed Development works.

1. Constructions of bunds (Field bund, contour bund, submergence bund, Marginal & peripheral).
2. Renovation of Existing Bund for in-situ moisture conservation.
3. Rain fed Horticulture with and without fencing.
4. Construction of recharge Filter.
5. Construction of new & renovation of Existing structures/ gully plugs/Check dams.
6. Afforestation and development of silvi– pastoral system.
7. Drainage line treatment (pucca structures, gully plug, check dams).

PASTURE MANAGEMENT

Introduction: The sound animal industry in any country centers around good quality feed and fodders. The livestock population in India is nearly 15%of the total livestock population of the world, tough we have only 2% of the world's geographical area. The project on for green and dry fodder requirement in India has been estimated at 1061 and 590 million by 2010 A-D, while the present feed and fodder resources in the country can meet only 4% of the requirement. The grazing intensity is very high i.e., 26 adult cattle unit (ACU)/ha as against 0.8 ACU in the developing countries.

The importance of grasses for protection and production, the two aspects of soil and water conservation is well known. Grass is unique in that it is the only resource utilized in situ by grazing. A "grassland" or more appropriately, a "range" is defined as "the areas which are predominantly covered with grasses or grass like plants and are primarily utilized as for age for grazing animals or used as hay." The grasslands are the major sources of food to the animals.

Pasture Management: All grazing areas are referred to as pastures, but ore specifically the term is applied to cultivated grassland used for grazing. Thus pastures are artificial grasslands with or without non-grass vegetation (such as legumes) that are created with selected high forage-yielding grass and legume species and with inputs like fertilizers and irrigation and carefully managed to exclude all other vegetation. Pastures are usually fenced and used either for grazing, for gay and silage making or for both.

Intensive Fodder Production: In areas where the major enterprise of the farmers centers around the milk production. Continuous supply of green fodder round the year is the basis for success of such as industry. Under the aegis of ICAR's all India coordinated Research Project on Forage Crops, several highly productive fodder cropping system have been tested and recommendations made for their general use. For central region important intensive crop rotations are presented as given below

Zone wise crop rotations	Green fodder yield(t / ha)
Central region	
1- Hybrid napier +Cowpea-Berseem+Japanrape	286.3
2- Maize+Cowper-Jowar-Berseem+Japanrape	197.2
3- Jawar+Cowper-Berseem+Japanrape-Jawer+Cowpea	168.6

Conservation on of Forages: In order to sustain animal production, it is essential that the optimum feeding should be maintained round the year. In India, we have two seasons, rainy season and winter season, when surplus quantities of green fodder is available-country to this there are 2 to 3 months of lean periods(October-November and April to July) when the fodder availability to animals is at its low. In the summer months, it is difficult even to meet the maintenance requirements of the animals. Stage of maturity to feed the animals adequately during the lean period. The conservation of forages could be done in the form of silage from cultivated fodders (legumes and cereals) and also pasture grasses. Forages could also be conserved in the form of hay when dried to its nutrients. This feed stuff is quantitatively important from both maintenance and nutritional point of view.

Agro-forestry system for fodder production: A number of fodder trees play an important role in human food security through their function as animal food sources, especially as drought services. Agro-forestry systems consisting of such tress and animals and/or pasture are called Silvo-Pastoral system.

Silvi-Pasture (or Silvo-Pastoral system) is the most promising alternate land use system which integrates multipurpose trees, shrubs, legumes and grasses mostly on non-arable, degraded and marginal lands for optimizing land productivity. It helps in conservation of vegetation, soil and nutrients and provides forage, timber and fuel wood on a sustainable basis.

Potentials of Semi-arid region for different forage production systems.

Region	**Forge Production Systems**
Semi arid	Integration of Agro-Silvi-Pasture, dry land agriculture on cultivated lands. Forage-cum-Copping forming on the marginal and sub marginal lands with intercropping dry lands cereals and legumes

ROLE OF GRASSLAND IN SOIL CONSERVATION

The grass plant itself protects the soil from the forces of water erosion including the impact of rain drops and surface flow. Grass acts a spring cushion intercepting and broking up the falling rain drops in their way down. Conducting the water down the blades and stems of the plants and finally allowing it to reach the ground as fine sprays without disturbing the surface. Clamps of grass plants, in a mechanical way, obstruct-flowing water and reduce its rate of flow.

In fact to control soil erosion whatever technique is adopted, there are four approaches to deal with the problem:

1- To condition the soil to make it resistant to determent and transportation and create more absorptive surface layer.
2- To cover the soil so that it is protected from the impact of wind and rain drops.
3- To decrease the velocity of wind or runoff water.
4- To provide safe disposal outlet for surplus run off.

Grass in the nature highly efficient device to protect the soil from destructive forces like rain, wind etc. Grass and legumes increase the aggregation of soil particles; improve soil structure and water holding capacity of the soil. Grasses gives quicker protection to eroded lands. To establish gully sides, water ways, gully head and check dams. Grass is perhaps the most effective and economical tool. It can put to various uses in soil conservation:

1- Strip cropping, rotational cropping or lay farming.
2- Stabilization of bunds and terraces.
3- Stabilization of gullies, diversion or drainage channels.
4- Stabilization of sand dunes.
5- Meadows and pasture on steep slopes.
6- Fertility builder for eroded soil.

HORTICULTURE DEVELOPMENT FOR WATERSHED MANAGEMENT

Horticulture is an important component of land use management. Now India is the second largest producer of fruits in the world after Brazil.

However, 53% of the total geographical area of the country is degraded due to various reasons. Fruit trees and fruit based systems are the viable alternatives for economic utilization of such lands. The basic philosophy behind the conservation horticulture is the use of available resources and skillful choice of fruits. The use of available soil moisture , collection of the runoff water from the catchment area to make up the deficit requirements as well as in situ water harvesting techniques are some of the measures . The in situ water harvesting techniques should be used for growing trees in such a way that each tree has its own micro catchment area. The success of the conservation of horticulture entirely depends on the selection of economically viable hardy varieties of fruit crops resistant to moisture stress or drought and other adverse climate conditions. The fruit crops selected for degraded lands must be such that their maximum growth take place during the period of maximum water availability in the soil and should have low demand.

The main constraints which restrict development of the horticulture land use in degraded lands are enumerated below:

(A) Basic constraints

1- Lack of suitable agro-techniques for degraded lands

2- Lack of trained resource persons

3- Inadequate dissemination of the technologies

4- Lack of community approach

5- High biotic interference

6- Lack of infrastructure including marketing.

(B) Soil constraints

1- Poor nutrient status of the soil

2- Physical impediment

3- Moisture stress / water logging / inadequate drainage.

(C) Plant related constraints

1- Problem of plant establishment

2- Physiological disorders

3- Fruit drop and poor productivity

4- Incidence of insects-pests.

However , apart from the above mentioned constraints, the measure bottleneck in horticulture development are poor technological advancements, high initial establishment cost, high input demand , timely operation and seasonal shortage of labours, etc.

CONCEPTS AND ADVANTAGES OF CONSERVATION HORTICULTURE

Conservation horticulture or horticulture land use based on soil and water conservation principle is a suitable alternative for utilization and management of land under rainfed conditions. Thus horticulture development in watershed management appears to be the most appropriate technique for sustained productivity as well as for restoration of degraded lands. In fact, horticulture system meet all the basic needs-food, fruits, fodder, fuel and timber besides, providing employment and sustaining a number of products for industries.

The fruit trees grown with crops can provide fuel from pruned shoots and dried branches, leaf fodder for animals and leaf litter that can be utilized as mulch material and organic matter the leaf litter of deciduous fruit trees not only protects the top

soil from the impact of raindrops but also improve soil structure, reduces evapotranspiration, increases infiltration and add to the nutrient status of soil. Therefore conservation based horticulture land use system assumes great significance as fruit trees on degraded lands provide higher returns and offer alternative opportunity in non-arable areas where cropping may not be possible.

Horticulture Practices (For plantation)

Some of the important practices are given below:

1- Selection of Suitable Fruits Types:

For the success of conservation horticulture, selection of hardy varieties resistant to diseases and pests and use of local or other hardy root stocks for raising fruit-trees is of great importance. The major part of the reproductive cycle ie. Period from flowering to fruiting must also fall during maximum water availability period and the root ripening must be completed before the onset of dry summer (April-May).

Ber, Guava, Karonda, Bel, Amla, Lemon, and Phalsa etc. are the plants which fulfill this requirement and all these fruit plants are most suitable for this region.

2-Planting Techniques:

For degraded lands, pits should be dug of 1m x 1m x 1m size, the excavated soil is mixed with Farmyard Manure (FYM) @ 5-10kg/pit with doses of potash and phosphorous and some insecticide / pesticide (numicide / aldrex) for prevention of white ant. Planting of the fruits plants should be done with the onset of monsoon.

3-Use of Root Stokes:

Budding and grafting on the wild root stock gives benefit of the establishment root and in turn provides better quality fruits with high field potential. For example, Ziziphun mauritiana, a wild ber can be successful budded with scion of improved cultivars, this practice is only successful where sizable patch of wild root stock is available. The budded/grafted stock needs

intensive management as it is required to be protected from the wild animals, birds, insects, pests etc. The wild root stock develops efficient top root to provide moisture and nutrients to the scion. Amla. Bel is other examples of raising the improved cultivation the wild root stock.

4-In Site Water Harvesting:

Since on slopy lands, runoff water is considerably higher, therefore, it should be harvested and used. The run off can be utilized for growing fruit plants in such a way that each tree in the established plants is at the time of fruit setting and fruiting. Moisture available at this critical period improves the fruit yield.

Runoff water will be harvested and stored in tanks during the rains. The stored water will be utilized at the time when the fruit trees show moisture stress during dry months. Counter trenches will dug between the rows of fruit trees because this is effective in conserving moisture and providing soil erosion.

5-Mulching:

Mulching is practiced to conserve moisture. It prevents the loss of moisture by evaporation and improve water intake by the soils. Various organic (Straw, hay, manure, tree leaves, dry wads) Mulches are used for mulching. Use of plastic mulch has been taken in rainfed and dryfarrming conditions to increase the productivity by minimizing evapotranspiration losses.

6-Drip Irrigation:

Drip irrigation saves water by 40 to 70 percent and two to three times mare area can be irrigated with the same amount of available water. It has the advantages that it ensures uniform distribution of water, provides perfect control over water application and minimizing the losses during convergence and seepage.

COST IN PLANTING ONE PLANT WITH DIGGING, FILLING MIXED WITH FYM AND COST OF PLANT

S.No.	Particular	No.	L	B	D/H	Quantity	Rate	Amount
1	Earth work in digging	1	1.0	1.0	1.00	1.00	36.66	36.66
2	Cost of FYM, in Kg/pit	1	-	-	-	10Kg	8.00	80.00
3	Filling of pits mixed with FYM and soil	1	1.0	1.0	1.0	1.00	36.66	36.66
4	Cost of plants	1	-	-	-	1	18.00	18.oo
Total								**171.32**
Say								**Rs. 172.00**

ESTIMATE FOR SILVI-PASTORAL SYSTEM (RS. ha^{-1}) PLANTATIONS (800 PLANTS ha^{1})

Sl. No.	Particulars of work		Rate (Rs.)	Cost (Rs.)	Remarks
1-	Clear felling or bush clearance of area Infected with *Lantana* etc. including Cost of burning	LS	550.00	The area is to be protected through biofencing	
2-	Soil working –earth work, digging of Pits/holes 60 cm deep, 30cm dia -800 Nos. Including cost of refilling and trenching (400 trenches/ha)	LS	6085.00		
3-	Cost of seedlings for 900 nos. and grass /legumes seeds and planning/sowing	-	2050.00	Rs.2.00 per seeding	
4-	Weeding and hoeing (2 Nos.)	LS	300.00		
	Total		**8985**		
	Maintenance 2nd year 15% of the 1st year expenditure including being up of 1st year failure				
	Grand total **Say**		**10,335.00** **10,350.00**		

Estimate of Orchard Development in the Watersheds Per Hectare (With Fencing)

S.No.	Particulars	Quantity	Rate	Amount	Remarks
A. Horticulture					
1.	Soil working 1m x 1m x 1m size pits (270nos.) including cost of refilling	270.00 cum	36.66/cum	9898.20	Since, the project is to be operated in a participatory mode, contribution in the form of labour input for pit digging, FYM and its applications, weeding and hoeing are to be provided by the participating farmers, hence the costs are not included in the estimates.
2.	Application of Farmyard Manure, including cost		L.S.	450.00	
3.	Cost of NPK mixture, neemicide @ 250 gm/plant		L.S.	400.00	
4.	Cost of plants (including 15% etc. for mortality) including transportation and planting	310 nos.	15.00/Plant	4650.00	
5.	Casualty replacement @ 10% of item No. 4 & 5			465.00	
6.	Cost of 2 weedings and hoeing		1.00/Plant	540	
7.	Contingency and unforeseen (3%)			492.00	
	Total			**Rs. 6,007.00**	
	Say			**Rs. 6,000.00**	
	Maintenance cost 2nd year onwards – 15 % of 1st year cost			900.00	
	For next 5 years i.e., Rs. 900 x 5			4500.00	
	Total Cost			**Rs. 10,500.00**	
	Say			**Rs. 10,500.00**	
B. Agro-Horticulture (cost per ha)					
1.	Cost of raising 270 plants up to 5 years @ Rs. 10,000.00			10500.00	The remarks mentioned under Horticulture are also applicable for Agro-Horticulture.
2.	Cost of raising agricultural crops @ Rs. 5,000 per hectare per year			5000.00	
3.	Fencing			45300.00	
	Total			**Rs. 60,800.00**	

Estimate of Orchard Development in the Watersheds Per Hectare (Without Fencing)

S.No.	Particulars	Quantity	Rate	Amount	Remarks
A. Horticulture					
1.	Soil working 1m x 1m x 1m size pits (270nos.) including cost of refilling	270.00 cum	36.66/cum	9898.20	Since, the project is to be operated in a participatory mode, contribution in the form of labour input for pit digging, FYM and its applications, weeding and hoeing are to be provided by the participating farmers, hence the costs are not included in the estimates.
2.	Application of Farmyard Manure, including cost		L.S.	450.00	
3.	Cost of NPK mixture, neemicide @ 250 gm/plant		L.S.	400.00	
4.	Cost of plants (including 15% etc. for mortality) including transportation and planting	310 nos.	15.00/Plant	4650.00	
5.	Casualty replacement @ 10% of item No. 4 & 5			465.00	
6.	Cost of 2 weedings and hoeing		1.00/Plant	540	
7.	Contingency and unforeseen (3%)			492.00	
	Total			**Rs. 6,007.00**	
	Say			**Rs. 6,000.00**	
	Maintenance cost 2nd year onwards – 15 % of 1st year cost			900.00	
	For next 5 years i.e., Rs. 900 x 5			4500.00	
	Total Cost			**Rs. 10,500.00**	
	Say			**Rs. 10,500.00**	
B. Agro-Horticulture (cost per ha)					
1.	Cost of raising 270 plants up to 5 years @ Rs. 10,000.00			10500.00	The remarks mentioned under Horticulture are also applicable for Agro-Horticulture.
2.	Cost of raising agricultural crops @ Rs. 5,000 per hectare per year			5000.00	
	Total			**Rs. 15,500.00**	

DAIRYING AND LIVESTOCK DEVELOPMENT

In income generating activities through Self Help Group, landless and marginal farmers are advised to use three or four cows of *JURSEE* breed or two or three buffalos of *MURRA* breed, for their good life.

Establishment of Goat Units for S.H.G.'s formed in I.W.M.P. IV, Project

District Bijnor is situated in Eastern plain region where the number of sheep is very less and they are small in nature. Goat population is appreciable and in fact, it is the major source of livelihood for poor people of the district.

In the state, on an average, 16 kg of meat is obtained from a goat, if they are dewormmed twice, there shall be increment of 4 kg in meat on an average, benefiting the farmers of the state.

Deworming and vitamins, mineral- supplement to the goats shall enhance their productivity and also improve anti-body response and protection level through vaccination, i.e., importance in efficiency of vaccination. More productivity and assured health and low mortality shall result into adoption of more farmers to goat farming with the formation of more S.H.G.'s and in turn availability of goats for processing units.

Goat excreta shall be of immense help in enrichment of soil fertility.

Establishment of Goat Units for S.H.G.'s

Eastern plain region, due to the Agro-climate conditions and land pattern is favorable for goat husbandry. Goats thrive well in dry and semi-dry climate with bushes and thorny vegetation. Presently in this area, farmers rear goats for their livelihood. If goat husbandry would be transformed to intensive husbandry, there shall be more economic stability of farmers, more profit sharing and availability of running capital for future expansion. Keeping in view the above facts, goat units shall be formed in the area in intensive way.

40 Goat Units are proposed in I.W.M.P. IV, Project for S.H.G. One unit constituting 10 goats and 1 buck will be distributed to one S.H.G.

A register of S.H.G. will be maintained by Secretary of S.H.G. in the supervision of W.D.T. member. The details of beneficiaries of S.H.G. including the breed of goat reared, breeding and feeding status, deworming status, deaths, post mortem conducted claim settlement and working status of unit will be maintained in the register.

Preferences shall be given in consecutive years in purchasing the goats and bucks for new units, from old units for which database maintained shall be of use and it should be assured by buy back arrangement.

Financial Component

S.No.	Component	Amount
1.	Cost of 10 goats of improved breed (not less than 6 months of age) @ Rs. 3200.00 each	32000.00
2.	Cost of 1 buck of improved breed @ Rs. 5000.00	5000.00
3.	Cost of insurance @ 11.63 / unit	4070.00
4.	Feed cost for 3 months @ 250 gm/ day for goats @ Rs. 11.84/ 250 gm	2930.40
5.	Provision of deworming, mineral and vitamin supplement, treatment, vaccination @ Rs.160/ animal	1760.00
6.	The expense including monitoring expenses, register and records @ Rs. 170.00/ unit	170.00
	Total	**Rs. 45,930.40**
		Say Rs. 46,000.00

Estimate of Livestock Development Activities

Total number of female animals: Buffalo - 3793

Cow - 4408

Total - 8,201

1. Artificial Insemination (A.I.): 33% of total animals per year, i.e., 4125 (say 3400 nos.)

Amount required for A.I. by BAIF @ 100.00/ animal.

Total Amount - Rs. 4,12,500

2. Vaccination: Total number of animals in I.W.M.P. IV - 20530 nos.

1. H.S. + B.Q. @ 5.50 112915.00

2. F.M.D. @10.50 2,15,565.00

(Twice in a year)

Total Amount - Rs. 3,28,480.00

3. Deworming: Adult animals - 19500

Child animals - 2000

Albendazole for 19500 animals @ 40.56 7,90,920.00

2000 child animals @20.28 40,560.00

Total Amount - Rs. 8,31,480.00

4. Mineral Mixture: Agrimine Forte Chelated for 15700 animals @ 115.00 Rs. 18,05,500.00

GRAND TOTAL - Rs. 25,45,500.00

DEVELOPMENT OF MICRO-ENTERPRISES

DEMONSTRATION OF WHEAT

1- Variety recommended for District-Bijnor
Irrigated-W.H-52
Unirrigated –K-8027, K-5351(Mandakini)
Kathia Raj 1555

2- Seed rate -100 -125 Kg/hectare

3- Requirement of fertilizers/ha N-125 Kg, P-70-75 Kg, K-70-75 Kg

ESTIMATE OF DEMONSTRATION OF WHEAT IN WATERSHED (PER ha)

S.No.	Particulars	Quantity	Rate	Amount	Remark
1	Tillage operation or preparation of field for sowing	1.0ha	1000.00/ha	1000.00	Since the project is to be operated in a participatory Mode, contribution in form of the tillage, sowing, irrigation and harvesting done by farmer is not included in the estimates
2	Cost of seed	100.00kg	18.00/kg	1800.00	
3	Sowing by seed drill	1.0ha	1000.00/ha	1000.00	
4	D.A.P. 18:46	160kg	573.00/ 50 kg	1833.60	
5	Urea	210kg	270.00/ 50 kg	1134.00	
6	Potash(M.O.P.)	150kg	300.00/50kg	900.00	
7	Irrigation(three irrigation)	1.00ha	650.00/ha	650.00	
8	Harvesting	1.00ha	2000.00/ha	2000.00	
Total				**10317.60**	
Say				**10318.00**	

Hence demonstration cost of wheat /ha is Rs. 10318.00

DEMONSTRATION OF GRAM IN WATERSHED AREA (per ha)

1- Variety - irrigated-vdai, KWR-108
Rainfed – J.G-315, Avrodhi

2- Seed rate/ha -50-55kg

3- Fertilizer requirement/ha N-25.0 kg, P-80 kg, K-30 kg

ESTIMATE FOR DEMONSTRATION OF GRAM (PER ha)

S.No.	Particulars	Quantity	Rate	Amount	Remark
1	Tillage operation in preparation of field and seed sowing	1.0ha (twice)	1000.00/ha	2000.00	Since the project is to be operated in participatory Mode, contribution by the farmer in the form of tillage, sowing operation, sowing and harvesting is not included in the estimates.
2	Cost of seed	55kg	90/kg	4950.00	
3	D.A.P	175kg	573.00/ 50 kg	2005.50	
4	M.O.P.	65kg	300.00/50kg	390.00	
5	Medicine	1.00ha	Lump sum	1250.00	
6	Harvesting	1.00ha	700.00/ha	700	
Total				**11295..50**	
Say				**Rs. 11296.00**	

Hence per hectare of demonstration –Rs. 11296.00

DEMONSTRATION OF ARHAR IN WATERSHED AREA (PER ha)

1- Variety - Malviya-13, narendra-1, Amar
2- Seed rate/ha -30 kg
3- Requirement of fertilizers/ha N-20.0 kg, P-50 kg, K-40 kg

ESTIMATE FOR DEMONSTRATION OF ARHAR (PER ha)

S.No.	Particulars	Quantity	Rate	Amount	Remark
1	Tillage operation in preparation of field and seed sowing	1.0ha	1000.00/ha	2000.00	Since the project is to be operated in participatory M0de, contribution by the farmer in the form of tillage, operation, sowing and harvesting provided by participating farmers, hence this cost is not included in the estimates.
2	Cost of seed	30.0kg	120.00/kg	3600.00	
3	Nitrogen N.P.K 16:32:16	190.0kg	470.00/50kg	1786.00	
4	Urea	-	-	-	
5	M.O.P.	-	-	-	
6	Harvesting	1.00 ha	650.00	650.00	
7	Medicine	1.00 ha	Lump sum	1000.00	
Total				**9036.00**	
Say				**Rs. 9036.00**	

Hence per hectare of demonstration –Rs. 9036.00

DEMONSTRATION OF HYBRID BAJRA IN WATERSHES (per ha)

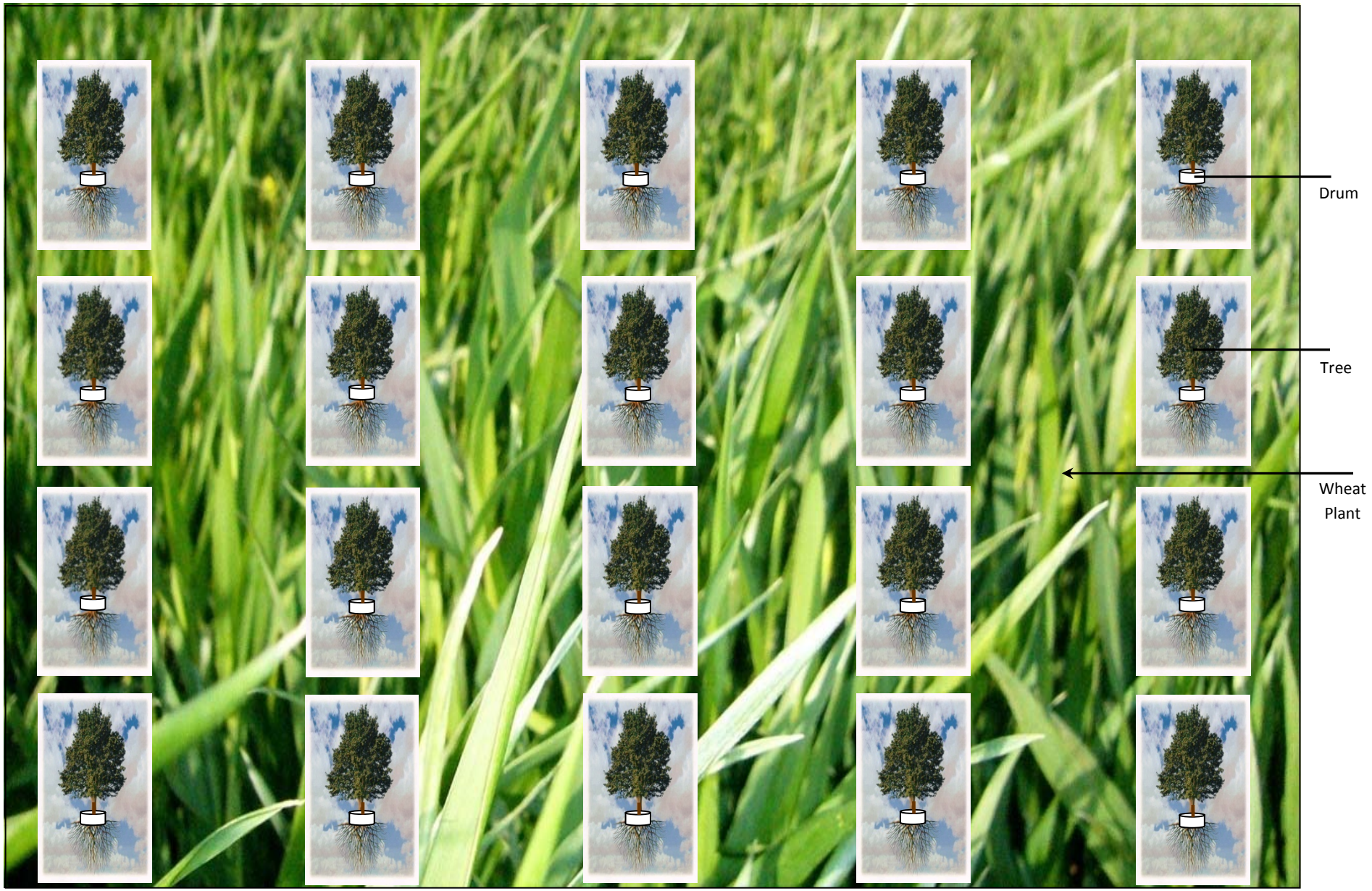
1- Requirement of Seed / ha -10kg
2- Requirement of fertilizers/ ha N- 60.00 kg, P- 40.00 kg, K-40.00 kg
3-

ESTIMATE FOR DEMONSTRATION OF BAJRA (per ha) RAINFED

S.No.	Particulars	Quantity	Rate	Amount	Remark
1	Tillage operation in preparation of field and for sowing	1.0ha	1000.00/ha	2000.00	Since the project is to be operated in participatory M0de, contribution of tillage operation, and harvesting cost
2	Cost of seed	10.0kg	130.00/kg	1300.00	
3	Nitrogen N.P.K 16:32:16	125.0kg	470.00/50kg	1175.00	
4	Urea	90kg	270.00/50 kg	486.00	
5	M.O.P.	40kg	300.00/50kg	240.00	
6	Harvesting	1.00Ha	650.00/ha	600.00	
Total				**5801.00**	
Say				**Rs. 5801.00**	

Hence per hectare of demonstration of Bajra is Rs. 5801.00/ha

DEMONSTRATION OF AGRO-FORESTRY / HORTICULTURE



DEMONSTRATION OF GREEN MANURING

Green Manuring is very useful but due to sowing of Kharif season crop, lack of suitable type of seeds, and limitation of moisture, it is not widely practiced. Green Manuring brings immediate advantage because of its quick decomposition where as FYM and compost improves the soil physical condition in the long-run. Benefits of Green Manuring accrue from substitution of chemical fertilizers, enhance soil biological activities and erosion control due to vegetative cover.

Sesbania Species (Dhaincha) and *Crotolaria Juneea* (Sunhemper Sanai) are most common green manure crops. They accumulate about 100 kg N/ha in their biomass and 64-88% of this is derived from atmosphere. Apart from direct benefit of green Manuring as a source of nutrients and organic matter, it has the capacity to mobilize soil phosphorus and other nutrients. It also helps in reclamation of problem of soil, e.g., *Sesbania* helps in removing exchangeable sodium and reclamation of salt affected soils.

In I.W.M.P. III Project, efforts will be made to oblise the farmers for Green Manuring.

A typical estimate is made for Green Manuring is given below:

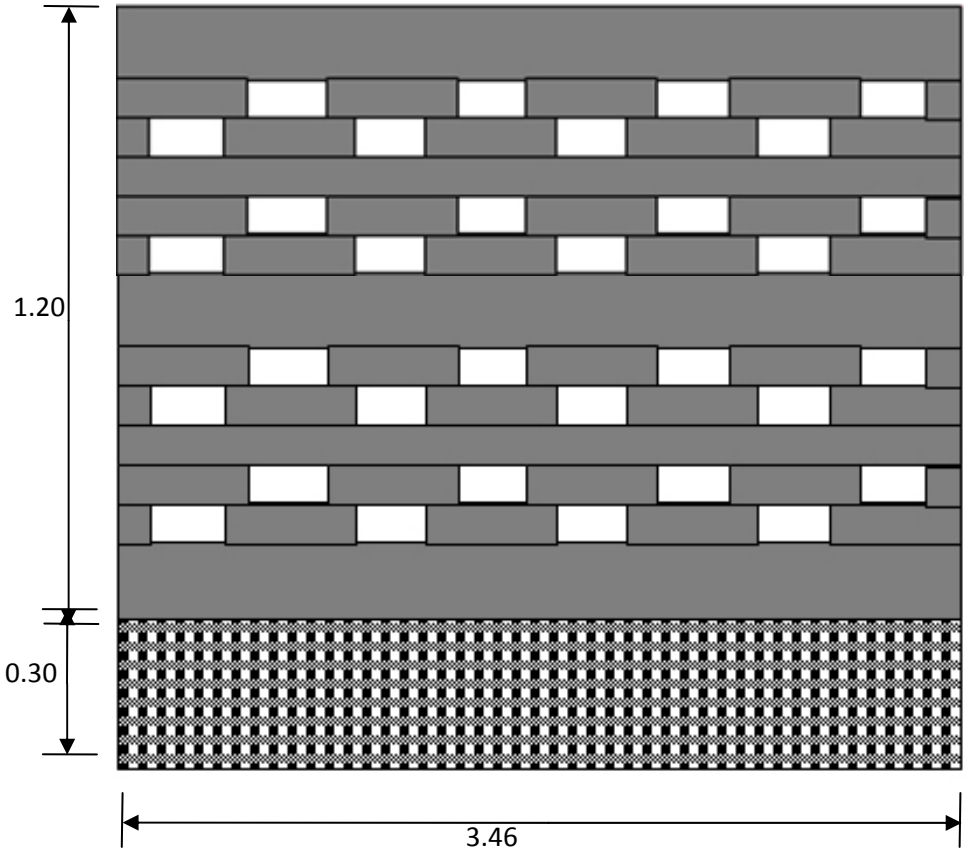
ESTIMATE FOR GREEN MANURING IN THE WATERSHED (PER ha)

S.No.	Particulurs	Rate	Cost	Remark
1	Seed of Sesbania (Dhaincha)25Kg/ha	25.00/Kg	625	Since the project is to be operated in a participatory mode, contribution in the form of tillage will be done by farmers is not included in the estimate.
2	Tillage operation before sowing and to plough the plants of Dhaincha after 40-45 days of sowing for Green Manuring.	1000/ha Before and after saring	2000.00	
Total			**Rs. 625.00**	

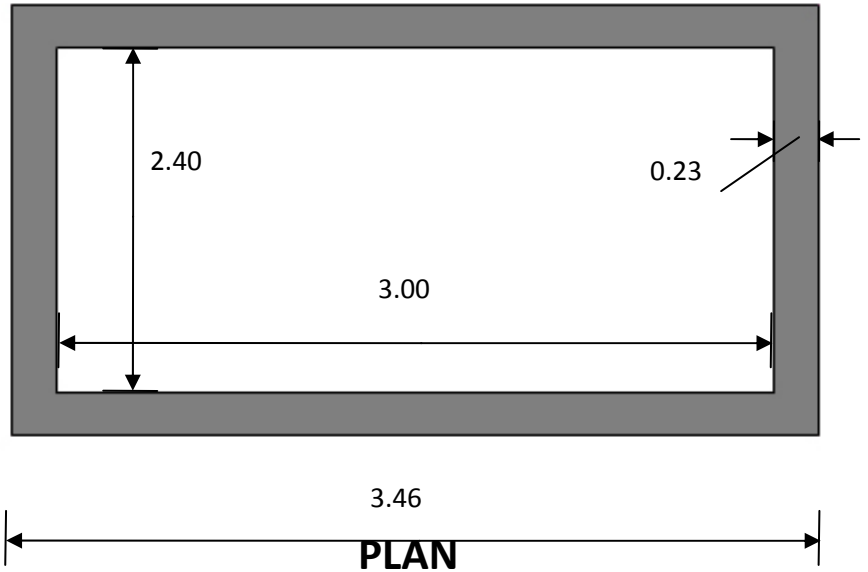
Therefore cost per hectare of Green Manuring is Rs. 625.00/ha

DRAWING AND DETAIL ESTIMATE OF LIVELIHOOD WATERSHED WORK PHASE

DRAWING OF NADEF COMPOST STRUCTURE



ELEVATION



PLAN

DESCRIPTION.

1. Brick work = 1:4.

2. Plastering = 1:4.

3. Thickness of wall = 0.23 m.

4. Total height of Structure = 1.20 + 0.30 = 1.50 m.

(Not to Scale)

PREPARATION OF COMPOST BY NADEF METHOD

Nadef is the name of inventor of this method. In this method glazed pit of brick masonry above Ground level is made as shown in the drying. In this method by using a little quantity of cow during, and crop residue, leaf of trees, straw and other organic materials. The method of filling up the pit is below.

First of all best soil of pond or field is spread in the bottom of pit as least 3" thickness and then one layer of 6" thickness and other agriculture waste is made then best soil is spread on it and on this layer the liquid made of cow dung is spread to wet the crop residue, straw etc. this method is repeated until the pit is net completely filled up. On the top layer of this material a bulk is made and then the pit is closed by earthen gara. Water is spread on the top of bulk and from glazed side weekly. This process is repeated to moist the filling material always. The decomposition in filling material started and within six month filled material becomes compost khad.

ESTIMATE OF COMPOST BY NADEF METHOD

S.No.	Description of Work	No.	L.	B.	D./H.	Quantity
1.	Earth Work					
	Long Wall	2	3.60	0.30	0.30	0.648
	Short Wall	2	2.33	0.30	0.30	0.419
	Total					**1.067 cum**
2.	Brick Work 1:4					
	Long Wall Solid	2	3.46	0.23	0.90	1.432
	Short Wall Solid	2	2.40	0.23	0.90	0.993
	Total					**2.425 cum**
	Long Wall Glazed	2	3.46	0.23	0.60	0.954
	Short Wall Glazed	2	2.40	0.23	0.60	0.662
	Total					**1.616**

						cum
3.	Plastering Work					
	Long Wall	2	3.46	-	0.60	4.152
	Short Wall	2	2.40	-	0.60	2.880
	Top of Long Wall	2	3.46	0.23	-	1.591
	Top of Short Wall	2	2.40	0.23	-	1.104
	Total					**9.727 m^2**

ABSTRACT OF WORK

S. No.	Particulars	Quantity
1.	Earth Work	1.06 cum
2.	Brick Work 1:4 2.425 + 1.616/ 2	3.233 cum
3.	Plastering 1:4	9.727 m^2

CONSUMPTION OF MATERIALS

S. No.	Particulars	Quantity	Cement (Bags)	Coarse Sand (cum)	Bricks (nos.)
1.	Brick work 1:4	3.233 cum	5.82	0.873	1487
2.	Plastering 1:4	9.727 m^2	1.07	0.146	-
	Total		**6.89**	**1.019**	**1487**
	Say		**7 Bags**	**1.02 cum**	**1500 nos.**

COST OF MATERIALS

S. No.	Particulars	Quantity	Rate	Amount
1.	Cement	7 Bags	285.00/ Bag	1995.00
2.	Coarse Sand	1.02 cum	2500.00/ cum	2550.00
3.	2nd class Brick Work 1:4	1500 nos.	4500.00/ Thousand	6750.00
	Total			**Rs. 10795.00**

LABOUR CHARGES

S.No.	Particulars	Quantity	Rate	Amount
1.	Earth Work	1.06 cum	36.66/ cum	30.85
2.	Brick Work	3.233 cum	370.00/ cum	1196.21
3.	Plastering	9.727 m^2	40.00/ m^2	389.08
	Total			**Rs. 1616.14**

Total Expenditure	
1. Cost of Materials	10795.00
2. Labour Charges	1616.14
Total	**Rs. 12411.14**
	Say Rs. 12411.00 only

CHAPTER - 6

CAPACITY BUILDING PLAN

CAPACITY BUILDING

Capacity building and training are the most important components of watershed management programme both for the field level project staff/officers and functionaries of people institutions i.e. watershed community. Apart from enhancing technical skill of project staff, this would also provide opportunities to community members to develop their capacity as the future custodians of the programme after project's withdrawal. In IWMP-IV, Bijnor financial outlay for capacity building 5% (Rs. 41.56 Lacs) of the total project cost has been proposed.

SCOPE OF CAPACITY BUILDING AT PROJECT AREA

- Alternative Land Use Plan
- Scientific technique of Soil and Moisture conservation
- Improved and Scientific agriculture practices
- Fodder development and Management
- Forestation
- Meteorological Information
- Dairy Development and Management
- Rural Craft
- Income Generation Activities
- Stitching
- Food Processing
- Post Harvest management practices

INSTITUTIONAL ARRANGEMENT & CAPACITY BUILDING IN THE PROJECTS

S. No.	Project Stake holders	No. of Stake holders	Total no. of persons	No. of persons trained so far	No. of Persons to be trained	Sources of funding for training, BSA Unit or DoLR or others		Name & Address of Training institute
						DoLR	BSA unit or others	
1	District Data centre	1	2	-	2	-	BSA unit	Krishi Anusandhan Kendra, Nagina
2	PIA	1	29	10	8	-	BSA unit	Krishi Anusandhan Kendra, Nagina
3	WDTs	1	6	0	6	-	BSA unit	Krishi Anusandhan Kendra, Nagina
4	W.Cs	10	-	-	-	-	BSA unit	Krishi Anusandhan Kendra, Nagina
5	PGs	50	-	-	-	-	BSA unit	Krishi Anusandhan Kendra, Nagina
6	SHG	20	-	-	-	-	BSA unit	Krishi Anusandhan Kendra, Nagina
7	UG	10	-	-	-	-	BSA unit	Krishi Anusandhan Kendra, Nagina
8	Community	-	-	-	-	-	BSA unit	Krishi Anusandhan Kendra, Nagina
9	Any others	-	-	-	-	-	BSA unit	Krishi Anusandhan Kendra, Nagina

CHAPTER - 7

PHASING OF PROGRAMME AND BUDGETING

WATERSHED ACTIVITIES

Watershed management as a strategy has been adopted by Government of India especially in the rain-fed regions of semi-arid tropics. These regions are characterized by low and undependable rain, low soil fertility, poor infrastructure development, low literacy and high incidence of migration. Several studies have identified that there is a dire need of a systematic and scientific approach to deal with watershed development. The common guidelines generate a fresh and flexible framework for the next generation watershed development.

SCIENTIFIC PLANNING

Cluster Approach

This envisages integrated development of Geo-hydrological unit i.e. Treatment of cluster of micro –watershed. The IWMP-IV, Bijnor Project consists of 6 micro watersheds.

Base line Survey

To access the impact of any watershed development programmed a detailed baseline survey has to be conducted. This acts a benchmark for any intervention during and post implementation of any development programme. A detailed baseline survey was undertaken which involved household census survey, Bio-physical survey and Village level data collection from Talati – cum mantri. Household census survey includes a detailed questionnaire which has been filled by visiting each and every household in the village. This gave in the details of the demographic profile of the village, the literacy percentage, SC/ST population, number of BPL household, cattle population and net consumption rate in the village, average milk production of the cattle and various schemes running and their benefits

Bio-physical survey was undertaken to identify various natural resources available in the village. It included the soil typology, wells in the area, crop taken in the field, Cropping pattern, fertilizer used and various sources of irrigation in the field.

Participatory Rural Appraisal (PRA)

The past experience of watershed has given tremendous input to focus on creating accountability of the stakeholders towards the program. This has created an emphasis to include all the stakeholder communities and their local and Indigenous Technological Knowledge (ITK) while planning for any activity. Participatory approach provides a new path for planning, implementing, and monitoring and post- withdrawal activities with a complete accountability of the stakeholders. Various PRA techniques like resource mapping, social mapping, and season calendars were used to understand the physical and social

orientation of the village in general and watershed in specific. These tools put the villagers in ease than the complicated questionnaires.

Use of GIS and Remote Sensing For Planning

Use of various GIS and Remote Sensing Technologies has been promoted at various stages of watershed development.

Prioritization

Geographical Information System (GIS) has been used for prioritization process. Various maps were created using spatial and non spatial data like Geo-morphological maps, Soil data, Crop productivity data, Meteorological data, BPL Population, SC/ST population, Ground water Status, Drinking water situation, Slope percent. These were all given proper weightage according to the DoLR specification. This will be helpful for effective dissemination of information on land and water resources to the users.

Planning

An action plan matrix was formulated by State Level Nodal Agency (SLNA) taking into account various features like the slope percent, Soil Depth, Soil Texture, Soil erosion in the area for wasteland, forest land and agricultural land. Global positioning System (GPS) was used to identify each and every water conservation structures available in the project area. This was used to create a map. Contour Map of vertical interval of 1.0 meter at a scale of 1:4000 was used for identifying various locations for soil and water conservation structures. GIS study is used to identify the area require the degree of concentration for the implementation of Watershed Plan.

Hydrological modeling

Hydrology modeling technique was used for locating drainage, stream length, flow direction, sink and flow accumulation. This model overlaid over cadastral map to calculate the catchment area of each structures like the check dam etc. This has helped to remove the human error which generally occurs while calculating the catchment area of a check dam.

Details of Scientific Planning and Inputs in IWMP projects

Scientific criteria / input used	Whether scientific criteria was used
(A) Planning	
Cluster approach	Yes
Whether technical back-stopping for the project has been arranged? If yes, mention the name of the Institute	-
Baseline survey	Yes
Hydro-geological survey	Yes
Contour mapping	Yes
Participatory Net Planning (PNP)	Yes
Remote sensing data-especially soil/ crop/ run-off cover	-
Ridge to Valley treatment	-
Online IT connectivity between	-
(1) Project and DRDA cell/ZP	Yes
(2) DRDA and SLNA	Yes
(3) SLNA and DoLR	Yes
Availability of GIS layers	Yes
Cadastral map	Yes
Village boundaries	Yes
Drainage	Yes
Soil (Soil nutrient status)	Yes

Land use	Yes
Ground water status	Yes
Watershed boundaries	Yes
Activity	Yes
Crop simulation models	No
Integrated coupled analyzer/ near infrared visible spectroscopy/ medium spectroscopy for high speed soil nutrient analysis	No
Normalized difference vegetation index (NDVI)#	No
Weather Station	-
(B) Inputs	NO
Bio-pesticides	No
Organic manures	No
Vermi compost	Yes
Bio-fertilizer	Yes
Water saving devices	Yes
Mechanized tools/ implements	Yes
Bio-fencing	Yes
Nutrient budgeting	Yes
Automatic water level recorders & sediment samplers	NO
Any other (please specify)	NO

YEAR WISE PHASING OF WORKS (PHYSICAL & FINANCIAL) BIJNOR , 2010-11

Phasing of various works/activities during different years of the project period for treatable area 5643(Ha) out of total area 10337 (Ha) is presented in Table Component wise & Year wise Phasing of Physical & Financial Outlay

Financial (Lakhs Rs.) Physical (Ha)

S. No.	Component	% of Budget	Ist Year (2010-11)		IIndYear (2011-12)		IIIrd Year (2012-13)		IVth Year (2013-14)		Total	
			F	P	F	P	F	P	F	P	F	P
1 A	Administrative Cost TA & DA, POl/Hiring of vehicle/office and payment of electricity and phone bill etc. computer, stationary and office consumable and contingency	10%	13.54		17.61		18.96		17.61		67.72	
B	Monitoring	1%	1.35		1.35		1.35		2.71		6.77	
C	Evaluation	1%	2.03		1.19		1.19		2.37		6.77	
	Sub-Total	12%	16.92		20.15		21.5		22.69		81.26	
2. A.	Preparatory Phases Kharanja,Krishak Vikas Munch Approach Road (Brick Soling), Primary& Junior School Boundary, Wall & Earth Work, Earth Work in Sub-roads	4%	27.09		0.00		0.00		0.00		27.09	
B.	Institutional and Capacity Building	5%	20.31		5.08		5.08		3.39		33.86	
C.	Preparation of DPR	1%	6.77		0.00		0.00		0.00		6.77	
	Sub-Total	10%	-									

S. No.	Component	% of Budget	Ist Year (2010-11)		IIndYear (2011-12)		IIIrd Year (2012-13)		IVth Year (2013-14)		Total	
			F	P	F	P	F	P	F	P	F	P
3. A.	**Watershed Works** **Soil & moisture conservation** **1)Construction of Bunds (graded, contour and field Bund, Marzinal & Peripheral Bund with structure)**		**50.79**	**846.45**	**116.98**	**1949.66**	**108.85**	**1814.22**	**61.96**	**1032.67**	**338.58**	**5643.00**
	2)Renovation of Existing Bund for *insitu* soil moisture conservation											
B.	**Water Resources Development** **3)New and Renovation of Water Harvesting Structure/ Bundhi Pucca Check Dams, Farm Ponds**											
	4)Drainage line treatment(Pucca structure inlet,outlet and spillway	**50%**										
C.	**Horticululture** **5)Rainfed Horticulture with Fencing**											
	6)Rainfed Horticulture without Fencing											
	7)Aforestation & development of Silvi_pastoral system											
	Sub-Total	**50%**	**50.79**	**846.45**	**116.98**	**1949.66**	**108.85**	**1814.22**	**61.96**	**1032.67**	**338.58**	**5643.00**

S. No.	Component	% of Budget	Ist Year (2010-11)		IIndYear (2011-12)		IIIrd Year (2012-13)		IVth Year (2013-14)		Total	
			F	P	F	P	F	P	F	P	F	P
4.	**LivelihoodActivities** Income generating Activities through SHGs for landless and Marginal farmers 1)Establishment of Nadef-Compost Units	10%	6.77		27.09		27.09		6.77		67.72	
	2)Diary Work											
	3)Goating-Keeping											
	4)Genaral Merchant Shop											
	5)Livestock Activities											
	Sub-Total	10%	6.77		27.09		27.09		6.77		67.72	
5.	**Production System & Micro enterprises** 1)CropProduction, Diversification of Agriculture	13%	6.77		33.86		40.63		6.77		88.03	
	2)Introduction of Agro-forestry/Horticulture											
	3)Demonstration of Green Manuring											
	Sub-Total	13%	6.77		33.86		40.63		6.77		88.03	
6.	**Consolidated Phase**	5%	-	-	-	-	-	-	33.86	-	33.86	-
	Grand Total	100%	135.43		203.15		203.15		135.43		677.16	

CHAPTER -8
CONSOLIDATION / EXIT STRATEGY

PLANS FOR MONITORING AND EVALUATION

A Web-based GIS system is being developed for monitoring and evaluating the project in its planning & implementation phases. The system would be available on a public domain and can be accessed by all the stakeholder of the project. The system shows the entire state of Uttar Pradesh and all of those areas selected over the next 18 years. Filtering allows the user to zoom onto one particular project. Details related to soil type, Land-use classification, inhabitation etc., can be obtained village-wise. Furthermore, survey-number wise details related to ownership, irrigation source, yield etc., can also be accessed by the users of the system. This system is being used for pooling up the details obtained from the DPR. In other words, the DPR is made available online in the form of a database which will help the stakeholders know areas of importance viz., already treated areas/historical works in the area, proposed areas for treatment etc., for further treatment and planning. The system would also show the satellite imageries of various years from the project inception stage to the project closing stages. This allows the user to evaluate the effectiveness of the treatment and thereby plan corrective measures for the project area. The system would serve as an aiding tool to the planners and evaluate the effectiveness of the treatment and thereby plan corrective measures for the project area. The system would serve as an aiding tool to the planners and evaluators for judging the efficacy of the project.

Yet another component of the Web-based GIS system is the Mobile based Monitoring & Evaluation System, which will help the ground staff alias WDTs (Watershed Development Team) to transmit information from the ground level to the central server. Also, any higher-up official in charge of the project can obtain information regarding the project area on the project area on their mobile phone by means of an SMS. The system works in the following manner. The WDT equipped with a GPS instrument marks the latitude-longitude information of various treatment areas during the DPR. The probable sites are then transferred onto the central server. During the works phase, any progress in the treatment areas is reported to the server by means of an SMS by the WDT. Similarly, any nodal officer or higher-up official can view the progress in a project by means of summarized reports generated over frequent periods of time.

PLANS AND PROJECT MANAGEMENT

The project management of a watershed programme is very important. It mainly depends upon the community organisation and the village level institutes. In watershed committee and various user groups have been formulated for post project operation and maintenance of assets created during project period. Major emphasis will on equity and sustainable benefit of the project even after implementation stage. A proper linkup will be built during project period with various institutes and capacity building organisation. They will act as a major kingpin during post implementation for scaling up the successful experience during project.

WATERSHED DEVELOPMENT FUND

The major source of financial assistance after post implementation period is Watershed Development Fund. The contribution of it will come mainly from the fund generated.

USER CHARGES

Various user groups will be formed in village. These user groups will collect user according to the designated rules formed during the formation of user group. These funds will be transferred to the WDF funds as per these formulated rules. The secretary of watershed committee (WC) shall maintain the records.

SUSTAINABILITY AND ENVIRONMENT SECURITY

In the proposed watershed management plan of IWMP-IV watershed, proper blending of bio engineering measures will be applied on 60% of the total watershed area. Based on the results of studies conducted in this region, it is estimated that more 50% of the watershed area will be treated and consequently the soil loss and runoff from the area is expected to be reduced by 70% and 65% respectively. The proposed land use plan will improve the land utilization index and crop diversification index

significantly as compared to the existing one. It will help in maintaining ecosystem integrity on sustained basis along with improving the livelihood security of the farming community.

ECONOMIC ANALYSIS

Economic analysis of the project was carried by taking direct benefits and costs considering 25 year project life at 10 per cent discount rate. For this purpose of economic analysis, whole watershed development plan was divided into three sectors namely, agriculture, horticulture and forest/fuel wood plantation. Net present value(NPV), Benefit cost ratio (BC) ratio criteria were employed to judge the economic efficiency of each enterprise and sector.

AGRICULTURE

In rainfed agriculture the development cost can be recovered within one year as the present rainfed agriculture is being done on well maintained field, therefore, does not require much investment.

FOREST/ FUEL WOOD PLANTATION

Economic analysis of fuel wood plantation at IWMP-IV watershed. Project life is considered to be 25 years and discount rate for NPV estimation is 10%.

FOOD SUFFICIENCY

Achieving self sufficiency in food production is one of the prime objectives of the project.

CHAPTER -9
EXPECTED OUTCOME

EMPLOYMENT

Employment has always been a problem in the village. The principal occupations of the people are agriculture, animal husbandry and casual labour work. Animal husbandry does not keep them engaged full time, Thus the people mainly depend upon casual labour, either in the village itself or outside it.

The project plans for creation of both wage employment and self employment opportunities. Wage employment would be created by engaging people in watershed physical works like construction of earthen bunds, farm bunds, village pond, plantation, etc. Self employment would be created by providing the people with cash support in the form of direct livelihood activities like agriculture, animal husbandry and other micro enterprise development.

Labor migration in search of gainful employment is one of the major problems in the remote watershed in particular. Causal employment opportunities to the tune of more than 0.60 lacs will be generated during the implementation of the project activities. However, the changes in land use pattern and adoption of other subsidiary enterprises will generate employment opportunities for persons of 1.80 lacs in the watershed.

EXPECTED EMPLOYMENT RELATED OUTCOMES

S.No.	No. of the Villages	Wage employment										Self employment				
		No. of mandays (Lakhs)					No. Of beneficiaries					No. Of beneficiaries				
		SC	ST	Others	Women	Total	SC	ST	Others	Women	Total	SC	ST	Others	Women	Total
1	158	1.027	0	3.038	0.253	4.318	1027	0	3038	253	4318	205	0	607	51	863

MIGRATION PATTERN

Labour migration in search of gainful employment is one of the major problems in the remote watershed in particular. People migrate during summer season to different parts of the state as daily wagers, agricultural labours and construction workers. The detail is given below.

DETAILS OF MIGRATION (I.W.M.P-IV) BIJNOR

S.No.	No. of the villages	No. of persons migrating	No. of days per year of migration	Main reason for migration	Expected reduction in no. of persons migrating
1	158	362	209	Unemployment & Low Wages	148

VEGETATION/ CROP RELATED OUTCOMES

It is expected that after compilation of the project, the crop productivity of Rice-Wheat will certainly enhance, It would be around Paddy (8.5 qt/ha), Wheat (20.00 qt/ha). There will be an improvement in soil health of the study area after conservation measures.

MAJOR CROPS GROWN AND THEIR PRODUCTIVITY IN THE PROJECT AREA

S. No.	Names of the crop	Current status		Expected Post-Project Status	
		Area (Ha)	Productivity (Kg/ha)	Area(Ha)	Productivity(Kg/ha)
1	Kharif (Jwar, Bajra)	3617	800	3275	859

2	Rabi	Wheat	366	1415	622	2050
		Pulses & Oil	1805	800	3150	1135
3	Zaid/Other season		167	-	184	-

FOOD SUFFICIENCY

Achieving self sufficiency in food production is one of the prime objectives of the project. The status of food requirement and production before and after the project is presented

STATUS OF FOOD REQUIREMENT AND AVAILABILITY PER ANNUM IN WATERSHED

Sr. No.	Items	Requirement (q/yr)	Before project		Proposed	
			Availability (q/yr)	Deficit or surplus (q/yr)	Availability (q/yr)	Deficit or surplus (q/yr)
1	Cereals	16518	7150	-9368	22520	+ 6002
2	Pulses	2215	1000	- 1215	3110	+ 895
3	Oil seeds	190	150	-40	300	+ 110
4	Vegetable	1890	1099	- 791	2050	+ 160

WATER RELATED OUTCOMES

The ground water quality of the project area is found to be suitable as per drinking water standard (IS:10500) the average pH value ranges from 7.5 to 7.8, the Electric conductivity of the ground water varies from 960 to 1125 us/cm . The overall analysis of the ground water shows that the water is suitable for the drinking purpose. The water level in the project area ranges from 7.5 to 8.0 metre.

STATUS OF DRINKING WATER

S. N.	No. of the villages	Availabilty of drinking water (no. of months in a year)		Quality of drinking water	
		Pre-project	Expected Post-Project	Pre-project	Expected Post-Project
1	158	10 months	12 months	Abnormal	Soft water

DETAILS OF AVERAGE GROUND WATER TABLE DEPTH IN THE PROJECT AREAS (IN METERS)

S. N.	No. of the villages	Sources	Pre-project	Expected Post-Project	Remarks
1	158	Open wells	8.00 mtr.	6.20 mtr.	-
2		Bore wells	8.00 mtr.	6.20 mtr.	-

LIVESTOCK RELATED OUTCOMES

The village has quite a good of livestock population. These include cows, bullocks, buffaloes, goats. The interventions like provision of good quality cows and buffaloes, the establishment of a fodder bank and other such related activities would spur up

the dairy development in the village. It is expected that the post project period would see a substantial increase in livestock population and yield from them.

FOREST/VEGETATIVE COVER RELATED OUTCOMES

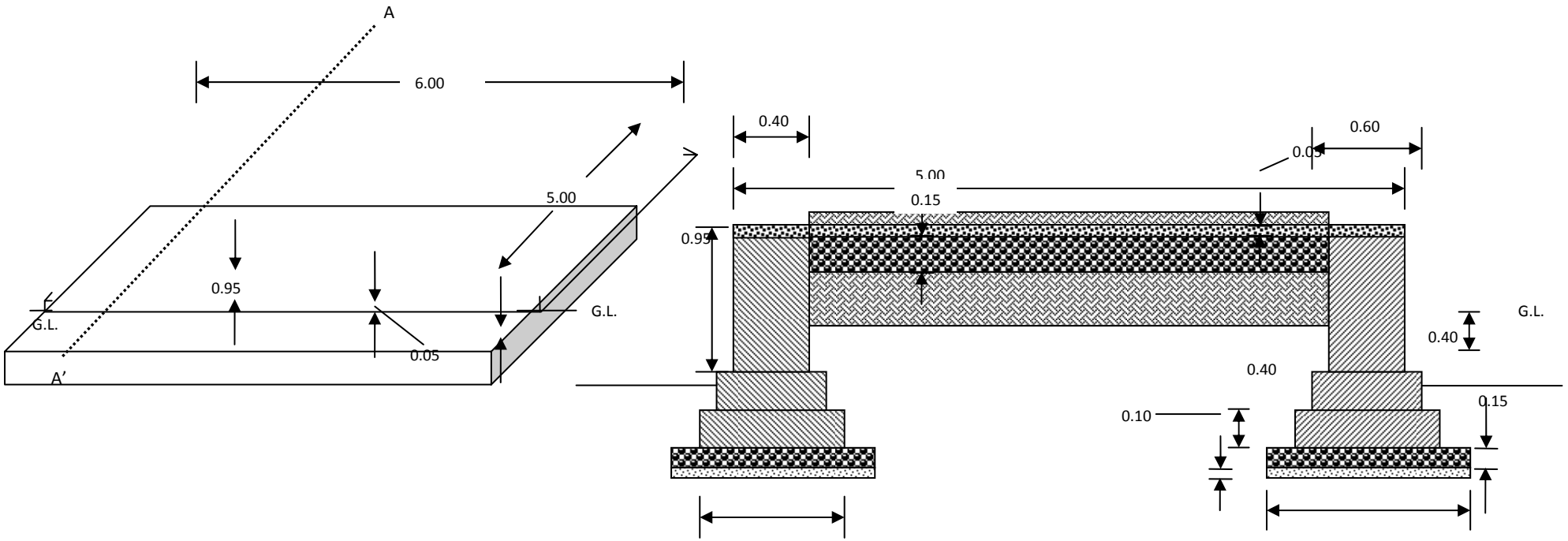
There is negligible area under tree cover. The village has a negligible forest area which consists of only *Prosopis Juliflora* (babool). Trees like Neem and *Alianthus* are seen just here and there, not concentrated in any area. It is planned that land to be covered under new plantation.

EXPECTED/ESTIMATED OUTCOMES OF IWMP-IV (2010-11) BIJNOR

S.No.	Item	Unit of Measurement	Pre-project Status	Post-project Status
1.	Status of Water Table	Meter	8	6.20
2.	Ground Water Structure Repaired/ Rejuvenated	No.	-	70
3.	Quality of Drinking Water	-	Smiley Poor	Good
4.	Availability of Drinking Water	Days	10 Month	12 Month
5.	Increase in Irrigated Area	%	-	5%
	Change in Cropping/Land use Pattern			
6.	Area under agriculture crop	Ha	7380.81	8892.16
	i- Area under single crop	Ha	5300	6164.00
	ii- Area under double crop	Ha	4800	5000.00
	iii- Area under multiple crop	Ha	3500	4000.00
	iv-Cropping Intensity	-	-	-
7.	Increase in area under vegetation (tree cover)	Ha	30	70
8.	Increase in area under horticulture	Ha	25	85
9.	Increase in area under fuel & fodder	-	-	-
10.	Increase in milk production	Av./Lit/Days/Cattle	4%	5%
11.	No. of SHGs	No.	-	25
12.	Increase in no. of Livelihood	-	-	-
13.	Migration	%	0.70	0.43
14.	SHG Federation Formed	-	-	-
15.	Credit Linkage with banks	-	-	25

COST NORMS & DESIGN OF STRUCTURE PROPOSED

DRAWING OF KRISHAK VIKAS MANCH



DESCRIPTION

ISOMETRIC VIEW OF PLATFORM (CHABUTRA)

SECTION AT A-A'

1. C.C.W. - 1:4:8.
2. Brick masonry- 1:4
3. Plastering- 1:4

DETAIL ESTIMATE OF KRISHAK VIKAS MANCH

S.No.	Description of Work	No.	L.	B.	D/H	Quantity
1.	Earth work in foundation					
	Long Wall Short	2	8.00 4.00	1.20	1.10	21.12
	Wall	2		1.20	1.10	10.56
	Total					**31.68 cum**
2.	Laying of Sand					1.32
	Long Wall	2	6.60 3.60	1.00 1.00	0.10	0.72
	Short Wall	2			0.10	
	Total					**2.04 cum**
3.	C.C.W. 1:4:8					
	Long Wall	2	6.60 3.60	1.00 1.00	0.15	1.98
	Short Wall	2			0.15	1.08
	Total					**3.06 cum**
4.	Brick masonary work 1:4 in foundation & super structure					
	1st Footing.					
	Long Wall	2	6.40	0.47	0.40	1.203
	Short Wall	2	3.80	0.47	0.40	0.714
	2nd Footing					
	Long Wall	2	6.20	0.35	0.40	0.868
	Short Wall	2	4.00	0.35	0.40	0.560
	Super Structure					
	Long Wall	2	6.00	0.23	0.90	1.242
	Short Wall	2	4.20	0.23	0.90	0.869
	Total					**5.456 cum**
5.	Earth work in filling	1	5.20	4.20	0.75	16.38 cum

6.	C.C.W. 1:4:8	1	5.20	4.20	0.15	3.276 cum
7.	C.C.W. 1:2:4	1	6.00	5.00	0.05	1.500 cum
8.	Plaster Work Long Wall Short Wall	2 2	6.00 5.00	- -	0.90 0.90	10.80 m^2 9.00 m^2
	Total					19.80 m^2

ABSTRACT OF WORK

1.	Earth Work in Digging	32.00 cum
2	Eart Work in Filling by Carriage	17.00cum
3.	Sand Laying	2.04 cum
4.	C.C.W. 1:4:8	6.336 cum
5.	Brick masonary 1:4	5.456 cum
6.	C.C.W. 1:2:4	1.500 cum
7.	Plastering	19.80 m^2

CONSUMPTION OF MATERIALS

S.No.	Particulars	Quantity	Cement (Bags)	Coarse Sand (cum)	Brick(No's)	G.S.B. 25-40 mm (cum)	Stone Grit 10-20 mm (cum)
1.	Sand Laying	2.040 cum	-	2.040	-	-	-
2.	C.C.W 1:4:8	6.336 cum	21.54	2.851	-	5.892	-
3.	Brick Masonary	5.456cum	10.91	1.500	2728	-	-
4.	C.C.W. 1:2:4	1.500 cum	9.15	0.630	-	-	1.275
5.	Plastering	19.800 m^2	2.17	0.297	-	-	-
Total			**43.77**	**7.318**	**2728**	**5.892**	**1.275**
Say			**44.00 Bags**	**7.500**	**2750**	**6.000**	**1.300**

COST OF MATERIALS

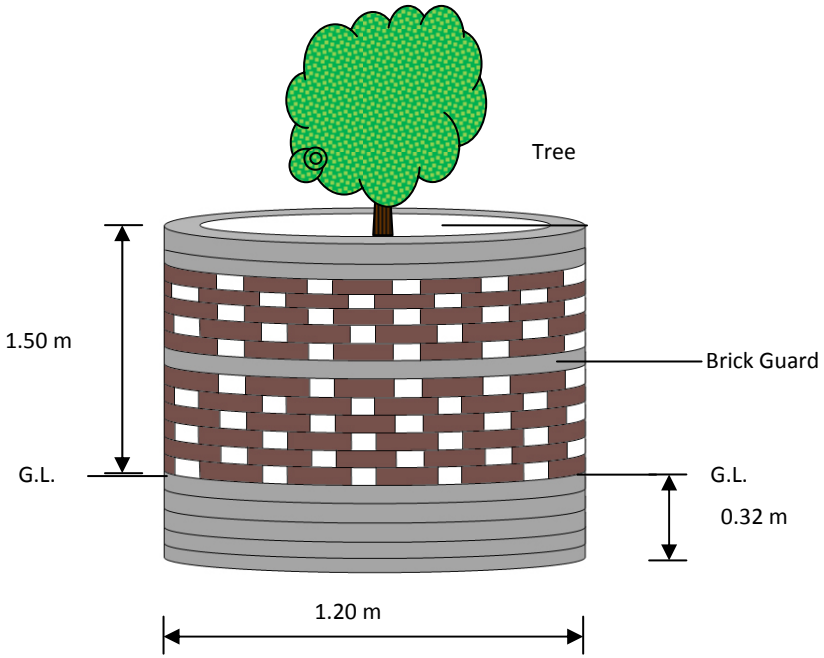
S.No.	Particulars	Quantity	Rate	Amount
1.	Cement	44.00 Bags	320/Bags	14080.00
2.	Coarse Sand	7.50 cum	2600.00/cum	19500.00
3.	Bricks	2750 No's	4600.00/No's	12650.00
4.	G.S.B. 25-40 mm	6.000 cum	1000.00/cum	6000.00
5.	G.S. Grit 10-20 mm	1.300 cum	1600.00/cum	2080.00
Total				**Rs. 54310.00**

LABOUR CHARGES

S.No.	Particulars	Quantity	Rate	Amount
1.	Earth Work in Digging	32.00 cum	37.00/cum	1184.00
2.	Earth Work in Filling by Carriage	17.00 cum	350.00/cum	5950.00
3.	Sand Laying	2.040 cum	41.00/cum	81.60
4.	C.C.W. 1:4:8	6.336 cum	550.00/cum	3484.80
5.	C.C.W. 1:2:4	1.500 cum	550.00/cum	825.00
6.	R/R Brick Masonary 1:4	5.456 cum	370.00/cum	2018.72
7.	Plastering 1:4	19.800 m^2	55.00/cum	1089.00
8.	Curing & Other Charges L . S	5.456 cum	100.00/cum	545.60
9.	Chowkidar	6 Man Days	120.00/Man Day	720.00
Total				**Rs. 15898.72**

Total Expenditure	
1. Cost of Materials	**Rs. 54310.00**
2. Labour Charges	**Rs. 15898.72**
Total	**Rs. 70208.72**
Say	**Rs. 70,200 only**

DRAWING OF BRICK GUARD



DESCRIPTION.

1. Brick work = 1:4.

2. Plastering = 1:4.

3. Thickness of wall = 0.11 m.

4. Total height of brick guard = 0.32 + 1.50 = 1.82 m.

DETAIL ESTIMATE OF BRICK GUARD

S.No.	Description of work	No.	L	B	D/H	Quantity	
1.	Earthwork for tree	1	0.60	0.60	0.60	0.216	
	In foundation	1	3.14x1.09	0.20	0.30	0.205	
Total						**0.421**	
2.	Brick work 1:4					Solid	Glazed
	In foundation	1	3.14x1.09	0.11	0.40	0.151	-
	In super structure with glazed	1	3.14x1.09	0.11	0.48	-	0.181
	Solid	1	3.14x1.09	0.11	0.08	-	0.030
	Glazed	1	3.14x1.09	0.11	0.40	-	0.151
	Solid	1	3.14x1.09	0.11	0.16	0.060	-
Total						**0.211**	**0.362**
3.	Plastering 1:4	1	3.14x1.20	-	0.07	0.264	
		1	3.14x1.20	-	0.15	0.565	
		1	3.14x1.09	-	0.07	0.239	
Total						**1.068 m^2**	

CONSUMPTION OF MATERIALS

S.No.	Description of work	Quantity	Brick Nos.	Cement Bags	Coarse Sand
1.	Brick work 11 cm thick 1:4 Brick work glazed	0.211 cum 0.362 cum	100 86	0.29 0.25	0.050 0.043
2.	Plastering 1:4	1.068 m^2	-	0.11	0.016
Total			**186**	**0.65**	**0.109**
Say			**200**	**0.75**	**0.110 cum**

COST OF MATERIALS

S.No.	Particulars	Quantity	Rate	Amount
1.	Brick I^{st} class	200nos.	4600.00	920.00
2.	Cement	0.75 Bags	320.00	240.00
3.	Coarse sand	0.110 cum	2600.00	286.00
Total				**Rs. 1446.00**

LABOUR CHARGES

S.No.	Particulars	Quantity	Rate	Amount
1.	Earth work	0.421 cum	37.00/cum	15.57
2.	Brick work	0.391 cum	370.00/cum	144.67
3.	Plastering	1.068 m^2	55.00/m^2	58.74
Total				**Rs. 218.98**

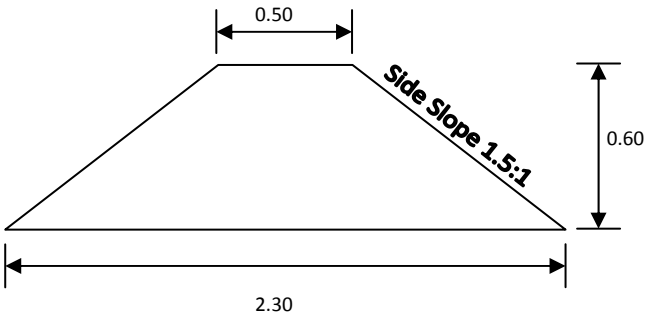
Head load and transportation L.S. - Rs. 335.00

Total Expenditure		
1.	Material	1446.00
2.	Labour	218.98
3.	Head load and transportation	335.00
Total		**Rs. 1999.98**
		Say Rs. 2000.00 only.

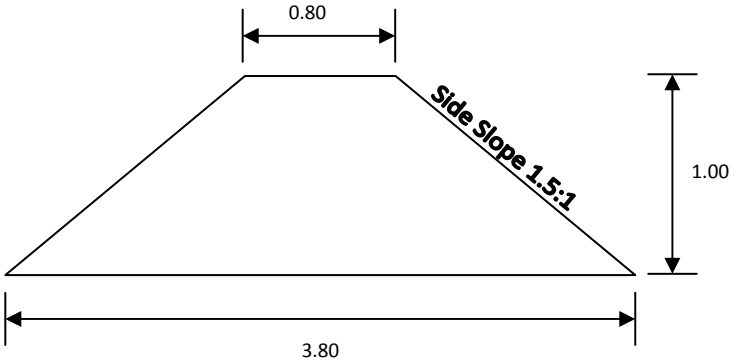
DETAILS ESTIMATE OF WATERSHED DEVELOPMENT WORK PHASE

DRAWING OF C.B., S.B., P.B., AND M.B.

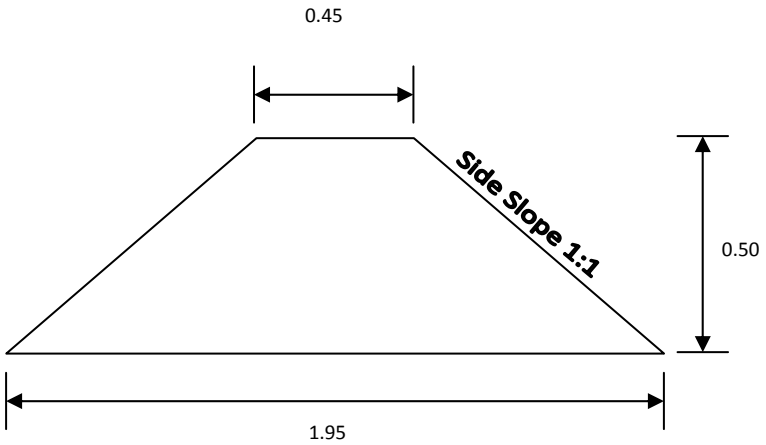
(Not to Scale)



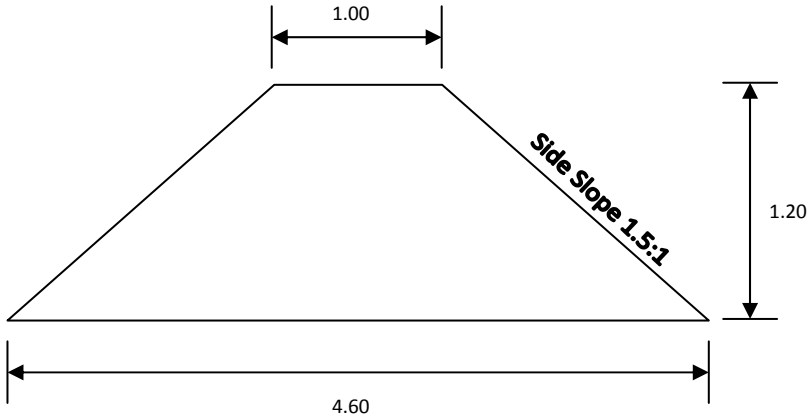
(C.B., Cross-Section – 0. 84 m^2)



(M.B., Cross-Section – 3.36m^2)



(Field Bund, Cross-Section – 0.60 m^2)



(S.B. /P.B., Cross-Section – 2.30 m^2)

(All dimensions in Metre)

Technical specification of Watershed work

Technical Specification of field Bund .

Particular	Value	Unit
Top Width	0.45	M
Height	0.50	M
Side slope	1.5:1	-
Bottom width	1.95	M
Cross section	0.60	M^2
Length /Ha	180.00	M
Earth work	108.00	CUM
Cost/ Ha	3518.00	Rs.

Technical Specification of contour bund. (1% slope land)

Particular	Value	Unit
Top Width	0.50	m
Height	0.60	m
Side Slope	1.5:1	-
Base of bund	2.30	m
Cross section	0.84	m^2
Length of bund/ha	120	m
Earth work	100.80	m^3
Cost/ Ha	3283.00	Rs..

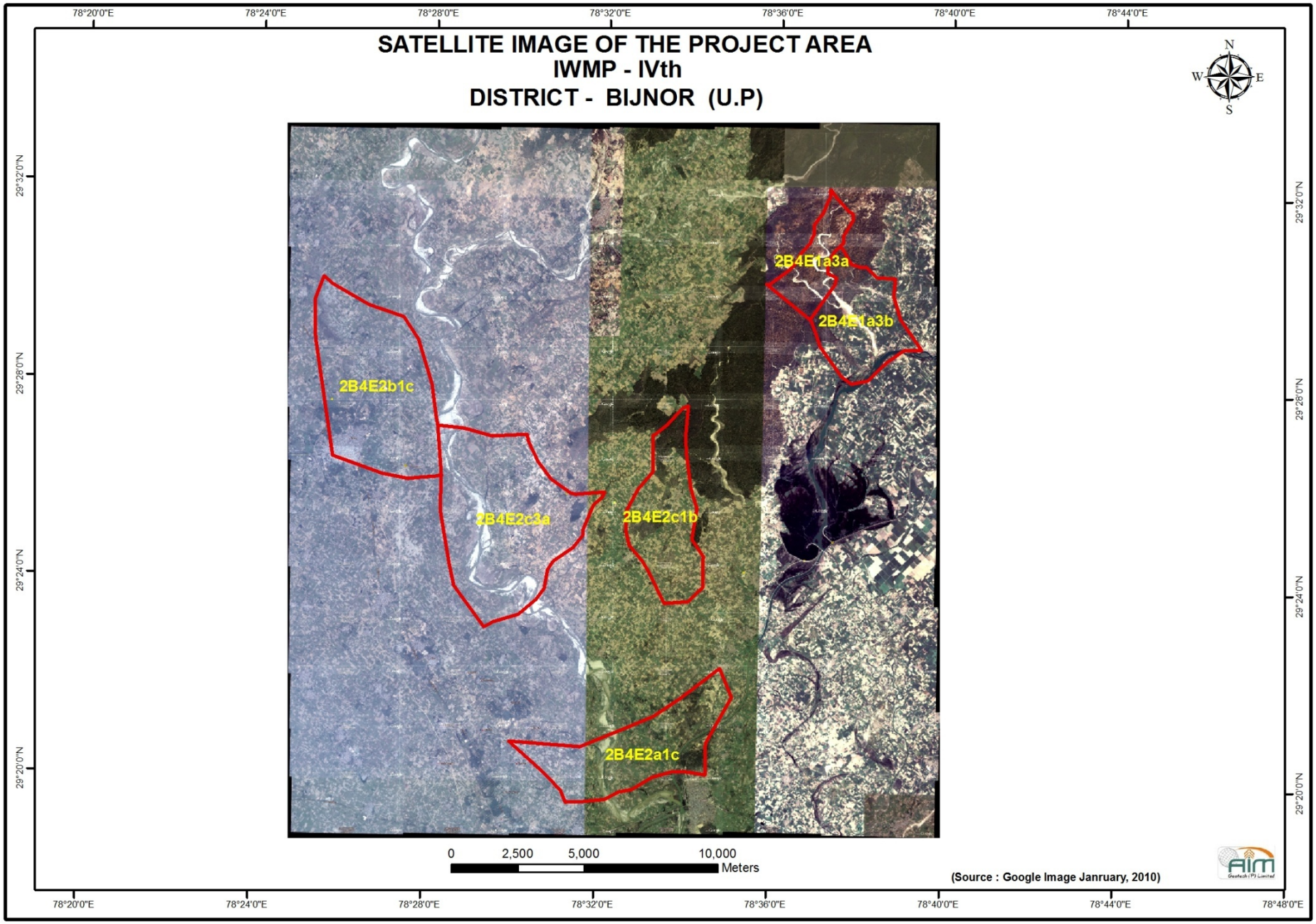
Technical Specification of Submergence bund

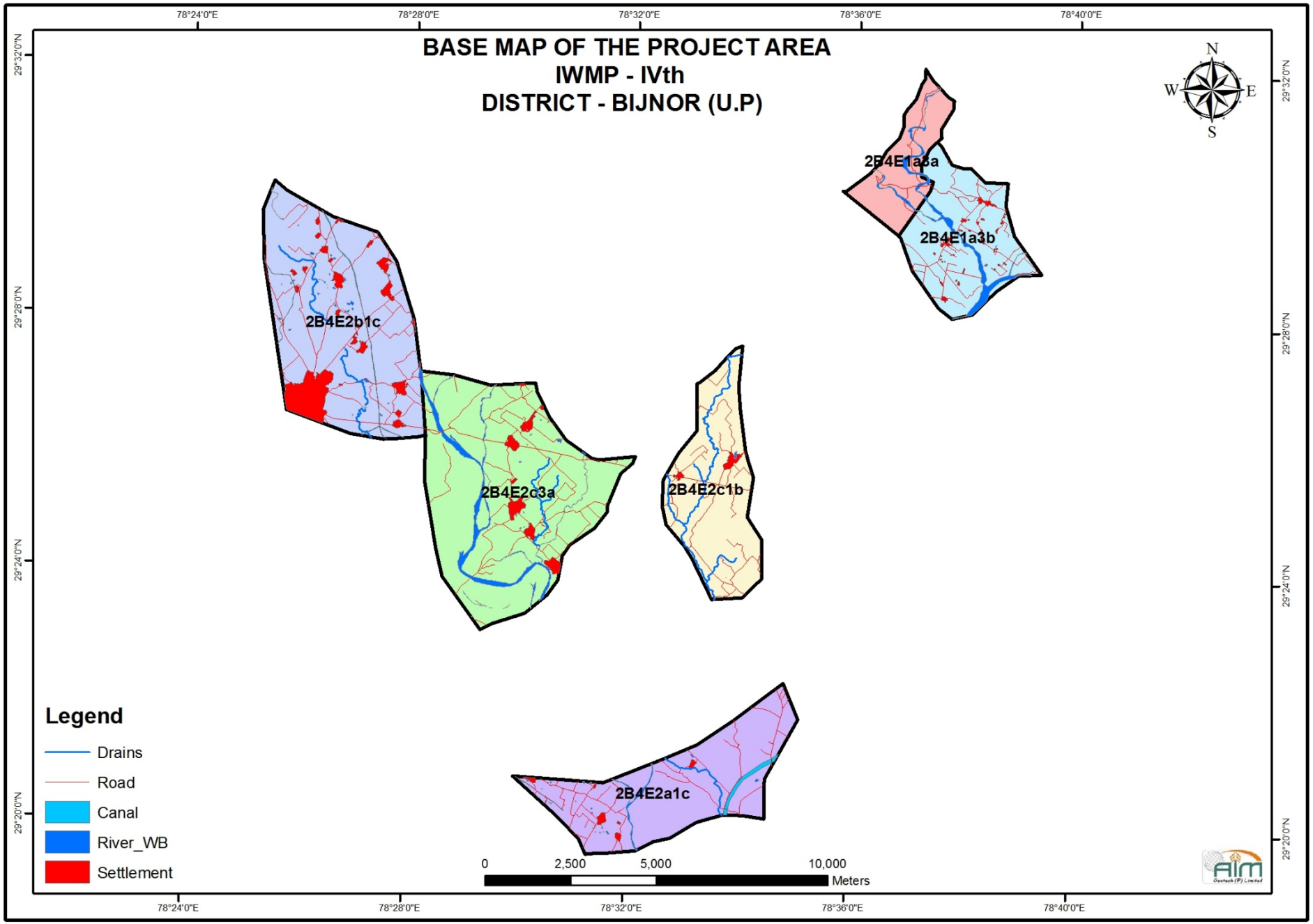
Particular	Value	Unit
Top Width	0.80	m
Height of Bund	1.00	m
Side Slope	1.5:1	-
Base width	3.80	m
Cross section	2.30	m^2
Length of bund/ha	100.00	m
Earth work	230.00	cum
Cost/ Ha	7491.00	Rs.

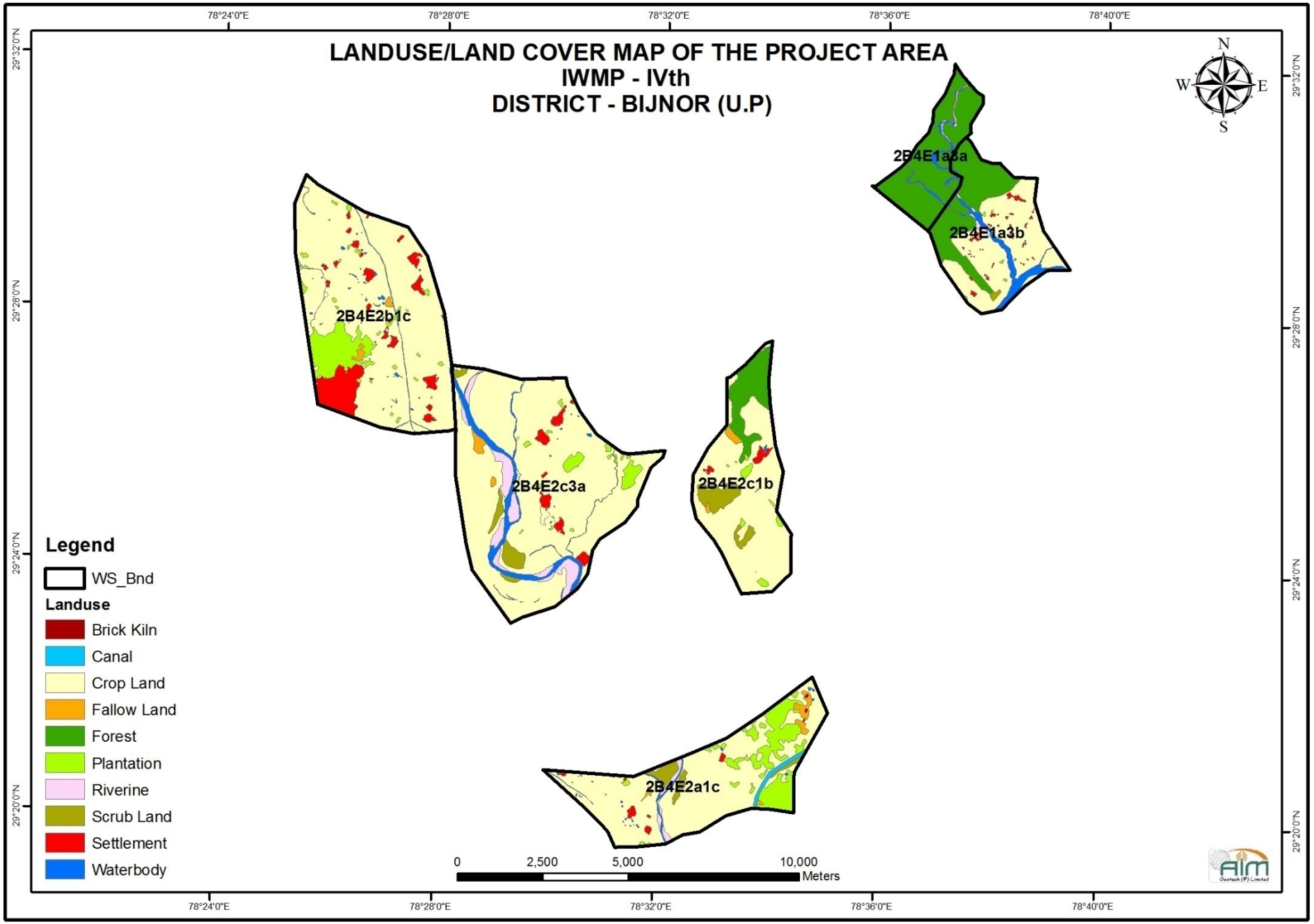
Technical Specification of Marginal bund

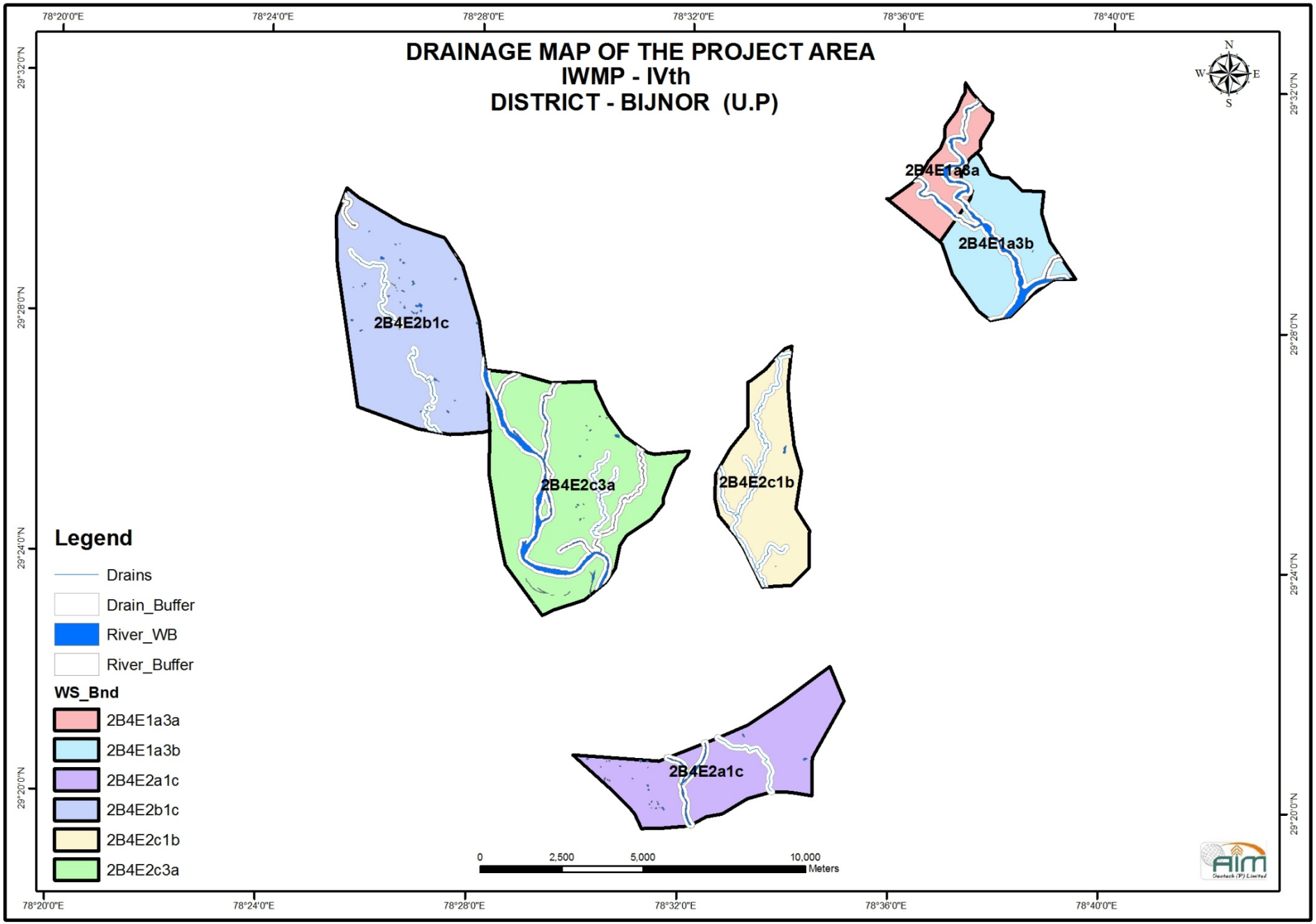
Particular	Value	Unit
Top Width	1.00	m
Height of bund	1.20	m
Side Slop	1.5:1	-
Bottom width	4.60	m^2
Cross section	3.36	m^3
Cost/ metre	109.43 say Rs. 110.00	Rs..

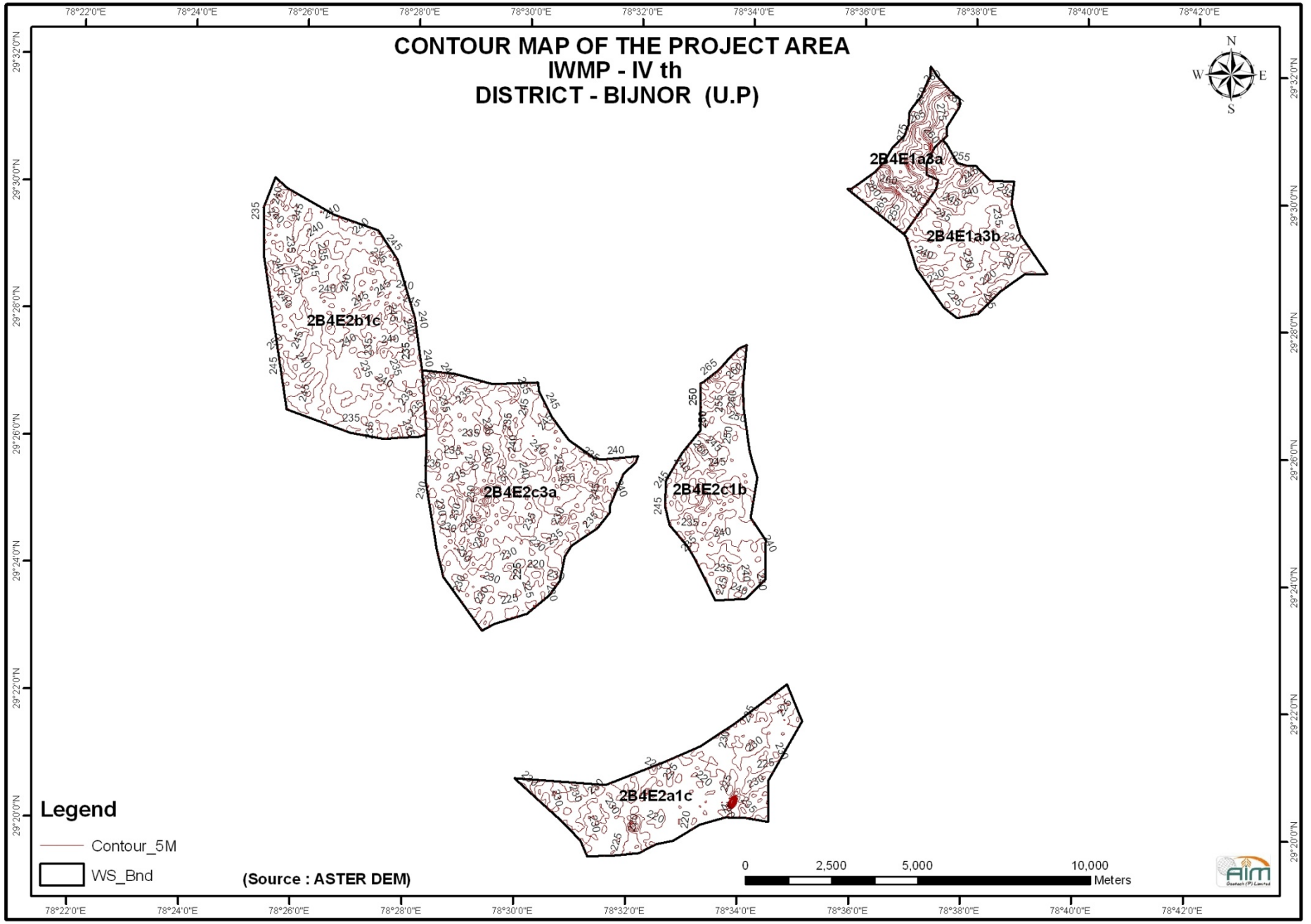
MAPS

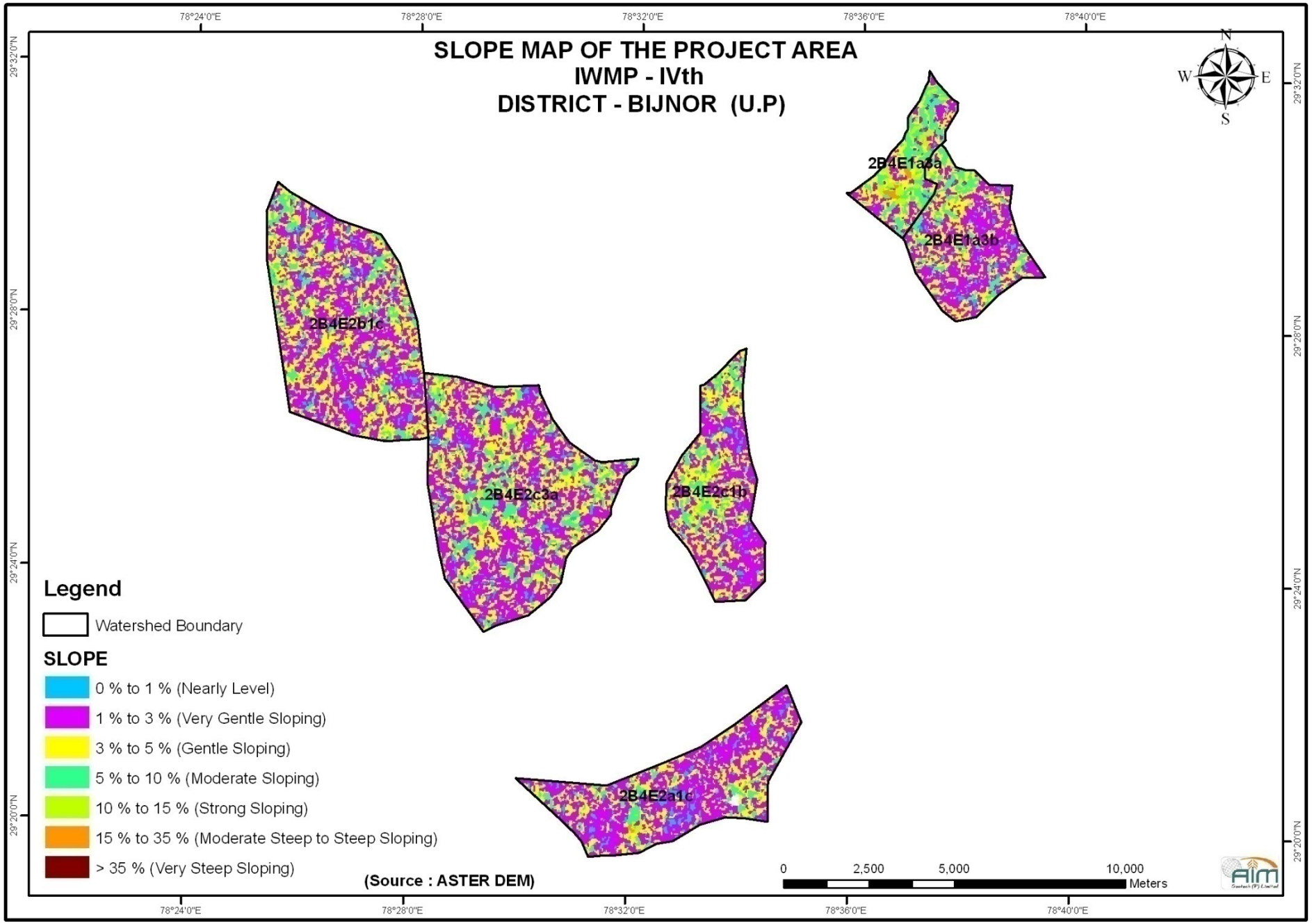

SATELLITE IMAGE OF THE PROJECT AREA
IWMP - IVth
DISTRICT - BIJNOR (U.P)
78°20'0"E
78°24'0"E
78°28'0"E
78°32'0"E
78°36'0"E
78°40'0"E
78°44'0"E
78°48'0"E
29°32'0"N
29°28'0"N
29°24'0"N
29°20'0"N
N
S
E
W
2B4E1a3a
2B4E1a3b
2B4E2b1c
2B4E2c3a
2B4E2c1b
2B4E2a1c
0
2,500
5,000
10,000
Meters
(Source : Google Image Janruary, 2010)

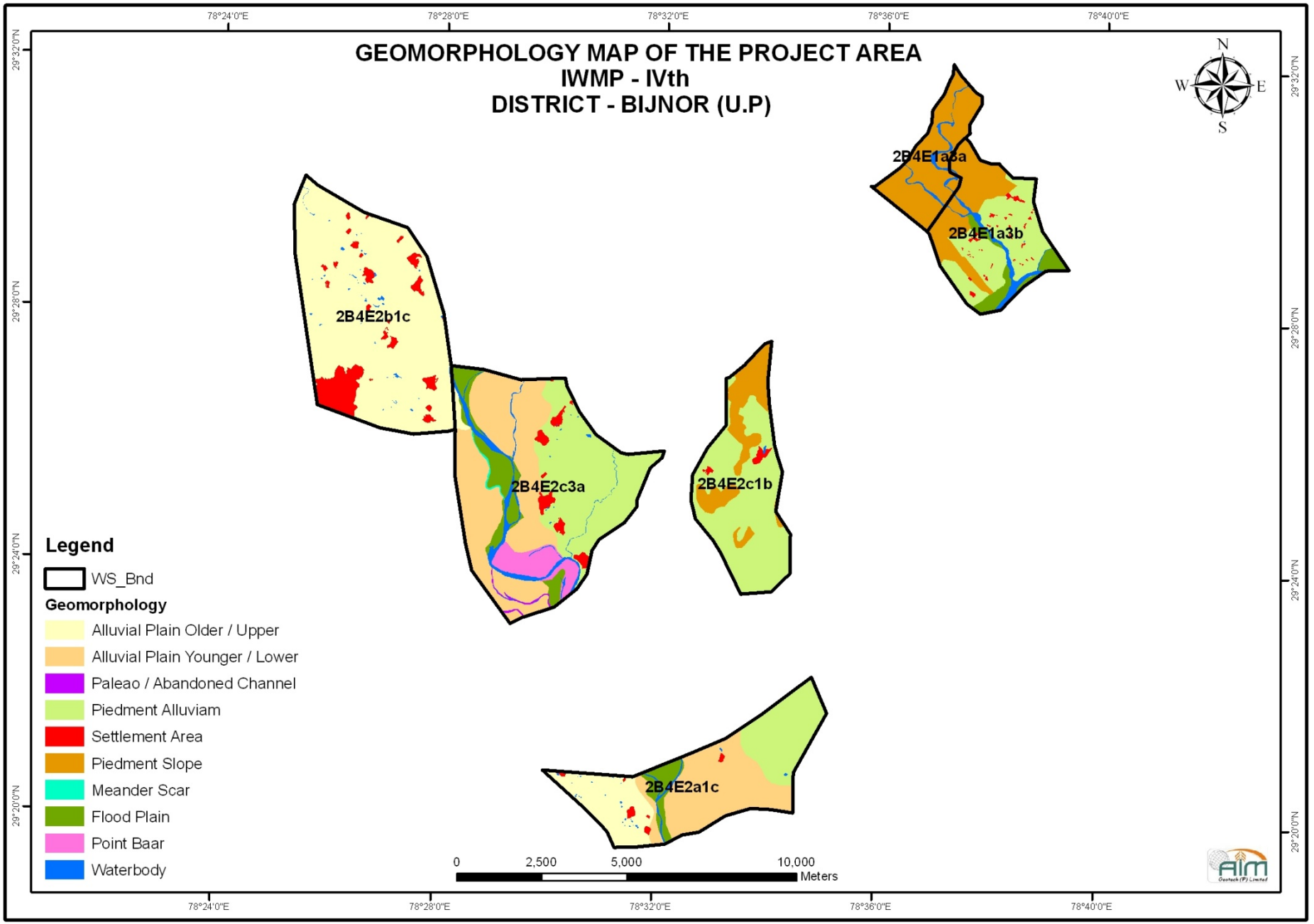

BASE MAP OF THE PROJECT AREA
IWMP - IVth
DISTRICT - BIJNOR (U.P)
N
S
E
W
78°24'0"E
78°28'0"E
78°32'0"E
78°36'0"E
78°40'0"E
29°32'0"N
29°28'0"N
29°24'0"N
29°20'0"N
2B4E1a3a
2B4E1a3b
2B4E2b1c
2B4E2c3a
2B4E2c1b
2B4E2a1c
Legend
Drains
Road
Canal
River_WB
Settlement
0
2,500
5,000
10,000
Meters

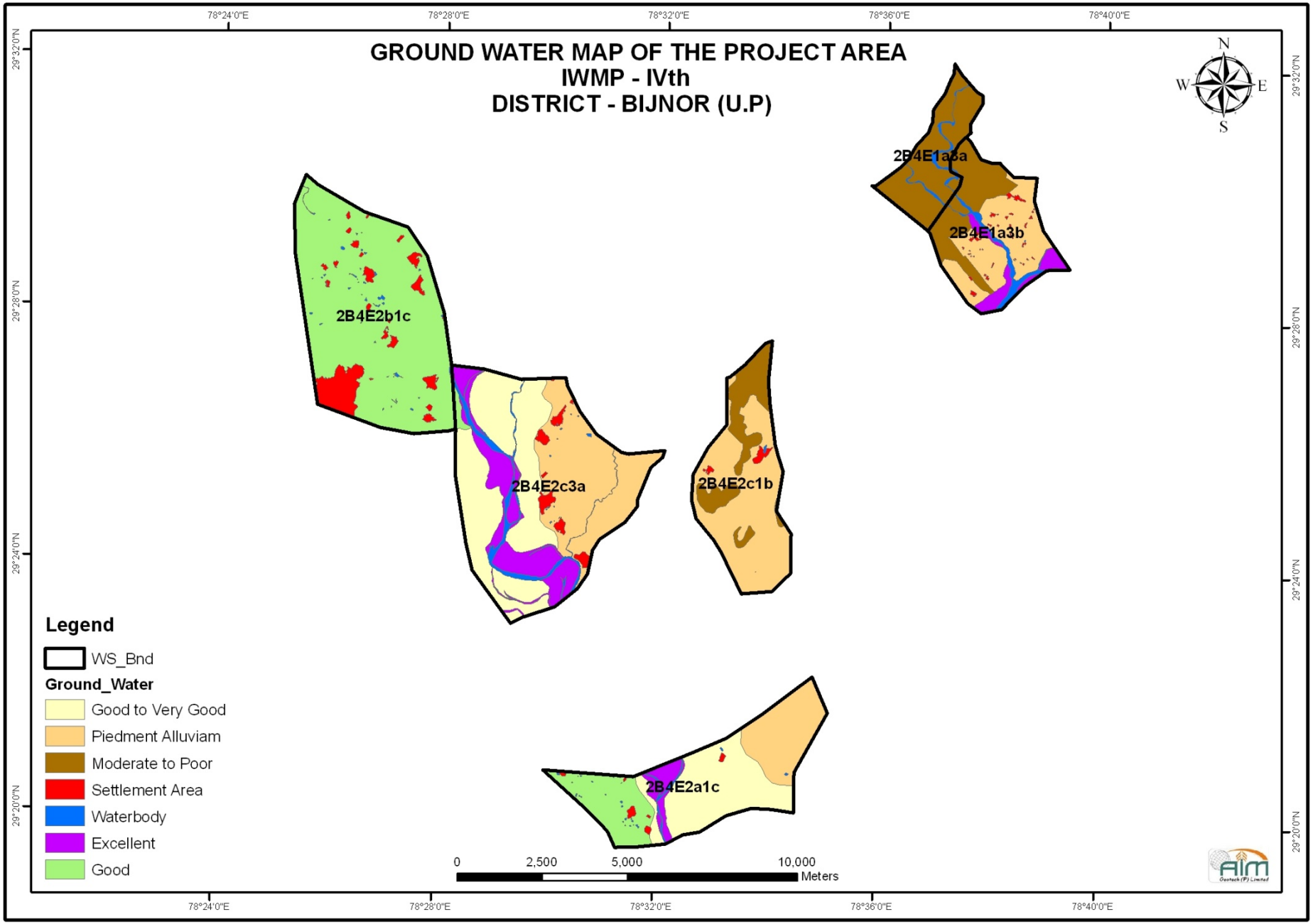

LANDUSE/LAND COVER MAP OF THE PROJECT AREA
IWMP - IVth
DISTRICT - BIJNOR (U.P)
78°24'0"E
78°28'0"E
78°32'0"E
78°36'0"E
78°40'0"E
29°32'0"N
29°28'0"N
29°24'0"N
29°20'0"N
N
S
E
W
2B4E1a3a
2B4E1a3b
2B4E2b1c
2B4E2c3a
2B4E2c1b
2B4E2a1c
Legend
WS_Bnd
Landuse
Brick Kiln
Canal
Crop Land
Fallow Land
Forest
Plantation
Riverine
Scrub Land
Settlement
Waterbody
0
2,500
5,000
10,000
Meters

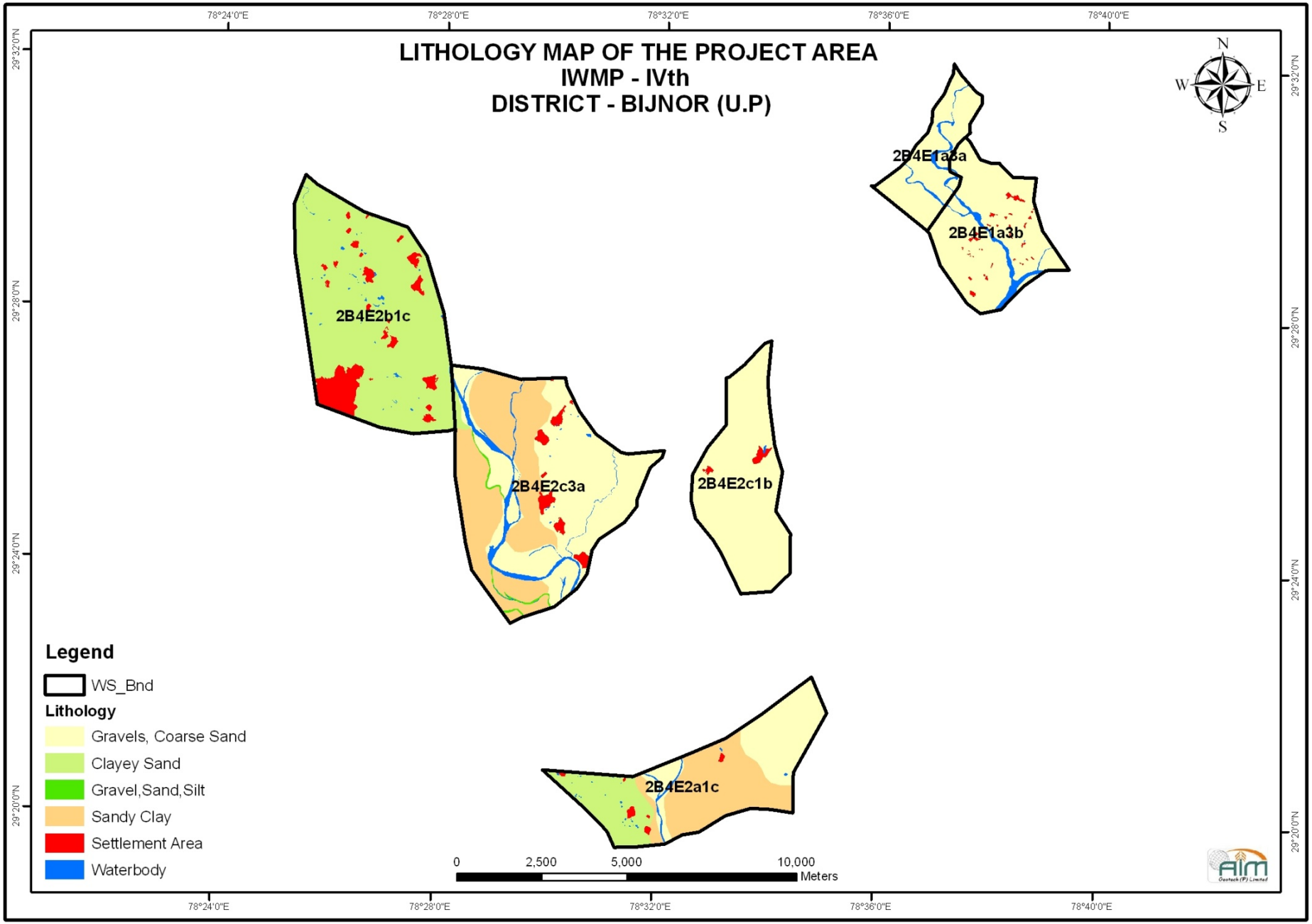

DRAINAGE MAP OF THE PROJECT AREA
IWMP - IVth
DISTRICT - BIJNOR (U.P)
78°20'0"E
78°24'0"E
78°28'0"E
78°32'0"E
78°36'0"E
78°40'0"E
29°32'0"N
29°28'0"N
29°24'0"N
29°20'0"N
N
W
E
S
2B4E1a3a
2B4E1a3b
2B4E2b1c
2B4E2c3a
2B4E2c1b
2B4E2a1c
Legend
Drains
Drain_Buffer
River_WB
River_Buffer
WS_Bnd
2B4E1a3a
2B4E1a3b
2B4E2a1c
2B4E2b1c
2B4E2c1b
2B4E2c3a
0
2,500
5,000
10,000
Meters

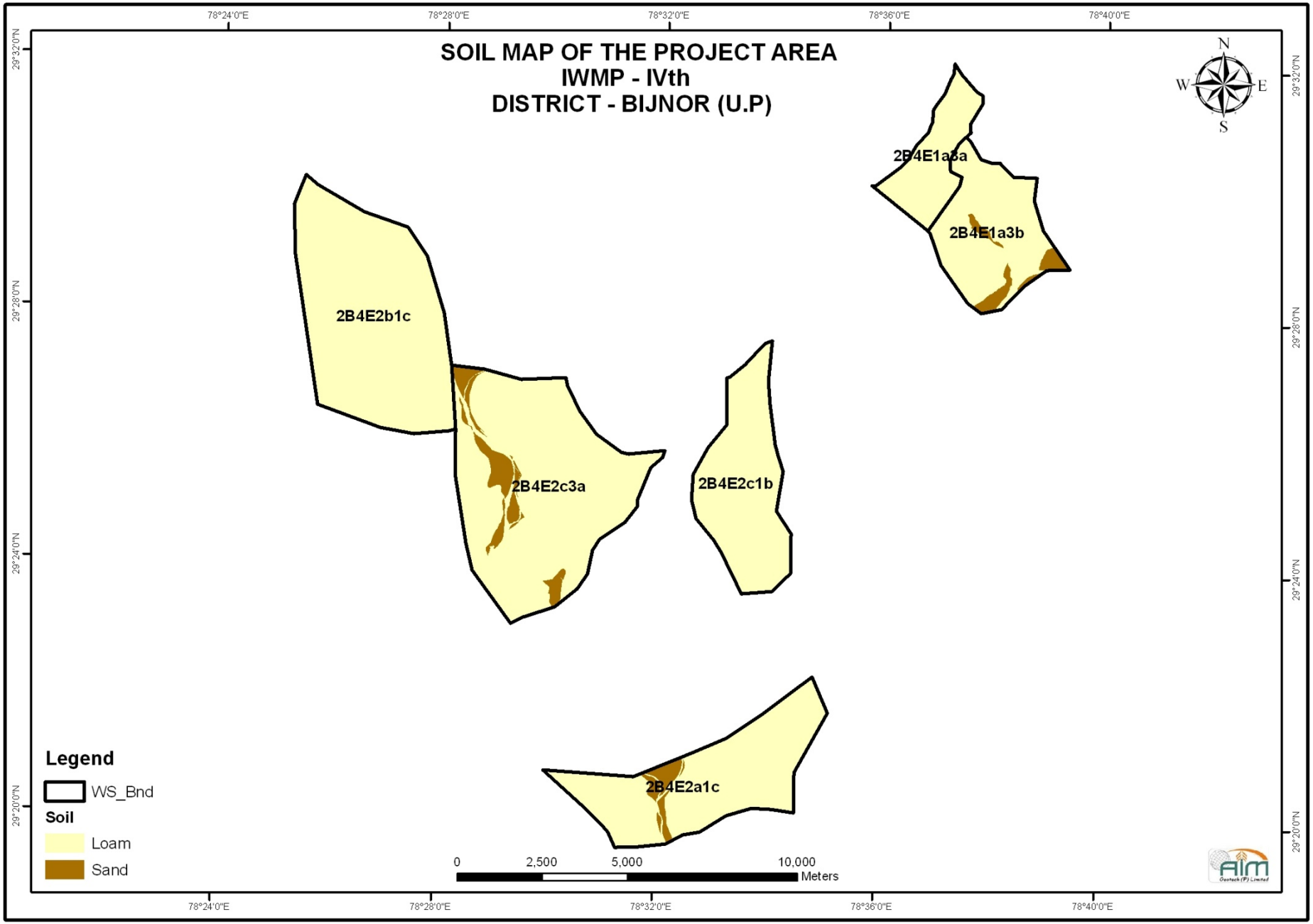

CONTOUR MAP OF THE PROJECT AREA
IWMP - IV th
DISTRICT - BIJNOR (U.P)
N
S
E
W
2B4E1a3a
2B4E1a3b
2B4E2b1c
2B4E2c3a
2B4E2c1b
2B4E2a1c
Legend
Contour_5M
WS_Bnd
(Source : ASTER DEM)
0
2,500
5,000
10,000
Meters
78°22'0"E
78°24'0"E
78°26'0"E
78°28'0"E
78°30'0"E
78°32'0"E
78°34'0"E
78°36'0"E
78°38'0"E
78°40'0"E
78°42'0"E
29°32'0"N
29°30'0"N
29°28'0"N
29°26'0"N
29°24'0"N
29°22'0"N
29°20'0"N


SLOPE MAP OF THE PROJECT AREA
IWMP - IVth
DISTRICT - BIJNOR (U.P)
78°24'0"E
78°28'0"E
78°32'0"E
78°36'0"E
78°40'0"E
29°32'0"N
29°28'0"N
29°24'0"N
29°20'0"N
N
W
E
S
2B4E1a3a
2B4E1a3b
2B4E2b1c
2B4E2c3a
2B4E2c1b
2B4E2a1c
Legend
Watershed Boundary
SLOPE
0 % to 1 % (Nearly Level)
1 % to 3 % (Very Gentle Sloping)
3 % to 5 % (Gentle Sloping)
5 % to 10 % (Moderate Sloping)
10 % to 15 % (Strong Sloping)
15 % to 35 % (Moderate Steep to Steep Sloping)
> 35 % (Very Steep Sloping)
(Source : ASTER DEM)
0
2,500
5,000
10,000
Meters


GEOMORPHOLOGY MAP OF THE PROJECT AREA
IWMP - IVth
DISTRICT - BIJNOR (U.P)
78°24'0"E
78°28'0"E
78°32'0"E
78°36'0"E
78°40'0"E
29°32'0"N
29°28'0"N
29°24'0"N
29°20'0"N
N
S
E
W
2B4E1a3a
2B4E1a3b
2B4E2b1c
2B4E2c3a
2B4E2c1b
2B4E2a1c
Legend
WS_Bnd
Geomorphology
Alluvial Plain Older / Upper
Alluvial Plain Younger / Lower
Paleao / Abandoned Channel
Piedment Alluviam
Settlement Area
Piedment Slope
Meander Scar
Flood Plain
Point Baar
Waterbody
0
2,500
5,000
10,000
Meters


GROUND WATER MAP OF THE PROJECT AREA
IWMP - IVth
DISTRICT - BIJNOR (U.P)
78°24'0"E
78°28'0"E
78°32'0"E
78°36'0"E
78°40'0"E
29°32'0"N
29°28'0"N
29°24'0"N
29°20'0"N
N
S
E
W
2B4E1a3a
2B4E1a3b
2B4E2b1c
2B4E2c3a
2B4E2c1b
2B4E2a1c
Legend
WS_Bnd
Ground_Water
Good to Very Good
Piedment Alluviam
Moderate to Poor
Settlement Area
Waterbody
Excellent
Good
0
2,500
5,000
10,000
Meters


LITHOLOGY MAP OF THE PROJECT AREA
IWMP - IVth
DISTRICT - BIJNOR (U.P)
78°24'0"E
78°28'0"E
78°32'0"E
78°36'0"E
78°40'0"E
29°32'0"N
29°28'0"N
29°24'0"N
29°20'0"N
N
S
E
W
2B4E1a3a
2B4E1a3b
2B4E2b1c
2B4E2c3a
2B4E2c1b
2B4E2a1c
Legend
WS_Bnd
Lithology
Gravels, Coarse Sand
Clayey Sand
Gravel,Sand,Silt
Sandy Clay
Settlement Area
Waterbody
0
2,500
5,000
10,000
Meters


SOIL MAP OF THE PROJECT AREA
IWMP - IVth
DISTRICT - BIJNOR (U.P)
78°24'0"E
78°28'0"E
78°32'0"E
78°36'0"E
78°40'0"E
29°32'0"N
29°28'0"N
29°24'0"N
29°20'0"N
N
S
E
W
2B4E1a3a
2B4E1a3b
2B4E2b1c
2B4E2c3a
2B4E2c1b
2B4E2a1c
Legend
WS_Bnd
Soil
Loam
Sand
0
2,500
5,000
10,000
Meters

PREPARATION OF DPR

Detail Project Report of Integrated Watershed Management Programme IWMP- I had been prepared through base line/ bench Mark survey for physiography climate, soil, land use, vegetation, hydrology and socio economic data analysis. PRA have been exercised to collect primary data, secondary data have been collected from Revenue, Statistics department, Statistical Magazine of the district, Bijnor ,department of animal Husbandry,development, Topo sheet (1 : 50000) survey of India- Dehradoon and technical & specific input and health with preparation and drafting of detail project report.

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7	Shri V.P. Singh	Jr. Engg., IWMP- IV,Bijnor
8	Shri P.K. Aggrawal	Accountant, IWMP- IV,Bijnor
9	Shri K. K. Tiwari	Jr. Clerk, IWMP- IV,Bijnor
10	Shri Surendra Singh Punia	A.S.C.I., IWMP- IV,Bijnor
11	Shri Devendra Singh	A.S.C.I. , IWMP- IV,Bijnor
12	Shri R.K. Pathak	A.S.C.I., IWMP- IV,Bijnor
13	Shri J.B. Jain	A.S.C.I. , IWMP- IV,Bijnor
14	Shri Aman Kumar	A.S.C.I., IWMP- IV,Bijnor
15	Shri Mohan Lal	Jile Dar, IWMP- IV,Bijnor
16	Shri Gorelal	Irrigation Superviser, IV,Bijnor

DPR PLAN ABSTRACT

The collection of all the relevant data of watershed area and the possible option and solution are described with the help of feedback of focused discussion and detailed perspective plan for the watershed area with year wise and activity wise summarized for the DPR plan abstract for 5 years (2010-11 to 2013-14).

The summary of the above document is verified by the following persons:

Prepared By:

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District – Bijnor

Technically Approved By:

Deputy Director
Dept. of Land Development & Water Resources
Region – Moradabad

Physically & Financially Approved:

Project Director
District Rural Development Authority
District – Bijnor

Chief Development Officer
District – Bijnor