Impact Assessment Study of Kalyanpura Watershed Project, Bhilwara District, Rajasthan

Final Report

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ITC Limited, Kolkata

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ABSTRACT

This public-private partnership for watershed development in Mandalgarh Tehsil of Bhilwara proposed to develop 5,000 hectares through financial support from the Government of Rajasthan and the ITC - Rural Development Trust. It was formally launched on March 6, 2007 and was primarily aimed at strengthening the ecological and institutional foundations for better and viable rural livelihoods in the Bhilwara district of Rajasthan. It has also demonstrated a viable model for bringing various partners (the Government of Rajasthan, the ITC - Rural Development Trust, Foundation for Ecological Security, Zila Parishad-Bhilwara and the respective Panchayats) to address critical issues of natural resource management.

The watershed development has led to significant economic development of the rural area, augmenting employment generation, and therefore significantly contributing to increased social well being in the rural area. Awareness on improved farm techniques due to the watershed development project has helped in major savings and augmented monthly family incomes across the programme area. This has not only led to better living conditions but also increased access and health in the region. Watershed development has significantly contributed to better land utlization, increased net cropped area and consequently, to increased cropping intensities across the programme villages. With an increase in irrigation due to the watershed development project a large percentage of non cropped areas have been brought under cultivation. Increase in livestock was also observed in the programme villages. The increase in livestock is a reflection of not only increased incomes as a result of watershed development but also increased availability of fodder and sufficient water in the programme area. Increased incomes has also percolated to increased financial security and asset creation (like land, housing and livestock) in the programe area.

The watershed development project has therefore not only strengthened capacity of village institutions and panchayats but also reduced the effects of inter annual rainfall variability on crop and livestock production in the programme area. Watershed development has therefore played a major role in restoring the functionality of different landscape components, restored ecological integrity and also increased household incomes through the strengthening current livelihood strategies, introducing new ones and diversifying sources of income.

1. PROJECT RATIONALE

Watershed development aims to balance the conservation, regeneration and use of land and water resources of communities within a watershed. Common benefits from successful watershed development projects include improved agricultural yields and increased access to drinking water. The overall attributes of the watershed development approach, by and large, are three fold, viz. promoting economic development of the rural area, employment generation, and restoring ecological balance. Multiple objectives include:

a. **Environmental** - Protection of vegetative cover throughout the year, to create an ecological balance in the watershed area, protection of fertile top soil, and utilisation of land based on its capabilities, in situ conservation of rain water, increase in ground water recharge, etc.

b. **Economic** - Increase in cropping intensity through inter and sequence cropping, maximizing farm income through agricultural related activities such as dairy, poultry, sheep and goat farming, improved and sustained livelihood status of the watershed community with special emphasis on the poor and women, etc.

c. **Institutional** - This includes formation of watershed committees and self-help groups, establishing sustainable community organization, etc. to manage, control and sustain the treatment methods and assets created through watershed programs.

d. **Social** - It includes alleviation of poverty, awareness generation, improving skills of the local communities, capacity building activities, women's participation in decision-making processes, empowerment of the community, etc.

e. **Equity** - Promote and develop systems for equitable distribution of the benefits of land and water resources and the consequent biomass production, involvement of village communities in participatory planning, implementation, social and environmental management, maintenance of assets and to operate in a more socially inclusive manner.

ITC through its "Mission Sunhera Kal" has been empowering rural communities to adopt sustainable changes that make them economically competitive and socially secure. To accomplish this change, ITC targets four problems, which it believes are the fundamental obstacles to productivity and growth in the farm sector. These are:

- Loss of productivity through soil erosion caused by intensification of land use and decline of water tables and forest resources;
- Dependence on out-moded farm practices and inferior inputs;
- Loss and disruption of farm incomes and non-availability of alternative livelihoods;
- Inadequate access to primary education and healthcare.

The Kalyanpura Watershed in Mandalgarh Tehsil of Bhilwara District in Rajasthan is India's first PPP project for water resource development between the Government of Rajasthan and ITC, and was signed in 2007-08. This partnership was an innovative attempt to create a multi stakeholder partnership [Government of Rajasthan, ITC-Rural Development Trust, Foundation for Ecological Security, Zila Parishad - Bhilwara, respective Panchayats and the communities] to address the critical issues of natural resource management and set an example of model practices for scaling up such initiatives.

The integrated watershed development initiative of ITC's was to develop 5,000 hectares through financial support from the Government of Rajasthan and the ITC - Rural Development Trust, a key intervention to reverse moisture stress in some of the more acutely affected, drought-prone districts of the country. This

programme aimed to achieve two critical objectives: water conservation and soil enrichment. ITC has been working on Watershed Development since 2000-01, towards this objective, and is presently running a large number of projects across several states by partnering with NGOs. The community has been a critical area of focus in the watershed programme and the project therefore, aimed to address participative development and long term sustainability by:

- Demonstrating an efficient public delivery system in NRM programmes through a model public-private partnership.
- Creating enduring value through capacity enhancement of Panchayati Raj Institutions for effective and efficient implementation of rural development programmes.
- Demonstrating a framework of synergy between relevant stakeholders to optimise the delivery process.
- Creating opportunities for eco restoration by improving biomass cover through re-vegetation measures in the commons and private wastelands.
- Assisting rural communities in undertaking appropriate soil and water conservation measures
- Strengthening community - based governance of biomass and water resources by initiating and intensifying local village based institutions.
- Promoting suitable interventions which could provide sustainable on and off farm livelihoods and therefore play a role in mitigating seasonal out-migration.

The implementation model mobilises a four-way partnership between village communities, specialist NGOs, the Government and ITC, bringing the best relevant management and technical expertise. Through this model ITC enables farmers to implement sustainable solutions that are:

- Mutually reinforcing;
- Based on knowledge transfer and co-operative application of technology;
- Dependent on mobilization and optimization of local resources.

ITC's watershed development constitutes water user groups and trains them to plan and build water harvesting structures like contour bunds, check dams, percolation tanks and farm ponds. Trained farmers use their knowledge of the terrain to identify locations for building water structures and develop the related micro plans. Currently, 1671 small and large water harvesting structures built by ITC provide critical irrigation in Andhra Pradesh, Karnataka, Madhya Pradesh, Tamil Nadu and Rajasthan.

In 2010-11, (the fourth year of the project), the focus of the programme broadened its shelf of activities to further enhance the participation of different sections of the community, not only to fulfill the larger principles of watershed development, but also contribute to the holistic development of the region. A range of physical interventions, such as contour trenching, construction of LBCD and Gully Plugs to conserve soil and reduce the flow of water to the drains and pasture land development to augment fodder availability, were undertaken in the region.

A similar consistent effort was demonstrated to improve and introduce newer and sustainable ways of supporting agricultural production in the area as also improve water use efficiency. But the main crux of the project lay in mobilizing people to regenerate and conserve natural resources for a better and sustainable future. Identification and enabling the capacities of a group of para workers and rural volunteers was another step towards sustainable self management of the programme, post withdrawal phase, that was actively advocated in the area.

2. OBJECTIVES & METHODOLOGY OF STUDY

As the project will be completed in the year 2012-13, the purpose of this study was to assess if such a model provided a more efficient delivery platform for implementation of watershed projects in terms of speed of implementation, quality of intervention and robustness of village institutions created.The main objectives of the study was therefore to assess the following:

i. Identify the socio-economic impact of the intervention on all the beneficiary households, including changes if any in groundwater recharge, productivity, cropping intensity and farm incomes and employment.
ii. Understand the perspectives of the community with regard to joint management of resources.
iii. To conduct a comparative analysis of IWMP projects in the same year of inception as this i.e, any other watershed that has same inception year (2006) with the PPP model so as to bring out any differences in terms of processes, progress and impacts.
iv. Identify the constraints operating during the implementation of the program and recommend ways to overcome them.
v. Study the role of various agencies in the implementation of the project and assess the sustainability of the projects in terms of village level institutional mechanisms built in the programme area
vi. To analyse the status of implementation in accordance with the Five Year Plans.
vii. To analyze the impact on soil health including soil carbon, de-siltation and organic matter due to the intervention.
viii. Outline the community institutional strengths and allied outcomes of the projects like changes in socio economic scenario, employment generated and community development.

The specific terms of reference of the study were:

1. Kalyanpura Watershed Details: its administrative location, map, names of villages covered, village census (of India) details
2. Technical details: catchment area, pre-project cropping pattern, soil survey details, pre-project groundwater, status, implementation details, etc.
3. Socio-economic impact on beneficiary households
4. Impact on farming sector: changes in cropping pattern, cropping intensity, crop yields, farm incomes and employment in farm sector
5. Impact on groundwater recharge (levels): data on pre-monsoon, post-monsoon & February water levels of nearby sample wells monitored by the groundwater department.
6. Data on cultivable area: land use pattern of villages
7. Data on fodder availability: area under fodder crops for last 5 years, production-yield details
8. Data on average rainfall
9. Sediment recorder data analysis & other innovative practices
10. Details of NREGA, programs of agriculture, Animal Husbandry and Dairy Departments in the project area
11. GIS Maps on land use, cropping intensity & varieties, geo-hydrological maps, watershed area maps & treatment maps
12. Livestock details
13. Soil survey details of project area, impact on soil health including soil carbon, desiltation and organic matter

14. Comparative analysis of IWDP projects in the similar year of implementation (inception year 2006) with the PPP model
15. Analysis of status of project implementation in accordance with the Five Year Plan
16. Constraints operating during implementation of the program & recommendations to overcome them
17. Role of various agencies in the implementation of the project and its sustainability in terms of village-level institutional mechanisms built up
18. Community institutional strengths and allied outcomes of the project: changes in socio-economic scenario, employment generation & overall community development

Methodology

The methodology followed for the study is explained below:

1. **Programme Data Review**

Past programme data (programme monitoring data and reports and documents pertaining to the project) was analysed to review past performance of the watershed development project

2. **Development of survey instruments**

- Reconnaissance field visit was conducted for programme data collection, fieldwork planning and orientation
- **Quantitative Survey** - The pre-coded survey instruments – in depth interviews, for beneficiary, control group households, and ITC service providers were developed.
- **Qualitative Survey** – Separate Discussion Guides (DG) for the Focused Group Discussion was developed for the beneficiary and the control group households.
- All the survey instruments were translated in Hindi
- Field-testing / Finalization of Survey Instruments & Reference Manuals was conducted prior to the survey.

Quantitative study at Village Madhupuria

Focussed group discussion at Jassuji Ka Kheda

3. **Sample selection**

- Sample frame was created using the sampling criteria developed, to collect baseline data from 19 villages spread across Mandalgarh Tehsil in Bhilwara

- Village sample selection - All 19 villages were selected for the survey
- Hamlet Selection was based on contour of the villages to ensure coverage of the various upper, middle & lower ridges of the village. Approximately 3 hamlets/area was thus selected from each village.
- Beneficiary Household selection was based on a random starting point and skip pattern from the village ITC beneficiary list available. Around 12 (4 x 3 ridges) beneficiary households per village was selected for the survey. A total of 228 beneficiaries were contacted.
- Control Group (non-beneficiary) Household selection was based on a random starting point (drinking water source) and skip pattern in 5 non - ITC project villages of a comparable size. Around 10 non ITC - beneficiary control households per village (5 sample villages) were selected for the survey. A total of 50 non beneficiaries were contacted.
- Respondents were the chief wage earners
- Around 19 service providers (1 from each sample village) was selected for an in depth service provider interview
- Qualitative focused group discussions were conducted in 6 randomly selected villages, with 8 – 10 farmers each

4. **Data collection, data cleaning and analysis**

- The survey was conducted in the months of November and December 2012 by a team of 15 field researchers.
- The quantitative data was analysed using SPSS, content analysis etc. to enumerate socio – economic impact as a cause of watershed in the region. The qualitative surveys (FGDs/IDIs) were transcribed, and the content was analysed.
- Subsequently the secondary information, quantitative data and qualitative findings were triangulated for the preparation of the draft report. The report was finalised after incorporating the feedback received from the relevant departments of ITC Watershed development project.

3. KALYANPURA WATERSHED DETAILS

Bhilwara District is situated at the south-eastern part of Rajasthan. It is surrounded by Ajmer in the north, Chittorgarh in the south, Udaipur in the west, and Bundi in the east. It has a total area of 10, 455 sq km with a population of around 2.4 million.

The district is now divided in to twelve sub-divisions, viz., Bhilwara, Banera, Shahpura, Gangapur, Gulabpura, Mandal, **Mandalgarh**, Asind, Kotdi, Bijoliyan and Jahazpur. Each sub division is under the charge of a sub divisional magistrate. These sub-divisions are further sub-divided into twelve Tehsils, Bhilwara, Banera, Mandal, **Mandalgarh**, Bijoliya, Kotri, Shahpura, Jahajpur, Sahada, Raipur, Asind, Hurda and four Sub Tehsils. They are Kareda (Mandal), Badnor (Asind), Hamirgarh(Bhilwara) and Puliakalan (Shahpura). These tehsils are again sub-divided into Patwar circles and villages. Bhilwara has 1783 villages as per census of 2002.

Mandalgarh Tehsil is situated at a distance of 54 km South - East of Bhilwara Town. It has an average elevation of 382 metres (1253 feet) above mean sea level (MSL). As of 2001 India census, Mandalgarh had a population of 21,569 males who constituted 51% of the population and females, who constituted 49%. Mandalgarh has an average literacy rate of 50% which is lower than the national average of 59.5%; male literacy stands at 63%, and female literacy at 36%. In Mandalgarh, 15% of the population is under six years of age.

Topography & Terrain

The topography of Kalyanpura watershed is uneven and undulating reaching a maximum height of 520 m above sea level and a minimum of 320 m below mean sea level. The area is highly undulating with enormous rocks and a thin soil cover. Rocks are highly fractured and rough. The general slope of the watershed lies in the northeast direction.

Population

This watershed comprises of five Panchayats, 18 revenue villages and seven hamlets situated 25 kms north-northeast of Mandalgarh. It supports 1473 households with a total population of 5674 (as per Census 2001).

Table 1: Village profile of the Kalyanpura Watershed

Sr no	Village	Code No	No of HH	BPL	APL	SC	ST	OBC / GEN	TOTAL
1	Mukangarh	2932200	103	43	60	34	2	67	103
2	Dhanji ka kheda	2931600	65	30	35	34	-	31	65
3	Mala ka kheda	2930000	39	20	19	-	4	35	39
4	Achlaji ka kheda	2930100	95	57	38	-	1	94	95
5	Jhanjola	2930300	135	23	112	52	7	76	135
6	Bagatpura	2929400	46	16	30	4	-	42	46
7	Jassuji ka kheda	2929800	136	25	111	22	3	111	136
8	Jethpura (hamlet of Jassuji ka kheda)		42					42	42
9	Dudhaji ka kheda	2931300	29	4	25	7	-	22	29
10	Nathji ka kheda	2929900	57	17	40	6	3	48	57
11	Madhupuriya	2928700	46	1	45	20	-	26	46
12	Rajpura	2928800	89	2	87	16	2	71	89
13	Amli	2929700	164	20	144	33	11	120	164
14	Salampura	2929500	83	5	78	7	-	76	83
15	Bikran	2931100	246	69	177	18	49	179	246
16	Deopuriya	2934700	28	7	21			28	28
17	Chawandiya	2929600	58	6	52	-	8	50	58
19	Devgarh	2931500	12			6	5	1	12
			1473			259	95	1119	1473

The data of the following section of the report has been extracted from the Kalyanpura Bio-diversity Report.

Catchment area

Kalyanpura watershed, located approximately between 250° 17' N - 250° 24'N and 750° 9' E – 750° 15' E, lies in the southern part of Bhilwara in Mandalgarh Tehsil; it forms a part of the larger confluence of the Aravali and Vindhyan mountain ranges, and is also a part of Mej river which is a tributary of the Chambal River lying on the left bank of the river Mej. The Jetpura dam, situated on Unli River (a tributary of the River Banas) also shows significant influence across the area and the watershed. It exhibits a peculiar characteristic, forming a gorge with high banks and occasional waterfalls. The watershed is 70 km from Bhilwara city.

The area is characterized by degraded commons, a depleting water table, subsistence agriculture and incessant migration. The project area falls under the Macro water number 090406 (micro ws no: 2,3,4,5,6) and Macro: 090407 (micro ws 1,2,3,4,5,6,7,8,9) which forms the catchments of the Mej river. The area falling in the semi-arid region has an average annual rainfall of 700 mm.

Table 2: Detailed profile of the Bhilwara watershed

S. No.	Name of Sub-watershed	Gram Panchayat	Micro-Watershed	Villages	Area *(%)*
1	Dudha ji ka khera	Bikran	7/6	Dudha ji ka khera	452 (*9.0%*)
2	Takhta ji khera	Bikran	7/6 & 7/7	Thakta ji ka khera & Dudha ji ka khera	400 (*8.0%*)
3	Amli	Jassuji ka Kheda	6/4 & 6/3 part of Deopuriya	Amli, ChawandiyaDeopura	500 (*10.0%*)
4	Salmpura	Jassuji ka Kheda	6/4 part	Salampura, Bakhatpura	573 (*11.5%*)
5	Jassuji ka Kheda 1st	Jassuji ka Kheda	6/5 & 6/6	Keriya, JKK	610 (*12.2%*)
6	Jassuji ka Kheda 2nd	Jassuji ka Kheda	7/1 & 7/3	JKK & Nath ji ka khera	502 (*10.0%*)
7	Nathji ka khera I st	Jassuji ka Kheda	7/3	Nath ji kakhera	500 (*10.0%*)
8	Nath ji ka khera 2nd	Jassuji ka Kheda	7/4	Nath ji ka khera	455 (*9.1%*)
9	Jhanjola	Jhanjola	7/2,7/8,7/9	Achla ji kakhera, Jhanjola	384 (*7.7%*)
10	Rajpura	Sarthala	6/2; & 6/3	Rajpura, Madhupuriya	519 (*10.4%*)
11	Deogarh	Srinagar	7/5	Deogarh	105 (*2.1%*)
	Total			**5000 (*100.0%*)**	

The sub watersheds of Jassuji ka Kheda GP contributes to over 70% of the total area covered by the project.

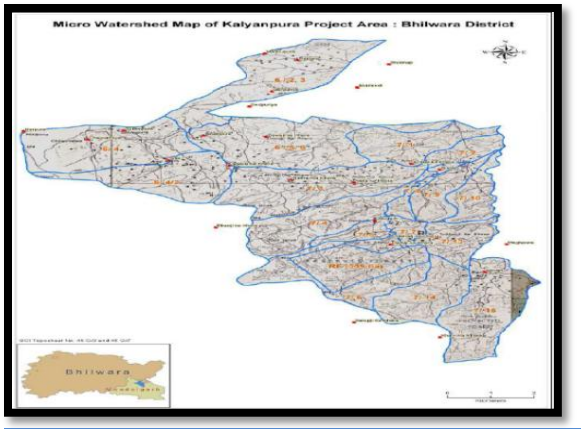


Figure 1: The watershed is the part of the Mej River which is a tributary of Chambal River and lies on the left bank of river Mej. The Survey of India toposheet no for this area is 45-O/3 (in 1:50,000 scale).

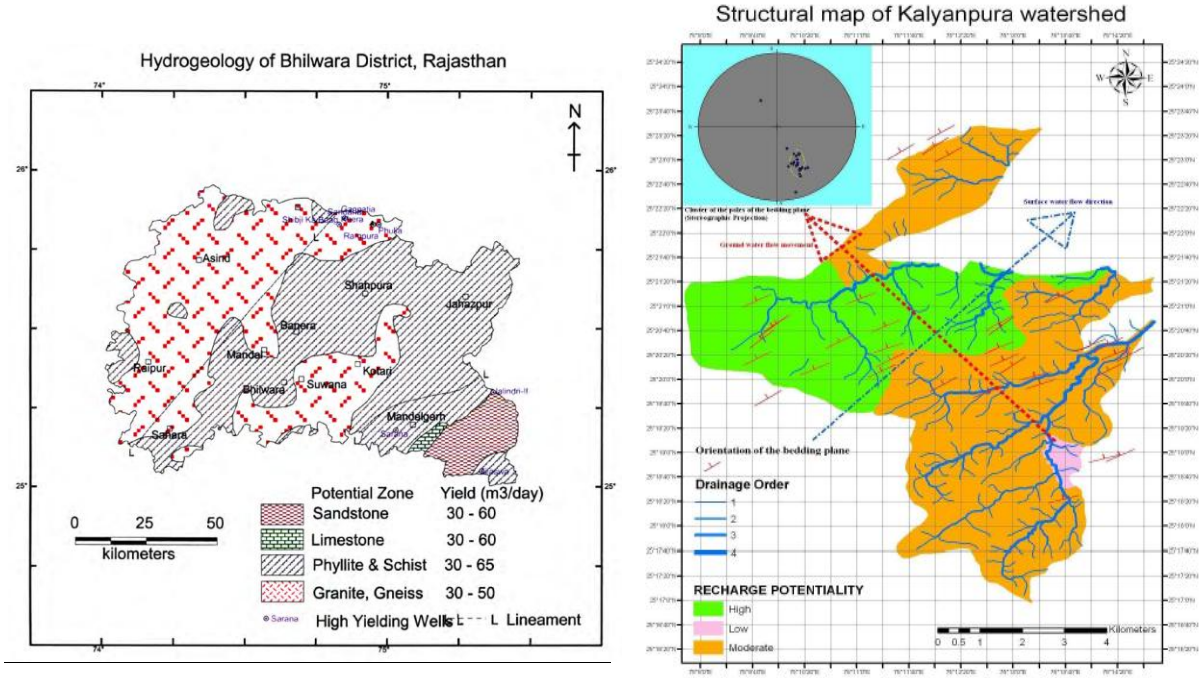
Geological Profile

The watershed area is a part of the sedimentary basin with characteristic evidences of minor and low grade metamorphism (Upper Vindhyan Super Group formed during the late proterozoic and early Cambrian eras). The area consists of shale, slate, phyllite and quartzite with minor inclusions of local quartz veins which resemble the Bhander group. The general trend of the bedding planes and foliations follows a NE-SW direction, albeit with local variations. Due to the active structural disturbances and physical processes operating in the area, the rocks appear highly fractured, with some of the fractures extending to a great depth. Geo-hydrologically, these fracture planes have opened the space for percolation of water and therefore, the area is good in terms of recharge capacity. Shale is the main rock in this area, which has consequenly metamorphosed to form slate and phyllite.

The compaction of shale and slate does not leave any porous spaces within the rock but enormous fractures throughout the area. This has enabled the rocky surfaces to make a path for flowing water to recharge the ground water table. Therefore, the surfaces may not hold water within itself, due to the absence of pores, the interconnected fracture zones can hold water, and supply the same to the upper unconfined aquifers.

Simultaneously, water can also percolate to a greater depth through these fractures in many places to recharge the deeper confined and semi-confined aquifer slowly. Further details on the geology and hydrology are given in chapter on Geohydrology

Figure 2: Geohydrological maps of Kalyanpura Watershed



Geo-Hydrology

The major water bearing formations in the area are gneiss and schist (Bhilwara Supergroup); gneiss, schist, phyllite, slate and limestone (Aravalli Supergroup); sandstone, shale and limestone (Vindhyan Supergroup) and alluvium. Ground water occurs under unconfined and semi-confined conditions. The weathered zone below the water table acts as a good storage. The joints, fissures and other plains of structural weakness as well as their

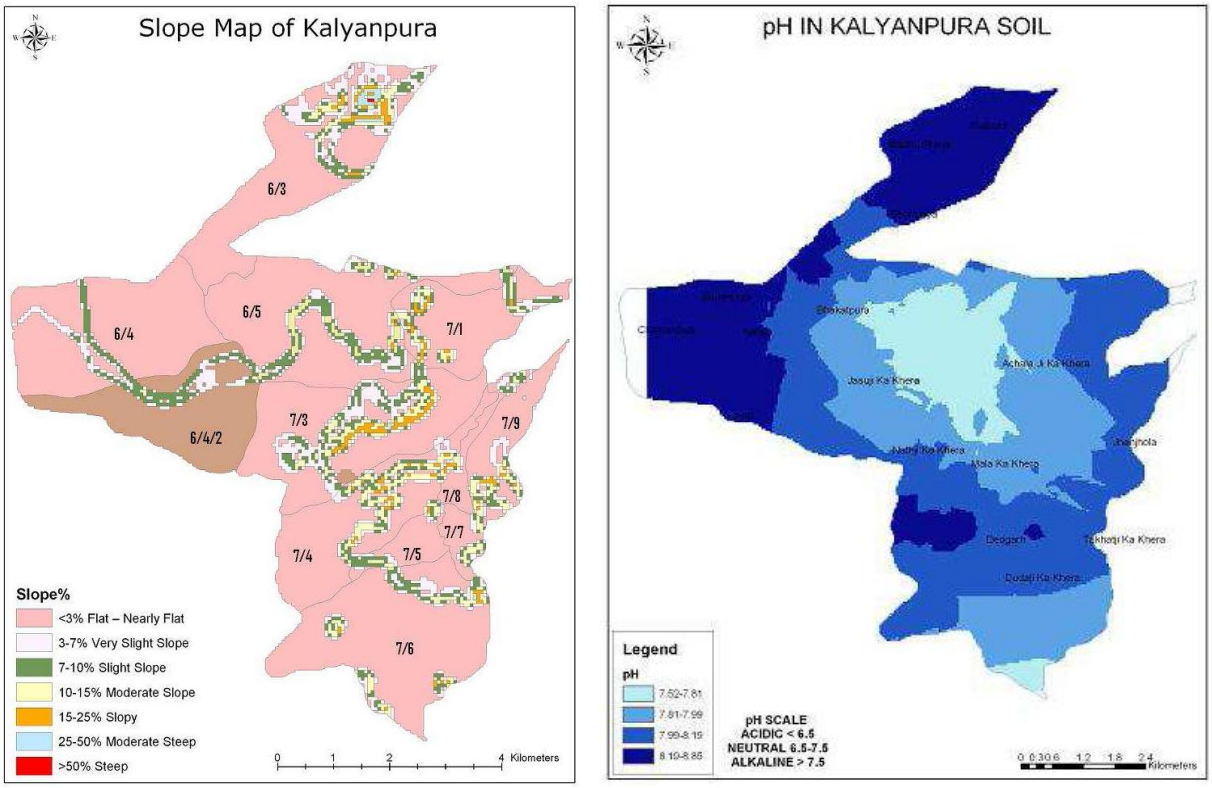
extent, size, opening and inter connections, control occurrence & movement of ground water. Weathered gneiss forms the upper part of the bedrock in the area.

Weathered gneiss with schist occupies most of the northern parta under a thin cover of alluvium. In schists, phyllites and slates, the weathered zone extends to depths greater than granites and gneisses. Muscovite schist often grade into gneiss in these areas. These have well-developed foliations and irregular joints and are intruded by granite, amphibolite, pegmatite and quartz veins. The contact between these intrusives and schist, provide a good channel for ground water circulation.

Dug wells in Gangapur and the Bhilwara area which tap the gneiss and mica schist yield between 25 & 50 m^3 of water per day. Phyllites and schists predominate the eastern parts of the district near Shakargarh, Amalda and Kachola as also the northern part of the Great Boundary Fault. These formations are intercalated with dolomitic limestone, quartzite and basic intrusives. The depth of wells which tap these formations varies between 15 to 50 m. The yield of such wells vary between 30 to 45 of water per day.

Dolomitic limestone is grey to light brown and compact at the surface. It forms an aquifer intercalated with slates and phyllites around Bagota, Laxmipura, Rampura, Amargarh, Dolpura, Kishangarh, Bakli, Bhajgarh, west of Banakhera, Mal Ka Khera, northeast of Mohanpura, Ladpura and Ratiya Khera. The depth of wells here, generally ranges between 15 to 35 m yielding 50 to 60 m^3 of water per day. Quartzite generally intercalates with phyllite and slate in the area. These are brown coloured, hard and jointed. The thickness of the weathered and fractured zone ranges between 10 to 30 m. The depth of dug wells here is generally more than 20m. Yield of the dug wells varies between 15 to 25 m^3 of water per day.

Figure 3: Slope classes in Different Micro-watersheds in Kalyanpura & Soil pH



The information of the following section is extracted from the District Groundwater Brochure prepared by the Central Ground Water Board June, 2008.

Geomorphology & Drainage

Bhilwara district consist of fairly open plains in the north and southeast with a few hillocks and undulating plains & hills in the south and north-eastern part. Occasional inselberg, low-lying hillocks and chains of ridges break the monotony of the peneplained tract. The area of the district is generally gently sloping except in the western & north-western part where it is steep. Geomorphologically, the district is divided into the following units:

Table 3: Geomorphology of Bhilwara district

Origin	Landform Unit	Occurrence
Fluvial	Alluvial Plain	Along rivers- Khari, Masi, Banas, Kothari
	Valley Fill	Small scattered patches in east & west
	Ravine	Along Berach River in south
Denudational	Pediment	Scattered in entire district, mainly in east & west
	Buried Pediment	Almost entire district except in east, southeast & north
	Intermontane Valley	Scattered in east & southeast
Aeoline	Sandy Plain	North
Structural	Plataeu	Southeast
Hills	Linear Ridges	Near Jahazpur town
	Structural Hill	In northwest & eastern part of the district and Bhilwara town

Bhilwara district falls in the Banas (9157.2 sq km), Chambal (1164.9 sq km) & Luni basins (133.0 sq km). The breakup of the basin area falling in various tehsil is enumerated below:

Table 4: Breakdown of the Bhilwara district into basins

S No	Block	Area in sq km		
		Banas Basin	Chambal Basin	Luni Basin
1	Asind	1161.3	0	133.0
2	Banera	725.3	0	0
3	Suwana	674.8	0	0
4	Hurda	962.2	0	0
5	Jahazpur	779.8	468.8	0
6	Kotri	686.8	0	0
7	Mandal	1156.5	0	0
8	Mandalgarh	668.4	696.1	0
9	Raipur	533.5	0	0
10	Sahara	494.9	0	0
11	Shahpura	1313.6	0	0
	Total	**9157.1**	**1164.9**	**133.0**

The major River of the district is Banas, which flows in a northeast to easterly direction. It enters Bhilwara near the village Doodiya in the west, flows east and takes an abrupt turn in the north-northeastern direction near Bigod, downstream of the confluence with Berach River, taking a turn again in an easterly direction near Kanti , and finally flows northeast till it enters Tonk district. The total length of the Banas River is 142 km in Bhilwara

district. The channel pattern of Banas is sinuous and changes to more or less a straight line between Bigod and Rajamahal indicating structural control on the drainage pattern. Important tributaries are Berach, Kothari, Unli, Mendi, Nakadi, Chandrabhaga and Khari River. All these are ephemeral.

Soil

The soils of the district are classified as follows:

- ***Clay loam or medium black**:* This type of soil is found in the hilly areas in the central parts of the district.
- ***Loam*:** This type of soil is found in the entire district.
- ***Sand and sandy loam*:** This type of soil is found mostly near the banks of rivers and nallahs.
- ***Loam pebbly & stony*:** These types of soils are found within the hilly areas of the eastern blocks in the district.

Land use and soil status of the programme area before the initiation of the project is shown in the tables below. The maximum and minimum values for each of these parameters are given in the table:

Table 5: Status of Soil in Agriculture Lands of Kalyanpura Watershed

Parameter	Minimum	Maximum	Mean
pH	7.11	8.92	7.9
EC (mmhos/cm)	0.041	0.197	0.112
OC %	0.105	0.79	0.365
Total N (ug/g)	90	680	312.63
Available P (ug/g)	19.1	39.51	22.99
Available K (ug/g)	45	189.7	80.69
Available Na (ug/g)	103.7	204.7	163.26
Microbial Activity (Pico kat/g)	1.34	5.19	3.6
Bulk Density (g/cm^3)	1.33	1.52	1.33
Soil Moisture%	0.67	10.44	3.86

Table 6: Status of Soil in Common Lands/ Grass or Grazing Lands of Kalyanpura

Parameter	Minimum	Maximum	Mean
pH	7.03	8.94	8.23
EC (mmhos/cm)	0.03	1.83	0.211
OC (%)	0.10	0.51	0.33
Total N (ug/g)	90	448	317.75
Available P (ug/g)	13.80	30.61	21.54
Available K (ug/g)	44	583	263.28
Available Na (ug/g)	170	1813	700.56
Microbial availability (pico kat/g)	1.96	13.8	5.766
Bulk Density (g/cm^3)	1.56	1.72	1.56
Soil Moisture (%)	0.64	3.2	1.61

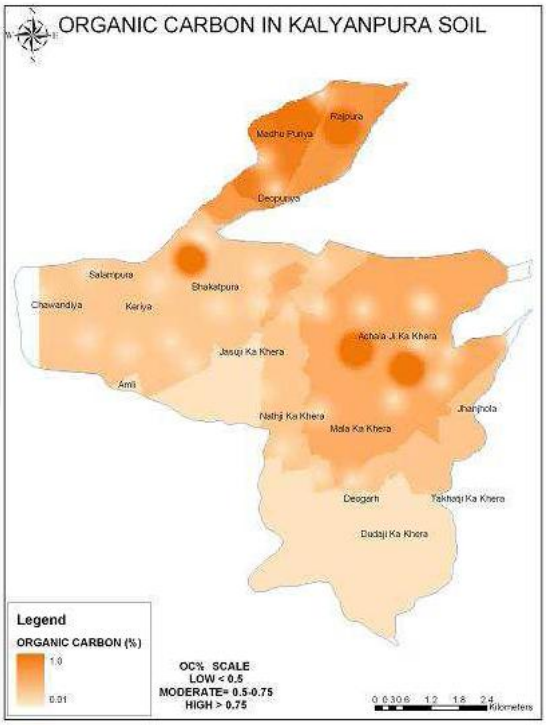


Figure 4: Map showing organic carbon distribution in Kalyan pura

Impact on soil health

The soil organic matter of in the region is nutrient rich, carrying a number of cations and trace elements that are extremely important to the growth of plants in the area. The soil organic carbon prevents nutrient leaching, and is integral to the organic acids that make minerals available to the plants. It also buffers the soil from strong changes in pH. It is a widely accepted fact that the carbon content of soil is a major factor in the overall health of the soil. Soil organic carbon not only improves the physical properties, cation exchange capacity (CEC) and water-holding capacity of the soil, but also contributes to the structural stability of clay soils by binding smaller particles into aggregates.

The average % of organic carbon was found to be highest (0.46%) in MWS-8 and the lowest (0.11%) in MWS-12. Most of the other micro-watersheds had an organic carbon %, way below average i.e. <0.5%. The status of organic carbon in the soil was generally observed to be poor in the Kalyanpura watershed area.

Improvement in soil condition

As per data (2007-2009) provided by FES, the soil conditions in Kalyanpura watershed has changed as a result of the watershed project. The organic carbon content of the soil has increased from 0.37 to 0.49%. This not only indicates an increase in the rate of growth of ground flora, but also higher flora and consequently an addition of organic matter in the soil.

The consequent increase in organic matter has prompted the increase of microbial activity from an average of 5.33 pkat/g to 7.12 pkat/g in the watershed. Electrical conductivity has declined by about 0.056 ds/m further contributing to the improvement of soil quality. The availability of major nutrient elements like nitrogen (332.4 to 477.5 ppm), phosphate (22.49 to 23.87 ppm) and potassium (351.07 to 366.28 ppm) has also increased in the region.

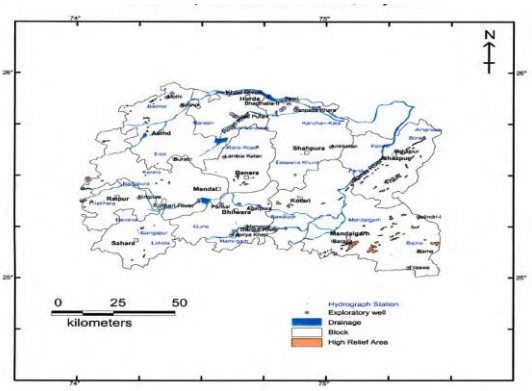
Increase in Green Cover

Increased green cover is one of the major objectives of the watershed development. The floral diversity of the watershed as per the initial surveys, enumerated a wide variety of trees, shrubs and weeds amongst which the species Dhok or Dhokara (Anogeissus pendula) was found to dominant because of its wide adaptation.

A total of 17 tree species were recorded in the Kalyanpura watershed; matured trees were represented by seven species of seven genera and the same number of families. Eight species (four families) were found in the form of regeneration, while recruitment was with 14 species belonging to 12 genera and 10 families. The regenation of 8 species has led to increased green cover of the watershed area.

Rainfall

Figure 5: Index map of Kalyanpura watershed



The information for the following section has been extracted from the District Groundwater Brochure prepared by the Central Ground Water Board June, 2008.

Mean annual rainfall (1986-2005) in the district was found to be 633.9 mm, whereas normal rainfall (1901-70) which was lower than average rainfall was around 603.3mm. 95% of the total annual rainfall occurs during the southwest monsoon, which enters the district in the last week of June and withdraws in the middle of September.

The probability of average annual rainfall exceeding 900 mm was found to be only 10% in the region. However, average annual rainfall greater than 400 mm had a 90% probability. The probability of mean annual rainfall was found to be 45%. A drought analysis developed on agriculture criteria indicated that the district was prone to mild and near normal droughts. The occurrence of severe and very severe droughts was extremely rare in the area.

January was found to be the coldest month with mean maximum and minimum temperatures at 22.20°C & 7.30°C respectively. Temperatures in summer, June, reaches to 46°C. However, temperatures drop a little during monsoon and rises again in the month of September. The atmosphere in the region is generally dry

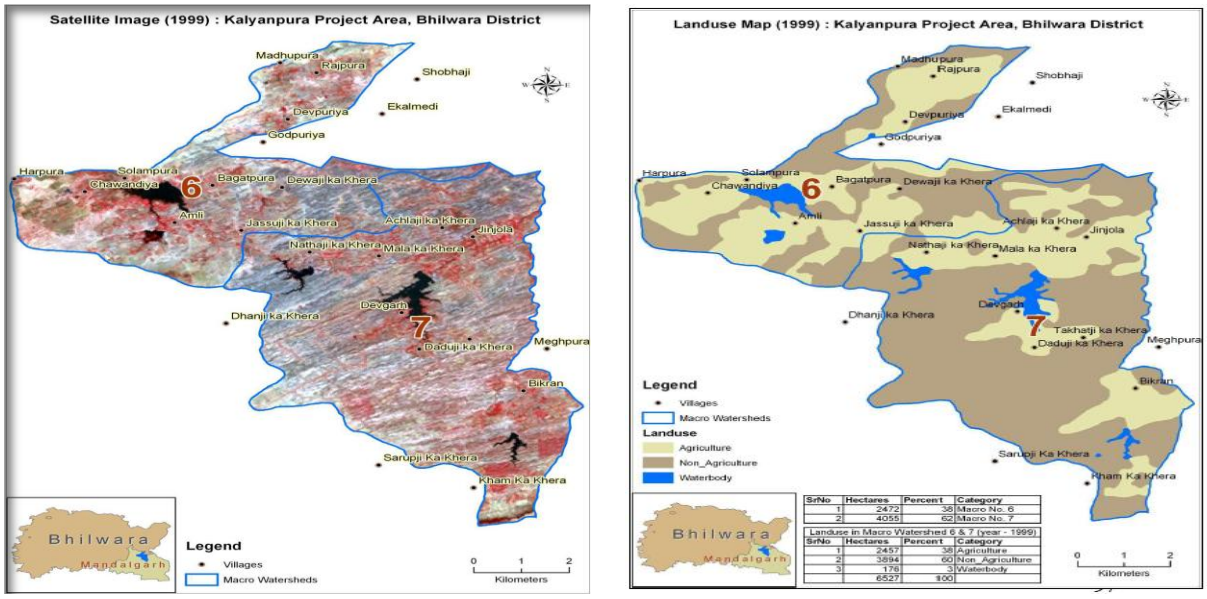
except during the monsoons. The humidity is highest in August with a mean daily relative humidity of 80%. The annual potential evapo-transpiration in the district is 1495 mm and is the highest in the month of May (228 mm).

Land Use

On average terms around 27% of the area in Kalyanpura watershed was used for agricultural purposes; the other areas constitute mainly common property land resources, used for livestock grazing and fuel wood collection. However significant variation can be seen within the watershed area in terms of land use.

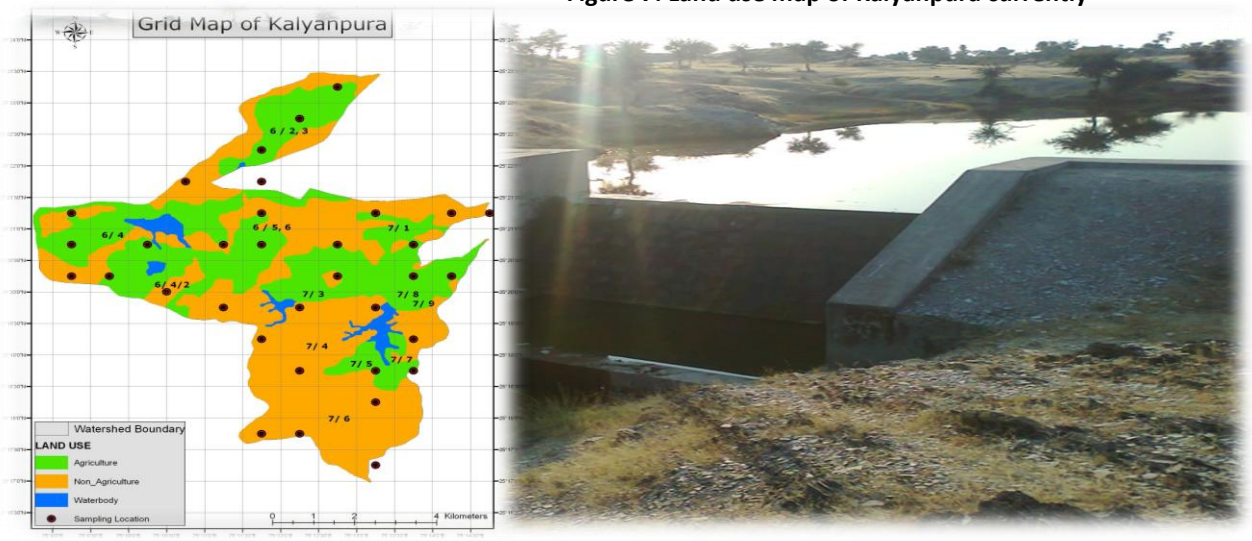
Land Use of the project area derived from satellite Imageries are shown below – land use 1999 and land use currently

Figure 6: Satellite images of land use – Kalyanpura 1999



The land use map of the catchment area currently, is presented below.

Figure 7: Land use map of Kalyanpura currently



Improvement in Biological Diversity

The diversity of flora and fauna status is very crucial in any natural and productive ecosystems as it provides many ecological services and also forms important links that is necessary for the sustenance of that ecosystem. Further, it is very crucial for planning restoration activities of both direct (improving the vegetative resource like fuel, fodder, seeds fruits) and indirect (reducing soil loss, retention of moisture, restoration of catchments and so on) benefits, in addition to aiding in identifying appropriate indicators to monitor the state of the restoration carried out in the system.

Biodiversity is the resource upon which families, communities, nations and future generations depend. In Kalyanpura watershed the issues of biodiversity was very well taken into consideration and elaborate studies were carried out to understand the current status of the biodiversity as well as the bio-potential of the area.

Kalyanpura watershed is predominated with the presence of Dhok or Dhokara (Anogeissus pendula) as a major member of the floral diversity. After Dhok, the other dominant floral species are Acacia leucophloea (Arunja/Ronj), Acacia catechu (Khair), Acacia nilotica (Desi babool), and Azadirachta indica (Neem).

The area also has a substantial shrub cover, which largely comprises of species like Zizyphus numularia, Capparis decidua etc. The area was characterized by the grass species of Aristida sp., signifying depleted water table. Such indicators led to increased focus on suitable conservation measures to hold rain water in situ and thereby augment the process of recharging ground water.

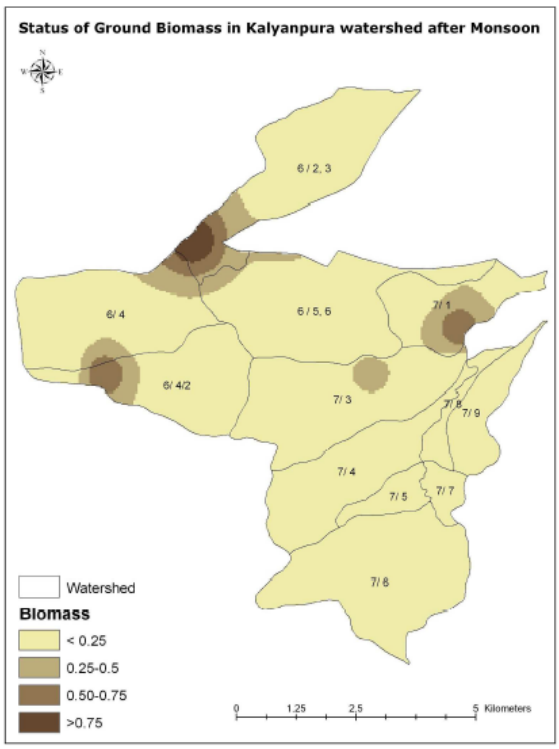
Hence systematic floral and fauna assessments were done. Among higher plants 74 species were recorded belonging to 60 genera and 27 families of which 24 were herbs followed by grass (21), shrubs (nine species), trees (seven species) and climbers (three species).

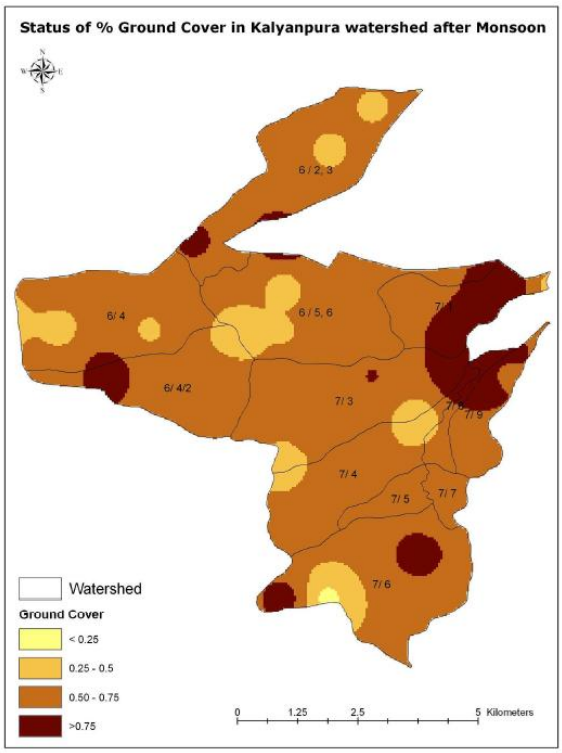
Among the faunal group, butterflies, one of the pollinators, were represented by 13 species, while spiders, which are good biological insect pest controllers, were represented by two species. The herpetofauna that includes biological pest controllers recorded 11 species with three amphibians and eight species of reptiles.

Birds that include pollinators, seed dispersers and biological pest controllers were represented by 86 species. The mammals were represented by 14 species. Details on the status of plants and fauna based on quantification of different land use and micro-watersheds are given along with the status on regeneration, recruitment, biomass, ground cover, dominance of species and their distribution.

In order to derive the areas of ecological significance, within the watershed and the micro-watersheds, seven different parameters (density of tree, recruitment, regeneration, shrub, climbers, herbs and grass) on plants and four different parameters (butterflies, herpetofauna, bird and mammals on fauna (richness in species) were taken into consideration. Grid wise data for each parameter were normalized, and data was transferred into GIS domain and floral and fauna diversity maps were derived.

Figure 8: Status of ground biomass and % ground cover, post monsoon





Conservation Action Plan adopted

Vision was to develop appropriate Conservation and Restoration strategies for Kalyanpura Watershed, to sustain the long term viability of the biodiversity, the integrity of ecosystems including production systems, ecological functions and the human communities that depend upon them.

Focal Conservation Targets identified based on this study were

Ecological Systems: Grassland (grazing land) Ecosystem – Grazing lands or plots for improving the fodder availability of the Watershed, Wetland Ecosystem – Existing medium to large water bodies; Productive or Agriculture Ecosystem – Agriculture lands including habitat like agriculture hedges, agriculture fringe forest, along with a mosaic of wasteland / grassland and agriculture fallow.

Ecological Communities: Spiders and birds (Biological Pest Controllers), Butterflies and birds (Pollinators). For each of these targets the critical threats, its present status and what would be the desired future status after conservation action are implemented are also detailed. This also includes conservation action plans for restoring and improving the soils which are crucial for improving the agriculture productivity. Specific plans for the betterment of the hydrological systems at both the surface and groundwater level is also mentioned.

In total 39 species of plants were found in the agriculture areas, especially on the bunds and the hedges of the Kalayanpura watershed. However, the sampling resulted in recording two species of grass, eight species of herbs, 13 species of shrubs and 16 species of trees, no climbers were noted during our survey. The overall abundance rating of each plant species in the watershed showed that eight species were abundant, 16 species were moderately abundant, while 15 species had a low abundance, thus revealing that most of the species in this watershed was found at moderate to low abundance in the agriculture area.

When the abundance rating of the species in agriculture area is compared with the overall rating of these species in the watershed, it was evident that some species that were abundant and moderately abundant in the

agriculture area were either moderate or low in the watershed landscape. Similarly some species that was abundant and moderate in the watershed landscape were moderate and low in the agriculture areas. The low abundance could be due to its increased usage by the local community in the watershed area. Its moderate abundance in the agricultural areas could be due to some level of protection in said plots in the region.

4. IMPLEMENTATION PROCESS

This was a unique model which brought together the state government, ITC-RDT, FES, Zilla Parishad and Panchayats together to implement a watershed management program in Mandalgarh Tehsil of Bhilwara District in Rajasthan. FES was the implementing partner on behalf of ITC-RDT while the Pachayat Samiti represented the Zilla Parishad. The capacity building component for both the funding partners, however, was looked after by FES.

To ensure sustainability of the project, the strengthening of existing institutions and developing new ones were an essential part of the project. The process involved each village adopting a formal body of terms and conditions to govern itself, with regard to commons.

Capacity Building & Community Mobilization

The purpose of the capacity building initiatives was to enable communities in the project area to build a perspective on watershed development in order to participate in a meaningful way on planning, implementation and governance. This obviously was a gradual process and was achieved over a period of time through structured programmes to address the major challenges of grassroots empowerment, community mobilization and consequently the sustainability of the programme.

During the reporting period, the capacity building and community mobilization programmes concentrated on the following aspects:

Strengthening off Panchayati Raj Institutions – A number of training programmes, of three days each, was organized on different aspects of local self-governance with emphasis on the role of different members in the strengthening the PRIs. Specialist resource persons from Vidya Bhawan Society Udaipur, project staff and ex-PRI members were involved in the programs covering members from seven panchayats. The sessions were largely interactive, including participatory games, traditional folk stories, songs, yoga, selfdisciplinary exercises, role-plays to sensitise them on gender issues and vulnerable groups, and assessment exercises to increase participation of gram and ward sabhas.

Padyatra for creating awareness on NRM issues - A Jan Chetna Padyatra, “Chal Bachaye Kal”, was organized for three days with the support of six NGOs and seven government departments. The event sought to generate awareness on the conservation of natural resource, strengthening of livelihood options, building of social capital and the criticality of good governance and effective convergence. The event included a Kalajatha in

which puppeteers from Ajmer, Bikaner, Bijoliya and Shahpura disseminated information on agriculture, e-Choupal, NRM, water management, women empowerment, PRI's, health- hygiene, nutrition, sanitation, social audit, public private partnership, dairy improvement and NREGA. People attended the Padyatra from 38 villages and 12 Panchayats of Mandalgarh and Jahazpur. As a mark of solidarity, all the adult participants left their hand imprints and children's footprints in different colours on a 52 metre long cloth, a symbolic affirmation of unity and brotherhood.

Technical Trainings on Watershed Management - Field trainings to impart technical competencies to the project volunteers on measurement of physical works and the construction of gully plugs and check dams were conducted. Samples of soil and biomass were collected to assess the ecological health of the area. Structured training programs were also carried out to transfer the information on soil health and biomass availability to the farmers so that they could plan interventions in an informed manner. The data was presented on GIS map based format, which enabled the communities to locate their village on the maps and understand the data properly.

Awareness Camp & planning meeting - Awareness programmes were undertaken in the villages, including hamlets, to facilitate informed decision-making processes. The attempt, in the initial stage of these programmes, was to ensure community participation and ownership in the planning and implementation of the watershed development work through the following:

- Generate awareness and understanding about the Kalyanpura watershed project funded by ITC and Government.
- Build capacity of the participants on their rights and duties
- Make the participants understand the role of Panchayat in governance and management of natural resources and watershed development
- Extend further effort to involve the ITC hub in-charge and e-Choupal sanchalaks in the programs to increase the awareness on e-Choupal network.
- Understand the gap in existing resources and plan accordingly.
- Strengthen village specific byelaws.

This was followed-up with village level meetings in which the women participants pointed out that a series of such programs were necessary to strengthen village institutions. Several participants affirmed that many of their doubts and concerns were resolved and that they were now willing to participate fully in the program.

Street Plays for Community Awareness - Street plays on various themes/issues were organized in ten villages of Kalyanpura watershed area with the help of a local theatre troupe. Due to their local origins, they were able to connect more meaningfully with the audience. Songs, dances and drama helped in the communication of key messages on natural resource management, and various government programs on women and child health, literacy, NREGA etc.

Community Institution Development

Village level institutions (VI) were created for sustainable management and ownership of community assets created under the program. To ensure increased networking between various villages, as also uniformity and acceptability of norms and regulations framed for rights of use and protection, the VIs were federated to form a **Federation** with representatives from each of the VIs. The village level committee/Samiti was responsible for all community decisions taken at the village level. There were generally 11-15 members, with significant women representatives. The members comprised of panchayat members, SHG members, farmers and also the landless and marginal farmers from the village.

Meetings were held once a month, to discuss various issues, like scope of employment through NREGA, the level of contribution by each member towards access and the right of use of the commons, level of contribution for construction of hardware treatments under the project, effectiveness of the regulation formulated and resolution of conflicts. All rules for the protection and use of their respective commons were formulated by each village committee. Protections in some villages were provided by the villagers themselves and in some villages locals were employed to guard the assets.

Institutional Training – A number of institutional development training programs were organized to enhance mechanisms for increased robustness of existing institutions and assure collective action. The participants in these training programs included members of self-help groups, habitation and village level institutions, federation bodies, representatives from the Panchayat and Zila Parishad level, various line department officials, and other stakeholders like WDT members and village resource persons like teachers. Regular interactions and meetings were held with members of the Kalyanpura Federation to facilitate the creation of new agendas and strategies to make optimal use of the ongoing and forthcoming, projects and schemes. These training programs were also helpful in facilitating community planning and building of institutional processes to meet the challenges of the future especially with respect to governance and usage of natural resources.

Field Training - Field training programs were organized to capacitate the rural youth in physical and technical implementation of soil and moisture conservation activities. Regular interactions with experts in Agriculture and Animal husbandry through these field trainings helped in capacitating the farmers. Farmers were capacitated on improved agricultural practices focusing on bio fertilizers and vermin-composting to improve soil health. Field training on geo-hydrology was organized wherein efforts were made to sensitize the community on ground water usage and issues related to water budgeting to ensure sustainable usage of water.

Exposure Visit - An exposure visit of the flag bearers of different villages of the project area was organized to old TGCS villages. The main purpose of this visit was to develop an understanding on conservation and securing tenure over commons, governance and management of resources, working of thrift groups in such villages, the building long term enduring institutions that would sustain even after the project life cycle has been completed.

Programme Initiatives

The various activites as listed below were undertaken throughout the duration of the project.

Watershed Management

- Soil & Moisture Conservation
  - Continuous Contour trenching
  - Construction of loose boulder check dam and Gully Plugs
- Drainage Line Treatment
  - Construction of Masonary Check Dam (Big & Small)
  - Construction of small percolation tanks
  - Construction of Gabion
  - Construction of Masonry Walls
- Regeneration Activities
  - Inter-culture operation such as repairing of ring and weeding

- Initiatives on arable lands
  - Farm bunding
  - Plantation on the bunds as binding and vegetative fencing
  - Excavation of farm ponds

Livelihood Promotion

- Integrated Pest & nutrient management (I.P.N.M.)
- Usage of Sprinklers
- Installation of Biogas

Operational model – Advantages and constraints

The model had several advantages as discussed below. Constraints operating during implementation of the program & recommendations to overcome them are also discussed in the following section.

- First successful model of watershed program development in India being implemented through PPP. It is a collective representation of private and public effort with accountability leading to greater delivery and positive impact.
- Effective and efficient harnessing of technical and human resources, which has been the basis for the success of this program.
- Unlike other PPP projects wherein the NGO's play a leading role, here the GoR and ITC are project holders with FES (an NGO) providing technical assistance. This has ensured that the implementing agencies are also held accountable.
- The VI's formed, however, need continued nurturing and handholding to ensure sustainability.
- The village institutions need to start discussing on the modalities of increased resource sharing with respect to the lopping of trees, sharing of usufructs and grazing of small ruminants.
- Increased focus on convergence will ensure sustainability of the project.
- It is suggested that while the beneficiary communities are aware of the benefits of the project, helping them assess in real terms how much they have benefited may help enhance their sense of ownership and pride and therefore ensure the sustainability of the project in the long run.

The entire operational model of the watershed development peoject was to mobilize people in the villages of Kalyanpura to proactively participate in planning and implementation of the entire process under the watershed development project so as to ensure good governance mechanisms for the sustainability of the project over a period of time. Efforts were made to strengthen the habitation level institutions, their Federation and the Gram Panchayats to take continued responsibility for providing a strong institutional base to the ongoing operational model. This required increased facilitation and sound planning for efficient utilization of project funds as well as increased avenues of convergence with ongoing programs such as MNREGA and NLM.

The institution specific rules and regulations that were formed were also found to be stronger and more adaptable to the changing social-political scenario of the region. Significant effort in terms of capacity building at the village level through local volunteer networks and jaankars were also adequately observed across the programme area.

5. IMPACT ON GROUNDWATER RECHARGE

The information for the following section has been extracted from the District Groundwater Brochure prepared by the Central Ground Water Board June, 2008.

Pre-project groundwater status

Rainfall infiltration method and water level fluctuation methods were used for the estimation of groundwater resources; Rainfall infiltration method has been applied in this study.

Table 5: Pre project groundwater status

WATER RESOURCE ESTIMATION OF KALYANPURA WATERSHED		
Average Rainfall	783	mm
Area	50.7	km^2
Recharge%	20	%
Recharge from rainfall	7939620	metercube
No of Pumps	354.9	(7pumps/km^2)
Average No of Days of pumping	25	day
Average duration of pumps	4	hr/day
Average Yield of the pumps	250	lit/min
Discharge due to Pumping	532350	cubicmeter
Recharge from Return Flow	239557.5	cubicmeter
Inflow	0	cubicmeter
Outflow	39941200	cubicmeter
Total Recharge	8179178	Cubicmeter
Total Discharge	40473550	Cubicmeter
Balance	-32294373	Cubicmeter
Storage level	-0.63	Meter
OUTFLOW CALCULATION FROM AQUIFER1		
No of wells for Outflow area	56	
Average Drawdown in Outflow area	4	Meter
Outflow area	8	Km^2
Water draft by pump	84000	metercube
Recharge from return flow	25200	metercube
Actual water loss by pumping	58800	metercube
Water level down due to pumping	0.00588	meter
Total outflow	39941200	cubicmeter

The study area had a hard rock terrain, and therefore estimation through rainfall infiltration method was found to be most suitable. Water resource estimation based on water level fluctuation method was not followed here.

The hard metamorphic rocks were intruded by amphibolite, granite, pegmatite and quartz veins. Well developed joints were found in the amphibolites and in some porphyritic granites. Dug wells which tapped the amphibolite reserves were observed to yield more water (average yield 30 m^3/day) as compared to wells in granitic gneiss. Sandstone and shale were also found in the Mandalgarh block. Dug wells in these regions were found to be 3 to 30 m deep and yielded 40 & 50 m^3 of water per day.

Data on pre-monsoon

Quaternary alluvium was found confined to narrow valleys along the river and stream courses. The alluvium was generally shallow but when saturated formed good aquifers. Yield of the wells in the alluvium ranges was found to be between 75 to 100 m^3/day.

Depth to water level as recorded in 37 NHS (2006) in the region ranged between 4.94 to 23.21 and 0.52 to 16.2 mbgl during pre-monsoon and post monsoon respectively.

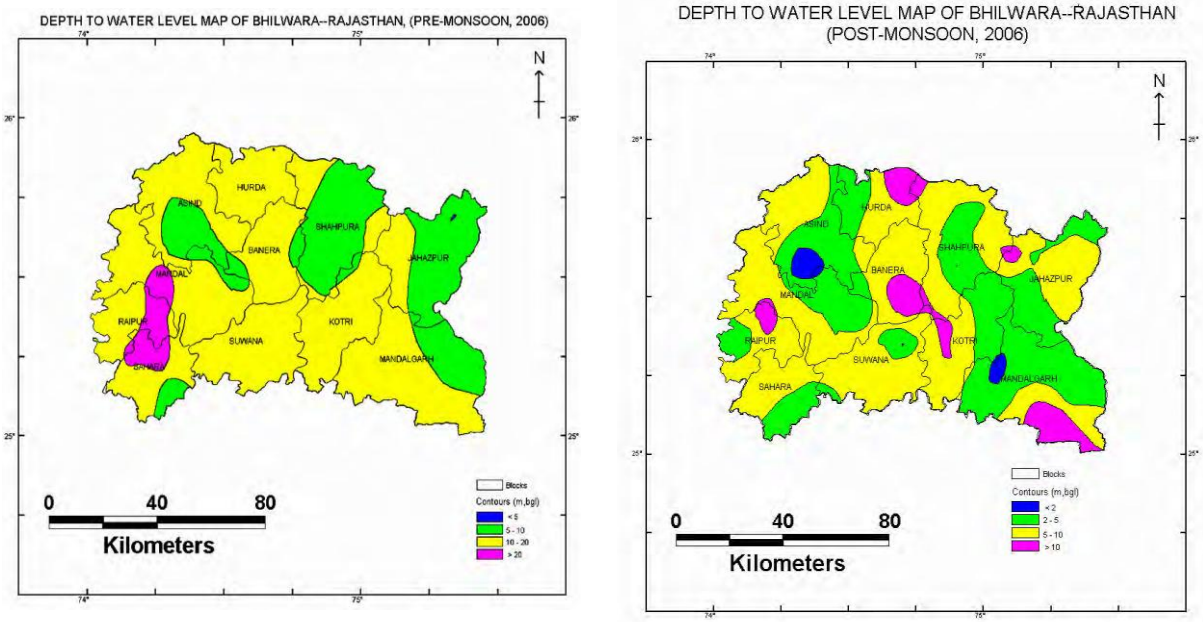
During pre monsoon, shallow (<10 m) water levels were found in Shahpura, Mandalgarh, Jahajpur and Asind blocks. In the remaining area, water level was between 10 & 20m except in central parts of Sahara, Raipur & Mandal blocks where water level was found to be more than 20m.

Post-monsoon

Post monsoon data collected, enumerated the depth to water level - below 2m in the Mandal block, and 2 to 5m in Mandalgarh, Asind, Mandal, Shahpura and Jahazpur blocks. South of Mandalgarh, northwest of Kotri, southeast of Banera, north of Hurda and Raipur showed water levels more than 10m. The rest of the area fell under the 5 to 10m category. Broadly, water table slopes follows drainage direction. Nature of Banas River is effluent. Water table elevation & gradient ranges from 360 to 260 meter above mean sea level (mamsl) & 2.5 to 3.02m/km respectively in the eastern part, Jahazpur block and northern part of Manadalgarh block.

In the rest of Mandalgarh block water table elevation ranges from 540 to 340 mamsl. Seasonal fluctuation of pre & post monsoon, 2006 indicates rise in about 8000 sq km due to widespread and good rainfall. Out of this, rise in water level more than 4m was observed in 5800 sq km area falling in Banera, Hurda, Raipur, Sahara, Suwana, Mandalgarh, Asind and parts of Kotri blocks. Jahazpur, Shahpura and Kotri blocks show decline at isolated locations.

Figure 9: Depth to water level map, pre and post monsoon, Bhilwara



Ground Water Development

The ground water development in the district is being done by dug wells, bore wells and dug cum bore wells. Dug wells with horizontal boring were very common. The diameter of the dug well varied from 1 m to 6 m with depths of 5 m to 40 m. The present stage of ground water development in the district is 116.01%, which indicates that the scope of ground water development is already exhausted.

Table 6: Groudwater development, present status

Formation	Yield of Dug well (m^3/day)	Discharge of Bore well (lpm)	Depth (m)		Diameter		Type of pump/Water lifting devices
			Dug well	Bore well	Dug well (m)	Bore well (mm)	
Alluvium (Tube well)	45-55	250-1500	20-25	15-20	4-5	200	Submersible /Centrifugal pump/ Bullock
Granite Gneiss	30-40	60-100	40-55	150-175	4-5	200	
Phyllite/ Schist	30-45	20-450	15-50	150	4-5	200	
Dolomitic Limestone	50-60	20-500	15-25	150	4-5	200	
Quartzite	15-25	20-600	10-30	150	4-5	200	
Sandstone Shale	40-50	20-500	3-30	150	4-5	200	

Ground water resources which have been reassessed as on 31.3.2004 based on Ground Water Estimation Committee (1997) are given below:

Figure 10: Net groundwater availability vs Gross draft for all uses (annual)

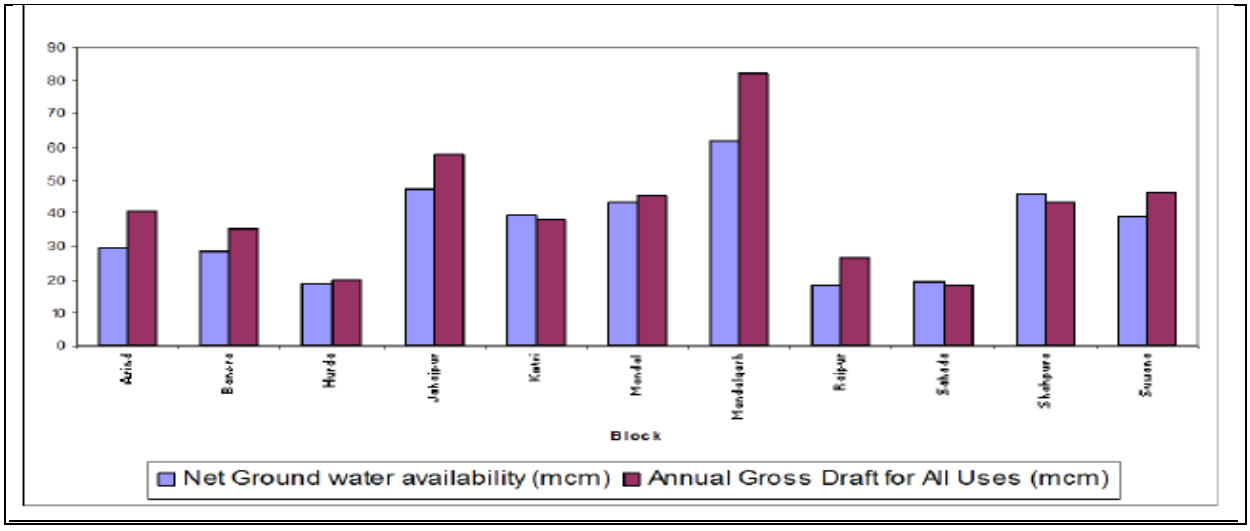
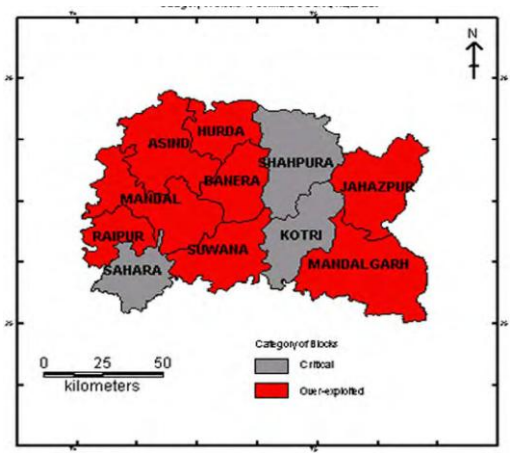


Figure 11: Map showing groundwater status, blockwise



Out of 11 blocks, 8 fall under "Over-exploited" category and 3 under "Critical" category. Gneiss, schist, phyllite, slate, dolomitic limestone, sandstone, shale and alluvium form the aquifers in different parts of the district.

Alluvium area is restricted to riverbeds. Ground water occurs under unconfined to semi-confined conditions. Depth and diameter of the dug wells and bore wells depend on formation and geomorphology. However, general depth of dug well and bore wells ranges between 10 to 30m and 150m respectively except in alluvial aquifers where depth of the dug well ranges between 15 to 20m.

Good practice: Water Harvesting Structures (Source: FES report)

The year 2009 was marred by drought across the nation. Farmers in the rain fed areas practicing mono-cropping were struck the most. In the absence of irrigational support, these farmers were unable to get adequate returns even from the single crop which they cultivate in a year to sustain themselves. It is in such situations that the role played by irrigation is felt the most. Although the role of irrigation in supporting farmers is widely agreed upon, the ways of doing so has been subject to various contestations. Perceptions of policy makers and policies pertaining to irrigation in India have also been of fluctuating nature. There was a time when huge dams and canals were being made to provide irrigation facilities to the farmers. These however, were accompanied with controversies of huge expenses involved in carrying water from thousands of miles and meeting the needs of farmers of a particular area at the cost of displacing the farmers of another area. A need was felt for building resources within the locality to meet the needs of the agricultural sector and the effectiveness of traditional water harvesting structures started getting highlighted. The trend shifted towards creating smaller water harvesting structures within the village. Over a period of time, these water harvesting structures have become instrumental in recharging the wells and enhancing the soil moisture regime of the area.

In the course of two and half years, 12 water harvesting structures (WHS) with the total storage capacity of 107891cum have been constructed in Kalyanpura watershed as part of the ongoing Kalyanpura Public Private Partnership project. These water bodies have been catalytic in recharging 15 adjoining wells and directly supporting farmers in the command area of these structures. Besides, as the structures have been constructed by the villagers themselves, they have generated 11597 man days for the villagers including the landless. With the declining annual rainfall, these WHSs have been all the more vital in supporting the farmers. The 28 monitoring wells that have been monitored from the time the project has started, show trends which indicate that the water levels in the wells have been impacted by the works of water harvesting and soil moisture conservation that has been undertaken in the region. All the wells in the region have been shows ground water development.

Annual Rainfall In Mandalgarh In Four Years	
2006	904
2007	885
2008	724
2009	500

Well Data (Depth of water from the surface in Feet) recorded in the 15 of the Monitoring wells in Kalyanpura Watershed

WELL_ID	VILLAGE	WELLTYPE	OWNER	Pre-monsoon (2007)	Post-monsoon (2007)	Pre-monsoon (2008)	Post-monsoon (2008)	Pre-monsoon (2009)	Post-monsoon (2009)
1	Madhupuriya	cemented	HeeraJi, Gopal Ji	108	70	73	29	100	39
2	Devpuriya	cemented	Meknath Gurjar	50	32	60	75	72	26
3	Devpuriya	Non Cemented	Raju Gurjar	53	52	77	76	72	26
4	JassujiKaKhera	cemented	Raghan Ji	73	52	80	55	75	20
5	JassujiKaKhera	cemented	Nanda Singh	55	47	79	53	73	26
6	JassujiKaKhera	cemented	Chandmal Jain	60	38	82	50	70	26
7	Jetpura	cemented	GopiJi	56	44	80	21	59	33
8	Jetpura	cemented	GulabJi	46	41	78	14	44	30
9	Jetpura	cemented	Community well	74	45	73	41	70	30
10	NathjiKaKhera	cemented	Raghunath Gurjar	48	25	67	25	37	26
11	NathjiKaKhera	cemented	Kishore Ji	63	48	72	33	68	30
12	MalaKaKhera	cemented	Bagla Ji Gurjar	39	29	38	27	36	33
13	MalaKaKhera	cemented	Jotar Gurjar	36	34	45	31	36	33
14	AchlaJiKaKhera	cemented	Shama Ji Gurjar	47	42	58	35	46	39
15	AchlaJiKaKhera	cemented	Sitara Gurjar	65	31	63	33	41	30

The WHSs constructed in Kalyanpura watershed have been a boon for the farmers particularly in terms of reducing their vulnerability to the vagaries of the monsoon. One such farmer is Motilal Berwa from Mukangarh village. Mukangarh is a small village in Srinagar Panchayat under the Kalyanpura watershed constituting of 103 households divided into three hamlets. The situation of Kalbeliyo ka Dera one of the three hamlets is worst. Although part of the larger village, they are unfortunately the most secluded section of the population residing in the remotest corners of the village. Agriculture too has not been very promising for them. In such a scenario,

migration has been a common phenomenon for the Kalbeliya community which belongs to the Scheduled Tribe category.

An anicut was constructed near Kalbeliyo ka Dera in the year 2008. Motilal Berwa and his three brothers own about 2.5 ha of land in the command area of the anicut. Although this portion of land has been divided among the three brothers, they undertake agricultural activities together and share the produce. In the context of water stress, maize used to be the only crop which this family cultivated. The land used to lie barren in the Rabi. However, about three months before the construction of the anicut, they dug a sixty feet deep well in their farm. Initially, there was no water in the well. Gradually with the onset of monsoon and construction of anicut the water column in their well began to increase. Soon after, they purchased a diesel operated pump. The year 2008 marked a breakthrough in the lives of this family as it was the first time when they sowed wheat in their field. The total yield of wheat was 32 quintals. Of this 10 quintal was used for domestic consumption and 22 quintal of wheat was sold at the rate of Rs 1000/- per quintal. This earned them an income of Rs 22,000/-.

This year's drought had an impact on the Berwa family also. Agricultural yield in their farm was not remarkable but it was good enough to support their family even in this situation of crisis. They sowed maize in Kharif. However, as it rained just once, they had to support their crop with two rounds of irrigation. The water level in their well post monsoon was 20 feet. During Rabi, they adopted a mixed cropping pattern wherein, wheat was sown on 12 bigha (2 ha) and mustard on 4 bigha (0.6 ha) of land. The well which had saved them from the shackles of a bad monsoon continued to support them even in the Rabi. They were able to provide two rounds of irrigation to their crops in this season. Twenty four quintals of wheat and six quintals of mustard were produced. Although the produce might not be enough to earn them a good amount of money in the market, but it has definitely been more than enough to sustain their family in this drought year.

The water harvesting structures that have been made in resource poor area such as Kalyanpura is making an impact in the lives of the people. The water recharge is acting as a cushion for the poor farmers in developing resilience against the drought which is a common phenomenon.

Bhilwara district comprises 9 urban areas, adequately facilitated with piped water supply. In all the 1745 villages in the district, drinking and domestic water requirements are met by piped water supply. The status of urban and rural water supply is as follows:

Table 12: Status of drinking water, Bhilwara district

S No	Town	Population	Source of drinking water		Water Demand (in K liter)	Supply (in K liter)	Daily/ capita Demand (liter)	Daily/ capita supply (liter)	Interval of water supply once (in hr)
			Bore well	Dug well					
1	Bhilwara	280128	36	48	28013	10000	100	40	72
2	Asind	14123	21	27	989	600	70	46	24
3	Mandal	197500	18	55	13825	800	70	40	48
4	Gangapur	24362	11	33	1705	576	70	32	48
5	Mandalgarh	20169	44	1	1412	1408	70	70	24
6	Bijolia	14570	N A	N A	1020	770	70	70	24
7	Shahpura	27792	6	33	2779	1700	100	61	24
8	Jahazpur	18815	19	14	1311	1250	70	69	24
9	Gulabpura	24362	7	24	1705	480	70	21	36

Major part of the district (about 90%) is covered by hard formation where success failure ratio is 73:27. High yield i.e. more than 1000 lpm was recorded in 27% of wells, yield between 500 & 1000 in 9% wells, between 100 & 500 lpm in 32% whereas yield less than 100 lpm was registered in 41% of wells. About 27% wells have yielded negligible quantity of water. Success –failure ratio of wells falling in alluvium is 87:13. High yield (>1000

lpm) was recorded in 50% wells, yield between 500 & 1000 lpm in 12%, between 100 & 500 lpm in 25% wells whereas 12% has negligible discharge.

The entire district was found to suffer from ground water scarcity. The greater parts of the district which were occupied by hard formation, the well yields were found to be very poor. As such the depth of weathered zone is generally restricted up to 30m, which control the occurrence and movement of groundwater. Deep-seated fractures below 100m are very rare. This causes reduction in the well yield drastically during the summers creating acute water shortage of domestic water supply. However, selective areas located on the structural weak planes were connected to some recharge source wells that yielded moderate quantities of water. Deeper levels are either devoid of water or of poor quality ground water (brackish to saline). Alluvium occurs at limited places along the major drainage/ valley fills, but has very shallow thickness.

Water Column in project area

Waterharvesting to increase groundwater level

Anicuts to ensure water harvesting post monsoon

The pre and post monsoon water column data collected from 26 wells in the villages in the programme areas since 2007 to 2011 already shows a minor increase in water column considering the increase the water intake of the major increase in agricultural activities in the area.

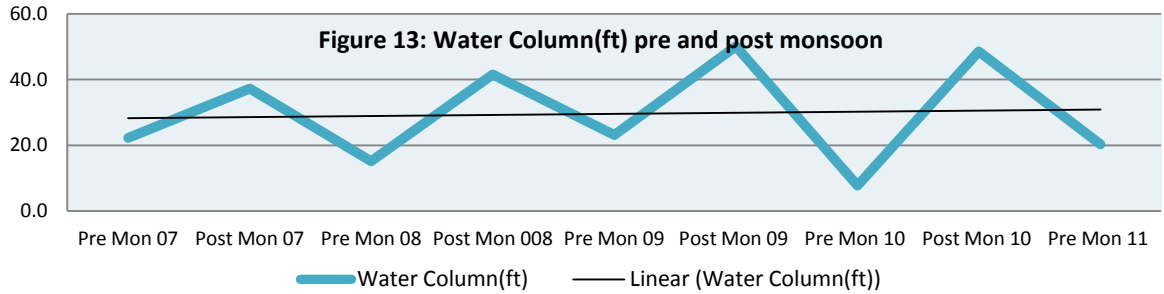
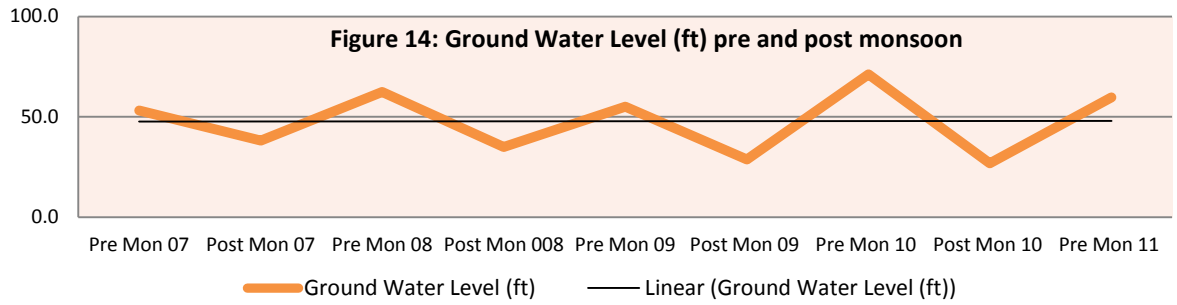


Figure 13: Water Column(ft) pre and post monsoon

Ground Water Level in project area

Similarly the pre and post monsoon ground water level data from those 26 monitored wells in the villages in the programme areas since 2007 to 2011 shows sustained water table considering the increase in agricultural activities in the area.



The well yield varies considerably year to year in different parts of the district and over the season. Thus the availability of surface as well as ground water is very scarce in low rainfall years and especially in summer months.

As per the discussions with the farmers the ground water level was claimed to have increased in the recent years.

Good practice: Water recharge, increased earning (Source: FES report)

Achlaji ka Khera, a small village of about eighty households in Mandalgarh Tehsil of Bhilwara district is predominantly inhabited by people belonging to the Gujjar community who over the years have been marginalized in the area. Efforts of strengthening the ecological and institutional foundation as part of the ongoing PPP project have helped to a certain extent in ensuring access and control of the community over their resources and enhancing their livelihoods. Viewing through lenses of 'partnership' rather than that of 'patronage', the focus has been to facilitate and enable the capacities of farmers as individuals and as collective members of the community to think innovatively and adopt better practices of natural resource management. Energies have been channelized towards strengthening the resource base through physical interventions as well as evolving better governance of these resources. The impact of these efforts in terms of improving the livelihoods resonates in the story of Jeetmal Mangna Gujjar, one of the farmers of this village.

Changes in the cropping area and cropping pattern of Jeetmal Mangna Gujjar's farmland during Rabi

Prior to Intervention		*Post Intervention*	
Crops cultivated	Area of land (in ha)	Crops cultivated	Area of land (in ha)
Wheat	0.6	Wheat	2
		Masoor, tara mira & rajka	0.4

Jeetmal Mangna Gujjar owns 2.4 ha of farm land adjacent to a 'khaal' (drainage line). High slop of the land and heavy flow of water along this drainage line has recurrently eroded the productive soil of his farmland. 0.4 ha of this land has lied fallow for many years now. The family had constructed a 'naadi' (a small earthen water harvesting structure) on the main drain to increase the availability of water but lack of resources to maintain this had made this structure almost redundant. The eighty feet well which the family owned almost dried during every Rabi season. Thus despite having quite a vast stretch of agricultural land and a well to provide irrigational support, there has been persistent scarcity of water and the cropped area and yield has been much lower than the actual potential of this land.

Through technical and financial support from the PPP project, the naadi was repaired in March 2010 wherein Jeetmal Mangna Gujjar voluntarily contributed 15% of the fund invested. He deepened his well further ten feet. Increased sensitization and awareness motivated him to initiate land leveling and he became one of the first farmers in the village to pursue farm bunding on two hectares of his farm land. Two hundred fifty saplings of 'karaunda' were planted on these bunds of which nearly 60% have survived. Learning from his experiences and encouraged by the impact of interventions on his farm land, he also constructed a loose boulder check dam across the drainage line at his own expenses to regulate the flow of water. Gradually a number of other farmers in the

village have also undertaken farm bunding on their agricultural fields which would be instrumental in retaining the soil and moisture in their farmlands and increase the productivity of their farm.

One of the most significant changes which can be seen is increased availability of water for irrigation in the Rabi season and the subsequent changes that it has brought in the cropping area and pattern. Prior to intervention, the water level in his well (depth of water from the ground level) was almost seventy feet which made it difficult to take a second crop using a bullock drawn "Charas" and diesel pump. Last year, he had sowed wheat on 0.6 ha only. The total yield was 8 quintals which is worth Rs 8,000/-. "Mahre 14 bigha khet se, par va mein kewal 4 bigha par hi gehun pakta hai. Mahra kuda sukh jata tha". (I have 14 bighas of land but I was able to cultivate wheat only on 4 bighas. My well used to dry up). Post intervention, the water column has increased significantly. The water overflowed from his well during monsoons this year. Even post monsoon the water column in his well is 50 feet which is proving vital in supporting irrigation of crops particularly during the Rabi.

Learning from his experiences, Jeetmal Mangna Gujjar constructed a loose boulder check dam

With 2 ha of land under wheat cultivation, Jeetmal Mangna Gujjar was able to produce wheat worth Rs 51,450/- this year as compared to Rs 8,000/- last year

A marked increase can be noticed in the total cropped area of Jeetmal Gujjar. With an improved soil and moisture regime and an assured source of water for irrigation, he was able to bring even the 0.4 ha of his barren land under cultivation. Even during Rabi, he cultivated on his entire farmland, with wheat sowed in 2 ha and masoor, tara mira and rajka sowed in the remaining 0.4 ha of land. Considering that there was enough water in his well to support his crops with the required amount of water for irrigation, the total yield of wheat this year was 49 quintals (almost six times the previous year). While he kept 22 quintals for domestic consumption, he sold the rest at the rate of Rs 10,500/- per quintal which generated an income of Rs 28,350/-. He was able to earn another Rs 3,900/- from sale of tara mira and masoor. Further, increased crop area has also meant an assured source of fodder as residues of maize and wheat and rajka as green fodder. He purchased two buffaloes and at present sells 4 liter milk per day to the dairy which fetches him monthly income of Rs 2500/-. He plans to get two of their daughters married this year and the additional income generated has come as a boon for the family.

Degradation of land and water resources and decreasing returns from the farm has increased the vulnerability of the farmers which clearly manifests in increased instances of farmer suicides and rural urban migration across the country. Farming has emerged as one of the last ventures people in this generation like to delve into. The story of Jeetmal Mangna Gujjar is not only testimonial to the benefits of watershed development in terms of changes in the cropping area and cropping pattern, but also as to how these can act as motivating factors for many farmers like him for whom farm based production system is the mainstay of their livelihood.

Pre-project cropping pattern

Prior to the initiation of the project, the major livelihood source was rain fed agriculture and animal husbandry. A large part of the villages' population composed of small and marginal farmers, with subsistence agriculture,

mainly for self-sufficiency. Out of the 1478 ha of arable land, un-irrigated area constituted around 999 ha (around 68%) and the irrigated area was 479 ha.

Agriculture was spread over two seasons of Kharif and Rabi. Maize, urad, jowar, moong, cotton, teel and soya bean were the major kharif crops whereas wheat, mustard and jeera were the rabi crops. Majority of the farmers were small and marginal farmers who usually grew crops to meet their subsistence requirements.

However with increasing mechanization and high input usage of both water and nutrients to cope with decreasing fertility, the agricultural economics had also become less viable for majority of farmers. This, to a large extent, had also influenced farmers to include certain cash crops in their cropping mix for the want of good returns in comparison to the cereal crops traditionally cultivated in the area.

6. SOCIO-ECONOMIC IMPACT ON BENEFICIARY HOUSEHOLDS

The area represents an overall undulated topography with maximum height above 402m from the mean sea level and minimum height below 370 m. The region receives an average rainfall of 450 mm but due to absence of any water conservation measures and undulating character, runoff was high, resulting in very less recharge. The area is surrounded by the command area of Jethpura dam but absence of irrigation facilities and reeling droughts had made local livelihood options highly vulnerable. This had resulted in high migration of villagers as wage laborers in the nearby mines. The average land holding was as low as 0.5 ha and lack of irrigation facilities had forced the majority area to lie fallow.

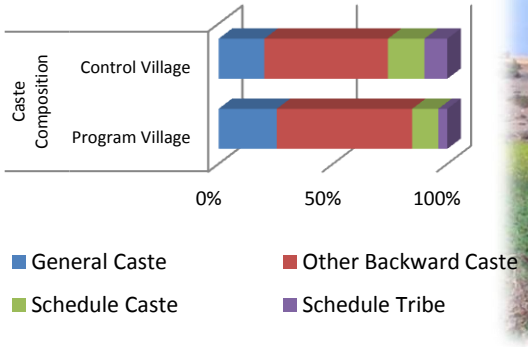
In this context people's collective initiative to regenerate the degraded commons and water conservation efforts became critical to sustain livelihood opportunities. Moreover the region lacked suitable infrastructure facilities and thus convergence of other government initiatives also proved to be an essential support for the community. Thus the public private initiatives in watershed development was not only a means to enhance chances of due recognition for the need of holistic development but also to augment capacities of PRI's to strategize and leverage programs for strengthening local livelihoods in the area.

Based on the findings of the beneficiary survey across 19 programme villages and 5 control villages outside the Kalyanpura programme areas, socio – economic impact has been detailed in the following paragraphs.

Caste Composition

Across the 19 villages which constitute the intervention area, majority of the population belong to the OBC category. There was hardly any significant difference in terms of composition of the caste across the programme village and control village.

Figure 15: Caste Composition

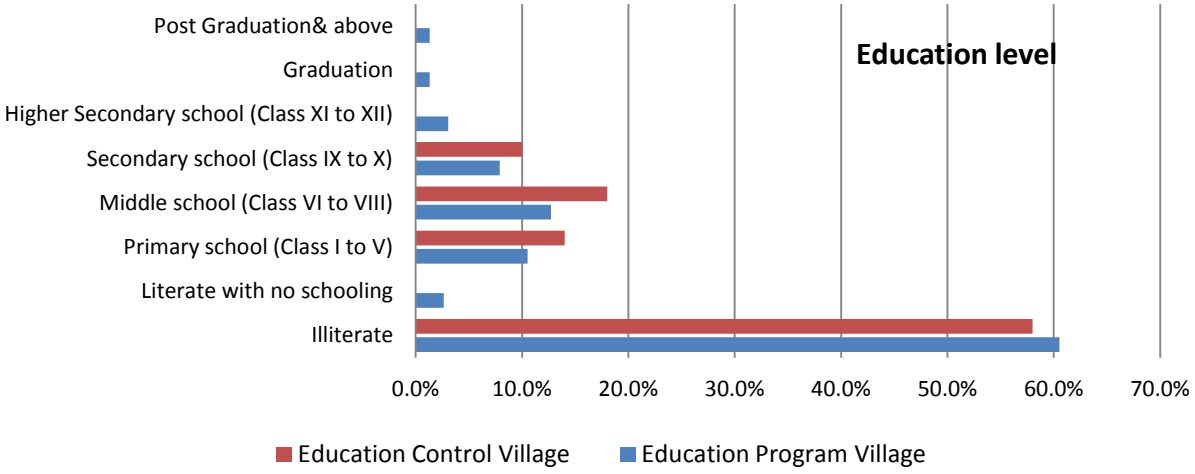


In the subsequent sections, due to non-availability of baseline data prior to the initiation of the programme, the impact of the programme in its catchment area would be compared with the control area for the purpose of benchmarking.

Education status

In terms of education majority of the respondents were illiterate across both the program & control villages. However, increased incomes from the watershed development project has resulted in significant investments in education across the programme village. This is especially visible from the following table which enumerates expenditure in higher education exclusively in programme villages compared to control village farmers whose children were still had no access to higher education

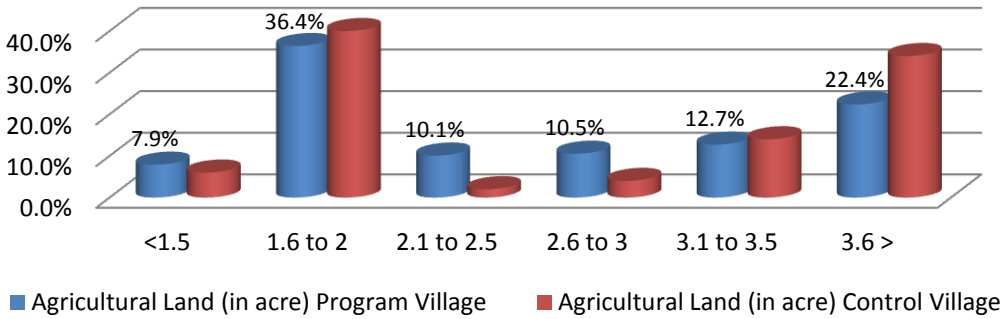
Figure 16: Status of education across program and control village



Average Agriculture Land Ownership

The dependence of a significant proportion of the world's poor on the agricultural sector makes the distribution of land in rural areas an important issue for poverty alleviation. In particular, the access of low income rural households to adequate amount of land is crucial in sustaining their livelihoods. The following graph depicts the average agriculture land ownership of the beneficiaries across the program & control villages.

Figure 17: Average Ag.Land Ownership



In the programme as well as the control villages majority of the households had between 1.6 to 2 acres of land, but the land distribution is relatively more equitable in programme areas as can be seen in the graph above. The increased access of households to land and a subsequent decrease in inequality in the programme area

therefore reflects a progressive indicator towards development and hence directs the sustainability of the watershed in the area

Living condition

The following table depicts the overall living condition, access to household amenities and asset ownership of the respondents dwelling in the programme area.

Table 8: Asset ownership and access to household amenities

Type of house	Program Village
Permanent house	73.7%
Semi-permanent house	5.7%
Traditional / hut	20.6%

Household amenities	Program Village
Electricity	46.10%
Bore-well / Hand pump	68.86%
Latrine	7.02%

Household Possessions	Program Village
Radio	11.80%
Motorcycle / scooter	22.80%
TV	14.90%
Mobile / land phone	79.40%
Water Pump	38.60%

- Type of house – Nearly ¾th of the residents dwells in permanent houses
- Household amenities - Bore-well / Hand pump are available to nearly 70%, whereas only 7% use latrine in the area.
- Household Possessions - Connectivity is good with nearly 80% mobile / land phone connectivity and 40% had water pumps at home.

- There has been marked increase in children especially young girls attending school, high schools and colleges in the nearby towns. The attendance at Anganwadis has also increased. The overall education status has improved in the programme area.
- Average household land ownreship in the programme as well as control villages, ranged between 1.6 to 2 acres, however, land distribution is relatively more equitable in the programme areas. Operational cultivation area across seasons is more evenly distributed in programme area indicating a better land utilisation.
- Nearly three forth of the programme area household resides in permanent houses, 70% of the households had Bore-well / Hand – pumps, 80% had a mobile / land phone connectivity and 40% had water pumps at home.

Farm Incomes & Employment in Farm Sector

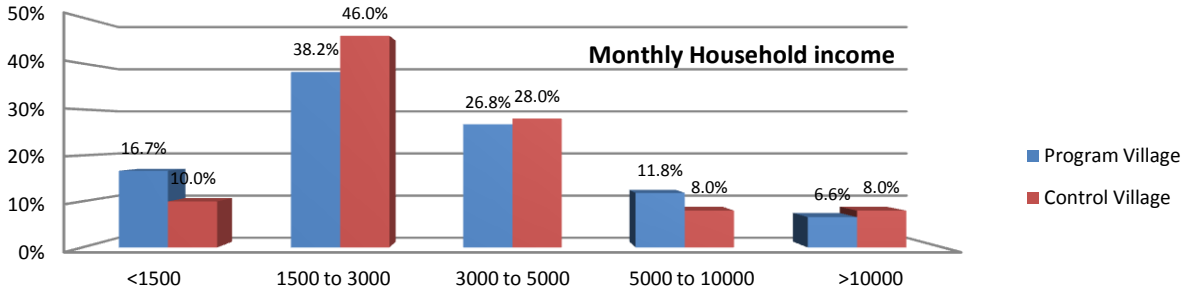
Previously even though agriculture was a primary form of livelihood, it was not the primary source of income and people were forced to take up other forms of livelihood in order to supplement household income. However, farmers today feel that agriculture can be the stated to be the primary source of income.

Awareness on improved techniques has helped in major savings due to the need to use lesser amounts of seeds and fertiliser for their crops. Due the watershed program there has been significant additional income which has accrued to the households.

Monthly household Income (Rs)

The following graph shows the monthly income reported by the respondents across programme and control villages.

Figure 18: Monthly household income comparison – program and control village



More than 18% of the programme village households reported earning more than Rs. 5000 per month whereas 16% of control village household reported earning the same amount.

Considering that livestock is an important source of regular income for farmers, ITC has also been working on a PPP model, for productivity increase through an integrated package of animal husbandry services comprising genetic improvement to ensure disease - free and resistant animals, along with its watershed development currently underway in Bhilwara. In partnership with NGOs, ITC and the Panchayati Raj Institutions is running several cattle development centres that provide animal husbandry services across the programme villages. Several other initiatives like formation of Milk Producer's Group, Dairy Cooperative Societies, promotion for cattle loan facility through regional rural banks and installation of bulk milk chillers have also been made. With improved breeds and enhanced milk production in the programme villages therefore, a significant percentage change in annual household income has been observed over the years.The following table depicts the Percentage change annual household income in 2012 over 2007

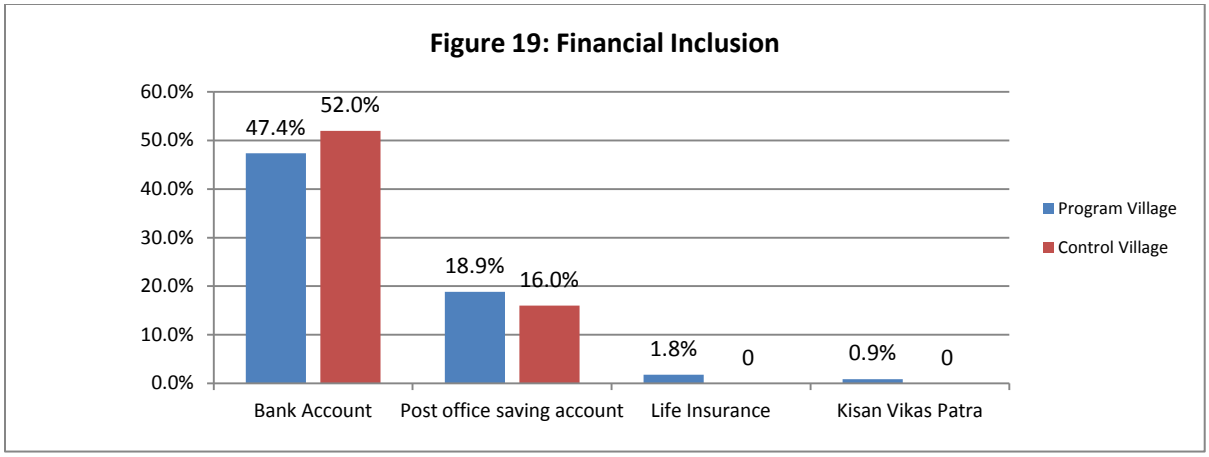
Table 9: Percentage change in annual income before and after watershed development

Annual household Income range (all sources) in Rs	Percentage change in 2012 over 2007
5000 -10000	35
10000 - 20000	48
20000 - 30000	10
30000 & above	7

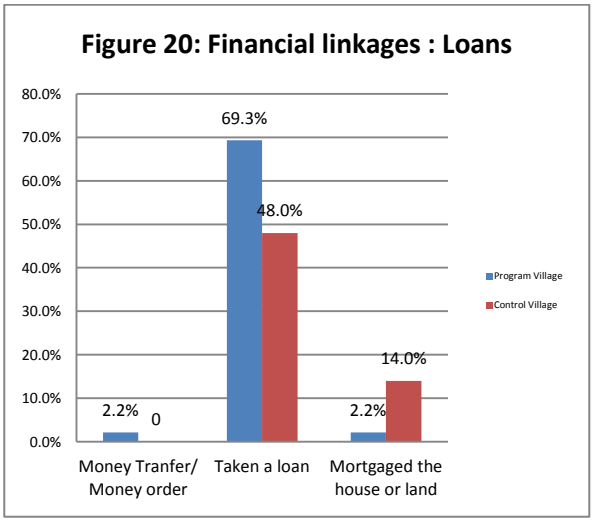
Due to increased milk production therefore, significant (65%) increases in percentage change of over Rs.10000 in annual household income was reported in last 5 years considering all sources.

Financial Linkages

About 47% of the households in the program area reported having a bank account and another 19% reported that they had an account in the post office. Greater empowerment and access to financial security is seen in the programme area such that a significant number of beneficiaries reported having life insurance policies and Kisan Vikas Patras after additional incomes due to watershed development projects



About 70 % of the programme village compared to control village households had taken a loan, which showed that programme village households were establishing/ investing significantly in better livelihoods – buying better inputs for agriculture etc. This was corroborated with findings from the FGD as majority of the loans were for agriculture.



- Awareness on improved farm techniques due to the watershed development project has helped in major savings and augmented monthly family incomes across the programme area**.** More than 18% of the programme village households reported earning more than Rs. 5000 per month whereas only 16% of control village huseholds reported earning the same amount.

- With increased incomes due to the watershed project, empowerment is visible across the programme area. This is reflected in the the access to financial security by programme village households. The greater number of programme village farmers reporting life insurance policies and Kisan Vikas Patras after the watershed development project indicates such financial inclusion and reflects on the sustainability of the programme in the area.

- Over two thirds of the households had a bank/post office account. Increased credit worthiness is observed such that about 70% of beneficiary households could avail loans for establishing/ investing in better livelihood – buying better inputs for agriculture.

7. IMPACT ON FARMING SECTOR

Agriculture in the area was predominantly rainfed. Out of the 1478 ha of arable land unirrigated area constitutes around 999 ha (around 68%) and the irrigated area was 479 ha. Agriculture is spread over two seasons of Kharif and Rabi. Maize, urad, jowar, moong, cotton, till and soyabeen are the major kharif crops and wheat, mustard and jeera are the rabi crops. Majority of the farmers were small and marginal farmers who usually grew crops to meet their subsistence requirements.

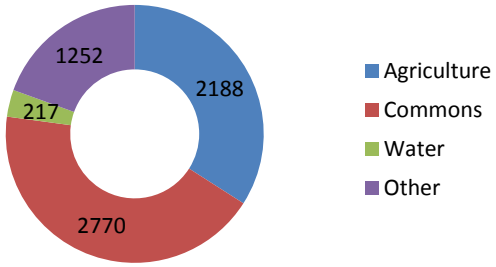
However with increasing mechanization and high input usage (of both water and nutrients to cope with decreasing fertility) the agricultural economics had also turned negative for the majority of farmers. This to a large extent had also influenced farmers to include in their cropping mix certain cash crops that could provide them with good returns in comparison to the cereal crops. Irrigation was mostly dependent on open wells, other sources of irrigation constituted a small category.

Land use pattern of villages

The overall 6427 Ha land usage in the MWS is presented in the following chart.

Figure 21: Land use pattern of the watershed project

	Area in Ha	%
Total Area	6427	100%
Under MWS	5175	81%
Commons	2770	43%
Agriculture	2188	34%
Water	217	3%
Other	1252	19%



About one third of the total area is under agriculture, whereas 43% of land is under commons. Both totally measure up to 77% of the total available land in the programme area, whereas 81% of the land is under the MWS.

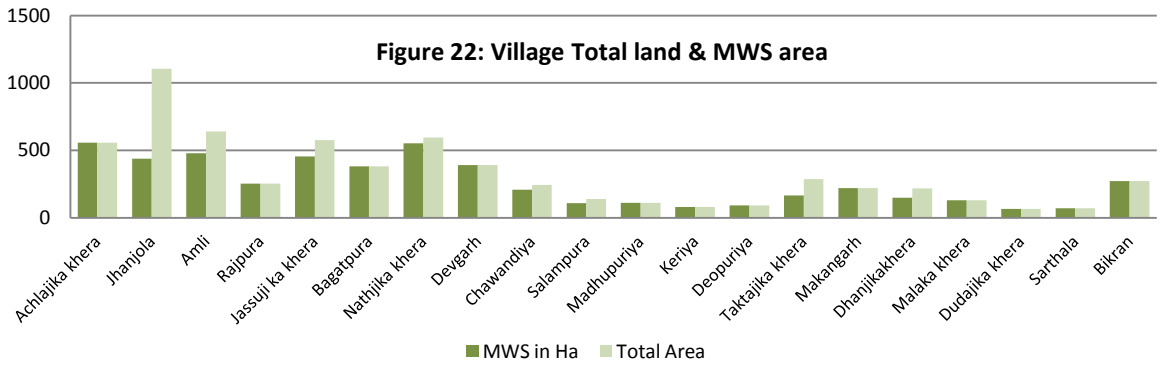
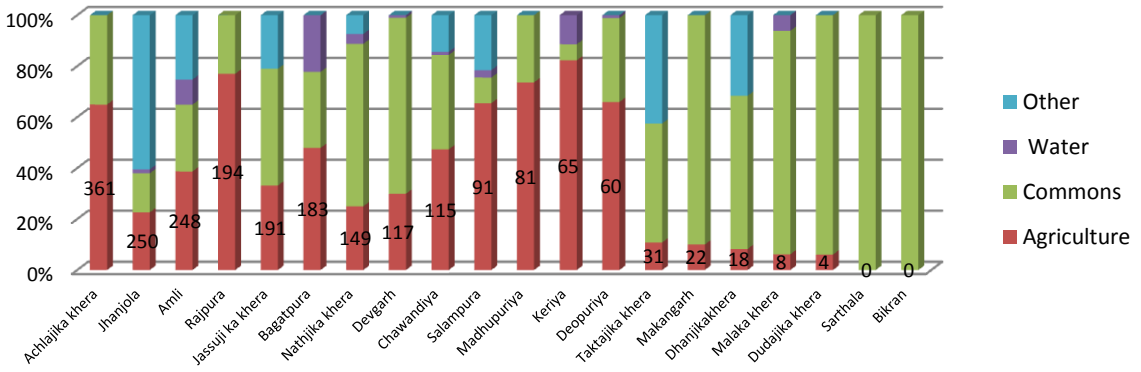


Figure 22: Village Total land & MWS area

The above graph shows the total village land and area under MWS across the programme villages of the project in Kalyanpura. Jhanjola, Amli, Jassuji Ka Khera, Nathji Ka Khera are some of the villages where not all the land under the MWS.

The land use pattern across the programme villages of the project in Kalyanpura is presented in the following graph.

Figure 23: Village land use



Seven villages (on the extreme right of the graph) have relatively low or no land under agriculture whereas the lands under the commons are high.

Land holding

Majority of the operational land holding per households across seasons was highest at about 2 acres; the findings were similar across the program villages as well as control villages.

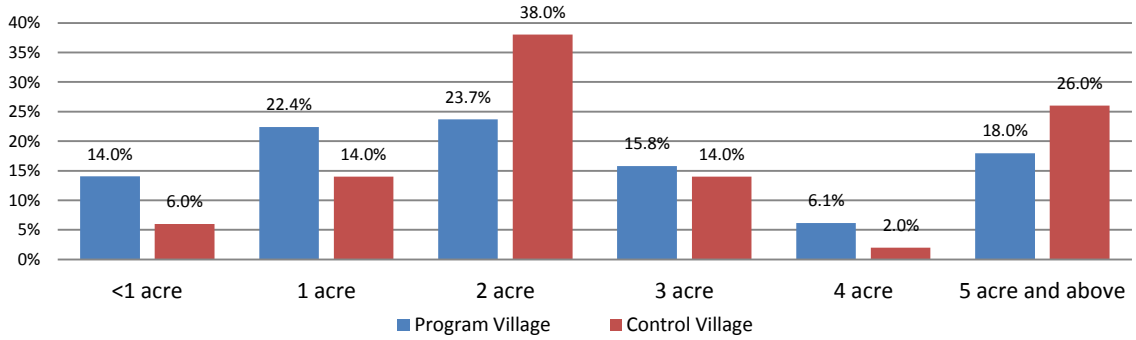


Figure 24: Operational land holding across seasons

From the above figure it can be seen that operational cultivation area across seasons is more evenly distributed in programme area indicating a better land utilisationand a greater eqality due to the watershed development project.

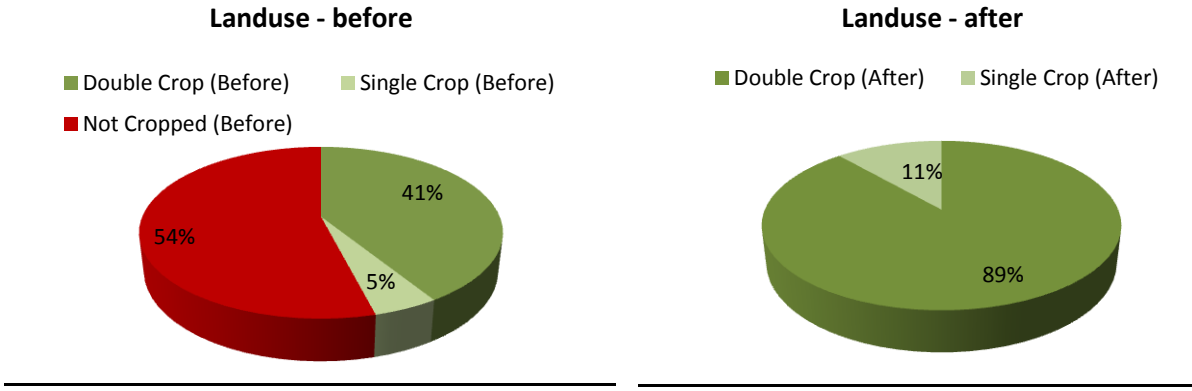
Major source of livelihood of the people is rain fed agriculture and is spread over two seasons of Kharif and Rabi. Maize, urad, jowar, moong, cotton, till and soyabean are the major kharif crops and wheat, mustard and jeera are the rabi crops, and animal husbandry, which are mainly indigenous cow, buffalo,

goat and sheep. Degraded commons, depleting water table, subsistence agriculture and incessant migration, characterizes the area.

Land use

The following chart shows that 54% of land in the sample area, which was not being cropped before the project, is now being used for agricultural purposes. The double cropped area has increased from 41% to 89% in the sample area.

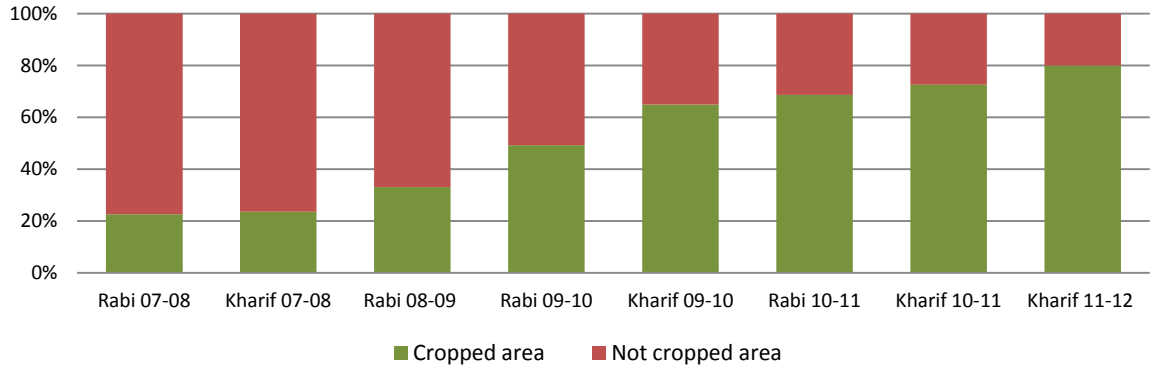
Figure 25: Land utilization before and after watershed development



Net cropped area

Trend data of season wise net cropped area collected by the ITC project team shows a steady increase from 20% in 2007-08 to 80% in 2011-12. Clearly a fourfold increase in the net cropped over 5 years is observed in the programme area.

Figure 26: Change in cropped area



- Over 54% of land in the sample area, which was not cropped earlier, has been converted to productve agricultural lands. The double cropped area has increased from 41% to 89% in the sample area.
- Net cropped area shows a steady increase from 20% in 2007-08 to 80% in 2011-12. A fourfold increase in the net cropped area has therefore been observed in the programme area after the watershed development project

Good practice: Organic chilis vs maize (Source: FES report)

Jagroop Gujar, 70 years old farmer from Amli was not be articulate in expressing his observations but conveyed his sentiments. He used organic manure in his fields until some 20 years back and switched to chemical fertilizers in last 20years. He however feels that they could not afford organic farming since they did not have enough animals. "Had we had enough supply of cow dung we wouldn't have gone for chemical fertilizers."

Jagroop Gujjar has 8 bheega land and has been growing Maize, mustard, and wheat. This year he has grown chilies in one bheega land organically. Comparing his yields as against Maize he feels, Chillis were far more profitable. The tables indicate his observations on the two crops in terms of inputs and outputs.

Comparison of Organic Chilli and Maize					
	Maize (Desi)	**Cost**		**Organic Chilli**	Cost
Seed	7.5 kg per bigha	480	**Sapling cost**	5800 saplings/bigha	250
Soil Test	Not done	0	**Soil test**	Done	25
DAP	17 KG	170	**Organic pesticide**	Trycoderma	125
Urea	40kg per bigha	200		Semboliyan	245
				Biocatch	275
Irrigation	one irrigation in situation of stress	300	**Other things added**	Gau mutra, Neem leaves , Ankra leaves mixed ad fermeted and sprayed	
			Irrigation	6	1800
	Total Cost	**1150**		**Total Cost**	**2720**
Production	4 quintal per bigha	2600	**Production**	Green chilli (2 Q)	4400
				Home consumption	1100
				Red chilli dry (1.5 Q)	10500
			Total Production		**16000**
Net Profit		**1450**	**Net Profit**		**13280**

He feels that his chilies were the best in the village this year. "I worked diligently and followed all the steps sincerely. My yield was much higher than the others. I have bartered almost 4 quintals of wheat in exchange of my chilies and also had 15 Q of dried chilies for self consumption". He finds organic farming better but for the regular supply of organic manure. He has 3 cows and 20 goats and suffered huge setback last year when almost 25 goats of his died of a disease.

He also experimented with the leaves of Neem and Desi Ankra paste and mixed with 'Gomutr' and allowed to ferment. He them used this fermented solution and sprayed for pest control. He feels it worked wonders. Growing chilies he feels is profitable." It gives more profits with less input as compared to crops like maize and wheat.

Major Crops grown

On comparison of the current survey data with the baseline data in Kalyanpura watershed area, it is observed that through the major crops by the season has not changed but some newer crops are cultivated in the areas

Table 10: Major crops grown by season, before and after watershed development				
Rabi baseline	**Rabi 2012**	**Kharif baseline**	**Kharif 2012**	**Kharif 2012**
Wheat	Wheat	Maize	Maize	Bajra*
Mustard	Mustard	Urad	Urad	Jowar*
Gram	Gram	Soyabean	Soya Bean	Mustard*
Barley	Barley	Til	Til	Lentils*
	Lentils*	Groundnut	Ground nut	Gaur*
	Cotton*		Cotton*	
	Methi*		Wheat*	

* New crops introduced into the cropping mix

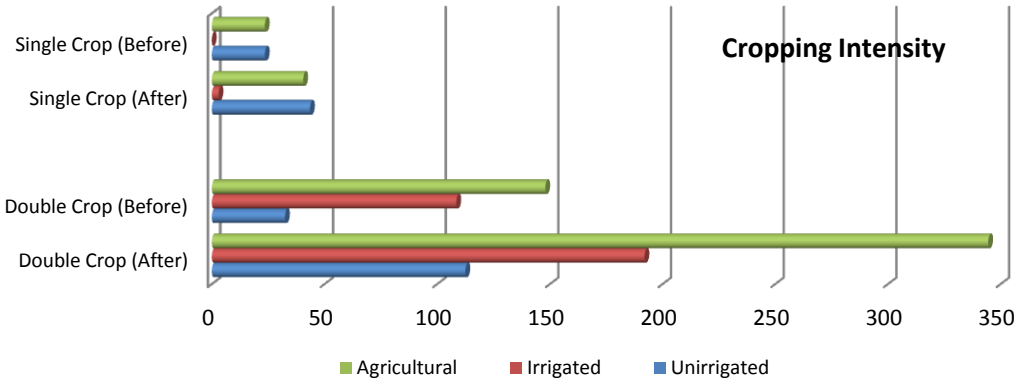
The cropping during Zaid (summer) season was found to be insignificant.

In comparison the villages in the control area do not show significant changes. The farmers mentioned increase in area under cultivation during the discussion with them (FGDs and in-depth discussions).

Cropping intensity

The cropping intensity on the available agricultural land has increased, both for the single cropped as well as the double cropped land. The irrigated agricultural land area has increased by 80% and the un-irrigated land, which was earlier not good for agriculture, has increased over 3 times.

Figure 27: Cropping intensity before and after watershed development



Cotton introduced in Rabi 2012

Mustard introduced in Kharif 2012

Good practice: Promoting Water Efficient Crops (Source: FES report)

With drastic decrease in the water available for agriculture inter and intra crop shift has been recommended since long by scientific community in Bhilwara. Decreasing groundwater table has put question marks on the viability of green revolution varieties in wheat. Often in the absence of options, either the farming community is forced to take up crops with low local food or fodder value or leave the land as fallow. Lowering of external input may be seen as critical to enhance options for the resource deprived sections through institution based

support.

A general willingness for adopting low water demanding wheat variety is visible amidst the community in Kalyanpura watershed. Through technical support of Maharana Pratap University of Agriculture and Technology, Udaipur, crop demonstration of HI 1500 Amrita wheat was taken up with 4 farmers in the project area this year. Inputs were distributed through institutional mechanisms targeting its self replication in the future.

Comparative analysis of the costs incurred in cultivation of Lokwan and Amrita varieties of wheat (per ha)

	Lokwan	***Amrita***
Seed cost	3750	3750
Sowing cost	4062	4062
DAP	1250	937
Urea	1250	469
Irrigation	7500	3750
Harvesting	5000	5000
Threshing	2188	1562
Total cost	**25000**	**19530**

A farmer with Amrita wheat harvest *(left)* showing higher biomass production than in Lokwan *(right)*

A comparative analysis of the costs incurred in cultivating the Lokwan and Amrita variety of wheat shows that with the water requirement for Amrita being almost half of that of Lokwan, the irrigation expenses of the farmer highly reduces. Low water demand of this variety of wheat has not only reduced irrigation expenses of the farmer, but also created an opportunity for those who have no option but to keep their land fallow in Rabi due to conditions of water stress.

Over irrigation of Amrita wheat impinged on its grain production this year and the yield was lower than that of Lokwan. However, the biomass production is much higher highlighting the fodder value of Amrita wheat. The fodder produced per bigha in case of Amrita variety is almost fifty quintals per hectare as compared to about thirty quintals in case of the Lokwan variety.

Institutional mechanisms have strengthened building up of local seed pool in the future. Linkage of village institution with research stations has enhanced possibility of dynamic crop planning in view of erratic climate of the area. The role of crafted institution for strengthening adaptations in field of agriculture may be accepted as crucial in view of increasingly evident climate crisis. Issue of reduction on pressure on ground water for winter crops through re-adopting of low external input demanding local varieties needs to be put into practice through institution based support. The fact that over irrigation limits the productivity in case of Amrita wheat may be taken as supporting factor against over exploitation of ground water. Being more than just a matter of productivity the intervention may be seen as a step towards revival of local farming systems.

When asked about the cropping practices, the farmers of Program and the control area, the farmers in programme villages acknowledged growing improvement in farming in terms of quality / quantity of output, reduction in input, and increase in area under irrigation and inter culture whereas 68% of the farmers in control area mentioned of no change in the situation.

Table 11: Cropping practices across program and control villages		
Responses received from 100% farmers surveyed (Column %)	Program Village	Control Village
Have grown more crops in their land	72.4%	28.0%
Have got better crop yields	71.5%	2.0%
Have undertaken inter culture successfully	43.0%	6.0%
Have brought more land under irrigation	40.8%	4.0%
Have reduced the quantity of fertilizers	28.5%	4.0%
Reduction in quantity of pesticide	25.4%	4.0%
Observed early crop maturity	25.0%	4.0%
No there has been no change	22.8%	68.0%

Good practice: Organic Farming (Source: FES report)

As a child Kashibai had seen her father use 'Desi Khad'(FYM) – organic manure in their fields. They did not know of the chemical fertilizers and pesticides then. However, over the years, she says, there has been tremendous change in the way farming is done. While earlier they grew for self-consumption now they produce for the markets. Seeds, fertilizers, pesticides are all bought from the market while earlier all that the farm needed could be procured from within the farm.

Kashibai who is now 45 years has not been happy with such changes. She never was convinced of using chemical fertilizers in the farms but since everyone was doing it she and her family too followed them. From her years of experience she has logically concluded that not only has their soil been affected by chemical fertilizers but even the food has lost its taste and nutritional value. She says "that though the production has increased, the grains we produce do not even make good fodder for our animals"

With her own experience pointing at the ill effects of chemical fertilizers it was not difficult for Kashibai to be willing to once again experiment with organic ways of farming. She has 15 Bheega land on which grows Sugarcane, chilies, Lentils like masoor, wheat, and seasonal vegetables. While all the sugar cane is grown for the market, part of the wheat is kept for self-consumption. Lentils and vegetables and chilies are grown purely for self-consumption.

Of her 15 bheega land Kashibai has cultivated wheat organically in one bheega of her land and she is convinced that over the years this would bring her much higher returns. "Its difficult to get over years of addiction at one go", she says, further adding, "Soil that is accustomed to chemical fertilizers will resist organic fertilizers initially. It's like how we can't digest good home made food after eating the junk food for days". Kashibai is ready to bear the loss of production in the initial years of transition from Chemical to organic fertilizers. "If not anything at least I will not loose my land. Right now this land has nothing in it and so I have to spend more money on providing the land with artificial supplements". She is open to the thought of going completely organic in her farms, eventually.

Just as she had seen the ill effects of the chemical fertilizers she is now noticing the benefits of going organic. "The grain this year is small in size, but look at its quality! It would taste sweet even if you eat it raw. I have saved at least 10kgs of seeds this year, 40kgs of urea and 10kgs of DAP. Besides the soil in this field (organic plot) is softer and coarse, where as one where chemicals have been used the soil is hard like rock". For Kashibai the loss and gain through organic farming is marked and clear.

Attending to her one-year-old grandson, Kashibai says, "the food these days has lost all its taste. Even the milk is not the same. The ghee we ate in our childhood had a rich smell. These days even the ghee doesn't taste like ghee. Since everyone was using urea we also blindly ran after them, even when we could see what it was doing to our land. I will not sell the wheat grown organically. Will keep it for self-consumption. Let my grandchild also know the real taste of wheat".

Land area under cultivation

The amount of land respondents had put under each crop is shown in the following tables -

Rabi – nearly 90% of the farmers had put more than 1 acre in programme area whereas only 64% of the control villages could provide same amount of land during the season.

Table 12: Land area under cultivation, Rabi season		
Land Unit for Rabi Crop	Program Village	Control Village
up to 0.25 acre	0.0%	2.0%
0.25 to 0.5 acre	0.9%	14.0%
0.5 to 1 acre	18.9%	64.0%
More than 1 acre	89.9%	64.0%

Kharif – Nearly all the farmers in had put more than 1 acre in programme area whereas only 72% of the control village could provide same amount of land during the season.

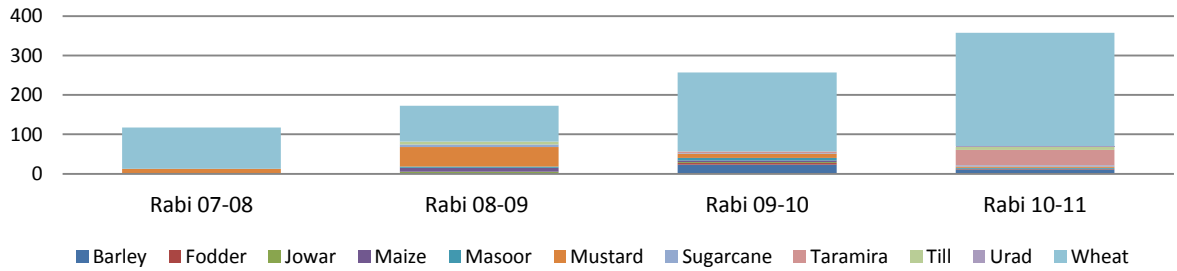
Table 13: Land area under cultivation, Kharif season		
Land Unit for Kharif crop	Program Village	Control Village
up to 0.25 acre	0	0
0.25 to 0.5 acre	0.4%	20.0%
0.5 to 1 acre	21.5%	64.0%
More than 1 acre	98.2%	72.0%

It is thus observed that more land is available for cultivation in the programme villages across both the main cropping seasons as compared to the control villages.

Crop rotation

With the increase in the net cropped area, the crop rotation practice has been consistent, with wheat being grown in Rabi and maize in Kharif season.

Figure 28: Crop rotation year wise, Rabi season

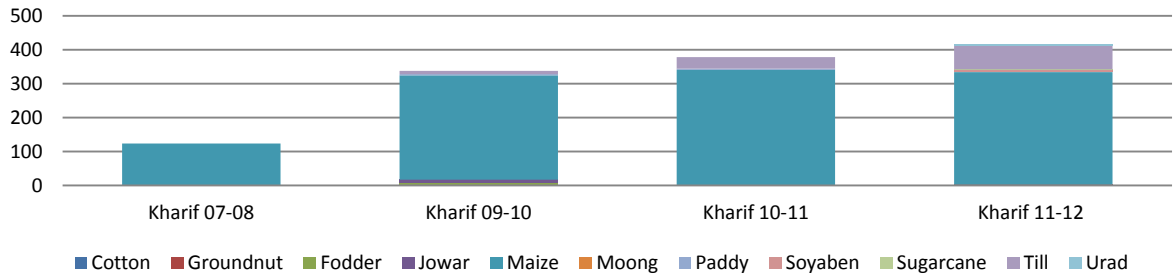


The above chart shows the year wise crop rotation in the programme village during the Rabi season. Several crops have been added to the mix after the watershed development project in the programme area. Area under wheat has consistently increased over the years although total area under irrigation has remained the same. This indicated greater utilization of non cropped areas after the watershed development project. With increased irrigation, barley, mustard and taramira have significantly added to the cropping mix.

From the following table, Increase in cropping intensity has also been observed during the Kharif season. Area under maize has significantly jumped from 2007 - 2008 (123 acres) to 306 acres in 2009 - 2010 due to the

watershed development project in the programme area. Areas which could not be cropped earlier have been brought under cultivation. In addition to maize, till has significantly added to the cropping mix after the watershed development project.

Figure 29: Crop rotation year wise, Kharif season



- The cropping intensity on the available agricultural land has increased, both for the single cropped as well as the double cropped land. The irrigated agricultural land area has increased by 80% and the un-irrigated land, which was earlier not good for agriculture, has increased over 3 times.
- With the increase in the net cropped area, crop rotation has been consistent, with wheat being grown in Rabi and maize in the Kharif season. Wheat was increasingly rotated with barley, mustard and sugarcane over the years in the rabi season whereas maize which is the main crop grown during Kharif was rotated with till and groundnuts over the years. Net sown area has increased to almost 125% after the watershed development projects with non - cropped areas coming under cultivation due to increased water availability

Farm mechanisation

The following table shows the farm equipments owned prior to 2007 and the new assets bought after 2007, during the project period.

Table 14: Farm equipments before and after watershed development

	Program Village	
	Equipments owned prior to 2007	New assets bought after 2007
	Column %	Column %
Tractor	5.3	5.1
Ploughing Equipments	49.6	66.7
Cart	7.5	6.1
Thresher	14.9	6.1
Fodder Cutting Machine	13.2	4.0
Generator	5.3	1.0
Diesel Pump	15.8	14.1
Other Machinery	0.9	0.0

It is observed that 67% of the farmers bought Ploughing Equipments, 14% procured diesel pumps in the last 5 years. The procurement pattern indicates active engagement in farming throughout the project duration.

Crop yields

As per the baseline data the yield of crops was very low in Kalyanpura watershed as compared to the data on yield in the block, with maize in Kharif season recording a yield of 7.83 q/ha as against the yield in the block of 25-30 q/ha. Similarly, the yield of wheat in Rabi season was 21.31 q/ha as against the yield in the block of 19-25 q/ha. The other crops also had a similar low yield. This was mainly due to very poor soil conditions, 20-25 % area of the area was highly rocky, thus reducing soil fertility and organic carbon percentage in the area.

Table 15: Baseline data – crop yields, blockwise and in the watershed area

Season	Crop name	Total area (Ha)	Average yield in Block (Mandalgarh) (q/ha)	Average yield in watershed area (q/ha)	Average yield of by product(q/ha)
Kharif	Maize	727.48	25-30	7.83	27.5
	Soya bean	3.76	15-20	14.56	
	Ground nut	0.8	5-10	4.14	
	Urad	13.6	5-10	4.35	
	Til (Sesame)	3.04	10-15	4.97	
Rabi	Wheat	380.04	19-25	21.13	19.5
	Mustard	32.72	4-6	7.97	
	Barley	10.16	10-15	17.29	
	Gram	11.4	8-10	9.69	
	Lentil	2.92	8-10	7.81	
	Turmeric	0.32	7-12	5.46	
	Dhania (Coriander)	1.28	5-10	5.4	

As per the respondents there has been an increase in productivity by 20% - 25% across various corps grown in the area between 2007 and 2012.

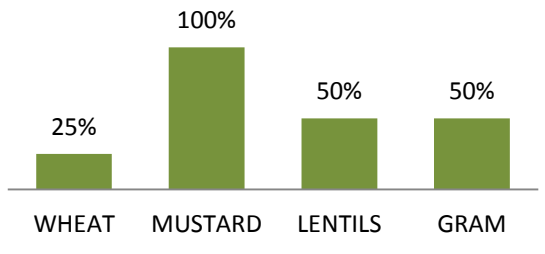
Changes in productivity per acre across time (2007 – 2012)

The following table denotes the change in productivity before and after watershed development in the program villages and also its comparison with the control villages during the Rabi season

Table 16: Production (Average quintals/acre), Rabi season

	Program Village Before	Program Village After	% increase	Control
Rabi				
Wheat	8	10	25%	6
Mustard	1	2	100%	2
Lentils	2	3	50%	2
Gram	4	6	50%	4

Figure 30: Rabi - Per cent Change in Productivity (q/acre) across program village



- Around 25% increase in the productivity of wheat, which is the major Rabi season crop was observed across the program villages
- Mustard production had almost doubled in the program area.

- Lentils and gram had also increased their productivity to 50% as a cause of the watershed development in the Rabi season

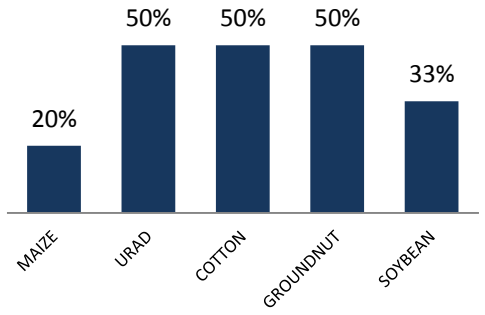
The following table denotes the the change in productivity before and after watershed development in the program villages and also its comparison with the control villages during the Kharif season

- Over 20% increase in maize (the major Khraif crop) productivity was achieved.
- Nearly a 33% increase in Soyabean production was observed in the programme area
- Urad, cotton and groundnut production had increased to more than 50% increase in the program villages after the watershed development project.
- The change in productivity is also significant to that of the control, whose productivity status is almost similar to that of the program villages before the watershed development project

Table 17: Production (quintals/acre), Kharif season

	Program village Before	Program village after	% increase	Control
Kharif				
Maize	5	6	20%	4
Urad	2	3	50%	2
Cotton	2	3	50%	2
Groundnut	2	3	50%	1
Soyabean	3	4	33%	2

Figure 31: Kharif - Per cent Change in Productivity (q/acre) across program villages



- Though the major crop by seasons has not changed but some newer crops have been added to the cropping mix. Wheat which is grown across the Rabi season showed a 25% increase. Mustard (100%) and lentils (50%) has also increased their productivity significantly after the watershed development project.
- Maize, which is grown in Kharif showed a similar increase of 20 – 26% over the years. Urad and cotton has increased their productivity by 50% as a cause of the watershed project in the programme area.
- With an increase in irrigation due to the watershed development project a large percentage of non cropped areas have been brought under cultivation. This is evident in a comparison between the beneficiary households and the control; in the Rabi season nearly 90% of the beneficiary farmers had put more than 1 acre in under cultivation whereas only 64% of the control farmers could provide same amount of land during the season.
- In Kharif, about all i.e 100% of the beneficiary farmers had put more than 1 acre under cultivation whereas only 72% of the control could provide the same amount of land during the season.

8. LIVESTOCK & FODDER AVAILABILTY

Increase in livestock holding in last 5 years

Based on the analysis of the farmer survey and focussed group discussions, the following increase in livestock was observed.

Table 18: Investment in livestock as a cause of increased incomes from the watershed development project

Live stock	2007	2012	New purchase (% HHs)
Cow (Nos.)	67 % HHs (1-2)	70% HHs (3-4)	28
Buffalo (Nos.)	52% HHs (3)	69 % HHs (4-5)	37
Sheep (Nos.)	54 % HHs (4-5)	66.7% HHs (7-8)	18
Goat (Nos.)	46% HHs (2-3)	57% HHs (7-8)	12

Over the past 5 years there has been a considerable increase in livestock. Nearly 70% farmers reporting to be increase of cows (3-4 nos.) & buffalo (4-5 nos.) over this period.

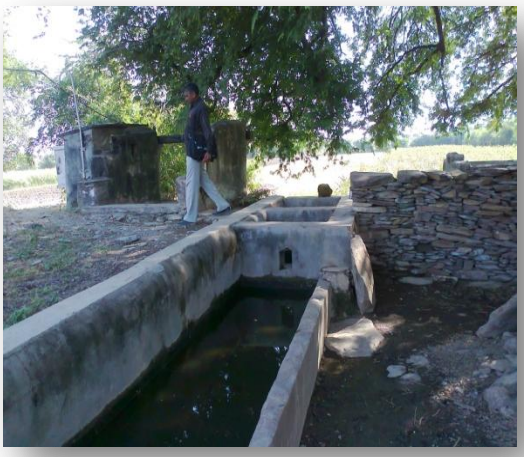
During the survey of the farmers the number of lean months in 2007 for fodder availability of 3 months or more by as opined by 70% of respondents in programme / control villages. In 2012, the farmers felt that the number of lean months of 3 months or less / no shortage by 74% of respondents in programme villages. This indicates a ¾th of the population did not face any major shortage in availability of fodder.

The farmers were also probed on whether the cattle have problem of drinking water or has the availability changed over time. According to the respondents, in 2007, the number of lean months of 2 months or more was felt by 83% of respondents in programme / control villages. Now in 2012, the number of lean months of 2 months or less / no shortage was reported 83% of respondents in programme villages. Thus 83% felt no major water shortage for their livestock.

About 68% of the farmers in the programme village opined that the intervention has changed the proximity of availability of water for livestock.

Table 19: Availability of water for livestock post intervention

Changed the proximity of availability of water for livestock	Program Village	Control Village
Changed	68.0%	0%
Not changed	18.4%	82.0%
Do Not Know / Cannot Say	13.6%	18.0%
	100.0%	100.0%



The respondents when enquired regarding saving in terms of yearly expenditure on fodder due to increased fodder and water availability for livestock, nearly 60% felt they had saved upto Rs. 2000 whereas 78% of the respondents felt there has been no savings on expenditure on fodder for their livestock.

Table 20: Annual savings due to intervention, on fodder costs

Money saved on yearly expenditure on fodder	Program Village	Control Village	Total
No Change	28.1%	78.0%	37.1%
Rs 500- 1000	32.0%	8.0%	27.7%
Rs 1001-2000	29.8%	12.0%	26.6%
Rs 2001-3000	4.8%	2.0%	4.3%
More than Rs 5000	5.3%	0.0%	4.3%
Total	100.0%	100.0%	100.0%

- Increase in livestock was observed after the watershed development project in the programme villages. The increase in livestock is a reflection of not only increased incomes as a result of watershed development but also increased availability of fodder and sufficient water in the programme area.
- Nearly three fourth of the population did not face any major shortage in availability of fodder and 83% felt no major water shortage for their livestock. About 68% of the farmers in the programme village opined that the intervention has changed the proximity of availability of water for livestock. Nearly 60% felt they had saved upto Rs.2000 p.a on fodder expenditure due to the ease in fodder and water availability as a result of the watershed development projec

Area under fodder crops and production-yield details for last 5 years

The fodder is grown on common lands and not on household agricultural lands. Hence no production-yield or change in area under fodder related information was reported on the agricultural land.

Good practice: Governing Commons (Source: FES report)

Common lands in Rural India are the one of the most valuable resources which are being contested for different uses subject to power and politics that revolves around the control and access over the resource. There are often differential responses from different stakeholders and village which offers an opportunity to understand the governance patterns and the community linkages with the resource. This case is about boundary dispute related to the usage of pasture between Aclaji ka kheda and Jhanjola which has been continuing for many years. This case adequately defines the role of village institutions in securing commons for safeguarding their future. The commons have now proved to be lifeline for the rural poor and their livestock during the drought season. In addition this has paved the path for the village institutions towards a robust and bright future.

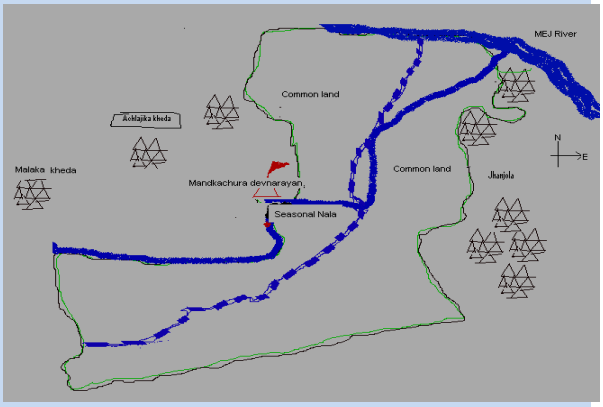
Achlajika kheda and Jhanjola are revenue villages of the Jhanjola Panchayat approximately 75kms south east of

the Bhilwara district. The villages are situated on the banks of river Mej. Both the village has combined households of 350 with a livestock population of approximately 2600. Both the villages had their pasture plots nearly 353ha adjoining each other. Achla ji ka kheda a Gujjar dominated village with people who over the years had been marginalized in terms of class, access and control and overall political scene in the area. This led to an increased access and control of the Jhanjola village over the village commons. The situation was such that the ration card of most of the residents of Achla ji ka Kheda village were with a person from Jhanjola. Some of the people also encroached the village pasture thereby further reducing the access of the poor livestock keepers on the village pasture which came under increased pressure leading to reduced productivity.

	Big animals	Small ruminants
Achlajika kheda	291	665
Jhanjola	593	1104

With the initiation of the institutional process in the villages people slowly started to discuss villages issues and challenges. The villagers of the Achlajika kheda never saw a role for themselves in the planning process of the watershed development work that needs to be undertaken in their village. With the initial work of construction of WHS being undertaken as per the community planning saw the people realizing that what they had planned can also be implemented. The community members had seen some pasture land development done in their neighboring villages, proposed work on their pasture land. When the village decided to bring the commons for regeneration, plans were drawn and encroachers were persuaded to evacuate the lands by the village institution.

The village institution conducted series of village level meetings to negotiate and persuade encroachers to leave their encroachment. Initially the individuals tried their level best to disassociate themselves from the institution but with increasing pressure they conceded to the demands to evacuate the illegal encroachments. This was the first victory for the institution which provided them strength and confidence in themselves and raise their voice for gaining control over the village pasture. This was the point when the conflict started as this was the first time the communities in Achla ji ka kheda had raised a collective effort towards accessing their right over the pasture. Some miscreant in Jhanjola broadcasted urea on the pasture so that the animals if they eat grass during that people would be affected by the urea. This aggravated the problem with both the parties lodging complain with the SDO and Tehsildar.



Map of the village and conflict zone depicting the commons

A marked increase can be noticed in the total cropped area of Jeetmal Gujjar. With an improved soil and moisture regime and an assured source of water for irrigation, he was able to bring even the 0.4 ha of his barren land under cultivation. Even during Rabi, he cultivated on his entire farmland, with wheat sowed in 2 ha and

masoor, tara mira and rajka sowed in the remaining 0.4 ha of land. Considering that there was enough water in his well to support his crops with the required amount of water for irrigation, the total yield of wheat this year was 49 quintals (almost six times the previous year). While he kept 22 quintals for domestic consumption, he sold the rest at the rate of Rs 10,500/- per quintal which generated an income of Rs 28,350/-. He was able to earn another Rs 3,900/- from sale of tara mira and masoor. Further, increased crop area has also meant an assured source of fodder as residues of maize and wheat and rajka as green fodder. He purchased two buffaloes and at present sells 4 liter milk per day to the dairy which fetches him monthly income of Rs 2500/-. He plans to get two of their daughters married this year and the additional income generated has come as a boon for the family.

Degradation of land and water resources and decreasing returns from the farm has increased the vulnerability of the farmers which clearly manifests in increased instances of farmer suicides and rural urban migration across the country. Farming has emerged as one of the last ventures people in this generation like to delve into. The story of Jeetmal Mangna Gujjar is not only testimonial to the benefits of watershed development in terms of changes in the cropping area and cropping pattern, but also as to how these can act as motivating factors for many farmers like him for whom farm based production system is the mainstay of their livelihood.

9. CONVERGENCE WITH GOVERNMENT PROJECTS

The strength of the watershed communities and robustness of the institutions were reflected in their efficient handling of several complex issues such as encroachment on commons and ensuring equity in distribution of benefits. From initial thrust on drainage line treatment the focus lied on complete treatment of the watershed in last financial year.

About 150 ha of commons with high potential of fodder production were freed of encroachment at Achlaji ka Kheda and brought under common property regime. Inter village dialogues resulted in transactions ensuring better management of commons as reflected in case of pastureland of Jhanjhola being managed by Achlaji ka Kheda. Vertical growth of the institution's capacity to govern natural resources was observed in Amli where work on pastureland by Panchayat through MGNREGS led to positive results wherein local volunteers played a significant role.

About 4000 kg of fodder could be extracted through common arrangements ensuring equity and participation at Amli which in spite of low grazing pressure had been unable to manage its commons in the past.

NREGA

The farmers mentioned undertaking various kinds of jobs, such as soil barricade, trenching, delineation, fencing and tree plantation, under the NREGA programme in the villages.

Table 21: Satisfaction with respect to the quality of the work completed under NREGA (% of respondents across program villages)	
Fully Satisfied	64.0%
Not Satisfied	17.5%
Could have been better	18.4%
Total	100.0%

Nearly 57% of the respondents felt that the panchayat/VI did undertake work for the protection of the environment. Over 64% of the respondents were satisfied with respect to the quality of the work completed.

Programs of Agriculture Development

The following activities such as Improved Irrigation Practices, Various Trainings of Cultivation Practices, Introduction of better varieties of seeds and Pest management trainings were undertaken in the villages for the Agriculture Development.

Table 22: Activities undertaken in the program villages for agriculture development (% of respondents)	
Various Trainings of Cultivation Practices	85.1
Demonstration Plots	33.8
Exposure Visits	11.8
Film/ Multimedia Shows	33.3
Pest management trainings	50.9
Improved Irrigation Practices	90.4
Introduction of better varieties of seeds	81.1

Types of other activities undertaken in the villages

Agriculture	Water management	Livestock / fodder
Apna Khet Apna Kam	Improved Drainage systems	Plantation of trees
Education on better varieties of seeds	Building of Check dams	Usage of animals manure for biogas
Education on improved cultivation practices	Deepening of trenches	Fence work
Education on newer high yielding hybrid seeds	Optimal water usage for agriculture	Fodder arrangement for animals
Education on improved irrigation practices	Pond excavation	Use of dung for manure, to act as organic fertlizers
Pest management	Water harvesting	
Soil testing	Water tank creation	
	Prevention of soil erosion	

Biogas

Biogas lightbulb

Over 53% of the respondents felt that the coordination between the Panchayat & VI/Federation was satisfactory with regard to the agricultural development work that was undertaken in the programme village.

Table 23: Opinion regarding coordination between the Panchayat & VI/Federation	Program Village
	% of respondents
Satisfactory	53.9%
Not satisfactory	13.6%
Could have been better	32.5%

Over 71% of the farmers in the programme village opined that they had benefited from the initiative of agriculture development that was currently underway in their villages.

About 55% of the respondents in the programme village mentioned at least 1-2 activities focused on agriculture development that was undertaken in their village over the past year.

Table 24: Opinion regarding agriculture development undertaken in the village	Program Village
	% of respondents
Farmers benefited	71.5%
Farmers not benefited	11.8%
Could have been better	16.7%

Table 25: % of respondents attesting to the no. of activities undertaken in the program villages	
No activity	37.7%
1 activity	25.9%
2 activities	30.3%
3 activities	5.3%
4 activities	0.9%
	100.0%

Animal Husbandry and Dairy Departments

The villagers in the programme villages mentioned the following dairy development activities that was currently underway in their villages by thePanchayat & VI/Federation.

Livestock Feed	Sale of good quality buffalo	Milk procurement
Calves provided	Artificial insemination	Veterinary Doctor Visit
Livestock loan	Sale of good cattle feed	Husbandry facility

Around 40% of the farmers felt that the village benefited from the initiative of dairy development, whereas 60% felt there was scope for improvement to make it more useful for the farmers.

Good practice: Biogas - environmental sustenance (Source: FES report)

The burgeoning biomass dependent population and the depleting natural resources propel the urgency to adopt alternative sources of renewable energy generated by technology which is amenable and can be managed and modified by the community itself. The biogas system provides with one such alternative for conserving the biomass and making effective use of the locally available resources. To reduce the pressure on commons and optimize the energy utilization within the system, coordinated efforts are being made to develop biogas into a dependable and sustainable source of energy in the Kalyanpura watershed.

The need for alternative source of renewable energy and the success of biogas plants in the neighboring village of Jalam ka Jhopra became the driving forces for its replication in the Kalyanpura watershed. Past experiences helped in better preparedness for its expansion. Perceptions of the people regarding biogas, viability of the technology in rural areas, the economics of the biogas system were carefully assessed. In the first phase, four biogas plants were installed in Jhanjhola village last year with the aim of gradually scaling up. To minimize the reliance on 'outside' assistance and developing experts on biogas within the community, skills of a group of community members (including women) were enhanced.

Prior to intervention	Intervention	Post intervention
▪ High dependence on fuel wood to meet the energy demands of the village ▪ Awareness and willingness to adopt those technologies that are limited to select caste and class groups ▪ Apprehensions regarding the technology	▪ Four biogas plants installed in Jhanjhola last year ▪ Sensitized the community on the urgency of conserving biomass and adopting alternative sources of renewable energy ▪ Regular maintenance and support provided ▪ Capacity building of a group of community members	▪ About twenty quintals of fuel wood saved per year per benefited household ▪ Twenty households in Jhanjhola village have demanded biogas on their own ▪ Biogas plants successfully operating round the year ▪ With a group of people from the community capacitated the viability of the technology in the long run has increased

Successful operation of the biogas plants installed last year generated demand for more biogas units in the

village. One of the immediate benefits that can be accrued is in terms of being useful for substituting fuel wood. It helped in conserving about twenty quintals of fuel wood per household annually. Regular supply of energy piped to the home has reduced the daily task of fuel wood gathering, which in most cases is done by the women.

Skill enhancement of people from the community has made the technology more amenable and would help in developing the biogas system as a truly viable option for meeting the energy requirements. In the long run these might also be useful in providing residue organic waste, after anaerobic digestions that has superior nutrient qualities over the usual organic fertilizer, cattle dung as it is in the form of ammonia. The role of subsidy in generating demand, particularly among the marginalized sections of the community could be banked upon by linking biogas with other animal husbandry based livelihood promotional activities.

- Convergence with NREGA is seen such that farmers attested to undertaking various kinds of jobs like building farm bunds, trenching, delineation, fencing and tree plantation under NREGA programme operating in the programme villages. Nearly 57% of the farmers felt that the panchayat/Village Institutions did undertake work for the protection of the environment. Over 64% of the respondents were satisfied with the quality of the work that was available and completed.

- Activities such as improved irrigation practices, various trainings under cultivation practices, introduction of better varieties of seeds and pest management were undertaken in the villages. Over 71% of the farmers opined that they have benefited from the initiative of agriculture development currently underway in the programme villages. About 55% of the farmers mentioned various activities focused on agriculture development that were undertaken in their village in the past one year.

10. ACHIEVEMENTS IN ACCORDANCE WITH THE FIVE YEAR PLAN

Most of the proposed treatments over achieved in the 5 yrs as shown in the following table

Table 26: Proposed treatments overachieved since watershed development project

Category of treatments	Treatments	Target of treatments for project period (2007-2012)	Achievements (2007-2011)
Arable land treatment	Earthen dam with vegetative waste weir	500	561
	Waste weir in semi-pucca bund	98	0
	Farm pond	24	2
	Loose boulder check dam	44	0
	Earthen gully plug	0	1
Non-arable land treatment	Pasture land development in areas having slope <5%	570 ha	690
	Earthen WHS	18	0
Drainage line Treatment	Earthen bund with waste weir	12	10
	Small masonry check dam	25	15
	Medium masonry check dam	15	22
	Gabion	25	15
	Stone slab check dam	26	19
	Repair of structure	12	2
Soil and water conservation	Contour bund and trench	461 ha	248
	Earthen gully plug	77	19
	Loose boulder check dam	414	569
Livelihood related activities in animal husbandry	Animal health camp	68	10
	Animal care and feed management	88	0
	Breed management	637	35
Livelihood related activities in agriculture	IPHM	269	738
	Dry land horticulture plantation	73 ha	12
	Vermi-compost	100	0
	Sprinkler	12	6

The project had initially targeted to regenerate 570 ha of common lands for pasture development. However, this activity has had active response from all the villagers since even the landless and marginal farmers could benefit from this activity. This project now covers 690 ha for regeneration.

Fodder development was monitored in order to get a better understanding of the fodder needs of villages and the carrying capacity of the regenerated land.

Based on the field situation, direct seeding was also taken up where required. Local species such as Butea Monosperma, Acacia Nilotica, Zizyphus Numularia and Acacia Catechu were sown directly. Saplings of Acacia Nilotica, Acacia Leucophloea and Acacia Senegal were also planted.

Watershed development has long been one of the major channels directing public investment to natural resource base and production systems in rain-fed agriculture. From their earlier emphasis on soil and water conservation, the focus in case of watershed projects is shifting towards livelihood security and income generation. It is also now generally accepted that to be effective, the watershed development and soil conservation investments have to be complemented with farming systems investments in a watershed-plus framework that takes into account the diversity of rain-fed agriculture.

However, despite considerable emphasis on this in the Eleventh Plan design and development of common guidelines, actual performance in regard to watershed development was poor during the Eleventh Plan. Since all watershed development programmes have been transferred to the Department of Land Resources, the Ministry of Agriculture has to redefine its initiatives for rain-fed farming and sustainable agriculture.

The Eleventh Plan saw several path-breaking initiatives in the watershed sector. The outlays of Rs.15,359 crore for IWMP and Rs.3095 crore (at 2006–07 prices) for the Rainfed Areas Development Programme of the Ministry of Agriculture were unprecedented. But even more than the outlays a radically new approach was proposed for implementation of watershed programmes in the Eleventh Plan.

The Technical Committee on Watershed Programmes in India (Parthasarathy Committee) set up by the Ministry of Rural Development submitted its report in January 2006. Drawing upon the lessons of the last two decades, the Parthasarathy Committee proposed key reforms in the watershed programme. These include a dedicated full-time implementation structure run by professionals, especially at the district level and below; a 3-phase programme, which includes an initial preparatory phase of two years focused on building local capacities and institutions; central emphasis on capacity building, involving the best available expertise from the voluntary sector; much greater emphasis on monitoring, evaluation, learning and social audit; building a livelihoods perspective into the programme; enhancing the per hectare norm to Rs.12000 from the prevailing Rs.6000; watershed works to be carried out on clusters of micro-watersheds from 4000 to 10000 ha rather than the earlier 500 ha micro-watershed.

The National Rainfed Areas Authority (NRAA) was set up in November 2006. The NRAA, in coordination with the Planning Commission, issued a new set of Common Guidelines for Watershed Development Projects in February 2008, which are applicable to all watershed development projects in all Departments/Ministries of the government. The Desert Development Programme (DDP), Drought Prone Areas Programme (DPAP) and Integrated Wastelands Development Programme (IWDP) were merged into a single Integrated Watershed Management Programme (IWMP).

However, a major part of the Eleventh Plan was occupied in completion of a large number of ongoing projects under DDP, DPAP and IWDP, although no new projects were sanctioned under these programmes. Out of 45062, 41812 projects were either closed or completed by the end of the Eleventh Plan. The remaining older projects are to be completed by the end of 2012–13. Sanctioning of new IWMP projects commenced towards

the latter half of 2009–10 and an area of 15.13 million hectare has been sanctioned across 23 States in the country. Overall, however, against an approved outlay of Rs.15359 crore in the Eleventh Plan, the actual expenditure was only Rs.9430 crore.

The Ministry of Rural Development constituted a Committee under the Chairmanship of Dr. Mihir Shah, Member Planning Commission to revisit the Common Guidelines for Watershed Development Projects to provide necessary flexibility within the Guidelines and to ensure momentum to IWMP, even while strengthening its innovative features. The new Guidelines proposed by the Mihir Shah Committee to be applied to watershed projects wef 1st of April 2013.

- Considering that livestock is an important source of regular income for farmers, ITC has also initiated a PPP model of dairy development, to increase productivity through an integrated package of animal husbandry services comprising genetic improvement to ensure disease-free and resistant animals. In partnership with NGOs, ITC and the Panchayati Raj Institutions has started several cattle development centres that provide animal husbandry services across the programme villages.

- Several other initiatives like formation of Milk Producer's Group, Dairy Co-operative Societies, promotion for cattle loan facility through regional rural banks and installation of bulk milk chillers have also been made. With improved breeds and enhanced milk production in the programme villages, a significant percentage change in annual household income has been observed over the years.

- The villagers acknowldged various dairy development activities currenty underway in their villages by the Panchayat & VI/Federation. Around 40% felt that the farmers in the village benefited greatly from the initiative of dairy development, where as 60% felt there was scope for improvement to make it more useful for the farmers.

11. COMMUNITY INSTITUTIONAL STRENGTHS

Institutional Development & Capacity Building

Efforts were made during the year 2009-10, towards bringing in convergence of information, science & technology, schemes programs and agencies to bring in holistic development of the poor and marginalized communities. To meet this end, various activities pertaining to institutional development and capacity building were undertaken in the watershed.

These institutional development and capacity building programs were designed towards developing an understanding of the developmental processes in general and natural resource management in particular. Training programs were organized to build people’s capacities on the technical aspects of the intervention. Dialogues and discussions were held with the community in the project area to generate awareness and sensitize them on the issue of balancing the appropriation and production needs.

Good practice: Social Impact of SHGs (Source: FES report)

Bagatpura a village in Jassu ji ka Kehda Panachayat of Mandalgarh Tehsil district Bhilwara is a small village with around 80 households has been marred by the inter-caste disputes and rivalries which are age old now. This village is also one of the constitution villages in the Kalyanpura Watershed. These disputes are largely between the Sadhu and Teli communities who are the dominant caste groups in the village. The other caste groups such as Barets, Rajputs etc are in very small numbers were silent spectators. These disputes reached to a level where these communities never have never shared drinking water and prohibited family interactions.

Starting the institutional development work in village was a big challenge as due to this age old conflict the two communities never used to sit together for discussions. To add the communities also had lost confidence on the Panchayat. "Panchayat ke maine kaam howe koni…. Saab panchayat mein gariba ka hunai na howe… (In Panchayat no work is being done….and nobody listens to the poor people) ." These were the few voices that were commonly heard during village meetings when the project team interacted with the community a year ago.

There was difficulty in resolving their caste conflict and the lack of ownership over their Panchayat. Strategically the work was first initiated through Gram Panchayat where regeneration of pasture land was done. This was intended towards reviving the relation between the village and the gram Pancahayat. Slowly the people started responding and initiated 'ORA' - rotational protection for protecting the Pasture land.

Alternatively women SHG was thought to be tool where women can participate, discuss in a collective forum other than initiating savings. This again turned out to be very complex one as the women wanted the SHG to be formed caste wise. To avoid conflict one SHG including all women in the village was formed. Slowly they started interacting with each other. As Ghisi [sadhu] speaks "Baiji maka gharwala naraz hoi jato par group meeting mein Jamna [teli] abaoo bata bhi hoba lag gii''. My husband used to get angry when I used to talk to some women from Teli Samaj, but after these group formations when I meet Jamna (Teli) and we interact, he doesn't object. Slowly these interactions were helpful in dissolving the inter-caste bitterness and women started sharing water and Tea amongst each other.

Women members collectively formulating the byelaws

After nearly three months the large SHG was proposed to be broken into three smaller SHGs so that they can be linked with the bank. This time the women agreed and themselves decided on the members for each SHG with no discrimination based on caste. This is only a beginning.

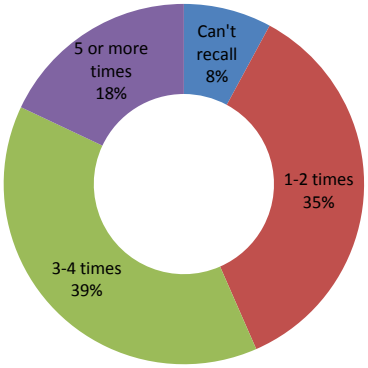
Role of Various Agencies In The Implementation

Role of various agencies in the implementation of the project and its sustainability in terms of village-level institutional mechanisms built up are discussed below.

When enquired regarding the functioning of the village institutions, it was found that:

- About 98% were aware of the formation of the VI in the village
- Only 14% of the respondents were part of any VI
- About two thirds of the respondents felt there were 15 members in the VI whereas the rest not sure of the numbers of members which constituted the VI
- About 87% claimed to be aware of the functioning of VI
- Nearly 85% felt that they could identify the VI Group member
- About 60% felt that the VI Group member attended any training
- Over 78% felt that the VI had been working in the village for 2 to 5 years
- Nearly 39% respondents felt that the VI met 3-4 times a year.

Figure 32: No. of meetings held in a year



When asked regarding the issues the VI / federation discussed with respondent, creating water harvesting structures and agriculture related knowledge were the two most discussed issues.

Table 27: Issues discussed with respondents (% of respondents)	
Management of common areas	51.3
Creating water harvesting structures	84.2
Agriculture knowledge	80.7
Stoppage of fuel wood cutting	55.3
NREGA Work related issues	65.4

Table 28: Members present in the meetings (% of respondents)	
Men	60.5
Women	51.3
Panchayat members	88.2
VI members	84.6
Federation Members	36.4
NGO Staff	48.7

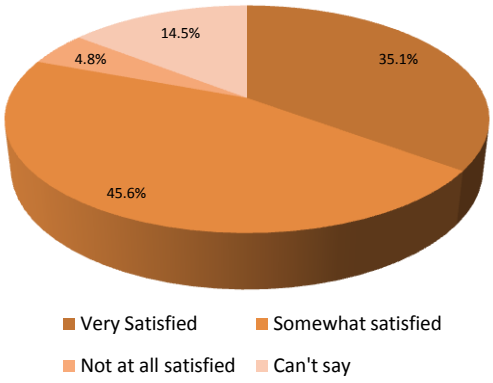
When asked about their knowledge regarding the elections / leadership selection process of VIs, about 29% claimed to be aware. Around 23% felt that they were aware of the rules & regulations of the VI.

Over 87% were aware of meetings in their area organized by Panchayats and VI/FEDERATION, but just about 40% claimed to have attended those meetings. More than 50% felt that these meetings did not follow any specified frequency, was held whenever required. It was found that in more than 50% of the respondents felt that woman members are present during the meetings besides the Panchayat & VI members.

Most of the respondents opined that village development issues, plantation work etc. Under MNREGA were discussed during the village meetings.

Table 29: Issues discussed during village meetings (% of respondents)	
New work to be undertaken in NREGA	65.8
Existing work under Employment Guarantee Programs	46.1
Works & expenditure details	40.4
Protection of Commons	24.1
Plantation Work to be undertaken	71.9
Other village development issues	90.8

Figure 33: Satisfaction with respect to the working of VI/ Federation



Only about one fourth of the respondents mentioned that they had prior information on which day Panchayat and VI/FEDERATION meeting was organized in their village.Nearly 47% of the farmers were aware of a community monitoring system prepared in their area. But only 23% knew when it was prepared.When asked about whether they were satisfied with the working of the VI/FEDERATION, over 35% were found to be very satisfied.

- The village level committee/samiti is responsible for all community decisions taken at the village level. The efficacy of the the Village Institution was studied across the programme area. It was observed that most were aware of the formation of this Village Institution in the village, but were not part of any VI. About two thirds of the respondents knew the number of the members in the VI.
- Majority claimed to be aware of the functioning of VI. Most of them could identify the VI Group member. About 60% felt that the VI Group members had attended some training. Over 78% felt that the VI had been working in the village for 2 to 5 years. Nearly 39% respondents felt that the VI met 3-4 times a year. When asked about their knowledge regarding the elections / leadership selection process of VIs, about 29% claimed to be aware. Around 23% felt that they were aware of the rules & regulations of the VI.
- Over 87% were aware of meetings in their area organized by Panchayats and VI/FEDERATION, but just about 40% claimed to have attended those meetings. More than 50% felt that these meetings did not follow any specified frequency, was held whenever required. It was found that more than 50% of the respondents felt woman members are present during the meetings besides the Panchayat & VI members.

Based on the above findings of beneficiary survey and the group discussions, it may be concluded that

- In most of the VI formed there was a need for more nurturing to increase participation and engagement of the villagers from the sustainability point of view.
- The village institutions need to start discussing on the modalities for resource sharing. The members may have to be more visible and pro-active in interacting with the villagers.

- NREGA Work related issues are one of the major points of convergence, but other issues like water harvesting and creating water harvesting structures could perhaps be emphasised to augment participation. Increased focus on issues for convergence of VI and PRI will ensure sustainability of the project.

It is suggested that while the beneficiary communities are aware of the benefits of the project, helping them assess in real terms, how much they have benefited may help enhance scope of them taking pride in their ownership of the project as well as in its sustainability.

12. CONCLUSION

This public-private partnership for watershed development in Mandalgarh Tehsil of Bhilwara proposed to develop 5,000 hectares through financial support from the Government of Rajasthan and the ITC - Rural Development Trust. It was formally launched on March 6, 2007 and was primarily aimed at strengthening the ecological and institutional foundations for better and viable rural livelihoods in the Bilwara district of Rajasthan. The ITC Watershed development project has also demonstrated a viable model for bringing various partners (the Government of Rajasthan, the ITC - Rural Development Trust, Foundation for Ecological Security, Zila Parishad-Bhilwara and the respective Panchayats) to address critical issues of natural resource management. Assessments reveal that this program has balanced growth with natural resource regeneration and protection, so that the local community can enjoy the natural resources of the region, while also enjoying economic prosperity. Sustainability is mostly influenced by stakeholder processes, where assets / services are delivered efficiently in time during watershed implementation. It is a collective representation of private and public effort with accountability leading to greater delivery and positive impact.

The various institutions (Federation and VIs) formed during the project are functioning as expected, all systems are in place and there is active participation of the community in providing support to these institutions. People are aware of that sustainability will ensure equitable flow of benefits. This essentially translates to maintenance of the assets through adherence to regulations of use. Rules and regulations have been framed for grazing and fodder collection in the protected pasturelands. In all villages access to the protected pasture lands is regulated and collection of fodder is against a small contribution. This money is credited into the village development fund. Increased focus on livelihoods and convergence with other government programmes like NREGA, dairy development, agricultural extension programmes will further enhance the sustainability of the program. There is a need to develop sustainable livelihoods through linkage with markets outside the watershed area.

The way forward

The major recommendations pertaining to institutional design aspects that emerged from the study were:

- To provide for a sustainable institutional arrangement for equitable distribution of benefits. It is important is to develop a blue print to scale it across time and geographies.
- Strengthening the capacities of the village institutions in terms of implementing tasks and management of resources after the handover of the project to the local institution and withdrawal of the active participation of the PPP stakeholders.
- The ITC PPP model presents a significant alternative in terms of institutional arrangements. It opens a window opportunity for the private sector to participate in watershed development and nation building at large.
- Ensure a proper legal status to the local bodies created, like the Village Institutions and Federations for self sustenance.

- Formal allocation of user rights and collection of user charges for usage of the benefits created for sustainability of common property resources
- Greater convergence with the government programmes and enhanced coordination with line departments.