CfID

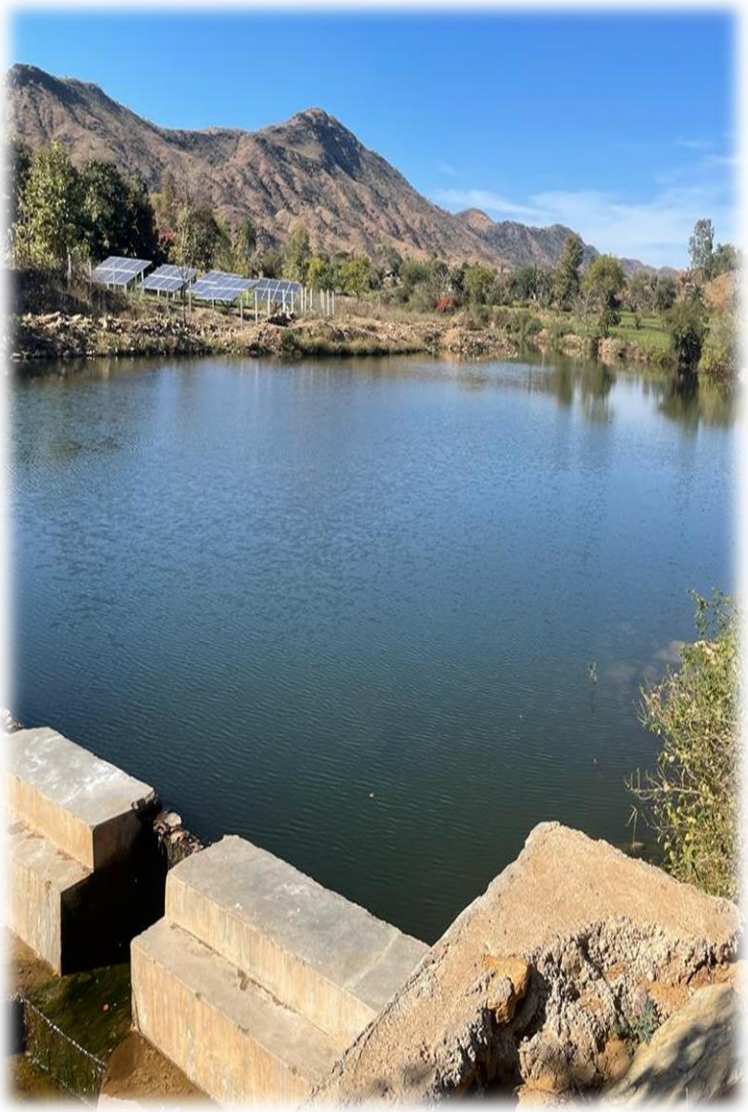
Centre for Integrated Development

Impact Assessment

April 2022

Impact Assessment of "Creation of Water Economic Zone" Udaipur, Rajasthan

Contents



Acknowledgement

‘Creation of Water Economic Zone (WEZ)’, through an integrated watershed development project has been implemented since 2018 by CSR wing of Dharampal Satyapal Group, treating 11000 hectares of land across the Alsigarh and Kurabad watersheds in the Udaipur district of Rajasthan.

This study is an effort to capture the impact of project in 3 years (2018-19 to 2020-2021) on enhancing natural resources and livelihoods of community.

It is our pleasure to be part of this study. We would like to thank DS Group for entrusting us responsibility of conducting this study. We express our sincere gratitude to entire team of DS group, Mahan Sewa Sansthan and Arpan Seva Sansthan for their support during field interactions with community and for providing their valuable inputs during the study. We thank all the community members for providing their valuable time for insightful conversations during the study.

Team CFID
April 2023

List of Tables & Figures

Abbreviations

APL	Above Poverty Line
BPL	Below Poverty Line
CAPI	Computerized Assisted Personal Interview
CCT	Continuous Contour Trench
co2e	Carbon Dioxide Equivalent
DS	Dharampal Satyapal
FGD	Focus Group Discussion
FPO	Farmers Producers Organization
GB	Gabion Bund
GHG	Green House Gas
KII	Key Informant Interview
LSCD	Loose Stone Check Dam
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
OBC	Ordinary Backward Class
MIS	Micro Irrigation System
MPT	Micro Percolation Tank
POP	Package of Practices
RRWHS	Roof Top Water Harvesting Structure
SB	Stone Bund
SC	Scheduled Caste
SCT	Staggered Contour Trench
SHG	Self Help Group
ST	Scheduled Tribe
SWC	Soil & Water Conservation
WEZ	Water Economic Zone

Glossary of Terms

1 Hectare	4.76 bigha for Girwa block
Marginal Farmers	Farmer with agricultural land holding less than 1 hectare
Small Farmer	Farmer with agricultural land holding of 1 - 1.99 hectares
Semi Medium	Farmer with agricultural land holding of 2 - 3.99 hectares
Medium Farmer	Farmer with agricultural land holding of 4 - 9.99 hectares
Large Farmers	Farmer with agricultural land holding of 10 hectares and above
Net Production Value	Due to subsistence agriculture in the region, most farmers are not selling produce and using for household consumption. Hence net production value is considered in this report. Sell price of those farmers who have sold their produce has been considered for rest of the farmers. Net Production Value : (quantity of produce * sell price/unit)- total production cost

Executive Summary

About Water Economic Zone Project

The DS Group (Dharampal Satyapal Group) is a Multi-Business Corporation and one of the leading FMCG (Fast Moving Consumer Goods) conglomerates with a strong Indian and International presence. Under Corporate Social Responsibility (CSR), DS group initiated project "Creation of Water Economic Zone" in Alsigarh and Kurabad watersheds in the Udaipur district of Rajasthan since 2018. The project aims at treating 11000 hectares of land in 5 years duration. The major objective of the project has been on enhancing natural resources, particularly water and soil whereby ensuring groundwater recharge, and improving the irrigation potential of identified geography, which in turn is expected to enhance the livelihoods of the people. Various Water and Soil conservation structures such as Anicuts or Check Dams, Mini Percolation Tanks or Earthen Dams, and other structures like Continuous Contour Trenches, Gabion, Gully Plugs, Recharge Pits, etc have been constructed in the ridge-to-valley approach. Also, the project subsequently promotes efficient use of water through improved irrigation practices such as Drip Irrigation and Rain guns along with harvesting climate-friendly crops. Project aims to target livelihood enhancement of 23000 people across 26 villages falling under watershed zone.

Phase 1 of the project covers 16 project villages, treating 5000 ha. Land and benefitting 3230 HH in Alsigarh and Kurabad Watershed regions in Girwa block of Udaipur.

About the Impact Study

Impact study aims to evaluate the impact of 3 year project (2018-19 to 2020-2021) on natural resource (mainly soil and water) and thus over all impact on livelihoods of people.

Study Approach & Methodology

The study adopts a mixed-methodology approach for data collection covering qualitative as well as quantitative aspects. 5 villages from each water shed plus 1 control village (total 6 villages per watershed and total 12 villages) are sampled through random sampling from the list.

- Quantitative Information is covered through CAPI based farmer /Household(HH) level surveys. Considering 95% confidence Level and 5% margin of error, 304 HHs are sampled from project villages (from total universe of 3230 HHs), which is approximately 9.5% of total sample. 71 HHs have been taken from 2 control villages (1 village in each watershed).
- Qualitative Information is captured through focus group discussion (FGD) with farmers, solar groups, PRI members, & NGO representatives. 10 FGDs are conducted (1 in each project village) through checklist of open ended questions and points of discussion. FGDs are done with PRI members and farmers group. Total 3- KIIs are done with field and program staff.
- Moreover, a total of 46 structures (30% of total physical structures) from all the project villages have been verified on site.

Key Findings

Despite of vicinity to Udaipur city, both Alsigarh and Kurabad have limited livelihood opportunities, high tribal and sizable poor (BPL and Antyodaya) population. Migration is high in the region. Due to undulating terrain, transportation is also limited. Most of the families have subsistence agriculture and small cattle rearing for livelihood. There is lot of

potential to harvest water and use it for enhancing livelihoods of the people. The project of creating Water Economic Zone is thus quite timely and relevant. It has potential to enhance the income and improve well being of the people, especially the poor families. Some of the major findings from the study are:

- Considering the topography, soil condiiton and water harvesting recharging potential, the focus on water led economy is justified. Also, considering socio economy and access to infrastructure, the livelihood enhancement interventions are well thought and relevant to the region.
- Impact on Irrigation Water Availability : Water harvesting structures interventions have been instrumental in increasing source of irrigation, augmenting source of irrigation as well as increasing access to irrigation through solar pumps. This has led to a rise in farmers having irrigation access. Post intervention, there has been rise in 15.8% farmers having access to irrigation (78.6% pre project and 94.4% post interventions in project villages).
- Impact on Ground Water Recharging: Project interventions like water harvesting and SWC have led to increased recharge and soil moisture conservation. Majority of farmers (87.9%) benefited with such interventions and owning open wells have reported to have rise in water table levels in monsoon and winter, while 85% farmers reported to have rise in water table levels in summer. Based on well monitoring data, it is evident that there is average rise of 7-13 feet in monsoon, 4-7 in winter and 2-3 feet in summer. Rise of water table is more evident in Kurabad region.

Average Rise in Water Table in Open Wells in each Watershed (in feet)

	Monsoon	Winter	Summer
Alsigarh	7	4	3
Kurabad	13	7	2

Based on well monitoring data- average of 2-3 years from baseline scenario

- Impact of Soil Water Conservation: Due to undulating terrain with high gradient, water runoff and soil erosion is one of the critical issues for land based and farm based economy. In this regard interventions on checking runoff and soil erosion is helpful for retaining soil moisture which will in turn support various seasonal cultivations.
- Over all impact on cultivated land & irrigated land of farmers: Due to increased irrigation source as a result of water harvesting & recharging , better access to irrigation source due to solar pumping, and improved soil moisture due to soil & water conservation interventions, there is dramatic rise in number of farmers taking summer cultivation in project villages from merely 22% to 58.9%. In terms of cultivated land, there is about 7.5% rise in area under cultivation in Rabi (from 54.4% to 61.9% land) and 9.9% rise in cultivated area in summer (from 7% to 16.9%). This indicates that there is considerable impact in terms of area brought under cultivation in Rabi and Summer in project villages due to project interventions. Irrigated land in project villages in Rabi is 57.1% of total land as against 35.6% before project.

Impact of Project on Cultivated & Irrigated land- % of Land

	Cultivated land			Irrigated land*		
	Project Villages		Control Villages	Project Villages		Control Villages
	Baseline Scenario	Post Interventions	Current Scenario	Baseline Scenario	Post Interventions	Current Scenario
Rabi	54.4	61.9	44.4	35.6	57.1	36.3
Summer	7.0	16.9	2.28	7.0	16.9	2.28
* % of total land						

- Impact on Seasonal Cultivation Pattern:
  - ✓ Kharif: There has been no major change in kharif cultivation in project villages, except nominal rise in cultivation of vegetables. Maize still remains major crop.
  - ✓ Rabi: Due to rise in irrigation, there is rise in wheat cultivation in project villages. As project promotes floriculture and vegetable cultivation, there is nominal rise in cultivation of vegetables and flowers in the project villages as compared to pre project scenario. Vegetable and floriculture is not taken in control villages.
  - ✓ Summer: Due to increased water availability, cultivation of fodder and vegetables has increased in summer.
- Changes in Package of Practices: Project has been instrumental in bringing awareness on various scientific cultivation practices in the project villages. Major impact has been seen through adoption of certified seeds (from mere 11% to 88% farmers post intervention), seed treatment for crop protection (from 10.4% pre project to 62.1% farmers currently) and use of dibbling/row method for seed sowing against broadcasting resulting in lower seed rate (from 12% pre project to 54% farmers currently). There is remarkable rise in number of farmers using organic manure, bio fertilizer and bio pesticides in project villages. This can be attributed to awareness and support given to farmers for producing, procuring and using organic fertilizers and bio pesticides. Project has been instrumental in introduction of solar based pumps, which has been highly beneficial to farmers for irrigation where there is no power supply or timings fluctuated in day and often supplied at night were not fixed or were given at night time or there were not power connections.
- Impact on Crop Productivity: Improved irrigation availability and changes in package of practices have led to improvement in crop productivity of major crops Maize, wheat, mustard and black gram in project villages in comparison to pre project scenario. Impact on productivity in maize and wheat is higher with more than 70% farmers in project villages reporting to have rise in crop productivity.
- Impact on Income from Farm based livelihood: Majority of farming is limited to sustenance and production limited to home consumption. Sell of produce is limited. It is evident that there has been considerable rise in average net production value of farmers in comparison to pre-project scenario and much higher than control villages. Increased irrigation water availability, increased cultivated land in Rabi and Summer and improved crop productivity have compounded over all rise in net production value. In comparison to pre project scenario in project villages, there has been rise in net production value of about 69% farmers.
- Environmental Impact: Project has been instrumental in creating environmental impact in 3 major areas:
  - ✓ Project has led to ground water recharge potential of 19,53,994 cu.m.
  - ✓ About 58.625 kw solar pumps (individual and community) have been installed in the entire project, which has led to reduction green house gas emissions against conventional diesel/electricity based pumps. About 235 kg co2e have been reduced annually by the project.
  - ✓ Introduction of micro irrigation system in the project has led to water saving. About 77.1 Ha. area of MIS (sprinkler/raingun- 62 Ha., Drip- 15.1 Ha.) has been promoted in the project in 3 years. However, field study indicate that not all farmers have been using MIS regularly as stated in sections above . If we consider use of drip system for vegetable/floriculture cultivation in atleast 1 season, then there is total saving of 45 lakh litres/year
  - ✓ There is increased use of bio pesticides and bio fertilizers against use of chemical fertilizers, which also contributes to reduction of green house gas emissions and improves soil quality.

- Findings on Project Design & Implementation:
  - ✓ Project need and relevance : Considering the project location and geo hydrology as well as socio-economy, there is lot of potential to harvest water and use it for enhancing livelihoods of the people. The project is thus quite relevant. It has potential to enhance the income and improve well-being of the people, especially the poor families.
  - ✓ Effectiveness: Strong rapport with people has been seen in both project areas. Strong technical aspect of designing the watershed activities and structures have been evident. Social processes have also brought about a sense of ownership and responsibility among community groups. Participation of people in planning of activities have been ensured.
  - ✓ Community institutions and groups (like water user groups and others) may not be as capacitated and strong to work on its own, but nonetheless engaged. These groups may be capitalized by building their capacity.
  - ✓ Community Involvement: People's participation in planning and selection of site has been ensured for all major structures in watershed region. Participation and decision making is seen from varied socio-economic groups. Community contribution has been ensured through 50% monetary contribution in individual interventions like solar and irrigation equipment. Gram Kosh (sperate bank account) has been created in Alsigarh water shed through project contribution for maintenance of group structures. Role of women, however, is limited in the project.
  - ✓ Equity: The first phase of the project was more focused on extensive watershed development through water harvesting & recharging as well as soil moisture improvement. Hence by default the physical works have been located based on geo hydrology and topography. Even though not by design, the project has laid major focus on socio-economically backward population. There is a need to maintain a data for next phase for activity wise planning versus socio-economy as second phase largely lays focus on improvement of agricultural practices.
  - ✓ Physical Works: All structures have been constructed at appropriate location according to the purpose of the structure, i.e. to enable water storage or ground water recharge, check soil erosion, check water runoff and its velocity, or to enable soil moisture conservation. Design of all structures have been done by competent technical person considering standards specification commonly used for design and construction of watershed structures. The structural quality of all structures seems acceptable with no major damage. Water seepage and scouring is seen in few structures due to wear and tear, which is listed ahead in report.
  - ✓ Sustainability: Though user groups are formed for physical structures, they need to be sensitized for ownership for overall long term maintenance. In order to sustain and scale up, some of the interventions like floriculture, horticulture and even general cropping; there is need to strengthen local institutions for better market linkages and input supply , awareness and handholding for leveraging government programs and financial institutions.

- Over all Impact : There has been significant work of water harvesting resulting in rise in ground water conservation and recharge. This has led to increase in cultivation and irrigation in Rabi and Summer crops. Vegetable production and horticulture cultivation has also increased due to project interventions, which has led to rise in income from agriculture.

- Project Challenges: One of the challenges in augmenting income from on farm livelihood is small hand holding, that too in undulating terrain. This factor limits the application of wide range of package of practices which

otherwise would have reduced input cost and increased yield. Remote locations, limited power and transport infrastructure also limits reach of government schemes and market connections.

Way Forward

First phase of project has laid major focus on drainage and stream level treatment under watershed project. The impact of these interventions has definitely benefitted in terms of increased irrigation water availability and its access, which has been translated into income augmentation from agriculture. However, translating benefits of augmented resources to increased income and better livelihood will need more intensive interventions, some of them listed below:

- ✓ Improved POP: Intensive interventions to educate, sensitize farmers to adopt better package of practices for crop cultivation is needed. Demonstration plots may be taken up for major crops to scale up adoption of good practices. Farmers' book may be introduced to document the package of practice and its results over a period of 3-5 years.
- ✓ Crop Diversification: As the land holding is small in the region, crop diversification can be taken up to avoid risk of loss of single crop. Adopting vegetable cultivation, floriculture and horticulture have given good results during the project period and may be scaled up.
- ✓ Value addition: Individual or group entrepreneurship for value addition like drying, powder, cattle feed etc. from the crops may be initiated to augment the income from farm produces.
- ✓ Promoting non-farm based livelihood: It is also observed that cattle rearing have greater economic returns than farming in the project area. Support for augmenting income through animal husbandry would also help in strengthening local economy.
- ✓ Market linkages: There is a need to strengthen market linkages for vegetable, horticulture and floriculture to incentivize the adoption of these practices among relatively small farmers. Market linkages for major crops like maize, wheat, black gram and other should also be strengthened.
- ✓ Capacity building of institutions: Building strong and sensitized institutions at local level would be beneficial for sustainability and scaling up of the project through government and other resources. Also this would help in maintaining and developing the assets that have been created in the project. There are many examples where institutions like SHGs, Youth group, women group, farmers' club, FPO, federation etc. have played important role in taking benefits of watershed activities forward.

Impact Indicators

Table 1 Impact Indicators

Sr. No.	Indicator		Baseline Scenario/Pre Project Scenario	Impact Scenario	Control Villages- Current Scenario	Source of Information
1	Water Table	% Farmers with rise in water table in wells	NA	Monsoon- 87.9 Winter- 87.9 Summer 85.2	NA	HH sample survey
		Average rise in water table in wells	NA	Monsoon- 7-13 ft. Winter- 4-7 feet Summer 2-3 feet	NA	Based on well monitoring data across both watersheds
2	Seasonal Cultivation- % Farmers Cultivating	Rabi	94.7	97.7	91.3	HH sample survey
		Summer	22.0	58.9	24.6	
3	Seasonal Cultivation % Area	Rabi	54.4	61.9	44.4	HH sample survey
		Summer	7.0	16.9	2.28	
4	Seasonal Irrigation % Area of total cultivated Land	Rabi	35.6	57.1	36.3	HH sample survey
		Summer	7.0	16.9	2.28	
5	Crop Productivity- % Farmers reporting rise	Maize	NA	74.3	NA	HH sample survey
		Wheat	NA	76.7	NA	
		Black Gram	NA	50.0	NA	
		Mustard	NA	36.4	NA	
6	Income from Agriculture	Average Net Annual Income- Rs.	13686	20462	10525	HH sample survey
		Rise in Income- % Farmers	NA	74.3	NA	
7	Total HH Income (all sources)	Average Net Annual Income- Rs.	29288	45283	30647	HH sample survey

Introduction

About the Project- Water Economic Zone

The DS Group (Dharampal Satyapal Group) is a Multi-Business Corporation and one of the leading FMCG (Fast Moving Consumer Goods) conglomerates with a strong Indian and International presence. Under Corporate Social Responsibility (CSR), DS group initiated project "Creation of Water Economic Zone" in Alsigarh and Kurabad watersheds in the Udaipur district of Rajasthan since 2018. The project aims at treating 11000 hectares of land in 5-year duration. The major objective of the project has been on enhancing natural resources, particularly water and soil whereby ensuring groundwater recharge, and improving the irrigation potential of identified geography, which in turn is expected to enhance the livelihoods of the people. Various Water and Soil conservation structures such as Anicuts or Check Dams, Mini Percolation Tanks or Earthen Dams, and other structures like Continuous Contour Trenches, Gabion, Gully Plugs, Recharge Pits, etc have been constructed in the ridge-to-valley approach. Also, the project subsequently promotes efficient use of water through improved irrigation practices such as Drip Irrigation and Rain guns along with harvesting climate-friendly crops.

The project targets 23000 people from 26 villages, mostly from a tribal background. Listed below is the project outreach for the financial year for which the impact evaluation is desired.

Table 2 Project Coverage in 3 year

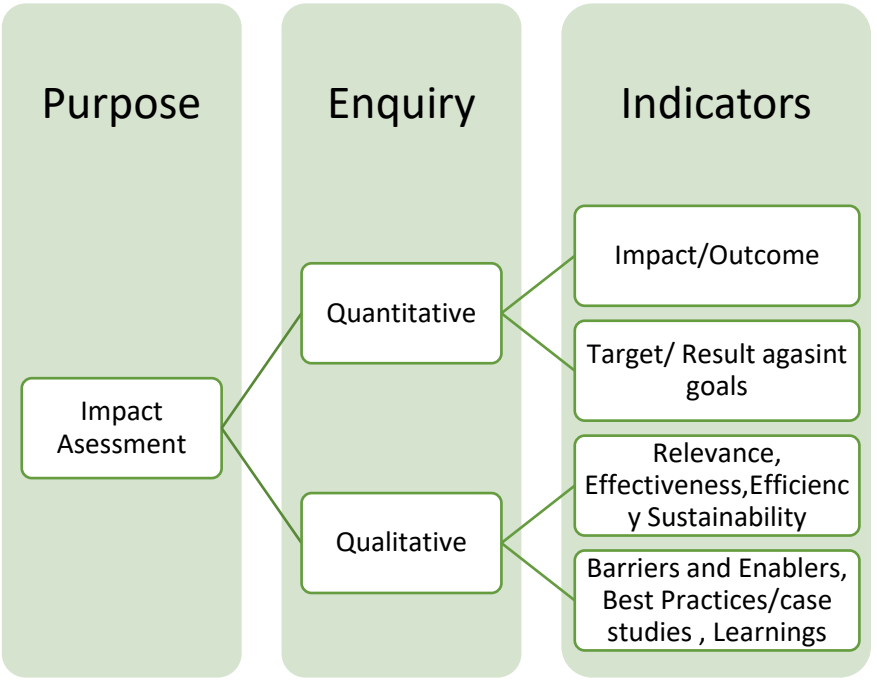
Project Coverage in 3 year (2018-19 to 2020-21)				
Sr. No.	**Watershed Region**	**Villages Covered**	**Household covered**	**Area Treated (Ha.)**
1.	Alsigarh (Panchayat Samiti- Girwa)	7	1948	5000
2.	Kurabad (Panchayat Samiti- Kurabad)	9	1282	
	Total	16	3230	5000

About the Impact Study

Impact study aims to evaluate the impact of 3 year project on natural resource (mainly soil and water) and thus over all impact on livelihoods of people.

Study Approach & Methodology

The study adopts a mixed-methodology approach for data collection covering qualitative as well as quantitative aspects. Quantitative Information is covered through CAPI based farmer /Household(HH) level surveys. Qualitative Information is captured through focus group discussion (FGD) with farmers, solar groups, PRI members, & NGO representatives.



Main areas from quantitative study are:

Thematic Area	Area of inquiry
Soil and Water Conservation	Impact on ground water table Increased seasonal drinking water availability Increased irrigation water availability Improved soil moisture Impact on cultivated and irrigated land due to increased water availability Impact on rise in crop productivity due to better irrigation Impact in price realization due to better crop quality/marketing linkage Over all impact on net income from agriculture
Efficient Water Management (mainly drip irrigation)	Impact on irrigation water needs for same crop Increased cultivated area due to better water management Impact on crop productivity Impact on pumping hours and power bills Over all impact on net income from agriculture
Livelihood Enhancement	Rise in crop productivity and income due to improved agriculture practices and better inputs Rise in annual income due to additional/support livelihood (horticulture/floriculture/trellis) Impact on fodder availability due to pastureland development and impact on cattle milk productivity.

	Impact on soil and crop productivity due to use of organic compost Rise in income and nutritional benefits at HH level due to WADI
Impact on Environment	Ground Water Recharge Water saving through MIS and other agriculture practices GHG Emission control through use of solar.

Qualitative Study focuses on assessing the relevance, efficiency, effectiveness, impact and sustainability of project interventions as per OECD DAC parameters of evaluation.

Project Design & Implementation	Need and Relevance, Effectiveness in term of delivery, Efficiency, Over all impact, Sustainability of interventions and institutions
Community Involvement analysis	How far the project is community-driven, level of involvement of community
Equity Analysis	Distribution of investment return by class, caste, and gender.

Tools and Sampling for quantitative study

Considering 95% confidence Level and 5% margin of error, 304 HHs are sampled (from total universe of 3230 HHs), which is approximately 9.5% of total sample. 71 HHs have been taken from 2 villages (1 in each watershed).

- Village Selection-
  5 villages from each water shed plus 1 control village (totaling to 6 villages per watershed) are sampled through random sampling from the list. Project Villages are sampled based on coverage of various interventions/coverage of HHs – intensive, medium and low. Control villages are sampled considering similar socio-economy to project village. Thus total 12 villages have been identified for study.
- HH Selection
  - ✓ App. 4-8 beneficiary HHs per structure are selected as sample and 4-5 individual benefitted household per village. Thus 25-35 HHs per village have been taken for study. HHs covered under various interventions (from broad 3 thematic areas- water harvesting, soil & moisture conservation and other interventions) are covered to assess impact/changes due to individual intervention or combination interventions.
  - ✓ Control HHs: 35 HHs per village have been sampled considering varied socio-economy and landholding.

CAPI method will be applied to collect data of individual HH survey. Questionnaires are developed on Kobo Collect software and conducted with the help of local research associates.

Village Wise List of HHs covered is listed as per annexure 1

Structure Sampling for Physical verification:

Structure Selection- Selection of 1-2 structures each in upper, middle & lower ridges of the village thus a total of 3-6 structures per village. All different categories of structures are selected considering coverage within water harvesting & recharging, Soil Conservation & Other Interventions. Total 46 structures from 10 villages have been covered in the study.

List of Structures Verified have been listed as per annexure 2.

Tool and Sampling for qualitative study

- 10 FGDs are conducted (1 in each project village) through checklist of open ended questions and points of discussion. FGDs are done with PRI members and farmers group.
- Total 3- KIIs are done with field and program staff.

Table 3 Study Sample

Quantitative Study Sample					
Watershed	No. of Project Villages	Benefitted HH Covered	Structure Verification	No. of Control Villages	No. of HHs from Control Villages
Alsigarh	5	152	25	1	35
Kurabad	5	152	21	1	36
Total	10	304	46	2	71

Socio-Economic Profile

About the Project Region

Udaipur district is located between 23°46' & 25°05' North latitude and 73°09' & 74°35' East longitude covering an area of 13419 sq. km. The district is part of Udaipur Division and is divided into eleven sub-divisions, viz. Girwa, Gogunda Kotda, Mavli, Vallabhnagar, Sarada, Salumber, Jhadol, Kherwada, Rishabhdeo, and Lasadiar. Administratively the district is divided into 11 tehsils and 11 development blocks. Total number of villages in the district is 2511. Administrative divisions of Udaipur district are shown in figure 1.

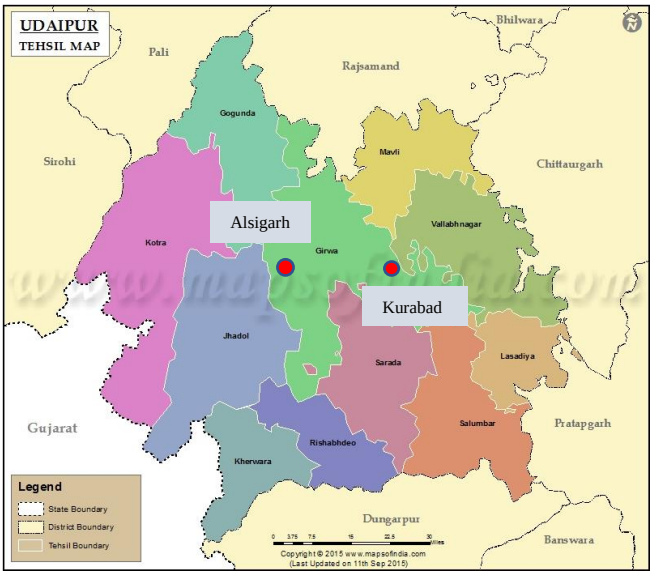


Figure 1 Sub divisions of Udaipur District

The project region fall under Girwa tehsil. Girwa tehsil consists of 220 revenue villages which are organized in 60 gram panchayats.[1] The population of the tehsil is 289,070. The area of the tehsil encompasses two panchayat samities - Girwa and Kurabad.[2]

[1] Government of Rajasthan. 2013

[2] Directorate of Census Operations. 2011.

Project region

Alsigarh watershed region is about 30 Km on the south west of Udaipur city, and Kurabad watershed region is about 50 Km south east to Udaipur city.

Socio Economy

Project villages of Alsigarh have predominantly tribal population. Kurabad also have significant tribal population along with OBCs. Land holding is small in both the regions (average 3-4 bigha) and most of the families rely on sustenance agriculture and animal husbandry, apart from agriculture and general labour outside the village. With undulating terrain, the region is suitable for advancing watershed works in order to enhance water and livelihood.

Water

The annual average rainfall in Girwa tehsil is 644.95 mm.[3] The region has many surface water sources in form of lakes and rivers, streams and rivulets. The water runoff is high due to undulation.

Groundwater resources mainly consist of wells (30-60 feet deep) and borewells (60-200 feet deep)

Topography

Alsigarh and Kurabad, both regions are undulating in nature, with Alsigarh having more hillocks and higher undulations than Kurabad.

Soil

The region has lime dominated clayey loam soil. Alsigarh is mostly rocky whereas Kurabad has yellowish brown soil.

[3] Aquifer Mapping and Management ff Ground Water Resources, 2020-21, Central Ground Water Board

Profile of Study Respondents

- Study Covers 374 respondents (304 HHs from project villages and 71 HHs from Control Villages)
- Gender: About 15% respondents from project villages and 22.5% from control villages are women.
- Age group: Respondents have been taken from age group 18-50 years and more. More than 55- 60% respondents in project and control villages are in age group of 36-50 years and above.
- Family Size: Family size of more than 50% HHs in project and control villages is 5-6 persons, more than 6 members in nearly 20% HHs, 3-4 members in nearly 20% HHs. Household with small family (1-2 members) is limited to 2-3% in project as well as control villages. About 0.8% HHs from project villages and 2.8% HHs from control villages are women headed/ single women HHs.
- Caste: Being a tribal area, nearly 69% HHs from project and 87% HHs from control villages are ST, remaining are OBC.
- Religion: Hindu is the major religion practices by all HHs studied.
- Poverty Status: More than 70% HHs in both project and control villages fall under BPL/Antyodaya, while nearly 30% HH fall in APL.

Table 4 Respondent Profile

Respondents Profile- % HHs			
Men	Project Villages: 85.0%	Women	Project Villages: 15.0%
	Control Villages: 77.5%		Control Villages: 22.5%

Parameter	Category	Project Villages- % HH (n=304)	Control Villages- % HHs (n= 71)
Age Group	18-25 years	4.6	8.5
	26-35 years	16.7	16.9
	36-50 years	46.4	38.0
	>50 years	32.4	36.6
Single Women/Widow		0.8%	2.8
Family Size	Upto 2	3.6	2.8
	3-4	23.9	25.4
	5-6	51.3	52.1
	>6	21.2	19.7
Religion	Hindu	100%	100%
Caste Category	General	2.3	
	Schedule Tribe (ST)	69.0	87.3
	Schedule Caste (SC)	1.0	
	Other Backward Class (OBC)	27.8	12.7
Poverty Status	BPL	49.4	39.4
	APL	32.4	32.4
	Antyodaya	18.3	28.2

- Educational Qualification: There is high illiteracy with nearly 39% respondents from project villages and as high as 49% respondents from control village not being literate. For remaining, education is limited mainly till 9th grade. Only 8-9% HHs in project and control villages are 10th pass and 3-5% HHs are diploma/graduate.
- Landholding Pattern: More than 90% HHs in project and control village have small land holding and are marginal/small farmers. About 4.6% HHs surveyed in project villages are semi-medium farmer and 0.3% HHs are medium farmers. 1% HHs in project villages and 8.5% HHs in control villages are landless, but of them majority take small cultivation in adjacent land. Average landholding in project villages is 3.8 bigha, while in control villages is 3.7 bigha.

Parameter	Category	Project Villages- % HH (n=304)	Control Villages- % HHs (n= 71)
Landholding Pattern 	Landless	0.3	0.0
	Landless (with land on lease/borrowed)	0.7	8.5
	Marginal Farmers	77.3	83.1
	Small Farmers	16.8	8.5
	Semi Medium Farmers	4.6	0.0
	Medium Farmers	0.3	0.0
Educational Qualification 	Illiterate	38.6	49.3
	1-5 std	27.5	15.5
	6-10 std	21.2	19.7
	10th Pass	8.5	9.9
	Inter/Diploma/+2	2.0	4.2
	Graduation	1.0	1.4

- **Drinking water**

Table 5 Drinking Water Source of Study HHs

Major source of drinking water wells in project villages and well/borewells in control villages. Handpump also form drinking water source for 11-18% HHs in both project and control villages. Higher use of nadi/village pond is seen in conrol villages. Roof top water harvesting tank is used by 0.3% HHs in project village and none in control villages. HH tap supply is minimal, 0.3% HHs in project villages and nil in control villages.

Drinking Water Source- % HHs		
Parameter	**Project Villages- % HH (n=304)**	**Control Villages- % HHs (n= 71)**
Well	66.3	36.6
Borewell	39.9	32.4
Hand Pump	11.4	18.3
Other	4.6	18.3
Nadi/Pond	2.9	11.3
Roof Top Water Harvesting	0.3	
HH Tap Supply	0.3	

- **Sanitation**

Table 6 Sanitation Status of Study HHs

IHHL Status- % HHs		
Parameter	**Project Villages- % HH (n=304)**	**Control Villages- % HHs (n= 71)**
HH having IHHL	83.7	74.7

HH toilet is available to 83.7% HHs in project village and 74.7% HHs in control villages.

- **Electricity/Power Supply**

Table 7 Status of Power Supply to Study HHs

Electricity Status - % HHs		
	Project Villages	Control Villages
	(n=304)	(n=71)
HH	94.1	88.7
Farm	81.6	76.1
hours power supply in farm	4-8 hours	4-6 hours

Electricity availablity at HH level is comparitively higher in project villages with 94% HHs having acces to power in project villages as compared to 88% HHs in control villages. Power supply in farms is available to 81.6% HHs in project villages and 76.1% HHs in control villages. However, the time of supply is not fixed and many times power is supplied even at night.

- **Institutional Affiliations**

Table 8 Institutional Affiliation of Study HHs

Institutional Affiliation - % HHs		
	Project Villages	Control Villages
	(n=304)	(n=71)
Self Help Group (SHG)	33.0	32.4
Gram Panchayat	3.3	1.4
Irrigation Committee/ Water Users Group	1.0	
Producer Co-Operative	0.7	
Pani Samiti/ Drinking Water Committee	0.7	
Farmers Producer Organization (FPO)	0.7	1.4

About 36% HHs in project villages and 31% HHs in control villages are affiliated to some institution, mainly sef help group.

Key Findings

1. Project Interventions

Phase I of the project (2018-21) covers 3 major thematic areas Water Harvesitng & Recharging, Soil & Water Conservation and Livelihood Enhancement covering 16 villages and 3230 HHs, treating 5000 Ha. land.

Water harvesting & Recharging	Soil & Water Conservation	Livelihood Enhancement
• Anicut /Check dam- new & Repair • Nadi – New & Repair • RRWHT • Beri/Well Repair • Percolation Tank • Micro Irrigation System	• Continuous contour trench/scattered continuous Trench • Gully Plug • Loose stone check dam • Masonary Gabion • Recharge Pit	• Wadi • Improved Practices for Crop Cultivation • Floriculture • Horticulture • Vermi Compost • Solar Pumps

Considering the topography, soil conditon and water harvesting recharging potential, the focus on water led economy is justified. Also, considering socio economy and access to infrastructure, the livelhood enhancement interventions are well thought and relevant to the region.

Detailed coverage of project interventions is as per annexure 3.

2. Type of Project Benefits Availed by Sample HHs

Of total 304 HHs studied in project villages, about 85.5% HHs have received benefits from Water Harvesting & Recharging; 56.3% HHs have benefitted from SWC and 69.1% HHs have benefitted from livelihood enhancement interventions. 78% HHs have received more than 1 type of benefit.

Table 9 Type of Project Support Received by Sample HHs

Category of Project Support Received by Sample HHs- % HHs			
Category of Project Support	**Total** (n=304)	**Alsigarh Watershed** (n=152)	**Kurabad Watershed** (n=152)
Water Harvesting & Recharging	85.5	82.9	88.8
Soil & Water Conservation	56.3	57.2	55.3
Livelihood Enhancement	69.1	76.3	67.8
> 1 benefit	78.0	77.6	78.3

Type of Project Benefit- % HHs (n=304)					
Water Harvesting/Recharging	**% HHs**	**Soil & Water Conservation**	**% HHs**	**Livelihood Enhancement**	**% HHs**
Anicut/Check dam	56.9	Continuous Contour Trench	25.5	Training /guidance -agri practice	57.5
Nadi/Pond	18.0	Recharge Pit	21.9	Wadi	17.7
Other	12.8	Staggered Contour Trench (SCT)	9.2	Good quality Seeds	16.0
Well repair	10.1	Loose Stone Check dam (LSCD)	8.8	Bio Fertilizer	11.4
Percolation Tank (MPT)	9.2	Other	6.5	Trellis	11.1
Nadi/Pond Repair	5.6	Deep Continuous Contour Trench (DCCT)	6.2	Drip	8.5
Anicut/Checkdam Repair	3.9	Gabion bund/ Stone bund (GB/SB)	3.3	Rain -gun	8.2
Water Harvesting Structure Repair	1.3	Gully Plug	2.6	Vermi- Compost	6.2
Beri repair	1.3	Field Bund	1.0	Other	5.2
Low Cost Water Harvesting Structure	1.0			Solar	4.9
RRWHS	0.7			Bio Pesticide	4.6
				Sprinkler	2.9
				Mini Sprinkler	0.7

Impact on Irrigation Water Availablity

Water harvesting structures interventions have been instrumental in increasing source of irrigation, augmenting source of irrigation as well as increasing access to irrigation through solar pumps. This has led to rise in farmers having irrigation access. Post intervention, there has been rise in 15.8% farmers having access to irrigation (78.6% pre project and 94.4% post interventions in project villages). In control villages, currently 80.3% farmers have access to irrigation as compared to as high as 94.4% farmers in project villages currently.

Major source of irrigation has been open well in project villages before project interventions. Post interventions, along with wells, new irrigation sources have been developed and access to other irrigation sources have been improved. Hence apart from open wells, other sources like borewells, anicut/check dam and Nadi are also used for irrigation purpose. In control villages, ground water, mainly wells and to some extent, borewells form major source of irrigation.

Table 10 Irrigation Source for Study Sample Farmers

Source of Irrigation- % Farmers			
	Project Villages (n=303)		Control Villages (n=71)
	Baseline Scenario	Post Interventions	Current Scenario
Open Well	71.1	74.0	59.2
Borewell	7.2	29.6	16.9
Check dam/anicut	3.9	27.0	
Tank/Pond/Nadi	2.3	8.9	
River/Stream	2.0	0.7	
Sharing with Other Farmers	1.6	0.3	4.2
None	21.4	5.6	19.7

Impact on Ground Water Recharge

Project interventions like water harvesting and SWC have led to increased recharge and soil moisture conservation. Majority of farmers (87.9%) benefited with such interventions and owning open wells have reported to have rise in water table levels in monsoon and winter, while 85% farmers reported to have rise in water table levels in summer.

Table 11 Impact on Ground Water Recharging

Impact on Ground Water Recharging			
Rise in water table level in open wells- % Farmers			
	Monsoon	Winter	Summer
Total of both watershed regions	87.9	87.9	85.2
Alsigarh Watershed	89.4	89.4	89.4
Kurabad Watershed	90.0	90.0	86.7
Average rise in feet	10-15	6-10	2-5
Based on HH survey			

Table 12 Rise in Water Table Level in Wells

Average Rise in Water Table in Open Wells in each Watershed (in feet)			
	Monsoon	Winter	Summer
Alsigarh	7	4	3
Kurabad	13	7	2
Based on well monitoring data- average of 2-3 years from baseline scenario			

Based on well monitoring data, it is evident that average rise in wells in monsoon and winter is higher in Kurabad as compared to Alsigarh.

3. Impact of Soil Water Conservation

Due to undulating terrain with high gradient, water runoff and soil erosion is one of the critical issues for land based and farm based economy. In this regard interventions on checking runoff and soil erosion is helpful for retaining soil moisture which will in turn support various seasonal cultivations.

Soil water conservation interventions have improved soil moisture in farms and thus rise in cultivated land, especially in Rabi season. More than 80% farmers benefitted with SWC reported to have improved soil moisture and quality, and 72.5% farmers have reported to have rise in cultivated area in Rabi. Another major impact is increase in fodder cultivation on hills due to soil moisture conservation and reduction is soil erosion reported by nearly 75% HHs. Due to improved soil moisture, nearly 18-25% farmers reported to have reduction in number of irrigation in Rabi and increased span between 2 irrigation cycles.

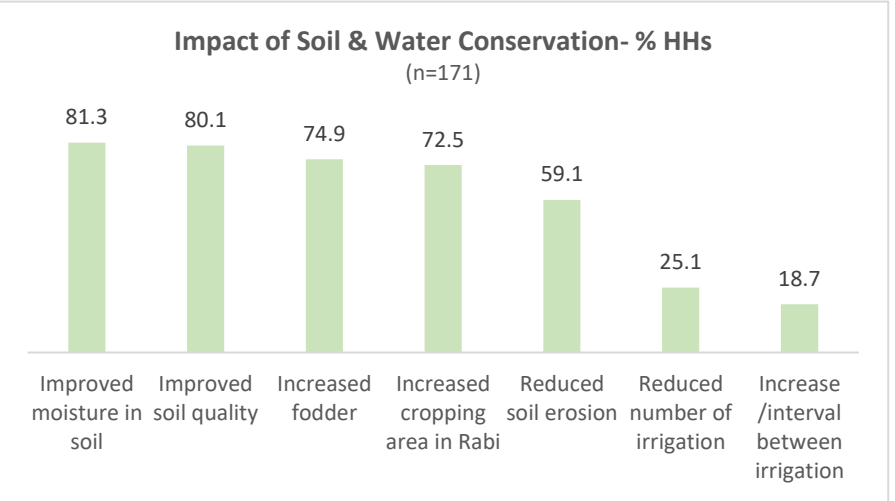


Figure 2 Impact of Soil & Water Conservation Interventions

4. Impact on Seasonal Culitvation & Irrigation Pattern

Table 13 Seasonal Cultivation- % Farmers

Seasonal Cultivation by Farmers- % of Farmers			
	Project Villages (n=303)		Control Villages (n=71)
	Baseline Scenario	Post Interventions	Current Scenario
Kharif	100.0	100.0	98.5
Rabi	94.7	97.7	91.3
Summer	22.0	58.9	24.6

Due to increased irrigation source as a result of water harvesting & recharging, better access to irrigation source due to solar pumping, and improved soil moisture due to soil & water conservation interventions, there is dramatic rise in number of farmers taking summer cultivation in project villages from merely 22% to 58.9%.

In summer, across both watershed regions, there is rise in about 30-40% farmers taking summer cultivation in comparison to baseline scenario across both watershed.

There is about 7.5% rise in area under cultivation in Rabi (from 54.4% to 61.9% land) and 9.9% rise in cultivated area in summer (from 7% to 16.9%). If we compare the situation with control villages, situation in summer is much better in project villages with higher number of farmers taking crops in summer as well as higher proportion of land being cultivated in summer. This indicates that there is considerable impact in terms of area brought under cultivation in Rabi and Summer in project villages due to project interventions. Irrigated land in Rabi is 57.1% land as against 35.6% before project in project villages.

Table 14 Impact of Project on Cultivated & Irrigated land-

Impact of Project on Cultivated & Irrigated land- % of Land						
	Cultivated land			Irrigated land		
	Project Villages (n=303)		Control Villages (n=71)	Project Villages (n=303)		Control Villages (n=71)
	Baseline Scenario	Post Interventions	Current Scenario	Baseline Scenario	Post Interventions	Current Scenario
Rabi	54.4	61.9	44.4	35.6	57.1	36.3
Summer	7.0	16.9	2.3	7.0	16.9	2.3

Table 15 Impact on Irrigated Land across both watersheds

Watershed Wise Irrigated Land- % Land				
	Alsigarh		Kurabad	
	Before Intervention	Post Interventions	Before Intervention	Post Interventions
Rabi	19.9	46.1	49.8	59.6
Summer	1.3	5.9	11.7	26.4

5. Impact on seasonal cultivation pattern and agricultural practices

- Kharif: There has been no major change in kharif cultivation in project villages, except nominal rise in cultivation of vegetables. Maize still remains major crop.
- Rabi: Due to rise in irrigation, there is rise in wheat cultivation in project villages. As project promotes floriculture and vegetable cultivation, there is nominal rise in cultivation of vegetables and flowers in the project villages as compared to pre project scenario. Vegetable and floriculture is not taken in control villages .
- Summer: Due to increased water availability, cultivation of fodder and vegetables has increased in summer.
- The situation is more or less similar across both watersheds.

Table 16 Seasonal Cropping Pattern

Cropping Pattern (% of total land)				
		Project Villages (n=303)		Control Villages (n=71)
		Pre Project	Post Interventions	Current Scenario
Kharif	Maize	83.6	81.1	94.1
	Soyabean	3.8	0.1	
	Fodder/Jowar		1.8	2.0
	Groundnut			0.7
	Vegetables		0.1 (Chilli, Tomato)	0.2
Rabi	Wheat	38.7	55.2	67.8
	Black gram	6.7	1.9	1.3
	Mustard	6.5	3.8	1.3
	Other/Fodder	2.6	0.2	
	Vegetables		0.6 (tomato, peas, cabbage)	
	Flower		0.3 (Sevanti/Marigold)	
Summer	Fodder	6.5	14.0	3.9
	Vegetables	0.4 (brinjal)	2.3 (brinjal, tomato)	
	Millet- Kangni	0.1		
	Napier Grass		0.5	

Project has been instrumental in bringing awareness on various scientific cultivation practices in the project villages. Major impact has been seen through adoption of better practices in following areas:

- Use of certified seeds (from mere 11% to 88% farmers post interventions). Use of certified seeds is still low in control villages with only 43.6% farmers adopting the practice.
- Undertaking seed treatment for protection of crops against diseases. Pre project merely 10.4% farmers adopted seed treatment. With increased awareness, about 62.1% farmers are now undertaking seed treatment.
- There is rise in farmers adopting dibbling /row method of seed sowing against broadcasting. Currently 54% farmers reported to use dibbling method against merely 12% farmers before project interventions. This has led to reduction in seed rate and thus marginal saving on input cost.
- There is remarkable rise in number of farmers using organic manure, bio fertilizer and bio pesticides in project villages. This can be attributed to awareness and support given to farmers for producing, procuring and using organic fertilizers and bio pesticides.
- Soil testing is also now largely taken up by farmers in project villages with more than 40% farmers adopting the practice against 18% farmers before the project.
- Project has been instrumental in introduction of solar based pumps, which has been highly beneficial to farmers for irrigation where there is no power supply or timings fluctuated in day and often supplied at night. were not fixed or were given at night time or there were not power connections.

Table 17 Package of Practices Adopted by Farmers

Package of Practices Adopted by Farmers- % farmers				
Package of Practices		Project Villages (n=303)		Control Villages (n=71)
		Pre intervention	Post Intervention	Current Scenario
Certified Seed	Yes	11.7	88.2	43.6
	As per crop needs	4.25	1.1	38.1
Seed Treatment	Yes	6.8	58.5	72.2
	As per crop needs	3.6	3.6	26.8
Use of Organic Manure		36.3	76.7	73.2
Use of machines for ploughing		32.7	97.1	67.6
Seed Sowing	Dibbling	12.1	54.1	67
Crop Rotation		21.2		
Intercropping		18.1	25.8	19.7
Use of bio fertilizer		59.3	90.1	88.7
Use of bio-pesticide		18.5	49.9	43.6
Chemical Fertilizers		71.1	50.3	70.2
Chemical Pesticides		39.2	22.4	26.7
Value Addition of Crop		8.5	20.2	16.9
Crop Insurance		1.9	5.2	5.6
Soil Testing		18.6	43.5	32.3
Electric Motor		20.8	83.1	64.7
Diesel Pump		27.19	8.5	12.6
Solar Pump		0	3.9	0

Table 18 % Land under Organic Inputs

Use of Bio Fertilizers & Bio Pesticides- % of Land			
	Project Villages		Control Villages
	Pre Project	Post Project	Current Scenario
Use of Bio Fertilizers- % Land	52.6	76.4	71.7
Use of Bio Pesticides- % Land	21	47.2	52

Micro irrigation system have been promoted in both the watersheds through project support as well as linkages with government program in availing the benefits. Drip Irrigation systems has been mainly used for vegetables or floriculture cultivation only. Use of sprinklers and rain guns is limited mainly due to perception of crop damage at higher growth stage of plants. Even those using sprinklers/ rain guns, use it only 1-2 irrigations in initial phase of crop.

Table 19 Use of MIS in Project Villages

Use of Micro Irrigation System in Project Villages				
		Kharif	Rabi	Summer
Drip (n=25)	% Farmers using*	4	12	28
	Type of crop	tomato	vegetables, floriculture	vegetables
Sprinkler (n=2)	% Farmers using*		29	
	Type of crop		wheat, mustard	
Rain gun (n=25)	% Farmers using*	4	29	
	Type of crop	maize	wheat, tomato	
*of those benefitted with specific system in the project				

Further, due to extensive awareness on demonstration on various package of practices and its benefits , other farmers in the project villages have also adopted some of the measures mainly, vegetable production, horticulture, use of line sowing, bio pesticides and organic fertilizers.

Adoption of Good Practices in Agriculture- Indirect beneficiary – Gudli

Mannaramji is a farmer in Gudli village in Kurabad watershed and owns 3 bigha land . He got inspired from other farmers in the region who had benefitted with support for installing mulching sheets and initiated vegetable cultivation on 0.5 bigha land using drip and mulching. This was his first experience in cultivating vegetables in Rabi in year 2022-23. The land where he cultivated vegetables was used to produce grass for fodder.

He invested around Rs. 25000 for preparing land and installing drip, mulching, trellis and electric motor. Now he is anticipating 1.5-2 tonne of tomatoes in the season, which he can sell at Rs. 20-30 per Kg. Thus, he will not only recover the investment amount but also get net profit of Rs. 25000 within the first season of production. In second season, the profits will be significantly higher as there would be very limited capital cost. Now he is planning to grow Papaya also using in nearby land.

6. Impact on Crop Productivity

Improved irrigation availability and changes in package of practices have led to improvement in crop productivity of major crops Maize, wheat, mustard and black gram in project villages in comparison to pre project scenario. Impact on productivity in maize and wheat is higher with more than 70% farmers in project villages reporting to have rise in crop productivity.

Table 20 Impact on Crop Productivity

Impact on Crop Productivity								
Crop	Season	Avg Productivity- kg/bigha			% Farmers applying irrigation			% Farmers reporting rise in productivity in Project Villages
		Project Villages		Control Villages	Project Villages		Control Villages	
		Pre Project	Post Interventions		Pre Project	Post Interventions		
Maize	Kharif	221	297	220	3.8	5.0	0.0	74.3
Wheat	Rabi	316	414	320	87.2	97.2	93.5	76.7
Black Gram	Rabi	56	89	40	33.3	40.1	0.0	50.0
Mustard	Rabi	81	82	60	75.0	86.8	0.0	36.4
Vegetables	winter	minimal cultivation	400	minimal		All irrigated		
Vegetables	Summer	minimal cultivation	260	no major cultivation	NA	All irrigated	NA	NA

If we compare both the watershed regions, over all productivity of crops is less in Alsigarh even before the project due to various physiological factors and access to irrigation sources. However, in comparison to pre project scenario, there is considerable rise in average crop productivity specially in maize and wheat in both the regions with nearly 70% farmers reported rise in productivity in both crops. Due to increased irrigation availability and improved POP, there is moderate rise in productivity of black gram and mustard.

Table 21 Comparative Scenario of Crop Productivity Across Watersheds.

Comparative Scenario of Crop Productivity Across Watersheds.						
	Alsigarh			Kurabad		
	Average Productivity- Kg/bigha		% Farmers with rise in productivity	Average Productivity- Kg/bigha		% Farmers with rise in productivity
	Pre Project	Post Interventions		Pre Project	Post Interventions	
Maize	146	206	79.0	263	358	69.7
Wheat	203	290	74.1	334	526	79.2
Black Gram	62	89	50.0			
Mustard	58	60	36.4	99	103	52.5

7. Horticulture & Floriculture

Table 22 Scenario of Farmers Adopting Horticulture

Farmers Taking Horticulture Plantations- % Farmers		
Project Villages (n=303)		Control Villages (n=71)
Pre Interventions	Post Interventions	Current Scenario
3.0	7.3	1.4

Due to handholding in the project and awareness, there has been rise in farmers taking horticulture plantation from mere 3% before project to about 7.3% after the project. In control villages, horticulture plantations in minimal with involvement of only 1.4% farmers. Major horticulture crops in project villages are lemon, mango and guava, while that in control villages in mainly mango.

Floriculture

Floriculture has been promoted in 2nd year for few farmers. The project has supported the farmers with good quality seeds and guidance/trainings. Normally marigold is taken up currently. Average net income from floriculture comes to Rs. 40000-60000/bigha. It is evident from sample survey and FGDs that floriculture is highly conducive for both the watershed regions due to higher income, lower risk of damage of crops by animals and good near by market in Udaipur.

Floriculture at Kadafalla, Alsigarh Watershed

Bherulal Meena is a progressive farmer in Kadafalla area in Alsigarh village . He has received multiple benefits from the project like floriculture, rain gun and drip irrigation system. He has benefitted with floriculture interventions in 2020-21. He has received good quality seeds and training on floriculture. Last year he was able to cultivate white and orange marigold for the first time with support from project in 2 bigha land.

He states, " There are around 600 plants per bigha. The cost of cultivation is around Rs. 5000 per bigha, which includes seed cost, manure and other inputs. There is around 20% wastage in seeds."

He was able to get production of 1800 kg and sold is to a vendor in Udaipur. In peak season, he gets around Rs. 60 per Kg, while at other times, the sale price varies from Rs. 30-40 per Kg. He uses rain gun and flooding method for irrigation.

According to Bherulal, "White marigold has 3 days shelf life, while Yellow Marigold has 1 day shelf life. But people prefer yellow marigold, so I have more plants of yellow marigold. I spend 1 hour daily for collecting flower."

Bherulal earned net income of Rs. 0.8 Lakh in once cycle from floriculture.

8. Impact on Drinking Water

In first phase of project, direct interventions related to drinking water have been minimal with support of Roof Top Water Harvesting System for 3 isolated houses in Alsigarh watershed for those not having any major drinking water source and living in isolated places.

Moreover, rise in water table in wells due to water harvesting interventions have added to water adequacy particularly in summer months.

Roof Top Water Harvesting Interventions in Alsigarh Village. Alsigarh Watershed

Santa Bera and her family lives on hill top land in Alsigarh village, which is actually forest land. They have migrated from the main village due to their livelihood which is based on collection of small forest produce. Men from the family migrate for agriculture labour for around 3 months of the year. Apart from that, they have leased 2 vigha land for cultivation.

Under this project, their family got support to construct rooftop rainwater harvesting (stone masonary), including construction of 5000 litre tank storage capacity and gutter pipelines, which has resulted in reduction in drudgery for fetching water considerably.

She states, "I would go to fetch water from a pond 5 Km away. With tank at home now, I feel security. We harvest rain water and use if for drinking only and tank stores water for 6 months after rains. This has reduced drudgery and ill effect on my health also. Now I am able to give more time to my family and children."

9. Impact of Solar Interventions

Solar interventions have been highly useful in increased access from irrigation sources, specially where power supply is interrupted and there is irregulairty in timings. Moreover, solar has direct inpact on reduction in power bills and reduction in carbon emissions. Solar interventions include both, individual farmer support and support in groups also. Individual solar are 3 kw capacity, while group solar are 10-13 kw capacity.

Case Study on Impact of Anicut and Community Solar Interventions at Bachhar. Alsigarh Watershed

Panni is a Member of committee formed for repair of Anicut and installing group Solar system in Bachhar.
Her family has land holding 2.5 bigha near the anicut and has benefitted by both community solar and anicut interventions in year 2020-21.
Before anicut, expense for providing irrigation water from well (through electric based pump) was Rs. 5000 per year and yet she was not able to irrigate whole land for two seasons adequately. Moreover, due to irregular timings of power supply, she was not able to provide irrigations on time. Due to anicut, irrigation water availability has increased. Further due to solar pump, cost of pumping is zero and there is ease in timings of irrigation.
Al this has led to increased critical irrigation in kharif and 1 additional watering in Rabi. Moreover, additional 1.5 bigha land is now under cultivation in Rabi. Other major benefit of community solar has been rise in cultivated land near by by other farmers, which has led to increased protection against animal menace . All these benefits compounded has led to rise in Panni's annual income from farming by about Rs. 15000/anum

	Before Project	After After Interventions
Irrigation cost	5000	Nil
Critical Watering in Kharif	None (rain depended only)	Able to provide 1-2 critical irrigation if required
Watering in Rabi	4	4-5
Productivity in Rabi	800-900 Kg	800-900 Kg
Rabi crop cultivation	0.5-1 vigha	2.5 vigha
Damage to crops	Animal menace due to open area/ no protection	Animal menace reduced significantly due to protection

Case Study of Individual Solar Intervention at Sulavas, Kurabad Watershed

Premaram has benefitted with support of Individual solar pump of 3 kW to reduce the cost of pumping. He own 3 bigha cultivable land.

Premaram used to irrigate 3 bigha land through electric motor from open well which had expenditure of Rs. 800-1000 per bigha per season. Total bill was Rs. 5000-6000 annually from pumping.

Premaram produces Gum Guvar in 1.5 bigha in Kharif season , maize in 1.5 bigha in Kharif and Wheat in 3 bigha in Rabi. Sometimes he also takes black gram in 1.5 vigha in Rabi season. With solar pump, he is able to give 9-10 waterings per season in Wheat and gets productivity of 1000 kg per bigha. In black gram, Premaram uses rain gun provided with support of project. However, he does not sell wheat, as it is kept for family consumption only. It is also used for fodder to cattle.

Premaram says, “Solar has benefitted through complete reduction of power cost. Moreover, water consumption is reduced after installation of solar because the wastage of water has reduced significantly. Earlier we had to wait for electricity, which often was supplied at night and would keep our motors running all night in fear that electricity may be cut anytime.”

He has contributed Rs. 20000 and rest is supported by project cost and government subsidy. He took money from lender at the rate of 1.5% per month. He is planning to repay it within one year by selling milk.

10. Impact on Income from farm based livelihood

Majority of farming is limited to sustenance and production limited to home consumption. Sell of produce is limited and hence computing income from agriculture is difficult. Hence net production value considering average market rate (based on those farmers who have sold their produce) have been computed to understand net production value.

It is evident that there has been considerable rise in average net production value of farmers in comparison to pre-project scenario and much higher than control villages. Increased irrigation water availability, increased cultivated land in Rabi and Summer and improved crop productivity have compounded over all rise in net production value. In comparison to pre project scenario in project villages, there has been rise in net production value of about 74.3% farmers.

Kurabad villages are less undulating, have access to market, farmers are more progressive and population is well off compared to Alsigarh and hence over all income before and even after the project in comparatively higher than Alsigarh. However, it should be noted from sample survey that more than 80% farmers in Alsigarh have reported rise in income from agriculture as compared to 68% farmers in Kurabad.

Table 23 Income from Farm Based Livelihood

Income from Farm Based Livelihood				
	Avg. Net Income of Farmers/Net Production value- Rs.			% Farmers with rise is net income/net production value
	Project Villages		Control Villages	
	Pre Project	Post Interventions	Current Scenario	Project Villages
Over All	13686	20462	10525	74.3
Marginal Farmers	10776	16517	10163	73.1
Small Farmers	25458	31037	14437	74.5
Semi-Medium/Medium Farmers	25740	31200		86.7
Alsigarh Watershed	7787 (Range- Rs. 4000-34000)	13718 (Range -Rs. 3000-99000)	Avg - 9094	80.3
Kurabad Watershed	Avg. 19584 (range Rs. 5000-95000)	Avg. 27206 (range- 6000-113500)	Avg- 11915	68.4

11. Annual HH Income

Agriculture is limited and meant for sustenance for majority of households in the region. Other major source of income including animal husbandary with more than 40% HHs involved in it. Due to increased fodder availability, there has been moderate rise in average income from sell of milk. General labour also forms another source of income with more than 40% HHs involved with it. While a small percentage of HHs are involved in small business (shop, trading etc) and job, annual income is high from this source. MGNREGS also augments income with 50-60% HHs taking up labour works as available.

Table 24 Average Annual Income from Other Sources

Annual Income from Other Sources						
	Project Villages				**Control Villages**	
	Pre Project		Post Project		Current Scenario	
	% HHs involved	Avg. income – Rs.	% HHs involved	Avg. income	% HHs involved	Avg. income
Agri Labour	9.9	9506	9.9	9621	12.5	11350
Other Labour/General Labour	42.2	21705	42.6	25314	42.8	9276
Animal Husbandary	36 (25.4% sell milk, other home use)	16818	40.6 (37% sell milk, other home use)	29314	41.7	12500
Job	2.3	55482	2.3	59200	2.8	24000
MGNREGS	61.4	5000	57.8	6000	58.3	5435
Small business	2.3	19000	4.0	21250	2.8	20000

Table 25 Average Annual Income from all sources

Average Annual Income from All Source		
Project Villages		**Control Villages**
Pre Project	Post Project	Current Scenario
Rs. 29288 Ranging upto Rs. 1.85 lakhs)	Rs. 45283 (ranging upto Rs. 2.48 Lakhs	Rs. 30647 (ranging upto Rs 1.67 lakhs)

12. Innovative Demonstration through Public Private Parterships

"Sanjeevan – Eco Park" Development on PPP (Public Private Partnership) Mode

A wasteland of 9 farmers was identified in Kurabad village to rejuvenate into a productive eco-park with multiple plantations. The development of eco-park is in PPP mode was initiated in 2021-22, where in initial investment is provided from the project support and for next seven years the income from the eco-park shall be shared equally between Arpan Seva Sansthan (as revolving fund) and Eco Park Committee. A committee of these nine farmers have been formed and the 50% income shall be deposited in their account. This amount shall be used as revolving fund for development of more such eco-parks in the area.

Key highlights of the eco-park are as follows:

- Total 10.55 Ha. Land with agro forestry plantations is developed, which will increase bio –diversity and improve the wasteland into productive silvi pasture.
- Eco park will not only increase green cover in treated wasteland, but would also be model for pastureland where horticulture (Lemon & Papaya) and commercial value plants (Malabar Neem – *Melia Dubia*: A fast growing plant with good height and girth which is used in furniture industry) along with medicinal crops (moringa, ashwagandha) shall provide the beneficiaries with income on regular basis for a long time period.
- Solar powered 5 hp pump has been installed for facilitating micro irrigation system (combination of drip, sprinkler and rain gun) in the park. This will ensure timely irrigation and increase water use efficiency. This will also act as a demonstration for the community to adopt similar MIS in their agriculture farms.
- Eco park is also strategically situated opposite the block administration office, right on road touch land. And hence the visibility is quite good for showcasing promising practices.
- It also has cold storage facility.
- Full time park manager is engaged for ensuring protection as well as irrigation of the park.
- It is expected to increase income of participating farmers multiple fold, from the current income of mere Rs. 12000 per year.

13. Impact on Migration

3 year project has laid major focus mainly on improving irrigation water scenario. Extensive interventions on improving package of practices and alternate livelihoods is still under work. Hence there is no major impact on migration pattern yet.

Table 26 Impact on Migration

Impact on Migration			
	Project Villages		Control Villages
	Pre Project	Post Intervention	Current Scenario
% HHs reporting migration	28.3	24.3	29.6
Duration (> 3 months)*	0.3	28.4	4.8
Migration with women/family*	5.8	5.4	0.0
*of those migrating			

14. Environmental Impact

Project has been instrumental in creating environmental impact in 3 major areas:

a. Project has led to ground water recharge potential of 19,53,994 cu.m.

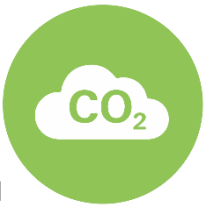
b. About 58.625 kw solar pumps (individual and community) have been installed in the entire project, which has led to reduction green house gas emissions against convnetional diesel/electicity based pumps. About 235 kg co2e have been reduced annually by the project.*

(*Considering reduction of CO_2 emission per 1 kWh of solar power = 0.8 kg of CO_2/ CO_2e (https://www.solarmango.com/in/tools/solar-carbon-emission-reduction). considers only the reduction in CO_2 emissions for the electricity generated from a solar power plant vs. a coal and does not take into account CO_2 from other parts of the value chain.. Considers average 5 hour of solar peak hours per day

c. Introduction of micro irrigation system in the project has led to water saving. About 77.1 Ha. area of MIS (sprinkler/raingun- 62 Ha., Drip- 15.1 Ha.) has been promoted in the project in 3 years. Howover, field study indicate that not all farmers have been using MIS regularly as stated in sections above . If we consider use of drip system for vegetable/floriculture cultivation in atleast 1 season, then there is total saving of 45 lakh litres/year**.

(**considering average 7000 cu.m/Ha. in flooding and 4000 cu.m./Ha. with use of drip)[4]

d. There is increased use of bio pesticides and bio fertilizers against use of chemical fertilizers, which also contributes to reduction of green house gas emissions and improves soil quality.



235 kg co2e/anum reduction in carbon emission

Creation of 19 lakh litres of ground water recharge/anum

Saving of 45 lakh litres/anum through use of MIS

[4] https://www.jains.com/Company/news/blog/HOWMUCHWATERDOESMYCROPNEEDPart8.htm, https://www.fao.org/land-water/databases-and-software/crop-information/tomato/en/#:~:text=Total%20water%20requirements%20(ETm)%20after,mm%2C%20depending%20on%20the%20climate.

15. Project Design & Implementation

Project need and relevance

Despite of vicinity to Udaipur city, both Alsigarh and Kurabad have limited livelihood opportunities and sizable poor population. Migration is high in the region. Due to undulating terrain, transportation is also limited. Most of the families have subsistence agriculture and small cattle rearing for livelihood. There is lot of potential to harvest water and use it for enhancing livelihoods of the people. The project of creating Water Economic Zone is thus quite timely and relevant. It has potential to enhance the income and improve well being of the people, especially the poor families.

Effectiveness

Strong rapport with people has been seen in both project areas. Strong technical aspect of designing the watershed activities and structures have been evident. Social processes have also brought about a sense of ownership and responsibility among community groups. Participation of people in planning of activities have been ensured.

Community institutions and groups (like water user groups and others) may not be as capacitated and strong to work on its own, but nonetheless engaged. These groups may be capitalized by building their capacity.

Efficiency

Overall, project has contributed Rs. 11.9 crores and the quantity of water harvested is 19,53,994 Cum. This reveals that per litre cost of water harvested is Rs. 0.06.

Impact

There has been ssignificant work of water harvesting resulting in rise in ground water conservation and recharge. This has led to increase in cultivation and irrigation in Rabi and Summer crops. Vegetable production and horticulture cultivation has also increased due to project interventions, which has led to rise in income from agriculture.

Sustainability

Sustainability of interventions can be divided into three categories :

a) Physical structures and its maintenance: The quality of structure is good and hence it will pay dividend for long term. User groups are created but not capacitated to carry out repairs on their own.
b) On farm support: The demonstration models of floriculture, mulching etc has positive effect and adaptation by other farmers can be seen. However, more work need to be done for scaling up and sustainability of the interventions. This may include i)large scale adaptation of better agricultural practices, ii) initiatives on value addition to produce, iii) stronger market linkage, iv) access to micro credit (still people prefer private lenders to banks or official channels due to documentation requirements), v) Financial inclusion and education to leverage government schemes and support.
c) Institutional building: for any long term impact, projects need strong institution to carry forward the benefits or to scale up the benefits of the interventions. While there have been extensive mobilization of community groups and individuals in the project, however presence of strong institutions, which is capacitated in carrying the work forward seems to be missing.

Physical Works

Total 46 physical structures have been verified in the study across 10 villages. Following are the findings of the same:

- Location: All structures have been constructed at appropriate location according to the purpose of the structure, i.e to enable water storage or ground water recharge, check soil erosion, check water runoff and its velocity, or to enable soil moisture conservation.
- Design: Design of all structures have been done by competent technical person considering standards specification commonly used for design and construction of watershed structures.
- Structural quality- structural quality of all structures seems acceptable with no major damages. Water seepage is seen in about 6% structures in anicuts in Pai & Bacchar villages in Alsigarh watershed. Scouring is seen in about 14% structures mainly in Anicuts in Bacchar & Pipalwas in Alisgarh and Gudli in Kurabad. List of damages as per annexure 2.

Figure 4 Minor Damage & Seepage in Malivala anicut at Pai Village

Figure 3 Scouring in Suryavala anicut , Pipalwas Village

- Operation & Maintenance: User groups have been created for operation and maintenance of the stuctures. These user groups involve households who have been directly or indirectly benefitted by structure.
- Community participation & Contribution: No cash or kind contribution was taken for community structures like anicut, check dam etc. For individual support like Solar, Drip & Rain gun; 50% contribution has been taken from the beneficiary.

Figure 8 Mandaliya Anicut at Alsigarh Village

Figure 7 Padarfalla Gully Plug at Pai Village

Figure 6 Hadiamal LSCD at Khajuriya Village

Figure 5 Badlafala Nadi with Core well in Pai Village

Figure 10 Masonary Gabion 3 at Alsigarh Village

Figure 9 Roof Top Water Harevesitng Strucutre at Patiya talai, Alsigarh Village

Community Involvement

People's participation in planning and selection of site has been ensured for all major structures in both watershed regions. Participation and decision making is seen from varied socio-economic groups. Local people have also worked as labour in construction of most of the structures. In Alsigarh watershed, separate Gram Kosh bank account has been opened where project has contributed 5-10% for works and interventions for community/group, which can be used for structure maintenance when needed. In both watershed regions, beneficiaries have contributed 50% of total cost in individual interventions like solar and irrigation equipment like rain gun, drip and sprinkler.

Equity

Table 27 Equity in Benefits based on Economic parameters

Equity in Benefits based on Economic parameters- % HHs			
	Alsigarh	Kurabad	Total
% BPL	39.5	59.2	50
% Antyodaya	28.3	3.3	18.3
% Marginal Farmers	82.2	69.7	77
Based on sample survey			

The first phase of project was more focused on extensive watershed development through water harvesting & recharging as well as soil moisture improvement. Hence by default the physical works have been located based on geo hydrology and topography. However, sample survey indicate coverage of 50% BPL HHs and 18.3% Antyodaya HHs, which indicate that major benefits have been accrued by economically backward households. If we consider caste factor, as the region has majority ST and OBC families, coverage of both these categories is high in the project with coverage of 69% ST HHs and 28% OBC HHs. In terms of benefits to type of farmer, from those benefitted, 77% are marginal farmers and 17% are small farmers. Alsigarh project has higher coverage of marginal as compared to Kurabad.

If we look at various categories of interventions, more than 50% benefited HHs in each interventions are BPL/Antyodaya and more than 70% are marginal farmers. Again, in terms of landholding, in Kurabad nearly 70% across all interventions are marginal, while in Alsigarh it is comparatively high with more than 80% HHs.

Intervention Wise Equity Analysis- % HHs									
	Alsigarh			Kurabad			Both Watershed		
	Water Harvesting & recharging	SWC	Agri Support	Water Harvesting & recharging	SWC	Agri Support	Water Harvesting & recharging	SWC	Agri Support
% BPL	34.4	29.9	31.6	60.7	60.2	59.2	48.8	44.4	44.7
% Antyodaya	32.0	42.5	60.7	3.7	2.4	3.9	17.7	22.8	32.4
% Marginal Farmers	82.0	82.8	83.8	69.6	69.9	71.8	76.5	74.9	78.1
Based on sample survey									

Table 28 Intervention Wise Equity Analysis

Individual Physical interventions like roof top water harvesting structures are normally provided to families which are far away/isolated region and having no other drinking water source and have high drudgery for fetching water. Based on sample survey, solar interventions cover both APL as well as BPL HHs and mainly marginal HHs. Solar intervention support is given to farmers who have been willing to contribute some amount.

Thus, even though not by design, the project has definitely laid major focus on socio-economically backward population. There is need to maintain a data for next phase for activity wise planning versus socio-economy as second phase largely lays focus on improvement of agricultural practices.

It should be noted that as the project was focused on enhancing the water recharging and harvesting, most of the activities were influenced by technical matters rather than social considerations. However, looking at the scale of the project there should be inherent element of equity embedded in selection of beneficiaries wherever possible, which can be taken care while design of project in next phase. The gender angle sees missing and participation of women seems minimal.

16. Project Challenges

Major Challenges

One of the challenges in augmenting income from on farm livelihood is small hand holding, that too in undulating terrain. This factor limits the application of wide range of package of practices which otherwise would have reduced input cost and increased yield. Remote locations, limited power and transport infrastructure also limits reach of government schemes and market connections.

Major Issues in agriculture

Some of the major issues reported in agriculture in project villages are lack of irrigation source and its access. Climatic changes like irregular rainfall, unseasonal rainfall is also a major issue leading to crop failure or lower productivity reported by nearly 47.7% farmers. More than 50% farmers reported crop damages due to animals like monkeys and Nilgay. Lack of good quality inputs like seeds, fertilizers, pesticides and organic inputs is also major issue in the region.

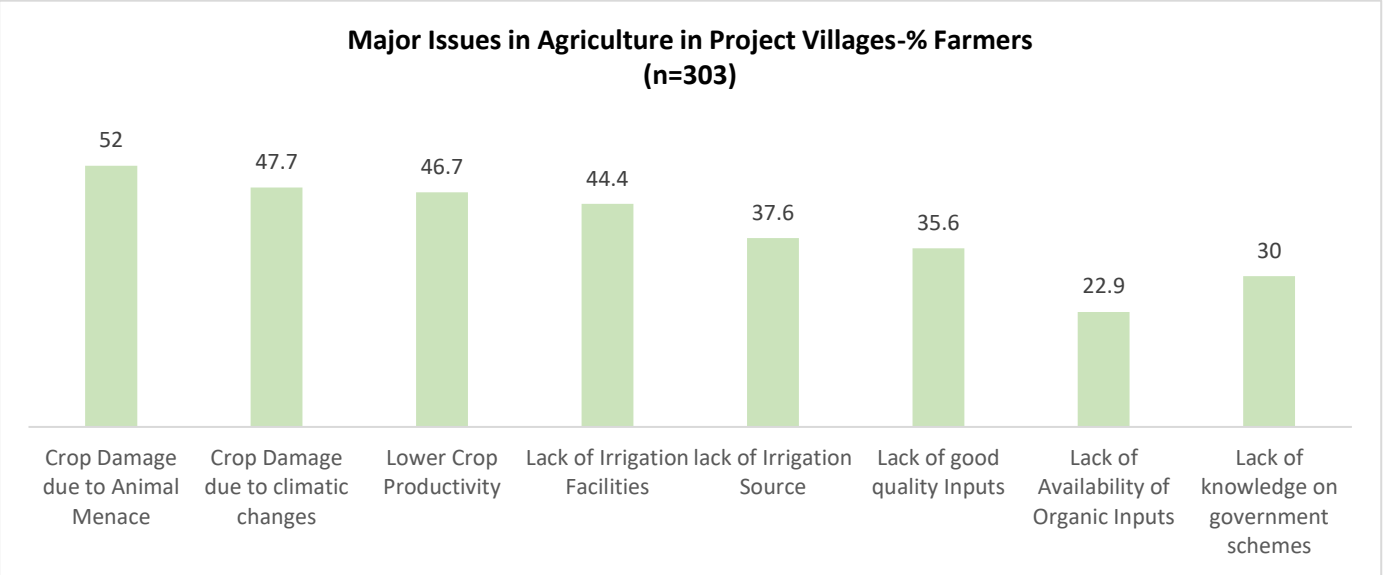


Figure 11 Major Issues in Agriculture in Project Villages-

Summary & Way Forward

Phase 1 of the project has laid major focus on drainage and stream level treatment under watershed project. The impact of these interventions has benefitted in terms of increased irrigation water availability and its access, which has been translated into income augmentation from agriculture.

However, translating benefits of augmented resources to increased income and better livelihood will need more intensive interventions. As of now, work on water resources have moderate impact on improvement of agricultural practices or other livelihoods of the people. Some the recommendations for coming project phase are:

- Package of Practices: Good package of practices have been disseminated to farmers for various crops in phase 1. Some of the farmers have adopted few practices. However there needs to be an intensive programme to educate, sensitize farmers to adopt these practices. Demonstration plots may be taken up for major crops to scale up adoption of good practices. Farmers' book may be introduced to document the package of practice and its results over a period of 3-5 years.

- Crop Diversification: As the land holding is small in the region, crop diversification can be taken up to avoid risk of loss of single crop. Adopting vegetable cultivation, floriculture and horticulture have given good results during the project period and may be scaled up. Floriculture in particular have advantage of low investment, minimum risk of damage, short production cycle and high returns. It was also observed that cattle rearing, horticulture and vegetable production have greater economic returns than farming in the project area. Support for augmenting income through animal husbandry would also help in strengthening local economy.

- Value addition: Individual or group entrepreneurship for value addition like drying, powder, cattle feed etc from the crops may be initiated to augment the income from farm produces.

- Market linkages: Though small handholding and subsistence agriculture limits the scope of income generation through market sale of the products, but strengthening market linkages for vegetable, horticulture and floriculture would incentivize the adoption of these practices among relatively small farmers also. Market linkages for major crops like maize, wheat, black gram and other should also be strengthened.

- Capacity building of institutions: Building strong and sensitized institutions at local level would be beneficial for sustainability and scaling up of the project through government and other resources. Also this would help in maintaining and developing the assets that have been created in the project. There are many examples where institutions like SHGs, Youth group, women group, farmers' club, FPO, federation etc have played important role in taking benefits of watershed activities forward.

- Animal husbandary also forms one of the major source of household income. Project can also look into various other interventions like improved fodder varieties, fodder cutting tools, cattle health improvement, improved breeding, linkages with relevant government etc.

Annexures- 1 Village Wise Sample

Watershed	Village Name	No .of HH studied
Project Villages		
Alsigarh	Pai	39
	Pipalwas	36
	Alsigarh	34
	Bacchar	29
	Kumariya Khera	14
		152
Kurabad	Sulawas	34
	Khajuriya	31
	Gudli	30
	Bhutiya	29
	Bhinmal	28
		152
	Total of Project Villages	**304**
Control Villages		
Alsigarh	Lamba Dhavda	35
Kurabad	Paramda	36
	Total of Control Villages	**71**

Annexures- 2 Physical Structure Verification

Watershed	Village Name	Type of Structure	No . of structures
Alsigarh	Alsigarh	Anicut	1
		Anicut Repair	1
		Masonry Gabion	1
		Nadi	1
		Well Repair	1
		Gully Plug	1
		Stone Plug	1
		RRWHS	1
	Pipalwas	Anicut	2
		Nadi	1
	Pai	MPT/Recharge Pit	1
		Masonry Gabion	1
		Staggered Contour Trench	1
		Anicut Repair	1
		Nadi	1
		Anicut	1
		Gully PLug	1
		Stone Bund	1
		Loose Stone Checkdam	1
	Bacchar	Anicut	2
		Anicut Repair	1
		Well Repair	1
	Kumariya Khera	Nadi Repair	1
Kurabad	Sulawas	Anicut	1
		MPT/Recharge Pit	1
		Loose Stone Checkdam	1
		Continuous Contour	1
		Tank	1
		Pond	1
		Nadi	1
	Khajuriya	Anicut	2
		Loose Stone Checkdam	1
		Continuous Contour	1
		Staggered Contour Trench	1
	Gudli	Anicut	3
		MPT/recharge pit	1
		Continuous Contour	1
	Bhutiya	MPT/recharge pit	1
		Continuous Contour	1
		Staggered Contour Trench	1
	Bhinmal	Continuous Contour	1

Structural Damage				
Name of Structure	Location	Village	Watershed	Type of Damage
Malivala anicut	Vadalafala	Pai	Alsigarh	Water Seepage
Takara ground anicut	Amloifala	Bacchar	Alsigarh	Water Seepage
Amloi mata anicut	Amloimatafala	Bacchar	Alsigarh	Water Seepage
Amloi mata anicut	Amloimatafala	Bacchar	Alsigarh	Scouring
Suryavala anicut	Ghatifala	Pipalvas	Alsigarh	Scouring
Rujiya anicut	Himalafala	Pipalvas	Alsigarh	Scouring
Anycut	Kanelakuva -mela fala	Gudali	Kurabad	Scouring
Anicut structure	Shankar pita dalla - khutana fala	Gudali	Kurabad	Scouring
Anicut structure	Vagakudi- Amela fala	Gudali	Kurabad	Scouring

Annexures- 3 Project Intervention Coverage

List of Activities undertaken (from 2018 to 2021)

List of Activities	Unit	Alsigarh				Kurabad				Grant total
		FY 2018-	FY 2019-	FY 2020-	Total	FY 2018-	FY 2019-	FY 2020-	Total	
		Micro No. 07/ 12 & 07/13	Micro No. 07/ 09 & 07/14,07/ 02,07/03,	Micro No. 07/ 08 & 07/10,07/ 11,07/15		Micro No. 16/3	Micro No. 16/1 &16/02	Micro No. 16/04,17/ 8,17/9,17 /10,17/11		
Total No. of	**No of HH**	811	705	432	1948	329	269	684	1282	**3230**
Water harvesting/recharging structures										
Anicut/Check Dam	No. of Structures	9	17		26	14	21		35	61
Repair of Anicut/pond/check	No. of Structures	7	15		22		9		9	31
Desiltation	No. of Structures	1	1		2				0	2
Nadi	No. of Structures	7	8		15				0	15
MPT	No. of Structures				0	38	46		84	84
Earthen embankment with masonry waste	No. of Structures				0		3		3	3
Semi circular	No. of Structures		1		1				0	1
Well	No. of Structures	17	44	4	65				0	65
Veri	No. of Structures	2	2	8	12				0	12
RRWHS	No. of Structures			3	3				0	3
Soil conservation works										
CCT/DCCT	Cum	12076.70	6172.73	1430.61	19680.04	36436.44	26581.27	44162.65	107180.4	126860.4
Gully	Cum	899.42	899.92	1064.45	2863.785					2863.785
LSCD(Loose stone check	Rmt	559.25	454.85	432.05	1446.15	1091.9	681.4	771.25	2544.55	3990.7
Masonry gabion	Rmt	51.60	121.45	14.70	187.75		15		15	202.75
Field	Cum	2839.00	1452.18	0.00	4291.18	795.74			795.74	5086.92
Stone	Nos.	61.00	38.00	0.00	99	24			24	123
Stone	Cum	2149.01	0.00	1827.39	3976.4				0	3976.4
Recharge	Cum	907.31	0.00	0.00	907.312				0	907.312
Others										
Rain-gun	No. of HH		18	200	218			2	2	220
Mini Sprinkler	No. of HH				0			5	5	5
Drip	No. of HH		16	34	50			50	50	100
Wadi	No. of HH			50	50			50	50	100
Floricutur	No. of HH			50	50				0	50
Plantation	No.			4000	4000			3000	3000	7000
Horticulture plants	No.			1000	1000			1500	1500	2500
Vermi	No. of HH			50	50			50	50	100
Solar	No.of HH			150	150				0	150