SATH
Enabling Development through Partnerships

srijan सृजन

Impact Assessment and Findings Report

Adivasi Samriddhi Pariyojana

Table of Contents

Acknowledgement

It is my pleasure to admit with deep gratitude & thankfulness towards the SRIJAN's project team for their trust and awarding this prestigious assignment "Impact Assessment and Findings Reports" for the Aadivasi Samriddhi Pariyojana to SATH Development Services. As a partner, I acknowledge and appreciate their precious guidance, unrelenting support, constructive criticism and valuable suggestion that helped accomplish the assignment within the given time frame.

I want to thank specially, Nitesh Kumar, Project Leader- M&E, for keeping track and continuously providing the required information as and when needed. I am also thankful to project team for meeting online and expounding any doubts related to data while doing analysis and writing report, even during late evening.

The direction from the Mr. Rupendra Sharma (Program Director, Rajasthan) in setting the whole context for the study and providing precious guidance and timely advise to team from time to time.

I also appreciate and congratulate the whole project team who have taken extraordinary endeavor to support women from underprivileged groups residing in some of the most difficult geographies, providing skilling and handholding support to create successful business enterprise that could provide jobs locally, strengthen local economy and contribute towards nation building, while keeping the sustainability intact. The results were found to be highly encouraging to set these words.

Sadique Akhtar

Partner, SATH Development Services.

List of Tables

List of Figures

Executive Summary

Introduction and Background

Self Reliant Initiatives through Joint Action (SRIJAN) in partnership with HDFC Bank flagship programme, Parivartan, a holistic rural development programme implemented project "Aadivasi Samridhi Pariyojana" for a duration of 03 years starting July 2020 and ending June 2023. The project was implemented with the women from the Garasiya Community who are designated as Scheduled Tribes (ST). The geography includes 10 project villages of Bali block of Pali district. The project includes 04 thematic areas viz., (i) Skills and Livelihoods, (ii) Climate Resilience, (iii) Natural Resource Management and (iv) Health Care and Hygiene. The project interventions around skills and livelihoods were majorly focused on strengthening the NTFP Value Chain implemented by women Farmers Producer Company, "Ghummar Mahila Producer Company Ltd. (GMPCL)". The project interventions on achieving climate resilience includes multiple and multipronged interventions to demonstrate natural farming methodology with 2200 women farmers, sprinkler irrigation as enhancing water productivity and water conservation technology, solar irrigation pumps and multi-layer farming methods. The interventions in Natural Resource Management include strategies to improve soil and water conservation practices by improving ground and surface water availability by repair and renovation of existing Check Dams/ Stop Dams and deepening dug wells. The interventions were carried out with intention to augment water availability and conserve productive topsoil which further improves the yield and production of crops, thereby impacting livelihoods of the targeted community. The project intervention in Health and Hygiene area was to be carried out with intension to improve the drinking water availability and reducing drudgery of women by construction of overhead water tanks operated using solar pump, organizing animal and human health camps for providing preventive health care to the population and raising awareness among the community in areas of improving health and hygiene aspects.

The total approved project budget was Rs. 392.00 lakh of which the project expenditure accounted to an extent of 98% amounting to Rs. 387.54 lakh.

Effectiveness of Implementation

i. The project was implemented with desired effectiveness evident from the physical and financial progress made during the project period from 2019-20 to 2022-23. Against the total approved budget of Rs. 392.00 lakh, the total expenditure made was Rs. 387.54 lakh, which was 99% of the approved budget.
ii. 98 to 100% of approved budget allocated across allocated different dimensions i.e NTFP Value Chain Strengthening, Climate Change Resilience, Natural Resource Management, Health & Hygiene were spent.
iii. The physical achievements in terms of numbers achieved against the planned targets were also achieved 100%, except the human health camp, where a shortfall of 04 camps were recorded.

NTFP VALUE CHAIN

iv. The NTFP Value Chain was diversified from one product, custard apple processing to 03 more value added products (Palash Leaf Plate, Plash flower – dehydrated and colour extraction and Ber Value Added Product). A total of 47.62 tonnes of custard apple pulp, 200 kgs of natural color, 4.74 tonnes of Ber, and 28.73 tonnes of dehydrated palash flowers were manufactured/ processed in FY 2022-23. The GMPCL, the women led enterprise witnessed significant financial progressions due to the project support and managed to generate revenue exceeding Rs. 72 lakh and overcame losses generated during the previous years. The company showed robust results on various business indicators i.e., generated net profits of Rs. 14.09 lakh and Rs. 18 lakhs during the last two subsequent years of the project. Earnings per equity improved from negative Rs. 61.75 to positive Rs. 24.51. The shareholders of the company also increased from 981 in the year 2019-20 to 1805 by the end of the project period.

v. The enterprising activity generated 8800 person days of job work in a year, thereby creating alternative employment opportunity particularly for Scheduled Tribe women of the project villages. The total amount paid to women as wage exceeded Rs. 41 lakh and the effective wage realized was Rs. 468 which is twice the amount of wage paid under MGNREGA. The enterprise also created employment opportunities for about 20 persons for managing operation of GMPCL.

CLIMATE CHANGE RESILIENCE

Natural Farming

vi. Against the targeted 2200 farmers for natural farming practice, total 2441 unique women farmers were covered through 3705 demonstration units under natural farming techniques, bringing 3705 bigha (1462 Ha) of land under NF production technique.

vii. The NF practices impacted the Kharif and Rabi production differently. In Kharif, the practice reduced the input cost from Rs. 943.80 per bigha to Rs. 797.03 per bigha. There was an over increase in value of production realized from NF technique by Rs. 440. The net gain per bigha from cost saving and enhanced production value worked out to be Rs. 585.

viii. In outcomes in Rabi crop was more significant. The per bigha value realized due production from NF production was estimated at Rs. 9814 against Rs. 4929 per bigha estimated from non-NF production, i.e., about 02 times the value realized in non-NF practices. The enhanced value is attributed to enhanced yield of wheat crop and the diversification activity demonstrated in the farm.

Sprinkler Irrigation

ix. Total 242.05 bigha (94 Acre.) of cultivated area was brought under the sprinkler irrigation. 1.06 lakh cum of water is estimated to be saved due adoption of sprinkler irrigation. Because of improvement in irrigation, on average 7% of additional area was brought under cultivation and on average 5% additional area was brought under wheat cultivation. The yield estimation also revealed an increase of 5% from the preadoption stage.

Solar Irrigation

x. 05 standalone solar powered irrigation system was installed benefiting 13 cultivators. Multiple benefits were found from the solar irrigation pumps. The total cultivated area increased by 44% and the

percentage of irrigated areas to net cultivated area also increased by 30% during the Rabi cropping. Because of the improved irrigation, there was an overall improvement of 35% in wheat production. Besides, the solar irrigation pump also managed to cut the diesel usage for irrigation by more than 60% there by reducing CO2 emission from 0.74 tonnes to 0.26 tonnes. The net gain realized due solar irrigation exceeded 136% of the pre project period.

Multi-layer Farming

xi. Multilayer farming technique was demonstrated with 60 farmers over a small area of 111 sq. meter with objectives to increase income and supplement household nutritional requirement. A combination of crops consisting of ginger, coriander, Spinach, Bottle Gourd and Bitter Gourd were chosen as layered farming a combination of crops at the same time. A total of 8 tonnes of vegetables were grown by sample 30 farmers. 20% of the total production was consumed at the household and the remaining 80% was sold with total value realization of Rs. 2.60 lakh. The income generated from sales ranges from Rs. 8425.10 to Rs. 14728 with an average income of Rs. 8671.04. Extrapolating the results with all the 60 farmers, total Rs. 6.39 lakh worth value of vegetable was grown, generating total income value of Rs. 540044.

NATURAL RESOURCE MANAGEMENT

xii. Dug well deepening and renovation and check dam renovation was done as soil and water conservation activity with an objective to augment water and support agriculture-based livelihoods. The survey results from 05 dug wells the average additional storage created was 95 cum. Total 10 dug wells were deepened creating and addition storage of created amounts 2362.93 cum as repored by SRIJAN. The enhanced volume of water impacted agriculture production fostering water availability thus enhancing irrigation intensity. The cultivated Kharif area increased by about 18% and cultivated rabi area increased significantly by 81% from 2019-20 period. The total wheat production increased from 26 quintal to 189 quintal resulting in an enhanced net return of Rs. 10379 by 2022-23 from 1059 in year 2019-20. The maize production increased from 80 quintals to 111 quintals and net return from maize per farmer increased to Rs. 6765 (2022-23) from Rs. 2811 (2019-20).

xiii. Five stop dams were repaired which resulted in surface water availability, ground water recharge and also conserving soil from erosion. In two sample check dams, the total cultivable area was 50.4 bigha shared by 26 farmers. No crops were taken prior to renovation work. After the repair a total storage capacity of 18238 cum meter was created and estimated recharge of 54714 cum. 50.4 bigha area was brought under irrigation. Total production of wheat was 227 quintals with an output value of Rs. 5.74 lakh. A net return of Rs. 3.81 lakh was realized after deducting the cost of cultivation, which on average has added an income of Rs. 14673 per farmer.

HEALTHCARE AND HYGIENE

xiv. Access to safe drinking water and health camps for both animals and human were the main interventions. Total 08 solar powered overhead water tanks of 5000 liter each were constructed in 08 project villages. The system has improved the overall water service by improving accessibility, reliability and functionality of water service as deemed essential for sustainable development. Total 171 households and population of 855 persons were benefited.

xv. A total of 21 animal health camps were organized during the project period. The camps were organized in collaboration with the Government Veterinary Department. Total 5154 animals were provided preventive health care service like deworming tablets and vaccination against the seasonal

diseases, that prevented occurrences of diseases and improve overall health and productivity of animals.

xvi. A total of 16 human health camps were organized covering all the villages during the project period in collaboration with health department to raise awareness about the provide preventive health care service for frequently occurring diseases. In total 1800 persons directly benefited from the camps besides the awareness session.

The project interventions chosen were holistic with specific local connection. The non-farm intervention in NTFP processing, the farm based interventions in strengthening water availability with elements of climate resilience and health and hygiene interventions consisting of access to drinking water and health care service for animal and human being were found to be highly effective in addressing the livelihoods challenges, teaching the community to participate in climate change adaptation in long run and adopt practices that would enhance resilience, mitigate risk while deriving enhanced livelihoods in the process. Overall, all the interventions have shown a positive result with respect to attain the desired objectives and attain enhanced goal in long term.

Chapter 1 Backdrop of the Project

SRIJAN, a grassroots resource agency, is deeply engaged in tackling livelihood challenges faced by disadvantaged and underprivileged communities. They do this through targeted project interventions in both agricultural and off-farm sectors. Their focus is on creating resources, fostering effectiveness, and ensuring sustainability by providing training and building the capacity of Community-based Organizations. This approach empowers these communities to access productive resources and participate in high-value chains, ultimately improving their economic prospects..

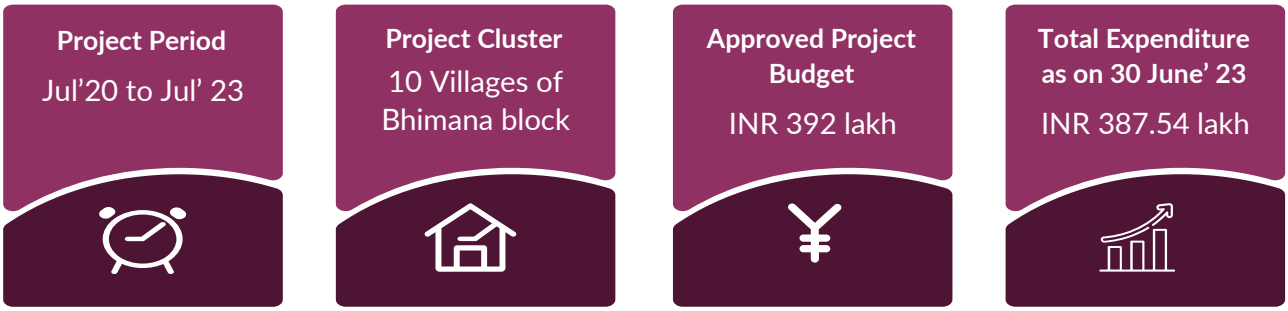
Since 2005, this organization has been actively operating in the challenging landscapes of the Bali block in Pali district, Rajasthan. Their notable achievement includes establishing the Ghummar Mahila Samiti, a federation of women's Self-Help Groups (SHGs), which evolved into collective community-based enterprises. This women-led enterprise, now registered as the Ghummar Mahila Producer Company Ltd., emerged from the initiative.

The project area is predominantly inhabited by the Grasiya and Bhil communities, representing 33% of the population and belonging to Scheduled Tribes (STs). Unfortunately, these communities lag behind in agricultural production and industrial development. The geographical characteristics of the area, being hilly and undulating, result in high run-off and erosion, leading to the depletion of topsoil, thereby affecting crop productivity and income.

Labor is the primary source of income for the community, with almost one person from each household migrating for labor work. Apart from labor and agriculture, the community also generates income through the collection of Non-Timber Forest Produce (NTFP). The available NTFPs include Honey, Custard Apple, Blue Berry, Aonla, Cassia tora, Ber, Anwal leaves, Van Tulsi, among others, offering significant opportunities for processing and manufacturing. This could serve as a supplemental income for households, particularly by employing women in these activities.

In the context described, SRIJAN, as part of HDFC's flagship initiative Parivartan, proposed a project aimed at "Enhancing the Prosperity of the Tribal Community through Comprehensive Development of Agriculture, Value Chains, and Improved Market Access." This project was focused on a cluster of 10 villages in Bali, encompassing a total of 5,477 households.

The project was executed with the objective of enhancing prosperity within tribal families by boosting their income through various interventions. These included improvements in water management and agricultural practices, as well as enhancing the value chain associated with Non-Timber Forest Products (NTFPs). Additionally, the project aimed to address environmental concerns and ensure the sustainability of its initiatives.



Info 1 Key Project Features

1.1 Objectives and Interventions

The specific objectives of the project were:

i. Contribute to the income by strengthening value chain enterprise of Farmers Producer Company Ltd., by diversifying value chain activities around NTFP and expanding their membership.
ii. To improve farm income by demonstration of sustainable agriculture practices and technologies and enhancing knowledge of better crop management through training.
iii. To improve farm income by bringing additional area under irrigation restoring old irrigation structures such as Check Dams, Sarans etc.
iv. To enhance awareness of community about better health and nutrition specially mine workers, children, and pregnant women.

Objectives	**Sector**	**Interventions**
Contribute to the income of by strengthening value chain enterprise of Farmers Producer Company Ltd., by diversifying value chain activities around NTFP and expanding their membership	Skill & Livelihoods- Developing Women Led Enterprise and Entrepreneurship on NTFP Value Chain	A. Expanding membership of Ghummar Mahila Producer Co. Ltd. B. Expand manufacturing of Custard Apple Pulp. C. Diversify NTFP Value Chain by including value addition activities in Ber and Palash Products.
To improve farm income by demonstration of sustainable agriculture practices and technologies and enhancing knowledge of better crop management through trainings and adoption of Tech. Adoption for efficient and cost-efficient irrigation	Skills and Livelihoods by demonstrating Climate Resilient Agriculture practice and adaptation acumen using technology	A. Demonstration of Natural Farming Practices to reduce cost of production and improve B. Demonstration of multi-layer vegetable farming C. Demonstration and execution of sprinkler irrigation system D. Demonstration and execution of solar irrigation system.
To improve farm income by bringing additional area under irrigation restoring old irrigation structures such as Check Dams, Sarans etc., and dug wells	Natural Resource Management enhancing livelihoods	A. Repair and renovation of existing old water harvesting structures
To enhance awareness of community about better health and nutrition specially mine workers, children and pregnant women.	Healthcare & Hygiene	B. Organize animal health camp C. Organize human health camp D. Solar water operated drinking water overhead tanks.

Chapter 2 Approach and Methodology

Given the project was implemented in the cluster of 10 villages for economic and overall empowerment, it was essential that the beneficiaries from all the villages are covered, ensuring adequate representation and capturing variances appropriately on the observed data sets. The sampling plan covered all interventions exclusively and selecting the sample considering a mixed method. Sample size was calculated using probability proportional to size for the activities pertaining to agriculture demonstration, sprinkler irrigation. The demonstration sample were covered from both the kharif and rabi beneficiaries. For community-based intervention such as repair/ renovation of Water Harvesting Structures, Group based Solar Irrigation Pumps and Drinking Water convenient sample approach was adopted. A case study method was used to obtain information of NTFP value chain intervention. The Table below presents the sampling methodology adopted for the assessment study.

Table 1: Total Intervention and sample covered for assessment study

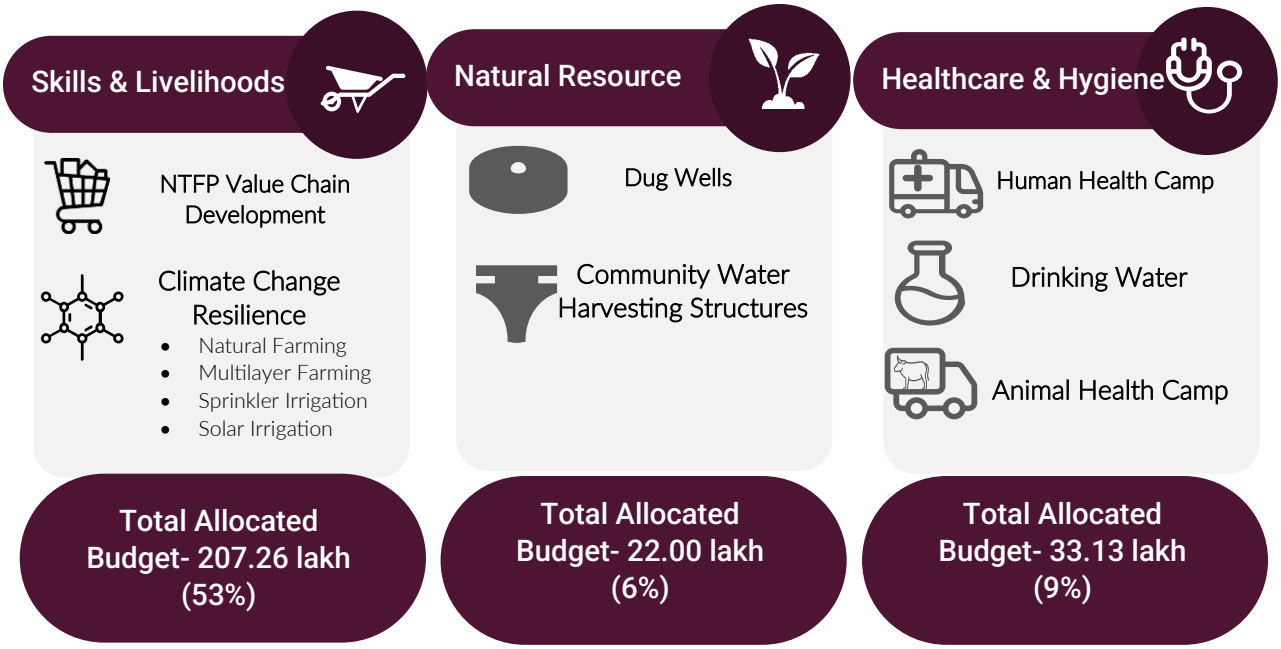
Intervention	**Total**	**Sample**	**Percent**	**Remark**
Agriculture Demonstration				
Kharif	2139	184	10%	At 95% CL, 5%MoE, and 50% PP, estimated sample size is 348 Sample covered from all 10 project villages
Rabi	1500	179		
Sprinkler	80	30	38%	10 project villages
Multilayer farming	60	30	50%	10 project villages
Water Harvesting Structure				
Dug Wells	10	05	50%	05 dug wells were selected randomly out of 10 dug wells from 05 villages
Check Dam/ Stop Dam	05	02	40%	02 check dams were selected randomly out of 05 check dams in 01 project village.
Group based Solar Irrigation	05	04	80%	04 solar based irrigation were selected out of 05 solar irrigation from 04 project villages
Drinking Water Overhead tank	08	02	25%	02 drinking water tank was selected randomly from 08 installed systems
Health Camps	21 & 16	NA	NA	Discussion and opinions were sought from project participants.

As the beneficiaries' numbers varied depending on the nature of intervention it was critical to obtain information through randomly selected beneficiaries to avoid any bias in the obtained observations. Therefore, for each of the interventions, random selection was followed to collect the data. The data were collected using structured questionnaires tabulated in excel and analysed to prepare an analytical report.

Chapter 3 Program Outline and Effectiveness in Implementation

The initiative, named "Adivasi Samridhi Pariyojana- Pali," was specifically designed to enhance the livelihoods and income of households within the 10-cluster villages of Bali block in Rajasthan's Pali district. Supported by HDFC Bank Limited's CSR initiative, Parivartan, this comprehensive rural development program aimed to target household livelihoods and income through strategic interventions in three primary sectors., (i) Skills and Livelihoods, (ii) Natural Resource Management (NRM) and (iii) Healthcare and Hygiene. A major component of Skills and Livelihoods consisted of developing NTFP Value Chain with the Social Enterprise, a women led Ghummar Producer Company Limited and two, Demonstration of Climate Resilient Practices in Agriculture, consisting of Natural Farming Practice, demonstration of Multilayer Vegetable Farming, demonstration of Mini- Sprinkler (water saving technology) and Solar Irrigation technology (an alternative to conventional irrigation technologies using diesel/ electricity as power source).

Self-Reliant Initiatives derives its strength from its proficiency in establishing community-based assets on natural resources and is motivated by the commitment to ensure sustainability through community accountability and responsible usage. Under the NRM component, the organization implemented interventions on the repair and renovation of aging water harvesting structures and dug wells. These interventions were strategically carried out to augment water availability to bolster agriculture. The other major component was Health and Hygiene to support health care activities for human and livestock through health camps. Drinking water over tanks were constructed to reduce the physical strain on women making water accessibility easier and more convenient for daily requirements.



Info 2 Major Components of the Project

It is to be noted here that the budgeted amount of Rs. 2.36 lakh for baseline, planning and review meeting was additional to the allocated budget in skills & livelihoods, natural resource management and health care and hygiene. The allocated budget for project management (including dedicated human resources, admin and overall project supervision and coordination) was Rs. 123.65 lakh.

3.1 Financial Progress- Allocation Vs. Expenditure

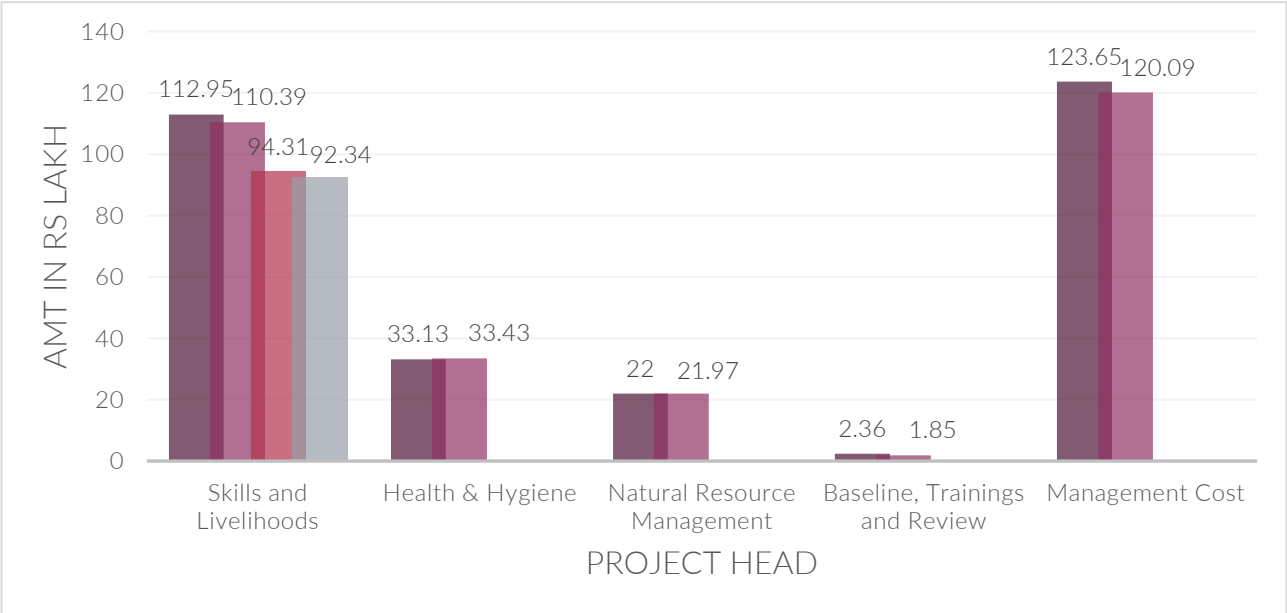


Figure 1 Sector wise budget allocation and Expenditure

Skills and Livelihoods: Under the Skills and Livelihoods component, the total budget allocated was Rs. 207.26 lakh with allocation of Rs. 112.95 lakh for NTFP Value Chain Development and Rs. 94.31 lakh for Climate Change Resilience. The allocations were made to create asset for enterprise strengthening to support value chain development through product diversification from sole Custard apple processing to Ber processing and Palash based leaf plate development and colour extraction. The budget also consisted of training and capacity building of women entrepreneurs on quality control, enterprise management and operations to enhance their competitiveness. Out of the total allocated budget of Rs. 112.95 lakh, expenditure on NTFP Value Chain Development was reported to be Rs. 110.39 lakh, thus attaining 98% expenditure of the budgeted amount.

Under Climate Change Resilience, a provision of Rs. 94.31 lakh was made on activities to demonstrate climate resilience practices viz., Natural Farming Practice, Sprinkler Irrigation, Multilayer Farming techniques, Solar Irrigation Pumps, and provisioning for solar based lighting system at common public places and at the household level. Out of the total allocation Rs. 94.31 lakh to demonstrate Climate Resilience Practices, Rs. 92.34 lakh were spent, achieving 98% of the total allocated budget.

Health and Hygiene: Healthcare & Hygiene was another imported component under HRDP Flagship programme of HDFC. The activities categorized were creation of asset for drinking water facilities (solar based drinking water overhead tanks), construction of soak pits as preventive measures and attain environmental hygiene. Human and Animal Health Camps were also facilitated for better preventive health and recommend curative measures towards better health management. Total allocated budget was Rs. 33.13 lakh, out of which Rs. 33.42 lakh was spent, achieving more than 100% of the allocated budget.

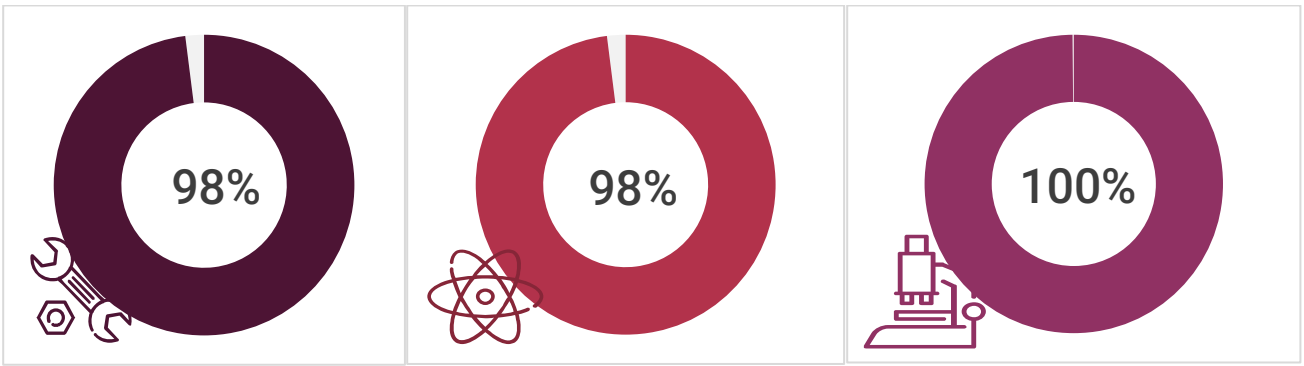
Natural Resource Management: Repair and renovation of dug wells and community-based water harvesting structures (Check Dams/ Stop Dams) were proposed under the Natural Resource Management (NRM). The activity was planned with objective to enhance water availability and support agriculture production by enhancing

irrigated area/ enhancing production by additional irrigation support. Out of the total allocation of Rs. 22.00 lakh, Rs. 21.97 lakh was spent, attaining 100% of the expenditure.

Baseline, Training and Review: The total budget allocated for creation of baseline, and strengthen projects institutional framework through review and training was Rs. 2.36 lakh. An amount of Rs. 1.85 lakh was reported to be spent under the component which is 78% of the total allocation under the head.

Management Cost: The management cost for the project the project, including Human Resource, Project Management and Administration was Rs. 123.65 lakh. The total spending in the head was reported to be Rs. 120.09 lakh which was 98% of the allocation.

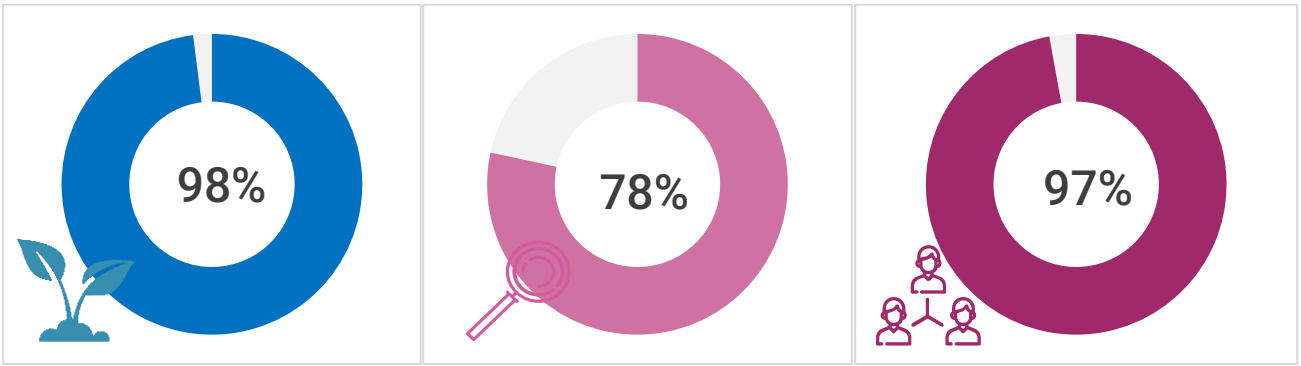
Thus, the overall expenditure reported under the project was found to an extent of Rs. 380.08 lakh of the total allocations of Rs. 388.40 crore, achieving 98% expenditure of the allocated budget.



NTFP Value Chain
Total Allocation
Rs 112.95 lakh
Total Expenditure
Rs. 110.39 lakh

Climate Change Resilience
Total Allocation
Rs. 94.31 lakh
Total Expenditure
Rs. 92.34 lakh

Health & Hygiene
Total Allocation
Rs. 33.13 lakh
Total Expenditure
Rs. 33.42 lakh



Natural Resource Management
Total Allocation
Rs 22.00 lakh
Total Expenditure
Rs. 21.97 lakh

Baseline, Training & Review
Total Allocation
Rs 2.36 lakh
Total Expenditure
Rs. 1.85 lakh

Project Management & Admin
Total Allocation
Rs 123.64 lakh
Total Expenditure
Rs. 120.09 lakh

3.2 Physical Progress- Targets Vs. Achievement

Table 2 Extent of activity implementation

Designed Interventions	**Planned**	**Achievements**				
		Yr1 (2020-21)	**Yr2 (2021-22)**	**Yr3 (2022-23)**	**Total**	**% Ach.**
NTFP Value Chain						
Custard Apple Processing (No of Women members)	-	389	717	955	2061	
Palash/ Ber Processing (No of women members)	-	112	41	505	658	
Climate Change Resilience						
Natural Farming Practice (No of Farm HH)	2200	440	1224	1446	3110	141%
Multilayer Farming (No of Farm HH)	60	15	20	25	60	100%
Sprinkler Irrigation (No of Farm HH)	80	20	30	30	80	100%
Solar Irrigation (No of Standalone system)	5	-	5	-	5	100%
Solar Street Lights	93	-	-	93	93	100%
Solar Lantern	145	-	-	145	145	100%
Natural Resource Management						
Dug Wells- R&R (No of dug wells)	10	-	10	-	10	100%
Water Harvesting Structure-R&R (No of WHS)	6	-	6	-	6	100%
Healthcare and Hygiene						
Drinking Water Overhead Tank (No of OHT)	8		8		8	100%
Animal Health Camp (No of Camps)	20	0	11	10	21	105%
Human Health Camp (No of Camps)	20	7	9	0	16	80%

The intervention was categorized under four broad heads viz., (i) NTFP Value Chain, (ii) Climate Change Resilience, (iii) Natural Resource Management and (iv) Healthcare and Hygiene.

NTFP Value Chain: The NTFP Value Chain includes intervention in creation of effective supply chain, attain efficiency, and quality control during processing custard apple for pulp extraction and packaging. The intervention also meant to increase shareholders of the enterprise and provide them job work through diversification of NTFP Value Chain. Activities of Ber Value Addition and Palash Leaf Plate manufacturing and organic colour manufacturing. Total women shareholders numbered 2061 who were involved in job work for pulp extraction, 645 women were involved in job work of Palash Leaf Plate manufacturing and colour manufacturing using flower from Palash trees. 118 women shareholders were also engaged in job works for manufacturing Ber Products (such as sticks and toffees).

Climate Change Resilience: Goal 13 of Sustainable Development Goals (SDG) calls for urgent action to combat climate change and its impact, an intrinsically linked indicator to all the other 16 SDG of 2030 for Sustainable Development. With the intent of positively impacting the environment, SRIJAN designed climate change mitigation/ adaptation activities through Natural Farming Practices, Crop Diversification using Multilayer Farming, Sprinkler Irrigation and Solar Irrigation system

Natural Farming: The climate change resilience models were demonstrated using concepts of Natural Farming Practice with potential benefits of producing safe food, improving soil quality (improving soil organic matter

content). The demonstration includes setting demonstration plots of One bigha each with targeted 2200 farm fields covering total of 3705 bigha (1465 Acre). Against the targets, the SRIJAN conducted the NF demonstration with 3705 farm fields covering 3705 bigha (1465 Acre). Organic inputs such as compost, bio inputs are available from market such as ZSB, Liquid consortia and Rhizobium culture. Demonstration plots were set for Kharif and Rabi Crops. 2139 bigha (846 Acre) of Kharif demonstrations, 1500 demonstration in Rabi (593 acre) of Rabi demonstration and 66 demonstration of Zaid crop (26 acre) were developed and demonstrated to community for encouraging to adopt NF production practices.

Multilayer Cash Crop Farming: Improved technique for crop diversification having potential to generate enhanced income through multi- layer farming practices of vegetable crops were demonstrated with 60 farm households. The demonstration includes small patch of land (111 sq meter of plot size)). The concept of multilayer farming includes growing tuber crop, mid height crop and creepers to harness full potential from small plot of land, maximizing income potential and reduce risk from crop failure.

Sprinkler Irrigation: Sprinkler irrigation systems are designed not only to improve water productivity but crop production. 80 sets of mini sprinkler systems were inducted with the community to save water, improving yield of crop thus gaining from the high level of crop production.

Solar Irrigation: Solar irrigation systems with groups of farmers were installed to mitigate climate change effect using alternate energy source to diesel/ electric that consume fossil fuel to produce power emitting greenhouse gases (CO_2/ SO_2 etc.). A total of five(05) standalone systems were installed in group-based model benefitting 59 farm families (12.5 Acre).

Natural Resource Management: Water is a very critical resource as the block being categorized under Dark Zone. There are more than 219 blocks of Rajasthan which are categorized as over exploited and need immediate attention to harness and conserve rainwater and ground water. The stages of ground water development of Pali district are 125%.

Deepening of Dug Wells: 10 dug wells were depended on to harness ground water and use it for productive agriculture production purposes.

Water Harvesting Structure: 06 stop dams/ check dams were also restored and repaired to store rainwater to its full designed capacity, conserve soil and use water for irrigation of crops.

Healthcare and Hygiene: Healthcare and Hygiene was another area under HRDP initiatives of HDFC CSR. Drinking water overhead tanks. 08 units of overhead tanks were constructed under the project with solar based pumping set. 21 animal health camps and 16 human health camps were organized with support from the veterinary department and health department.

It is evident from Table 1 that the activities were achieved to their fullest extent of 100% or more of the planned numbers, except in Human Health Camp, which was under achieved by almost 20% with respect to the planned number. It can be inferred that the interventions were implemented as per the planned targets, managed effectively to achieve the financial and physical goals.

Chapter 4: Outcome and Impact from the Interventions

4.1 NTFP Value Chain

To assess the results achieved from the implemented interventions with regard to outcomes and impact, each activity was evaluated on different parameters that would reflect in intended benefits from the project. The NTFP Value Chain Development was evaluated on different outcome indicators such as, increase in shareholders, quantity processed as value added products for 03 different NTFPs, revenue generated from the operations, profits realized, earning per equity share, employment generated, and income realized from the wages to the workers of the Ghummar Mahila Producer Co. Ltd (GMPCL). The data were obtained from the financial statements of the firm (Ghummar Mahila Producer Co. Ltd.) and records of operations of GMPCL. Table 3 presents the results data on different parameters of GMPCL over the period of operation.

Table 3 Outcomes of GMPCL on various short term and intermediate indicators

Particular	**FY 2019-20**	**FY 2020-21**	**FY 2021-22**	**FY 2022-23**
Total Shareholder by Financial Year	981	981	991	1,805
Total Share Capital	575,000.00	575,000.00	575,000.00	745,000.00
Value Chain Products (Volume)				
Pulp Extraction from Custard Apple (Tonnes)	2.63	7.87	19.01	47.62
Palash Leaf Plate manufacturing (Number)	-	-	-	-
Palash - Natural Gulala (Kg.)	-	28	500	200
Ber- Value Added Products (Tonnes)	-	4.7	-	4.74
Dehydrated Palash Flowers (Tonnes)	-	6.06	6.23	28.73
GMPCL- Income and Profit				
Revenue Generated from the operation	529,348.00	764,563.00	2,824,879.00	7,212,108.00[1]
Other Income	233,496.00	1,189,207.00	1,615,583.00	
Total Income		1,953,770.00	4,440,462.00	7,212,108.00
Net of Profit from the operation	(617,475.00)	(287,124.00)	1,409,080.00	1,800,000.00[2]
Earnings per equity Share (Rs.)	(61.75)	(5.64)	24.51	

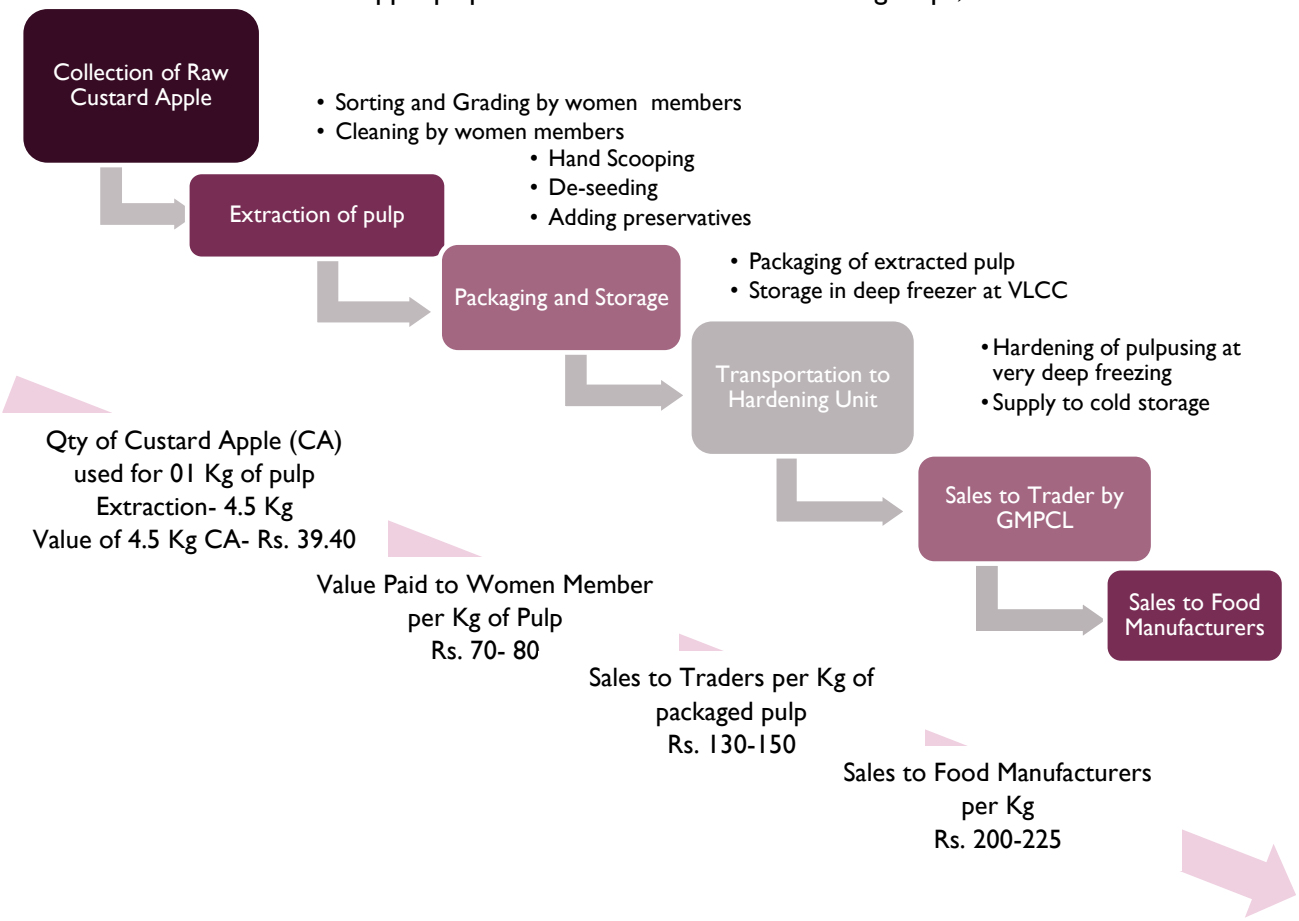
Shareholding Vs. Equity Contribution: The membership in GMPCL as shareholders almost doubled to 1805 members by 2022-23 from the previous years, as a result the equity contribution also increases from Rs. 5.75 lakh to Rs. 7.45 lakh recording 30% increase. The financial contribution as equity helped meet the working capital requirement for business operations of GMPCL, besides the project contribution. This is also an indicator of entrepreneurial success and members' trust for creating a successful social enterprise.

Value Chain Development: GMPCL product basket was diversified to maximize the asset use of GMPCL by engaging production round the year starting Aug to May (10 months of year) as against the 06-month operations (Sept- Feb). Results were achieved by diversifying the manufacturing of NTFP products by GMPLC from single custard apple to palash based leaf plate manufacturing, manufacturing of natural color using palash flower and dehydrated flowers. Ber products were also started as additional production through GMPCL. A small quantity of palash based leaf plates were manufactured during the year 2022-23 as training and capacity building activities. The GMPCL started the production of leaf plates from the current year i.e., 2023-24 and 6690 plates were reportedly manufactured and sold, though we are not considering the details of current FY for the purpose of analysis.

[1] Provisional data from GMPCL data records, audit due to happen.
[2] Estimated figure based on provisional data of GMPCL.

4.1.1 Custard Apple Value Chain

The Value Chain: The custard apple pulp value chain includes the following steps,



The whole custard apple value chain is an intricate process involving collection of raw material (custard apple fruit) from the forest, which is done by women folk of the village. On collection of raw fruit, the fruits are sorted and graded by women based on the maximization of pulp per fruit. Once the fruits are sorted and graded, it is cleaned for further process of pulp extraction. The pulp is scooped using a tool kit and collected on the plate where de-seeding is done, separated, and added preservative and packed in plastic bags after weighing. The packaged pulp is then stored in solar powered deep freezers at Village Level Collection Centers. The frozen pulp is then sent to the hardening unit which is a central processing unit and then stored in cold storage. From the cold storage, the pulp is sold to traders based on their order who further supply the pulp to food manufacturers.

The value addition happens once the pulp is extracted. For conversion ratio of fruit to pulp is 4.5:1 i.e., 4.5 kg of custard apple is required to extract one kg of pulp. The custard apple when in open market at average prices of Rs. 7-7.5 per kilogram. The value realized for 4.5 kg of pulp is Rs. 39.40. The GMPCL then procure the custard apple from women at rate of Rs. 70 per kilogram. The GMPCL further sells the packaged custard apple to traders having linkages with food manufacturers based on the orders. Bulk sales are preferred by GMPCL to reduce the cost. The traders finally sell the CA to food manufacturers in different states.

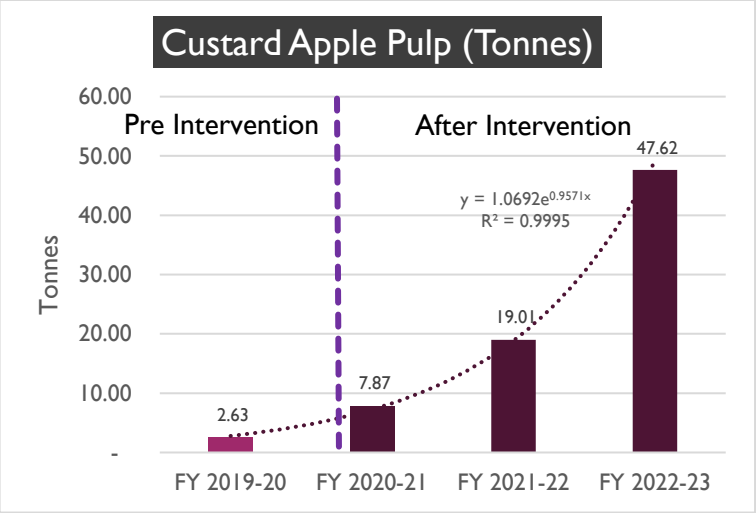


Figure 2 Custard apple pulp production- before and after intervention

The custard apple pulp production grew almost exponentially (Figure 1) at an average annual growth rate of 163 %. The quantity processed in 2019-20 was 2.63 tonnes which almost tripled by 2020-21 and 18 times by the year 2022-23 recording total production of 47.62 tonnes. The growth drivers prominently were the strategic change in production by delegation to women on their own after collection of fruit and buying pulp directly. Earlier, GMPCL use to buy the raw material (custard apple) from women at a higher price than the market rates and used to pay extra wages for extraction. This increased the marginal production cost for the GMPCL. The marginal production cost at centralized processing was Rs. 125/- per kg. With the change in strategy of decentralized production of pulp, the GMPCL managed to reduce the marginal cost of production to Rs. 100/- per kg which 20% reduction in production cost. GMPCL, other than selling custard apples, sold seeds and residue through traders. The quality parameters were also enhanced by ensuring quality checks and training. The VLCC was equipped with freezers to store the pulp using solar based system, which also reduced the energy cost and risk of power failure and ensuring proper storage thus achieving efficiency in overall supply chain. The pulp was then transferred to hardening units and finally to cold storage for storage and supply to vendors.

4.1.2 Palash Value Chain

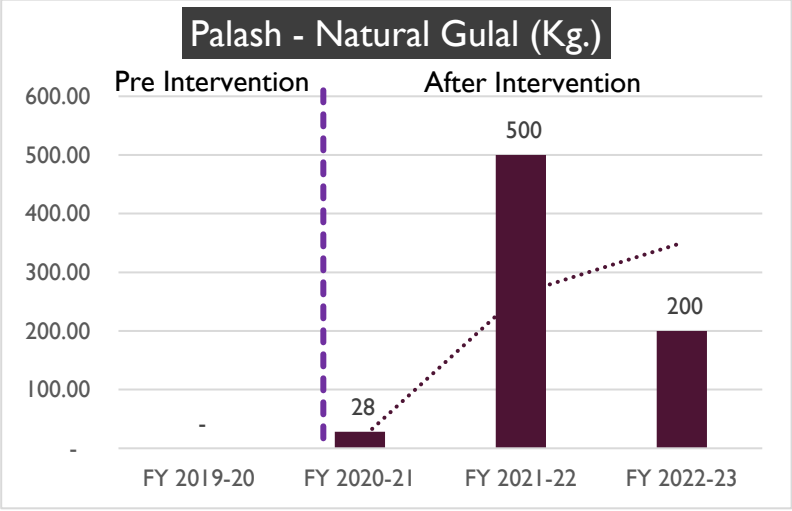


Figure 3 Production of natural gulal from Palash flowers by GMPCL

GMPCL started production of Natural Gulal from palash flower. The production was initiated as a small training activity in the year 2020-21, the inception year of the project. In year 2 (2021-22), GMPCL produced 500 kilograms of natural Gulal and 200 kgs in year 2022-23. These products have niche markets and prime customers. The product has been sold at a good price of Rs. 200/- per kilogram. This is a good start for the enterprise to test and market conditions and accordingly adjust itself based on the demand from the market in future.

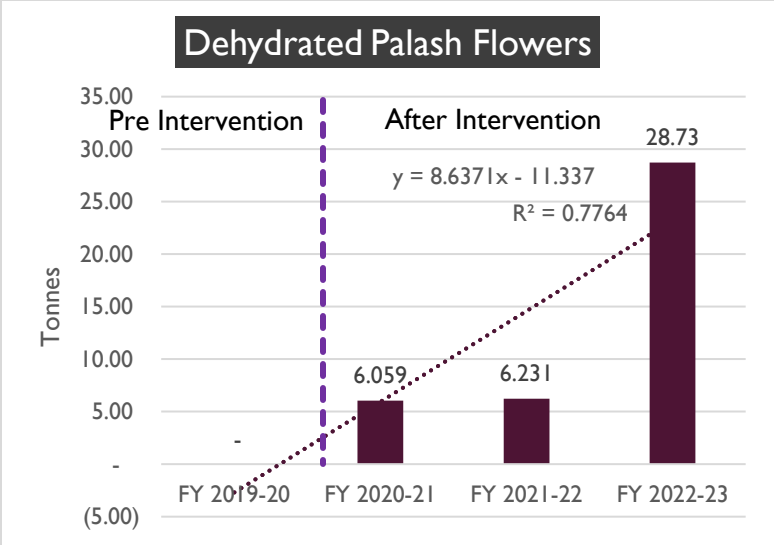


Figure 4 Production of dehydrated palash flower by GMPCL

GMPCL also diversified its product basket by dehydration of palash flowers collected from the forest and commons. The members have been trained in collection, drying and processing of palash flowers. A total of 6 tonnes dehydrated flowers were produced in the year 2020-21, 6.3 tonnes in 2021-22 and 28.73 tonnes produced in year 2020-23. The process of dehydration was done using solar dryers which were installed from the project.

The dehydrated flower production by GMPCL recorded growth of more than 4.5 times in 2022-23 from the previous years, showcasing the potential and demand from the market.

4.1.3 Ber Value Chain

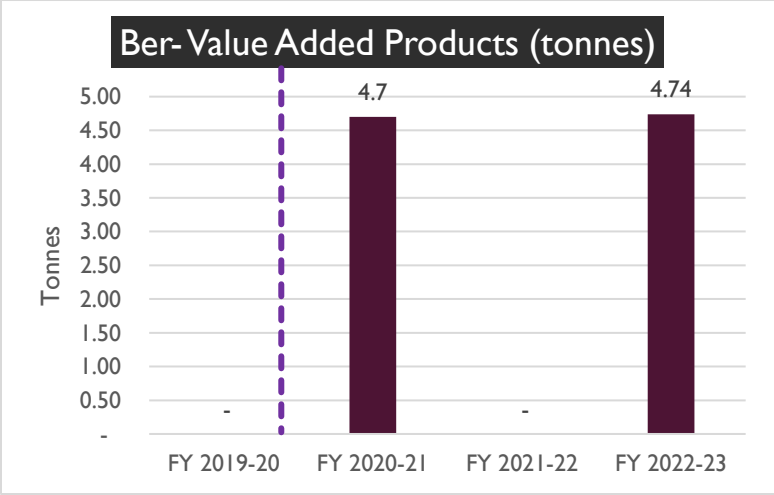


Figure 5 Processing of Ber by GMPCL for VAP

Ber is another commonly available seasonal fruit that remained unharnessed without much value. The unrealized potential of Ber through value addition was realized by making value added products. The production and value addition continues for 03 months between Dec and Feb. The value addition of Ber is done by collection of Ber fruits from the forest and commons. The ber is dehydrated and ber sticks are produced which is favorite among children. The ber sticks are packaged in boxes of 80 pieces. The cost of production per box worked out to be Rs. 20/- and sales were reportedly made at the rate of Rs. 30 per box. GMPCL at present is targeting local, rural and peri urban markets, doing direct sales to retailers as well as through wholesales.

A total of 4.7 tonnes of ber was processed in the years 2020-21 and 2022-23. Production did not happen through 2021-22 due to bad season.

4.1.4 Revenue and Profits of GMPCL

The financial health of the GMPCL has shown a significant improvement from 2020-21 and onwards. The revenue and profitability grew significantly during 2021-22 and 2022-23[3] period. The company was not only able to generate revenue from operations but significantly reduce the losses from the operations, made profits during two consecutive financial years 2021-22 and 2022-23 respectively. Total income grew at an average of 115% through 2029-20 and 2022-23 and net profits recorded an increase of 27% in the year 2022-23 from 2021-22. GMPCL

[3] The provisional figures from the records of GMPCL were used to analyse the date for the FY 2022-23 period, as the financial audits were found to be due.

from the profits have also purchased the land to improve their collateral base and assets portfolio. The earnings per share were negatively valued at Rs. (61.75) and Rs. (5.64) during the year 2019-20 and 2020-21 improved positively to Rs. 24.51. The overall financial health of the GMPCL has seen a profound improvement during the project period due to the investment made through the project in improving the business operations of the GMPCL. The diversification of NTFP based value addition and value chain of products have resulted in round the year production improving cash flow of the GMPCL realizing good revenue. The cost reduction strategy in custard apple processing and diversification of the production with enough margins to sustain business operations have led to improve the profitability of the GMPCL.

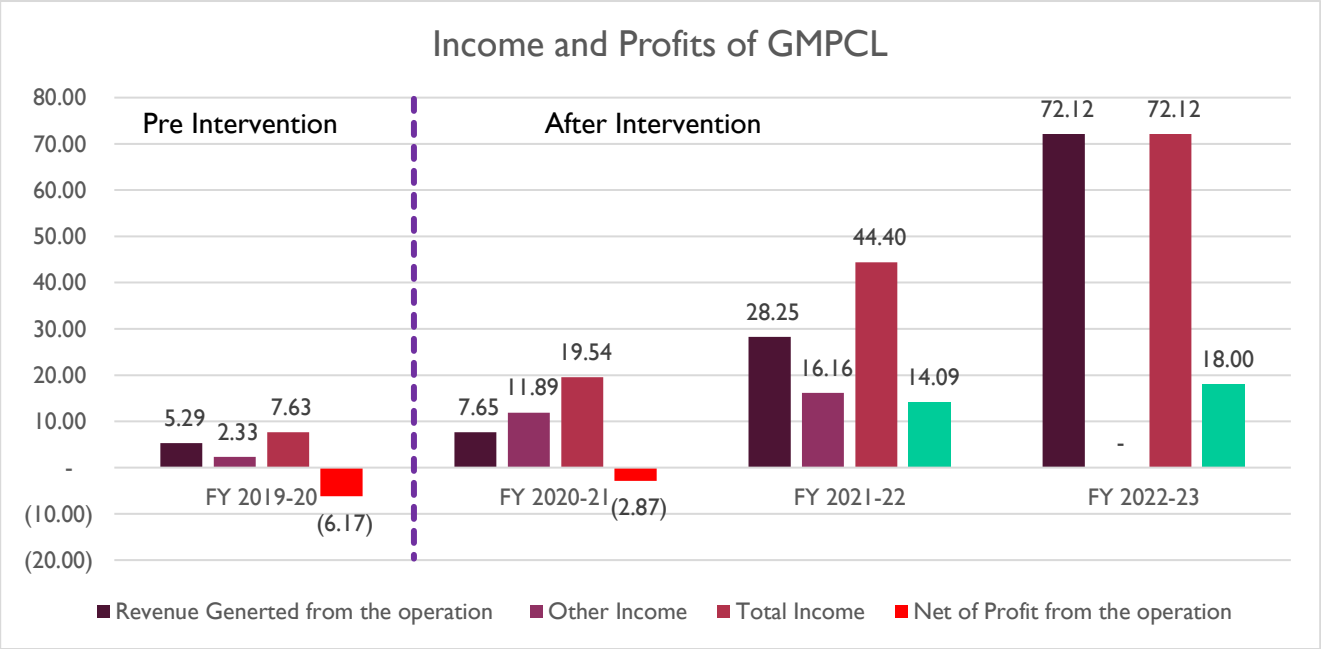


Figure 6 Income and Profitability of GMPCL

The caution that GMPCL must take to sustain its future operations is create enough reserve and surplus to meet any unforeseen expenditures and sustain future operation such as working capital requirements, repair and maintenance, equipment, and technology upgradation etc.

4.1.5 Impact on the Households Income of Women due to NTFP Value Chain

The NTFP Value Chain Intervention has resulted in impacting the household income broadly by two ways, one, providing employment to women employed by GMPCL and creating job work opportunity of women members, thus creating season job works. The job work includes collection of NTFPs, cleaning, segregation, and manufacturing as the main job functions.

During the discussion with the women folks of GMPCL, it was found that in an hour a woman can extract 1.33 kilograms of pulp. A woman effectively works 4.5 hours a day. Therefore, to estimate the number of person days of employment, 4.5 hrs./ day is considered as against 8 hrs. a day. To compare the impact on wage, the wage per day of MGNREGA wage was taken as benchmark.

The impact resulted in terms of effective number of person days of job work created only from custard apple value chain and income realized because of wages received from extraction of pulp is provided in table 4 below.

Table 4 Impact of NTFP Enterprise development on Job Work and Wage

Project Year	**2020-21**	**2021-22**	**2022-23**
Women in Pulp Extraction (No)	387	717	955
Effective Days of Job Work (No)	3.14	4.43	9.24
Total Job Work (Person days)	1215.18	3176.31	8824.2
Total pulp Extracted (Kgs)	7279	19010	52834
Amount paid to women for pulp (Rs.)	518,897	1330,712	41,31,291
Wage realized for Job Work (Rs)	427.01	418.95	468.18

Total 2059 women were given the job work of pulp extraction from custard apple during the year project life cycle of the HRDP of HDFC. The enterprise set created the effective job work of 13259 person days during the project period. Total value transferred to women members of GMPCL only for pulp extraction amounted to Rs. 59.81 lakh. The effective wage works out to be minimum Rs. 419 and maximum Rs. 468. The wage realized per day (4.5 hrs. of operation a day) was twice the wage of MGNREGA (Rs. 221) given for unskilled work,

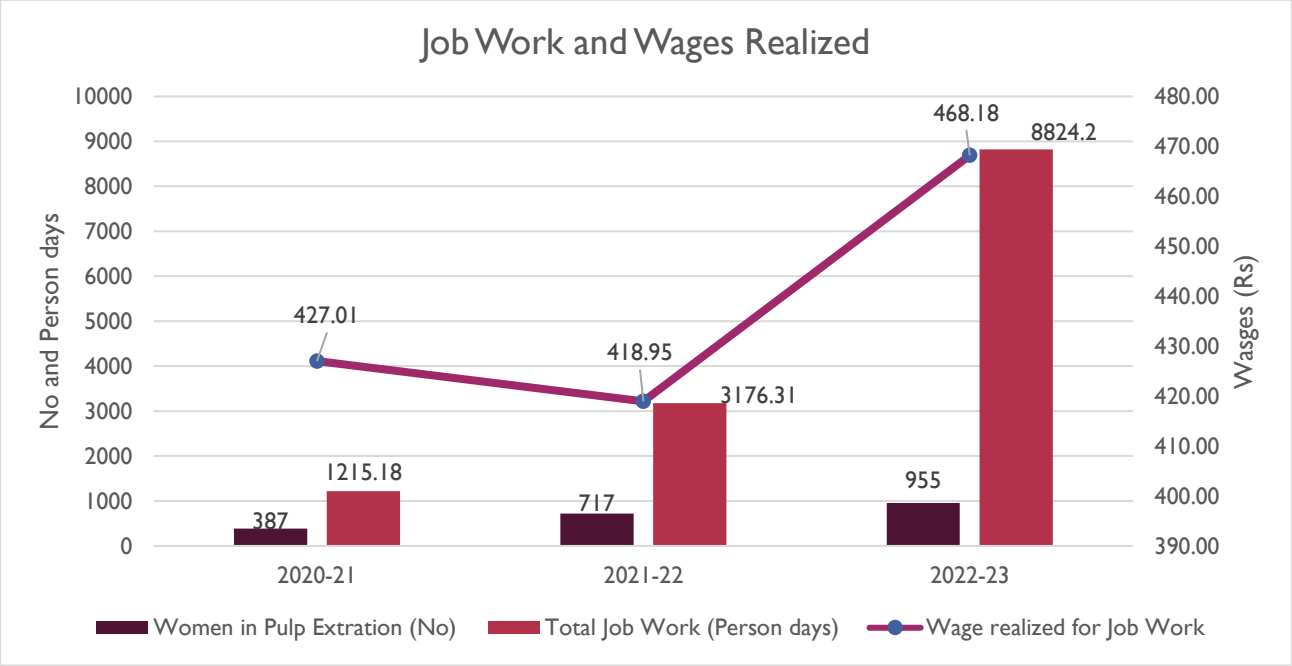


Figure 7 No of women given job work and wage realized from CA processing.

Thus, the average income realized per women member only from pulp extraction Rs. 1340 for the year, that subsequently increased to Rs. 1856 in year 2 of the project and Rs. 4326 in year three of the project life cycle, 03 times increase per women member from year 01 of the project life cycle.

In addition to job work, the GMPCL also gave employment to women folks for performing function of quality control, packaging and maintaining records of business operations of GMPCL. The amount transferred as management cost of GMPCL for managing business operations such as procurement, quality monitoring, marketing etc., is given in Table 5.

Table 5 Employment generated by GMPCL for managing Business Operation

Year	2020-21	2021-22	2022-23
Operation and Management Cost (Rs)	399,202	457,317	1,125,440
Persons Employed (No)	8	16	20
Average income realized annually (Rs)	49,900	28,528	56,272

As the business of GMPCL grew, the number of employees (full time/ temporary) also grew during the project period. In 2020-21 the staff employed by GMPCL were 8 and in the year 2022-23, the number of staff grew to 20. On average the income realized by the staff for managing the business operation of GMPCL was Rs. 49,900/- during the year 2020-21, Rs. 28,528/- in 2021-22 and Rs. 56,272 in the year 2022-23.

4.2 Natural Farming Demonstration for Upscaling Adoption

4.2.1 Results from Demonstration in Kharif Cropping 2022-23

Profile of Sample Demonstration Farmers

Total 182 women farmers were interviewed who participated in Kharif Demonstration. All the farmers belonged to the Scheduled Castes category with an average age of 39 years. The farmers on average own approximately 3.10 Bigha of agriculture land, out of which 3.04 bigha was cultivated and 2.38 bigha on average was reportedly irrigated which was about 77% of the total agriculture land owned.

Table 6 Profile of farmers participated in NF Demonstration in Kharif Cropping Season

Panchayat	N	Age	Average Agri-land*	Total cultivable	Irrigated Land
Bhimana	36	38.11	2.92	2.92	2.28
Koyalvav	18	43.00	2.72	2.56	2.28
Nadiya	53	37.62	3.16	3.13	2.22
Thandiberi	38	38.50	3.37	3.24	2.89
Upla Bhimana	37	41.97	3.08	3.08	2.24
Grand Total	**182**	**39.30**	3.10	3.04	2.38

SRIJAN planned an agriculture demonstration of Natural Farming with 2200 farmers covering 2200 bigha. The demonstrations were carried out with 2441 unique families with 3705 demonstrations covering 3705 bigha (1465) of cultivable area. The demonstrations were carried out for grain crops of Kharif, Rabi and Zaid season. In total 3705 demonstrations were done for Kharif (2139) and Rabi (1500) crops and balance was done for Zaid season. As the number of demonstrations for Zaid crop was very small and confined to demonstration of compost and azolla, sampling for impact assessment was done for Kharif and Rabi Seasons only. Samples were drawn equally using PPS method for analysis. A Total of 182 samples were drawn randomly from Kharif demonstration participants and 179 samples were randomly drawn from Rabi demonstration participants. The demonstration plot established the use of Ghanjeevamrit and organic inputs available in the market. The assumptions made were that the natural inputs instead of synthetic inputs will reduce the cost of production while not affecting the yield significantly. This will help improve the soil organic matter content and acquaint farmers using natural inputs to mitigate climate change risk by diversifying the cropping pattern. Analysis was done to check if the demonstration was able to showcase any reduction in the cost of production due to the reduction in input cost as against the baseline scenario.

It was found that the demonstration was able to reduce the input cost by 16% from the baseline scenario, assuming other costs of production (labour, irrigation, etc.,) remain same.

Table 7 Input cost in NF demonstration and baseline scenario of Kharif Cropping Season

Cultivation Cost	**Demonstration**			**Baseline**		
Crop	**Qty Used (Kg)**	**Rate**	**Amount**	**Qty Used (Kg)**	**Rate**	**Amount**
Maize (kg)	4	70	280.00	6.71	97.34	653.1514
Urad (Kg)	1	150	150.00			
Chavala (Kg)	0.25	548	137.00			
Total Seed Cost			**567.00**			**653.15**
Inputs Used						
GhanJeevamrit (Kg)	178.88	0.48	85.86			
Jivamrit (lts)	98.07	1.47	144.16			
Urea				37.12	7.83	290.6496
Total Input Cost			**230.03**			**290.65**
Total cost of inputs			**797.03**			**943.80**

From Table 6, it can well infer that due to change in practices of production using Natural Farming, the quantity of seed used for production was reduced by almost 21% and total reduction in seed cost was by 13%. The major input used for maize production was urea as fertilizer while in demonstration, the inputs were largely home prepared using natural inputs. The total cost of urea per bigha of maize cultivation in baseline scenario was Rs. 290.65 and input worth Rs. 230 was used demonstration, with total reduction of 21%. The cost of inputs used in production of maize in baseline scenario was Rs. 943.80 per bigha, which reduced by Rs. 16%.

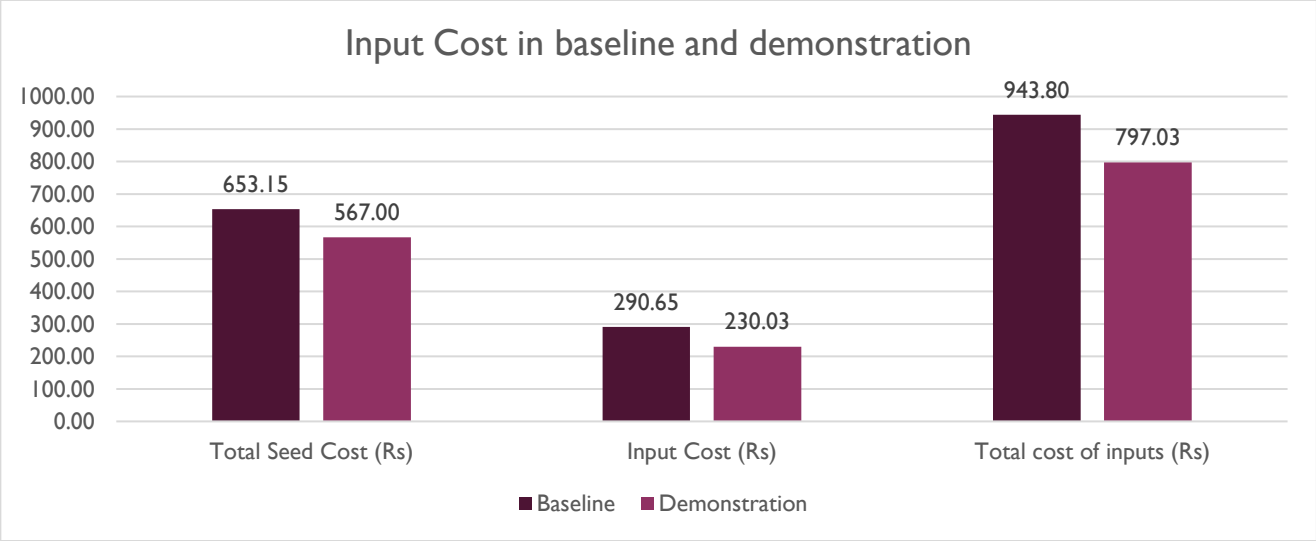


Figure 8 Cost of Inputs used in baseline and demonstration (Kharif Cropping)

4.2.2 Value of Production in Kharif Demonstration

Table 8 Production and Value of Production from NF demonstration vs. baseline of Kharif Cropping Season

	Demonstration				Baseline			
Crops	Area[4]	Production[5]	Yield	Total Value of Production[6]	Area	Production	Yield	Total Value of Production
Maize	182	47671	262	740460	182	50510	278	676256.5
Urad		150	150	12750				
Chavala		55	220	3300				
Total	**182**	**47876**	**263**	**756510**	**182**	**50510**	**278**	**676256.5**
Value/ bigha				**4156**				**3715**

One of the risks of any innovation is reluctance to adopt a new innovation in the absence of any credible data supporting the benefits. It was presumed that the natural farming practice would not offset the value of production significantly but realize the at least the same benefits as in baseline scenario. The estimation of value of production realized per bigha of production in baseline scenario and demonstration and compared. It was found that the total value of production of maize in baseline scenario from same area was about Rs. 6.76 lakh, which is enhanced to Rs. 7.56 lakh from demonstration (12% more), despite the reduction of overall land productivity. The enhanced value realization is on account of diversification of crops that resulted in enhanced value. The diversification resulted in reducing risk of crop failure, the crops used for diversification was legume that help replenish soil nitrogen content, while also reducing the need of nitrogen-based fertilizer.

4.2.3 Results from Demonstration in Rabi Cropping 2022-23

Profile of Sample Demonstration Farmers

Total 179 women farmers were interviewed who practiced the Rabi Demonstration in a Bigha of land. All the farmers belonged to the Scheduled Tribes category with an average age of 39 years. The farmers on average own approximately 3.38 Bigha of agriculture land, out of which 3.25 bigha on is cultivable and 2.65 bigha on average was reportedly irrigated which is about 81% of the total agriculture land owned.

Table 9 Profile of Farmers participated in NF Demonstration of Rabi Cropping Season

Panchayat	**N**	**Age**	**Average Agri-land***	**Total cultivable**	**Irrigated Land**
Bhimana	38	37.65	3.05	3.05	2.42
Koyalvav	18	44.22	3.22	3.11	2.61
Nadiya	52	39.86	3.38	3.33	2.57
Thandiberi	37	34.48	3.86	3.38	2.81
Upla Bhimana	34	39.23	3.32	3.29	2.85
Grand Total	**179**	**38.60**	**3.38**	**3.25**	**2.65**

**Unit of land is in Bigha*

[4] Area in Bigha. A bigha is unit of measurement of land locally, which in contest of Pali is 1600 sq meter in area. An acre is approximately 2.52 bigha and Ha. is 6.25 bigha.
[5] Production is in Kilogram
[6] Value of production is in Rupees.

4.2.4 Cultivation Cost

Estimation of cultivation cost of demonstration along and Baseline was done based on the survey results of 179 project participants. Inputs as seed, fertilizer and naturally prepared inoculation, organic fertilizers were considered while other inputs such as labour, irrigation were assumed to be same in both the cases. The demonstrations were performed by diversifying the single crop with red gram and mustard in small quantity. The estimated cost of naturally prepared inoculation (Ghanjeevamrit) and Jeevamrit were taken for the demonstration plot of 01 bigha.

It was found that the overall input cost in demonstration of Rabi increased by 2.3 times the cost of cultivating wheat; The increased cost was attributed due to increased quantity of wheat crop (33%), addition seed of red gram and mustard and other cost of organic inputs used by replacing the synthetic fertilizer. The fertilizer cost increase was 3.5 times the cost used in growing crop without the organic fertilizers/ inoculations. Such increased inputs cost must either be compensated by enhanced production or value of crop or combination of both compared to growing single, wheat crop.

Table 10 Cost comparison of inputs in Rabi crop demonstration from baseline

Cultivation Cost	**Demonstration**			**Baseline**		
Crop	Qty Used (Kg)	Rate	Amount	Qty Used (Kg)	Rate	Amount
Wheat (Kg)	20.00	35.11	702.20	30	37.5	1125.00
Gram (Kg)	1.5	120	180.00			
Mustard (Kg)	0.1	350	35.00			
Total Seed Cost			**917.20**			**1125.00**
Inputs Used						
Compost (Kg)	126.94	0.51	64.73			
ZSB (lt)	0.25	240	60			
Liquid Consortia	0.25	240	60			
Rhizobium	0.25	240	60			
GhanJeevamrit (Kg)	177.98	2.5	444.95			
Jivamrit	103.47	1.46	151.07			
Urea				41.56	7.66	318.3496
Input Cost			**840.76**			**318.35**
Total cost of inputs			**1757.96**			**1443.35**

From Table 10 and Figure 9 below, the overall cost of input shows an increment of 22% from the baseline scenario. The fertilizer/ concoction cost was found to be increased by almost 164%, while seed cost record and reduced by 18% from the baseline. This increase cost must be compensated either by increased production or value realized or combination of both. The analysis was performed to check the change in overall production and value of production in two different scenarios.

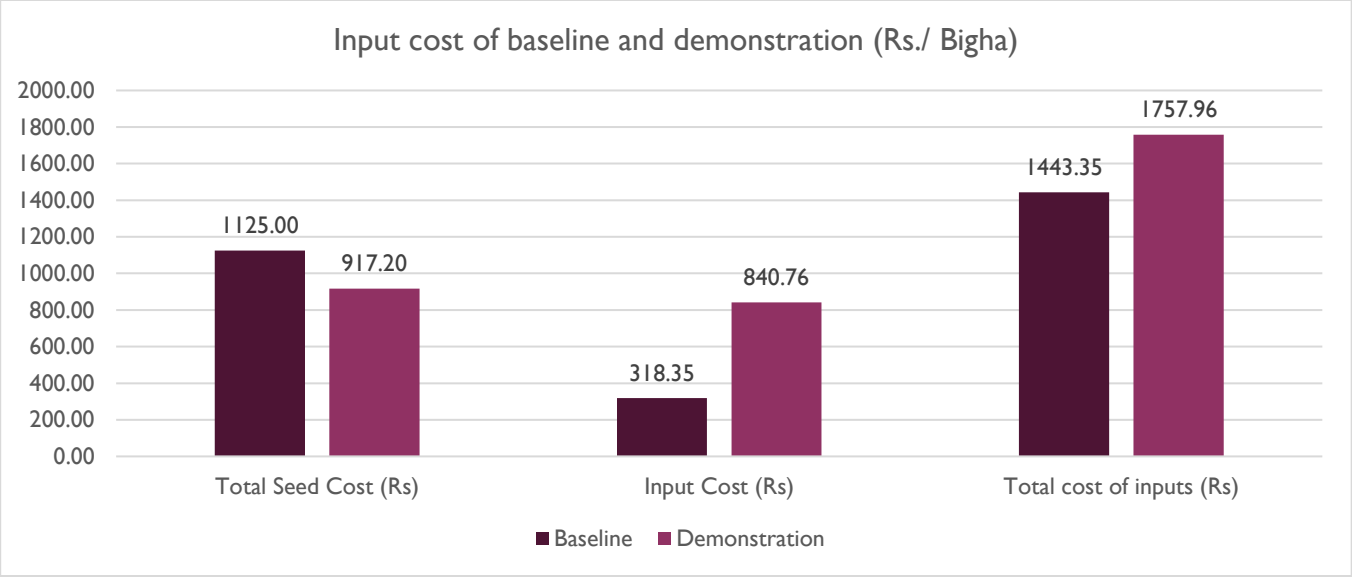


Figure 9 Comparison of input cost of Rabi Crop demonstration with baseline

4.2.5 Value of Production in Demonstration

Table 11 Production and value of production demonstration vs. baseline for Rabi Crop

	Demonstration				**Baseline**			
Crops	Area	Production	Yield	Total Value of Production	Area	Production Yield	Yield	Total Value of Production
Wheat (Kg)	179	71343	399.60	1756050	179	56495	315.61	882345
Gram (Kg)		5		450				
Mustard (Kg)		3		225				
Total	179	71351	398.60	1756725	179	56495	315.61	882345
Value/ Bigha (Rs)				9814				4929

The production of wheat in the demonstration was found to be increased from the baseline scenario 26%, which is observed to be significantly different from the baseline. In addition, the introduction of two additional crops in the same piece of land as a crop diversification strategy has also added to realization of value per bigha. The price difference of wheat between the two different scenarios was found to be 59%, a significant factor contributing to the overall enhanced value of production realised per bigha of demonstration besides the enhanced yield. The overall value addition of about two times can offset the cost of production of demonstration which was increased by more than two times in demonstration.

The survey results demonstrate that NF Practices had resulted in positive realization, differently for Kharif and Rabi Crop. In Kharif, while it has resulted in lowering the cost and added value per unit of land from crop diversification, the gain in Rabi Crop per unit of land area was quite significant as it doubled from the baseline scenario. The marginal value realized increased by Rs. 441 from the Kharif demonstration plots of Kharif crop, the value realized from rabi crop demonstration from a bigha of land increased by Rs. 4885 almost doubling as compared to the total value realized from the non-demonstration plot (baseline). Despite, rise in marginal production cost, the value realized offset the additional production cost in Rabi and make additional profits.

certainly, analysis could be made for overall cost and benefits of natural farming factoring the cost of labor for the manufacturing of inputs and other such factors which has not been considered in the present study, which is certainly a limitation due to short time of the study.

4.3 Sprinkler Irrigation

A total of 80 mini sprinkler sets were planned in the project to be implemented that could cover 300 bigha of land for with objectives to save water, improve water productivity, address issue of ground water sustainability and crop productivity. The effectiveness of sprinkler irrigation is gauged during the rabi cropping season that is irrigation dependent. A sample of 39 irrigation beneficiaries were interviewed on outcomes and results indicators to assess the overall impact of the sprinkler irrigation of the project. Area coverage under sprinkler Irrigation

Table 12 Area brought under sprinkler Irrigation.

Total Project Participants of Sprinkler Irrigation	**Average Area Irrigated (Rabi Cropping) in Bigha**	**Total Area covered under Sprinkler (in Bigha)**
80	3.03	242.05 Bigha

The area brought under sprinkler irrigation from the brought amounts to 242.05 bigha in 10 project villages.

4.3.1 Impacts from Sprinkler Irrigation

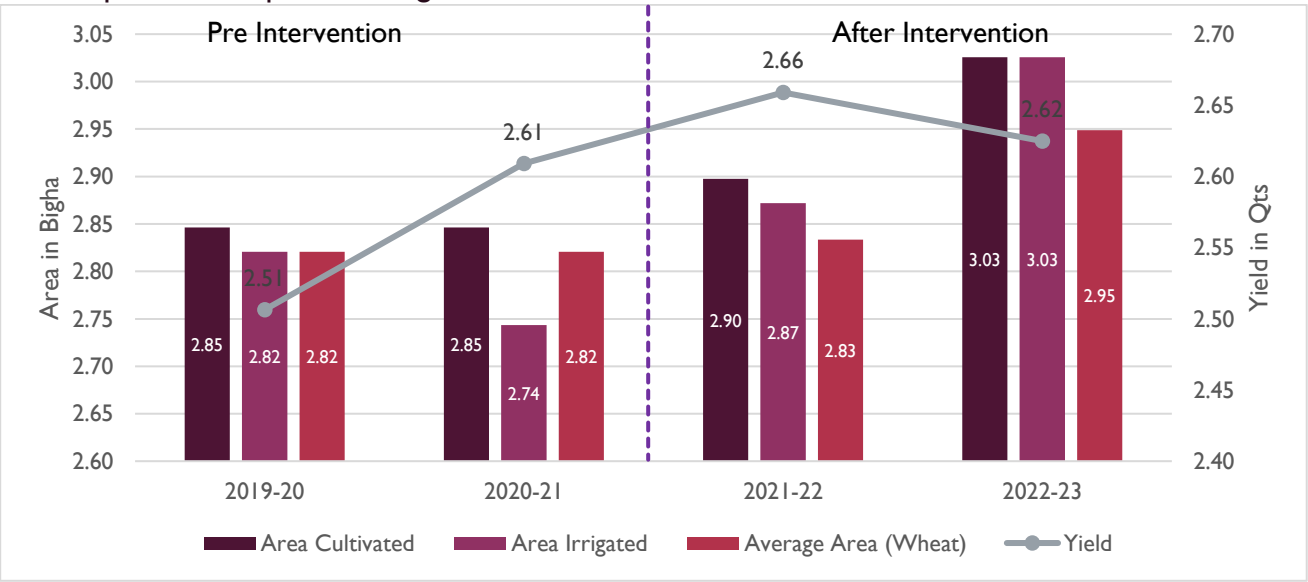


Figure 10 Impacts resulting from sprinklers irrigation.

The total cultivated area shows an increment of 7% bringing additional area under rabi cropping. The area irrigated has also shown an increment to 7% that resulted in bringing more area under wheat crop as well as increasing the yield. The area under wheat has gone up 5% and the average yield increase witnessed is 5%. The overall scenario is that the sprinkler irrigation has positively impacted the irrigation intensity by saving water that increased the numbers of irrigation subsequently impacting the yield of wheat crop and saved water has brought additional area under irrigation.

The sprinkler irrigation has also brought about good results in environmental sustainability by saving ground water, thus ameliorating ground water sustainability, reduction in diesel consumption though very marginal and saving labour, which resulted in total incremental value from the intervention, compared to convention irrigation i.e., flood irrigation. Table 13 below illustrates the social benefits realized per bigha of sprinkler irrigation.

Table 13 Estimated benefits from sprinkler compared to conventional flood irrigation for Rabi crop.

Particulars	**Flood Irrigation**	**Sprinkler Irrigation**	**Reference/ Illustration/ Methodology of estimation**
Depth of irrigation for wheat crop (m)	0.42	0.1452	Water requirement for wheat cultivation from flood irrigation is estimated at 0.42 m and 0.145 m under sprinkler by various scientific research[7].
Area in sq m in a bigha	1600	1600	
Total volume of water used in irrigation of wheat crop (cubic meter)	672	232.32	Dept of irrigation x total area (in sq m)
Water saving per bigha (cubic meter)		439.68	Water required in flood – water required in sprinkler irrigation is the volume of water saved.
Estimated total water saving from sprinkler intervention (cubic meter)		106578.43	Total estimated irrigated land by sprinkler irrigation is 242.4 bigha by 80 farmers.

Compared to the flood irrigation, the total estimated volume of water saved from sprinkler intervention is 1.06 lakh cubic meter. For monetizing the benefits of water saving water rates charged in Rajasthan for wheat crop was considered. As the range of water charges varies from Rs. 29.64 per ha to Rs. 607.42 per ha., highest water rate of Rs. 607.42 per ha was considered[8]. The irrigation charge was estimated per cubic meter of water which comes to Rs. 0.1446 and multiplied by the total cubic meter of water saved per bigha. The total cost saving per bigha on water was estimated at Rs. 184/-.

4.3.2 Net Gain Realized from Sprinkler

The net gain realized from sprinkler irrigation was calculated by considering direct and indirect benefits i.e., yield enhancement, saving in diesel cost, value of CO2 equivalent (average of USD 60 was considered), labour saved in irrigation and value of water charges. It was found that that a net gain of Rs. 759 per bigha could be realized from the sprinkler irrigation. Extrapolating the benefits to all the irrigated area of 242.4 bigha brought under sprinkler irrigation, the benefits amount to Rs. 184224 only from the Rabi cropping.

Table 14 Net gain from the sprinkler irrigation compared to flood irrigation for Rabi Wheat crop.

Particular	**Flood Irrigation**	**Sprinkler**
Yield of wheat per bigha (quintals)	2.51	2.62
Total value of wheat crop at MSP of Rs. 2350 for yr. 2022-23 (Rs.) ***(A)***	5898.5	6157
Diesel Saving (liters)		0.6
Cost saving from diesel @ Rs. 91.33 per liter (Rs) ***(B)***	Nil	54.80
CO_2 equivalent (Tons/ bigha). A liter of diesel produces 2.68 kg of CO_2		0.0016
Value of Carbon Credit @ USD 60 converted to INR @ Rs. 80/- ***(C)***	Nil	7.68
Labour required for irrigation	2	0.84
Saving in labour wage @ Rs. 221 per labour ***(D)***	Nil	254.15
Water Cost per Bigha ***(E)***	Nil	184.82
Total Net Value per Bigha	5898.5	6658.45
Net Gain (per bigha)		**759.95**

[7] Sprinkler Irrigation- An asset in water scarce and undulating areas, Research Gate

[8] Irrigation water pricing policies and water resource management, Water policy 23 (2021) 130-141. Dept. of Water Engineering and Management, Central University of Jharkhand, India

The sprinkler intervention has brought 242.42 bigha of land under sprinkler irrigation and saving 1.06 lakh cubic meter of water. The intervention also resulted in direct benefits of increasing yield though marginal, saving labor cost in irrigation, diesel cost of irrigation and indirect benefits such as CO2 credit and saving water equivalent.

4.4 Solar Irrigation

A total of 05 standalone Solar Irrigation System of 3.2 Kilo Watt (KWp) was installed from the project with a total investment of Rs. 1054650. The system was installed as a group-based activity where 13 cultivators benefited. The system was cross subsidized to an extent of 80% by taking 20% contribution (Rs. 210000) from the beneficiaries. Four standalone systems were evaluated for the results expected to be achieved on livelihoods and environmental indicators.

4.4.1 Impact from Solar Irrigation

The results obtained are placed figure 11 below.

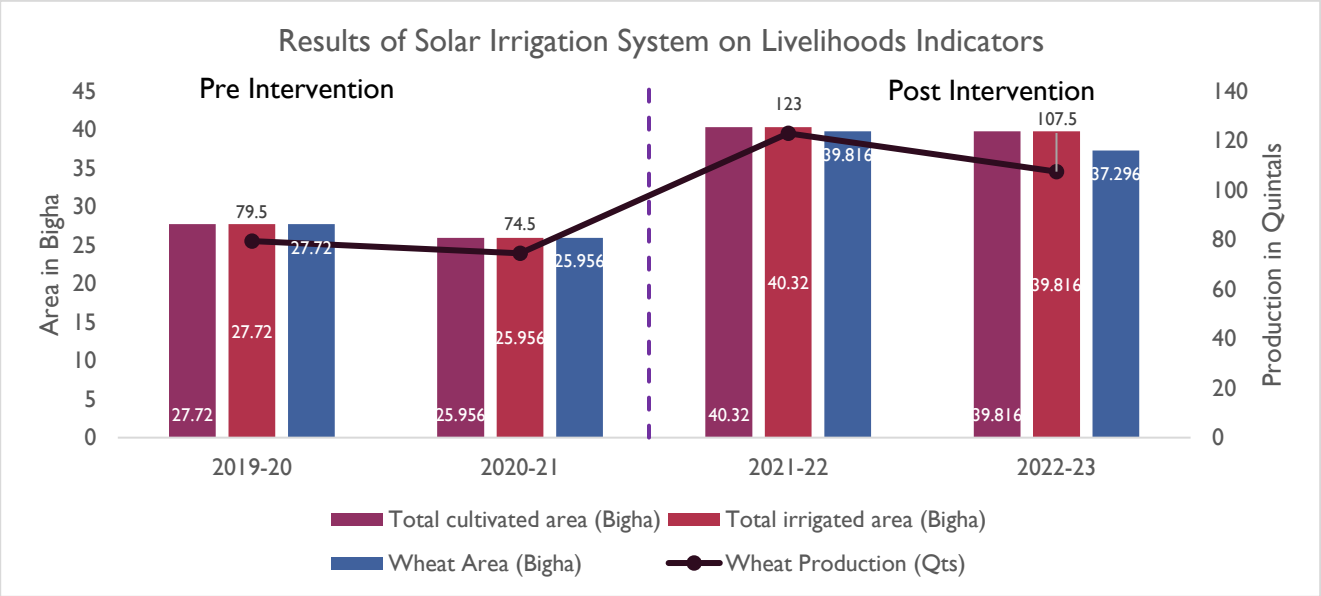


Figure 11Change in area of cultivation and production in Solar based Irrigation System

From figure 11, it was observed that the total cultivated area increased by 44% to 39.81 bigha in 2022-23 from 27.72 bigha in 2019-20. The percentage of total irrigated area to cultivable area also witnessed an increase by 30% thereby bringing additional 35% (9.5 bigha) under wheat production in Rabi Cropping. Total production of wheat increased from 79.5 quintals in 2019-20 to 107.5 quintals in 2022-23, an increase of 35%.

The installed system also brought environmental benefits with respect to environmental amelioration reducing the diesel consumption for irrigation and thereby reducing CO_2 emission to an extent of 64%. The diesel consumed for irrigating 27.72 bigha of land for 04 irrigation was estimated at 277.2 liters and estimated CO_2 emission of 743 kg of CO_2. The installation of Solar Irrigation reduced the diesel consumption to almost 1/4th of the previous requirements. The estimated diesel consumption for irrigation was about 99.54 liters and estimated CO_2 emission of 266.76 kgs. Figure 12 provides the glimpse of reduction of diesel consumption and CO_2 emission from installation of Solar based Irrigation System.

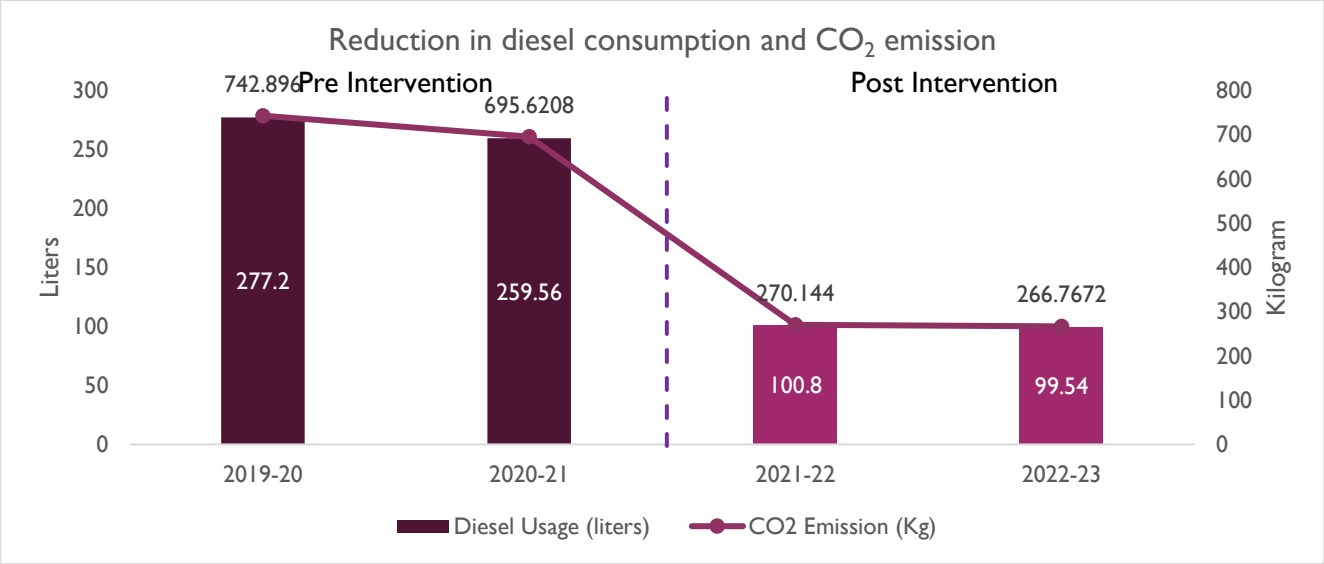


Figure 12 Reduction in diesel consumption and CO2 emission from Solar Irrigation

4.4.2 Net Gain Realized from Solar Irrigation

The net gain in terms of value realized from installation of solar irrigation exceeded by more than 136% from the baseline scenario (using diesel pump). The overall value was estimated basis cost saving from the diesel, CO2 equivalent of carbon credit and lessening the cost of cultivation net of inflation, which is assumed at 7%.

Table 15 Net benefits realized from Installation of Solar Irrigation Pump vs. Diesel Pump

Particulars	**2019-20**	**2022-23**
Value of Wheat Production (Rs)	147,075	292,426.5
Saving in diesel cost (Rs)		162,25.69
CO_2 equivalent (Value of Carbon Credit) in Rs.		38.0903
Total (Rs)	147,075	308,690.3
Less cost of cultivation (Rs)	32,500	38,200
Net Gain realized by using Solar Irrigation Pump	114,575	270,490.3

4.5 Multilayer Farming

Multilayer farming in a small area of 111 sq meters was demonstrated with 60 farmers over a three-year project period. The demonstration was meant to generate additional income from a small plot of land as also supplementing nutritional need for the household. The vegetable chosen was tuber crop (Ginger), with small shrubs such as Coriander and Spinach and creepers like bottle gourd and bitter gourd. A sample of 30 farmers who participated in the concept of multilayer farming were interviewed.

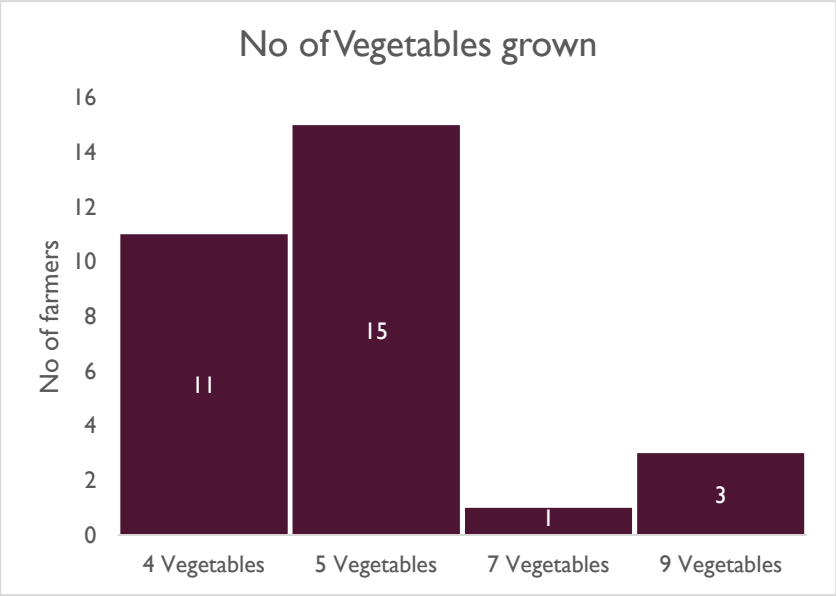


Figure 13 No of farmers vis a vis no of vegetables grown in multilayer farming model.

From figure 13, about 37% of the farmers had grown 4 vegetables and 50% had grown 5 vegetables. Only 03 or 10% of the farmers had taken 09 vegetables. The vegetables thus grown were repeated in different cropping seasons.

Out of the total vegetables grown about 20% are consumed while the remaining 80% were sold in the market. The intervention provided the source of income while meeting the nutritional requirements of the household from a small patch of area that largely remains unutilized.

From table 16, it could be seen that the vegetables grown were mixed in accordance with the cropping season and as per the layers required. The ginger crop that requires shade was the prominent rabi crop followed by crops like spinach and coriander, a little shrub grown during Zaid season and crops like bottle guard and bitter guard grown during Kharif cropping. The total production among the sample 30 farmers was 8.17 tonnes of vegetable from 3330 sq meter of cropped area. The total value realized from sales of vegetables was Rs. 2.60 lakh with an average additional income of Rs. 8671 for the sampled households. The income ranges from Rs. 8425 to Rs. 14728 as can be seen from table 16.

The model, besides demonstration of multilayer farming strategy to generate additional income and supplement nutrition was also a demonstration to cover risk arising from climate change by diversifying and mitigate risk from crop failure.

Table 16 Vegetables grown in multilayer farming model.

No of Veg Grown	**No of Farmers**	**Crop**	**Production (kg)**	**Consumption (Kg)**	**Sales (kg)**	**Avg Price (Rs)**	**Income (Rs)**	**Total Income**	**Average HH Income (Rs)**
04 Vegetables	11	Ginger	395	80	315	49	15435	92676.12	8425.10
		Coriander	198	17	181	49.44	8948.64		
		Spinach	115	10	105	27.5	2887.5		
		Bottle Gourd	1005	182	823	36.36	29924.28		
		Bitter Gourd	933	160	773	45.9	35480.7		
05 Vegetables	15	Ginger	612	60	532	49.5	26334	122611.58	8174.11
		Coriander	248	10	238	48.33	11502.54		
		Spinach	335	58	275	28	7700		
		Bottle Gourd	1436	332	1124	35.2	39564.8		
		Bitter Gourd	1107	256	828	44.33	36705.24		
		Tomato	28	7	23	35	805		
07 Vegetables	1	Ginger	72	10	62	40	2480	10550	10550.00
		Bitter Gourd	87	15	72	40	2880		
		Coriander	32	2	30	40	1200		
		Bottle Gourd	70	20	50	30	1500		
		Bitter Gourd	87	15	72	40	2880		
09 Vegetables	3	Ginger	250	0	250	40	10000	44184.38	14728.13
		Bottle Gourd	500	134	370	33.33	12332.1		
		Bitter Gourd	454	134	340	40	13600		
		Coriander	121	7	114	58.33	6649.62		
		Spinach	88	12	76	21.66	1646.16		
Total	**30**		**8173**	**1521**	**6653**	**39.1**	**260132.3**	**260132.3**	**8671.08**

4.6 Natural Resource Management

The intervention designed under Natural Resource Management theme was intended to augment water availability to support agriculture production and livelihoods of farmers by enhancing availability of ground water, recharging ground water through soil and water conservation activities. Two interventions were implemented, viz., dug well deepening to harvest ground water and repair and renovation of old stop dams/ check dams to conserve soil and water.

A total of 10 dug wells were deepened and renovated to harvest ground water for the agriculture production system. The deepening of dug wells was done by cross subsidizing the cost, taking contribution from the producers. The total investment for deepening and repair of 10 dug wells was Rs. 993660, and beneficiaries contributed 60% of the total cost.

4.6.1 Impact of Dug Well on Water Storage and Cultivation Area

Out of 10 dug wells, 05 dug wells were selected randomly and evaluated on selected indicators to observe the results expected from dug well intervention with respect to agriculture development and livelihoods. In the sample wells, the depth of the well increased from minimum 3.66 m to maximum 19.82 m with an average of 8.54 m. The width of the well also ranges between a minimum of 3.05 m to 4.57 m and an average of 3.78 m. As per the date provided by SRIJAN, the deepening resulted in creation of additional storage volume of 2362.29 cum with an average of 236.29 cum per dug well for all the dug wells. The enhanced volume has impacted agriculture by fostering water availability and increasing irrigation intensity that enhanced the yield production of cultivated crops. Figure 14 presents the impact of augmented water in agriculture production of crops particularly in Rabi cropping season.

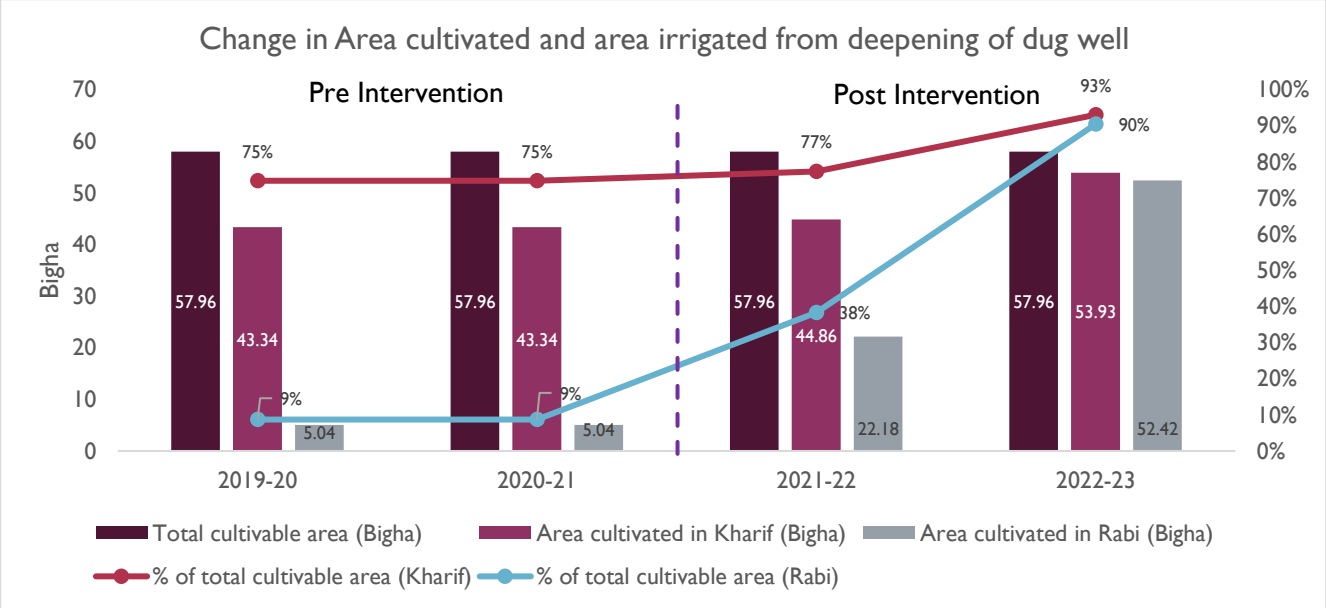


Figure 14 Change in area cultivated and area irrigated due to dug well deepening.

The total cultivated area of the sample farmers was 57.96 bigha. It was found that the total cultivated area in Kharif increased from 43.34 bigha to 53.93 bigha recording an increase by 18% to 93% of the total cultivable land. A significant increase was observed in Rabi cropping. The total cultivated land in Rabi before the deepening of well was only 9% (5.04 bigha) of the total cultivable area, which increased to 90% (52.42 bigha) of total cultivable area by 2022-23. The area increase in Kharif is attributed largely to assured irrigation in case of rainfall, while the rabi

cropping is large due to available water for irrigation that resulted in addition of cultivated area post intervention period.

The available irrigation also impacted the production of crops, particularly wheat in Rabi season and maize in Kharif season. Though other crops were also grown, however the area covered was not very significant compared to wheat and maize, largely due to food and nutrition requirements.

4.6.2 Impact on Production and Value Realization

Table 17 Impact on production and income of farmers households from Wheat Production

Particulars	**2019-20**	**2020-21**	**2021-22**	**2022-23**
Area (Bigha)	6.55	4.79	17.39	49.14
Total Production (Quintal)	26	16	73	189
Price (Rs. / Quintal)	1800	2000	2225	2240
Total Income Value from Production	46800	32000	162425	423360
Cost of Production (Per Bigha)	2777.78	3571.43	2162.70	2912.70
Total cost of production (Rs)	18200	17100	37605	143130
Net Return (Rs)	28600	14900	124820	280230
Return per Bigha	4365.08	3111.95	7178.51	5702.69
Average Net Return/ farmer	1059	552	4622	10379

From table 17 it could be established that due to increased area in production, the total production increased by more than 07 times the base year 2019-20. However, the yield remains the same over these periods. Thus, the total value of crops harvested increased from Rs. 46800 to Rs. 423360 which was more than 8 times net of inflation with reference to the base year. The return per bigha also increased from Rs. 4365 in the year 2019-20 to Rs. 5703 by the year 2022-23. The enhanced production provided household the edge to sell the surplus to market after meeting their food security, which is a significant change from the intervention.

Table 18 Impact on production and income of farmers households from Maize Production

Particulars	**2019-20**	**2020-21**	**2021-22**	**2022-23**
Area (Bigha)	41.33	35.78	37.30	43.85
Total Production (Quintal)	80	89	95	111
Price (Rs. / Quintal)	1580	1640	1780	2180
Total Income Value from Production	126400	145960	169100	241980
Cost of Production (Per Bigha)	1222.22	1222.22	1369.05	1353.17
Total cost of production (Rs)	50512	43736	51060	59334
Net Return (Rs)	75888	102224	118040	182646
Return per Bigha	1836.24	2856.70	3164.95	4165.44
Average Net Return/ farmer	2811	3786	4372	6765

Table 18 also shows the results achieved in Kharif cropping due to assured irrigation, through maize largely a rainfed crop also benefits if irrigation is provided. It could be seen from the table there is an increased cultivated area of maize production to 43.85 bigha and production from 80 quintals to 111 quintals from base year (2019-20) The yield more of less remains the same over three subsequent years i.e., from 2020-21 to 2022-23. Thus,

the total value of maize crop harvested increased from Rs. 126400 to Rs. 241980 which was 1.7 times net of inflation with reference to the base year (2019-20) value. The return per bigha also increased from Rs. 2856 in the year 2019-20to Rs. 4165 by the year 2022-23.

4.7 Community Water Harvesting Structures

Five Check dams/ Stop Dams were constructed in villages, Nadiya (01), Koyalvav (02), Thandiveri (02). Being a common property resource, strong community ownership was required to re-establish the structures and reap the benefits of water as a common pool resource. The ownership and strong desire to renovate the structures was established by ensure that community contribute monetarily and through labour towards meeting the material and labour cost for the repair. Total investment of Rs. 1892568 was made for repairing the water harvesting structures and farmers contributed Rs. 95250 (5%) in cash towards renovation cost. Total storage volume created by renovation was estimated at 18562 cum for 05 structures and about 65 bigha of agriculture land was benefited from irrigation.

4.7.1 Impact on Storage, Recharge, Area of Cultivation and Production

Two sample check dams were selected for evaluation of results from renovation of dams. Table 19 below presents the impact of check dam renovation on production and livelihoods of farmers. In the two check dams, the total cultivable area was 50.4 bigha shared by 26 farmers. No crops were taken prior to renovation work as there was no storage. After the repair of stop wall, the two check dams created a total storage capacity of 18238 cum meter, creating estimated recharge of 54714 cum and bringing all 50.4 bigha area under irrigation. On average 05 irrigations were done by the farmers due to the storage. Total production of wheat was 227 quintals with total output value of Rs. 5.74 lakh. A net return of Rs. 3.81 lakh was realized after deducting the cost of cultivation, which on average has added an income of Rs. 14673 per farmer.

Table 19 Impact on production and income of farmers households from Rabi Crop due to renovation of Sample Check Dam

Particulars	**2019-20**	**2020-21**	**2021-22**	**2022-23**
Total storage capacity (Cum)	0	0	0	18238
Estimated recharge due to storage (Cum)	0	0	0	54714
Area cultivable (Bigha)	50.4	50.4	50.4	50.4
Total group members (No)	26	26	26	26
Area cultivated by group members (Bigha)	0	0	0	50.4
Area irrigated (Bigha)	0	0	0	50.4
Irrigation (no)	0	0	0	10
Wheat Area (Bigha)	0	0	0	50.4
Total Production (Quintal)	0	0	0	227
Price (Rs. / Quintal)	1580	1640	1780	2400
Total Income Value from Production	0	0	0	574000
Cost of Production (Per Bigha)	0	0	0	3819.44
Total cost of production (Rs)	0	0	0	192500
Net Return (Rs)	0	0	0	381500
Return per Bigha	0	0	0	7569.44
Average Net Return/ farmer	0	0	0	14673.07

It can therefore be concluded that the renovation of dug well, and check dams have positively impacted the livelihoods of farmers by bringing additional area under production, augmenting much needed water resource for improving production of food grains, improving income possibility from surplus production and also meeting their food needs.

4.8 Health Care and Hygiene

An allocation of Rs. 33.13 lakh was made to strengthen the health sector of both human and animal by strengthening the drinking water infrastructure and addressing human and animal issues through health camps and advisories on preventive health care.

Table 20 Intervention in areas of health and hygiene

Activities	**Planned**	**Achieved**	**HH & Population benefitted**
Solar powered Drinking Water Overhead Tank (No)	8	8	171 & 855
Animal Health Camp (No of Camps)	20	21	5154
Human Health Camp (No of Camps)	20	16	1800

4.8.1 Solar Powered Drinking Water Overhead Tank

The drinking water overhead tanks were powered using solar based pumping system. The 08 systems were installed in the villages of Nadiya, Bothara, Upla Bhimana, Tani, Bhimana, Koyalvao, Chopa Ki Nal and Chingta Bhata. The necessity of manual withdrawal of water by women stopped due to installation of clean energy based solar powered pump. The water is stored in an overhead tank of 5000 liters installed 10-12 feet above the ground. Thus, the manual withdrawal and waiting time of women was saved, also the level of drudgery.

The system has improved the overall water service by improving accessibility, reliability and functionality of water service as deemed essential for sustainable development.

4.8.2 Animal Health Camps

A total of 21 animal health camps were organized during the project period. The camps were organized in collaboration with the Government Veterinary Department. Total 5154 animals were provided preventive health care service like deworming tablets and vaccination against the seasonal diseases, that prevented occurrences of diseases and improve overall health and productivity of animals.

4.8.3 Human Health Camps

A total of 16 human health camps were organized covering all the villages during the project period. The human health camps were also organized in collaboration with health department to raise awareness about the frequently occurring diseases and preventive measures that can enhance health outcomes, especially during high-risk period of rainy seasons and winter seasons. During the camps medical checkup services were also provided. In total 1800 persons directly benefited from the camps besides the awareness session.

Chapter 5 Conclusion

The project Aadivasi Samriddhi Pariyojana implemented under the aegis of HDFC's Parivartan Flagship Program was implemented in collaboration with Self Reliant Initiatives through Joint Action (SRIJAN) as an implementing partner. The project was developed and designed to holistically impact the people of 10 villages, as cluster, across multidimensional areas, covering Skills and Livelihoods, Natural Resource Management and Healthcare and Hygiene. The interventions chosen were multiple based on the scope and potential to attain the maximum impact from the investment made under the project. The intervention activities chosen was Strengthening NTFP Value Chain (Budget allocation of Rs. 112.9 lakh), Climate Change Resilience (Budget allocation of Rs. 94.31 lakh), Healthcare and Hygiene (Rs. 33.14 lakh) and Natural Resource Management (Rs. 22.00 lakh). From the findings the following conclusion can be drawn for the project.

Effectiveness of Implementation

i. The project was implemented with desired effectiveness evident from the physical and financial progress made during the project period from 2019-20 to 2022-23. Against the total approved budget of Rs. 388.40 lakh, the total expenditure made was Rs. 380.08 lakh, which was 98% of the approved budget.
ii. 98 to 100% of approved budget allocated across allocated different dimensions i.e., NTFP Value Chain Strengthening, Climate Change Resilience, Natural Resource Management, Health & Hygiene were spent.
iii. The physical achievements in terms of numbers achieved against the planned targets were also achieved 100%, except the human health camp, where a shortfall of 04 camps was recorded.

Outputs and Outcome

NTFP Value Chain

iv. The NTFP Value Chain was diversified from one product, custard apple processing to 03 more value added products (Palash Leaf Plate, Plash flower – dehydrated and colour extraction and Ber Value Added Product). A total of 47.62 tonnes of custard apple pulp, 200 kgs of natural color, 4.74 tonnes of Ber, and 28.73 tonnes of dehydrated palash flowers were manufactured/ processed in FY 2022-23. The GMPCL, the women led enterprise witnessed significant financial progressions due to the project support and managed to generate revenue exceeding Rs. 72 lakh and overcame losses generated during the previous years. The company showed robust results on various business indicators, i.e., generated net profits of Rs. 14.09 lakh and Rs. 18 lakhs during the last two subsequent years of the project. Earnings per equity improved from negative Rs. 61.75 to positive Rs. 24.51. The shareholders of the company also increased from 981 in the year 2019-20 to 1805 by the end of the project period.
v. The enterprising activity generated 8800 person days of job work in a year, thereby creating alternative employment opportunity particularly for Scheduled Tribe women of the project villages. The total amount paid to women as wage exceeded Rs. 41 lakh and the effective wage realized was Rs. 468 which is twice the amount of wage paid under MGNREGA. The enterprise also created employment opportunities for about 20 persons for managing operation of GMPCL.

Climate Change Resilience

vi. Against the targeted 2200 farmers for natural farming practice, total 3705 demonstrations were covered under natural farming techniques, bringing 3700 bigha (592 Ha) of land under NF production technique.

vii. The NF practices impacted the Kharif and Rabi production differently. In Kharif, the practice reduced the input cost from Rs. 943.80 per bigha to Rs. 797.03 per bigha. There was an over increase in value of production realized from NF technique by Rs. 440. The net gain per bigha from cost saving and enhanced production value worked out to be Rs. 585.

viii. In outcomes in Rabi crop was more significant. The per bigha value realized due production from NF production was estimated at Rs. 9814 against Rs. 4929 per bigha estimated from non-NF production, i.e., about 02 times the value realized in non-NF practices. The enhanced value is attributed to enhanced yield of wheat crop and the diversification activity demonstrated in the farm.

Sprinkler Irrigation

ix. Total 242.05 bigha (38 Ha.) of cultivated area was brought under the sprinkler irrigation. 1.06 lakh cum of water is estimated to be saved due adoption of sprinkler irrigation. Because of improvement in irrigation, on average 7% of additional area was brought under cultivation and on average 5% additional area was brought under wheat cultivation. The yield estimation also revealed an increase of 5% from the preadoption stage.

Solar Irrigation

x. 05 stand-alone solar powered irrigation system was installed benefiting 13 cultivators. Multiple benefits were found from the solar irrigation pumps. The total cultivated area increased by 44% and the percentage of irrigated areas to net cultivated area also increased by 30% during the Rabi cropping. Because of the improved irrigation, there was an overall improvement of 35% in wheat production. Besides, the solar irrigation pump also managed to cut the diesel usage for irrigation by more than 60% there by reducing CO2 emission from 0.74 tonnes to 0.26 tonnes. The net gain realized due solar irrigation exceeded 136% of the pre project period.

Multi-layer Farming

xi. Multilayer farming technique was demonstrated with 60 farmers over a small area of 111 sq. meter with objectives to increase income and supplement household nutritional requirement. A combination of crops consisting of ginger, coriander, Spinach, Bottle Gourd, and Bitter Gourd were chosen as layered farming a combination of crops at the same time. Total 8 tonne of vegetable was grown by sample 30 farmers. 20% of the total production was consumed at the household and the remaining 80% was sold with total value realization of Rs. 2.60 lakh. The income generated from sales ranges from Rs. 8425.10 to Rs. 14728 with an average income of Rs. 8671.04. Extrapolating the results with all the 60 farmers, total Rs. 6.39 lakh worth value of vegetable was grown, generating total income value of Rs. 540044.

Natural Resource Management

xii. Dug well deepening and renovation and check dam renovation was done as soil and water conservation activity with an objective to augment water and support agriculture-based livelihoods. Total 10 dug wells were deepened creating addition storage of 958 cum with an average of 95 cum per well. The enhanced volume impacted agriculture production by fostering water availability and enhanced irrigation intensity. The cultivated Kharif area increased by about 18% and cultivated rabi area increased significantly by 81% from 2019-20 period. The total wheat production increased from

26 quintal to 189 quintal resulting in an enhanced net return of Rs. 10379 by 2022-23 from 1059 in year 2019-20. The maize production increased from 80 quintals to 111 quintals and net return from maize per farmer increased to Rs. 6765 (2022-23) from Rs. 2811 (2019-20).

xiii. Five stop dams were repaired which resulted in surface water availability, ground water recharge and conserving soil from erosion. In two sample check dams, the total cultivable area was 50.4 bigha shared by 26 farmers. No crops were taken prior to renovation work. After the repair a total storage capacity of 18238 cum meter was created and estimated recharge of 54714 cum. 50.4 bigha area was brought under irrigation. Total production of wheat was 227 quintals with an output value of Rs. 5.74 lakh. A net return of Rs. 3.81 lakh was realized after deducting the cost of cultivation, which on average has added an income of Rs. 14673 per farmer.

Healthcare and Hygiene

xiv. Access to safe drinking water and health camps for both animals and humans were the main interventions. Total 08 solar powered overhead water tanks of 5000 liter each were constructed in 08 project villages. The system has improved the overall water service by improving accessibility, reliability and functionality of water service as deemed essential for sustainable development.

xv. A total of 21 animal health camps were organized during the project period. The camps were organized in collaboration with the Government Veterinary Department. Total 5154 animals were provided preventive health care service like deworming tablets and vaccination against the seasonal diseases, that prevented occurrences of diseases and improve overall health and productivity of animals.

xvi. A total of 16 human health camps were organized covering all the villages during the project period in collaboration with the health department to raise awareness about the provide preventive health care service for frequently occurring diseases. In total 1800 persons directly benefited from the camps besides the awareness session.

The project interventions chosen were holistic with specific local connection. The non-farm intervention in NTFP processing, the farm based interventions in strengthening water availability with elements of climate resilience and health and hygiene interventions consisting of access to drinking water and health care service for animal and human being were found to be highly effective in addressing the livelihoods challenges, teaching the community to participate in climate change adaptation in long run and adopt practices that would enhance resilience, mitigate risk while deriving enhanced livelihoods in the process. Overall, all the interventions have shown a positive result with respect to attaining the desired objectives and attaining enhanced goal in long term.

Annexures

Annexure I: Questions on Agriculture Demonstration on Natural Farming

1. General Information

Gram Panchayat: _____ Village: _____

Name: _____ Caste:_____

Gender: _____ Education: _____

Age: _____ Total Cultivable Land (Acre): _____

Total Cultivated land (2022-23) (Acre): _____ Area Irrigated (Acre): _____

2. Information related to Demonstrations

Cropping season of Demonstration (Please tick): □ Kharif □ Rabi

Area of agriculture demonstration (Acre): _____

Activities taken in demonstration:

Activities of Demonstration	Response	Qty Used	UoM	Value (in Rs.)
Organic Extract Manufacturing	□Yes □No			
a.				
b.				
c.				
d.				
e.				
Bio fertilizer usage	□Yes □No			
a.				
b.				
c.				
Intercropping	□Yes □No			
a.				
b.				
c.				

Cost of Demonstration

Total cost of demonstration (in Rs)	
Participants share (in Rs.)	
Project share (in Rs)	

Factor usage (quantity vs cost)

Before Project (Baseline Value)	After Project

Type of Inputs Used	Qty (in Kg/ lit)	Amount (Rs)	Types of Input Used (Name the Inputs used)	Qty (in Kg/ lit)	Amount (Rs)
Fertilizer					
Pesticide/ Chemicals					
Seed					

Production from area of demonstration or equivalent area of demonstration before project

Before Project			After Project		
Output (Name)	Qty (in Kg)	Amount (Rs)	Output	Qty (in Kg)	Amount (Rs)

Expected results from Demonstration (Replication and Scaling up)

How many farmers participated to learn from the demonstration (No)	
Whether the demonstration helped develop interest among other farmers	□ Yes to a great extent □ Yes but to limited extent □ No interest generated
Do you remember the practices learned from demonstration	□ Yes all practices □ Yes but some practices □ Do not remember
Do you believe that practice helps improve the soil health and production	□ Yes to great extent □ Yes but to limited extent □ Not experienced as of now
Will you adopt the practice	□ Yes, all the practice □ Yes, but limited practices □ Will not adopt
Will you expand the area of adopted practice	□ Yes to all the cultivatable area □ Yes to some additional cultivable area □ Will not practice
In case, you do not intend to adopt the practice, please give the reasons	i. _____ ii. _____ iii. _____

Annexure II: Questions on Agriculture Demonstration on Sprinkler

1. General Information

Gram Panchayat: _____ Village: _____

Name: _____	Caste:_____
Gender: _____	Education: _____
Age: _____	Total Cultivable Land (Acre): _____
Total Cultivable land (Acre): _____	Area Irrigated (Acre): _____
Year of sprinkler introduction: _____	

2. Land Details

Particular	2019-20	2020-21	2021-22	2022-23
Area Cultivated (Kharif) (Acre)				
Area irrigated in Kharif (Acre)				
Area Cultivated (Rabi) (Acre)				
Area irrigated in Rabi (Acre)				
Diesel Used if irrigated using Diesel Pump (lit)				

3. Crop Grown and Production

Year	Kharif			Rabi		
	Crop	Area (Acre)	Production (Quintal)	Crop	Area (Acre)	Production (Quintal)
2019-20	C1.			C1.		
	C2			C2		
	C3			C3		
2020-21	C1.			C1.		
	C2			C2		
	C3			C3		
2021-22	C1.			C1.		
	C2			C2		
	C3			C3		
2022-23	C1.			C1.		
	C2			C2		
	C3			C3		

4. Other Benefits of Sprinkler Irrigation

Parameters	Before using Sprinkler Irrigation	After using sprinkler Irrigation
Hours of pumping		
No of labors used		

Diesel Used (liter)		

5. Information related to Demonstrations

Cost of Sprinkler

Total cost of Sprinkler (in Rs)	
Participants share (in Rs.)	
Project share (in Rs)	

Expected results from Demonstration (Replication and Scaling up)

How many farmers participated to see the sprinkler demonstration from you (No)	
Whether the demonstration helped develop interest among other farmers	□ Yes to a great extent □ Yes but to limited extent □ No interest generated
Do you remember the practices learned from demonstration	□ Yes all practices □ Yes but some practices □ Do not remember
Do you believe that practice helps improve the water usage	□ Yes to great extent □ Yes but to limited extent □ Not experienced as of now
Will you encourage others to adopt the sprinkler	□ Yes, all the practice □ Yes, but limited practices □ Will not adopt
In case, you do not intend to adopt the practice, please give the reasons	iv. _____ v. _____ vi. _____

Annexure III: Questionnaire for Multilayer Farming

1. General information

Gram Panchayat: _____ Village: _____

Name: _____	Caste:_____		
Gender: _____	Education: _____		
Age: _____			
Total cultivable land (in acre): _____	Total area cultivated (in acre):_____		
Area used for multilayer farming (in sq meter):			
Other sources of income: Please enlist	Source	Annual Income (in Rs)	Percentage
	Agriculture		
	Labour		
	Allied activity		
	Migration		

2. Crop Details

Area of Multilayer Farming (in sq. meter)	
Total numbers of crop grown	
Numbers of Crops grown during Rabi (From_____ to _____) (months)	
Number of Crops grown during Zaid (From_____ to _____) (months)	
Number of crops grown during Kharif (From_____ to_____)	

Season/ Crop	**Total Production (in Kg)**	**Quantity Consumed (in Kg)**	**Quantity Sold (in Kg**	**Average Price (Rs/ Kg)**
Rabi (2022-23)				
Crop 1:				
Crop 2:				
Crop 3:				
Zaid (2022)				
Crop 1:				
Crop 2:				
Crop 3:				
Kharif (2022)				
Crop 1:				
Crop 2:				
Crop 3:				

Season/ Crop	Total Production (in Kg)	Total Cost of Cultivation (in Rs)	Cost borne by beneficiaries (in Rs)	Cost borne by Project (in Rs)
Rabi (2022-23)				
Crop 1:				
Crop 2:				
Crop 3:				
Zaid (2022)				
Crop 1:				
Crop 2:				
Crop 3:				
Kharif (2022)				
Crop 1:				
Crop 2:				
Crop 3:				

Annexure IV: Questions on Dug Well

1. General Information

Gram Panchayat: _____ Village: _____

Name of respondent: _____	Caste: □SC □ST □Oth
Gender: □Female □Male	Education: _____
Age: _____	Total Cultivable Land (Acre): _____
Total Cultivated land (2022-23) (Acre): _____	Area Irrigated (Acre): _____

2. Cost of Dug Well

Total Cost of repair and deepening of the Dug Well (in Rs.): _____

Cost contributed by the beneficiaries (in Rs.): _____

Cost contributed by the project (in Rs.): _____

3. Key features of Dug Well

Month & Year of deepening of Dug Well: _____

Features	Before Project (2019-20)	After/ present (2022-23)
Total Depth of Dug Well (in feet)		
Average width of Dug Well (in feet)		
Water Table during the month of May (Below Ground Level) in Feet		
Water Table during the month of Aug (Below Ground Level) in Feet		
Water Table during the month of Nov (Below Ground Level) in Feet		
Water Table during the month of Jan (Below Ground Level) in Feet		
No of irrigation done during Rabi Cropping season (no)		
Area cultivated during Rabi Cropping season (in Acre)		
Area Irrigated during Rabi Cropping season (in acre)		

Factor usage per acre of production during Rabi season (quantity vs cost)

Before Project (Baseline Value)- Using recall method (2019-20)			After Project (2022-23)		
Type of Inputs Used	Qty (in Kg/ lit)	Amount (Rs)	Types of Input Used (Name the Inputs used)	Qty (in Kg/ lit)	Amount (Rs)
Fertilizer					

Pesticide/ Chemicals					
Seed					

Crop Cultivation and Returns

Particular		2019-20	2020-21	2021-22	2022-23
Total Land cultivated by in Rabi cropping season (in acre)					
Kharif					
Rabi					
Total land irrigated by the group members in Rabi cropping season (in acre)					
No of irrigations done					
Crops grown during Rabi season and Production (in Quintal) from the cultivated land of group members					
Crop	Area (in Acre)	Production (in Quintals)			
Crop 1:-					
Crop 2:-					
Crop 3:-					
Price/ Quintal of Production					
Crop 1:-					
Crop 2:-					
Crop 3:-					
Cost of cultivation/ Acre of land					
Crop 1:-					
Crop 2:-					
Crop 3:-					
Crops grown during Kharif season and Production (in Quintal) from the cultivated land of group members					
Crop	Area (in Acre)	Production (in Quintals)			
Crop 1:-					
Crop 2:-					
Crop 3:-					
Price/ Quintal of Production					
Crop 1:-					
Crop 2:-					
Crop 3:-					
Cost of cultivation/ Acre of land					
Crop 1:-					
Crop 2:-					
Crop 3:-					

Annexure V: Questionnaire for Check Dam/ Tank

1. General information

Gram Panchayat: _____ Village: _____

Month & Year of Installation of completion of construction of Check Dam/Tank : _____

Total number of members in groups of Check Dam: _____

2. Cost of Check Dam

Total Cost of Check Dam in Rs. _____

Cost contributed by the beneficiaries in Rs. _____

Cost contributed by the project in Rs. _____

3. Key features of Check Dam

Total Length of Wall of Check Dam (in meter):

Total length of backwater (in meter):

Total storage capacity of Check Dam (in cum):

Estimated recharge due to storage created (in cum):

Storage created for duration (in month): From _____ to _____

4. Group Details

Sl	Name of member	Caste	Economic Category (APL/BPL)	Total land (Acre)	Type of farmer (Small & Marginal/ Medium/ Large)
	Total				

5. Cultivation Details

Particular		2019-20	2020-21	2021-22	2022-23
Total Land cultivated by the Group members in Rabi cropping season (in acre)					
Total land irrigated by the group members in Rabi cropping season (in acre)					
No of irrigations done					
Crops grown during Rabi season by Group members and Production (in Quintal) from the cultivated land of group members					
Crop	Area (in Acre)	Production (in Quintals)			
Crop 1:-					
Crop 2:-					

Crop 3:-					
Price/ Quintal of Production					
Crop 1:-					
Crop 2:-					
Crop 3:-					
Total Cost of Production (in Rs., Approx)					
Crop 1:-					
Crop 2:-					
Crop 3:-					
Cost of cultivation/ Acre of land					
Crop 1:-					
Crop 2:-					
Crop 3:-					

Annexure VI: Questions on Agriculture Demonstration on Sprinkler

1. General Information

Gram Panchayat: _____ Village: _____

Year of Installation of Sprinkler Irrigation System: _____

Total no of members in Group: _____

2. Land Details

Particular	2019-20	2020-21	2021-22	2022-23
Area Cultivated (Kharif) (Acre)				
Area irrigated in Kharif (Acre)				
Area Cultivated (Rabi) (Acre)				
Area irrigated in Rabi (Acre)				
Diesel Used if irrigated using Diesel Pump (lit)				

3. Crop Grown and Production

Year	Kharif			Rabi		
	Crop	Area (Acre)	Production (Quintal)	Crop	Area (Acre)	Production (Quintal)
2019-20	C1.			C1.		
	C2			C2		
	C3			C3		
2020-21	C1.			C1.		
	C2			C2		
	C3			C3		
2021-22	C1.			C1.		
	C2			C2		
	C3			C3		
2022-23	C1.			C1.		
	C2			C2		
	C3			C3		

4. Other Benefits of Sprinkler Irrigation

Parameters	Before using Sprinkler Irrigation	After using sprinkler Irrigation
Hours of pumping (Hrs)		
No of labors used		
Diesel Used (liter)		

5. Information related to Demonstrations

Cost of Sprinkler

Total cost of Sprinkler (in Rs)	

Participants share (in Rs.)	
Project share (in Rs)	

Expected results from Demonstration (Replication and Scaling up)

How many farmers participated to see the sprinkler demonstration from you (No)	
Whether the demonstration helped develop interest among other farmers	□ Yes to a great extent □ Yes but to limited extent □ No interest generated
Do you remember the practices learned from demonstration	□ Yes all practices □ Yes but some practices □ Do not remember
Do you believe that practice helps improve the water usage	□ Yes to great extent □ Yes but to limited extent □ Not experienced as of now
Will you encourage others to adopt the sprinkler	□ Yes, all the practice □ Yes, but limited practices □ Will not adopt
In case, you do not intend to adopt the practice, please give the reasons	vii. _____ viii. _____ ix. _____

Annexure VII: Questionnaire for Drinking Water Facility

1. General information

Gram Panchayat: _____ Village: _____

Month & Year of Installation of completion of Installation of System : _____

Total number of households impacted by the installation of Drinking water facility:_____

Total population impacted by the installation of Drinking Water facility: _____

2. Cost of Installation of Drinking Water System

Components installed	**Total Project Cost**	**Beneficiaries' contribution**	**Project Contribution**

3. Expected/ Realized impact/ benefits of installed system

Expected/ Realized Benefits	Response
Who in the family is responsible for taking water to the system	□ Male members of the family □ Female members of the family
How was the water carried from the point to household before installation of system	Please elaborate
How was the water drawn from tube well before installation	□ Using Diesel pumpset □ Using electric pumpset □ Manually using handpump
How is the installation helped the women?	Please elaborate
Is there any time saved for carrying water compared to time incurred before the system is installed? If yes, how is the time utilized?	
Who maintain the system and how is the system maintained in case of any breakdown?	