Grant Thornton

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SHAPING VIBRANT INDIA

Impact assessment of Water Conservation Project, Ludhiana

United Breweries Limited

December 2024

Contents

Abbreviations

AFPRO	Action for Food Production
CSR	Corporate Social Responsibility
FGD	Focus Group Discussion
GT	Grant Thornton Bharat LLP
KAP	Knowledge, Attitudes and Practices
KL	Kilo Litre
KOF	Key Opinion Former
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
OECD-DAC	Organisation for Economic Co-operation and Development-Development Assistance Committee
PRI	Panchayati Raj Institutions
RRWH	Rooftop Rainwater Harvesting
UBL	United Breweries Limited
VDC	Village Development Committee
VWBA	Volumetric Water Benefits Accounting

Lists of figures

Lists of tables

Lists of graphs

Executive summary

UBL, as a part of its CSR activities implemented a water conservation project with the primarily goal to promote water conservation through groundwater rejuvenation structures and rainwater harvesting practices in Ludhiana, Punjab. **The project included the construction of 14 Rooftop Rainwater Harvesting Structures across 10 Government institutions, the rejuvenation of 6 ponds, installation of solar streetlights and installation 3 piezometers.** Additionally, the project aimed to enhance the knowledge of community members on water conservation practices. This project was implemented by their on-ground NGO partner Action for Food Production (AFPRO).

The study was conducted in 2024, to assess the impact of the recharge structures on the groundwater levels, record the perceptions of the community members and evaluate the overall impact of the project on all relevant stakeholders. The study was designed based on the OECD-DAC principles. The study also evaluated the knowledge, attitude, and practices of the community members, and gauged the perception of Key Opinion Formers (KOF). Furthermore, a Volumetric Water Benefit Accounting (VWBA) was carried out to assess the hydrological impact of the recharge structures. The study undertook a mixed methodology, utilising both quantitative and qualitative techniques of data collection.

Data collection included a total of 285 quantitative surveys and, 24 qualitative and KOF interactions. For VWBA 100% of the 20 recharge structures were visited and evaluated.

Key Findings

Table 1: OECD key findings

Principles	Key Findings
Relevance	**Pond Rejuvenation**: The project addressed critical groundwater depletion affecting water availability for drinking, agriculture, and industry. Before the intervention, **87% of respondents reported water scarcity, with 88% using the pond primarily for livestock and fishing.** The project not only restored the pond for sustainable groundwater recharge but also installed solar streetlights and piezometers to improve local infrastructure. **RRWH:** The project addresses a critical water crisis in the region, where communities face significant groundwater scarcity and poor quality. Prior to the project, **70% of respondents reported water shortages, with 34% experiencing them more than twice a month.** Additionally, 14% cited poor groundwater quality, compounding the issue. Rapidly declining groundwater levels and seasonal flooding further exacerbated these challenges, disrupting daily life.
Effectiveness	**Pond Rejuvenation**: The project effectively addresses water scarcity and promotes groundwater recharge by rejuvenating ponds to capture runoff from nearby fields, reducing land degradation. Local Gram Panchayats actively support the project, committing funds for the maintenance of ponds and solar streetlights to ensure sustainability. **Despite challenges from erratic rainfall, the ponds are designed to maximise intermittent water storage, thus supporting groundwater levels and preventing erosion.**

	RRWH: The water conservation structures effectively address water scarcity by utilising rooftop rainwater harvesting systems to improve groundwater levels. **By collecting rainwater from terraces and storing it underground, the project leverages existing infrastructure, significantly reducing costs.** The systems have shown promising results, particularly during monsoon season, with stored rainwater meeting various needs and enhancing local groundwater recharge.
Efficiency	**Pond Rejuvenation**: The pond rejuvenation project achieved sustainable water conservation through efficient design, local engagement, and cost-effective implementation. **By involving Gram Panchayats, it fostered community ownership and minimised costs, leveraging the natural geography to maximise water capture.** This decentralised approach offers a replicable, community-led model for addressing water scarcity. **RRWH:** The responsibility for constructing and maintaining water conservation structures lies with the authorities, ensuring direct oversight and long-term functionality. **The project efficiently utilised existing terraces for rainwater collection, minimising additional costs while maximising resource efficiency.** This strategic approach not only reduces financial burdens but also enhances sustainability. This model showcases the potential for replicating cost-effective, sustainable water conservation solutions in other regions.
Impact	**Pond Rejuvenation**: **The pond rejuvenation project has effectively reduced crop stress and boosted irrigation, benefiting 64% of the community**. Solar streetlights brought environmental gains and improved public aesthetics. While 50% were aware of a maintenance committee, only 11% observed ongoing upkeep, indicating a need for better post-project maintenance. **RRWH:** The project has significantly improved water security, benefiting households and agriculture. **Approximately 70% of respondents reported positive impacts from the rooftop rainwater harvesting (RRWH) initiative**, with improved access to stored rainwater and reduced flood risks. While only 28% directly linked the project to increased agricultural productivity, 70% acknowledged its overall benefits. Additionally, 31% noted new job opportunities from pond maintenance under the MGNREGA scheme. Community members observed increased groundwater levels, with 46% reporting improved irrigation supply and 24% indicating reduced crop stress.
Sustainability	**Pond Rejuvenation**: The pond rejuvenation initiative promotes sustainable water security by recharging groundwater and involving the community in maintenance. **The ponds offer stable water resources, reduce climate impact, and prevent land degradation, while community-led upkeep ensures resilience and longevity.** This model sets a replicable standard for sustainable water management. **RRWH:** The sustainability of the rainwater harvesting (RRWH) initiative in government institutions is strengthened by their stability as community hubs with consistent funding for maintenance. **Staff actively engages in upkeep, even contributing personally to repairs, demonstrating their commitment to these systems.** Additionally, the knowledge transfer regarding maintenance practices empowers staff and administrators to address issues proactively. This combination of institutional support, community involvement, and staff awareness is essential for the initiative's long-term effectiveness in alleviating local water scarcity.

KAP Analysis

Rooftop Rainwater Harvesting

Awareness of the Rooftop Rainwater Harvesting (RRWH) system has significantly grown among beneficiaries, who now understand its function and maintenance needs. While many recognise its value in meeting water needs and enhancing groundwater levels, some RRWH structures have required minor repairs, revealing a gap in technical knowledge among some staff members that could affect long-term sustainability. Nevertheless, there is a strong commitment to maintaining these systems, as many stakeholders contribute financially to their upkeep and actively engage in regular maintenance practices.

Pond Rejuvenation

The pond rejuvenation initiative has successfully raised awareness of water conservation among community members, who understand the importance of ponds in replenishing groundwater. This has fostered strong community support for the maintenance of these ponds, with local leaders and key opinion formers expressing enthusiasm for preserving them as vital resources. Active involvement in regular upkeep ensures that the ponds and their associated infrastructure remain operational, demonstrating the community's commitment to sustainable water use and groundwater replenishment.

KOF perception

The water conservation project has received overwhelmingly positive feedback from the community, indicating strong support and satisfaction. Notably, **93%** respondents reported increased groundwater levels, directly addressing local water scarcity concerns. Additionally, **81%** feel that the project has reduced the community's vulnerability to water shortages, while **89%** believe it will provide long-term benefits. The intervention's impact extends beyond water access, with **95%** respondents acknowledging enhancements to public infrastructure and **92%** recognising its positive effects on environmental quality, contributing to an improved quality of life. Furthermore, **85%** community members feel that the project has raised awareness of water-related issues, suggesting a significant educational impact that could lead to shifts in attitudes and practices regarding water conservation. Overall, these statistics reflect the project's effectiveness in achieving tangible outcomes and fostering a sense of community ownership and commitment to sustainable water management practices for the future.

VWBA

The maximum ground water recharge potential as per VWBA is achieved by Recharge Ponds (191403 KL/annum) followed by Rooftop Rainwater Harvesting (2676 KL/annum). Overall, estimated recharge potential as per VWBA is 194079 KL/Annum in Ludhiana.

Conclusion

The water conservation project in Ludhiana has demonstrated significant positive impacts on groundwater levels and community awareness. By implementing 14 Rooftop Rainwater Harvesting Structures across 10 Government institutions and rejuvenating 6 ponds, the project has effectively addressed critical water scarcity issues. The construction of these structures, along with the installation of solar streetlights and piezometers, has not only enhanced local infrastructure but also promoted sustainable water management practices. The involvement of the community, particularly through the support of local Gram Panchayats and the active participation of the staff, has been crucial in ensuring the project's success and sustainability. The study highlighted the project's relevance, effectiveness, efficiency, impact, and sustainability. Overall, the project has not only improved water security and reduced crop stress but also fostered a sense of ownership and responsibility among community members. The strong commitment to maintaining these systems, as evidenced by the financial contributions and active engagement of local leaders, underscores the project's long-term viability. This initiative sets a replicable model for other regions facing similar water challenges.

1. Background

1.1. About United Breweries Limited

United Breweries Limited (UBL), established in 1915, stands as one of the largest social beverage companies in India, offering both alcoholic and non-alcoholic products. The company is dedicated to serving the interests of all its stakeholders, including the communities surrounding its operations.

As part of its Corporate Social Responsibility (CSR) policy, UBL is committed to operating and growing its business in a socially responsible manner. This involves balancing commercial and economic progress with social and environmental development. The company's CSR policy focuses **on four key areas: environment, women empowerment, community development, and address harmful use**.

Figure 1- UBL's CSR areas

By integrating CSR into its corporate strategy, UBL aims to drive sustainable social development for its co-communities ensuring a positive and lasting impact. A significant emphasis is placed on water conservation initiatives across India, with ~70% of its CSR investments directed towards this domain.

1.2. About the Water Conservation Project

India is the largest user of groundwater in the world, as per a World Bank study[1]. For irrigation, more than two-thirds of India's agriculture is dependent on groundwater. India's most agriculturally prosperous state, Punjab, faces a crisis due to the over-extraction of groundwater for irrigation purposes[2]. In India, most households in rural regions depend on groundwater for drinking and agricultural practices. However, the quantity of water required to meet domestic use is relatively less compared to the water needed for agriculture and other livelihood practices.

To address this challenge, UBL, as part of its CSR initiatives, undertook the construction of water conservation structures in 14 villages across the district of Ludhiana from 2020 to 2023. This project was carried out in collaboration with Action for Food Production (AFPRO). **The primary goal was to promote water conservation through water rejuvenation structures and rainwater harvesting practices.** Additionally, the project aimed to enhance the knowledge of community members on water conservation practices.

Key activities under the project in Ludhiana included:

- Construction of **fourteen (14) roof-top rainwater harvesting** structures in ten Government institutions.
- Rejuvenation of **six (06) ponds** in six (06) villages for recharge of groundwater.
- Installation of **thirty-five (35) solar streetlights** near the ponds.
- Installation of **three (03) piezometers** to monitor groundwater levels.

The project also included an awareness session and workshop with the aim to **empower and motivate community members** on the importance of water.

About Action for Food Production

Action For Food Production (AFPRO) is a secular non-government, socio-technical development organisation working towards the reduction of poverty in India since 1966. AFPRO was established in response to the Bihar-Uttar Pradesh-Maharashtra drought, as a Non-Governmental Organisation (NGO) that would provide technical support for development and rehabilitation work.

Initially, AFPRO concentrated on developing groundwater to augment food production. Subsequently, it shifted its focus from merely providing sources of groundwater to educating and capacitating people for its proper utilisation, conjunctive use of water, and other water conservation practices. This included the adoption of the watershed development approach and an integrated approach to rural development.

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[1] World Bank. (2010). Deep Wells and Prudence: Towards Pragmatic Action for Addressing Groundwater Overexploitation in India. Washington, DC: World Bank. Deep wells and prudence : towards pragmatic action for addressing groundwater overexploitation in India

[2] "Punjab's Farming Crisis: Groundwater to Be Depleted by 2039." The Wire, 27 Sep. 2024, https://science.thewire.in/environment/punjab-farming-groundwater-depleted-2039/

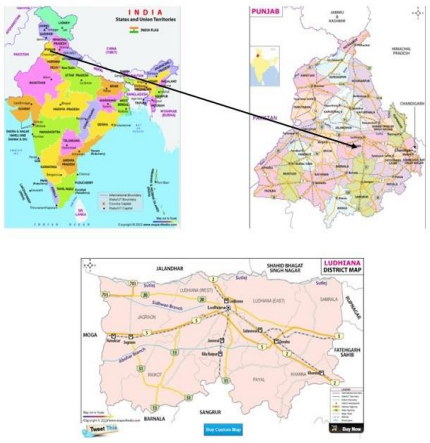
AFPRO today provides socio-technical support for ensuring food security and developing livelihoods through proper natural resource management, continuing its unique focus on the development and management of water resources. It reaches out to poor and marginalised communities throughout India, particularly small and marginal farmers, landless, tribal, and others having urgent needs.

1.3. About the project location

Ludhiana

Ludhiana is a district in the northern state of Punjab, located approximately 100 kilometres from the state capital, Chandigarh. The district spans an area of about 3,767 square kilometres and is divided into several tehsils and development blocks. According to the 2011 Census, Ludhiana has a population of over 3.4 million people, making it the most populous district in Punjab. The district is a mix of urban and rural settlements, with Ludhiana city being a major industrial hub known for its bicycle parts, hosiery, and small-scale manufacturing units.

Figure 2: Project Location



Ludhiana experiences a humid subtropical climate with hot summers and cold winters. The average annual rainfall is around 700-800 mm, primarily during the monsoon season from July to September. Despite the monsoon rains, the district faces challenges related to water scarcity due to over-extraction of groundwater and pollution from industrial activities.

1.4. About the study

Grant Thornton Bharat LLP (GTBLLP) was engaged by UBL for conducting an independent impact assessment of their water conservation project in Ludhiana.

The scope of work for the assignment included:

1. Review of all the activities implemented under the project.
2. Assess the quality of the infrastructures constructed under the project.
3. Evaluate the status and usage of the structures.
4. Assess community awareness on water conservation practices.
5. Assess community awareness on UBL and the project being a CSR initiative.
6. Assess community awareness on AFPRO and the work undertaken.
7. Conduct site visits for data validation and conduct one-on-one stakeholder (implementing partner, Gram Panchayat, and community) meetings/focussed group discussions (FGDs) and household surveys to assess the effectiveness, efficiency, and sustainability of the project.

8. Quantify the volumetric benefits using the volumetric water benefit accounting (VWBA) method as developed by the World Resources Institute (WRI) to measure water recharge and rainwater harnessed.
9. Assess the programme results (outputs, outcomes, and impacts) through a survey of key stakeholders, key opinion formers to develop a perception index, review social benefits associated and overall impact on the community.
10. Draft report preparation and submission of an impact assessment report and a brief presentation (in PPT format).

2. Approach and methodology

2.1 Assessment framework

The aim of the study was to gauge an overall understanding of the outcomes and impact through discussions with relevant stakeholders and documenting their perception and feedback on the outcomes and impact of the project. The study also focused on capturing their suggestions for improvement.

Further an understanding of the modality of the programmes was developed. This was followed by an analysis of the beneficiary responses and further corroboration with inferences from stakeholder discussions, while identifying the critical factors, gaps, and possible methods of improvement.

The study was conducted through a pre-defined approach to assess the outcome/ impact of the project on the beneficiaries. The methodology adopted for the study considered quantitative and qualitative data collection. The study followed the OECD-DAC principles which helped understand the project holistically and focuses on five (05) key indicators. The indicators are presented below along with the explanation:

Table 2: OECD DAC Principles

OECD DAC	Principle explanation
Relevance	• Correlation of the programme objectives with the need • Consistency of the activities with the overall goal / objectives • Consistency of the activities with the intended impact
Effectiveness	• Extent of the objectives achieved or to be achieved • Major factors influencing the achievement / non-achievement of the objectives
Efficiency	• Timely achievement of objectives • Efficiency of the implementation process as compared to alternatives
Impact	• Results of the programme • Difference in the lives of beneficiaries due to the activities • Number of people affected • Any undesirable impact
Sustainability	• Extent of benefits to continue after funding ceases • Major factors which influenced the achievement or non-achievement of sustainability of the model

KAP Analysis

Further, the impact assessment study included Knowledge-Attitude-Practices (KAP) analysis to gauge the changes within the community regarding their knowledge and behaviour with respect to water conservation.

Table 3: KAP Analysis

Principle	Areas of Enquiry
Knowledge	• Pre-post situation w.r.t access to knowledge and capacity building etc. • Pre-post situation w.r.t, change in level of knowledge
Attitude	• Pre-post situation w.r.t, change in level of overall perception on water conservation • Pre-post situation w.r.t, ability to spread the awareness on water conservation
Practice	• Pre-post situation w.r.t, change in water usage practices • Pre-post situation w.r.t, change in safe drinking water practices, water budgeting etc.

2.2. Methodology for the study

The methodology followed to conduct the study was spread across three stages as follows:

Table 4: Three stages methodology

Stage I Planning	Stage II Data collection & analysis	Stage III Reporting
Quality assurance across all stages		
1. Inception meeting to understand the objectives of the study 2. Review of documents & identification of key stakeholders 3. Sampling strategy 4. Development and testing of tools	5. Selection/ training of enumerators and ethical concerns 6. Data collection and quality management – stakeholder (KOFs) and beneficiary interaction on sample basis 7. Data cleaning and analysis	8. Share draft report for inputs from UBL team 9. Incorporate inputs and share final report to UBL 10. Share management presentation based on the final report

Stage I: Planning

Inception meeting

Kick-off meeting was held with UBL's CSR team to develop an in-depth understanding about the nuances of the projects, clearly articulate the expectations and identify the key stakeholders. Post the initial discussion, an information request was shared with UBL listing out the required project documents, reports, and other available data.

Review of documents

A desk review of the documents and reports was conducted. The understanding gained from the desk research was eventually fed into the identification of the key respondents and their respective areas of enquiry.

Study design

A mixed methods study design was adopted for data collection. It included both, quantitative survey with beneficiaries, and qualitative interviews with the key stakeholders.

Stakeholder mapping and areas of enquiry

The next step involved mapping of key stakeholders of the projects. The table below presents the list of stakeholders along with the key areas of enquiry:

Table 5: Key areas of enquiry

Sl. No.	Key stakeholders	Areas of enquiry
1.	Community Members	• Water sources and availability • Water usage patterns • Understanding ground water levels • Irrigation practices followed by farmers • Quality of water available • Available water structures • Level of community awareness
2.	PRI members	• Understanding current water sources • Water usage patterns • Understanding water scarcity periods • Understanding ground water levels • Identifying water quality issues • Available water storage infrastructures • Community participation and awareness levels
3.	Implementation partner	• Understanding the need of the project • Rationale behind the geographical location for the project • Project implementation and execution • Procedures followed for community member mobilisation and sensitisation about the project

Development of survey tools

To triangulate the information captured from different stakeholders, both qualitative and quantitative data collection tools were developed. It was based on the areas of enquiry highlighted in the previous section. Qualitative interactions were conducted through in-depth interviews and Focus Group Discussions (FGDs) whereas quantitative survey was undertaken using a detailed survey questionnaire (with few open-ended questions) for on-field data collection. Further, a questionnaire in the form of statement-set for Key Opinion Formers (KOF) was developed. For VWBA, assessment tools were developed based on documents and type of structures.

The tools were reviewed and tested before administering on-field. The quantitative surveys were translated into Punjabi, as per requirements. Qualitative interview

questions were also translated into the local language, to enable easy comprehension of questions.

Stage 2: Data collection

Sampling plan

For the present assessment, a random sampling was done considering the population benefitted. The below table presents the sample size for each project:

Table 6: Sample: Target vs Achieved

Location	Planned	Achieved
Ludhiana	285	285

The below table presents the village-wise target achieved in both for quantitative, qualitative and Key Opinion Formers (KOF) interactions.

Table 7: Village wise distribution of interactions

S/N	Location / Village name	Quantitative interactions	Qualitative interactions	KOF interactions
1.	Ayali Kalan	18	2	1
2.	Ayali Khurd	17	1	1
3.	Dolon Kalan	18	1	1
4.	Gill	18	2	1
5.	Jawaddi Kalan	18	2	1
6.	Lalton Kalan	19	2	1
7.	Sahibana	19	2	1
8.	Sarabha Nagar	19	1	1
9.	Bhamia Khurd	17	1	2
10.	Budhewal	22	2	2
11.	Hawas	23	2	2
12.	Kot Gangurai	22	2	2
13.	Panglian	21	2	2
14.	Khasi Kalan	34	2	2

Data Collection

For the study, data collection was undertaken in fourteen (14) villages of Ludhiana. For VWBA, all the project's structures were visited. The process involved collecting technical data on all water conservation structures created by United Breweries Limited (UBL). A comprehensive site visit was conducted, ensuring the validation of technical data for VWBA and the functionality of each structure. The gathered data was then compiled, cleaned, and analysed to calculate groundwater recharge.

Data Analysis

Data was collated, cleaned, and coded as per the tools for closed ended questions. Descriptive and inferential statistics were used to analyse the quantitative data of the respondent group to understand trends and relations. Qualitative data analysis was carried out to triangulate the findings of the quantitative data, in line with its objectives. KOF data was analysed to assess the extent the agreement with the statements. VWBA analysis was carried out based on the structure type, local geographic and geological conditions, and water storage capacities. Initial findings were shared with UBL team.

Stage 3: Reporting

Draft and final report

The analysed data was collated, triangulated, and segmented based on different areas of inquiry. Based on the data sets, points of analysis or trends were identified and presented with the aid of tools and diagrams. A draft report was prepared which incorporated the study findings and shared with UBL for feedback. Thereafter, a comprehensive report was prepared which included the key findings, inferences from stakeholder discussions, and recommendations.

2.3. Coverage

The following section presents details of the structures covered at various project locations. In Ludhiana a total of 14 Rooftop Rainwater Harvesting Structures were covered across 10 Government institutions in 8 villages. Also, a total of 6 pond structures were covered across 6 villages. 100% of the structures were visited for the VWBA study.

Mentioned below are the details of the structures visited.

Pond Rejuvenation, Solar Streetlights and Piezometers

Table 8: Locations visited - Pond Rejuvenation

Sl. No.	Location	Ponds Rejuvenated	Solar Streetlights	Piezometers
1.	Budhewal	1	7	
2.	Panglian	1	6	1
3.	Hawas	1	6	
4.	Kot Gangurai	1	7	1
5.	Bhamia Khurd	1	4	1
6.	Khasi Kalan	1	5	

Rooftop Rainwater Harvesting System

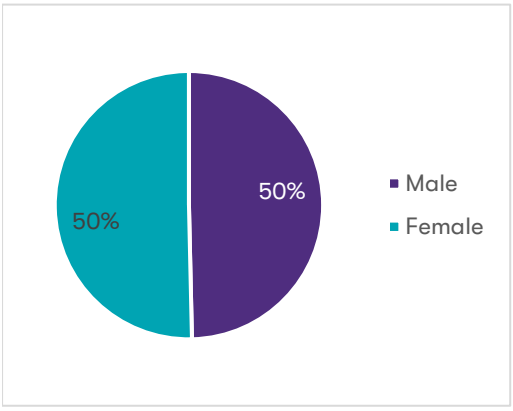
Table 9: Locations visited - RRWH

Sl. No.	Location	No. of structures
1.	Lalton Kalan	1
2.	Dolon Kalan	1
3.	Gill	2
4.	Gill	1
5.	Jawaddi Kalan	2
6.	Sahibana	1
7.	Sahibana	1
8.	Ayali Kalan	1
9.	Ayali Khurd	3
10.	Sarabha Nagar	1

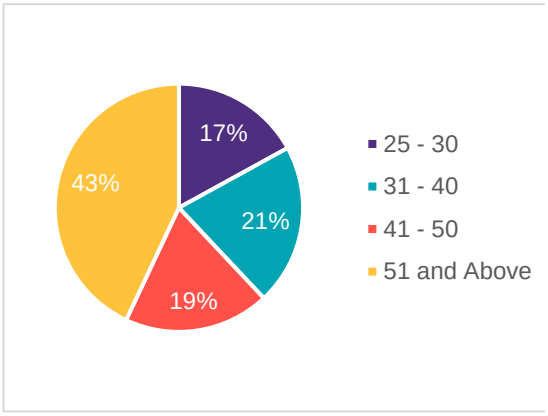
Demographic Profile

For the assessment of the pond rejuvenation initiative, installation of Piezometers and Solar streetlights initiative, the data was collected from a total of 285 respondents across 14 villages in Ludhiana. The demographic data collected is presented below:

Graph 1: Gender of respondents



Graph 2: Age of respondents (in years)



Graph 3: Occupation of respondents

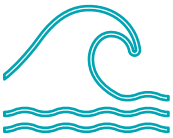
The data shows the distribution of 285 respondents across different age groups. The largest group, comprising 43%, is aged 51 and above, the age group of 31 to 40 follows with 21%, while the 41-50 age group accounts for 19%. The youngest group, aged 25-30, makes up 17% of the respondents. In terms of gender, the data indicated an equal gender distribution among respondents, with 50% identifying as male and 50% as female.

Regarding the occupations of respondents, 46% are daily wage labourers, 24% engage in farming/ agriculture or related activities and 17% are self-employed.

3. Key findings

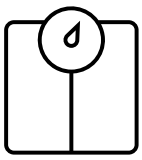
The following section outlines the key findings from the study conducted in Ludhiana on the Rooftop Rainwater Harvesting and pond rejuvenation initiatives. To clearly highlight the unique impacts of each initiative, the findings are organised by project. It summarises the main observations from various activities, analysed according to the OECD DAC principles. The KAP (Knowledge, Attitudes, and Practices) framework was also used to assess some key findings. In the KOF (Key Opinion Former) section, findings were evaluated based on the level of agreement or disagreement with statements.

Infrastructure interventions made:



Ponds: Ponds are natural/ constructed water bodies, often designed for purposes like irrigation, aquaculture, and wildlife support. These ponds help manage water resources by collecting runoff, storing rainwater, and creating habitats for flora and fauna. They're also popular for landscaping and recreational uses. A total of 6 ponds were rejuvenated in Ludhiana.

Solar streetlights: Solar streetlights are energy-efficient lighting solutions powered by solar panels that convert sunlight into electricity. They're widely used in outdoor spaces for sustainability, as they reduce reliance on conventional electricity and have minimal environmental impact. Solar streetlights are ideal for rural, off-grid areas and emergency lighting. Each pond was surrounded by 4 - 7 solar streetlights to enhance the visibility as well as the recreational value of the structure.



Piezometer: A piezometer measures the pressure or depth of groundwater within aquifers, wells, or boreholes. It's vital for monitoring groundwater levels, assessing water quality, and studying aquifer health. Engineers and hydrologists use piezometers to manage water resources, prevent flooding, and understand environmental changes in subsurface water. A total of 3 piezometers were installed in Ludhiana.

Rooftop Rainwater Harvesting Systems: Rooftop rainwater harvesting systems capture rainwater from roofs and channel it into storage tanks or directly into the ground. This technique conserves water reduces dependency on municipal sources and prevents water scarcity. It's an eco-friendly solution to water management, especially beneficial in drought-prone areas. A total of 14 structures were constructed across 10 Government institutions in Ludhiana.

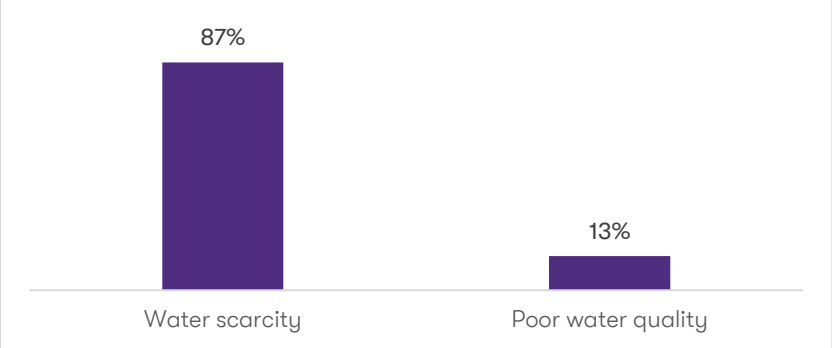
3.1. Pond Rejuvenation, Installation of Solar Streetlights and Piezometer

Relevance

The project was initiated to address the critical issue of depleting groundwater levels, which continues to pose significant challenges including reduced water availability for drinking, agriculture, and industrial use. This depletion could lead to increased costs for water extraction, greater reliance on alternative water sources, and conflicts over water rights.

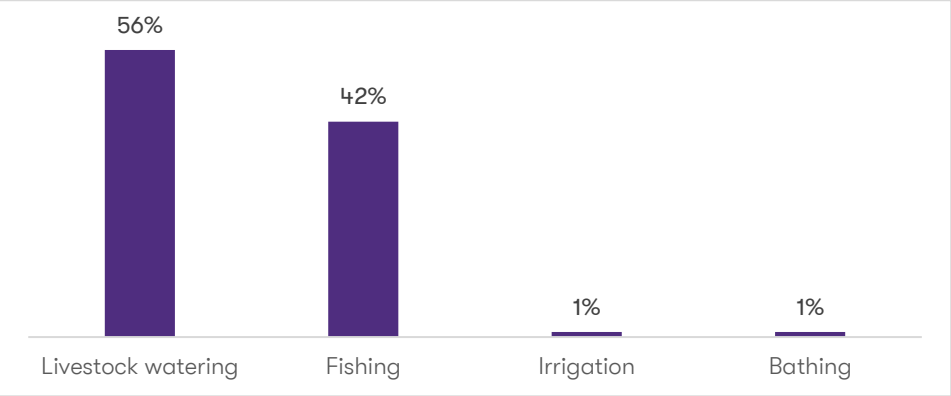
76%
respondents stated that there was a shortage of water before the project intervention.

Graph 4: Water related challenges - pond rejuvenation



Prior to the intervention, **87% respondents identified water scarcity as their main challenge, while 13% cited poor water quality.** Despite this, 87% were unsure about the frequency of water shortages, meanwhile 8% respondents experienced shortages occasionally and 5% never faced shortages. This highlights that while **water scarcity was a major concern**, the frequency of shortages varied widely among respondents.

Graph 5: Pond usage - before intervention



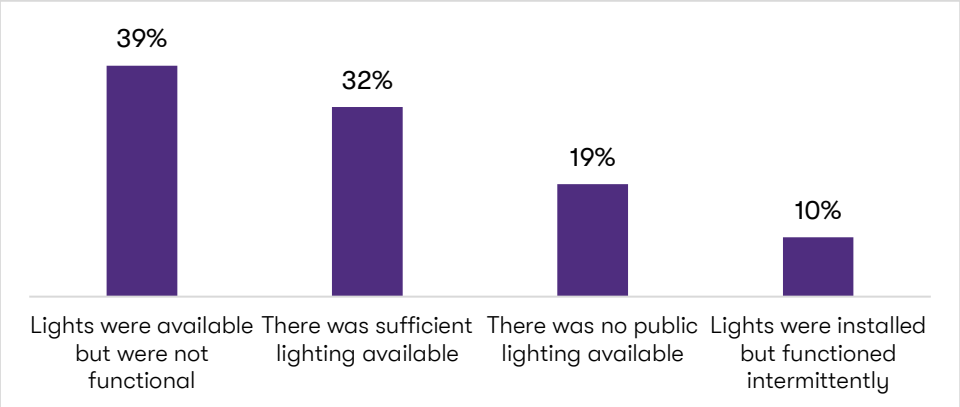
Before the project, **88% of respondents reported using the pond, primarily for livestock watering (56%) and fishing (42%).** Minimal use was reported for irrigation and bathing, each at 1%. This indicates the **pond's crucial role in supporting livestock activities within the community.** The 12% respondents who did not use the pond either had alternative water sources or faced barriers to access. Overall, the pond was a vital resource for the majority highlighting its importance in the community's water management practices before the project's intervention.

> "
>
> The pond rejuvenation initiative and the installation of solar streetlights has beautified the village and given us, a place to congregate. Many residents even use the area for their evening walks.
>
> **Sarpanch, Panglian village**

The pond rejuvenation project in Ludhiana, addresses a critical need in the intervention area, **tackling the pressing issue of depleting groundwater levels and associated water scarcity.** The project's focus on rejuvenating ponds provides a sustainable solution to recharge groundwater, mitigating the adverse effects of water depletion including increased cost of extracting groundwater.

In addition to the pond rejuvenation initiative, the project also involved the installation of solar streetlights and piezometers in the area surrounding the pond. 76% respondents stated that they were aware of the solar streetlights and piezometers installed in the area.

Graph 6: Before project- Electrification in area



Before the start of the project, 39% respondents reported that public lighting was accessible in their village but did not function. Further, 23% respondents indicated that while public lights were installed, they were non-functional and had not been maintained for regular use. Another 10% stated that the lights worked intermittently, providing inconsistent lighting that was often insufficient for safety and convenience. This lack of reliable public lighting likely impacted safe movement during evening hours and reduced the community's sense of security at night.

The project's impact on flood control and land degradation prevention underscores its relevance. **By capturing rainwater and recharging groundwater, the ponds help regulate water flows, reducing the risk of floods and land degradation.** This safeguards agricultural productivity and protects the community's infrastructure and natural resources.

Effectiveness

The pond rejuvenation project has emerged as an effective solution to mitigate water scarcity and enhance groundwater recharge in Ludhiana. By rejuvenating ponds with ample storage capacity, the project efficiently harnesses water from nearby fields, thereby reducing surface runoff and preventing land degradation.

Additionally, **Gram Panchayat members have demonstrated ownership and commitment to the project's sustainability, ensuring regular maintenance and upkeep of the ponds and the solar streetlights through Panchayat funds.** This collaborative approach guarantees the long-term viability of the ponds.

The project's potential benefits are substantial. The ponds are designed to capitalise on rainfall, capturing and storing water for future use. This strategic approach enables the project to address pressing water needs, particularly during periods of scarcity. Moreover, by recharging groundwater and minimising surface runoff, the ponds contribute significantly to maintaining healthy water tables and preventing land erosion.

100%
respondents stated that they were satisfied with the way the project was implemented.

The project's effectiveness extends beyond immediate water conservation benefits, fostering broader environmental sustainability and community resilience. By harnessing rainwater and recharging groundwater, the ponds support agricultural productivity, enhance livelihoods, and improve overall community well-being. **The integration of pond rejuvenation with local water management practices has created a replicable and scalable model for addressing water challenges in regions vulnerable to climate change.**

Figure 3: Pond at Kot Gangurai

Efficiency

The pond rejuvenation project has shown efficiency in its implementation and maintenance, ensuring long-term sustainability. By engaging Gram Panchayats in construction and conducting awareness camps, the project fostered community ownership and decentralised oversight. This collaborative approach enabled timely completion and optimal resource allocation, leveraging local expertise to minimise costs.

> “”
>
> We are satisfied with the intervention done by UBL. We understand that such an intervention was necessary to help rejuvenating the groundwater which has been reducing over the last few years. As the sarpanch, I have already put in place measures to ensure the maintenance of the pond.
>
> **Sarpanch, Bhamia Khurd Village**

Strategic placement and efficient design of ponds maximised water capture and storage potential, making the project financially viable. By utilising existing topography and natural water flows, the project reduced additional infrastructure requirements. **This design minimised construction and maintenance costs while enhancing groundwater recharge benefits.**

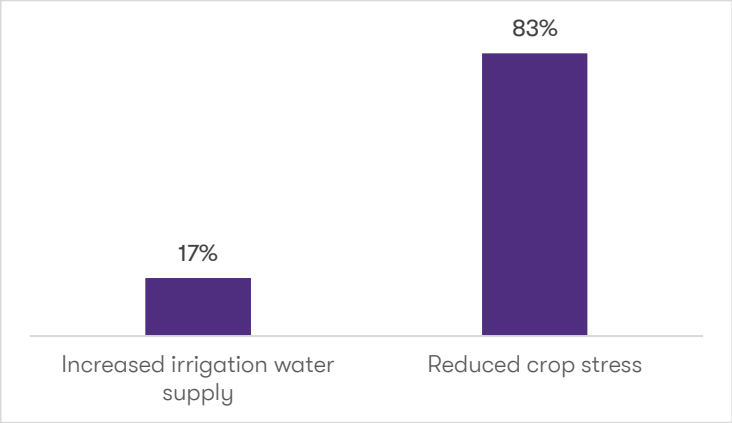
The project's efficient implementation and maintenance have positioned it as a **replicable model for addressing water scarcity.** Well-planned construction, community-led oversight, and optimal resource use have created a sustainable solution. The intervention showcases the importance of cost-effective, decentralised approaches in water conservation. This intervention serves as a valuable reference for future initiatives aimed at enhancing water security.

Figure 4: Solar streetlights installed at Khasi Kalan

Impact

The following section assesses the impact of the pond rejuvenation project, examining its success in addressing water scarcity and promoting sustainable water management practices. **The project has a positive impact on the community, with 64% of respondents reporting that they benefitted due to the project.** This indicates that the project has effectively addressed agricultural vulnerabilities, enhancing resilience and productivity.

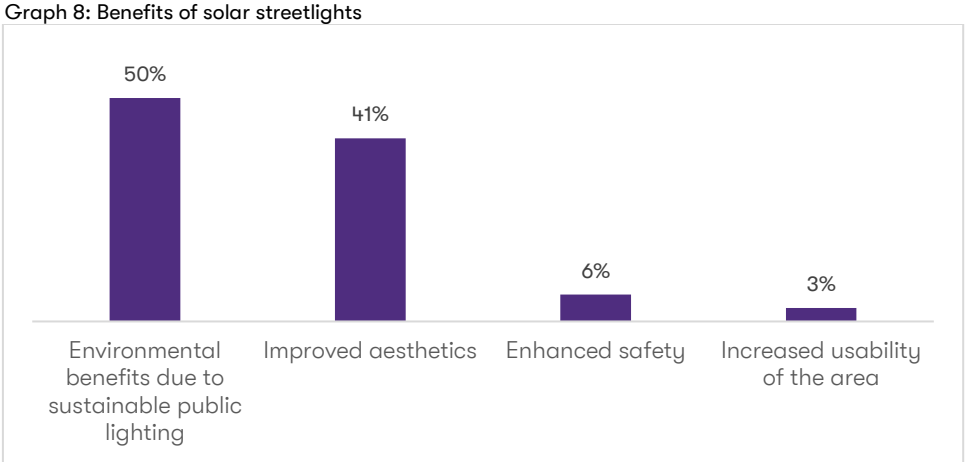
Graph 7: Impact on agriculture – pond rejuvenation



Agricultural benefits: **83% respondents stated that the project had benefitted the local agriculture through reduced crop stress.** Additionally, 17% reported increased irrigation water supply, indicating improved water availability for agricultural purposes. These benefits are attributed to the project's design, which has created a safety net of groundwater recharge for the community. By capturing and storing rainwater, the ponds mitigate floods and surface run-off due to erratic rains, thereby protecting crops and agricultural land.

By leveraging funds from MGNREGA, several PRI members have taken ownership of the project, ensuring sustainability and community engagement. **The project's impact by reducing crop stress, increasing irrigation water supply, and promoting groundwater recharge underscores its relevance and efficiency.** This integrated approach has contributed to enhanced food security, community well-being, and resilience to climate-related risks, demonstrating the project's potential for replication and scaling up in similar contexts.

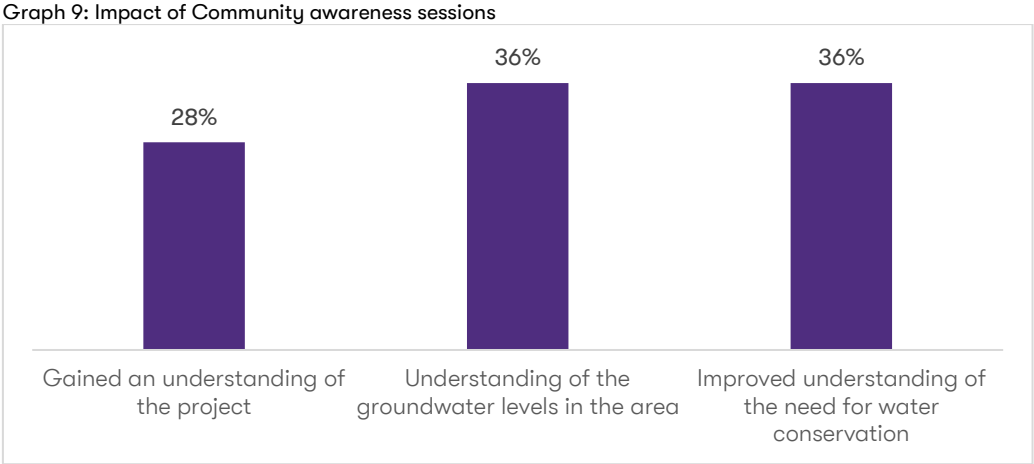
Graph 8: Benefits of solar streetlights



Environmental Benefits: The data highlights significant environmental and aesthetic benefits attributed to the introduction of sustainable public lighting in the community. 50% respondents reported that the new lighting system has provided environmental benefits due to the energy-efficient and eco-friendly technology used, which reduces carbon emissions and promotes sustainability. Additionally, 41% of respondents noted an improvement in the area's aesthetics, indicating that the lighting enhances the visual appeal of public spaces.

Community Awareness - **60% of beneficiaries attended community awareness sessions related to the pond rejuvenation project, and 28% reported gaining an understanding of the project's purpose.** 36% respondents reported understanding of the importance of groundwater levels for agriculture and need for water conservation respectively.

Graph 9: Impact of Community awareness sessions



The community engagement sessions conducted as part of the project have yielded some educational impacts, with respondents citing various benefits. Specifically, the sessions have enabled 28% of respondents to gain a comprehensive understanding of the project, while 36% each reported improved understanding of groundwater levels in the area and the necessity of water conservation. These findings demonstrate the project's effectiveness in raising awareness and educating the community about critical water management issues. However, the fact that fewer than half of the respondents reported improved understanding across these areas suggests a remaining knowledge gap, underscoring the need for sustained outreach efforts to ensure broader community comprehension and optimal utilisation of the project's benefits.

The community engagement efforts have shown mixed results in terms of sustainability and long-term maintenance. While 50% of respondents are aware of a committee formed for pond maintenance, indicating some level of community ownership, the actual maintenance efforts undertaken by the Village Development Committee (VDC) post-project completion are alarmingly low. Only 11% of respondents reported any maintenance efforts, suggesting a significant gap between committee formation and actual implementation.

Sustainability

The pond rejuvenation initiative is a model of sustainable development, securing a resilient water future through community involvement and environmental stewardship. By focusing on groundwater recharge, these ponds have transformed the landscape, alleviated water stress, and ensured a dependable water supply for generations. The ponds offer a consistent water source that shields communities from unpredictable rainfall and climate shifts. **They also help replenish groundwater, supporting ecosystem health, stabilising water tables, and preventing land degradation. This initiative establishes a legacy that fosters future growth, food security, and economic prosperity.**

Figure 5: Pond at Khasi Kalan

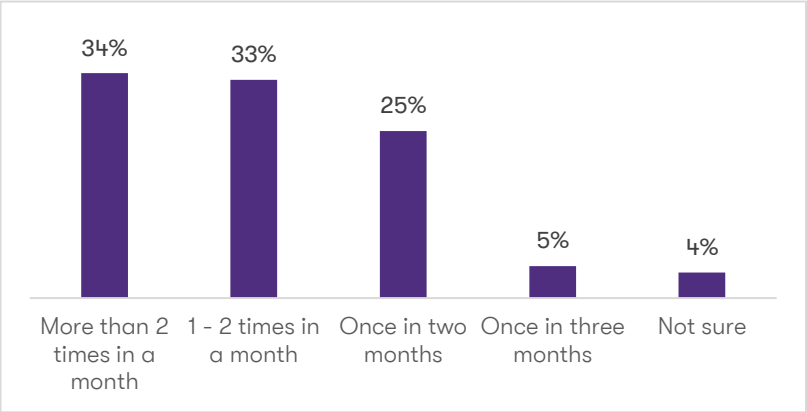
The project's sustainability is further strengthened by active community participation in maintenance, which fosters a sense of ownership, ensures durability, and builds resilience. Community-led upkeep cultivates responsibility, extends the ponds' lifespan, and enables communities to develop adaptive strategies to face climate-related stresses. **By integrating community engagement, environmental care, and forward-thinking, this initiative creates a lasting impact and serves as a replicable model for water security projects.**

3.2. Rooftop Rainwater Harvesting System

Relevance

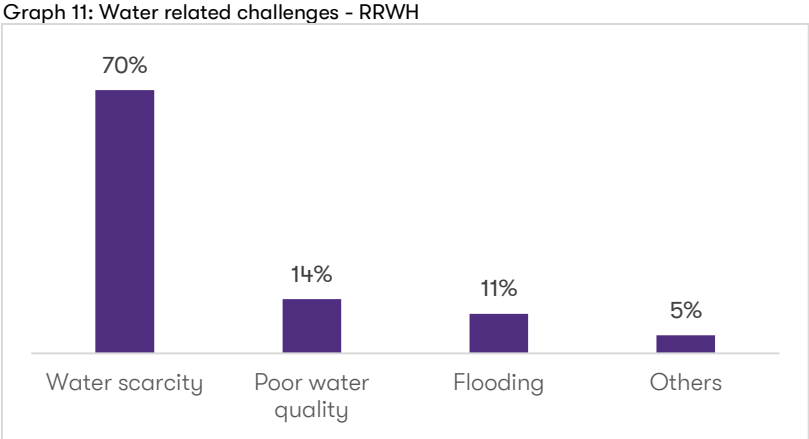
The following section highlights the critical need for the project in the intervention area, focusing on the availability of groundwater. The intervention project was initiated in response to the acute water crisis facing the region, where communities struggled with both water scarcity and poor groundwater quality. In this region, the lack of reliable water access had begun to severely impact daily life.

Graph 10: Water shortage before project - RRWH



Prior to the intervention, a large portion of the population struggled with consistent water shortages, as reflected in the data collected. **About 34% of the respondents reported experiencing water shortages more than twice a month, while 33% faced shortages 1-2 times a month.** In total, **70% of the community faced varying degrees of water scarcity.** In addition to the quantity of water, 14% of respondents indicated that the groundwater available was of poor quality, adding another layer of difficulty to the residents' daily lives. The combination of inadequate water supply and poor-quality groundwater underscored the urgency of the situation and highlighted the need for an effective intervention to alleviate these problems.

Graph 11: Water related challenges - RRWH



A concerning trend observed in the area was the rapid decline in groundwater levels. The declining groundwater levels, combined with the poor quality of water, contributed to the growing vulnerability of the community. **Without proper intervention, the residents would likely continue to face worsening conditions, impacting not only their agricultural productivity but also their overall well-being.** Combining these water-related challenges was the issue of heavy flooding during the monsoon season. This seasonal flooding created additional hardships for the community.

70%
respondents stated that there was a shortage of water before the project intervention.

Beneficiaries from Government institutions reported that the floods severely disrupted activities, damaged infrastructure, and interrupted their daily functioning. Additionally, the floods aggravated the already fragile water situation, as managing resources became even more difficult. The combination of water scarcity, poor groundwater quality, declining reserves, and seasonal flooding created a dire situation for the residents. These overlapping issues emphasised the critical need for a comprehensive intervention that addressed both the immediate water shortage and the long-term sustainability of groundwater resources in the region.

> “We experienced quite a bit of flooding during the monsoons. It used to be exceedingly difficult to operate on certain days due to the heavy rains. Now with the RRWH system installed, we do not experience flooding within our compound.
>
> **Government Staff, Lalton Kalan**

The water challenges in the intervention area were complex, ranging from frequent shortages and declining groundwater levels to poor water quality and seasonal flooding. These issues collectively threatened the sustainability and quality of life for the local population. The intervention project aimed to tackle these pressing concerns holistically by improving water access, ensuring the sustainability of groundwater resources, and mitigating the effects of seasonal flooding. The project's success would not only address immediate needs but also safeguard the community's long-term resilience in the face of ongoing environmental challenges.

Effectiveness

The water conservation structures implemented have proven to be an effective solution for addressing water scarcity by efficiently improving groundwater levels through the construction of rooftop rainwater harvesting structures. **These structures are designed to store water underground by collecting rainwater from the terraces, which are connected to underground storage systems through pipes. This approach capitalises on the existing infrastructure, specifically the terraces, eliminating the need for additional costly construction.**

By repurposing terraces for rainwater collection, the project significantly reduces expenses while maximising the available resources, making it a cost-effective method of water conservation.

100%
respondents stated that they were satisfied with the way the project was implemented

The functional water conservation systems within the Government institutions have shown promising results, particularly during the monsoon season. Through interviews with key stakeholders, it was revealed that the rainwater collected was successfully stored in the tanks constructed as part of the project. **As the rainwater percolates through the underground storage systems, it enhances groundwater recharge, which is crucial for maintaining long-term water availability in the region.**

By reducing reliance on external water sources and improving groundwater reserves, **these systems provide a sustainable solution**. The success of these initiatives demonstrates the potential of rainwater harvesting as an effective and low-cost intervention for water conservation, especially in areas facing water shortages.

Efficiency

The responsibility for the construction and ongoing maintenance of the water conservation structures rests with the authorities. This decentralised approach allows for more direct oversight and ensures that the system remains functional over the long term. **The intervention itself was carried out in a timely and efficient manner, making use of already existing infrastructure—such as the terraces—to collect and store rainwater.** By leveraging these pre-existing structures, the project minimised additional input costs while maximising efficiency.

Figure 6: RRWH tank at Ayali Khurd

This strategic use of resources not only reduced the financial burden but also contributed to the sustainability and longevity of the intervention.

The well-planned construction and efficient maintenance system have positioned these water conservation structures as a long-term solution to the water scarcity issues faced by the surrounding communities. Through this approach, the intervention has created a model that can be replicated in other areas, highlighting the importance of cost-effective, sustainable solutions for water conservation.

Impact

On the impact of the project, it has shown significant promise in enhancing water security for households as well as for agriculture through the recharging of groundwater in the intervention areas. To highlight the impact of the project, the following section shall focus on the impact of agricultural productivity, job creation, improved water supply and benefits to the government institutions.

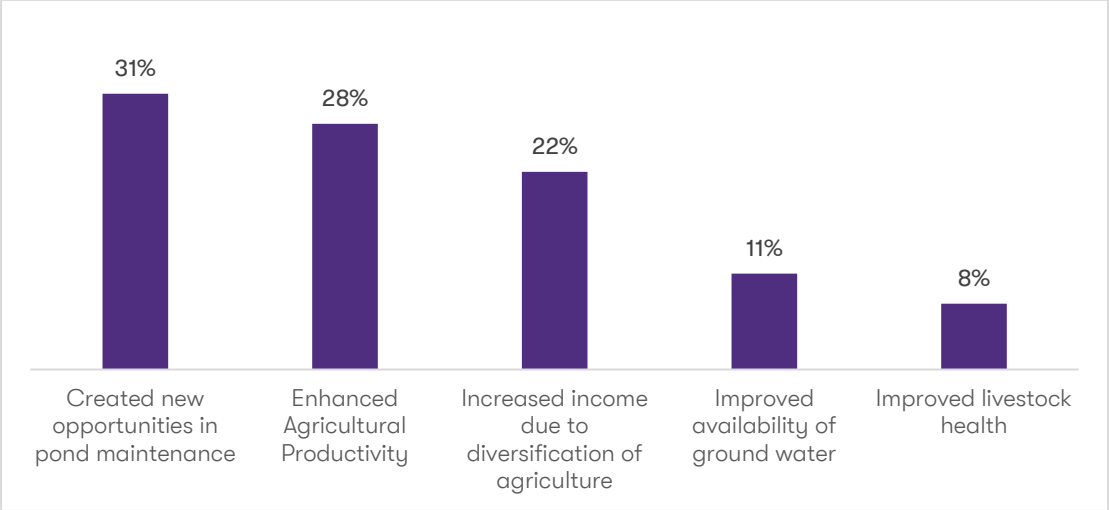
82% respondents stated that the RRWH initiatives had benefitted the Government institution and the village

Benefits to the Government Institutions: **Most respondents reported that the RRWH initiative benefitted their village, indicating strong community support for the project.** The high percentage of beneficiaries reporting positive impact suggests that the RRWH initiative has successfully met local water needs.

Community members highlighted improved access to stored rainwater, which has been beneficial. Additionally, the project has contributed to reducing flood risks, which has improved infrastructure and community safety.

Livelihood and Agriculture: While 28% of respondents attributed direct improvements in agricultural productivity to the RRWH project, **70% believed that the initiative had a positive impact on agriculture in general.**

Graph 12: Impact on livelihood - RRWH



Although only 28% of respondents linked improvements in agricultural productivity to the RRWH project, the data reveals some underlying positive influences. This indicates that the project's impact on farming has been more indirect whereby though there have been benefits, they are not directly visible to community members.

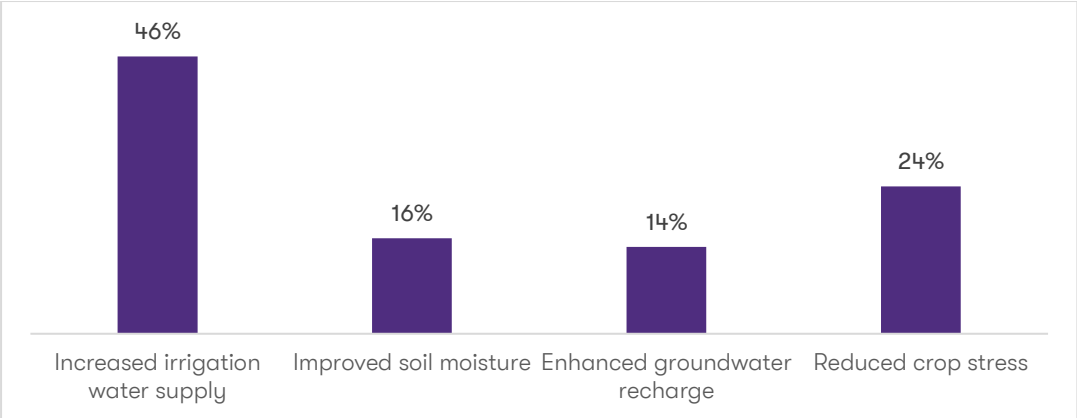
The project has also contributed to job creation, with 31% of respondents reporting new employment opportunities, particularly in pond maintenance under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) scheme. These jobs have been crucial for local populations, especially in providing income

during the off-season for farming. The moderate percentage of job creation reflects the seasonal nature of the work, which is largely tied to maintenance activities. While employment generation was not the project's primary focus, this aspect has had a significant impact on the local economy by providing temporary but valuable sources of income for rural workers, enhancing the project's overall benefits.

> “”
>
> We are extremely satisfied with the new RRWH structures installed. The structures have been constructed in an appropriate manner and ensures that the water that would have earlier flowed into the drains is used to replenish the groundwater.
>
> **Government Staff, Sahibana Village**

70% of respondents stated that the RRWH initiative had a positive impact on agriculture overall. This positive outlook suggests that, while the immediate productivity gains have been limited, the community acknowledges the potential of the system to improve groundwater levels which in the long term would benefit local agriculture. Farmers understand that having access to stored rainwater could reduce dependence on erratic monsoons and make them less vulnerable to water scarcity in the long term. Additionally, respondents stated that the project has raised awareness of the importance of sustainable water management, encouraging farmers to use water more efficiently.

Graph 13: Impact on agriculture - RRWH



Additionally, **46% respondents stated that the project has increased irrigation water supply and 24% stated that it had reduced crop stress.** 46% respondents reported a noticeable improvement in water supply and reduced crop stress because of the RRWH project. Farmers who were able to utilise the stored rainwater for irrigation noted that their crops were less vulnerable to water shortages during critical growing periods. This led to a reduction in crop failure and increased resilience against droughts. **However, the fact that 54% did not report similar benefits suggests that access to water storage or the effectiveness of the systems may vary across different areas.** In some cases, the scale of the rainwater harvesting systems

may not have been sufficient to meet the needs of all farmers, limiting the project's overall impact on water supply and agricultural output.

Groundwater Recharge and Flood control: Local community members stated that there was an **increase in groundwater levels and a reduction in flooding in surrounding areas. The RRWH project did impact the environment in a positive manner, with community members reporting increases in groundwater levels as well as reductions in flooding.** In a region where groundwater depletion has been a continuing problem, the project has successfully replenished groundwater levels by capturing rainwater that would otherwise be lost to runoff. **This stored water has provided a critical resource during dry periods, improving water availability for both agriculture and household use.** The reduction in flooding has also been a major benefit, protecting infrastructure and reducing health risks associated with standing water. These environmental improvements contribute to the long-term sustainability of the region's water resources, though ongoing maintenance and monitoring will be essential to sustaining these positive outcomes.

Sustainability

Sustainability through government institutions: The sustainability of the rainwater harvesting initiative is largely attributed to the choice of implementing the programme within government institutions. **Government institutions, by nature, are more stable and enduring, providing a secure foundation for long-term projects like rooftop rainwater harvesting (RRWH) systems.** Moreover, some government institutions allocate a portion of their budget towards the upkeep and maintenance of the systems, further ensuring their longevity. This institutional backing creates a solid foundation for the sustainability of the initiative.

Maintenance and Funding: **The sustainability of the programme is also reinforced by their active involvement in maintaining the RRWH systems.** They have demonstrated a commitment to keeping these systems functional by allocating specific budget lines for maintenance. **The administrative staff recognises the importance of the water conservation systems and have ensured that they remain operational. In some instances, if immediate repairs are required and the budget is insufficient, staff has personally contributed from their own salaries to cover repair costs.** This level of personal commitment and responsibility reflects the value that the staff place on the systems and the critical role they play in addressing local water scarcity.

Awareness and knowledge among staff: Another key factor contributing to the sustainability of the initiative is the awareness and knowledge of the staff regarding the maintenance of the RRWH systems. A few beneficiaries mentioned that they were informed by the implementing partner about the specific requirements for keeping the systems functional**. This transfer of knowledge has empowered the staff to take proactive steps in ensuring the longevity of the structures. Their understanding of how the systems work and the importance of regular maintenance has enabled them to handle minor issues and prevent larger problems from occurring.** This awareness is crucial for the success of any long-term intervention, as it ensures that the systems remain effective well after the initial implementation phase.

4. KAP Analysis

Rooftop Rainwater Harvesting

Knowledge

Awareness of the Rooftop Rainwater Harvesting (RRWH) system has grown among the beneficiaries, who **understand how the system functions and are familiar with the basic maintenance steps**. They have developed a better understanding of rainwater harvesting and water conservation. However, some RRWH structure need minor repairs, and the staff has indicated they lack the knowledge to manage these technical issues, which may affect the system's long-term sustainability.

Attitudes

The staff views the RRWH system as a valuable resource, both for meeting their water needs and contributing to the broader goal of improving groundwater levels. **Also, community members stated that they are motivated to maintain the system and ensure its longevity**, reflecting a strong commitment to the RRWH initiative. This positive attitude towards the project helps build a sense of ownership and supports the system's continued effectiveness.

Practices

Most Government institutions have set up routines to ensure the RRWH systems are well-maintained, including regular cleaning and inspections to keep the structures functional. Many staff members have even contributed a portion of their salaries to support maintenance costs, demonstrating their commitment to the system's upkeep. **This proactive approach by the staff members shows a strong sense of responsibility, essential for sustaining the system and its benefits over time.**

Pond Rejuvenation

Knowledge

With the rejuvenation of ponds, awareness of water conservation practices has increased among community members and village leaders. **There is a strong understanding within the community, that the ponds help replenish groundwater, which is crucial for long-term water sustainability.** This level of awareness encourages community members to support and responsibly engage with the ponds, recognising their importance in water resource management.

Attitudes

The community has shown a highly positive attitude toward groundwater conservation and the pond rejuvenation efforts, with strong support for maintaining the ponds. Key opinion formers (KOFs) and Panchayat officials expressed enthusiasm for preserving the ponds, understanding that these interventions are vital for sustaining groundwater resources. **This supportive attitude, particularly from local leaders, enhances community involvement and motivates collective care for the ponds.**

Practices

Key opinion formers, village leaders, and Panchayat members are actively involved in the regular upkeep of the ponds. In most areas, the ponds and accompanying solar streetlights and piezometers are well-maintained and fully operational, highlighting the community's dedication to the project. **This collaborative approach to maintaining the water conservation infrastructure reinforces the community's commitment to sustainable water use practices and helps ensure that the ponds continue to support groundwater replenishment.**

5. KOF Perception Analysis

During the study, opinions of some of the key prominent and influential members of the community were asked to respond to a series of 16 statements. These statements were drafted to gauge their opinion about the project relevance, planning, operations, impact, and sustainability. The Key Opinion Formers (KOF) included community members such as village leaders, community elders, Panchayat members and staff from Government institutions. They were asked to respond in terms of extent of agreement to the statements. The KOF tabulated below highlights the various responses in terms of agreement levels.

S/N	KOF Questions	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	% in agreement*
1.	I am aware of the objectives and activities that were undertaken for the water conservation project	0%	1%	21%	38%	40%	78%
2.	I am aware of the benefits of the water conservation project	0%	0%	17%	45%	38%	83%
3.	I understand the importance of water conservation	0%	0%	1%	6%	93%	99%
4.	I believe that the interventions have been to the benefit of my community	0%	1%	10%	27%	62%	89%
5.	I believe that the interventions have led to an increase in the groundwater levels in my village	0%	0%	7%	28%	65%	93%
6.	I believe that the interventions have reduced the vulnerability of my community to water shortages	0%	1%	18%	22%	59%	81%
7.	I believe that the intervention was carried out in a fair and satisfactory manner	0%	0%	0%	19%	81%	100%
8.	I am satisfied with my level of involvement in the project	1%	4%	13%	18%	64%	82%

9.	I believe that my community was well represented in the decision-making process throughout the intervention	0%	1%	18%	26%	55%	81%
10.	I believe that the intervention has increased access to water in my community	0%	0%	7%	21%	72%	93%
11.	I am satisfied with the support provided by AFPRO throughout the project	0%	0%	5%	17%	78%	95%
12.	I believe that the project was carried out smoothly and there was good collaboration among different stakeholders involved in the project	0%	0%	4%	23%	73%	96%
13.	I believe the intervention has improved public infrastructure within the community	0%	0%	11%	21%	68%	89%
14.	I believe that the intervention has had a positive impact on the environment which has led to an improvement in our quality of life	0%	0%	20%	21%	59%	80%
15.	I believe that the intervention will benefit my community for a very long time	0%	2%	9%	24%	65%	89%
16.	I believe the intervention has improved the community's awareness on water related issues	0%	1%	14%	14%	71%	85%

	Above 15% in Neutral, and disagree responses
	Below 90% in Percentage of agreement
	90% and above in Percentage of agreement

* The Percentage in Agreement column represents total responses from Agree and Strongly Agree categories.

The table highlights the community's responses to the water conservation project, showcasing significant positive perceptions across various aspects. The survey results demonstrate that the water conservation project has been well-received and is likely to have a lasting impact on

the community. **Notably, 93% of respondents believe that the interventions have led to increased groundwater levels in their village, which speaks directly to one of the core objectives of the project.** This high percentage underscores the effectiveness of the intervention in addressing local water scarcity issues, a critical concern for many rural areas.

Furthermore, 81% of respondents feel that the project has reduced their community's vulnerability to water shortages, while **89% believe that the intervention will have long-term benefits**. This perception of reduced vulnerability suggests that the community not only sees immediate improvements in water availability but also trusts that the intervention will help mitigate future water crises. This trust is essential for long-term sustainability, as it can encourage the community to continue supporting and maintaining the infrastructure over time.

There is also strong support for the intervention's impact on community infrastructure and environmental quality. **89% of respondents believe that the intervention has enhanced public infrastructure within the community, showing that the benefits go beyond water access and include improvements to the physical environment.** Additionally, 80% feel that the project has positively impacted the environment, which has improved their quality of life. This high level of agreement suggests that the project's benefits are broad and visible, affecting various aspects of daily life. Moreover, 85% of respondents feel that the intervention has raised community awareness on water-related issues, indicating that the project has educational value, which could contribute to a shift in attitudes and practices around water conservation.

Overall, the high levels of satisfaction, trust, and perceived benefits among community members reflect a successful intervention that has achieved both tangible and intangible outcomes. The strong community support and perceived sustainability suggest that this project has laid a solid foundation for lasting positive change in water conservation practices and groundwater management.

6. Volumetric Water Benefit Accounting

In order to assess and account the benefits of their water stewardship activities under the project, Volumetric Water Benefit Accounting (VWBA) was undertaken as a part of the impact assessment study. VWBA was conducted to disseminate the hydrogeological impact in terms of quantified amount through various water conservation measures. The methodology included collection of information related to hydro-physical properties of soils, detailed and careful inspection of the project implementation sites, water storage/retention/infiltration capacities, and performance of the structure.

For the purpose of VWBA, 100% structures were covered. A specialised agency called People's WASH Solution LLP was appointed for conducting VWBA. GT oversaw the work of the agency and managed logistics for the team.

About the People's WASH Solution LLP

People's WASH Solution LLP is a start-up firm recognised by Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, Government of India and a Micro Enterprise as registered with MSME/ Udyam. It offers services and products to help organisations with solutions in areas of water, air sanitation, and hygiene and adopts a pro-planet development model.

6.1 Methodology for VWBA

For estimating the potential volumetric water benefits under this study, the methodology prescribed in the document titled "Volumetric Water Benefit Accounting: A method for implementing and valuing Water Stewardship Activities," developed in 2019 by the World Resources Institute (WRI) in association with LimnoTech, Quantis, and Valuing Nature, has been used as the basis. The VWBA methodology provides water stewardship practitioners with standardised methods for implementing stewardship actions and quantifying the benefits of various water stewardship activities.

Category	Activity	VWB Indicator	Calculation Methods	Appendix
Water Supply and Reliability	Recharge Ponds	Increased Recharge	Capture and Infiltration Method	A-4
	Rooftop Rainwater Harvesting	Increased Recharge	Capture and Infiltration Method	A-4

To calculate additional infiltration potential created from the activities, the Capture and Infiltration Method described in Appendix A-4 of the VWBA working paper was adopted. The capture and infiltration method estimates the groundwater recharge based on three parameters as given below:

Ground Water Recharge Estimation	
01	**Available Water Supply** The volume of water draining from a catchment (runoff) corresponding to the intervention under consideration
02	**Volume of Water** Volume of water captured by the intervention under consideration
03	**Water Loss** Losses due to evaporation and usage (i.e., withdrawal)

Accordingly, recharge volume is calculated using the equations, as presented below:

Recharge volume = Volume captured - [Evaporation + Withdrawal] Where, volume captured (actual volume captured by the intervention) is considered as minimum of the volume of the available supply or runoff from the catchment and the storage potential minus the sum of evaporation and withdrawal.
Volume captured = Min [Available supply, Storage potential] Storage potential is the volume of water stored by the intervention under consideration during the assessment period. Accordingly, the storage potential is calculated as the volume of the intervention multiplied by the number of times the structure is filled to its capacity during the assessment period.
Storage potential = Design storage capacity x Number of times filled to capacity Available water supply or runoff is calculated based on the catchment area, runoff coefficient, and the rainfall during the assessment period (e.g., year)
Available supply (runoff) = Catchment area x Runoff coefficient x Annual rainfall For modified structures, these calculations are estimated for the baseline condition and then repeated using the improved storage capacity of the lakes after the rejuvenation activities. The difference would provide the additional recharge volume or potential volumetric water benefit that has been created as a result of the project activities.

Ponds capture excess rainfall and runoff for groundwater recharge and community, economic, and/or ecosystems use. Increased recharge is calculated as the difference in recharge volume for the "with-project" condition compared to the "baseline" condition. The "baseline" condition typically has no recharge, unless the project improves the recharge capability of an existing intervention (e.g., by desilting an existing pond). The "with-project" condition represents construction of rainwater capture interventions to increase recharge.

The method is applied through the following steps:

- The available supply is calculated by multiplying the catchment area by the annual average precipitation (rainfall depth) and an appropriate catchment runoff coefficient.
- Storage potential is then calculated based on the design storage capacity of the intervention(s) and the number of times the intervention(s) fill(s) to capacity during a typical year.

- The volume captured is then calculated as the minimum of available supply and storage capacity.
- Finally, the volume available for recharge is calculated by subtracting evaporative and usage losses (for some features, such as infiltration pits and wells, the usage and evaporation losses may be negligible) from the volume captured, if applicable.

The VWB is quantified as the difference in recharge volume for the "baseline" and "with-project" conditions.

VWB = Recharge (With-project) – Recharge (Baseline)

Note: For rainwater harvesting projects, typically the "baseline" recharge volume can be assumed to be 0, and the equation simplifies to VWB = "with project" recharge.

The following steps were followed for the data collection:

- In-depth interaction with the implementing partner (AFPRO) for assessing the project's rationale, objectives, activities, and other details.
- A desk review of the documents including project completion report enabled detailed understanding of the purpose and implementation details of the structures.
- Site visits were carried out for careful inspection of the landscape and the structures constructed under the project.
- Details such as water storage, retention, infiltration capacities, and performance of the structure were assessed.
- Post data collection, analysis was carried out, and based on calculations, the results were published.

6.2 Key assumptions for VWBA

The following key assumptions were made during the calculation of the VWBA for the structures across Ludhiana.

- Evaporation losses are assumed to be 10% of the total water storage capacity per annum and have been accounted for accordingly.
- During the site visit, groundwater recharge is considered zero if the structure is completely damaged, non-functional, or affected by other developmental activities or encroachments.
- The runoff coefficient is taken as 0.2 for open and green areas and 0.8 for paved/road or concrete/shed roof areas for calculating rainwater storage and groundwater recharge.
- Groundwater recharge potential is assumed to be 50% of the annual water storage capacity and the number of fillings reported in 2023 by stakeholders and project teams. The rest of the water is assumed to be either lost as runoff or used for irrigation and other purposes from rejuvenated ponds.

6.3 VWBA for Recharge Pond

All 6 ponds were found to be fully functional during the time of the site visits. The following section presents the key findings of the Volumetric Water Benefit Accounting (VWBA) for ponds in Ludhiana:

Table 10 - VWBA for pond structures

Project Activity	No. of structures	Estimated VWBA in KL/Year in 2024	Type of Benefit	Assumptions
Recharge Pond	6	191403	Recharge Potential	-10% evaporation losses considered - 3 fillings per annum

It was observed that the estimated Recharge Potential for Ponds in Ludhiana, as per VWBA in 2024 is 191403 KL/ Annum.

6.4 VWBA for Rooftop Rainwater Harvesting structures

13[3] out of the 14 RRWH structures in Ludhiana were found to be functional. The following section presents the key findings of the Volumetric Water Benefit Accounting (VWBA) for RRWH in Ludhiana:

Table 11: VWBA for RRWH structures

Project Activity	No. of structure	Estimated VWBA in KL/Year in in 2024	Type of Benefit	Assumptions
Rooftop Rainwater Harvesting	14	2676	Recharge Potential	-25% First Flush and other losses considered - Rainfall data of assessment year used

It was observed that the estimated Recharge Potential for Roof Top Rainwater Harvesting in Ludhiana, as per VWBA in 2024 is 2676 KL/ Annum.

[3] One structure could not be examined as the Government institution has built a structure above the tank.

7. Way Forward

Activation of Village Development Committees: It was noted that several community members, other than Key Opinion Formers, were not aware of reasons for the rejuvenation of ponds. UBL may consider activating Village Development Committees (VDCs) at the community level, with Key Opinion Formers (KOFs) in each village. This would increase water conservation activities at the village level and support the maintenance of existing RRWH infrastructure, contributing to the overall sustainability of the project.

Developing Well-Defined KPIs: It was observed that KPIs were not identified during the baseline study by implementing partner. Establishing these KPIs early on would have provided a clearer framework for tracking progress and measuring outcomes. UBL might consider defining KPIs during baseline studies to help streamline project objectives, improve documentation, and create a strong foundation for monitoring and evaluating the project's impact throughout its lifecycle.

8. Case Studies

Baljinder Singh

Farmer, Budhewal

Baljinder Singh of Budhewal, plays a crucial role in the sustainable water management efforts in his village, which encompasses over 1,850 acres of agricultural land requiring significant irrigation. The region has faced challenges related to the overutilisation of water for farming and wastage in households.

The UBL project focused on rejuvenating a local pond, addressing a pressing need for reliable water resources while ensuring the pond remained free from pollution. In contrast to another pond in the village that had become polluted and nearly unusable, the new project aimed to provide a clean and functional water source for both agricultural and domestic needs. Singh expressed satisfaction with the project, noting that the pond has transformed an unused area into a valuable resource, significantly preventing rainwater wastage and reducing the risk of flooding in the community.

Moreover, the project has fostered a sense of ownership among the residents, who have become actively involved in its maintenance. Under Singh's leadership, the village utilises funds from the National Rural Employment Guarantee Act (NREGA) to ensure ongoing upkeep of the pond. This initiative has not only enhanced the infrastructure surrounding the pond but also created a walking path that encourages community interaction and promotes environmental stewardship.

9. Annexures

Volumetric Water Benefit Accounting for Rooftop Rainwater Harvesting structures

Volumetric Water Benefit Accounting for the year 2023 key data (data to be validated in FGDs or Key Stakeholders Interviews during site visit)									Volumetric Water Benefit Accounting for the year 2023 key data (data to be validated in FGDs or Key Stakeholders Interviews during site visit)				
S No	Gram Panchayat	Village	Roof Area in sqm	Type of Roof	Run off cofficient of roof type	Annual average rain fall assumed in designing in mm	Dia of the recharge bore shaft in mm	Depth of the bore shaft in feet	Average Annual rainfall in mm (2023)	No of Rainy days when rained in year 2023	Average losses due to first flush, evaporation, filter efficiency etc.	Ground Water Recharge in as per VWBA in 2024	Remarks based on Field Visits
1	Lalton Kalan	Lalton Kalan	979	RCC	0.8	550	200	150	459.1	60 - 70	90	270	Need cleaning and flushing of filter medium
2	Lalton Kalan	Dolon Kalan	940	RCC	0.8	550	200	160	459.1	60 - 70	86	259	Need cleaning and flushing of filter medium
3	Gill	Gill	689	RCC	0.8	550	200	180	459.1	60 - 70	63	190	Need cleaning and flushing of filter medium
4	Gill	Gill	808	RCC	0.8	550	200	210	459.1	60 - 70	74	223	Need cleaning and flushing of filter medium
5	Gill	Gill	682	RCC	0.8	550	200	230	459.1	60 - 70	63	188	Need cleaning and flushing of filter medium
6	Ward No- 3	Jawaddi kalan	543	RCC	0.8	550	200	210	459.1	60 - 70	50	150	Need cleaning and flushing of filter medium

7	Ward No- 4	Jawaddi kalan	450	RCC	0.8	550	200	240	459.1	60 - 70	41	124	Need cleaning and flushing of filter medium
8	Sahibana	Sahibana	459	RCC	0.8	550	200	200	459.1	60 - 70	42	126	Need cleaning and flushing of filter medium
9	Sahibana	Sahibana	981	RCC	0.8	550	200	220	459.1	60 - 70	90	270	Need cleaning and flushing of filter medium
10	Ayali Kalan	Ayali Kalan	954	RCC	0.8	550	200	240	459.1	60 - 70	88	263	Need cleaning and flushing of filter medium
11	Dasmesh Nagar	Ayali Khurd	850	RCC	0.8	550	200	220	459.1	60 - 70	78	234	Need cleaning and flushing of filter medium
12	Dasmesh Nagar	Ayali Khurd	449	RCC	0.8	550	200	200	459.1	60 - 70	41	124	Need cleaning and flushing of filter medium
13	Dasmesh Nagar	Ayali Khurd	415	RCC	0.8	550	200	210	459.1	60 - 70	38	114	Need cleaning and flushing of filter medium
14	Ward No - 56	Sarabha Nagar	515	RCC	0.8	550	200	230	459.1	60 - 70	47	142	Not accessible during visit as structure has been covered by new building
	Total for all RWH											**2676**	

Volumetric Water Benefit Accounting for Pond structures

Gram Panchayat	Budhewal	Panglian	Hawas	Bhamia Kurdh	Kot GanguRai	Khasi Kalan	Total
Village	Budhewal	Panglian	Hawas	Bhamia Kurdh	Kot GanguRai	Khasi Kalan	
Length or circumference of rejuvenated pond in m (e.g. L=10m or C=10 m)	48	80	100	48	60	35	
Width or Diameter of the pond in m (e.g. W=5 m or D=5m)	40	30	30	35	48	35	
Maximum depth/ Height of water of Pond in m	5.82	5.82	5.82	5.2	5.3	3.5	
No. of Fillings in a year till top level of the Pond assumed in design	3	3	3	3	3	3	
Annual average rain fall assumed in designing in mm	550	550	550	550	550	550	
Catchment area of the Pond in Ha	300	163	278	89	472	63	
Runoff coeff.	0.8	0.8	0.8	0.8	0.8	0.8	
Average Annual rainfall in mm (2023)	459	459	459	459	459	459	
No of Rainy days when rained in year 2023	40 - 50	40 - 50	40 - 50	40 - 50	40 - 50	40 - 50	
No of times Pond was filled up to maximum storage capacity (2023)	3	3	3	3	3	3	

Name of the Crop Sown in 2023	Paddy, Wheat	Paddy, pulses	Wheat, Rice	Vegetables	Pulses	Pulses	
Sown Area of crop in the vicinity of Pond in Ha (2023) directly irrigated by Pond Water	18	24	22	14	28	32	
Depth in inches of water Irrigated in each irrigation event	2 inch - 3 inch	2 inch - 3 inch	2 inch - 3 inch	2 inch - 3 inch	2 inch - 3 inch	2 inch - 3 inch	
No of Irrigation wells/ Tubewells in the area in 2023	12	11	7	4	8	5	
Average Dia meter of Wells /Tubewells in mm	8 inch	8 inch	8 inch	8 inch	8 inch	8 inch	
Depth of Irrigation wells / Tubewells in m	60 - 80	60 - 80	60 - 80	60 - 80	60 - 80	60 - 80	
Capacity of Pumps installed in HP	5 HP	5 HP	5 HP	5 HP	5 HP	5 HP	
Average No of Pumping hours per day	8	8	8	8	8	8	
Depth of water table below Ground level (Minimum) in m in 2023	16	15	19	17	14	19	
Depth of water table below Ground level (Maximum) in m in 2023	17	15	19	17.5	14	19	
Average Evapotranspiration rate of the year in mm/day/ha	4	4	4	4	4	4	

Ground Water Recharge Capacity Generated minus 10% evaporation losses	992606	537773	918054	294304	1561147	207872	**4511755**
Net Surplus/Deficit ground water storage (+/-)	-178591590	-177037492	-178336855	-176205593	-180534212	-175910268	**-1066616011**
Estimated Ground Water Recharge as per VWBA in Cum/annum	30171	37714	47142	23587	41213	11576	**191403**
Remarks	Verified and okay	Verified and okay	Verified and okay	Verified and okay	Verified and okay	Verified and okay	

Tools

Quantitative questionnaire for Pond Rejuvenation, Solar Streetlights and Piezometers

Sl. no	Question	Response	Code	Skip
A.	**Demographic Details**			
1.	Name of Respondent			
2.	Name of State			
3.	Name of Village			
4.	Age			
5.	Gender	Male	1	
		Female	2	
		Others/ Prefer not to say	99	
6.	Caste	SC	1	
		ST	2	
		OBC	3	
		General	4	
		Prefer not to say	98	
7.	Occupation(s)	Farming / Agriculture	1	
		Livestock rearing	2	
		Daily wage labour	3	
		Self-employed	4	
		Employed in Govt or Private company	5	
		Unemployed	6	
		Others_____	99	
B.	**Pond Rejuvenation – Before Project**			
8.	Was there a shortage of water in the area before the rejuvenation of ponds?	Yes	1	
		No	2	Skip to 12
9.	How often did you experience water shortage before the project?	More than 2 times in a month	1	
		1 - 2 times in a month	2	
		Once in two months	3	
		Once in three months	4	
		Only in summer / winter	5	
		Never	6	
		Not sure	7	

10.	What was the main water-related challenge you faced before the project?	Water scarcity	1	
		Poor water quality	2	
		Lack of irrigation	3	
		Flooding	4	
11.	How often would the pond dry up before the programme	Every Year	1	
		Every Few years	2	
		Rarely	3	
		Never	4	
12.	Was the pond used before the project	Yes	1	
		No	2	Skip to 14
13.	If, yes, what was the pond used for before the project	Irrigation	1	
		Drinking Water	2	
		Bathing	3	
		Livestock watering	4	
		Fishing	5	
		Socio-cultural Activities	6	
C.	**Pond Rejuvenation – Project Impact**			
14.	Are you aware of the pond rejuvenation efforts undertaken by UBL	Yes	1	
		No	2	Skip to 16
15.	How did you first hear about the pond rejuvenation project?	Community meeting	1	
		Local government	2	
		Neighbours	3	
		Other	4	
16.	Do you think that the project has had a positive impact on the community	Yes	1	
		No	2	Skip to 18
17.	If yes, what impact have you seen since the start of the project?	Improved water quality	1	
		Better irrigation	2	
		Increased underground water table	3	
		Increased surface water	4	
18.	Do you think that the project has had a positive impact on your livelihood?	Yes	1	
		No	2	Skip to 20
19.	If yes, what impact has it had on your livelihood?	Enhanced Agricultural Productivity	1	
		Improved livestock health	2	
		Improved availability of ground water	3	

		Increased income due to diversification of agriculture	4	
		Created new job opportunities in pond maintenance	5	
		No noticeable impact	6	
20.	Is your primary occupation farming?	Yes	1	
		No	2	Skip to 23
21.	Do you think the rejuvenation of the pond has had an impact on agriculture in the area?	Yes	1	
		No	2	Skip to 23
22.	What impact has there been of the rejuvenation of the pond on agriculture	Increased irrigation water supply	1	
		Improved soil moisture	2	
		Enhanced groundwater recharge	3	
		Increased availability of silt	4	
		Reduced crop stress	5	
23.	Is your primary occupation animal husbandry	Yes	1	
		No	2	Skip to 29
24.	Do you think the rejuvenation of the pond has had an impact on your occupation?	Yes	1	
		No	2	Skip to 29
25.	If yes, what impact has there been on animal husbandry	Reliable water source for bathing	1	
		Reliable water source for drinking water	2	
		Improved livestock health	3	
		Increased milk and meat production	4	
26.	Did you attend any of the awareness sessions held in your village during the project?	Yes	1	
		No	2	Skip to 31
27.	What was the impact of the community engagement sessions?	Gained an understanding of the project	1	
		Understanding of the groundwater levels in the area	2	
		Formation of Village development committee	3	
		Improved understanding of the need for water conservation	4	

D.	**Pond Rejuvenation – After Project**			
28.	Are you aware of any committee formed in the village for the maintenance of the pond?	Yes	1	
		No	2	Skip to 33
29.	Are you aware of any maintenance efforts undertaken by the Village Development Committee after project completion	Yes	1	
		No	2	
E.	**Solar streetlights**			
30.	Are you aware that solar streetlights were installed around the pond?	Yes	1	
		No	2	Skip to 32
31.	What was the situation with regards to electrification in the village before the project	There was no public lighting available	1	
		A few streetlights were installed but they were largely non-functional	2	
		Streetlights were installed but functioned intermittently	3	
		Streetlights were available but do not function	4	
		There is sufficient lighting available	5	
32.	Do you think the installation of solar streetlights has benefitted the village?	Yes	1	
		No	2	Skip to 34
33.	How has the installation of the solar streetlights benefitted the village?	Enhanced Safety	1	
		Increased Usability of the area	2	
		Environmental Benefits due to sustainable public lighting	3	
		Improved Aesthetics	4	
34.	Is there a mechanism in the village to ensure the maintenance of solar streetlights?	Yes	1	
		No	2	
35.	How would you rate the overall satisfaction with the solar streetlights installation?	Extremely satisfied	1	
		Satisfied	2	
		Neutral	3	
		Not Satisfied	4	
F.	**Piezometer**			
36.	Are you aware that piezometers were installed in the village	Yes	1	
		No	2	Skip to 40
37.		Yes	1	

	Do you know how the piezometer works	No	2	
38.	How regularly in the piezometer checked and maintained	Daily	1	
		Weekly	2	
		Monthly	3	
		Once in 6 months	4	
		Never	5	
39.	How satisfied are you with the installation of the piezometer	Extremely satisfied	1	
		Satisfied	2	
		Neutral	3	
		Not Satisfied	4	
G.	**Satisfaction Levels**			
40.	**Satisfaction ratings**	Not Satisfied, Neutral, Satisfied, Extremely Satisfied		
	Pong Rejuvenation			
	Solar Streetlights installation			
	Piezometer installation			

Quantitative Tool - Rooftop Rainwater Harvesting

Sl. No.	Question	Response	Code	Skip
A.	**Demographic Details**			
1.	Name of Respondent			
2.	Name of State			
3.	Name of Village			
4.	Age			
5.	Gender	Male	1	
		Female	2	
		Others/ Prefer not to say	99	
6.	Caste	SC	1	
		ST	2	
		OBC	3	
		General	4	
		Prefer not to say	98	
7.	Your occupation(s)	Farming / Agriculture	1	
		Livestock rearing	2	
		Daily wage labour	3	
		Self-employed	4	

		Employed in Govt or Private company	5	
		Unemployed	6	
		Others_____	99	
8.	Average annual household income			
9.	Average landholding size			
B.	**RRWH – Before Project**			
10.	Was there a shortage of water in the area before the construction of the Rooftop Rainwater Harvesting System?	Yes	1	
		No	2	Skip to 13
11.	How often did you experience water shortage before the project?	More than 2 times in a month	1	
		1 - 2 times in a month	2	
		Once in two months	3	
		Once in three months	4	
		Only in summer / winter	5	
		Never	6	
		Not sure	7	
12.	What was the main water-related challenge you faced before the project?	Water scarcity	1	
		Poor water quality	2	
		Lack of irrigation	3	
		Flooding	4	
		Others	99	
C.	**RRWH – Project Impact**			
13.	Are you aware of the Rooftop Rainwater Harvesting structures installed?	Yes	1	
		No	2	
14.	Do you think that the Rooftop Rainwater Harvesting has benefitted the village?	Yes	1	
		No	2	Skip to 16
15.	If, yes, how do you think it has benefitted the village	Increased groundwater levels	1	
		Reduced water scarcity	2	
		Enhanced water quality	3	
		Improved agricultural productivity	4	
		Reduced surface run off	5	
16.	Do you think that the project has had a positive impact on your livelihood?	Yes	1	
		No	2	Skip to 18
17.	If yes, what impact has it had on your livelihood?	Enhanced Agricultural Productivity	1	
		Improved livestock health	2	

		Improved availability of ground water	3	
		Increased income due to diversification of agriculture	4	
		No noticeable impact	5	
18.	Is your primary occupation farming?	Yes	1	
		No	2	Skip to 21
19.	Do you think the increased availability of water has had an impact on agriculture in the area?	Yes	1	
		No	2	Skip to 21
20.	If yes, What impact has there been on agriculture?	Increased irrigation water supply	1	
		Improved soil moisture	2	
		Enhanced groundwater recharge	3	
		Increased availability of silt	4	
		Reduced crop stress	5	
21.	Did you attend any of the awareness sessions held in your village during the project?	Yes	1	
		No	2	Skip to 23
22.	What was the impact of the community engagement sessions?	Gained an understanding of the project	1	
		Understanding of the groundwater levels in the area	2	
		Improved understanding of the need for water conservation	3	
D.	**RRWH – Satisfaction levels**			
23.	Are you satisfied with the Rooftop Rainwater Harvesting initiative?	Extremely Satisfied	1	
		Satisfied	2	
		Neutral	3	
		Not Satisfied	4	

Qualitative Tool for Community members – Pond Rejuvenation, Solar Streetlights and Piezometer

S/N	Question	Response
A.	**General Details**	
1	Name	
2	Age	
3	Date	
4	Village name and GP Name	
B.	**Programme Specific Details**	
5	What are the sources of water for your community? **Probe**: perennial ponds, lakes, rivers, streams, tap water, community borewell, private borewells, seasonal (rain-fed) ponds or tanks	
6	What were the water-related challenges faced by your community before the project? Please explain in detail. **Probe**: availability and access to ground water, water for agriculture, livestock, domestic purposes, seasonality	
7	Are you aware that pond rejuvenation activities have been undertaken in your village? If yes, could you tell me a bit about the intervention? Probe: Awareness of the project, understanding of water conservation, awareness of the benefits of the project)	
8	Do you think the project here has helped the community in any way? (Probe: impact on ground water levels, awareness among the community, behavioural change among community members, impact on livelihoods)	
9	Are you aware that solar streetlights have been installed in your village? If yes, could you tell me a bit about the intervention? Probe: Awareness of the project, understanding of the need for solar streetlights, awareness of the benefits of the project)	
10	Do you think the project here has helped the community in any way? (Probe: impact on ground water levels, awareness among the community, behavioural change among community members, impact on livelihoods, aesthetic changes to the area)	
11	Are you aware that a piezometer has been installed? If yes, could you tell me a bit about the intervention? Probe: Awareness of the project, awareness of the benefits of the intervention, use and maintenance, understanding of the instrument)	
12	Do you think the project here has helped the community in any way? (Probe: impact on ground water levels, awareness among the community, behavioural change among community members, impact on livelihoods)	
13	Did you take part in the awareness meetings? If yes, what was discussed during the meetings and how has it impacted your understanding of water conservation? Probe: improved understanding of the project, need for the project, understanding of water conservation, understanding of groundwater levels and its importance, way sessions were conducted)	
14	Are you aware of the activities of the Village Development Committee? If yes, could you tell me more about their activities? Probe: regularity of meetings, discussion points, action taken on repairs and maintenance, any other water conservation activities undertaken)	

15	How sustainable are these improvements? (probe: maintenance and repairs, long term impact on the lives of community members)	

Qualitative Tool for Community Members – Rooftop Rainwater Harvesting

S/N.	Question	Response
A.	**General Details**	
1	Name	
2	Age	
3	Date	
4	Village name and GP Name	
B.	**Programme Specific Details**	
5	What are the sources of water for your community? **Probe**: perennial ponds, lakes, rivers, streams, tap water, community borewell, private borewells, seasonal (rain-fed) ponds or tanks	
6	What were the water-related challenges faced by your community before the project? Please explain in detail. (Probe: availability and access to ground water, water for agriculture, livestock, domestic purposes, seasonality)	
7	Are you aware that RRWH systems have been installed? If yes, could you tell me a bit about the intervention? (Probe: Awareness of the project, understanding of water conservation, awareness of the benefits of the project)	
8	Do you think the project here has helped the community in any way? (Probe: impact on ground water levels, awareness among the community, behavioural change among community members, impact on livelihoods)	
9	Did you take part in the awareness meetings? If yes, what was discussed during the meetings and how has it impacted your understanding of water conservation? Probe: improved understanding of the project, need for the project, understanding of water conservation, understanding of groundwater levels and its importance, way sessions were conducted)	
10	How sustainable are these improvements? (probe: maintenance and repairs, long term impact on the lives of community members)	

Qualitative questionnaire for PRI members

S/N	Questions	Response
A	**General details**	
1	Name	
2	Village	
3	Block/District name	
4	Designation	
5	Occupation	
B	**Programme specific questions**	
1	Could you provide detailed information regarding the activities/initiatives undertaken by AFPRO in your village? (Probe: details on the activities, how they were taken place, duration of the activities)	
2	What has been your role and responsibility in the overall programme duration? (Probe: facilitating programme implementation, involvement in project phases, mitigating challenges in the project, collaboration and decision making)	
3	What was the situation of water availability and quality before project implementation and how has the programme benefited the village? (Probe: understanding water quality before intervention, challenges faced regarding water availability, post implementation how challenges were addressed)	
4	Have you noticed any changes in the community w.r.t. water conservation and participation in the implementation of the project? (Probe: behavioural changes, improved awareness, and education on water conservation)	
5	How active is the Gram Panchayat towards ensuring the sustainability of the water conservation practices introduced by the project? (Probe: any ongoing initiatives stated by the GP, maintenance and monitoring of ground water level, community engagement)	
6	How was the collaboration with AFPRO (implementing partner)? (Probe: communication with AFPRO, roles and responsibilities, planning and execution, community involvement)	
7	Feedback and suggestion	

Qualitative questionnaire for Implementing Partner

S/N	Questions	Response
A	**General details**	
1	Name	
2	Designation	
B	**Programme specific questions**	
1	Please elaborate on project execution and implementation and details on activities undertaken. (Probe: rationale behind the project, geographical significance, details of the activities undertaken)	
2	Please elaborate upon the awareness level among community member w.r.t. water conservation before project implementation. (Probe: project team's observation on water conservation practices in the village, need for project implementation)	
3	How did you engage the community member and Gram Panchayat of the village in the project, and what was their response? (Probe: mobilisation and sensitisation participation levels, roles and responsibilities, training and capacity building)	
4	How do you measure the effectiveness and impact of the rainwater harvesting structures, pond rejuvenation efforts and the installation of solar streetlights? (Probe: water quality improvement, clean water availability, ground water recharge levels, environmental impact)	
5	What provisions are made to ensure the long-term sustainability of the water conservation structures and the solar streetlights? (Probe: community involvement, training, and capacity building)	
6	Can you provide details about the awareness sessions and workshops conducted for the community? (Probe: Frequency and duration, participation level, mobilisation of target audience, content of the trainings sessions, details on the trainers)	
7	Are there any plans to expand or replicate this project in other areas? If so, what are the next steps?	
8	Feedback and suggestion	

Qualitative questionnaire for the Administration

S/N	Questions	Response
A	**General details**	
1	Name	
2	Name of the institution	
3	Village	
4	Block/District name	
5	Designation	
B	**Programme specific questions**	
1	Could you provide detailed information regarding the activities/initiatives undertaken by AFPRO? (Probe: details on the activities, how they were taken place, duration of the activities)	
2	What was your role and responsibility in the implementation of the programme? (Probe: facilitating programme implementation, involvement in project phases, mitigating challenges in the project, collaboration and decision making)	
3	What was the situation of water availability and quality before project implementation and how has the roof top water harvesting programme benefited the village?	
4	How has the availability of water changed since the installation of the rainwater harvesting structures? (Probe: water availability, difference during dry season/summers)	
5	Have you noticed any changes in the environmental awareness and behaviour of beneficiaries since the implementation of project? (Probe: behavioural changes, engagement, improved awareness, and education on water conservation)	
6	Have there been any educational programmes or activities related to rainwater harvesting introduced in your organisation? (Probe: type of programmes, frequency)	
7	Have you received any trainings on the maintenance of the roof top water harvesting structure? If yes, please elaborate. (Probe: types of training, frequency)	
8	Are there any operational challenges in maintaining the rainwater harvesting structures? (Probe: maintenance, usage)	
9	How active are the community members/GP towards ensuring the sustainability of the water conservation practices introduced by the project? (Probe: any ongoing initiatives stated by the GP, maintenance and monitoring of ground water level, community engagement)	
10	How was the collaboration with AFPRO (implementing partner)? (Probe: communication with AFPRO, roles and responsibilities, planning and execution, community involvement)	
11	Feedback and suggestion	

Perception Index for Key Opinion Formers (KOF)

S.No.	Statement	Responses
1.	I am aware of the objectives and activities that were undertaken for the water conservation project	
2.	I am aware of the benefits of the water conservation project	
3.	I understand the importance of water conservation	
4.	I believe that the interventions have been to the benefit of my community	
5.	I believe that the interventions have led to an increase in the groundwater levels in my village	
6.	I believe that the interventions have reduced the vulnerability of my community to water shortages	
7.	I believe that the intervention was carried out in a fair and satisfactory manner	
8.	I am satisfied with my level of involvement in the project	
9.	I believe that my community was well represented in the decision-making process throughout the intervention	
10.	I believe that the intervention has increased access to water in my community	
11.	I am satisfied with the support provided by AFFPRO throughout the project	
12.	I believe that the project was carried out smoothly and there was good collaboration among different stakeholders involved in the project	
13.	I believe the intervention has improved public infrastructure within the community	
14.	I believe that the intervention has had a positive impact on the environment which has led to an improvement in our quality of life	
15.	I believe that the intervention will benefit my community for a very long time	
16.	I believe the intervention has improved the community's awareness on water related issues	

Possible responses	Weightage
Strongly Disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly Agree	5

Photos from the field

Figure 7: Interaction with officials at Dolon Kalan

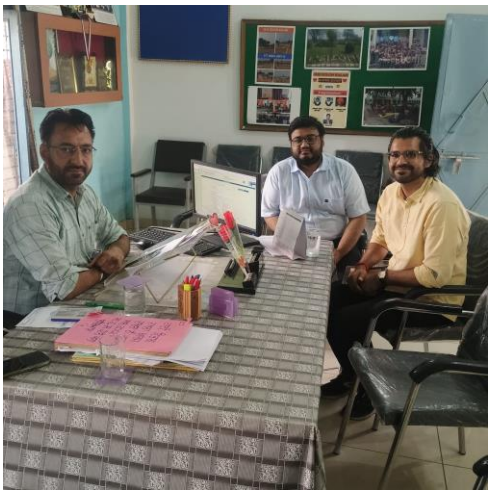


Figure 8: Interaction with Sarpanch at Panglian

Figure 9: Interaction with officials at Lalton Kalan

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