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Impact assessment of Water Conservation project

Karnataka, and Telangana

United Breweries Limited

December 2024

Contents

Abbreviations

AFPRO	Action for Food Production
CGWB	Central Ground Water Board
CSR	Corporate Social Responsibility
FGD	Focus Group Discussion
GTBLLP	Grant Thornton Bharat LLP
KL	Kilo Litres
KOF	Key Opinion Former
NGO	Non-Governmental Organisation
OECD-DAC	Organisation for Economic Cooperation and Development- Development Assistance Committee
PRI	Panchayat Raj Institutes
UBL	United Breweries Limited
VWBA	Volumetric Water Benefits Accounting
WUG	Water User Group

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Executive summary

UBL, as a part of its CSR activities, implemented a water conservation project with **the primary goal to promote water conservation through groundwater rejuvenation structures and rainwater harvesting practices in Telangana and Karnataka**. The project included the construction of groundwater recharge structures in 14 villages of Sangareddy district in Telangana, and in 10 villages of Nelamangala taluk, Bangalore Rural district in Karnataka, from November 2019 to November 2022. 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 impact assessment 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 (KAP) of the community members, and gauged the perception of Key Opinion Formers (KOF). Further, the Volumetric Water Benefit Accounting (VWBA) evaluation was carried out to assess the hydrological impact of the recharge structures – including check dams, recharge shafts/ injection borewells, and percolation tanks. The study undertook a mixed methodology, utilising both quantitative and qualitative techniques of data collection.

Data collection included a total of 736 quantitative surveys, 167 qualitative interactions, 64 KOF interactions. For VWBA 100% of the 63 recharge structures, were visited and evaluated.

Key Findings

In Karnataka, a total of 11 check dams, 30 recharge shafts / injection borewells were constructed under the project. **In Telangana, a total of 8 check dams, 10 recharge shafts / injection borewells and 4 percolation tanks were constructed across**. The below table presents the findings as the OECD-DAC principles.

Principles	Key Findings
Relevance	The project locations, including 24 villages were facing significant reduction in groundwater levels. **91% respondents revealed that they experienced water shortages** prior to the project. Additionally, 87% mentioned that their water sources would often dry up, leading to frequent water shortage. **By improving groundwater levels, the project contributed to the long-term resilience of agriculture, which is the primary occupation and source of income among these communities.**
Effectiveness	An important component of the project was water budget workshops, which brought local community members together, to assess the

	water resources in their villages. These workshops helped in understanding the history, trends, and relevant economic-socio-cultural aspects of water in the region. Additionally, awareness sessions were conducted to educate and train the beneficiaries on the efficient and sustainable use of different water resources. During these sessions, the participants were explained how the water structures worked, and ways to maintain them. **Respondents rated the effectiveness of the awareness sessions a 3.9/5. They expressed satisfaction in their learnings from the sessions.**
Efficiency	**70% respondents who attended the water budget workshops, believed that the discussions during the water budget workshops were helpful in project planning.** 68% of the respondents who attended the awareness sessions, stated that the sessions were instrumental in increasing awareness regarding water usage, conservation, and sustainability, among the community members across both locations. **Respondents provided 4/5 rating for procedures and processes followed by the implementation partner while executing the project.**
Impact	The study found that **74% of respondents felt that the infrastructure constructed under the project have been beneficial** to them. 67% of respondents reported a positive impact on their livelihoods due to the water conservation project. 46% of the farmers reported increased availability of water for irrigation. **Respondents conveyed satisfaction and rated the availability of groundwater levels post project completion a 3.8/5.**
Sustainability	For ensuring sustainability of the structures, Water User Groups (WUG) were formed among community members and local leaders. After construction of the groundwater recharge structures, the project teams handed the structures to the local Gram Panchayats (GP). The team submitted necessary letters to GP officials. **Respondents have rated the effectiveness of the structures constructed in recharging the ground water levels at 4/5.** Respondents have rated the maintenance of the structures a 3.8/5. **Farmers located near the structures were well equipped with knowledge to maintain the structures.**

Knowledge, Attitude and Practices (KAP)

To assess the participation and perceptions of the community members, KAP evaluation was carried out. The study found that 45% of respondents were aware that water conservation project was implemented by UBL. **Most (70%) of the respondents came to know about the project from Gram Panchayat members and local leaders.** Respondents rated the involvement and participation of the community members in the project a 3.9/5, reflecting proactive participation.

To enable sustainable practices and efficient management of the structures, Water User Groups (WUGs) were formed. **63% of respondents reported that the WUGs were actively maintaining the structures after project completion**. This reflects

positive outcomes in terms of community ownership and provides scope for improvement in terms of sustained practices.

Key Opinion Formers

To evaluate some crucial aspects of the project, some of the key prominent and influential members 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 local leaders, influential community members, former and active Panchayat elected members, staff of local government departments including watermen.

Of the total 64 KOFs, 28 were from Karnataka and 36 were from Telangana. Based on the KOF analysis, **it was inferred that more than 90% of KOF respondents agreed to 8 (out of 16) statements.**

Volumetric Water Benefit Accounting (VWBA)

The VWBA was carried for each of the 3 structure types in both locations, covering 100% of the structures. In Sangareddy, across the 3 structures, the groundwater recharge potential as per VWBA is 3,60,810 KL/ annum.

In Nelamangala, the groundwater recharge potential, as per VWBA, across the 2 structure types, was found to be 3,63,406 KL/ annum.

Conclusion

The water conservation project in Sangareddy and Nelamangala has positively impacted groundwater levels and raised community awareness regarding water conservation and sustainable use. **Through the construction of 19 check dams, 40 recharge shafts/injection borewells, and 4 percolation tanks, the project has tackled critical water scarcity issues and promoted sustainable water management practices.** Community involvement, supported by local Gram Panchayats and active participation, has been essential for the project's success. This assessment study based on OECD-DAC principles and Volumetric Water Benefit Accounting (VWBA) confirmed the project's effectiveness, improving water security, reducing crop stress, and fostering community ownership and responsibility, setting a replicable model for other regions.

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.**
UBL's CSR initiatives in the environmental focus area include a range of impactful projects across different domains:

Figure 1: UBL's CSR focus areas

Environment

Large-scale projects in the areas of water conservation, waste management, climate resilient agriculture and other environmental initiatives.

Women empowerment

Providing skill-based training, accelerator and incubator programmes, and livelihood opportunities to elevate socio-economic status of women.

Community development

Technology and infrastructure development for providing safe drinking water and other projects addressing specific needs of communities.

Address harmful use

Conducting awareness campaigns, workshops, and training programmes, through behaviour change communication, to empower informed choices.

By integrating CSR into its corporate strategy, UBL aims to drive sustainable social development for its 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. For drinking water, the dependence is nearly 80%. In southern states like Telangana and Karnataka, where seasonal monsoons are often unpredictable, groundwater offers a buffer against rainfall variability.

In several locations in India, excessive extraction of groundwater for irrigation and other agriculture-allied activities has led to a steady decline in groundwater tables over the years. This is frequently reported from regions with inadequate groundwater recharge mechanisms. According to the Central Ground Water Board (CGWB), over-extraction of groundwater in these regions has led to "critical" levels in several districts. About 11.08 % of the extractable groundwater resources are 'over-exploited'[2].

UBL, as a part of its CSR strategy, decided to address the issues related to groundwater recharge in Karnataka and Telangana. The project was implemented with **the primary goal to promote water conservation through groundwater rejuvenation structures and rainwater harvesting practices**. The project included construction of water conservation structures in 14 villages of Sangareddy district in Telangana, and in 10 villages of Nelamangala taluk, Bangalore Rural district in Karnataka, from November 2019 to November 2022. 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 key activities under the project in Karnataka and Telangana included:

- Construction of eight (08) check dams in five villages of Sangareddy and eleven (11) check dams in six villages of Nelamangala.
- Construction of four (04) percolation tanks in four villages of Sangareddy.
- Construction of ten (10) recharge shafts/ injection borewells in seven villages of Sangareddy and thirty (30) recharge structures in ten villages of Nelamangala.
- Conducting water budget workshops with local community members in Sangareddy and Nelamangala.
- Capacity building sessions to enhance water conservation in the areas.
- Formation of eight (08) Water User Groups (WUGs) in Sangareddy and ten (10) WUGs in Nelamangala.

[1] The Hindu (2023) https://www.thehindu.com/opinion/op-ed/indias-groundwater-governance-is-in-better-shape/article66440954.ece

[2] Central Ground Water Board (2023) https://cgwb.gov.in/cgwbpnm/public/uploads/documents/17014272111704550895file.pdf

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.

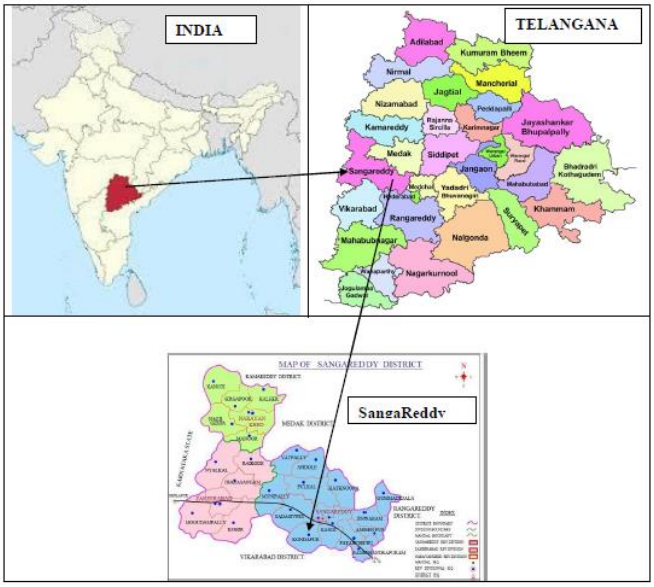
AFPRO today provides socio-technical support for ensuring food security and developing livelihoods through proper natural resource management, continuing its unique focus on the development and management of water resources. It reaches out to poor and marginalised communities throughout India, particularly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

1.3. About the project locations

About Sangareddy

Sangareddy is a district in the southern state of Telangana, located about 60 kms from the state capital, Hyderabad. The district covers an area of approximately 4,464 sq kms and is divided into 26 mandals (administrative blocks) or taluks. As of the 2011 Census, Sangareddy has a population of over 1.5 million people, with a mix of rural and urban settlements. The population is predominantly rural, with agriculture being the main livelihood for a large portion of the population[3].

Figure 2: Location map of Sangareddy, Telangana



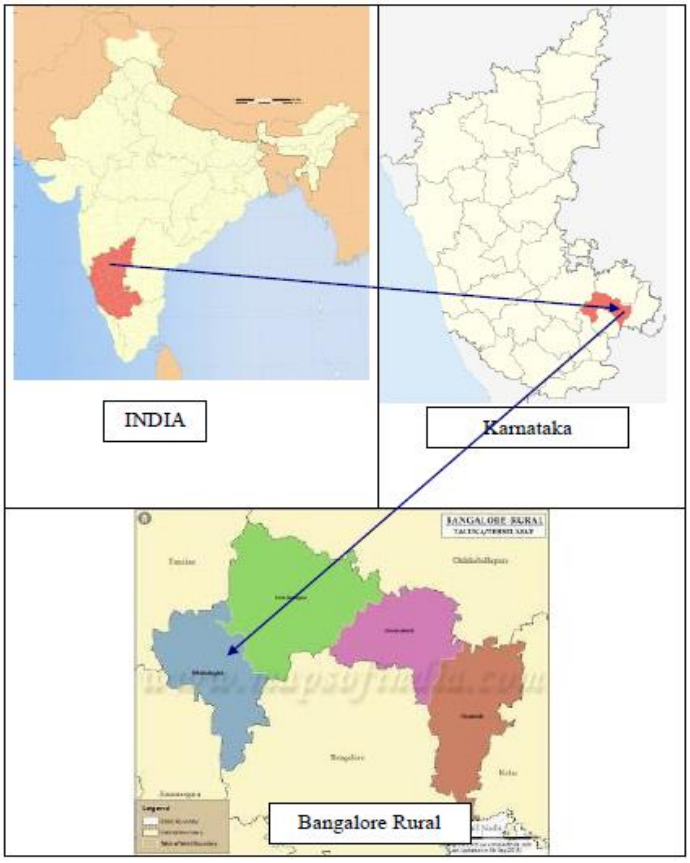
The district, with its semi-arid climate, experiences an average annual rainfall of around 700-900 mm, largely concentrated during the monsoon season from June to September[4]. Despite the seasonal rains, water scarcity is a persistent issue due to erratic rainfall patterns and over-extraction of groundwater for agricultural and domestic purposes. Efforts by the Government and various civil organisations have focused on improving water

[3] Census (2011). Government of India: https://censusindia.gov.in/census.website/
[4] Central Ground Water Board (2022). https://cgwb.gov.in/cgwbpnm/publication-detail/1105

availability and conservation in the district. Programmes such as Mission Kakatiya—a flagship water conservation initiative by the Telangana government—have been instrumental in reviving water bodies and enhancing groundwater recharge across the state, including in Sangareddy[5].

About Nelamangala

Figure 3: Location map of Nelamangala, Karnataka



Bangalore rural district is one of the 31 districts in the southern state of Karnataka. The district has 4 taluks - Devanahalli, Nelamangala, Doddaballapura, and Hoskote. Nelamangala, a predominantly rural taluk, is bounded by Tumkur taluk on north-west, Doddaballapur taluk on north-east, Bangalore Urban district to east and south-east, Ramanagara district on south and south-west.

According to 2011 census, the total population in Nelamangala taluk was 2,10,889, with a population density of about 415 persons per sq.km. About 77% of the population lives in rural areas and 23% in urban areas. Agriculture is the main occupation in the area, with about 52% of the land in the taluk covered in farming. For irrigation, the farmers are dependent on rainfall and groundwater.

The primary source of water for irrigation and domestic requirements are tubewells. There are sparsely distributed tanks / lakes which are rainfed and degraded with silt accumulation. Further, the taluka has been categorised as "Over-Exploited" in National Compilation on Dynamic Ground Water Resources of India, 2023. The average annual rainfall in the area is 776 mm. As per the report published by the Ministry of Jal Shakti, Central Ground Water Board, the probability of drought occurrences in the taluk is once in four years[6].

[5] Mission Kakatiya, Government of Telangana. (2024). https://missionkakatiya.cgg.gov.in/
[6] Aquifer Mapping and Management of Groundwater resources, CGWB, Government of India. (2020). https://antharjala.karnataka.gov.in/storage/pdf-files/NAQUIM%20REPORTS/10.pdf

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 Telangana and Karnataka. The assessment was carried out in 2024.

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).

Figure 4: Beneficiaries of recharge shaft in Nelamangala

2. Approach and methodology

2.1. Assessment framework

The aim of the impact assessment study was to assess the project, its activities, outcomes, and impact through discussions with relevant stakeholders. The perception and feedback on the outcomes and impact of the project were documented. The study also focused on capturing their suggestions for improvement.

To conduct a comprehensive evaluation, necessary documents were reviewed, tools were developed, and discussions were carried out. This was followed by detailed analysis of the 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 and other stakeholders. For the study, mixed methodology was adopted, including both quantitative and qualitative methods of data collection.

OECD-DAC principles

The study was designed based on OECD-DAC principles which helped in evaluating the project holistically, while focusing on five (05) key principles. The project was assessed based on the key principles and their explanation (refer table 1).

Table 1: OECD DAC principles

Principles	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 (refer table 2).

Table 2: KAP analysis

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.

Figure 5: Evaluation of recharge structures in Sangareddy

2.2. Methodology for the study

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

Table 3: Three stages of evaluation methodology

Stage I Planning	Stage II Data collection	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. Study design and Stakeholder mapping 4. Development of tools	5. Sampling plan 6. Data collection – quantitative, qualitative, KOFs, VWBA on sample basis 7. Data analysis and sharing initial findings with UBL team	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

Introductory 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 and stakeholder mapping

A mixed methods study design was adopted for data collection. It included both, quantitative survey with beneficiaries, and qualitative interviews with the key stakeholders. 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 4: Key areas of enquiry

S. 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 • Understanding other water related support provided by the government
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	Government officials	• Understanding the district geographical spread • Availability of water in the block • Water-related Challenges faced by the community members • Relevant Government initiatives • Available government schemes and support for providing quality water
4	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, based on documents and type of structures, assessment tools were developed.

The tools were reviewed and tested before administering on-field. The quantitative surveys were translated into Telugu and Kannada, as per requirements. Qualitative interview questions were also translated into local languages, to enable easy comprehension of questions.

Stage II: Data collection

Sampling plan

For the assessment, the sample size was calculated based on 95% confidence level and 5% margin of error. The table below (table 5) represents the sample size for quantitative data collection, with target planned and achieved.

Table 5: Sample target and achieved for the quantitative study

State	Quantitative survey target	Quantitative survey achieved
Nelamangala	360	360
Sangareddy	364	376
Total	**724**	**736**

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

Table 6: Village wise distribution of quantitative, qualitative and KFO interaction distribution

S. No.	Location / Village name	Quantitative interactions	Qualitative interactions	KOF interactions
A	**Nelamangala**			
1	Byranyakanhahalli	49	4	4
2	Hasiruvalli	35	7	6
3	Vadakunte	35	6	1
4	Jakkanahalli	30	8	4
5	G. Chanohalli	31	8	3
6	Chikkanahalli	35	13	5
7	Kodihalli	35	5	3
8	Minnapura	40	1	1
9	Kalalaghatta	35	2	1
10	Gundenahalli	35	1	0
B	**Sangareddy**			
1	Terpole	51	8	3
2	Haridaspur	35	7	3
3	Machepalli	28	7	2
4	Marepally	27	8	1
5	Gangaram	26	9	3
6	Anantsagar	52	8	3
7	Golapalli	53	6	0
8	Mandhapur	26	9	5
9	Aliyabad	26	7	3
10	Garakurthy	-	14	4
11	Kothlapur	26	12	5
12	Gopularam	-	8	3
13	Dobbakunta	26	9	1
14	Saidapur	-	-	-
	Total	**736**	**167**	**64**

Data Collection

For the study, data collection was covered in fourteen (14) villages of Kondapur block of Sangareddy district of Telangana. In Karnataka, ten (10) villages from Nelamangala taluk were covered. KOF interactions were also conducted across these locations. For VWBA, all the project's structures were visited.

For VWBA, comprehensive site visits were conducted to assess 100% of the water conservation structures constructed across all project districts, 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 potential for each of the structures.

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 of 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 III: Reporting

Report drafting and final submission
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

This section presents details of the structures constructed at various project locations. In Karnataka, a total of 11 check dams, 30 recharge shafts / injection borewells were constructed. In Telangana, a total of 8 check dams, 10 recharge shafts / injection borewells and 4 percolation tanks were constructed across. 100% of the structures were visited for VWBA study. Beneficiaries of all structure types were covered through the quantitative and qualitative interactions.

Table 7: Location-wise check dams and recharge structures

S. No.	State	Village name	Number of check dams	Number of recharge shafts / injection borewells
1	Karnataka	Byranyakanhahalli	2	3
2	Karnataka	Hasiruvalli	3	3
3	Karnataka	Vadakunte	2	2
4	Karnataka	Jakkanahalli	0	5
5	Karnataka	G. Chanohalli	1	3
6	Karnataka	Chikkanahalli	2	3
7	Karnataka	Kodihalli	1	2
8	Karnataka	Minnapura	0	1
9	Karnataka	Kalalaghatta	0	6
10	Karnataka	Gundenahalli	0	2
11	Telangana	Terpole	4	2
12	Telangana	Haridaspur	1	0
14	Telangana	Marepally	1	0
15	Telangana	Gangagram	0	1
16	Telangana	Anantsagar	0	1
17	Telangana	Golapalli	1	1
18	Telangana	Aliyabad	1	0
19	Telangana	Garakurthy	0	1
20	Telangana	Kothlapur	0	2
21	Telangana	Gopularam	0	2
		TOTAL	**19**	**40**

Table 8: Location wise percolation tanks

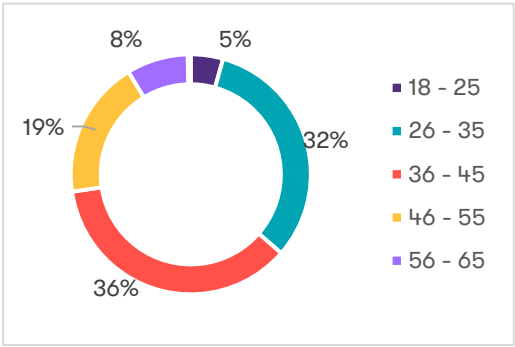
S. No.	State	Village	Number of Percolation tanks
1	Telangana	Machepalli	1
2	Telangana	Mandhapur	1
3	Telangana	Anantsagar	1
4	Telangana	Dobbakunta	1
		TOTAL	**4**

Figure 6: Recharge structures at Sangareddy and Nelamangala

Demographic profile

The study captured information on key demographic aspects such as age, gender, and socio-economic status, among others.

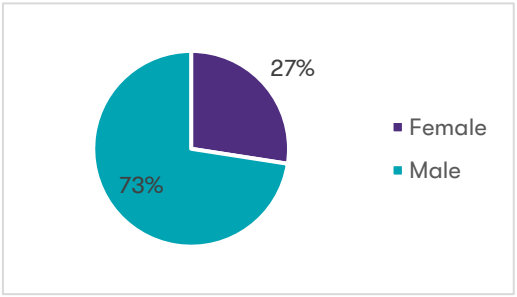
Graph 1: Age of respondents in years (n=736)



About 36% of the respondents from the study were from the age group of 36- 45 years, and 32% were between 26 and 35 years (refer Graph 1). This indicated individuals in these age groups were typically in the prime of their work lives, playing a central role in agricultural activities, which forms the backbone of rural economies.

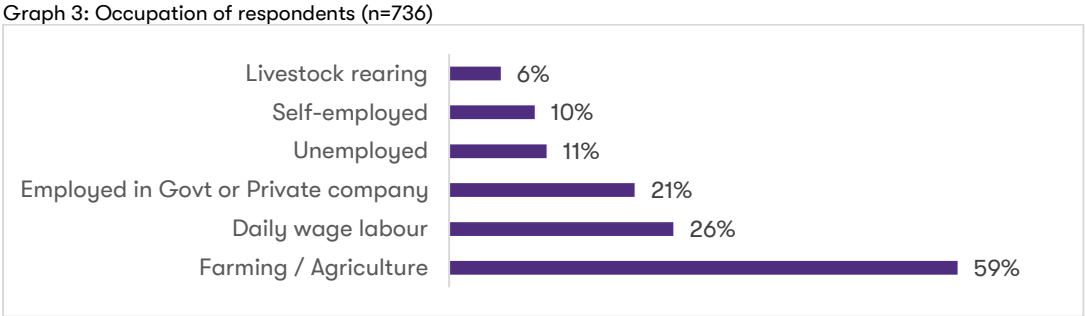
The study found that only 27% of the respondents were women, while 73% were men (refer Graph 2). **This gender imbalance in the respondent demographic can provide valuable insights into the social dynamics and the role of women in the community, particularly in relation to water management and agricultural activities.** Despite the lower representation of women, the water conservation project remains highly relevant to improving livelihoods for all community members, including women. In rural contexts like in Sangareddy and Nelamangala, women are often actively involved in water collection and household water management, making the project's focus on improving groundwater recharge highly beneficial to them.

Graph 2: Gender of respondents (n=736)



59% of the respondents indicated agriculture to be their primary source of income. 26% of them were engaged in daily wage activities related to agriculture. Majority of community members involved in agriculture and allied activities, indicating significant dependence on water for irrigation.

Graph 3: Occupation of respondents (n=736)



Aside from demographic metrics, community members in Telangana also validated the project's relevance due to the region's geographic settings. Interaction with the Sarpanch in Machepalli village revealed that Sangareddy is part of the larger Deccan Plateau, characterised by hard rock geology, which presents additional challenges for groundwater retention and recharge. In this context, the introduction of artificial recharge structures plays a vital role in addressing the region's water management needs.

3. Key Findings

The section highlights the key findings and observations from the various activities conducted under the project. The analysis of these observations was guided by the OECD DAC principles. The KAP (Knowledge, Attitudes, and Practices) framework was also used to assess some of the key findings. In the KOF (Key Opinion Former) section, findings were assessed in terms of extent of agreeing or disagreeing of statements.

Check Dams

Check dams are small dams or physical barriers constructed across the water-flow direction. They are constructed to arrest the fast flow of storm water, holding temporarily, for water harvesting purposes. They allow the storm water to get stored, in turn enabling water seepage into the ground and hence assisting in ground water recharge[7].

In Telangana and Karnataka, based on the baseline studies, a total of nineteen (19) check dams were constructed. Across both locations, the water stored in the check dams were not used for irrigation and were reserved only for the sole purpose of ground water recharge.

Figure 7: Check dam at Sangareddy

Recharge Shafts / Injection borewells

Borewells which extract groundwater get dried up when the level of water table drops, most likely due to over extraction or insufficient water percolation. Recharge shafts or injection borewells are constructed to replenish groundwater by enabling rainwater or surface water to percolate into the ground and reach the underground aquifers. This percolation helps in the restoration of groundwater, thereby enhancing the sustainability of borewells.

A total of forty (40) recharge shafts were constructed across both the project locations. These were constructed only around government owned borewells, which the local panchayats used for public water supply.

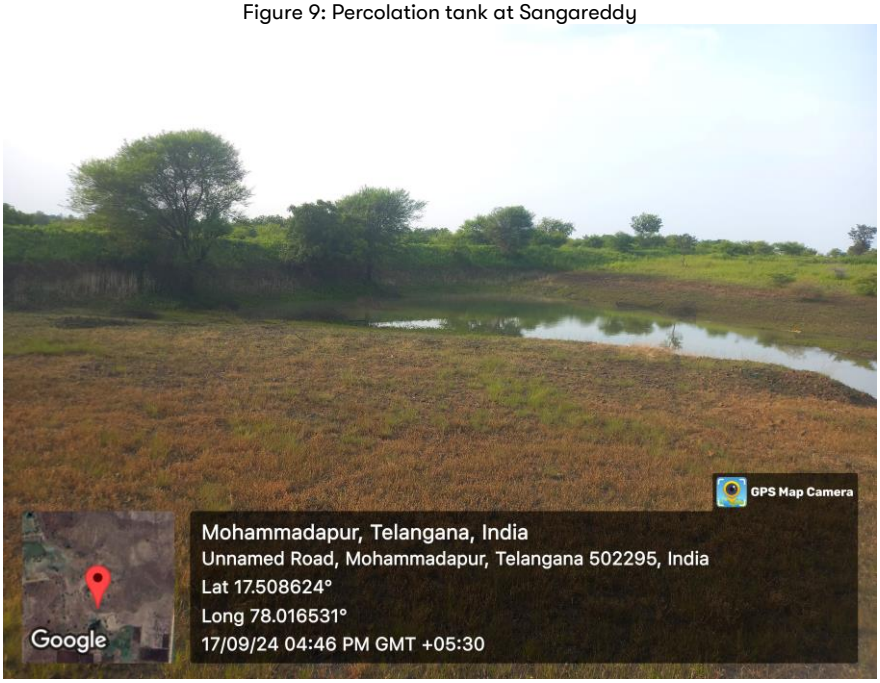
[7] Watershed Development Department, Government of Karnataka (n.d.). https://watershed.karnataka.gov.in/info-2/RKVY+-+Check+Dam/en

Figure 8: Recharge shaft at Nelamangala

Percolation Tanks

Percolation tanks are man-made mini reservoirs built for water storage and conservation. They are on site which have permeable or semi-permeable soil. Rainwater and surface runoff water gets collected in these tanks, and eventually percolate into the ground, thereby increasing the groundwater levels. In Telangana, four (04) percolation tanks were constructed in 4 villages.

Figure 9: Percolation tank at Sangareddy



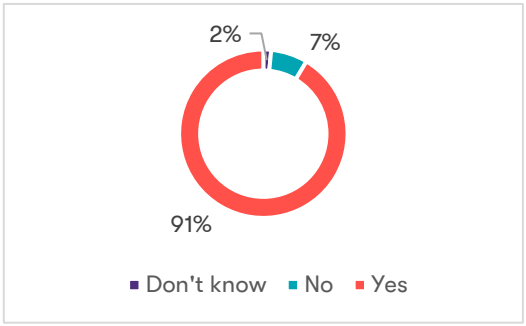
Relevance

Water shortage in the villages

91% respondents stated that they experienced water shortages prior to the implementation of the water conservation project. This high percentage clearly indicates that water scarcity was a widespread and pressing issue for the communities in both Sangareddy and Nelamangala.

During discussions, community members of Sangareddy, particularly those involved in farming, expressed concerns about irrigation and access to water for livestock. Due to water shortage, many farmers were restricted to cultivating only one crop per year. They also highlighted the issue of declining groundwater levels, with many borewells running dry. In some cases, borewells had to be further drilled to depths exceeding 1,000 feet to access groundwater. Similarly, in Karnataka, groundwater levels had receded to more than 900 feet in most project villages.

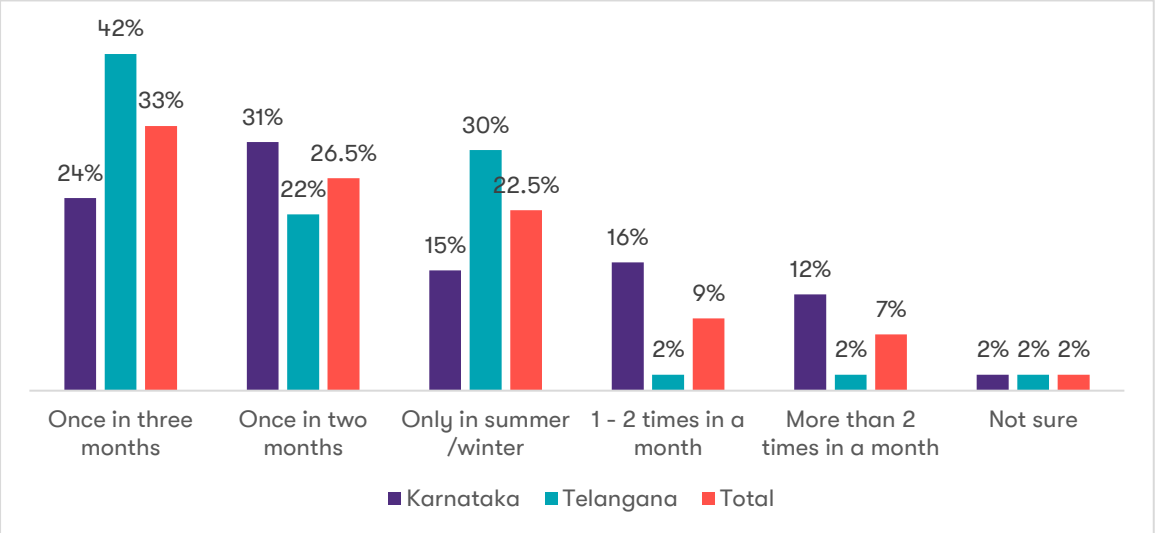
Graph 4: Water shortage faced by the community (n=736)



> “Earlier, during summers it was very difficult for farmers in our village to carry on with farming due to low water availability. After project completion, they are exploring options for growing more than one crop per year.”
>
> **Sarpanch, Terpole, Sangareddy**

On further probing, 32% (refer Graph 5) respondents mentioned that such shortages were felt at least once in three months. UBL's focus on building check dams, percolation tanks, and recharge shafts to enhance groundwater recharge directly addresses this challenge. **By improving groundwater levels, the project contributed to the long-term resilience of agricultural activities, which are the backbone of these communities' livelihoods.**

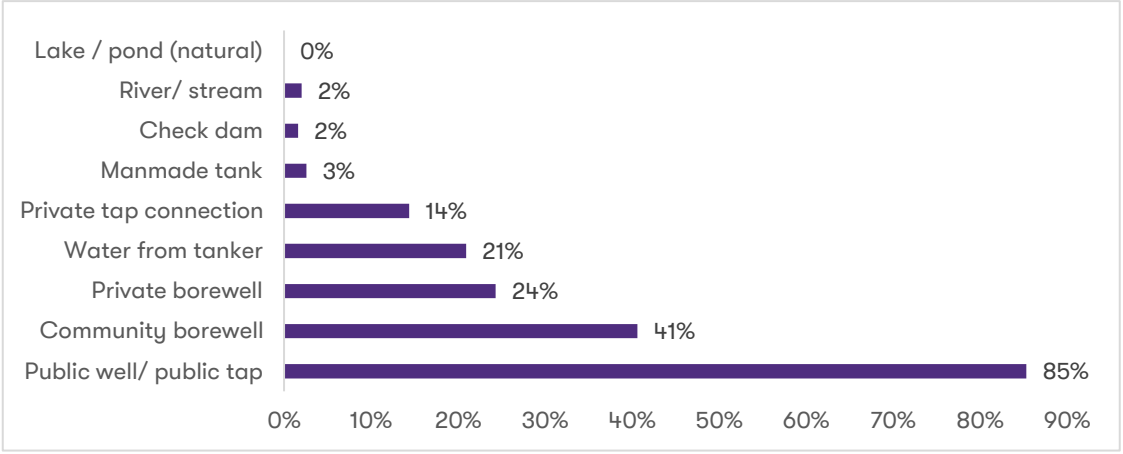
Graph 5: Frequency of water shortage in project locations



Water sources and challenges prior to the project

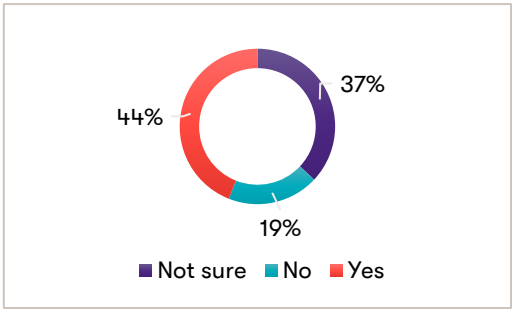
The study revealed that 85% of respondents relied on public wells and taps for their daily water needs before the implementation of the water conservation project (refer Graph 6). Additionally, **87% mentioned that these water sources would often dry up, leading to frequent water shortages**. This finding highlights the precarious nature of water availability in these communities and underscores the urgency of the water conservation efforts.

Graph 6: Primary source of water (multiple choice, n=736)



Public wells and taps are often dependent on groundwater sources[8]. Due to over-extraction of groundwater, and insufficient recharge capabilities, particularly during dry seasons, the dependent water sources frequently dried up. Such conditions would directly negatively impact on households and agricultural activities, affecting not only daily water consumption but also farming operations, and income generation.

Graph 7: Relevance of recharge structures (n=736)



The community members were asked about the relevance of check dams, recharge shafts and percolation tanks in enabling groundwater recharge. **44% of respondents agreed, that the infrastructures were relevant and necessary** in raising groundwater levels, demonstrating its long-term relevance in water offering sustainable solutions to the scarcity problems (refer Graph 7). However, 37% were not sure, indicating that the project required focused awareness on relevance and function of the structures.

Effectiveness

The study included assessment of the activities towards fulfilment of project's objectives. It also covered the overall project effectiveness in including the beneficiaries.

Water budget workshops

[8] Dhruvika Dhamija (2023), "What is the primary source of drinking water for Indian households?" *Centre for Economic Data and Analysis (CEDA), Ashoka University.* https://ceda.ashoka.edu.in/what-is-the-primary-source-of-drinking-water-for-indian-households/

An important component of the Water Conservation Project was **water budget workshops, which brought local communities together to assess the water resources in their villages.** The focus was primarily on three components: understanding the status of water availability across different sources, determining water availability for various purposes, and calculating the balance water remaining for future use, and meeting gaps if any. The aim was to promote better water management practices, through awareness and sustainable use of water.

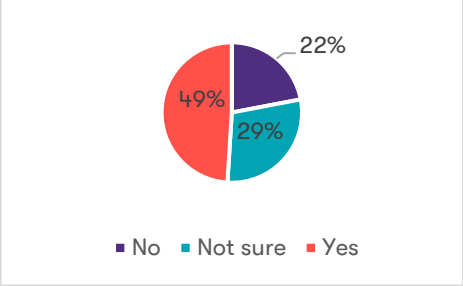
These workshops helped in understanding the history of water usage, rainfall patterns, watershed, landscape, agricultural and livestock dependencies. In Nelamangala, it was reported that the community leaders, Panchayat officials and farmers were gathered to conduct the water budget workshops. This helped in understanding the crucial areas in villages that required construction of different structures along different sources, their status, and gaps in meeting their water requirements.

> “”
>
> The water budget workshops, and awareness sessions were unique to this project, and we all participated actively.
>
> **Community member, Marepally**

Awareness Sessions

Alongside the water budget workshops, the project conducted awareness sessions to educate and empower the beneficiaries, primarily farmers, on the efficient and sustainable use of different water resources. The sessions aimed to raise awareness about the importance of groundwater conservation structures such as check dams, percolation tanks, and recharge shafts, and how these systems could significantly improve groundwater recharge.

Graph 8: Participation in awareness sessions (n=736)



The community members, across both locations, participated actively in the awareness sessions. The sessions focused on informing about the importance of groundwater recharge, its methods, and water conservation. The community members of Terpole village stated that they learnt about maintenance of the structures during the sessions. Some of them were able to explain about silt removal for optimal functioning of the structures.

Respondents rated the effectiveness of the awareness sessions a **3.9/5**. They expressed satisfaction in their learnings from the sessions.

They were looking forward to using the silt extracted, as inputs in their farmlands to boost productivity. **This level of participation reflects the effectiveness of the project's community engagement efforts to educate a significant portion of the population about water conservation practices and infrastructure maintenance.**

Figure 10: Recharge structure at Nelamangala

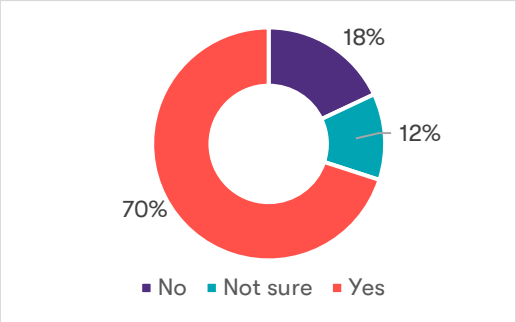
Efficiency

The study also assessed procedural compliance, inclusion of community members and their knowledge, and operational performance, to understand overall efficiency of the project.

Community inclusion and knowledge sharing

The study found that 70% of respondents believed that the discussions during the water budget workshops were helpful in project planning. They discussed relevant topics such as geographical conditions, terrain, storm water drainage directions, impact of rainfall during monsoons, and extent of surface water run-off in the area.

Graph 9: Use of information from water budget workshops (n=280)



68% of the respondents stated that the awareness sessions were instrumental in increasing awareness regarding water usage, conservation, and sustainability. **Community members appreciated the project's implementation strategy that fostered a sense of ownership and responsibility by involving the community in such assessments, leading to better-informed decisions regarding the placement and maintenance of check dams, percolation tanks, and recharge structures.**

Interaction with the implementation team from AFPRO highlighted the pressing challenges the team faced to organise these workshops. Since the initial phase of the project was implemented during COVID-19, the team faced considerable challenges in terms of mobilising the community members for such activities. They had to organise these activities in smaller clusters as per the availability of community members and their willingness to join, given the social distance restrictions.

Respondents expressed a **4/5** rating for project procedures and processes followed by the implementing partner to execute the project.

Impact

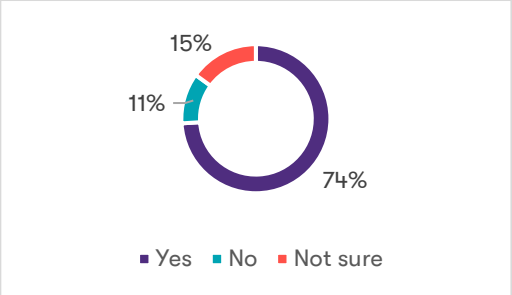
The following section assesses the impact of the project, examining its effectiveness in addressing water scarcity and promoting sustainable water.

Community perception of the project

The study found that **74% of respondents felt that the water infrastructure provided under the project have been beneficial to them**. On probing, respondents revealed that such benefits were primarily experienced through increased groundwater levels, reduced surface run-off, and improved water availability for agriculture and livestock.
Increased groundwater levels indicate that the project has succeeded in its primary goal of enhancing groundwater recharge, which is essential for sustaining agricultural activities and improving livelihoods in these communities.

The reduction in surface run-off suggests that the water infrastructure effectively captured and stored rainwater, minimising water loss and ensuring that more water percolated into the ground. **This led to an increase in water availability for households and farms, contributing to better irrigation, improved crop yields, and greater resilience during dry periods.**

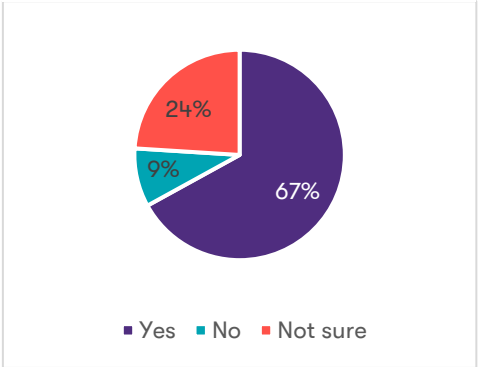
Graph 10: Has the project benefitted the community? (n=736)



Economic empowerment

67% of respondents reported a positive impact on their livelihoods due to the water conservation project. This outcome is largely attributed to improved water availability, better livestock health, and increased agricultural productivity. Improved water availability, facilitated by the construction of check dams, percolation tanks, and recharge structures, has had a direct influence on the agricultural output of the region. **Access to sufficient water is critical for farming communities, especially in water-scarce areas like Sangareddy and Nelamangala.**

Graph 11: Project's positive impact on livelihood (n=736)



> "Our village is happy to have two functional borewells, we don't have to struggle for water now. Water is one of the most essential elements, we need it for almost all activities."
>
> **Community member, G. Chanohalli, Nelamangala**

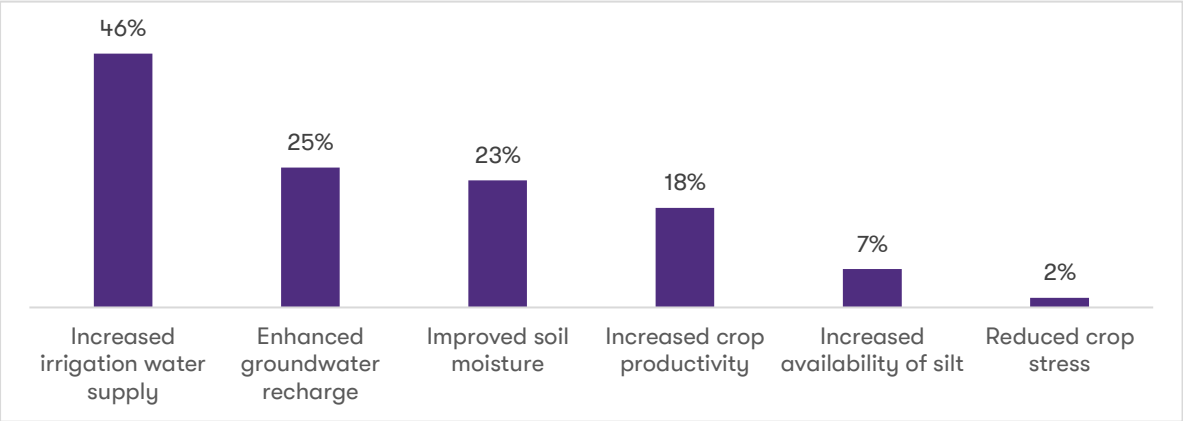
As can be seen in Graph 10, 9% of respondents reported no positive impact, and 24% were unsure, highlighting that not all beneficiaries have experienced the same level of financial benefit. Thus, while the majority of respondents have seen a positive change, the mixed responses suggest that the project's benefits may not be uniformly distributed. This indicates a need for targeted interventions to ensure that all farmers can equally benefit from the project's initiatives, thereby maximising its overall impact on their livelihoods.

Agricultural benefits

The study gauged the impact of the project on agricultural pursuits of beneficiaries since majority (65%) respondents indicated their primary occupation to be farming and livestock rearing.

46% of the farmers involved in the project reported increased water availability for irrigation, which is a critical factor in improving crop yield and diversifying the types of crops grown. Additionally, 25% of respondents noted improved groundwater levels, which not only secures future water availability but also contributes to long-term agricultural sustainability. These projects further enhance soil moisture content, as reported by 23% of beneficiaries, which is essential for healthy plant growth and reducing soil degradation.

Graph 12: Project impact on agriculture (multiple choice) (n=736)



Respondents conveyed satisfaction and rated the availability of ground water levels post project completion a **3.8/5.**

Better water access could help farmers with increased yield and crop diversification, leading to enhanced food security and economic stability. Community members from several villages in Sangareddy revealed that prior to the water conservation project, the region could grow limited crops such as paddy and cotton. However, post the project crops such as onion and maize are also grown, thereby supplementing their earning capabilities. Access to clean groundwater is crucial for overall well-being as it directly impacts health by preventing waterborne diseases and promoting hygiene. Reliable groundwater sources in rural landscapes, support agriculture and livelihoods, contributing to food security and economic growth. Additionally, groundwater is also vital for local ecosystems and wildlife, maintaining the habitats necessary for biodiversity and ecological balance.

Respondents conveyed positive impact and rated the overall wellbeing of the community through the project **4.2/5**.

Sustainability

Sustaining groundwater rejuvenation is crucial for ensuring the availability of freshwater resources for future generations and maintaining ecological balance. It helps mitigate the impacts of droughts, supports agriculture, and provides a reliable source of drinking water, which is essential for the well-being of communities and the environment.

Water User Groups

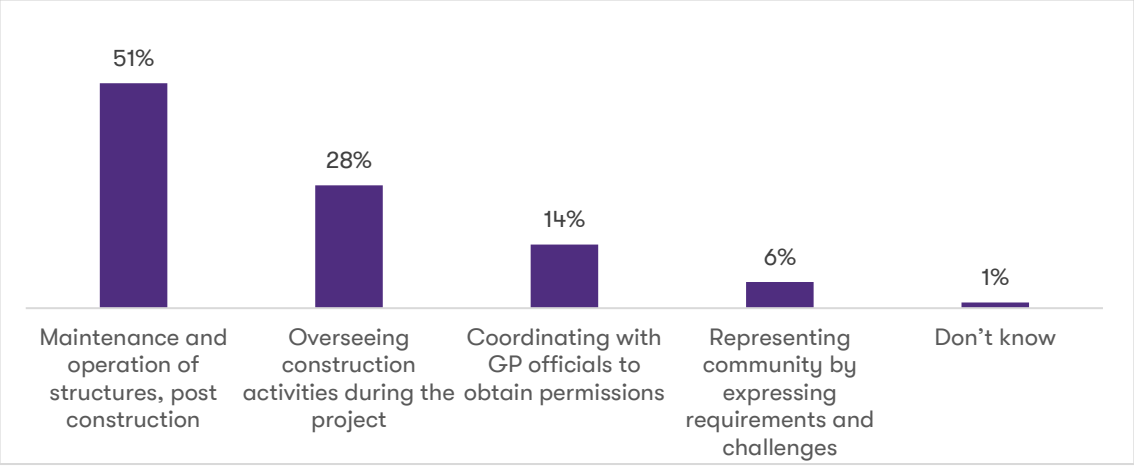
Under the project, after construction of the structures, Water User Groups (WUGs) were created, for the purpose of maintaining and taking care of the structures. It was primarily a group of community leaders living in close proximity to the structures. These groups were established to foster community ownership of water management initiatives, ensuring that the local population takes an active role in the operation, maintenance, and preservation of water infrastructure post-project. The group comprised of community leaders, farmers living around the structures, representatives from the gram panchayat and watermen in-charge of water supply to the village.

> “”
>
> I have been observing increase in groundwater level in the borewells around the check dam. We have seen better yield in the farms, which can be due to increase in groundwater. The quality of construction is very good. The structures will last a long time.
>
> **Community member, Chikkanahalli, Nelamangala**

Most of the respondents had understood the group’s scope accurately and stated that the WUGs are responsible for maintenance of the structures provided under the project. They also explained that the WUG members were also responsible for administrative activities and coordinating with Government officials for matters related to the structures. However, some were unable to recall or explain about the responsibilities of the WUG.

Respondents have rated the maintenance of the structures a **3.8/5**. Farmers near the structures were well equipped with knowledge to maintain the structures.

Graph 13: Responsibilities of Water User Groups (n=736)



Quality of construction

During the visits to the infrastructures constructed, it was observed that the quality of construction was adequate. The structures were scientifically designed, considering the local geography, geology, and hydrology. The local gram panchayat members and watermen were sought for insights and recommendations. The community members living around the check dams in Nelamangala explained how the construction of structures was well planned and built to last. Earlier water-related infrastructure built by other agencies had not lasted more than two years. These geographies face large volumes of surface run-off, which require the structures to be built strategically, to arrest adequate volume of water, to enable storage and seepage into the ground.

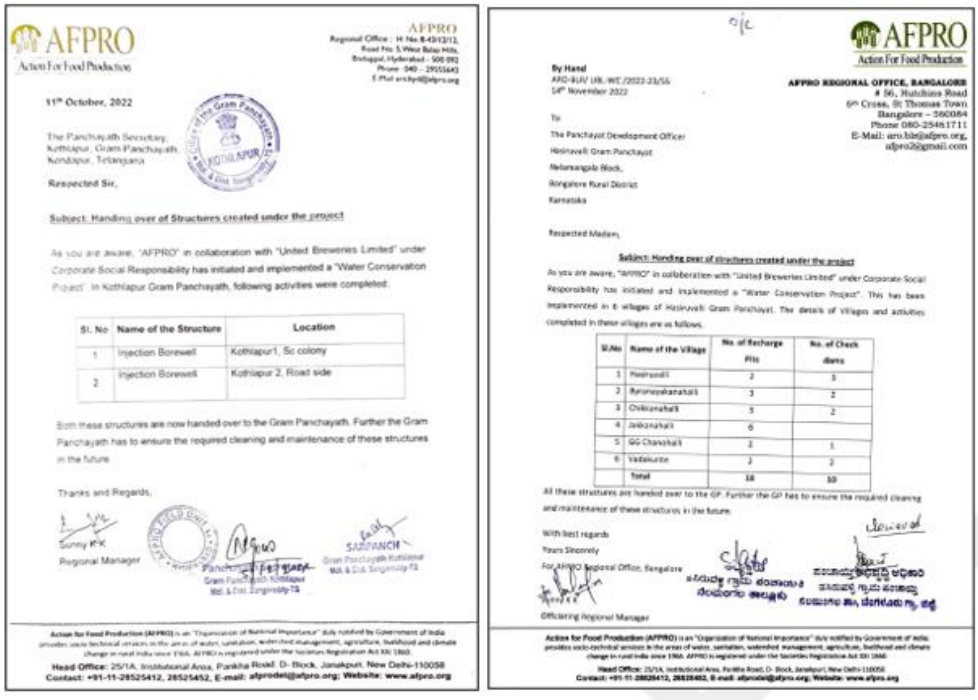
Respondents have rated the effectives of the structures constructed in recharging the ground water levels a **4/5**.

Handing over structures to local Panchayats

After construction of the groundwater recharge structures, the project teams handed them over to the local Gram Panchayats. The letters stating structure details and necessary information about maintenance were submitted to respective officials.

> “”
>
> The AFPRO project team submitted letters after completing the construction of all the check dams and recharge shafts in the Panchayat. They also explained how we could maintain the structures. Our community members, specifically the farmers living around the structures were made aware of how the structures would work and their efficient use.
>
> **Panchayat member, Hasiruvalli, Nelamangala**

Figure 11: Sample documents submitted to local Gram Panchayats



AFPRO
Action For Food Production

11th October, 2022

The Panchayath Secretary,
Kothlapur, Gram Panchayath,
Kondapur, Telangana

Respected Sir,

Subject: Handing over of Structures created under the project

As you are aware, 'AFPRO' in collaboration with 'United Breweries Limited' under Corporate Social Responsibility has initiated and implemented a 'Water Conservation Project' in Kothlapur Gram Panchayath, following activities were completed:

Sl. No	Name of the Structure	Location
1	Injection Borewell	Kothlapur1, Sc colony
2	Injection Borewell	Kothlapur 2, Road side

Both these structures are now handed over to the Gram Panchayath. Further the Gram Panchayath has to ensure the required cleaning and maintenance of these structures in the future.

Thanks and Regards,

Sunny KK
Regional Manager

Head Office: 25/1A, Institutional Area, Pankha Road, D- Block, Janakpuri, New Delhi-110058
Contact: +91-11-28525412, 28525452, E-mail: afprodel@afpro.org; Website: www.afpro.org

AFPRO
Action For Food Production

By Hand
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afpro2@gmail.com

14th November 2022

To
The Panchayat Development Officer
Hasiruvalli Gram Panchayat
Nelamangala Block,
Bangalore Rural District
Karnataka

Respected Madam,

Subject: Handing over of structures created under the project

As you are aware, "AFPRO" in collaboration with "United Breweries Limited" under Corporate Social Responsibility has initiated and implemented a "Water Conservation Project". This has been implemented in 6 villages of Hasiruvalli Gram Panchayat. The details of villages and activities completed in these villages are as follows.

Sl.No	Name of the Village	No. of Recharge Pits	No. of Check dams
1	Hasiruvalli	2	3
2	Ranganayakanahalli	3	2
3	Chikkanahalli	3	2
4	Jakkanahalli	6	
5	GG Chanahalli	2	1
6	Vadakuru	2	2
	Total	18	10

All these structures are handed over to the GP. Further the GP has to ensure the required cleaning and maintenance of these structures in the future.

With best regards
Yours Sincerely
For AFPRO Regional Office, Bangalore

Officiating Regional Manager

Action for Food Production (AFPRO) is an "Organization of National Importance" duly notified by Government of India provides socio-technical services in the areas of water, sanitation, watershed management, agriculture, livelihood and climate change in rural India since 1966. AFPRO is registered under the Societies Registration Act XXI 1860.
Head Office: 25/1A, Institutional Area, Pankha Road, D- Block, Janakpuri, New Delhi-110058
Contact: +91-11-28525412, 28525452, E-mail: afprodel@afpro.org; Website: www.afpro.org

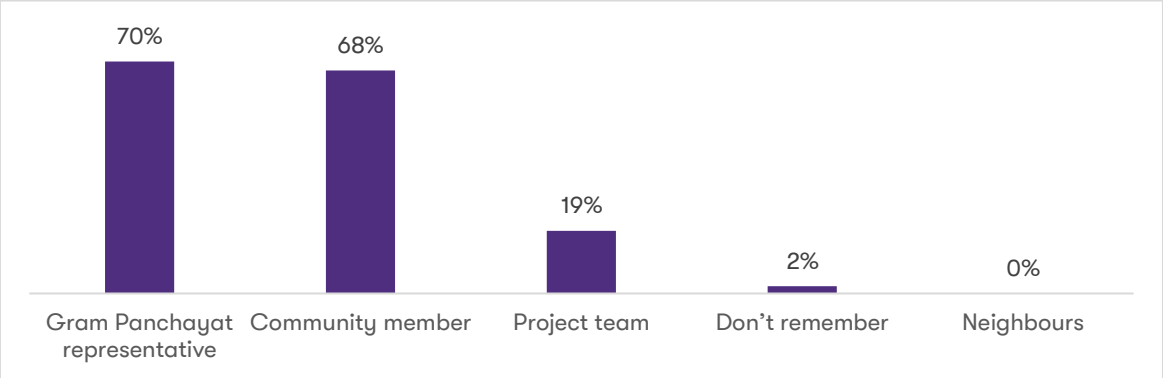
4. KAP Analysis

The current study also employed the **Knowledge, Attitude, and Practices (KAP) framework** to gauge critical insights into how much the community knows about the water conservation project (knowledge), their willingness to support and engage in water-saving practices (attitude), and the actual steps they take to maintain and utilise the provided water infrastructure (practices).

Knowledge

The study found that most (70%) of the respondents came to know about the project from Gram Panchayat members and representatives. This highlights that the community was well-knit in communicating effectively amongst themselves.

Graph 14: Source of project information (multiple choice) (n=736)



From a knowledge standpoint**, it was also observed that the community members at both Nelamangala and Sangareddy were aware about the project and its activities. They were aware about the importance of water conservation, which was only enhanced during the term of the project.** A senior citizen from Nelamangala explained that he used to talk about and mentor his fellow villagers about groundwater, its importance and recharge. He expressed that this project helped him, and his neighbours understand the ways to conserve and sustainably use the groundwater.

Attitude

In water conservation projects, fostering a positive community attitude may often be linked to better engagement in maintenance activities and long-term sustainability of the water infrastructure. In the current study, **68% of respondents revealed that they found the awareness sessions on water conservation useful.** These sessions helped the community to build a positive attitude towards water conservation efforts. The sessions provided practical techniques for sustainable water use, such as rainwater harvesting and efficient irrigation.

Respondents rated the involvement and participation of the community members in the project a **3.9/5**, reflecting an initiative-taking participation.

Practices

The foundation of Water User Groups (WUGs), established under this project, was to progressively create sustainable practices and shift community practices toward resource management. However, **63% of respondents reported that the Water User Groups (WUGs) were actively maintaining the structures post-project**. This reflects a positive outcome in terms of community ownership and sustained practices.

During qualitative interactions, the community members of **Terpole and Dobbakunta villages in Sangareddy explained that the Panchayat is primarily responsible for maintaining all the structures.** Since the structures were fairly new and silt collection was minimal, no major maintenance works were required.

Respondents rated the involvement of PRI members in the project a **4.4/5**.

In Nelamangala, farmers living around the check dams were practicing livestock rearing alongside farming. They explained how the check dams had become an important source of water for their cows, providing a space for the animals to hydrate and rest.

Figure 12: Cows resting near check dam in Nelamangala

5. KOF Perception Analysis

During the impact assessment study, opinions and perceptions of the community members were collected. Some of the key prominent and influential members 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 local leaders, influential community members, former and active Panchayat elected members, staff of local Government departments including watermen. They were asked to respond in terms of extent of agreement to the provided statements. The KOF tabulated below highlights the various responses in terms of agreement levels. A total of 64 KOFs were covered during the evaluation study, as represented in Table 9. Of the 64, 28 were form Karnataka and 36 were from Telangana.

Table 9: Responses from Key Opinion Formers (64 respondents)

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%	12%	19%	68%	87%
2	I am aware of the benefits of the water conservation project	0%	0%	10%	13%	77%	90%
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%	25%	21%	54%	75%
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%	8%	17%	74%	91%

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

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

The table highlights the community's responses to the water conservation project, showcasing significant positive perceptions across various aspects. Notably, 90% of Key Opinion Formers (KOF) felt well-informed about the project's benefits, with 99% understanding the importance of water conservation, reflecting strong awareness. The project interventions were perceived as beneficial, with 93% believing these efforts have led to an increase in groundwater levels, and 89% acknowledging improved public infrastructure. Execution quality stands out, as **100% agreed that the project was conducted fairly and satisfactorily**, with **96% acknowledging smooth operations** and effective stakeholder collaboration. Additionally, **93% are satisfied with the support from AFPRO.**

Looking at long-term impacts, 75% agreed it has led to an immediate improvement in quality of life, with 25% remaining neutral. This suggests that while the community recognised the project's value, some felt its tangible, day-to-day impacts were limited or still unfolding. Overall, **the responses reflected high community satisfaction, particularly with awareness, execution, and infrastructure improvements**. Yet, addressing concerns around representation, vulnerability reduction, and immediate quality of life impact could further enhance the project's acceptance and effectiveness.

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	Check Dams	Increased Recharge	Capture and Infiltration Method	A-4
	Percolation Tank	Increased Recharge	Capture and Infiltration Method	A-4
	Recharge Structures with Recharge Bore Shaft	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.

Percolation tanks, recharge shafts, and check dams 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)

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 Sangareddy and Nelamangala.

- Evaporation losses are assumed to be 10% of the total water storage capacity per annum and have been accounted for accordingly.
- Bore Shaft recharge structures observed during site visits varied in efficiency: structures needing shrub cleaning and filter media refilling were assumed to have 90% efficiency for groundwater recharge, while those requiring general cleaning and maintenance were rated at 70%.
- 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 check dams, rejuvenated or recharge ponds, percolation tanks etc.

6.3 VWBA for Check Dams

In Nelamangala, all the 11 check dams were found to be fully functional, during the time of the site visits and as per discussions with stakeholders. The following section presents the key findings of the Volumetric Water Benefit Accounting (VWBA) for check dams in both locations:

Table 10- VWBA for Check Dams in Sangareddy and Nelamangala

Project Location	No. of Structures	Estimated Ground Water Recharge Potential as per VWBA in KL/Annum in 2024	Type of Benefit	Assumptions
Sangareddy	8	1,08,506	Ground Water Recharge Potential	• 10% evaporation losses considered. • 2 fillings per annum • Water Losses as per site visit observations considered
Nelamangala	11	46,053		
Total	**19**	**1,54,559**		
For VWBA, calculation based on catchment area of each check dam multiplied by annual average rainfall and run off coefficient. In Aliyabad, Sangareddy check dam is defunct, so no recharge has been taken up. In Haridaspur Check Dam in Sangareddy, seepage losses downstream were assumed as 30% for calculation of VWBA Water Harvested/ annum based on actual assessment by Project Engineer during site visit. All 11 check dams of Nelamangala were found to be fully functional.				

It was observed that the estimated recharge potential for check dams in Sangareddy as per VWBA in 2024, was 1,08,506 KL/ annum. **Six of eight check dams (75%) were providing full benefit, as per field assessment.**

It was observed that the estimated recharge potential for check dams in Nelamangala as per VWBA in 2024, was 46,053 KL/ annum. **All the 11 check dams (100%) are providing full benefit, as per field assessment.**

6.4 VWBA for recharge borewell shafts

For Sangareddy and Nelamangala, estimated groundwater recharge potential created as per VWBA for recharge borewell shafts is presented below:

Table 11- VWBA for Ground Water Recharge Shafts in Sangareddy and Nelamangala

Project Location	No. of Structures	Estimated Ground Water Recharge potential as per VWBA in KL/Annum in 2024	Type of Benefit	Assumptions
Sangareddy	10	1,07,944	Ground Water Recharge Potential	• 10% evaporation losses considered. • Other Losses as per site visit observations considered.
Nelamangala	30	3,17,353		
Total	**40**	**4,25,297**		
Assumptions based on assessment of functionality of each structure during site visits by engineer in 2024. In Sangareddy, 90% efficiency has been taken for structures that require cleaning of filter media (7 nos.) and 70% efficiency of ground water recharge is taken for structures with minor damage and cleaning requirements (3 Nos.) In Nelamangala, 9 structures were not fully beneficial due to varied reasons of being non-functional or destroyed completely by local community / Government agencies for developmental activities. For one structure, since major repairs were required, 70% efficiency was considered. One structure was 100% clean and functional, and the rest of the 19 structures required minor cleaning and repairs; they were considered as 90% functional.				

It was observed that the estimated recharge potential for borewell shaft recharge structures in Sangareddy, as per VWBA in 2024, was 1,07,944 KL/ annum.
Similar analysis and calculations for Nelamangala revealed that the recharge structures were at is 3,17,353 KL/ annum.

6.5 VWBA for percolation tanks of Sangareddy

All the four percolation tanks constructed in Sangareddy, were observed to be fully functional, during the site visits indicating that they were fully beneficial. The estimated groundwater recharge potential created as per VWBA for percolation tanks is presented below:

Table 12- VWBA for Percolation Tanks in Sangareddy

Project Location	No. of Structures	Estimated Ground Water Recharge potential as per VWBA in KL/Annum in 2024	Type of Benefit	Assumptions
Sangareddy	4	1,44,360	Ground Water Recharge Potential	• 10% evaporation losses considered. • 2 fillings per annum
During site visits by project engineer in 2024, all 4 percolation ponds found to be functional.				

It was observed that the estimated recharge potential for percolation tanks of Sangareddy, as per VWBA in 2024, was 1,44,360 KL/ annum.

7. Way Forward

This section provides the way forward and recommendations for the project, based on the assessment carried out.

1. Assess sustainability and community ownership

UBL may consider encouraging the communities to take ownership of the water infrastructure through maintenance activities and knowledge sharing. This could be done by incorporating indicators like participation in water budget workshops and reactivating the Water User Groups and village committees for water management.

2. Gender and social inclusion analysis

Ensuring equitable distribution of benefits across different sections of the community highlights the project's fairness and reach. The study found a lower representation of women as compared to men. In order to make the project's impact more inclusive, UBL may consider encouraging women, marginalised groups, and smallholder farmers to participate actively to be equally benefited from the project. This could be achieved by disaggregating data by gender and social categories to evaluate inclusiveness.

3. Capacity building and knowledge transfer

It was observed during interactions that a few beneficiaries were unable to recall about the structures and their precise locations. This could be attributed to either limited recall abilities, or frequent migration of local population. Sustainability of water conservation projects depend on the community's engagement and awareness. This could be accomplished through continued engagement with key stakeholders, for capacity-building at regular intervals, after the completion of the construction of the structures. A well-planned schedule for capacity-building could build and expand the knowledge and skills to manage water resources and infrastructure effectively.

4. Post-project support

To ensure the continued success of the water conservation efforts, it is recommended that a structured post-project support plan be developed. This plan could emphasise on identifying the experts that the WUG could consult. It could facilitate the scientific maintenance and sustainable utilisation of the structures.

8. Case Studies

Case study 1

Name: Purshotham

Age: 44 years old

Location: Kodihalli village, Nelamangala

Occupation: Agriculture

Purshotham, a 44-year-old farmer from Kodihalli village in Nelamangala taluk, had been practising farming on his ancestral land. He lived with 10 family members, who collectively worked on their farmland and took care for their livestock.

Very close to their property, they had an old borewell that had dried up and become non-functional. Despite attempts to rejuvenate it, they were unsuccessful. The methods followed were not efficient. However, through the water conservation project, the borewell was successfully recharged. Purshotham shared, "**Earlier, the groundwater level was at 800 feet, now it is at 500 feet. We are very happy to get water for our agricultural purposes from this borewell.**"

Additionally, in Kodihalli village, a check dam was constructed along the natural rainwater drainage, benefiting 160 households, who relied on rain and groundwater for farming. The check dam had a significant positive impact on the farmers. Purshotham explained, "My neighbour's farm was facing many issues due to the lack of groundwater. Now, after the check dam was completed, they have resumed farming and planted banana, arecanut, and coconut trees. All the borewells in the village are recharged and have sufficient water levels. **"It makes me happy to see how these structures are helping so many of us in the village. I too have been able to grow vegetables, and my cows have ample water to drink. We are also hopeful about the future now!"**

Case study 2

Name: Anjanamma

Age: 46

Location: Jakkanahalli village, Nelamangala

Occupation: Cashew Farmer

Anjanamma and her husband were owners of a cashew farm in Jakkanahalli village, located within Hasiruvalli Gram Panchayat. Her husband also worked as a waterman with the Gram Panchayat. He grew concerned about their farm when groundwater levels in the area began to deteriorate. The borewell near their farm, although strategically placed near the drainage, had dried up few years ago.

In Jakkanahalli, five borewell recharge structures were constructed to aid in the recharge of degraded or non-functional borewells. Anjanamma and her husband have been diligent in maintaining their borewell and the structure, setting an example as model farmers in the village. They not only cared for their farm but also extended responsibility towards maintaining public infrastructure.

Anjanamma shared, “Earlier, none of the farmers grew cashew in this area. Now that we have started, some neighbours are considering it too. Our ancestors passed this farm down to us, and we witnessed the hard work they put into keeping the farm and family thriving. I believe we should put our full efforts to protect the farmland and pass it down to future generations. **Farmers have a lot of responsibility towards the family, the nation, and the environment, including all water resources.**”

Case study 3

Name: Ram Reddy

Age: 56 years old

Location: Kothlapur, Sangareddy

Occupation: Agricultural farmer

Ram Reddy is a farmer from Kothlapur village in Sangareddy district. Being the breadwinner of his family, he catered to the responsibility of providing for his old mother, his wife and two sons. With diligent support from his wife, he had been practising agriculture on his family's land, but the task at hand has been proving difficult with the rising temperatures during summers and water shortages.

Before the implementation of the project, his village had one borewell situated in front of the panchayat office, which was not adequate. Most of the population of

the village was dependent on this borewell for both agricultural and household needs. Since the village was located in a naturally dry and arid climate, the groundwater levels declined below 500 feet, making it difficult for village members to carry out their daily activities. The water conservation programme installed two recharge shafts across the village to renew the ground water levels. This proved to be extremely beneficial, and the groundwater level has increased by 125 ft, allowing for the collection and uptake of good quality and quantity of water for irrigation and other domestic purposes. **Moreover, earlier, farmers could only sustain the growth of a single crop per year. Since the project, they were able to nurture two crops per year which has increased their annual agricultural turnover**.

Ram now is hopeful about his agricultural prospects. The construction of these recharge stations has acted as a boon not only for him but also for most of the villagers who are able to yield maximum agricultural outputs. "**The structures have been constructed strategically and in accordance with the village needs. All the community members are aware about the project, and we are grateful for the benefits received through the programme. The programme not only contributed to recharging the ground water levels but also improved our awareness levels and knowledge on judicial water usage.**"

Case Study 4

Name: D. Satish Kumar

Age: 60 years old

Location: Terpole village, Sangareddy

Occupation: Sarpanch

Working meticulously towards the betterment of his village, D Satish Kumar is the 60-year-old Sarpanch of Terpole Panchayati Raj Institution. Given the dry climatic conditions that the village falls under, he spoke about the difficulties previously faced by his fellow villagers in obtaining enough water for agricultural and household needs. During hot summer days, the groundwater levels in the borewells would deplete to a level of 800 feet, reducing water availability. Not only was there a water scarcity for irrigation, but celebrating festivals and cultural events was increasingly becoming challenging.

The multifaceted challenges faced by them was solved by the water conservation project. The project initially started off with the construction of two check dams, and followed by two more check dams, which were supplemented with two recharge shafts. The construction of these new structures augmented the water levels in the borewells allowing a sustained flow of water supply throughout the village. Moreover, the farmers received training on techniques for maintaining the structures. **The project served a dual purpose: enriching the groundwater supply and enhancing the farmers' knowledge on efficient water usage.** Through strategic water usage and increased groundwater levels, the farmers can grow more crops every year ranging from maize, onion, cotton, and paddy.

9. Annexures

VWBA Study for structures

Volumetric Water Benefit Accounting for check dams Bangaluru Rural (Nelamangala)

S No	Village	Length in m	Width in m	Height / Depth in m	No. of Fillings in a year	Annual average rainfall in mm	Catchment area in Ha	Ruoff Coeff.	Multiplication factor for Evaporation losses @10%	Volume Captured catchment in KL/ Annum - Evaporation Losses	Ground Water Recharge Volume in KL/ annum as per VWBA	Remarks
1	Chikkanahalli	550	8	0.7	2	776	200	0.2	0.9	279360	5544	Was found Okay during site visit
2	Chikkanahalli	450	7	0.7	2	776	180	0.2	0.9	251424	3969	Was found Okay during site visit
3	Kodihalli	500	7	0.7	2	776	160	0.2	0.9	223488	4410	Was found Okay during site visit
4	Byranyakana halli	500	8	0.7	2	776	200	0.2	0.9	279360	5040	Was found Okay during site visit
5	Hasiruvalli-1	500	7	0.7	2	776	180	0.2	0.9	251424	4410	Was found Okay during site visit
6	Vadakunte-1	400	7	0.7	2	776	100	0.2	0.9	139680	3528	Was found Okay during site visit
7	Hasiruvalli	500	7	0.7	2	776	220	0.2	0.9	307296	4410	Was found Okay during site visit
8	Guddegowda na Chanohalli	550	7	0.6	2	776	250	0.2	0.9	349200	4158	Was found Okay during site visit
9	Hasiruvalli-2	500	7	0.6	2	776	120	0.2	0.9	167616	3780	Was found Okay during site visit
10	Vadakunte-2	450	7	0.6	2	776	100	0.2	0.9	139680	3402	Was found Okay during site visit

11	Byranyakanhahalli	450	7	0.6	2	776	120	0.2	0.9	167616	3402	Was found Okay during site visit

Volumetric Water Benefit Accounting for Bore Shaft Recharge Structures in Bangaluru Rural (Nelamangala)

S No	Village	Diameter in mm	Maximum depth in m	Annual average rainfall in mm	Total Catchment area in Ha	Run off Coeff.	Multiplication factor for evaporation losses @10%	Total Ground Water Recharge Capacity in KL/ Annum considering evaporation losses	Estimated Total Ground Water recharge in KL / Annum	Remarks
1	Byranyakanhahalli-1	6"	80 - 100	776	13	0.2	0.9	18158	16343	Need Cleaning and flushing of filter medium. 90% efficiency undertaken
2	Byranyakanhahalli-2	6"	80 - 100	776	15	0.2	0.9	20952	0	Needs maintenance. Not Functional. Zero % efficiency
3	Byranyakanhahalli-3	6"	80 - 100	776	15	0.2	0.9	20952	18857	Needs Cleaning and flushing of filter medium. 90% efficiency undertaken
4	Hasiruvalli-1	6"	80 - 100	776	12	0.2	0.9	16762	11733	Needs Maintenance, cleaning and flushing of filters. 70% efficiency
5	Hasiruvalli-2	6"	80 - 100	776	12	0.2	0.9	16762	15085	Needs Cleaning and flushing of filter medium.90% efficiency undertaken
6	Hasiruvalli-3	6"	80 - 100	776	12	0.2	0.9	16762	0	Destroyed due land sale for house constructions
7	Kalalaghatta-1	6"	80 - 100	776	15	0.2	0.9	20952	18857	Need Cleaning and flushing of filter medium.90% efficiency undertaken
8	Kalalaghatta-2	6"	80 - 100	776	15	0.2	0.9	20952	18857	Need Cleaning and flushing of filter medium. 90% efficiency undertaken
9	Kalalaghatta-3	6"	80 - 100	776	10	0.2	0.9	13968	12571	Need Cleaning and flushing of filter medium. 90% efficiency undertaken

10	Kalalaghatta-4	6"	80 - 100	776	10	0.2	0.9	13968	12571	Need Cleaning and flushing of filter medium.90% efficiency undertaken
11	Kalalaghatta-5	6"	80 - 100	776	10	0.2	0.9	13968	12571	Need Cleaning and flushing of filter medium.90% efficiency undertaken
12	Kalalghatta- 6	6"	80 - 100	776	12	0.2	0.9	16762	15085	Need Cleaning and flushing of filter medium.90% efficiency undertaken
13	Gundenahalli-1	6"	80 - 100	776	15	0.2	0.9	20952	0	Destroyed due to drain construction
14	Gundenahalli-2	6"	80 - 100	776	10	0.2	0.9	13968	0	Pond has been constructed around it
15	Vadakunte-1	6"	80 - 100	776	12	0.2	0.9	16762	15085	Need Cleaning and flushing of filter medium.90% efficiency undertaken
16	Vadukante-2	6"	80 - 100	776	10	0.2	0.9	13968	12571	Need cleaning and flushing of filter.90% efficiency undertaken
17	Jakkanahalli-1	6"	80 - 100	776	10	0.2	0.9	13968	12571	Need cleaning and flushing of filter.90% efficiency undertaken
18	Jakkanahalli-2	6"	80 - 100	776	10	0.2	0.9	13968	12571	Need cleaning and flushing of filter.90% efficiency undertaken
19	Jakkanahalli-3	6"	80 - 100	776	12	0.2	0.9	16762	0	Destroyed due to road construction
20	Jakkanahalli-4	6"	80 - 100	776	12	0.2	0.9	16762	15085	Need cleaning and flushing of filter.90% efficiency undertaken
21	Jakkanahalli-5	6"	80 - 100	776	15	0.2	0.9	20952	18857	Need cleaning and flushing of filter.90% efficiency undertaken
22	Guddegowdana Chanohalli-1	6"	80 - 100	776	12	0.2	0.9	16762	0	Destroyed due to road construction
23	Guddegowdana Chanohalli-2	6"	80 - 100	776	15	0.2	0.9	20952	18857	Need Cleaning and Flushing of filters.90% efficiency undertaken

24	Guddegowdana Chanohalli-3	6"	80 - 100	776	15	0.2	0.9	20952	0	could not be located
25	Chikkanahalli-1	6"	80 - 100	776	12	0.2	0.9	16762	15085	Need cleaning and flushing of Filter Medium.90% efficiency undertaken
26	Chikkanahalli-2	6"	80 - 100	776	12	0.2	0.9	16762	0	damaged due to road construction
27	Chikkanahalli-3	6"	80 - 100	776	12	0.2	0.9	16762	0	Damaged due to road construction
28	Kodihalli-1	6"	80 - 100	776	12	0.2	0.9	16762	15085	Need cleaning and flushing of filter.90% efficiency undertaken
29	Kodihalli-2	6"	80 - 100	776	12	0.2	0.9	16762	15085	Need cleaning and flushing of filter.90% efficiency undertaken
30	Minnapura	6"	80 - 100	776	10	0.2	0.9	13968	13968	Functional and working

Volumetric Water Benefit Accounting for Check Dams in Sangareddy

S No	Village	Length in m	Width in m	Height / Depth in m	No. of Fillings in a year	Annual average rainfall in mm	Catchment area in Ha	Ruoff Coeff.	Multiplication factor for Evaporation losses @10%	Volume Captured catchment in KL/ Annum - evaporation losses	Volume Captured in KL / Annum from catchment area	Ground Water Recharge Volume in KL / annum	Remarks
1	Aliyabad	245	23.10	1.45	2	910	28	0.2	0.9	45864	0	0	No water storage found, required maintenance inside walls and apron is completely filled with soil up to crest level
2	Haridaspur	265	20	1.5	2	910	49	0.2	0.9	80262	56183	10017	Water is not stored up to its capacity, may be leakage or water seepage as water is flowing in the drain with good velocity and quantity so requires maintenance.

3	Marepally	300	20	1.5	2	910	57	0.2	0.9	93366	93366	16200	during site visit found Okay
4	Golapalli	325	23.5	1.5	2	910	34	0.2	0.9	55692	55692	20621	during site visit found Okay
5	Terpole	240	21	1.5	2	910	28	0.2	0.9	45864	45864	13608	during site visit found Okay
6	Terpole	250	25	1.5	2	910	32	0.2	0.9	52416	52416	16875	during site visit found Okay
7	Terpole	250	21	1.5	2	910	38	0.2	0.9	62244	62244	14175	during site visit found Okay
8	Terpole	300	21	1.5	2	910	49	0.2	0.9	80262	80262	17010	during site visit found Okay

Volumetric Water Benefit Accounting for Bore Shaft Recharge Structures in Sangareddy

S No	Village	Diameter in mm	Maximum depth in m	Annual average rainfall in mm	Total Catchment area in Ha	Runoff Coeff.	Multiplication factor for accounting Evaporation Losses @10%	Total Volume Captured capacity in KL/ Annum- Evaporation losses	Estimated Total Ground Water recharge in KL / Annum	Remarks
1	Anantsagar	6"	80 - 100	910	8	0.2	0.9	13104	11794	Need cleaning of shrubs & refilling of filter media. 90% efficiency for recharge undertaken
2	Gangagram	6"	80 - 100	910	7	0.2	0.9	11466	8026	Need cleaning and maintenance. 70% efficiency for water
3	Garakurthy	6"	80 - 100	910	10	0.2	0.9	16380	11466	Structure walls are damaged required cleaning and maintenance. 70% efficiency undertaken
4	Kothlapur 1	6"	80 - 100	910	7	0.2	0.9	11466	10319	Need cleaning of shrubs & refilling of filter media.90% efficiency undertaken
5	Kothlapur 2	6"	80 - 100	910	10	0.2	0.9	16380	14742	Need cleaning of shrubs & refilling of filter media.90% efficiency undertaken

6	Gollapally	6"	80 - 100	910	9	0.2	0.9	14742	10319	Structure walls are damaged required cleaning and maintenance.70% efficiency undertaken.
7	Terpole	6"	80 - 100	910	10	0.2	0.9	16380	14742	Need cleaning of shrubs & refilling of filter media.90% efficiency undertaken.
8	Terpole	6"	80 - 100	910	6	0.2	0.9	9828	8845	Need cleaning of shrubs & refilling of filter media.90% efficiency undertaken.
9	Gopularam	6"	80 - 100	910	6	0.2	0.9	9828	8845	Need cleaning of shrubs & refilling of filter media.90% efficiency undertaken
10	Gopularam	6"	80 - 100	910	6	0.2	0.9	9828	8845	Need cleaning of shrubs & refilling of filter media.90% efficiency undertaken

Volumetric Water Benefit Accounting for Percolation Tank Structures in Sangareddy

S No	Village	Length in m	Height in m	No. of Fillings in a year 2023	Annual average rainfall in mm	Catchment area in Ha	Runoff coefficient	Multiplication Factor for accounting Evaporation losses @10%	Estimated Total Water storage for Ground Water Recharge Potential	Remarks
1	Machepalli	110	10	2	910	30	0.2	0.9	36000	Tank was found to be functional and okay
2	Anantsagar	105	8	2	910	34	0.2	0.9	32400	Tank was found to be functional and okay

3	Mandhapur	95	8	2	910	45	0.2	0.9	36360	Tank was found to be functional and okay
4	Dobbakunta	140	8	2	910	30	0.2	0.9	39600	Tank was functional and okay

Tools

Quantitative and qualitative questionnaires used for assessing the perception of different stakeholders.

Quantitative tool for Water Conservation in Karnataka and Telangana				
S. No.	**Question**	**Response**	**Skip**	**Mandatory**
Demographic details				
1	Name of Respondent			Yes
2	Name of State			Yes
3	Name of Village			Yes
4	Age			Yes
5	Gender	Male		Yes
		Female		
		Others/ Prefer not to say		
6	Caste	SC		Yes
		ST		
		OBC		
		General		
		Prefer not to say		
7	Occupation(s)	Farming / Agriculture		Yes, multi-select
		Livestock rearing		
		Daily wage labour		
		Self-employed		
		Employed in Govt or Private company		
		Unemployed		
		Others_____		
8	Do you have a BPL card?	Yes		Yes
		No		
		Don't know		
Before project details				
9	Was there a shortage of water in the area before the construction of check dams and recharge structures?	Yes	Go to 10	Yes
		No	Go to 11	
		Don't know	Go to 10	
10	How often did you experience water shortage before the project?	More than 2 times in a month		Yes
		1 - 2 times in a month		
		Once in two months		
		Once in three months		
		Only in summer / winter		
		Never		
		Not sure		
11	What are the primary sources of water in your household?	Private borewell		Yes, multi-select
		Community borewell		
		Check dam		
		River/ stream		
		Lake / pond (natural)		
		Manmade tank		
		Water from tanker		
		Private tap connection		
		Public well/ public tap		
		Others____		
12	What were the other water-	Water sources had		Yes, multi-select

	related challenges you faced before the project?	dried up		
		Poor water quality		
		Lack of water for irrigation or other livelihoods		
		Flooding during monsoons (soil erosion or surface runoff)		
		Not sure		
		Others _____		
Project details				
13	Are you aware that the water conservation project was funded by UBL	Yes		Yes
		No		
		Don't know		
14	From whom did you first hear about the project?	Community member		Yes
		Gram Panchayat representative		
		Neighbours		
		Project team		
		Others _____		
		Don't remember		
15	What are the different infrastructures your community has received under the project?	Check dam		Yes, multi-select
		Recharge structure		
		Percolation tank		
		Others _____		
		Don't remember		
16	Do you think the infrastructure was important for groundwater rejuvenation?	Yes		Yes
		No		
		Don't know		
17	Did you participate in the water budgeting workshops?	Yes	Go to 18	Yes
		No	Go to 19	
		Unsure	Go to 19	
18	Was the workshop useful for planning the project?	Yes		Yes
		No		
		Not sure		
19	Did you participate in the awareness building sessions	Yes	Go to 20	Yes
		No	Go to 21	
		Not sure	Go to 21	
20	Have the sessions made you more aware in water usage, requirements, and ground water recharge	Yes		Yes
		No		
		Not sure		
21	Are you a member of the Water User Group (WUG)?	Yes	Go to 22	Yes
		No	Go to 23	
		Not sure	Go to 23	
22	What are the responsibilities of WUGs? Choose all options that apply.	Representing community by expressing requirements and challenges		Yes, multi-select
		Coordinating with GP officials to obtain permissions		
		Overseeing construction activities during the project		

		Maintenance and operation of structures, post construction		
		Others____		
		Don't know		
23	Are the WUG members actively maintaining the infrastructures	Yes		Yes
		No		
		Not sure		
Project impact				
24	Do you think the project has benefitted your community?	Yes	Go to 25	Yes
		No	Go to 26	
		Don't know	Go to 26	
25	Which of the following benefits have you experienced?	Increased groundwater level		Yes
		Reduced water scarcity		
		Better water quality		
		Increased water availability for agriculture and livestock		
		Increase in family income		
		Reduced surface run-off		
		Increased water for recreation		
		Increased water for other livelihoods (fishing, etc)		
		Not sure		
26	Do you think that the project has had a positive impact on your livelihood?	Yes	Go to 27	Yes
		No	Go to 28	
		Don't know	Go to 27	
27	What impact has it had on your livelihood?	Enhanced agricultural productivity		Yes
		Improved livestock health / produce		
		Improved availability of ground water		
		Increased income due to diversification of agriculture		
		No noticeable impact		
28	Is your primary occupation farming?	Yes	Go to 29	Yes
		No	Go to 30	
29	What impact has there been on agriculture?	Increased crop productivity		Yes
		Increased irrigation water supply		

		Improved soil moisture		
		Enhanced groundwater recharge		
		Increased availability of silt		
		Reduced crop stress		
		No noticeable impact		
Satisfaction Level				
30	**Rate the following -**			Yes
	Process followed by the project team in constructing the infrastructure	Not satisfied, Neural, Satisfied		
	Quality of infrastructure built under project			
	Quality of maintenance of infrastructure by Water User Groups			
	Availability of groundwater due to infrastructure			
	Over-all project implementation			
31	Would you recommend this project (similar infrastructures) to neighbouring villages?	Yes		Yes
		No		
		Not sure		
32	Any other feedback			No

Qualitative questionnaire for implementing partner		
S. No.	**Questions**	**Responses**
1	Name	
2	Age	
3	Date	
4	Village name and GP Name	
5	What are the sources of water for the 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 the community before the project? Please explain in detail. **Probe**: availability and access to ground water, water for agriculture, livestock, domestic purposes	
7	How did the water budgeting workshops help with understanding the community's water requirements? **Probe**: community participation, workshop content, using workshop insights for project planning	
8	How did the awareness session help the community? **Probe**: strategies to raise awareness, content, delivery, and mobilisation	
9	What were the infrastructure solutions provided to the community? How do they help the community? **Probe**: relevance and importance of infrastructure, location of infrastructure	

10	Please explain about the procedure / processes used for infrastructure building. **Probe**: role of GP members, construction companies, permissions, DPR preparation, engagement of scientific and technical experts.	
11	How effective are infrastructures (check dams, recharge shafts and percolation tanks) in conserving water?	
12	How well were the project objectives and activities were communicated to the community?	
13	Please explain about how the water user groups were formed, their purpose, functions, and membership. **Probe**: maintenance of project assets, repair if needed	
14	Has water availability in the community significantly improved? Please provide examples to support this. **Probe**: agriculture, livestock and domestic usage, access to all community members	
15	What are the other benefits of the project? Please provide details **Probe**: increase in income (or saving) due to increased water availability, better water planning-budgeting, increased access to water (earlier limited access)	
16	What challenges were faced during project implementation. How were they overcome?	
17	Please explain how about the sustainability of the project **Probe**: Water user groups, support from PRI, local govt depts	
18	**Rate the following (1-5, 1: not satisfactory 5: very satisfactory)**	
	Project procedures / processes	
	Involvement of community	
	Effectiveness of awareness sessions	
	Support from PRI members in project implementation	
	Effectiveness of infrastructures in ground water recharge	
	Availability of ground water post project completion	
	Impact of project on over-all wellbeing of the community	
19	Would you recommend such interventions in similar areas? Please explain.	

Qualitative questionnaire for community		
S. No.	**Questions**	**Responses**
1	Name	
2	Age	
3	Date	
4	Village name and GP Name	
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	Explain how the water-budgeting workshops were conducted. **Probe**: content, location, project team involvement	
8	Explain how the awareness / capacity building sessions were conducted. **Probe**: content, location, project team involvement, community participation and mobilisation	
9	What were the infrastructure solutions provided? How do they help in recharge of groundwater? **Probe**: relevance and importance of infrastructure, location of infrastructure	

10	How were you made aware of the objectives and activities of the water conservation project? Did anybody explain the scientific and technical details to you?	
11	Please explain about the water user groups. What are their activities? Are they proactively maintaining the infrastructures?	
12	Please explain your role or community role in project activities. **Probe:** planning, supervising, helping project team	
13	Please explain about the quality and durability of the infrastructures built.	
14	Do you believe the project has improved water availability and quality in your community? If yes, please provide examples or instances.	
15	How sustainable are these improvements?	
16	How has the project impacted your household? - agriculture, livestock, domestic uses, other livelihood depending on water.	
17	**Rate the following (1-5, 1: not satisfactory 5: very satisfactory)**	
	Project procedures / processes followed by implementing agency	
	Involvement of community	
	Effectiveness of awareness sessions	
	Support from PRI members in project implementation	
	Effectiveness of infrastructures in ground water recharge	
	Availability of ground water post project completion	
	Maintenance of infrastructure	
	Impact of project on over-all wellbeing of the community	
18	Would you recommend such interventions in similar areas? Please explain.	

Qualitative questionnaire for govt officials and PRI members		
S. No.	**Questions**	**Responses**
1	Name	
2	Age	
3	Date	
4	Village name and GP Name	
5	Department and designation	
6	What were the water-related challenges faced by the community before the project? Please explain in detail. **Probe:** availability and access to ground water, water for agriculture, livestock, domestic purposes, seasonality	
7	How were you made aware of the objectives and activities of the water conservation project? Please elaborate.	
8	Please explain about the procedure / processes used for infrastructure building. **Probe:** role of GP members, construction companies, permissions, DPR preparation, engagement of scientific and technical experts.	
9	How effective are infrastructures (check dams, recharge shafts and percolation tanks) in conserving water?	
10	Please explain your role in project activities. **Probe:** planning, supervising, helping project team, helping with permissions	
11	Please explain about the quality and durability of the infrastructures built.	
12	Do you believe the project has improved water availability in the community? If yes, please provide examples or instances.	
13	How sustainable are these improvements?	
14	What challenges were faced during project implementation. How were they overcome?	

15	Are there any other projects of similar nature, implemented by govt or private agencies? If yes, please explain how this project was different.	
16	**Rate the following (1-5, 1: not satisfactory 5: very satisfactory)**	
	Project procedures / processes followed by implementing agency	
	Involvement of community	
	Effectiveness of awareness sessions	
	Support from PRI members in project implementation	
	Effectiveness of infrastructures in ground water recharge	
	Availability of ground water post project completion	
	Maintenance of infrastructure	
	Impact of project on over-all wellbeing of the community	
17	Would you recommend such interventions in similar areas? Please explain.	

Perception Index from 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

Field photos

Figure 13: FGD at Nelamangala

Figure 14:FGD at Nelamangala

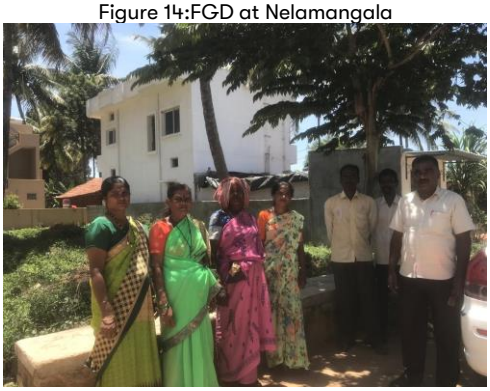


Figure 15:FGD at Sangareddy

Figure 16: FGD at Sangareddy

Figure 17:FGD at Hasriruvalli GP, Nelamangala

Figure 18:FGD with beneficiaries at Nelamangala

Figure 19:Group discussion with AFPRO team

Figure 20: KOF interactions at Sangareddy

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