PARTICIPANT SURVEY

SUMMARY REPORT: Assessing the Benefits of Integrated Water Resource Management (IWRM) and Water-Energy-Food-Ecosystems (WEFE) Nexus Technologies and Management Practices Introduced by the USAID Regional Water and Vulnerable Environments (WAVE) Activity in Central Asia (2022-2024)

September 2024

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1. Background

On October 1, 2020, Tetra Tech was awarded the USAID Regional Water and Vulnerable Environments (WAVE) Activity, a five-year, $24 million contract, from the United States Agency for International Development (USAID). The Activity is being implemented across five Central Asian countries—Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan—from October 1, 2020, to September 30, 2025

The goal of the WAVE Activity is to strengthen water cooperation across Central Asia, promoting stability, economic prosperity, and healthy ecosystems. Water, energy, and food security are tightly interconnected in Central Asia, forming a resource nexus that transcends borders. The Activity focuses on two major river basins, the Syr Darya and Amu Darya, and adopts a multi-level governance approach to address complex regional water challenges. This is achieved through stakeholder dialogues, developing a shared vision for sustainable river basin management based on evidence and modeling, and fostering collaborative actions across sectors and governance levels.

The WAVE Activity aims to achieve the following three objectives:

- Objective 1. Strengthening human capital and educational institutions to address IWRM and the WEFE nexus.
- Objective 2. Establishing sustainable basin councils that promote cooperation for mutual economic benefits.
- Objective 3. Supporting regional and national initiatives that foster water cooperation and address governance needs.

2. Introduction

As water resource management challenges become increasingly complex, it is essential that stakeholders at all levels—regional, national, sub-national, and community—use the best available knowledge and experience to address these issues. Science, technology, innovation, and partnerships (STIP) play a crucial role in this regard. In line with the Objective 2, the Activity implemented STIP through the grants program. The STIP component supported efforts to bring innovative technologies, best practices, and partnership models to Central Asia that have proven successful in other regions.

According to the WAVE Activity Monitoring, Evaluation, and Learning Plan (AMELP), the MEL team monitors performance across all objectives by using various data collection and analysis methods to measure progress against planned outputs and outcomes, as outlined in the Activity results framework. The WAVE includes 12 key indicators for monitoring intermediate results, with most performance data collected during events and activities organized by the WAVE or its grantees. For Objective 2, two specific indicators—**IR 2.3a (Number of individuals applying WEFE-related STIP activities or management practices)** and **IR 2.3b (Number of individuals benefiting from WEFE-related STIP activities or management practices)**—focused on the implementation of science, technology, innovation, and partnership (STIP) measures. These

indicators tracked the number of participants in the Activity who not only applied WEFE-related STIP interventions but also experienced benefits from their application. The data for these indicators was gathered through surveys conducted with participants and staff from grant implementers. Participants include individuals from public or private sectors (namely the water, food, energy, and environment sectors) who apply WEFE-related STIP activities or management practices at local, national, or regional levels. The participants include:

- Farmers and other primary producers of food, fish, agroforestry, and natural resource-based products.
- Private sector actors, such as service providers, entrepreneurs, and processors.
- Government officials, including policymakers, extension workers, and natural resource managers.

WEFE-related STIP activities and management practices aim to coordinate the development and management of water, land, and resources to maximize economic and social benefits while safeguarding ecosystem sustainability. Examples of WEFE-related STIP activities promoted by the USAID WAVE Activity include WEAP (water evaluation and planning) and LEAP (long-term evaluation and planning) systems modeling, automated water measurement systems, GIS-based databases and maps, satellite imagery for water facilities, afforestation (e.g., riparian buffer and riverbed protection), alternative irrigation techniques (drip, sprinkler), crop selection, climate adaptation measures, and solar-powered water infrastructure.

3. Survey objective

The survey is administered among participants who, with the support of the USAID WAVE Activity, applied technologies and management practices related to STIP activities to address IWRM and the WEFE nexus. Through this survey, the WAVE team aims to:

- Capture field data on the types of technologies and management practices applied through grantees or directly by the WAVE team in Central Asia.
- Assess the benefits received by individuals who participated in implementing STIP measures.

4. Methodology

The survey targeted participants who applied technologies or benefited directly through USAID WAVE Activity support in Central Asia. A cross-sectional design and a stratified random sampling method were used to select participants from a population of 3,122 participants across five countries. The sample size was determined using a 95 percent confidence interval and a 5 percent margin of error. Data was collected once through questionnaires in local languages, administered via phone or in person, and responses were captured using the KoBo Toolbox platform.

Table 1. Sample size of the participant population by country strata.

#	Country	Actual number of participants	Sample of respondents
1	Tajikistan	498	67
2	Kyrgyz Republic	1677	200
3	Kazakhstan	315	82
4	Turkmenistan	71	38
5	Uzbekistan	561	67
	Total	**3122**	**454**

5. Data collection

Questionnaire: The survey employed a questionnaire designed to capture the benefits received from the application of technologies and management practices, as outlined in the "Introduction" section of this document. The questionnaires and consent forms were initially created in English and then translated into the local languages (Kazakh, Kyrgyz, Tajik, Turkmen, and Uzbek) of the WAVE Activity target countries. Responses were recorded electronically via tablets programmed with the KoBo Toolbox online platform. The translated versions were pilot-tested for clarity, and the wording of the questions was adjusted as needed based on pilot feedback. The questionnaires consisted of structured questions designed to gather both qualitative and quantitative data. The first section collected general respondent information, followed by questions about the types of technologies and management practices introduced and adopted by participants. The enumerators also recorded GPS locations and took photos of the technologies, when applicable.

In cases where surveys were conducted remotely by phone, GPS coordinates and photos could not be captured and were omitted. The final section of the questionnaire focused on the benefits participants received from the technologies and management practices, as well as their satisfaction with the Activity's implementation. Overall, administering each questionnaire took approximately 20-40 minutes.

6. Limitations

While the survey provided valuable insights into the benefits received by participants of the USAID WAVE Activity, several limitations should be considered when interpreting the findings:

- *Language and Translation Challenges:* Although the questionnaires were translated into local languages and pilot-tested, nuances in language or regional dialects may have led to varying interpretations of the questions. Despite efforts to ensure clarity, some responses might have been influenced by these language differences.

- *Non-Response and Sampling Bias:* While the survey aimed to reach a representative sample of participants, non-response from certain individuals or groups could introduce bias. Additionally, participants who did not participate in the survey may have different experiences or outcomes than those who responded.

- *Cross-Sectional Design:* The survey employed a cross-sectional design, capturing data at a single point in time. As a result, it does not provide insights into changes or developments in the application of technologies and management practices over time. Longitudinal data collection would be necessary to understand the full impact of these interventions.

- *Limited Sample Size at the Country Level:* The overall sample size is statistically valid for regional analysis, providing a representative view of the population adopting the technologies and management practices. However, in the individual target countries, the sampled population was too small to ensure statistical validity, limiting the ability to draw robust country-specific conclusions.

- *Self-Reported Data:* The survey relied on self-reported data, which can be subject to recall bias, social desirability bias, or inaccuracies in reporting. Participants may have overstated or understated their use of technologies or the benefits they received.

- *Technology Adoption Stages:* The survey captured participants at varying stages of technology adoption. Some respondents may have had more time to experience the benefits of the interventions, while others were in the early stages of implementation, potentially skewing the results.

7. Survey Findings

The WAVE participant survey collected a broad array of data, including demographic information, adoption of innovative technologies, and the participants' satisfaction with the WAVE Activity. These findings, alongside the demographic data, provide a holistic view of the project's outcomes.

Gender: The gender distribution of survey participants shows a higher proportion of male respondents 64 percent compared to females 36 percent. The lower female participation likely reflects socio-cultural factors, particularly in rural Central Asian communities where men dominate decision-making in agriculture and water management. Women often face barriers such as limited access to resources, as men typically control land ownership and farming decisions. Additionally, women in these areas may have less access to training due to household responsibilities and social norms that discourage their involvement in public decision-making and voicing their opinions.

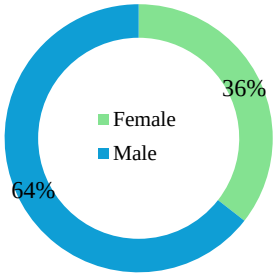

Figure 1. Gender Distribution of Survey Respondents

Education Level: Participants in the survey had varying educational backgrounds as indicated in Figure 2. This distribution suggests that most participants had the necessary educational background to understand and apply the technologies promoted by the WAVE Activity. The substantial number of participants with higher education also indicates a relatively well-educated group, which may have facilitated the adoption of innovative technologies.

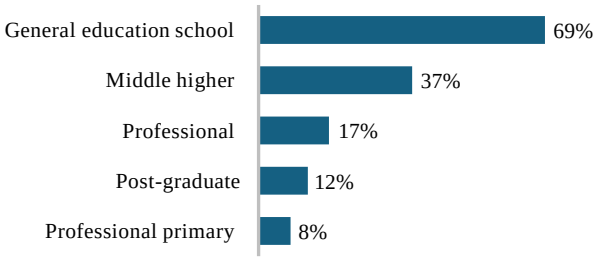

Figure 2. Education Levels of Survey Respondents

Occupation: The occupational data highlighted the focus of WAVE Activity participants. The prominence of farmers aligns with the activity's focus on water and agricultural management, while the involvement of public workers suggests the inclusion of key stakeholders in policy and management roles.

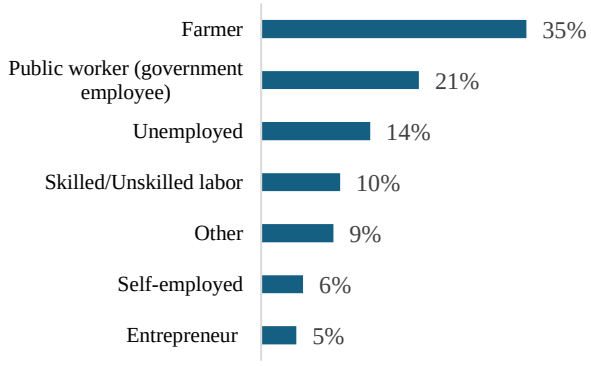

Figure 3. Occupational Breakdown of Survey Respondents

Adoption of Technologies and Management Practices

The survey demonstrated broad adoption of various technologies, with notable examples such as the **water price control system** 32.2 percent and **automated water measuring systems** 15.9 percent, both of which were vital for improving water efficiency. Environmental technologies, including **biodegradable fishing nets** 18.1 percent and **green patrols** 5.7 percent, also saw significant uptake. These technologies were primarily aimed at improving water usage efficiency and environmental sustainability, which are crucial in the Central Asian region and key elements in the USAID WAVE Activity.

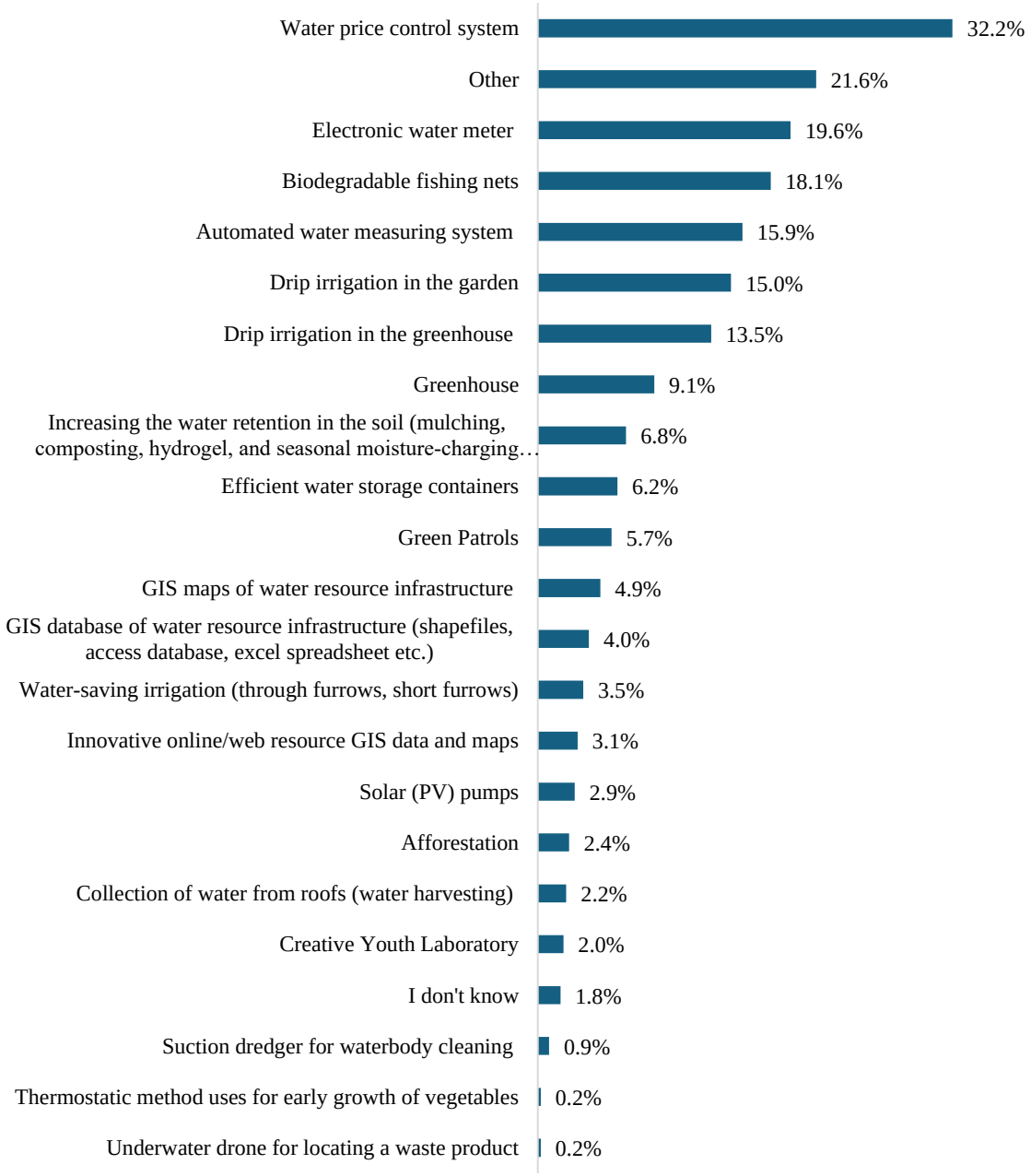

Figure 4. Adoption rates of key technologies and management practices by respondents

Additionally, technologies like **electronic water meters** 19.6 percent and **drip irrigation in gardens** 15.0 percent reflect participants' strong focus on enhancing resource management and agricultural productivity. **Greenhouse systems** 9.1 percent and **solar (PV) pumps** 2.9 percent were also adopted, contributing to the region's efforts in optimizing agricultural yields and energy use.

The adoption of **GIS-based technologies**, such as **GIS maps of water resource infrastructure** 4.9 percent and **GIS databases** 4.0 percent, demonstrates a growing reliance on data-driven decision-making to manage water resources more effectively and was adopted by water management agencies. Participants also expressed interest in various other practices, including **efficient water storage containers** 6.2 percent and **increasing the water retention in the soil** through methods like mulching and hydrogel use 6.8 percent. The focus on these technologies and practices reflects the participants' priorities in optimizing resource use and addressing environmental challenges in Central Asia.

Key Positive Changes in Socio-Economic and Environmental Conditions of Households and Communities Resulting from Introduced Technologies and Management Practices

The WAVE Activity contributed to positive outcomes in both environmental and socio-economic conditions among participants. According to the survey, 88 percent of respondents **reported improvements in their households' socio-economic and environmental conditions**. This strong response underscores the effectiveness of WAVE's interventions in these communities. Meanwhile, 5 percent of respondents reported that they **did not see any positive changes** taking place in their household or community.

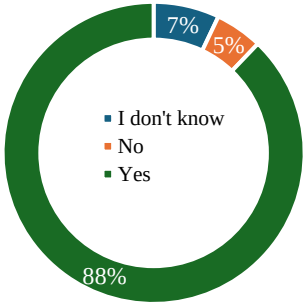

Figure 5. Respondents reported positive changes taking place in their households and communities

One of the most visible impacts observed was the **increased practice of efficient water usage by the community and institutions**, with 38 percent of respondents **identifying this as a major outcome**. This finding underscores the success of the water management technologies promoted by WAVE in addressing resource efficiency and conservation.

Other notable outcomes included **better awareness and coordination among people on water resources and environmental management** 31 percent and **more actions taken to reduce environmental degradation** 30 percent. These changes reflect an increased community engagement in sustainable environmental practices, which is crucial for the long-term success of the project.

Further positive changes included:

- 26 percent of respondents reported an **increase in income** as a result of the interventions.
- 18 percent saw an **increase in available water for irrigation**, reinforcing the importance of water conservation measures.

- 18 percent of respondents also noted **less conflict in the community** due to better management of water and environmental resources.

While these findings **reveal predominantly positive outcomes**, (5 percent of respondents **reported improved harvests**, **demonstrating a direct link between environmental management enhancements and economic benefits**. Additionally, 10 percent noted an **increase in work opportunities in the community** as a result of WAVE's efforts. Meanwhile, 2 percent **expressed uncertainty about the changes**, and another 2 percent **cited other positive developments**. These figures suggest that, although the majority have benefited from the interventions, some participants may not have experienced or recognized the same level of impact, indicating areas where further engagement or support may be necessary.

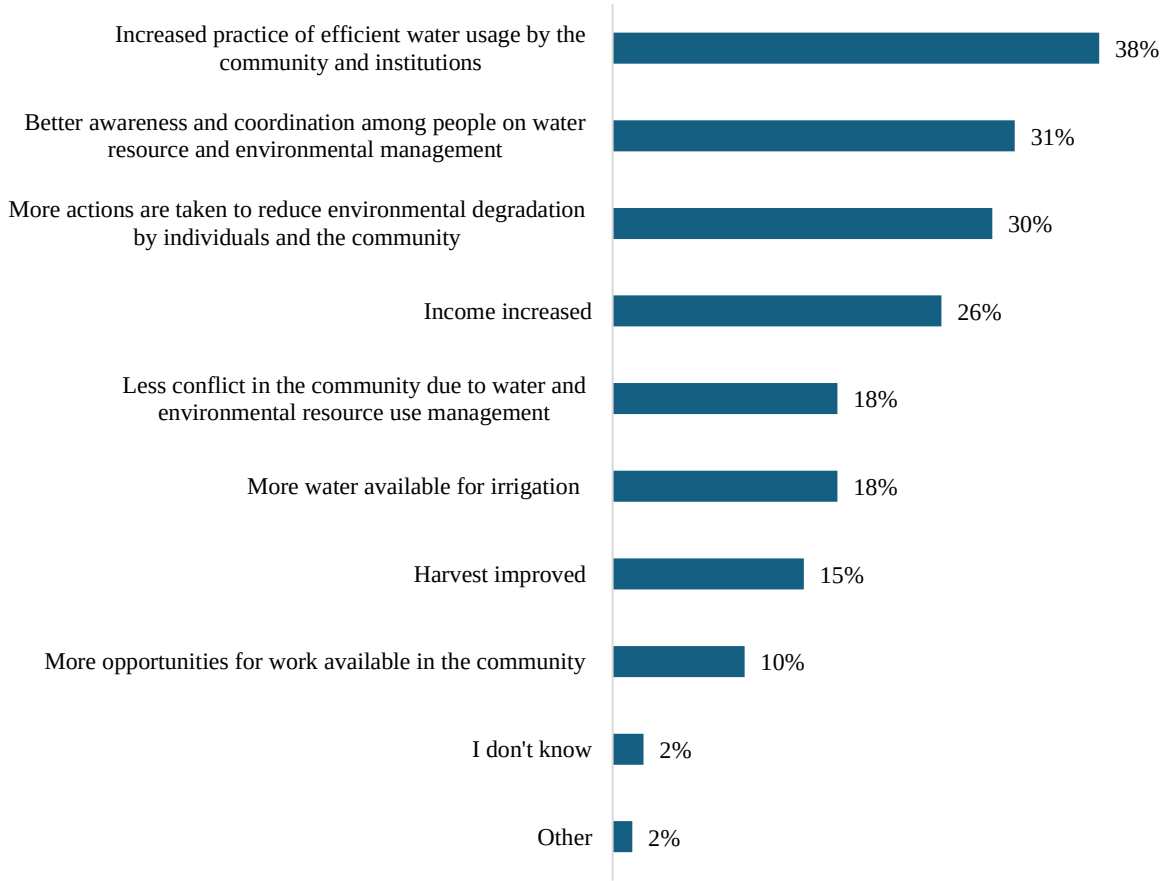

Figure 6. Positive changes in households and communities from USAID WAVE Activity's technologies and practices.

Satisfaction with WAVE Activity

The survey results demonstrated high levels of satisfaction among participants, both in their experiences with the technologies and the overall project implementation.

a. Satisfaction with Technology and Management Practices

- 63.7 percent **of participants were very satisfied** with the introduced technologies, and 31.5 percent **were satisfied**.
- Only 1.4 percent **were not very satisfied**, and a mere 0.5 percent **were not satisfied** at all.

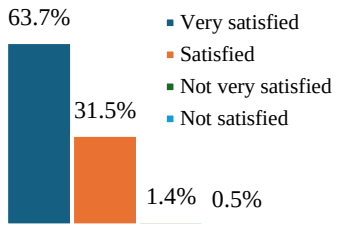

Figure 7. Participants' Satisfaction with Technologies and Management Practices

These high satisfaction levels suggest that the technologies and management practices introduced through the WAVE Activity have been well-received and are likely to generate continued adoption and positive impacts over time.

b. Satisfaction with Overall WAVE Activity Implementation

- 62 percent **of respondents were very satisfied** with the overall implementation of the WAVE Activity, while **32 percent expressed satisfaction**.
- Only 2 percent **of respondents were not very satisfied**, and just 1 percent **were not satisfied**.

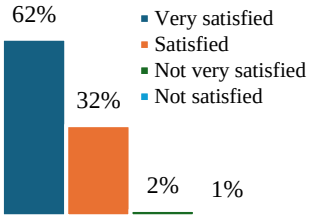

Figure 8. Participants' Overall Satisfaction with WAVE Activity Grants Implementation

This overwhelmingly positive response indicates that the project has effectively met the needs and expectations of the majority of participants, likely due to the relevance and impact of the technologies introduced.

Prior Use of Similar Technologies and Management Practices

When participants were asked whether similar technologies and management practices were already in use in their communities before the introduction of the WAVE Activity, the responses highlighted the novelty and impact of the new interventions:

- 59 percent **of respondents reported that the technologies were new to their community**, suggesting that the WAVE Activity introduced innovative practices that had not been previously implemented.
- 23 percent **of respondents indicated that similar technologies were somewhat in use**, reflecting a mix of traditional and newer approaches to water and resource management in these areas.

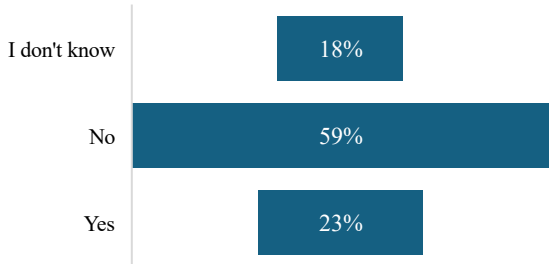

Figure 9. Prior Use of Similar Technologies in the Community

- 18 percent of respondents **were uncertain about whether similar technologies were already being used** in their community, which may indicate a lack of awareness. This highlights the potential role of the WAVE Activity in introducing both new and existing practices to these individuals.

These results emphasize the WAVE Activity's role in introducing new technologies and expanding the reach of existing methods, particularly in areas where advanced water management systems and environmental practices were previously limited or underutilized.

Summary of Qualitative Feedback Received from Respondents

Respondents expressed gratitude for the support provided by USAID WAVE Activity. However, they recommended several improvements for the future:

- **Expansion**: Extend the coverage of greenhouses and irrigation systems, and involve a broader audience, especially more women and young people. The participants see these interventions as scalable solutions that could benefit more farms and larger areas.
- **Increased training**: Conduct more frequent, hands-on training, particularly in remote and underserved areas. Increasing the engagement of women in hands-on training sessions could bridge the gender gap in technology adoption and enhance their role in community decision-making.
- **Improved communication**: Enhance access to information about grants and technologies, ensuring it reaches not just organizations but also more individuals.
- **Technological resilience**: Address water shortages, improve access to clean water, and provide ongoing support and maintenance for technologies, especially in challenging climate conditions. Technologies like solar (PV) pumps or automated water systems may require ongoing technical maintenance, and communities might struggle to maintain them without external support. This suggests a need for more structured follow-up and maintenance plans post-implementation.

USAID Regional Water and Vulnerable Environment Activity

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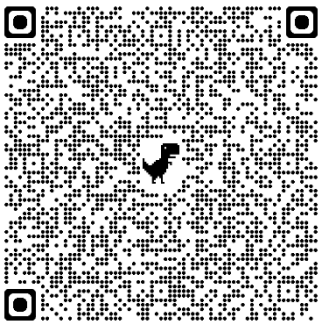

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