



Inception Report

26th December 2023

Project Title: Upscaling of customized irrigation and climate advisory services through citizen science

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ACRONYMS

ADPC	Asian Disaster Preparedness Center
PCRWR	Pakistan Council of Research in Water Resources
KP	Khyber Pakhtunkhwa
ICAS	Irrigation and Climate Advisory Service

1. INTRODUCTION

“Customized irrigation and climate advisory services through citizen science” is an innovative concept that was piloted to improve ownership of the existing irrigation advisory services launched by Pakistan Council of Research in Water Resources (PCRWR). The concept of this innovation was to engage farmers as citizen scientists for generating irrigation specific climate data. The purpose of this collaboration was to develop farmer’s capacity in applying this technical information for irrigating their fields and developing their resilience through awareness about climate parameters. This pilot was tested in the climate change hotspots and agricultural hub districts of Pakistan. This innovation is all about enabling climate change adaptation by creatively collaborating with farmers in the knowledge exchange process instead of knowledge receiving process. Almost all of the climate change policies and financial plans talk about “generating awareness” about climate change to farmers but the paths of achieving these policy goals are often left uncarved. In Pakistan, this issue becomes more relevant because farmers live under the enormous pressure of unprecedented climate anomalies and produce more to meet the national food security needs. The concept of this project stood validated during 2022 when Pakistan faced recurrent heat waves followed by rainfall induced floods. The aftermath of these disasters highlighted that access to climate information and building farmer’s capacity in using this information is a key to the success of any investment in the directions of climate change policy implementation.

Building on the previous pilot, the present work will upscale the innovation in 10 additional districts of Pakistan geographically located in all four provinces namely: Sargodha, Sheikhpura, Sahiwal, Bahawalpur, Toba Tek Singh districts in Punjab, Sanghar, Tandojam, Mirpurkhas districts in Sindh, Peshawar division in Khyber Pakhtunkhwa and Quetta in Balochistan.

The overall scope of this project includes the following;

- i. Upscaling citizen science component from 3 pilot districts to 10 districts
- ii. Launching the “citizen science” data collection mobile app both for OS and iOS
- iii. Development of a governance model and protocol for citizen science data management for ICAS
- iv. Integrating the citizen science data with existing advisory service dashboard.

While the anticipated outcomes of the project are:

Outcome 1: Sustainability and upscaling of Irrigation and Climate Advisory Services through Citizen science

Outcome 2: Popularizing the concept of “citizen science” for climate change adaptation

The intended purpose of producing the inception report is to provide an overview of the scope of activities and approach to implement on ground, stakeholder mapping, farmers selection criteria and project team.

2. APPROACH AND METHODOLOGY

The following paragraphs elaborate the detailed approach and methodology to implement various project activities:

Phase 1: Preparation and planning

- a. Selection of site and participants:* Keeping in mind the major food producing areas of Pakistan as well as vulnerability to climate change in recent years, the project districts are as: Sargodha, Sheikhpura, Sahiwal, Bahawalpur, Toba Tek Singh districts in Punjab, Sanghar, Tandojam, Mirpurkhas districts in Sindh, Peshawar division in Khyber Pakhtunkhwa and Quetta in Balochistan. PCRWR regional office teams will help identify farmer clusters who are willing to participate in the pilot. This activity will be performed within 60 days after the signing of the project agreement. The farmer cluster selection will be made on the basis of pre-agreed farmer selection criteria. Key features of the criteria include; education level, gender, age, land holding, level of understanding of problem and willingness to participate. Priority will be given to young and educated females to serve as the source of weather information and to enhance their contribution to citizen science. In each area, a total of 15 farmers (maximum) will be selected from 1-3 adjoining villages. In this process, key facilitators will also be selected for each province as the “champion” of citizen science. In this regard, a site selection criteria is drafted along with a farmer listing sheet (enclosed as annexure H & I).
- b. Procurement of gadgets :* The concept of this innovation relies on collecting necessary weather parameters information through “citizen science” approach. The reason behind engaging the citizens in this project is generating information by the help of farmers/citizens while developing their resilience through information about climate change. In this regard, farmers/citizens will be selected in 10 project districts. In each village 15 farmers/citizens will be selected based on the annexed selection criteria from each district. In order to facilitate them to work as citizen scientists, they will be provided with weather gadgets and a mobile phone with citizen science data sharing app. At the start of the project they will be provided training about the use, data reading and sharing of data through App as well as the frequency of data sharing. Weather gadgets and mobile phones will be procured locally by floating an RFQ. A mobile phone will be an android smartphone version exceeding OS version 11 to support the mobile phone data sharing app. Weather gadgets will include; temperature and humidity sensor, barometer, anemometer and rain gauge. In each district, three sets of each gadget will be provided enabling the backend to take an average of data shared by the farmers, who will be the direct users of these gadgets and cell phones. Whereas the innovators will be utilizing the data to generate the information to optimize the satellite observed forecast of the ICAS.
- c. Upgradation and finalization of mobile phone App:* The mobile phone app will have to be upgraded according to platform’s requirement. The current mobile phone app is designed according to three pilot locations only, likewise the database at its back end was also designed to plot the data shared by the citizens located only in three pilot districts. Now the number of studied districts has increased to 10 and more citizen scientists will be added so the front end mobile app will require the following upgradation; expansion to larger number of districts (target: whole country), enabled for automatic update, enabled for storing data due to low internet bandwidth, suitable for both OS and iOS versions and available on the play stores. Additionally, a feedback tab will be provided enabling the citizens to submit their questions. Since the project is aimed at upscaling of the ICAS which involves engagement of a wider

number of citizen scientists, upgradation will also include maximum location compatibility.

Phase 2: Execution

- d. *Training of citizen scientists:* This is the key component of this project that will involve: Development of training modules for the selected citizens/farmers, development of district-wise training plan, execution of training, handing over mobile phone devices and the weather gadget to farmers, signing an agreement form with the farmers. In the first step, training modules will include the ICAS process, the information ICAS provides, functioning of different weather gadgets, procedure to read data from these weather gadgets and uploading data on the app. In the second step, a district wise training plan will be chalked out which will also include travel plan, training venue planning and logistical planning. In the third and final step, training will be imparted to the selected citizens/farmers according to the training delivery plan. After the training, a simple agreement will be signed with the participating citizens/farmers that they will protect the gadgets and the mobile phone during the project lifetime as well as their commitment to submit the data. By following this protocol, farmers will be engaged as citizen scientists and start to submit the data.
- e. *Synchronization of citizen scientist database with main database:* The Irrigation and Climate Advisory Database is up and functioning but there is a need to integrate it with citizen scientist data source. The database created was only a database store and visualized the data and only had admin access. It was created during the “react” coding protocol and now its front-end will be programmed according to “angular”. This modification is critical for the upscaling of pilot innovation. Moreover, in this improved version citizens/farmers who will show voluntary interest in becoming citizen science will be registered through the website upon request. This will in turn develop a confidence among the participating citizen scientists regarding climate information disseminated to them through cell phones. Both the front end and back end database will be updated from the earlier version to the upscale version. Key modifications are coding language to support the upscaled/upgraded mobile phone and the back end database. Database will be designed on postgresql and the coding language will be django. The database will be organized for archiving old data avoiding data loss in near future.
- f. *Webpage for citizen scientists:* The experience of pilots shows that the citizen scientists are also interested to see where their data is stored and analyzed as well as the kind of difference it is making. In this regard, an interactive database/webpage will be developed highlighting the data submitted by all the citizen scientists involved in a project.

Phase 3: Up-scaling and sustainability

- g. *Interaction with stakeholders in the public sector:* In the provincial governments, departments of agriculture are closely working with farming communities and disseminating them with crop specific information. However, for information relating to climate and irrigation, they are mostly reliant on low frequency data sources which often lack local processing for improving the quality of weather-related advisories. The ICAS, unlike other advisories, utilizes remotely sensed data to determine potential evapotranspiration of major crops by integrating local crop coefficient values in it. The computations for this advisory service are now automated and the dashboard is capable of managing advisory generation for the entire country. Such type of information

support is not available to the provincial governments. The concept of citizen science, however, is craved to improve the farmer/users' linkages with the public sector institutions because this concept makes them feel "valued" and respected for playing a role in the decision making process. Therefore, engagement with the public and private sectors will be established and maintained throughout the project life. After the completion of the pilot in August 2022, PCRWR, the technical partner of Inara Technologies (Pvt) Ltd, started to work with key provincial government organizations to scale up the ICAS. The provincial governments welcomed the initiatives and requested PCRWR to engage with them in the co-learning process as a trust building exercise on ICAS. Following up on this strategy, the provincial government of Khyber Pakhtunkhwa province, already shared its database of 100,000 farmers with PCRWR to upscale the ICAS advisory in the northern province. PCRWR has already developed a relevant stakeholder's database to upscale this advisory. Two main activities will be carried out under this component: a) Consultative (in person) or virtual meetings with key stakeholder organizations, b) Farmer to stakeholder engagement exercise enabling the citizens to share their first hand experience of using ICAS with the representatives of provincial government organizations, c) Co-developing and disseminating the knowledge products developed in this project with the key stakeholders.

- h. Upscaling and governance plan:* Development of this component will be made through farmer feedback survey, consultations with key stakeholders and coordination with the relevant government agencies. Similar to all other digital advisory services in Pakistan, ICAS also faces challenges of sustainability, for instance the cost of disseminating the advisory SMS. There are certain private sector solutions available in the market which can provide auto-subscription but they are not dependent on interaction with farmers in real time. In this regard, the upscaling and governance plan will answer some unresolved challenges; the extent of monetization of ICAS delivery to farmers, use of low cost and alternate means of communication to farmers, how best ICAS dashboard may be integrated to other advisories generated by a diversity of stakeholders. This governance plan may reach three possible conclusions for the sustainability of ICAS; Partial monetization (through feedback system for quality assurance), alternate means of communication and lastly any third alternate which will be finalized at the end of the project.

3. OVERVIEW OF THE INCEPTION PHASE ACTIVITIES

Following activities are envisaged during the inception phase of the project:

- i. Reconnaissance survey of the project districts for identification of farmers
- ii. Selection of weather gadgets and procurement planning
- iii. Demonstration of project concept to software developers
- iv. Identification of relevant stakeholders from public and private sectors

A detailed work plan with timelines is provided as Annex-C.

4. STAKEHOLDER ANALYSIS AND PARTNER MAPPING

Name	Role	Responsibility	Interest	Expectation	Capacity	Contribution
INARA Technologies	Partner	Project implementation	Use of technologies	High	Has the capacity to implement project activities	Will provide all technical support in terms of software development and project execution
PCRWR	Partner	Technical support	Innovative solutions	High	Has the capacity to provide technical support for implementation of project	Will provide its experience of pilot phase and technical support for this project
Provincial agriculture departments	Stakeholders	Participation	Data user	Medium	Outreach to the farming community	Will nominate focal persons to participate in the project
National Agricultural Research Center	Stakeholder	Participation	Data and knowledge user	Medium		Will nominate focal person to participate in the project
Pakistan Meteorological Department	Stakeholder	Participation	Data user	Medium		Will nominate focal person to participate in the project
Fauji Fertilizer Company	Stakeholders	Participation	Advisory user	Medium		Will nominate focal person to participate in the project
SAWIE Agro Eco System Services	Stakeholders	Participation	Advisory user	Medium		Will nominate focal person to participate in the project

The biggest opportunity in engaging the above-mentioned stakeholders is the current mindset to employ technology in disseminating the information to the farming community. Provincial extension departments have developed their web platforms to disseminate various information related to crops to the farmers. One of the missing parameters in their advisories is related to climate and water. The existing advisory services have the gap which ICAS fills, the SMS advisory system on “irrigation scheduling”. The project team is already in contact with them to link up our advisory through their system to reach out to a wider farming community. The only challenge that can be emerged is the shift in the overall strategy of the department. To overcome this, local field officers will be nominated who have already a relationship with the farmers and will be allowed to interact with the project

farmers so that a confidence of the field officers may also be developed regarding use of such technologies.

5. KEY OUTCOME AND OUTPUTS OF THE PROJECT

Outcome	Output	Indicator	Target	Mean of verification	Frequency	Responsibility
Outcome 1: Sustainability and upscaling of Irrigation and Climate Advisory Services through Citizen science	Output 1.1: Upgradation of ICAS in the target districts	Advisory services disseminated to the registered farmers	150 farmers	Citizen science database	Monthly	PCRWR
	Output 1.2: Investigating the impacts of change by the use of upgraded ICAS among farmers	Farmers reporting on the use of ICAS text messages	150 farmers	Farmers feedback through questionnaire	3 rd quarter of 2024	INARA Technologies
	Output 1.3: Upscaling and governance plan for scaling out this innovation across the region	Plan developed	Plan in the form of a report	Verify the report	1 st quarter of 2025	Governance expert
Outcome 2: Popularizing the concept of "citizen science" for climate change adaption	Output 2.1: Availability of Citizen Science App and web page open for all citizens to enroll themselves	Mobile app launched on app store	App for android and iOS users	Downloads from App store	Quarterly	INARA Technologies
	Output 2.2: At least 150 more people trained as citizen scientists	Farmers sending data through mobile app	150 farmers sending data on every day	Database	Monthly	INARA Technologies
	Output 2.3: Collaboration with public sector institutions developed	Nomination of the focal persons received from stakeholders	10 persons	Participation in the consultative meetings	2 nd quarters 2024	PCRWR

6. PROJECT MANAGEMENT AND OVERSIGHT

Inara Technologies (Overall project lead (administrative and financial management) and responsible to take care of all software and IT related tasks)

- Mr. Faisal Waheed, Project Manager
- Ms. Maryam Tauheed, Software Development Engineer
- Ms. Areebah Mushtaq, Database Development Engineer
- Mr. Shahid Zaman, Application Development Engineer
- Mr. Muhammad Luqman Ashraf, Field Engineer
- Mr. Hassan Sipra, Finance and Admin Officer

PCRWR (responsible for providing assistance on technical parameters of irrigation and climate advisory; select suitable farming communities and provide them training on citizen science component; and coordinate with relevant public and private sector agencies to access the advisory)

- Ms. Bareerah Fatima (Co-Lead) – innovator
- Mr. Arslan Mumtaz (Advisory Manager)
- Mr. Izhar Hussain Bhutto, Field Officer, Sindh
- Mr. Khurram Ejaz, Field Officer, Punjab
- Dr. Muneeb Ur Rahman, Field Officer, KP
- Mr. Imtiaz Ali, Field Officer, Balochistan

Advisor

- Mr. Faizan Ul Hasan (Governance plan for innovation upscaling in future and lead trainer for training to farmers)

Anticipated risks:

- The gender disparity issue in the citizen science project
- Continued involvement of citizen scientists in the project
- Active collaboration of provincial government organizations
- Organic upscaling of this innovation

Mitigation strategy:

- In the pilot phase of this innovation, the concept was appreciated by all participating members of the groups, mostly males. In this upscaling phase, at least one female facilitator will be engaged to enhance women partnership in the project.
- Citizen scientists will be engaged through training and on their volunteer willingness to participate. In this project, participants will be introduced with a badge of honor for becoming a citizen scientist.

7. ANNEXURES

- A. List of people met/consulted during the inception phase.
- B. Presentation from the Inception Meeting (4 December 2023)
- C. Updated Work Plan
- D. Updated Budget
- E. Updated Results Framework
- F. Updated M&E Plan
- G. List of key Personnel
- H. Site selection criteria
- I. Citizen scientists/farmer listing sheet

Site Selection Criteria

Cluster size: 15 farmers

Cluster expansion: This farmer cluster may be located in 1-3 villages. Farmers per village will be decided after the willingness and availability of farmers.

- The cluster farmers should be located within the designated district.
- Farmers are willing to participate in the citizen science project;
 - o To sign a formal agreement
 - o To protect and safeguard the gadgets provided to them
 - o To share data through mobile app on daily basis
- Farmer cluster may be located in 1-3 villages.
- Farmers with ability to read, write and use smartphones
- Preferably young farmers willing to cooperate and advocate citizen science
- Female members of farming family willing to participate in the citizen science will be an additional benefit
- Farmers already the beneficiary of earlier educational projects may also be included.
- Farmers should agree to sign an agreement after joining as citizen scientists and share the data prior to the provision of a smartphone and weather measurement gadget.

Annexure I.

Citizen Science for ICAS: Farmer Selection,

Site.....

Sr No	Farmers are willing to sign a formal agreement	Farmers are willing to safeguard the mobile phone and the gadget	Farmer is willing to participate in the training program	Farmer is able to read and write	Farmers is able to use smart phone	Farmer is willing to share data on daily basis



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