



## iCARE Innovation Fund

# Calculating Evapotranspiration Using GIS and Remote Sensing Techniques for Calculating Crop Water Productivity in Sindh Province, Pakistan

## Monthly Progress Report

**Reporting Period** *(August 2024)*

Prepared by: Asian Institute of Technology, Thailand

## 1. Project Information

<b>Project Title:</b>	Calculating Evapotranspiration Using GIS and Remote Sensing Techniques for Calculating Crop Water Productivity in Sindh Province, Pakistan
<b>Project Code:</b>	WBCAR
<b>Partner Organisation:</b>	
<b>Reporting Period:</b>	1 August 2024- 31 August 2024
<b>Date of Submission:</b>	September 5, 2024
<b>Contact Name:</b>	Furqan Ali Shaikh
<b>Contact Position:</b>	Project Manager
<b>Contact Email Address:</b>	srp.ait@ait.asia
<b>Contact Telephone Number:</b>	+66875978284
<b>Status of project progress in this reporting period</b>	<input type="checkbox"/> Significant delay <input type="checkbox"/> Delay <input checked="" type="checkbox"/> On Track
<b>Report sign Off</b>	<p><input checked="" type="checkbox"/> I have reviewed all the information provided for each section including the number of beneficiaries. The information provided for each section of the report is complete.</p> <p>Name: Furqan Ali Shaikh      Designation: Project Manager</p>

## 2. Key Achievements

**1. Attended National Workshop and arranged a meeting with ADPC and stakeholders at Irrigation Data Center Karachi**

In August, we organized a meeting with the Asian Disaster Preparedness Center (ADPC) and the Sindh Irrigation Department at the Irrigation Data Center in Karachi, focusing on our innovative solution and its potential for scaling up. We additionally, attended a National workshop in Islamabad, hosted by ADPC, on Innovation and Climate Resilience. These engagements provided valuable insights and feedback from participants, which we actively incorporate into our innovation to enhance its effectiveness and impact.

**2. Water Balance of the Area**

The water balance analysis of the canal command area is currently in progress. Canal flow data has been acquired from the Irrigation Department for all canal command areas, and crop data has been obtained from the Agriculture Department. Any missing data is supplemented through a literature review to accurately calculate the water balance for one canal command area. Once the results are obtained, they will be integrated with those from other canal command areas.

**3. Second Output Report**

Started working on the second output report of the project which focused on the development of (i) a web dashboard to visualize the collected and analyzed data, reported crop water productivity analysis, and (ii) guidelines for the dashboard.

**4. Continuous Improvement and enhancement of the Innovation Dashboard**

We are consistently enhancing the Innovation Dashboard to better serve user needs. Recent improvements include the ability to generate ETa (Actual Evapotranspiration) graphs for each growth stage of specific crops at selected points. We have also added an introduction section to provide a better project context. To increase data accessibility, users can now download outputs in various formats, including Excel, PNG, and HTML. Additionally, a new feature has been introduced that allows users to select multiple points simultaneously, enabling the retrieval and export of data for multiple locations in their preferred formats.

<https://salmankhan72901.users.earthengine.app/view/test>

### 3. Implementation Progress

Activity Title	Last Month Progress	Current Month Progress	Activities, and Events, planned for the subsequent month
Activity 1.1.1: Pre-Pilot Preparation / Inception Phase (Dec-Jan,2024)	<b>Completed</b>	<b>Completed</b>	Meeting with Stakeholders
Activity 2.1.1: Remote Sensing and Image Processing (Jan,2024)	<b>Completed</b>	<b>Completed</b>	N/A
Activity 2.2.1: Remotely Sensed Data of ET (Feb,2024)	<b>Completed</b>	<b>Completed</b>	N/A
Activity 2.3.1: Reference Evapotranspiration (ET <sub>r</sub> ) (Feb,2024)	<b>Completed</b>	<b>Completed</b>	N/A
Activity 2.4.1: Actual Evapotranspiration (ET <sub>a</sub> ) (Feb-Mar,2024)	<b>Completed</b>	<b>Completed</b>	Meeting with the Irrigation Department, Government of Sindh
Activity 3.1.1.: Temporal Analysis and ET Variation for Adaptive Water Management (Feb-Mar,2024)	<b>Completed</b>	<b>Completed</b>	N/A
Activity 3.2.1.: Statistical Insights and Environmental Factors for Enhanced Resilience (Mar,2024)	<b>Completed</b>	<b>Completed</b>	Ground truthing Survey in Progress
Activity 3.3.1: Water Demand and Efficiency Assessment for Sustainable Practices (Mar-April,2024)	<b>Completed</b>	<b>Completed</b>	Ground truthing Survey in Progress

Activity 3.4.1: Temporal Variation and Ground Truth Validation for Informed Decision-Making (April-May,2024)	<b>Completed</b>	<b>Completed</b>	N/A
Activity 4.1.1: Spatial Mapping of Efficiency and Identification of Inefficiencies (May-June,2024)	<b>Completed</b>	<b>Completed</b>	Activity completed and results added in the First Output report
Activity 4.2.1: Comparative Assessment and Sustainable Performance (June-July,2024)	<b>Completed</b>	<b>Completed</b>	
Activity 5.1.1.: Categorization and Delineation for Targeted Interventions (July - August, 2024)	<b>In Progress</b>	<b>Completed</b>	
Activity 5.2.1.: Comparative Analysis and Best Practices (July - August, 2024)	<b>In Progress</b>	<b>In Progress</b>	
Activity 6.1.1.: Capacity Building and Economic Considerations (August - September, 2024)	<b>In Progress</b>	<b>In Progress</b>	
Activity 7.1.1: Design and Development of the Dashboard (Oct – Nov 2024)	<b>In Progress</b>	<b>In Progress</b> <ul style="list-style-type: none"> <li>Dashboard development using Google Earth Engine is in progress.</li> </ul>	Meeting with Stakeholders

## Results Framework Indicators Progress

<b>PDO Indicator Description:</b> Government agencies and Citizens who have access to climate-resilient solutions tested under the project				
	<b>Baseline</b>	<b>Actual (Previous)</b>	<b>Actual (Current)</b>	<b>End Target</b>
Value	0	10 4 (SID Government Official) 6 (Farmers)	10 4 (SID Government Official) 6 (Farmers)	10 Access to Sindh Irrigation Department and Farmers
Date	15 Dec 2023	30 July,2024	30 July 2024	Nov 2024
Comments	The Stakeholder Meeting was held on 15 Feb 2024 at Karachi and discussed the project details with the Sindh Irrigation Department and farmers from different areas of Jamshoro District. <b>The final product will be tested with the SID and Farmers</b> in Nov 2024.			

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	<b>Baseline</b>	<b>Actual (Previous)</b>	<b>Actual (Current)</b>	<b>End Target</b>
Value	0	Gov: 4 Citizens: 6	Gov: 4 Citizens: 4	National Gov: 1 Sub-National Gov: 5 Citizens: 100
Date	15 Dec 2023	30 July,2024	31 August,2024	15 Jan 2025
Comments	The Stakeholder Meeting was held on 15 Feb 2024, at Karachi, and discussed the project details with the Sindh Irrigation Department and farmers from different areas of Jamshoro District. The final product will be tested with the SID and Farmers in Nov 2024.			

<b>Indicator 1 : Number of People Trained (In Person)</b>				
	<b>Baseline</b>	<b>Actual (Previous)</b>	<b>Actual (Current)</b>	<b>End Target</b>
Value	0	10	10	20
Date	1 Jan 2024	30 July,2024	31 August,2024	15 Jan 2025
Comments	Local Training was held during May 2024 on output 1 and the climate change awareness training program, another training will be conducted after the final dashboard testing.			

<b>Indicator 2: Number of People Trained (Online)</b>				
Value	0	10	10	20
Date	1 Jan 2024	30 July,2024	31 August,2024	15 Jan 2025
Comments	Local Training was held during May 2024 on output 1 and the climate change awareness training program, another training will be conducted after the final dashboard testing.			

Value	0	0	0	35
Date	1-Feb-2024	30 July,2024	31 August 2024	15 Jan 2025
Comments	This will be conducted after the completion of output 2.			

<b>Indicator 3: Number of Knowledge Products Provided</b>				
Value	0	0	0	15
Date	1-Feb-2024	25 Nov 2024	31 August 2024	15 Jan 2025
Comments	Product Development in Progress			
<b>Indicator 4: Number of People / Organizations Provided with Knowledge Products</b>				
Value	0	0	0	25
Date	1-Feb-2024	25 Nov 2024	31 August 2024	15 Jan 2025
Comments	Product Development in Progress			
<b>Indicator 5: Number of Events Supported</b>				
Value	0	0	2	4
Date	1-Feb-2024	25 Nov 2024	31 August 2024	15 Jan 2025
Comments	A workshop with stakeholders has been conducted in Karachi during May 2024.			
<b>Indicator 6: Number of People Participating in Supported Events</b>				
Value	0	0	10	50
Date	1-Feb-2024	30 June,2024	31 August 2024	15 Jan 2025
Comments				

## 5. Challenges, Lessons Learned, and Way Forward

The comprehensive overview that ensues intends to summarise our learnings, experiences, and subsequent phases to achieve the project objectives.

### Challenges:

1. The crop yield data was district-wise data. It was first calculated for each sub CCA on an area basis and then the seasonal ETa was used to calculate crop water productivity for the crops for each season for each Sub CCA.
2. Conducting a ground-truthing survey presents several challenges, including accessibility issues in remote or difficult terrain, weather-related disruptions, and security concerns that can limit data collection in certain areas.
3. Finding Crop Coefficient values for each crop and all four stages on a local scale is one of the challenging tasks as globally we have data available from FAO but to get more accurate results it is important to use the local datasets. Local data may not always be readily available and require extensive research, which can be time-consuming and resource-intensive.
4. To Ensure that the images chosen for Evapotranspiration (ET) calculation are both consistent over time and free from excessive cloud cover and noise is a complex and time-consuming task. This involves carefully selecting images that represent different stages of crop growth, while also making sure they have minimal interference from clouds or other distortions. Additionally, manual verification is essential to guarantee the quality of the selected images.

### Lessons Learned:

1. During the National Workshop in Islamabad and meetings with the ADPC team and stakeholders, we received valuable suggestions on how to enhance our innovation to make it more impactful and sustainable. Additionally, we received feedback on improving our upscaling strategies during these events.
2. Collaborative Partnerships: The success of the project depends on establishing partnerships with technical specialists, provincial government departments, and local communities.
3. Adaptive Planning: It became apparent that the project's planning required to be adaptable to overcome unforeseen obstacles.

### The Way Forward:

1. Enhanced Stakeholder Engagement: Continued efforts to foster community involvement and understanding through focused awareness initiatives such as workshops and training.

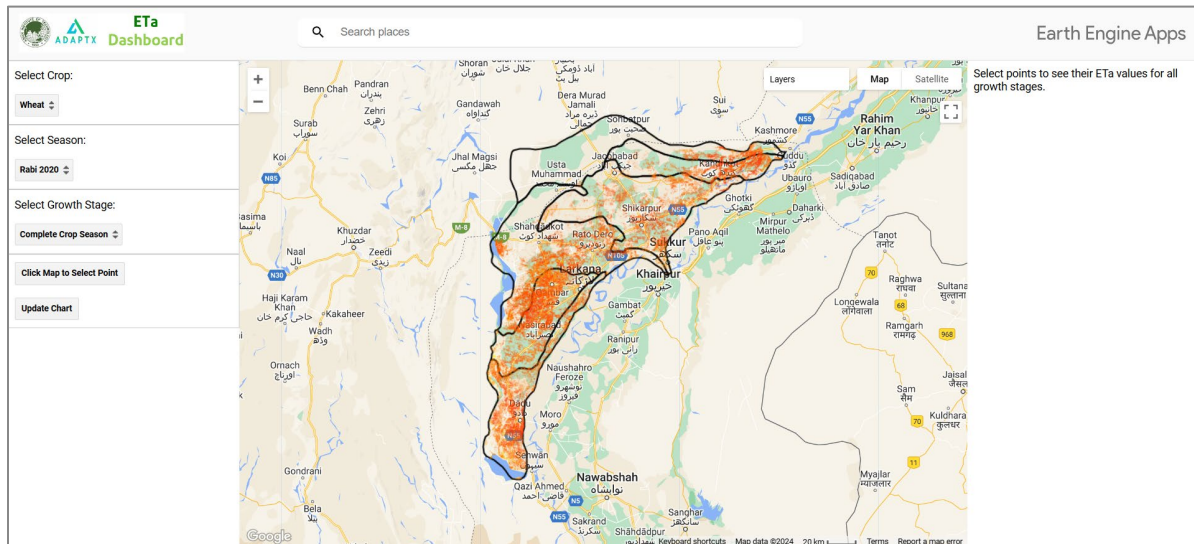
The collective efforts of all stakeholders will be pivotal in realizing the long-term impact and success of this transformative project on the right bank of the River Indus.



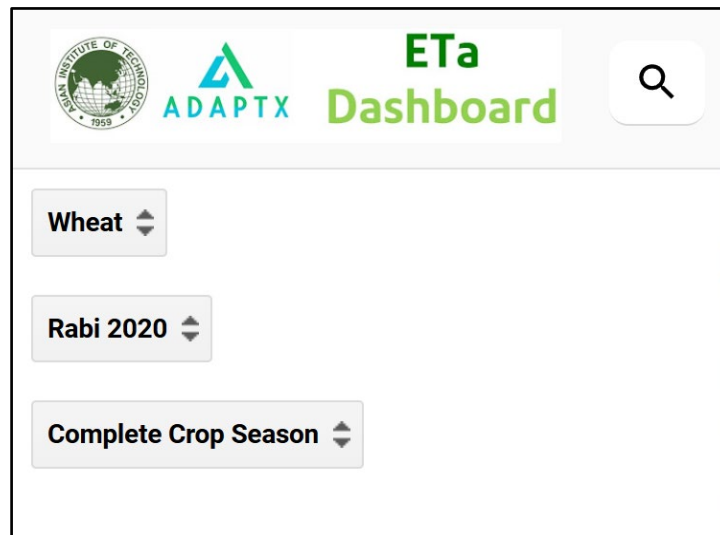
## Annexures:

### Screenshots for Dashboard Development Process

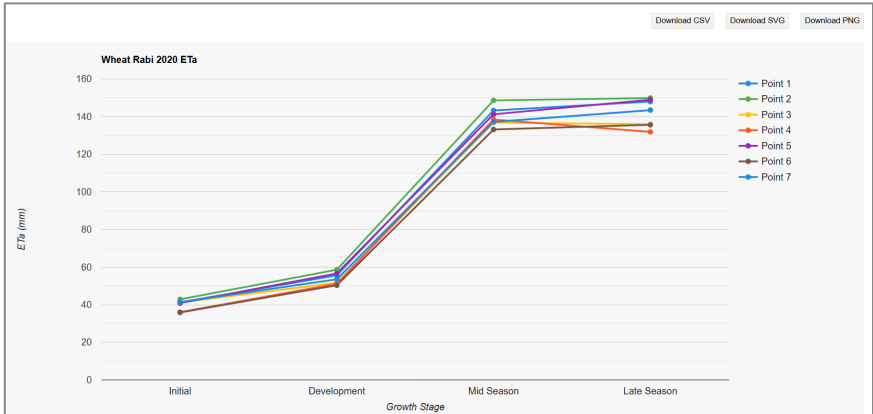
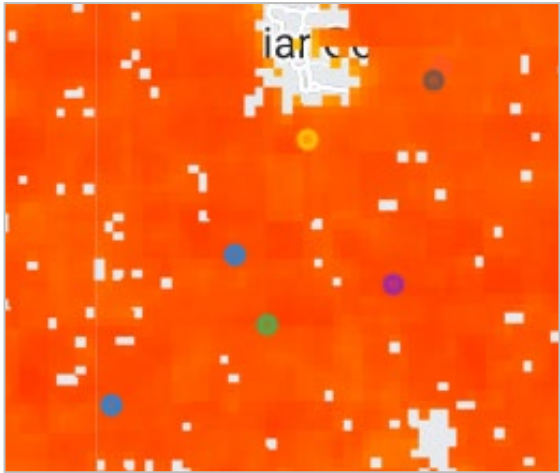
Basic Web Interface of the Dashboard.



User Interface Panel of the dashboard for selecting crop, season, and crop growth stage.



Eta Graphs integrated in Dashbaord



**List of Involve Staff under AIT Payroll: (Tentative)**

<b>Sr.</b>	<b>Name</b>	<b>Position in the project</b>	<b>Working time (Man-Months)</b>
1.	Mr. Furqan Ali Shaikh	Water Resource Management Specialist	6
2.	Mr. Suhail Ahmed	Hydrologist	6
3.	Ms. Nadia Almarri	Strategy and Finance Lead	6
4.	Mr. Zafarullah Memon	Project Coordinator (National)	6
5.	Mr. Salman Khan	Remote Sensing, GIS & Spatial Data Expert	3
6.	Ms. Thitichaya Pongsub	Support Staff	6

## Glossary

<b>Project Title</b>	means	Exact and full name of the project as defined in the Sub Grant Agreement
<b>Project Code</b>	means	A five-digit code assigned by ADPC
<b>Partner Organization</b>	means	The lead agency(ies) responsible for the implementation of the project
<b>Key Achievements</b>	means	The actual outcome or impact of your work, such as reaching a PDO, or outcome or output defined in the final and agreed Results Framework.
<b>Implementation Progress</b>	means	Implementation progress means the steps or actions taken to achieve the PDO or outcomes or outputs. In this case it would be the list of activities defined in the final and approved work plan
<b>Challenges</b>	means	The most significant and persistent areas of risk that affect the project's ability to achieve its objectives. Challenges could be related to managing the Sub Grant, sustaining development gains, coordinating with stakeholders, and implementing core management functions. Please also discuss the solutions to mitigate these risks.
<b>Lessons Learned</b>	means	Lessons learned are contextual or operational information that may affect planning and future performance. They highlight the insights gained from the activity's implementation practices and progress, such as staff feedback, stakeholder interviews, data analysis, and success stories. They also include any changes required by or support requested from ADPC or partners.



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