



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 *(July 2024)*

Prepared by: Asian Institute of Technology, Thailand

1. Project Information

Project Title:	Calculating Evapotranspiration Using GIS and Remote Sensing Techniques for Calculating Crop Water Productivity in Sindh Province, Pakistan
Project Code:	WBCAR
Partner Organisation:	
Reporting Period:	1 July 2024- 31 July 2024
Date of Submission:	August 5, 2024
Contact Name:	Furqan Ali Shaikh
Contact Position:	Project Manager
Contact Email Address:	srp.ait@ait.asia
Contact Telephone Number:	+66875978284
Status of project progress in this reporting period	<input type="checkbox"/> Significant delay <input type="checkbox"/> Delay <input checked="" type="checkbox"/> On Track
Report sign Off	<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. **Climate Resilient Zones and Water Balance of the Area**

Started working on delineating climate-resilient zones in canal command areas. The water balance of the area is also in progress, which is a key component of the water management strategies in the region.

2. **Completed Statistical Analysis of Crop Water Productivity (CWP)**

The statistical analysis of crop water productivity was completed using the crop yield data for both wheat and rice crops in all canal command areas. The graphs of the analysis are shown in ANNEXURE.

3. **Stakeholders suggestions incorporated to the Dashboard**

After meeting with stakeholders, all the comments are incorporated in the dashboard such as generating the graph of ETa for each stage for that specific crop for that point. Adding some introduction to the project. Additionally, the end users will be able to download the outputs in Excel format and also in PNG and web-based formats such as HTML which can be used for multiple purposes. Multiple points selection features are added where users can select multiple points and then get the data of those multiple points in different formats. Link to the dashboard <https://salmankhan72901.users.earthengine.app/view/test>

4. **Meeting with DSS Irrigation Department for integration of Project Dashboard**

During the meeting, the discussions with the team of the Decision Support System Irrigation Department focused on the integration of the project dashboard with the current system of the Irrigation Department. After the finalization of the dashboard, it will be integrated into the existing system also recommendations to enhance the dashboard's functionalities with user needs, ensuring it effectively supports agricultural productivity and water management in the region.

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)	Completed	Completed	Meeting with Stakeholders
Activity 2.1.1: Remote Sensing and Image Processing (Jan,2024)	Completed	Completed	N/A
Activity 2.2.1: Remotely Sensed Data of ET (Feb,2024)	Completed	Completed	N/A
Activity 2.3.1: Reference Evapotranspiration (ET _r) (Feb,2024)	Completed	Completed	N/A
Activity 2.4.1: Actual Evapotranspiration (ET _a) (Feb-Mar,2024)	Completed	Completed	Meeting with the Irrigation Department, Government of Sindh

Activity 3.1.1.: Temporal Analysis and ET Variation for Adaptive Water Management (Feb-Mar,2024)	Completed	Completed	N/A
Activity 3.2.1.: Statistical Insights and Environmental Factors for Enhanced Resilience (Mar,2024)	Completed	Completed	Ground truthing Survey in Progress
Activity 3.3.1: Water Demand and Efficiency Assessment for Sustainable Practices (Mar-April,2024)	Completed	Completed	Ground truthing Survey in Progress
Activity 3.4.1: Temporal Variation and Ground Truth Validation for Informed Decision-Making (April-May,2024)	Completed	Completed	N/A
Activity 4.1.1: Spatial Mapping of Efficiency and Identification of Inefficiencies (May-June,2024)	Completed	Completed	Activity completed and results added in the First Output report

Activity 4.2.1: Comparative Assessment and Sustainable Performance (June-July,2024)	Completed	Completed	
Activity 5.1.1.: Categorization and Delineation for Targeted Interventions (July - August, 2024)	In Progress	In Progress	
Activity 5.2.1.: Comparative Analysis and Best Practices (July - August, 2024)	In Progress	In Progress	
Activity 7.1.1: Design and Development of the Dashboard (Oct - Nov 2024)	In Progress	In Progress <ul style="list-style-type: none"> ● Dashboard development using Google Earth Engine is in progress. 	Meeting with Stakeholders

4. Results Framework Indicators Progress

PDO Indicator Description:				
	Baseline	Actual (Previous)	Actual (Current)	End Target
Indicator 1: Government Agencies and Citizens with Access to Climate-Resilient Solutions Tested under the Project				
Value	0	0	10	10
Date	15 Dec 2023	15 Jan 2024	15 Feb 2024	29 Feb 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. The final product will be tested with the SID and Farmers during Nov 2024.			
Indicator 2: Number of People Trained (In Person)				
Value	0	0	10	20
Date	1 Jan 2024	15 April 2024	31 July 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.			
Indicator 3: Number of People Trained (Online)				
Value	0	0	0	35
Date	1-Feb-2024			15 Jan 2025
Comments	This will be conducted after the completion of output 2.			
Indicator 4: Number of Knowledge Products Provided				
Value	0	0	0	15
Date	1-Feb-2024	25 Nov 2024		15 Jan 2025
Comments	Product Development in Progress			

Indicator 5: Number of People / Organizations Provided with Knowledge Products				
Value	0	0	0	25
Date	1-Feb-2024	25 Nov 2024		15 Jan 2025
Comments	Product Development in Progress			
Indicator 6: Number of Events Supported				
Value	0	0	2	4
Date	1-Feb-2024	25 Nov 2024	30 July 2024	15 Jan 2025
Comments	A workshop with stakeholders has been conducted in Karachi during May 2024.			
Indicator 7: Number of People Participating in Supported Events				
Value	0	0	10	50
Date	1-Feb-2024		31 July 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. Collaborative Partnerships: The success of the project depends on establishing partnerships with technical specialists, provincial government departments, and local communities.
2. Adaptive Planning: It became apparent that the project's planning required to be adaptable to overcome unforeseen obstacles.

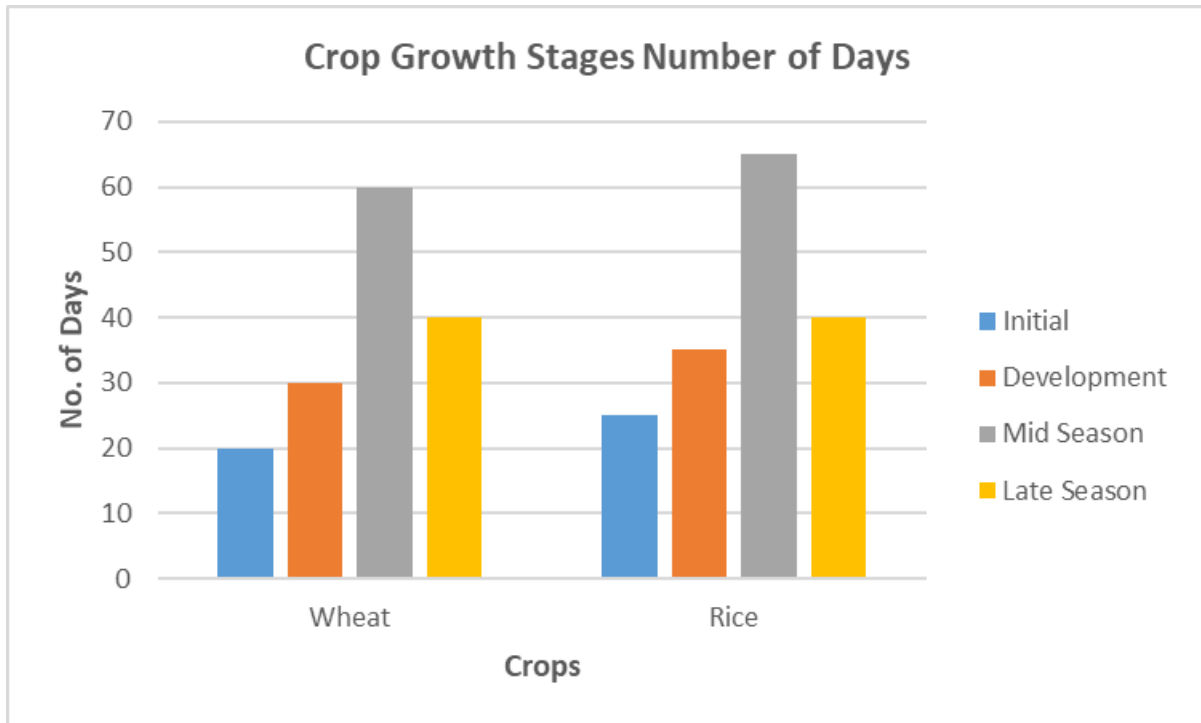
The Way Forward:

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

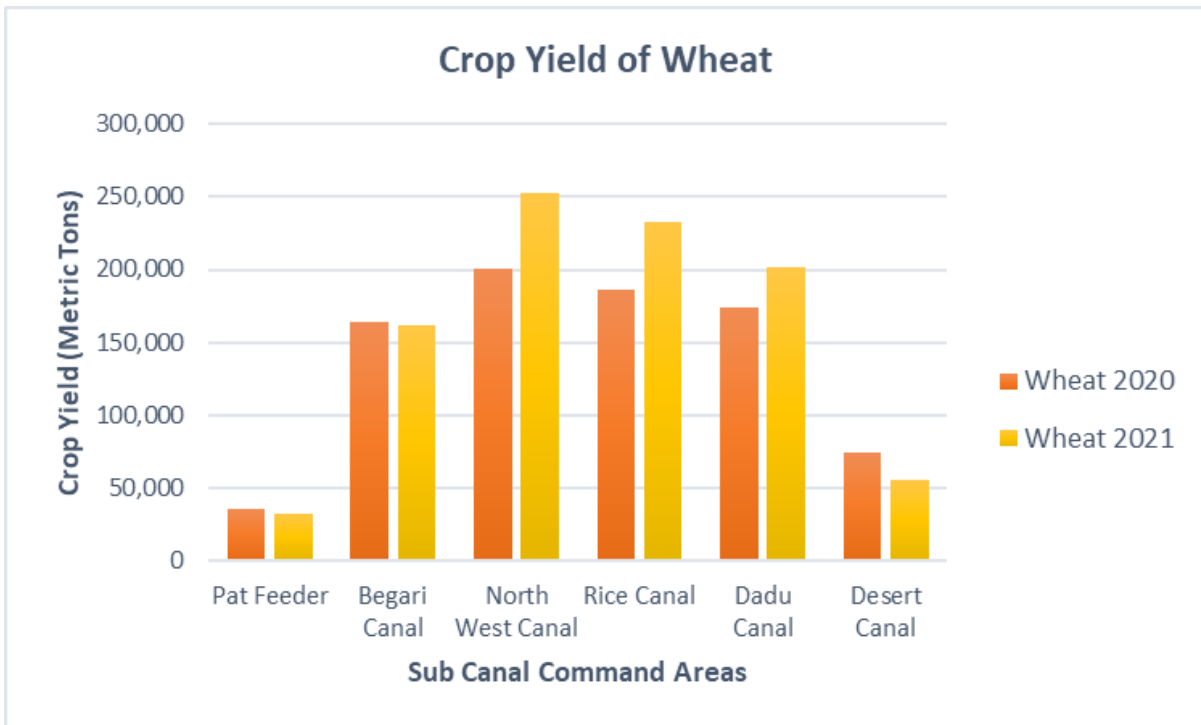
The collective efforts of all stakeholders will be pivotal in realizing the long-term impact and success of this transformative project on the right bank of the River Indus.

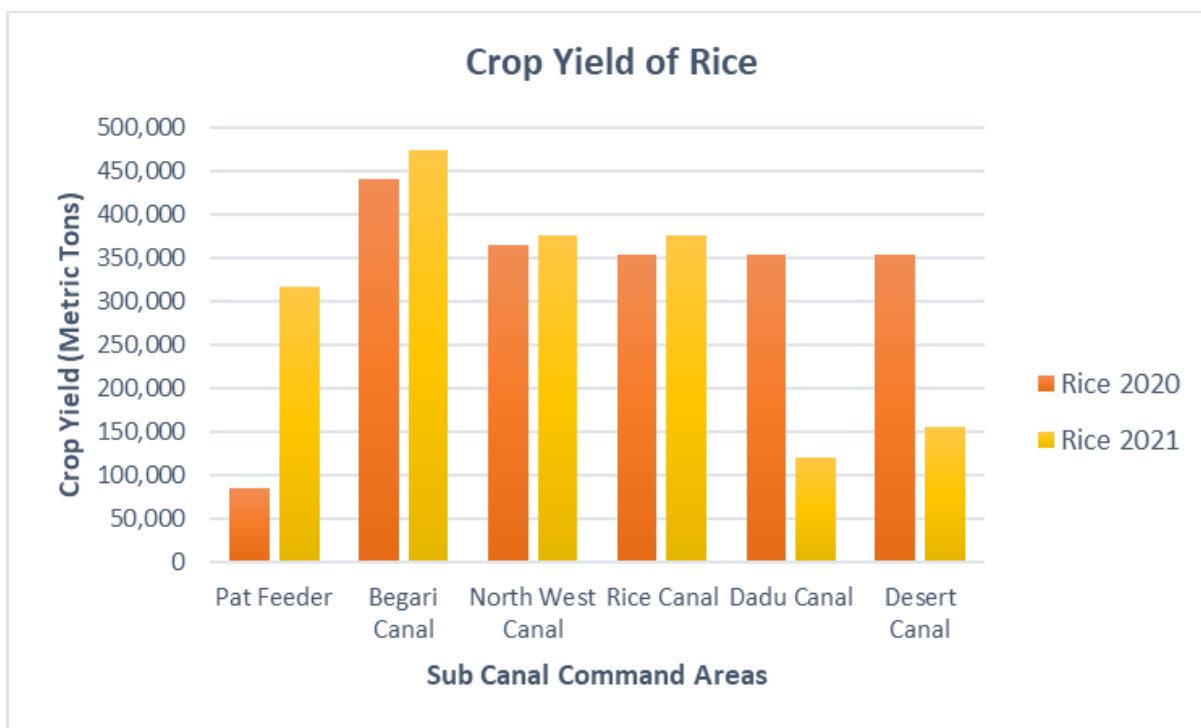
Annexures:

Crop Growth Stages No. of Days for Wheat and Rice



Crop Yield Data of Sub-CCA

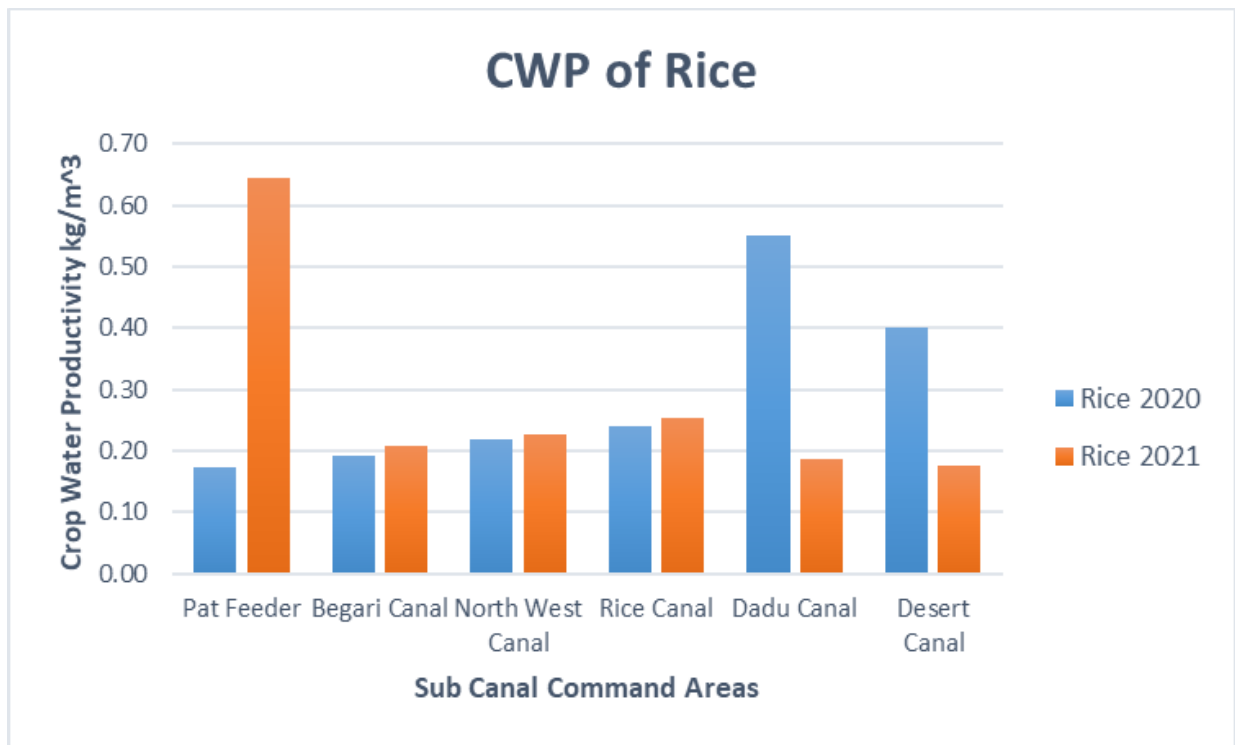
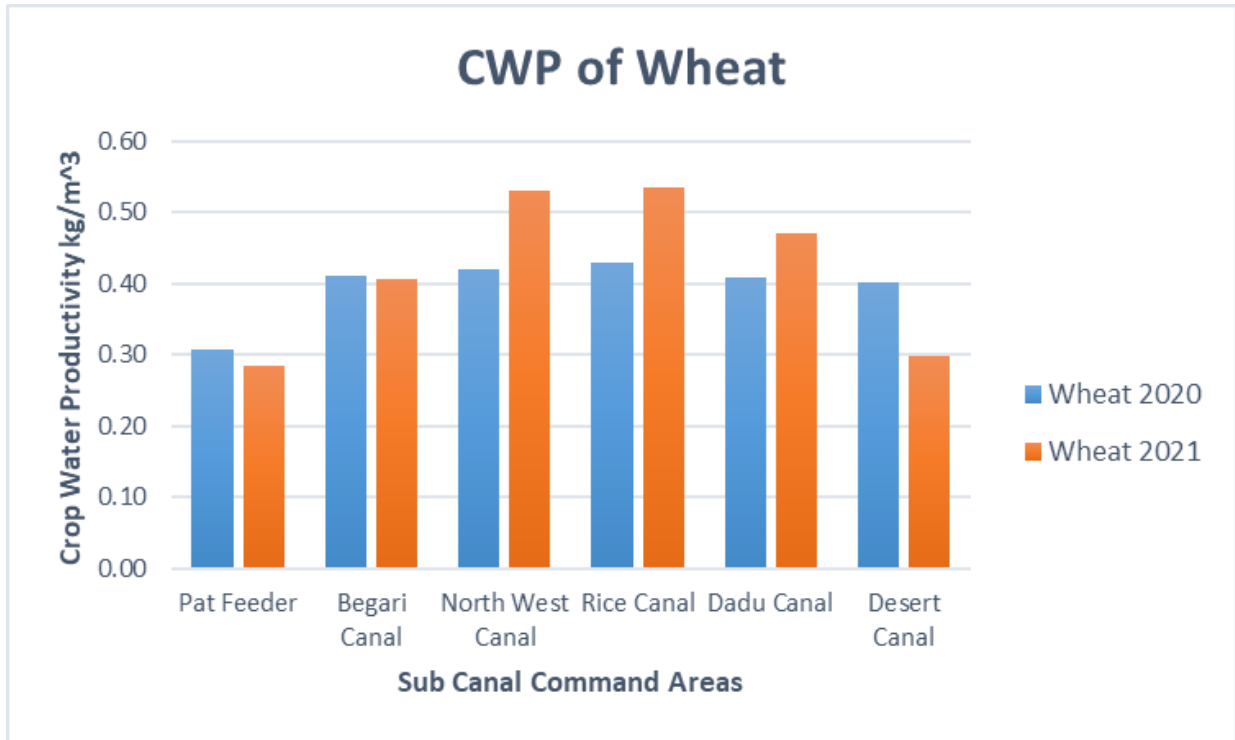




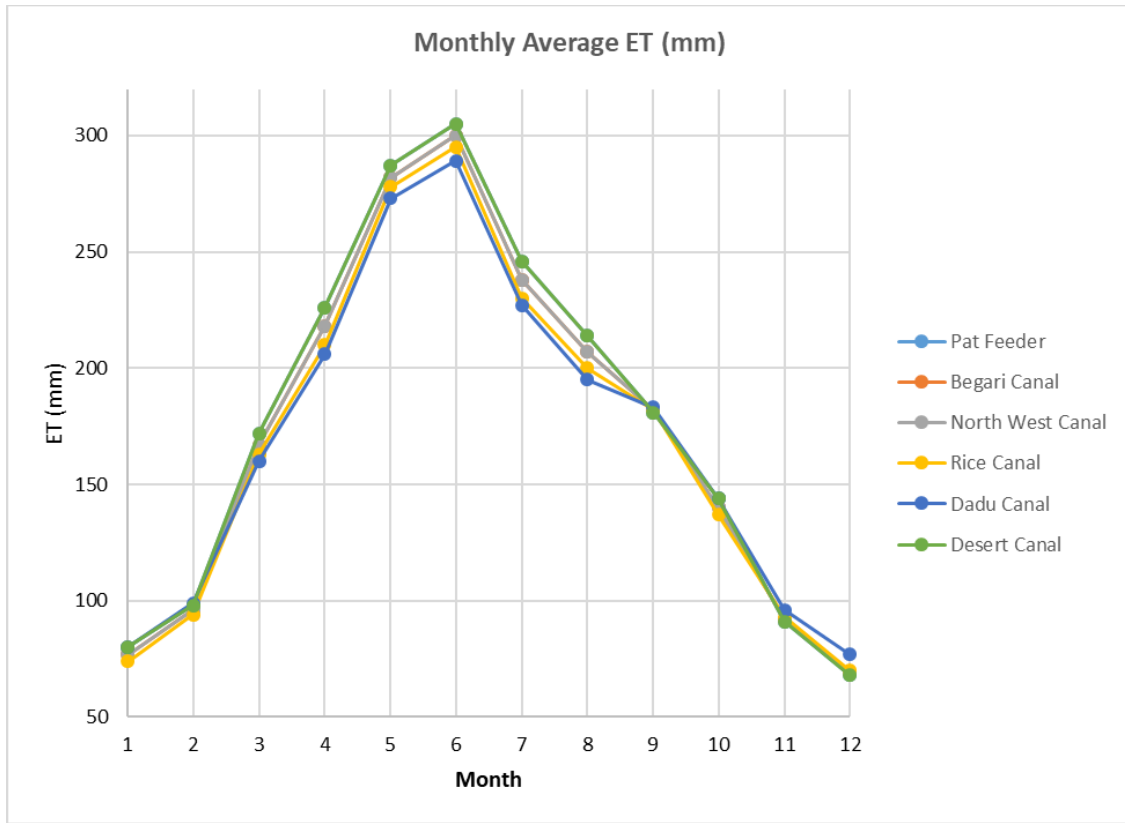
Percentage of Crops Area of each Sub CCA (%) (Pixel Counts based Area)

S.No.	Name	Wheat 2020	Wheat 2021	Rice 2020	Rice 2021
1	Pat Feeder	4.1914	3.4716	4.3676	17.3646
2	Begari Canal	19.6345	17.2826	22.5344	26.0755
3	North West Canal	24.0250	27.0216	18.6425	20.6911
4	Rice Canal	22.3527	24.8237	18.1517	20.6911
5	Dadu Canal	20.9432	21.5479	18.1517	6.6414
6	Desert Canal	8.8530	5.8523	18.1517	8.5359

Sub-CCA Crop Water Productivity (CWP)

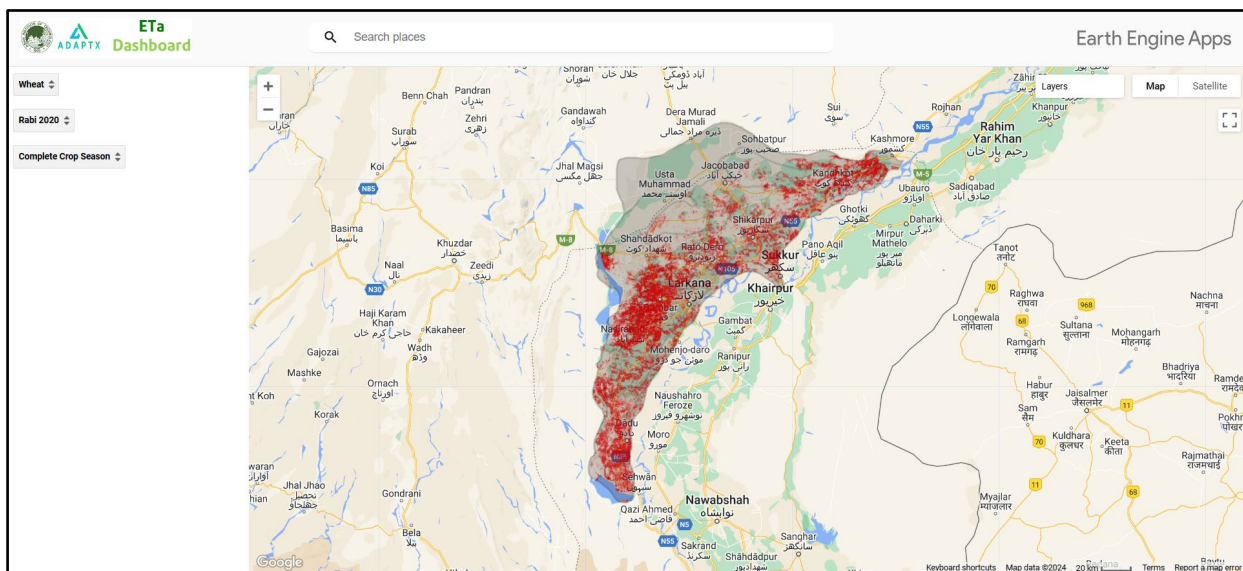


Sub-CCA Monthly Average Evapotranspiration

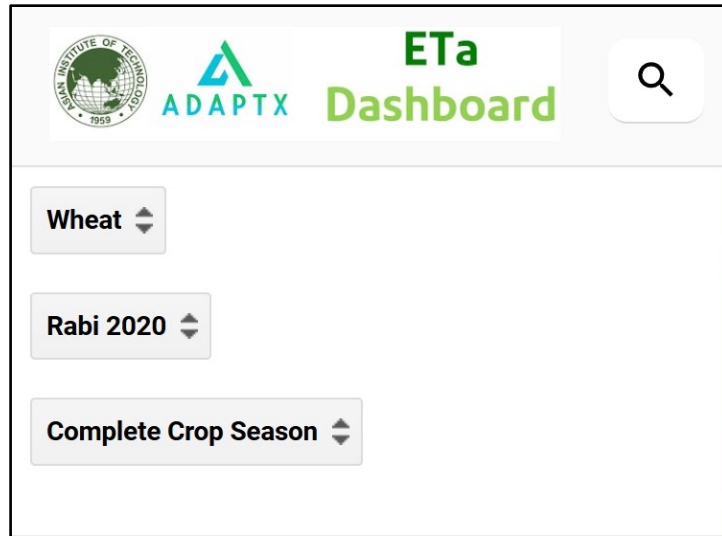


Screenshots for Dashboard Development Initial Process

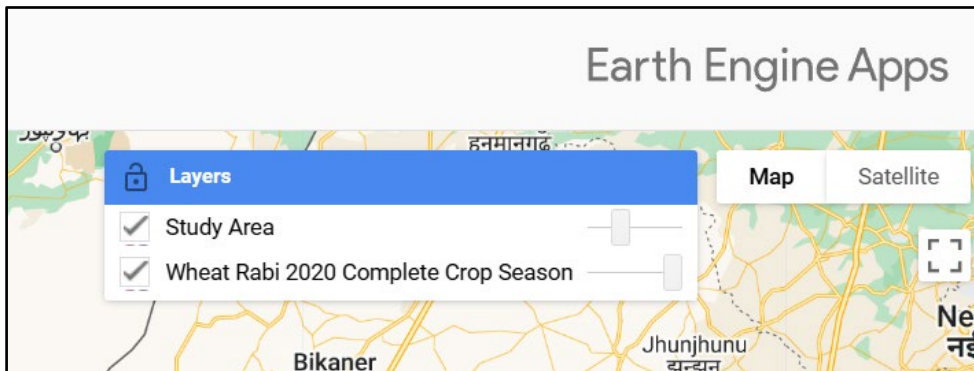
Basic Web Interface of the Dashboard.



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



Layers panel of the dashboard for turning on and off different layers and changing the visualization opacity and background maps.



List of Involve Staff under AIT Payroll: (Tentative)

Sr.	Name	Position in the project	Working time (Man-Months)
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

Project Title	means	Exact and full name of the project as defined in the Sub Grant Agreement
Project Code	means	A five-digit code assigned by ADPC
Partner Organization	means	The lead agency(ies) responsible for the implementation of the project
Key Achievements	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.
Implementation Progress	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
Challenges	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.
Lessons Learned	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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