Food and Agriculture Organization
of the United Nations


©FAO Pakistan

DEVELOPMENT OF E-AGRICULTURE APPLICATIONS AND KNOWLEDGE PRODUCTS USING INNOVATIVE ICT TECHNOLOGIES

April 2022

SDGs:	
Country:	Pakistan
Project Code:	TCP/PAK/3704
FAO Contribution:	USD 300 000
Duration:	1 July 2019 – 31 December 2021
Contact Info:	FAO Representation in Pakistan FAO-PK@fao.org

Implementing Partners

Department of Agriculture, Government of Punjab; Ignite National Technology Fund (Ignite); Ministry of Information Technology and Telecommunication.

Beneficiaries

Federal Ministry of National Food Security and Research and provincial-level staff of agricultural departments.

Country Programming Framework (CPF) Outputs

Priority Area 2 – Climate smart resilient agriculture and sustainable ecosystems including forests, fisheries, livestock, rangeland and water management.

©FAO Pakistan

Background

According to the Global Climate Risk Index, Pakistan is among the top ten most climate-vulnerable countries in the world, with the short- and longer-term effects of climate change impacting agricultural production in the country. Indeed, severe droughts and flooding have damaged crops, livestock and irrigation infrastructure in recent years, contributing to food shortages.

Information and communication technologies (ICTs) have significant potential to transform agriculture by addressing climate-related issues in the sector. These technologies can support evidence-based decision-making through the provision of accurate, reliable and up-to-date data. It is in this context that FAO has supported the Government of Pakistan in the drafting of the country's first E-Agriculture Strategy, which aims to improve food security, livelihoods and value chains through the employment of innovative and smart technologies. Information that will feed into the Strategy was gathered through consultative workshops that allowed for the identification of existing work in this area and for discussions on how to spark growth in the agriculture sector through the use of ICTs.

To support the Government of Pakistan in its goal of improving the country's agriculture sector through the use of ICTs, this Technical Cooperation Programme (TCP) project built the capacities of government staff on various ICTs and supported innovation in the sector through the establishment of an Agriculture Innovation Lab and Agrisurge, an Agriculture Innovation Challenge (AIC) that took place in 2020.

Impact

This project built the capacities of government staff on new e-agriculture modalities and technologies. It is expected that the adoption of these new ICT tools will ultimately benefit smallholder farmers with e-agriculture-based knowledge and information products, which, in turn, will contribute to increased access to safe and nutritious foods for beneficiaries in the targeted areas.

Achievement of results

The project was originally designed to target the Punjab region; however, the scope was expanded to target beneficiaries in the Balochistan, Khyber Pakhtunkhwa and Sindh regions as well.

The project's two Outputs were fully achieved. Under Output 1, two training sessions were organized. The first was held virtually from 14 October 2020 to 12 December 2020 on Google Earth Engine, a remote-sensing platform used for agriculture mapping applications. The second session took place over two days (7-8 December 2021) and was attended by 40 participants (35 men and 5 women). The workshop consisted of a refresher course on Google Earth Engine and an exercise to validate the results of a land cover mapping activity.

A Geographic Information System (GIS) portal was developed under Output 2. Its initial design was approved by the Ministry of National Food Security and Research, and updates were suggested. A web-based climate-smart tool was also developed for Android devices to monitor the crop water requirements of farmers in (near) real time.

Two activities under Output 2 focused on supporting innovations in agriculture in Pakistan. To facilitate the establishment of an Agriculture Innovation Lab, an innovation firm, Tandemic, was contracted to carry out several workshops on the design and services to be provided by the lab. The virtual launch of the lab was planned for February 2022.

Under the final activity, Agrisurge, the 2020 AIC was launched by the Federal Secretary of Information Technology (IT) and a representative from FAO. The AIC called for revolutionizing agriculture in Pakistan through the development of innovative solutions to increase the resilience of food systems and quickly transform smallholder agriculture systems through Fourth Industrial Wave (4IW) technology.

©FAO Pakistan

Implementation of work plan and budget

Owing to the restrictions brought about by the coronavirus disease 2019 (COVID-19) pandemic, two no-cost extensions were requested and granted to allow for the implementation of activities that were delayed or required adaptation. All of the activities were carried out within the allotted budget.

One of the project's original aims was to procure drones for certain activities; however, this was not possible. The focus of the project was therefore slightly changed to incorporate the development of the GIS portal, and the two above-mentioned activities on the Agriculture Innovation Lab and AIC were added. Owing to these changes, the scope of the project increased to reach more beneficiaries who benefited from capacity development on various tools for e- agriculture.

No risks to implementation were identified during the formulation of the project.

Follow-up for government attention

The data for the land cover map should be updated and temporally analysed, and the map should be made available on the GIS portal.

Extension staff should be trained on the use of the climate-smart tool, and it should be debugged and maintained as necessary.

©FAO Pakistan

Sustainability

1. Capacity development

The project originally focused on building the capacities of government staff in Punjab on innovative ICTs for agriculture; however, the scope was extended to other provinces. Training sessions were organized on Google Earth Engine for agriculture mapping applications. In addition, several workshops were held for the design and activation of the Pakistan Agriculture Innovation Lab.

It is anticipated that stakeholders will utilize the skills built and the data produced within their organizational structures.

One new partnership was formed under this project with the Ministry of Information Technology and Telecommunication. Partnerships with other provincial and national entities were also strengthened.

2. Gender equality

Women and men equally benefited from the activities, and female participation was encouraged. A number of women participated in the capacity-building initiatives, including the two-day training session on Google Earth Engine. In addition, majority-women teams were awarded special prizes for the AIC, which not only ensured the participation of women, but promoted it. The top two teams were women's teams.

3. Technological sustainability

The project ensured that open-source technologies were used for the creation of apps, tools and portals. In addition, Google Earth Engine, remote sensing and GIS were used for land cover mapping. Google Earth Engine is a robust open-source platform for satellite image processing. Stakeholders were introduced to it, and after the detailed virtual and physical training provided, they are expected to be able to use it for multiple agriculture mapping applications.

4. Economic sustainability

Additional projects in the country on digital villages and climate-smart agriculture included the scaling up of some of the project activities.

All of the training on data collection and apps developed as a result of the project were made available free of charge to beneficiaries.

ACHIEVEMENT OF RESULTS - LOGICAL FRAMEWORK

<table>
<tr><td>Expected Impact</td><td colspan="4">People of Punjab have improved access to safe and nutritious food</td></tr>
<tr><td rowspan="5">Outcome</td><td colspan="4">Punjab Agriculture Department adopts new modalities and reaches out small holder farmers with E-agriculture based knowledge/information products</td></tr>
<tr><td>Indicator</td><td colspan="3"># of district level agriculture offices adopt E-Agriculture products/portal/online dashboard/atlases</td></tr>
<tr><td>Baseline</td><td colspan="3"></td></tr>
<tr><td>End Target</td><td colspan="3"></td></tr>
<tr><td>Comments and follow-up action to be taken</td><td colspan="3">Staff from a number of departments honed their skilled on the use of e-Agriculture tools, and the tools were shared widely. An impact assessment is expected to be carried out to measure the project outcome.</td></tr>
<tr><td></td><td colspan="4"></td></tr>
<tr><td rowspan="3">Output 1</td><td colspan="4">Practitioners from Punjab Agriculture Department skilled in use of innovative ICTs for agriculture</td></tr>
<tr><td colspan="2">Indicators</td><td>Target</td><td>Achieved</td></tr>
<tr><td colspan="2"># of government staff trained in utilizing ICTs (disaggregated by gender).</td><td>20(40)</td><td>Yes</td></tr>
<tr><td>Baseline</td><td colspan="4">0</td></tr>
<tr><td>Comments</td><td colspan="4">The original target of 20 staff being trained under this output was greatly exceeded, as 40 staff members were reached. The project initially focussed on Punjab but later, the scope was extended, and practitioners from all provinces had their capacities built and their skills enhanced. There were two training sessions organized.</td></tr>
<tr><td rowspan="3">Activity 1.1</td><td colspan="4">Virtual course on Google Earth Engine and its mapping applications (14th October-16th December 2020)</td></tr>
<tr><td>Achieved</td><td colspan="3">Yes</td></tr>
<tr><td>Comments</td><td colspan="3">A virtual training course was conducted from 14 October 2020 to 12 December 2020 to introduce the remote-sensing platform Google Earth Engine, used for agriculture mapping applications.</td></tr>
<tr><td rowspan="3">Activity 1.2</td><td colspan="4">Two day training on Google Earth Engine and Land cover mapping (7-8 December 2021)</td></tr>
<tr><td>Achieved</td><td colspan="3">Yes</td></tr>
<tr><td>Comments</td><td colspan="3">This two-day physical training was held in Islamabad for 40 participants (35 men, 5 women) from federal-level government departments and the provincial departments of four provinces. As part of the project's capacity-building interventions, FAO organized training sessions with the support of its international experts to promote the use of modern geospatial technologies. The workshop aimed to refresh knowledge from the virtual Google Earth Engine training session, and to validate the results of the land cover mapping activity that took place under Output 2. An invitation was extended to all related departments to participate in the validation workshop. The land cover map for the four provinces was also updated.</td></tr>
</table>

<table>
<tr><td rowspan="3">Output 2</td><td colspan="3">e-Agriculture knowledge based products/climate smart tools and atlases available for relevant Government Institution in Punjab</td></tr>
<tr><td>Indicators</td><td>Target</td><td>Achieved</td></tr>
<tr><td>– Number of e-Agriculture Atlases developed.
– Number of individuals/government staff participated in atlases dissemination workshops (disaggregated by gender).
– Number of GIS portals developed.
– Number of climate smart toolkits available for farmers in Punjab.</td><td>– 1(4)
– 20(40)
– 1(1)
– 1(1)</td><td>Yes</td></tr>
<tr><td>Baseline</td><td colspan="3">0</td></tr>
<tr><td>Comments</td><td colspan="3">A total of four e-agriculture atlases were developed, exceeding the original target of one, and 40 people participated in the atlas dissemination workshop, doubling the original goal of 20. One GIS portal was developed, and one climate-smart toolkit was made available to farmers in Punjab.</td></tr>
<tr><td rowspan="3">Activity 2.1</td><td colspan="3">Land cover Mapping for four provinces</td></tr>
<tr><td>Achieved</td><td colspan="2">Yes</td></tr>
<tr><td>Comments</td><td colspan="2">The land cover mapping was initially planned only for the Punjab province; however, the scope was extended to three other provinces (Balochistan, Khyber Pakhtunkhwa and Sindh), which were also mapped. The results were shared with project partners in the workshop held on 7-8 December 2020.
The next steps include the updating of data, a temporal analysis and making the map available on the GIS portal.</td></tr>
<tr><td rowspan="3">Activity 2.2</td><td colspan="3">Development of GIS portal</td></tr>
<tr><td>Achieved</td><td colspan="2">Yes</td></tr>
<tr><td>Comments</td><td colspan="2">The GIS portal was developed and deployed on a cloud server. This portal focuses on spatial representation and the mapping of data on agriculture, food security and nutrition in Pakistan. The data is available for research and effective policymaking for better-informed planning and decision-making.
The focus areas of the GIS portal are: land cover mapping, crop area mapping, mapping indicators related to food price monitoring, food security (availability, accessibility, utilization, etc.), soil fertility and agroecological zone mapping. It can link up its food pricing and related data feed with the dashboard of an already developed food pricing portal. This portal will be used for the mapping and visualization of agroecological zones, land cover and agriculture statistics. The portal is available at: http://portal-www.pakagdp.com/.</td></tr>
<tr><td rowspan="3">Activity 2.3</td><td colspan="3">Development of Climate Smart tool</td></tr>
<tr><td>Achieved</td><td colspan="2">Yes</td></tr>
<tr><td>Comments</td><td colspan="2">A web-based Android tool was developed for monitoring the (near) real-time crop water requirement of farmers. The tool was made available on the internet.
Suggested follow-up actions include orienting extension staff on the use of the tool and debugging and maintaining the tool to keep it operational.</td></tr>
<tr><td rowspan="3">Activity 2.4</td><td colspan="3">Setting up the Pakistan's Agriculture Innovation Lab</td></tr>
<tr><td>Achieved</td><td colspan="2">Yes</td></tr>
<tr><td>Comments</td><td colspan="2">With the support of Tandemic, contracted through the FAO Regional Office for Asia and the Pacific (RAP), FAO Pakistan was able to have several workshops for the country team to design and activate services within the Pakistan Agriculture Innovation Lab.
Two virtual launches of the lab were planned for 23 February 2022: one for partners in the country, and the other for the entire region.</td></tr>
<tr><td rowspan="3">Activity 2.5</td><td colspan="3">Agriculture Innovation Challenge (AIC)</td></tr>
<tr><td>Achieved</td><td colspan="2">Yes</td></tr>
<tr><td>Comments</td><td colspan="2">Consequent to a framework collaboration agreement signed between the Ministry of Information Technology and Telecommunication and FAO on 25 March 2020 to jointly work for the acceleration of the development of Pakistan's agriculture sector using technology, the Agrisurge 2020 AIC was virtually launched by the federal secretary of IT and a representative of FAO.
Under the Agrisurge 2020 AIC, the Ignite National Technology Fund (Ignite), in collaboration with FAO, called for innovative solutions that can revolutionize agriculture in Pakistan, increase the resilience of food systems and help the rapid transformation of smallholder agriculture systems through 4IW technology. The competition was open for all with no age limit. There were special prizes for teams with a majority of women, conditional to the solution presented.</td></tr>
</table>

Partnerships and Outreach
For more information, please contact: Reporting@fao.org

Food and Agriculture Organization of the United Nations
Viale delle Terme di Caracalla
00153 Rome, Italy