



How to Conduct a Market Scan of Digital Agriculture Solutions

A Toolkit for IFAD-Financed Partners



HOW TO CONDUCT A MARKET SCAN OF DIGITAL AGRICULTURE SOLUTIONS: A TOOLKIT FOR IFAD-FINANCED PARTNERS

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INTRODUCTION AND BACKGROUND

DIGITAL AGRICULTURE SOLUTIONS

Digital agriculture, also referred to as **agriculture technology (agritech)**, has the potential to address challenges facing the agriculture sector by transforming how agri-food actors access information, goods, and services. Agritech solutions are digital innovations that enhance agricultural outcomes by enabling smallholder farmers, agribusinesses, governments, and development partners to increase their productivity, efficiency, and competitiveness. These innovations encompass devices, digital networks, services, and applications. Agritech innovations can also reduce transaction costs, increase accessibility and affordability of agricultural equipment through more circular models, and expand access to information related to production technologies, inputs, prices, markets, climate conditions, sustainable practices, and the prevention, control, and diagnosis of animal and plant diseases. Agritech solutions can thus be valuable tools for mitigating the challenges faced by smallholder farmers, which include low productivity and income, financial exclusion, and climate change.

However, to improve agricultural efficiency and address complex food and market systems, agritech solutions must be affordable, sustainable, and – where possible – bundled with other solutions and tools used by farmers. The growth, scale-up, and sustainability of agritech solutions is highly dependent on an enabling ecosystem including the availability and accessibility of foundational digital infrastructure (connectivity networks, internet infrastructure, etc.) and digital skills (numerical and digital literacy).

IFAD'S WORK

IFAD-financed projects help farmers increase yields through enhanced soil and pest management, improved fertiliser use, better access to high-quality seeds, and other optimised agricultural practices. Its projects improve farmers' access to input and output markets, as well as rural financial services that allow them to invest in their farms.

The **Digital Advisory Support Services for Accelerated Rural Transformation (DAS) Programme** provides technical support for information and communication technology for development (ICT4D) activities within IFAD-financed programs. The DAS Programme's main objectives are to (a) increase the access smallholder farmers have to information and inclusive financial services, and (b) achieve better targeting, monitoring, and impact measurement for agricultural development through increased use of ICT4D solutions. The DAS Programme partners are Development Gateway, Jengalab, and TechChange.

ICT4D Strategy

The objective of IFAD's first ICT4D Strategy 2020-2030 is to provide a framework for leveraging ICT to increase development impact. It aims to improve the economic and social conditions of rural people through increased agricultural productivity, greater market participation, and strengthened environmental sustainability and climate resilience.

ICT4D Action Plan, Objectives, and Key Principles

IFAD's ICT4D Strategy proposes four key action areas: (i) promote scalable uptake of ICT4D solutions; (ii) strengthen ICT4D partnerships; (iii) enhance ICT4D knowledge management and sharing; and (iv) build internal ICT4D awareness, capacity, and leadership. Within the framework of these key areas, the ICT4D strategy is focused on increasing access to information (including information on markets and weather), services, and inclusive finance, as well as increasing the use of ICT4D solutions in targeting, monitoring, and measuring the impact of agricultural development.

PURPOSE OF THE TOOLKIT

Market scans are an assessment of digital tools in an existing environment or context. Broadly speaking the goal is to identify existing and emerging agricultural technologies whose scaling is likely to have the most significant impact in increasing the average income of smallholder families and strengthening their resilience through improved access to information, markets and inclusive financial services in developing countries. Broadly speaking, a market scan is an assessment of the digital tools in an existing environment or context.

This toolkit contains guidelines on how to conduct a **market scan of agritech solutions**. The toolkit will help development experts at IFAD and its partners conduct a comprehensive market research and assessment of agritech solutions in target developing regions. It will also help these experts gauge the possible adoption of a particular solution within an IFAD programme and/or scale an existing tool via partnerships.

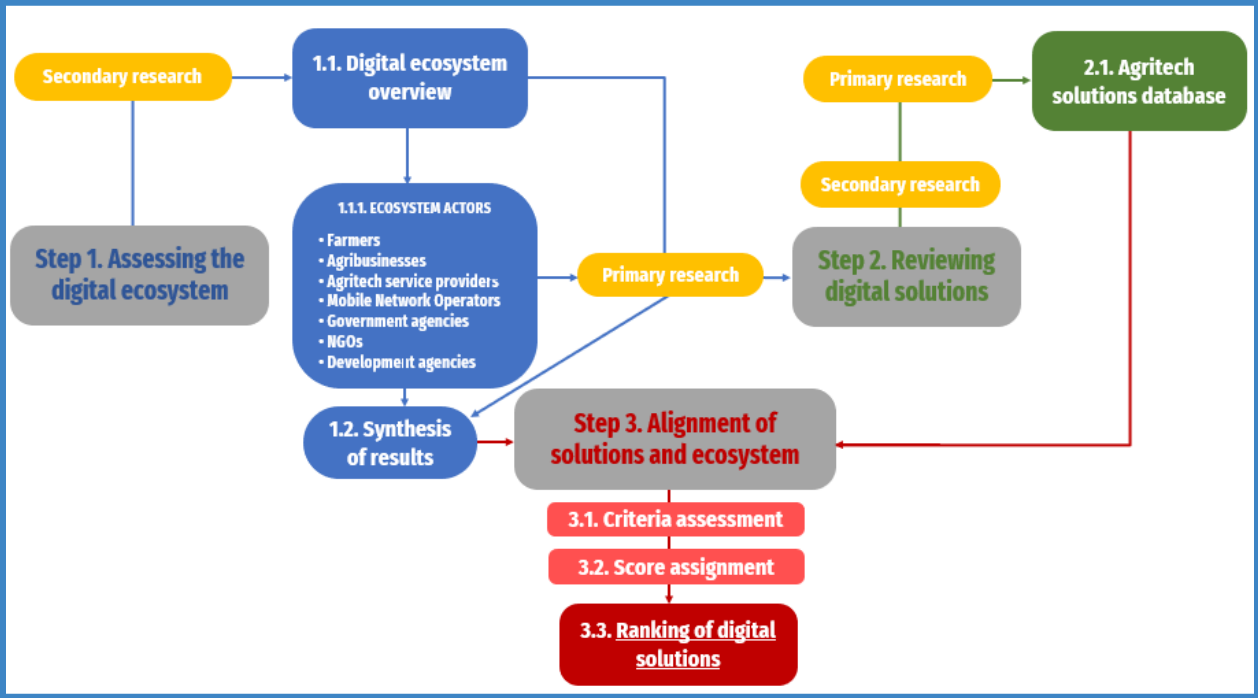
METHODOLOGY FOR SCANNING AGRITECH SOLUTIONS

The toolkit outlines a three-step assessment process. These steps should ideally be completed sequentially because each builds upon the completion of the former (i.e., step 2 builds on step 1, and so on). However, steps 1 and 2 may be taken concurrently in some cases. The list of steps and the methodology to be applied for their completion is provided below. Given that digital ecosystems can change rapidly, steps may be repeated periodically to see how a digital solution remains aligned with the broader ecosystem.

Step 1: Assessment of the Digital Ecosystem

Step 2: Review of Existing Digital Solutions

Step 3: Alignment Between the Digital Solutions and the Ecosystem Requirements: Selecting the Best Option



Approach to Scanning Agritech Solutions

The toolkit proposes a mixed-method approach to gathering quantitative and qualitative data from primary and secondary data sources.

STEP 1: UNDERSTANDING THE EXISTING DIGITAL AGRICULTURE ECOSYSTEM

The growth, scale-up, and sustainability of agritech solutions are highly dependent on the existing digital ecosystem, including the availability and accessibility of digital infrastructure and digital skills. For this reason, the particular digital ecosystem in a given country, region, or community must first be understood if an appropriate digital framework for agritech solution is to be developed. Dedicating time and resources to analyse and understand the existing ecosystem not only ensures that selected technology tools are relevant and sustainable. It also allows the reuse and improvement of existing efforts to prevent the duplication of effort and contributes to collaboration among digital development actors. (See [Principles for Digital Development](#)).

Box 1: Relevant Definitions

The digital ecosystem encompasses the culture, gender norms, political environment, economy, technology infrastructure, and other factors that affect an individual's ability to access and use technology or participate in an initiative. It comprises stakeholders, systems, and an enabling environment that, together, empowers people and communities to use digital technology to access services, engage with each other, and pursue economic opportunities ([USAID DECA Toolkit](#)).

AgriTech (or Digital agriculture solutions) are products and services that utilise digital tools, digital channels, or digitally-enabled data analytics (e.g., machine learning/artificial intelligence) to deliver information, advice, farming input linkages, market access, logistics support, financial services, and decision-making tools directly to smallholder farmers or other intermediaries of smallholder value chains, including extension agents, agro-dealers, agribusinesses, financial service providers, and policymakers ([Digital Agri Hub](#)).

Ecosystem actors are individuals, groups, and organisations that actively and continually support the advancement of the digital ecosystem through their time, resources, connections, and engagement. They include developers, supporters, and end users such as advisory services providers, agro-supply firms, and public authorities. These actors can have more than one role during the course of a digital innovation ([Kernecker et al., 2021](#)).

The agricultural value chain consists of the people and activities that produce a basic agricultural product (e.g., maize, vegetables, or cotton), spanning stages such as obtaining inputs, cultivating, processing, packaging, and distributing to consumers ([Farm Radio International](#)).

Below are the proposed steps for completing an assessment of the digital ecosystem.

1.1. Digital Agriculture Ecosystem Overview

Secondary Research

At the beginning of the assessment process, extensive but not necessarily exhaustive **desk research** should be conducted on the target digital agriculture ecosystem. The socioeconomic indicators and trends, the digital trends in the country, the relevance of agriculture to the economy, and the key challenges facing the sector are outlined at this stage (see section 1.2 below). Information should be collected from a variety of sources, including:

- Reports published by organisations such as the Alliance for a Green Revolution in Africa, the Consultative Group to Assist the Poor, the Technical Centre for Agricultural and Rural Cooperation, the Food and Agriculture Organization, GIZ, the GSM Association, USAID, World Bank, and other similar institutions
- Public domain information
- Data from think tanks, government statistics, or research centres
- Research journals, education institutions, and commercial sources like newspapers.

While completing the desk research, generate a full **list of potential actors and stakeholders** to engage for primary research (see below).

1.1.1. Identifying the Most Relevant Ecosystem Actors

By identifying and determining the roles of ecosystem actors, IFAD experts can tailor agritech solutions to diverse needs and market contexts. Potential actors can be grouped in the categories listed below. While IFAD has strong relationships with farmer groups and governments, it has historically not worked closely with traders. As such, the list of potential actors should be considered when defining needs and challenges in a particular market (see Step 1.2).

- Farmers and farmer organisations
- Agribusinesses
- Agritech service providers
- Mobile network operators
- Government agencies
- Non-governmental organisations (NGOs)
- Development agencies
- Academic and research institutions

Primary Research

Interviews with participants that represent key sectors or actors in the digital ecosystem should be carried out as part of primary research. These interviews can be taken in-person in an individual or group setting (key participants can be brought together for focus group sessions). Participants can also be reached remotely via direct phone calls, interactive voice response (IVR) systems, or online surveys (which may be conducted via email or specialised software that automatically collects answers). Insights from the different ecosystem actors may then be used to develop specific questionnaires (see Annex III for the questionnaire templates targeted at specific ecosystem actors). An inventory of all applications and systems used by participants should also be taken at this stage (this inventory will later complement information collected during Step 2).

1.2. Synthesis of Research Results

The findings derived from primary and secondary research are used to identify digital solution implementation needs and constraints. Research results can be categorised into different groups:

- **Value chain mapping:** Level of agricultural productivity, amount of surface or arable land, types of farming systems, primary food crops, prices of agricultural products, vulnerability to climate

change, number of smallholder farms in the value chains, farmers' household income, and farmers' age and gender

- **Agritech:** Suppliers of agricultural technology, companies developing digital platforms and apps, incubators and accelerators, and national systems and infrastructure (e.g., traceability systems for quality standards of agricultural products)
- **Accessibility to websites, mobile apps, and other digital tools and technologies:** Reliable power supply, mobile broadband coverage, telecommunication operators, telephone network availability, internet coverage, internet users, and digital skills among farmers
- **Digital divide, youth, and gender bias:** Technology access in rural and urban areas, youth access and engagement, women's use of new technologies, and gender biases.
- **Policy and regulatory environment:** Key policies and regulations, the role of agriculture in national economy and food security, policies supporting agricultural producers, strategies for promotion of e-agriculture; policies and regulation related to data, technology, and privacy (e.g. national data privacy laws).
- **Donor, development institution programmes, and innovation/entrepreneurship programmes and interventions** (e.g., innovation hubs) supporting the uptake of digital solutions
- **Needs of smallholder farmers** and other relevant actors
- **Gaps and challenges across the ecosystem** that hinder the scale up and sustainability of the digital solution(s)
- **Relevant IFAD programmes operating in the country:** Main objectives, target audience, and programme approaches to technology (if any)

1.3. Additional Resources

- [Systematic Stakeholder Inclusion in Digital Agriculture: A Framework and Application to Canada](#)¹

¹ Ebrahimi HP, Schillo RS, Bronson K. Systematic Stakeholder Inclusion in Digital Agriculture: A Framework and Application to Canada. Sustainability. 2021; 13(12):6879. <https://doi.org/10.3390/su13126879>

STEP 2. REVIEW OF EXISTING AGRITECH SOLUTIONS

Dedicating time and resources to analysing the available agritech solutions helps ensure that the selected solution will be relevant and sustainable without duplicating existing efforts (in line with the [Principles for Digital Development](#)). A database of the digital solutions currently operating in the region/country should be developed where possible.² Information should be collected about the business model, impact, and technology used by each of these digital solutions. Where tools have become inactive or discontinued, it may be valuable to gather any lessons learned from why the tools are no longer functioning.

As in step 1, a combination of primary and secondary research should be used to compile the database. Firstly, **desk research** (i.e., secondary research) on agritech solutions that have been piloted or scaled should be conducted by reviewing conferences, blogs, program evaluations, and web searches. A non-exhaustive list of web-based sources for desk research can be found in Box 2. **Secondly, large-scale surveys of solution providers and interviews with the users of their tools should be carried out** (i.e., primary research). A questionnaire template specifically targeting agritech solution providers is available in Annex III. Alongside the interviews and surveys detailed above, an inventory of all applications and systems used by interviewees and focus group session members should be taken. This inventory will be used to populate the agritech solutions database.

² A comprehensive, up-to-date database may be difficult to develop depending on the density of the local technology market (i.e., the number of tools available across value chains) and the speed of development (how fast tools move from live to discontinued). It is recommended to focus on capturing a snapshot in time of available tools to the best of your availability (time, resources, needs).

Box 2. Web-Based Resources for Desk Research (Step 2)

Resource	Description
Africa AgTech startup landscape maps	Innovation maps visually showcase the technology ecosystems across emerging markets. The sector-focused maps provide an overview of several verticals across Africa, the Middle East, and beyond
AgFunder	Its mission is to invest in the bold and impactful technologies that are rapidly transforming our food and agriculture system
Digital Agri Hub	The hub provides insights into digital agriculture to small-scale producers, and supports investments in solutions that have real impact on the ground
Digital Agriculture in Southeast Asia	IFAD report, Digital Agriculture in ASEAN: Strategies for Donor Impact
Digital development community	Digital Development Principles Community
Digitalisation and Smallholder Agriculture	A living database for ICT4Ag
Global Open Data for Agriculture Network (GODAN)	To unlock the power of technology and open data, end extreme poverty, and empower farming communities
Growasia Digital Directory	List of digital solutions being used in Southeast Asia
GSMA AgriTech tracker maps	Maps the mobile products and services used in agriculture across the developing world
GSMA AgriTech's Digital Agriculture Maps report	It offers a snapshot into the digital agriculture landscape in low and middle-income countries
JengaLab's Innovators Map	Traces existing innovative and tech solutions and supports co-designed and open innovation setups
QuantiFarm project	Supports the further deployment of digital technologies to enhance the sustainability and competitiveness of the agricultural sector
Swisscontact	A digital information platform for agricultural entrepreneurs to network and access better business opportunities
The South African Startup Ecosystem Report 2022	It dives into the local ecosystem by analysing active startups, local support networks, and funding and exit activity over the last 7.5 years
Trendlines	Funding projects with an agritech focus or mandate

2.1. Compiling Research Results: Agritech Solutions Database

Below is a list of fields to be completed for each solution identified during the review process. In case there is no information available, the particular field can be filled with N/A (i.e., not available/not applicable).

Name; Use Case and Subcase (see Annex I for taxonomies regarding this topics); Year of Launch; Value Chain Focus (if any); Target Users; Agritech Service Provider; Technology Type (see Annex I for a list of the possible typologies); Engagement (registrations and active users); Institutions Funding/Investing in Solution Development; Integration With Other Platforms, e.g. WhatsApp (indicate the platform or just type "no"); Inclusion (users by gender and age); Hardware Required (tablets; smartphones; basic phones; laptop/desktops, others); Network Requirements (offline, 2G, 3G, 4G, 5G); Data Collected and Owner of the Data; Type of Support Centre (none, call centre, in-person field staff); Pricing of the Service for the User; Training Needed? (yes/no); Technology Readiness Level -TLR- (see Annex I for a description of the levels); Potential for Replication/Scaling Up of the Solution; Already Adopted by any of the Identified Actors in Step 1 (yes/no); Contact Information; Description.

STEP 3. ALIGNMENT BETWEEN AGRITECH SOLUTIONS & ECOSYSTEM REQUIREMENTS

The results obtained in Steps 1 and 2 (i.e., assessment of the digital ecosystem and review of the digital solutions available) will be used to rank the different solutions based on a list of criteria and associated scores.

3.1. Suggested Criteria for Ranking the Solutions

1. Critically assess the alignment of the solutions with the principles, objectives, and target indicators of a country's key ICT4D strategy (if any) and the IFAD ICT4D Strategy. Keep in mind that these strategy documents may be named differently in each country (eg. Digital Economy Strategy, Digital Development Blueprint, Digital Agriculture Strategy) and may originate from different government ministries or departments.
2. Evaluate if the different digital solutions fit into the existing ecosystem, are designed for scale and data-driven, built for sustainability, secure and private, collaborative, and reusable/improvable (using the [Principles for Digital Development](#))
3. Critically assess whether the digital solutions support climate change mitigation or adaptation
4. Ensure that the solution aligns with existing or planned technological, legal, and regulatory policies
5. Gauge whether solution use cases (and sub use cases) match farmer needs and challenges
6. Ensure that solutions are affordable, accessible, and appropriate for emerging economies, specifically rural or remote areas with unreliable electricity and internet infrastructure
7. Certify that solutions are scalable and can magnify gains in productivity, efficiency, and livelihoods
8. Verify that solutions are inclusive to ensure that benefits are equitably distributed and reach the greatest numbers of people
9. Determine if the solutions are sustainable over the long term
10. Investigate if solutions are offered by home-grown organisations and/or headquartered in the country of interest
11. Ensure that solutions have clear contractual or legal conditions about data (covering who can access and use data, how and why data will be used, and how data will be shared using closed or open models). The solutions should also have mechanisms to secure and manage data as well as descriptions of how generated value is distributed. For evaluation purposes, solutions using open standards and open source/data platforms should be preferred.

3.2. Score Assignment

If a given agritech solution meets a criterion described in Section 3.1, it will be assigned a quantitative score "3". If the criterion is only partially met, the score to be assigned is "2". If the criterion is not met at all, the score will be "0". If no information for a particular criterion is available, a score of "1" should be assigned. Information gaps are assumed because there may be limited availability of data across the ecosystem.

3.3. Agritech Solution Prioritisation

All the agritech solutions contained in the database created in Step 2 should be ranked based on the sum of their criteria scores. This ranking will determine a solution’s alignment to the needs and constraints identified during the digital ecosystem assessment in Step 1. The relevance of the solution (measured as the total sum of scores) will range from 0 to 39, with 39 being the maximum alignment (i.e., all the criteria are met) of a solution.

Box 3: Checklist for a Successful Market Scan of Agritech Solutions

* Adapted from the report ‘Digital Tools for Implementing the Sustainable Development Goals in Africa’ (2019), commissioned by the GIZ Sector Network Governance Africa.

1	a. We have given sufficient consideration to the actors, drivers, infrastructures, and incentives that make up the context in which our digital solution will operate
	b. We have defined precisely who will benefit from the digital solution
	c. We have clearly defined the problem we are trying to solve and explained how the digital solution will solve the problem
2	a. We have defined what scaling means for the target digital solution
	b. There is a plan in place that allows the digital solution to scale
3	a. We have identified the constraints, barriers, and challenges associated with the implementation of the digital solution
	b. We have paid particular attention to the challenges and usefulness of the digital solution for vulnerable communities and groups
	c. We have verified the existence and effectiveness of the policies and laws in place
4	Digital solutions are open, using open standards, open data, and open source platforms, where possible
5	There are resources that ensure the long-term sustainability of the digital solution
6	The digital solution addresses the identified needs and challenges of smallholder farmers
7	We have metrics to measure and assess the reach and engagement of the digital solution
8	We have aligned our project with the country ict4d strategy, the IFAD ICT4D Strategy, and with specific Digital Development Principles

ANNEXES

Annex I. Database Taxonomies

Use Cases

To identify the varying use cases of tech solutions in the agricultural sector, this toolkit uses data definitions and taxonomies developed by the [Digital Agri Hub](#) in September 2021. The full list of taxonomies and definitions can be found [here](#). Apart from these taxonomies, additional use cases (*Social and behaviour change; Smart farming*) have been added to the list based on the [CNFA approach](#) and [GSMA framework](#). These new use cases are defined in the section below:

Use Case	Sub Use Case
Advisory	Precision agriculture advisory Farmer information services Participatory advisory Farm management
Market Linkage & E-commerce	Digitally enables value chain integration Mechanisation access services E-commerce services E-market places
Supply Chain Management	Traceability and certification Logistics Supply chain enterprise resource planning solutions Quality assurance and counterfeiting Procurement
Finance	Payments Savings Credits and loans Credit scoring Insurance Financial analytics Crowdfunding Financial service provider digitalisation
Smart Farming	Crop management Livestock management Mechanisation access services
Social and Behaviour Change	--
Ecosystem Support	--

Smart farming: This is the use of on-farm and remote sensors to generate and transmit data about a specific crop, animal, or agricultural practice. In addition to enabling the mechanisation and automation of on-farm practices, smart farming ensures production of agricultural goods is efficient and sustainable. Smart farming solutions often rely on connectivity between Internet of Things (IoT)-enabled devices to optimise production processes and growth conditions while minimising costs and lowering resource use. Smart farming use cases may have the following features or components:

- **Crop management:** This feature monitors the equipment used in crop production, including irrigation systems, soil sampling systems, greenhouses, and storage units. It enables farmers to remotely control, track, and look after equipment and farming operations, thereby ensuring the efficient use of fertilisers, pesticides, inputs, labour, and natural resources such as water.
- **Livestock management:** This feature supports the monitoring of livestock, beehives, and seafood. Digital solutions can be designed to help farmers remotely monitor herds, determine their exact locations at any time, and track their health and habits (including when they are in estrus or about to calve). These solutions include aquaculture management systems that enable farmers to monitor the feeding patterns of fish and other aquaculture, detect diseases in advance, control water quality and, in some cases, automate feeding.
- **Mechanisation access services:** These are services that extend farmers' access to agricultural machinery (e.g. tractors, drones, cold storage facilities) under a shared economy model. They provide smallholder farmers with an opportunity to mechanise processes such as land preparation, crop spraying, and crop monitoring or harvesting. They can also extend the life of crops by giving smallholders access to cold storage and transportation services.

Social and behaviour change: These are videos, mobile applications, and ICT tools used to incentivize farmers and their families to adopt new practices and technologies.

Technology-type

Agritech solutions leverage a number of diverse technologies. For the purposes of the toolkit database, the following typologies are considered:

- SMS-based applications
- Unstructured Supplementary Service Data (USSD) applications
- Mobile applications
- Smartphone applications
- Web-based platforms
- Cloud-based platforms
- Use of satellite data, drones, IoT and machine learning

Technology Readiness Levels (TRL), as elaborated by [Enspire Science](#)

- TRL 1 – Basic principles observed
- TRL 2 – Technology concept formulated
- TRL 3 – Experimental proof of concept
- TRL 4 – Technology validated through testing and evaluation, either as a prototype or pilot
- TRL 5 – Technology *validated* in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6 – Technology *demonstrated* in relevant environment (competitive manufacturing in the case of key enabling technologies; beta prototype system level)
- TRL 7 – System prototype demonstration in operational environment
- TRL 8 – System complete and qualified
- TRL 9 – Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Annex II. Questionnaires by Actor Type

Questionnaires are to be used in one-to-one interviews, focus group discussions, and surveys addressing targeted actors. They have been adapted from questionnaires available at USAID 2022 (see Reference list 12).

Smallholder Farmers and Farmer Groups

Objectives

- How can digital services help address the unmet needs of smallholder farmers?
- Under what conditions would smallholder farmers adopt digital services to address these needs?

Questions

1. What is the size of land under cultivation?
2. What are the main planting seasons?
3. Who works on the farm? (Individual family members/employed labour)
4. Are you involved in multiple value chains (specific crops)?
 - A. What else are you involved in?
5. Where do you sell your products?
 - A. How are you paid for your products? (cash at hand, bank transfer, mobile money, money sent to a savings group, IOU, provision of services [e.g school fees])
 - B. Why do you prefer to sell to a particular buyer? (they pay cash at hand, they pay for transport and logistics [e.g., warehousing], pays best prices, it is the only option, they provide a ready market, they buy in bulk, you can use the checkoff system)
6. How do you sell (bulk/contract/individually)?
7. What happens to your products after harvest?
 - A. Do you sell everything or store some?
8. Do you save some of the money received after harvesting?
 - A. If no, what prevents you from saving?
9. Where do you save your money? (bank, mobile money account, rotating savings and credit association (ROSCA), Savings and Credit Cooperative Organisation (SACCO), farmer group, buy land, livestock, or other assets)
 - A. Why do you save money here?
10. Do you use multiple financial services? (bank, e-wallet, SACCO, ROSCA, farmer group)?
 - A. If so, why?
11. Do you own a bank account?
 - A. If so, what do you use it for?
 - B. When was the last time you used it?
 - C. Do you own an e-wallet or mobile money account?
 - D. If so, what do you use it for?
 - E. When was the last time you used it?
12. What were the main reasons you signed up for a bank account or e-wallet? (Pay bills, receive money, keep money safe, save money, send money, pay government or other organisations)

13. What is your preferred channel to send and receive money?
14. Do you own or access a mobile phone or a computer?
 - A. What do you use it for?
 - B. Do you use it for your farm?
15. What type of phone do you own? (feature phone or smartphone) (disaggregate by gender and age)
16. Do you access the internet? What do you use it for? (Facebook, Google, WhatsApp, search for suppliers, agricultural apps, access bank account, email)
17. Do you access the internet on your phone?
18. How do you pay for the cost of airtime and internet?
 - A. Are these costs affordable?
19. Are you comfortable performing the following using your phone? (Withdraw money, deposit money, buy airtime, change your PIN, receive payments, make payments, access information, browse the internet, download apps, videos, music, and pictures)
20. Did you receive any agricultural information in the last six months?
 - A. Who provided this information?
21. Who do you trust to give you advice on your farm? (self, family and friends, radio/TV, farmer groups, development organisations, bank officials, private company marketers, extension officers, government officials)
22. Are you willing to pay to receive any agricultural information?
 - A. Why or why not?
23. How do you hear about and manage disease, pests, and adverse weather conditions?
24. How do you determine the price of your product?
25. What are your biggest challenges on the farm?
 - A. What do you need the most to overcome these challenges?
26. In five years, what would you want to see in your farm?
 - A. What would be the most helpful thing you would need to achieve this?
27. Have you tried using digital technology before?
If no, then the questionnaire is finished here
28. Please tell us about the different digital tools and services you use.
29. How did you hear/learn about the digital services you are using?
30. What factors led you to adopt these digital services?
31. Did you ever discontinue using a digital tool or service? If so, what was it and why did you stop using it?
32. What hardware requirements does the digital tool have?
33. Do you find it easy to use? If yes, why; if no, why?
34. What was the biggest incentive for taking on/transitioning to the use of digital agriculture tools in your work?
35. Beside any challenges you cited before, have there been other challenges in rolling these digital services out?
 - a. Data Entry?
 - b. Connectivity?
 - c. Cost?

36. What would you say have been the greatest benefits you have gotten from the use of digital tools? (Ensure we capture their thoughts on each digital tool they use)
37. What other benefits do you hope to accomplish from using digital tools?
38. Do you plan to use the digital service long term? Is it part of your production success now?

Government Agencies

Objectives

- Understand the role of governmental agencies and regulators in developing and enhancing the digital ecosystem for smallholder farmers
- Understand how governmental agencies and regulators perceive farmer needs, digital inclusion and incentives and barriers to digital adoption

Questions

1. Which pressing challenge have you seen in the agricultural sector that you think digital solutions have the greatest potential to solve?
2. What benefits have you seen or are you hoping to see with digitalization of the ecosystem?
3. What are the priorities for digitalization? (weather, extension services, technology, etc.)
4. What are the challenges for digitalization for your agency, department, or government as a whole?
5. Tell us about digital programs you are developing or have need to develop?
 - A. Of the digital solutions implemented, which ones were successful?
 - B. What made them successful?
 - C. How can the success be replicated?
 - D. For the solutions that did not work, what were the problems?
 - E. How are you developing new programs to avoid these previous problems?
6. What could be done to accelerate the process of digitalization for the beneficiaries of your ministry, organisation?
7. What can you suggest to accelerate the process of digitization?
8. How do you think the digital ecosystem will change in five years?
9. What tools are worth scaling up for digitising the ecosystem?

Agritech solution providers

Objectives

- To understand role of digital services in smallholder digital inclusion
- Understand how these organisations perceive farmer needs, digital inclusion, and barriers to digital adoption
- Understand how these organisations work with farmers

Questions (Some of the insights have been borrowed from a [Digital Frontiers report](#) on Digital Agricultural Assessment)

1. Please tell us about the product and the rationale for developing it.
 - a. What are the key challenges this product is trying to overcome?

- b. Who are the target users, and how did you design for them? (business-to-business versus business-to-consumer)
 - c. Is it geared toward specific value chains and, if so, which ones?
2. What hardware does the product require? (Tablets, smartphones, basic phones, laptops/desktops)
3. What institutions funded/invested in tool development? What is their current role?
4. Does this product integrate with other platforms (e.g. WhatsApp)? Please describe.
5. Please describe the network requirements for the product to function (e.g. offline, 2G)
6. Please tell us about user security on the product.
7. What data is collected, and how is it secured? (e.g. advanced firewalls, intrusion detection, event logging, internal firewalls, encryption)
8. Who owns the data?
9. What customer support features exist? (e.g. call centre, in-person field staff)
10. User Uptake: How is the tool rolled out to users?
11. Is training needed, and if so, what is the estimated training time needed?
 - a. Do you supply hardware to any users?
12. How many users does it have?
 - a. Active users?
 - b. By type (e.g. farmer, agribusiness)? By gender?
13. By region? (If they don't know details by division/province/county, get at least the divisions with active users)
14. Are there specific customer segments your organisation is focusing on? Which ones and why?
15. What successes/results has the tool realised? (i.e. in uptake, on agricultural productivity and income)
16. What challenges have you experienced with the rollout of the tool?
17. How do you calculate the revenue the tool brings to your business?
 - a. If the tool is donor funded and does not have a payment structure, you may wish to skip questions 17-21
18. What was the tool's total revenue in 2020?
19. If they do not wish to say, can they share if they had net positive revenues, or tell us about how that figure is changing?
20. What is your average revenue per user per year?
 - a. If they do not wish to say, can they share if they had net positive revenues/user, or tell us about how that figure is changing?
 - b. Does this number change as you grow?
21. Does it grow larger or smaller as your customer base grows, or does it stay the same?
22. What is your customer acquisition cost?
 - a. If they do not wish to say, what types of costs go into customer acquisition?
23. What are your other ongoing costs, including ongoing customer service costs, per year?
 - a. If they do not wish to say, what types of ongoing costs do they have?
24. Do you have plans to reach more users in your value chains? Please describe. Any intention to sell the tool to other agribusinesses?
 - a. For donor-funded tools, how will costs be sustained after funding concludes?
25. What competitor digital tools are you aware of, if any? How is your product differentiated?
26. Are there specific regulations that present challenges to your service?

