AMEA Kenya AgTech Roadmap Study

Study Report Submitted to AMEA Kenya Local Network

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This report summarizes the findings and recommendations of the AMEA Kenya AgTech Roadmap Study conducted in Kenya. We appreciate the FOs and BDS providers who participated in the KIIs, as well as the AMEA Kenya Local Network for the support.

ACRONYMS AND ABBREVIATIONS

AI	Artificial Intelligence
AMEA	Agribusiness Market Ecosystem Alliance
BDS	Business Development Service
DECA	Digital Ecosystem for Agricultural Development
FO	Farmer Organization
GSMA	Global System for Mobile Communications
ISO	International Organization for Standardization
IWA	International Workshop Agreement
KENAFF	Kenya National Farmers Federation
KII	Key Informant Interview
KPA	Key Performance Area
MFI	Microfinance Institution
SACCO	Savings and Credit Cooperative Organization
SDG	Sustainable Development Goals
SHF	Smallholder Farmer
SSA	Sub-Saharan Africa

EXECUTIVE SUMMARY

Ag-Tech organizations need more capacity to provide the digital services required to improve performance at all levels of the agricultural supply chain. Although many of the AgTech bundles are appropriate for different Farmer Organizations (FOs) archetypes and they have the potential to disrupt the status quo, there is a need for these bundles to be more specifically targeted, using a segmentation of the FO market, and they need to prove they can move beyond a subsidized pilot phase.

Evidence shows that FOs and corresponding Business Development Services (BDS) providers increasingly demand high-quality digital technologies, products, and services to enable business planning and improved business performance. Furthermore, the agricultural stakeholders, including farmers, require specialized and timely information to increase agricultural outputs, raise productivity, and adapt to climate change. FOs therefore need a framework to identify and invest in disruptive and appropriate technology bundles to provide insights into the capacity constraints and address the stakeholders' prevalent and persistent challenges.

This study report provides consistent and targeted guidance for FOs and BDS providers regarding the prioritization and selection of technology for investment to enable them to achieve their goals effectively. The study was conducted from April to June 2023 in consultation with 34 key informants (22 BDS providers and 12 FOs). Guided by ISO/IWA 29[1] and AMEA's FO archetypes categorization of nascent, intermediate, and advanced, the study identified the following key findings.

Key Findings

1. **Archetypes are needed but FO capacity data is needed to enable use of archetypes.**

The study confirmed that the use of archetypes to segment the FO market was valuable. The study also confirmed that AMEA's use of the six Key Performance Areas (KPA)[2] in IWA29 as a good basis for categorizing FO archetypes. Annex 3 of the report contains more details. However, the KPA data on the FOs selected for interview was not available and the study had to rely on subjective categorization by the BDS providers. This categorization often did not agree with the FO's internal understanding and categorization. Therefore, the use of archetypes will require an improvement in the availability of KPA data. A report on BDS effectiveness and efficiency[3] also recognizes this and recommends BDS Funders to consolidate and align on assessment goals and methodologies. This lack of consensus on archetypes also means that the findings on the AgTech bundles for each archetype was challenging to agree upon. As such, the following findings will need further work with stakeholders in the roadmap process.

2. **Nascent FOs should use mobile phones to access low-cost AgTech.**

It was noted that simplicity and ease of use are key at the early stage; and AgTech should be selected in order to build confidence in the use of AgTech.

The study found that Nascent FOs should look for AgTech to support basic financial management, marketing, simple record keeping, and database information (capture and maintenance). This is critical

[1] https://www.iso.org/standard/75808.html
[2] Organization Purpose and Governance, Business Management, Human Resources Management, Financial Management, Community and Stakeholder Engagement, Member Services and Business Development
[3] https://isfadvisors.org/effectiveness-efficiency-of-business-development-services-bds-for-agri-smes/

as most partners and investors want to see a credible track record. In terms of building up FO data and accessing information, mobile phones have become indispensable tools for FOs. They enable them to transact through mobile money and to access and disseminate information on weather patterns, market prices, and farming techniques through free or low-cost applications such as WhatsApp, Facebook, Telegram, and Instagram. The use of these AgTech have substantial potential if they are embedded in robust processes (i.e., their use is properly documented). Such applications already have a high level of acceptance and also overcome language barriers faced by custom-built applications.

3. **Intermediate FOs should invest in AgTech that enables improved communication, production planning, asset management, and market intelligence.**

The Intermediate FOs should look for AgTech solutions to support knowledge management, communication with members, market and price information, weather forecast information, financial reporting, legal reporting, farm management, payroll software, insurance, website, and sales transactions.

4. **Advanced FOs should consider more comprehensive, integrated software.**

At advanced stages, more advanced and integrated systems are preferred. These systems do not need to be bundled necessarily. Examples of software preferred by advanced FOs are QuickBooks, zero, Navision, Wafu, work pay and Sage by players like eProd, Safaricom, AmTech Africa and Apollo.

5. **A Roadmap needs to assist BDS providers to understand FO needs at different growth stages.**

The study results show that FOs require a roadmap at each development growth stage. These roadmaps should recognize that there are various barriers to adopting agricultural technology solutions and different views exist on when it is suitable for FOs to adopt them. The Roadmap therefore needs to enable FOs and BDS providers to understand the progression between the three categories, especially how to identify FOs with the potential to evolve quickly and the key assets needed for their development.

6. **There is a need for M&E data on AgTech products during and after the subsidy period.**

The study results further showed a need for more monitoring and evaluation of the use of AgTech products once they have been made available. This could be in the form of a database of all active FOs and the AgTech they are using. It is also proposed that AgTech adoption rates should be assessed at a period after the subsidy or project ends e.g. 2 years. This would be a more accurate measure of demand and success. This information would be useful for BDS providers to guide future support.

7. **Consensus is needed on how to enable FOs to acquire AgTech.**

The FOs must allocate limited financial resources to various operational needs, making investing in emerging technology infrastructure and services difficult, especially in a crowded digital ecosystem. A question therefore arises about how development programs can support FOs to acquire AgTech that they need and that will drive performance improvement. A debate is needed at the national level to decide on how subsidies can support AgTech market development in a more coordinated way.

1 INTRODUCTION

1.1 Background

Over time, studies show that professional Farmer Organizations (FOs) in many developing countries need guidelines to improve business performance and contribute to the achievement of the United Nations' Sustainable Development Goals (SDGs) (An et al., 2020). Many FOs, especially those in the developing world, need help to meet the requirements and standards to enhance their professional capabilities in different areas and in general. For instance, learning from China, the rapid development of new professional farmer organizations has promoted improving professional skills and knowledge among farmers, thereby reducing inappropriate use of agricultural technologies (Zhao et al., 2020). Categorization of FOs archetypes and AgTech organizations is critical since, by default, the FOs are at different growth stages, with different needs and capacities. Therefore, blanket solution packages would be inappropriate, especially when their uniqueness is not considered. Still, categorization is not practiced regularly due to a lack of understanding of its essential role.

Consequently, most potential investors hesitate to make investment decisions regarding FOs. This averseness is because evidence showing their categories and capacities is lacking. There is also a need to identify the technology bundles appropriate for each type of FO archetype to improve the entire business ecosystem by having better business opportunities for their members and staff within markets and greater sustainability. Despite these limitations and constraints, AgTech solutions can empower farmer organizations by providing them with the tools, knowledge, and resources needed to operate professionally, make informed decisions, increase productivity, access markets, and manage their operations efficiently. These solutions enable FOs to demonstrate professionalism in their agricultural practices, business operations, and stakeholder engagement, contributing to their long-term sustainability and success.

In Sub-Saharan Africa (SSA), Kenya has one of the most advanced Digital Agriculture ecosystems. It is among the top-rated digital ecosystems. For instance, it ranked second in the 2018 Enabling Digitalization Index, in SSA in HBR 2017 Digital Evolution Index, and fourth in World Bank (WB) in the 2016 Digital Adoption Index. Similarly, Kenya is the leading destination for tech startup investment in Africa. For instance, it attracted $348 million over 44 deals in 2018, making it third in the SSA region regarding the number of tech incubators and accelerators (30), after South Africa and Nigeria (Munene & Wanyama, 2020). While Kenya has performed well overall in digitizing the agricultural sector and is the leading digital innovation hub in Sub-Saharan Africa, there is a need to categorize and identify viable digital agricultural technologies using global standards and guidelines such as suggested by the ISO *International Workshop Agreement* 29 (ISO/IWA 29).

1.2 The Roadmap Study Context

According to the resulting composite indicators, Kenya has one of the most robust digital enabling environments in Sub-Saharan Africa and high levels of mobile penetration and use relative to the rest of the SSA region (Dalberg, 2019; Masyuko & Nyamwamu, 2022). In addition, it has about 85-90% unique mobile subscribers' penetration, compared to the average of 44% in the SSA region (Mutune et al., 2021). Subsequently, 80% of smallholder farmers own mobile phones. In contrast, more than 15% of

smallholders own smartphones, 30% of smartphone penetration of all Kenyans, and above 70% of the population uses mobile money regularly (Ejang, 2021; Munene & Wanyama, 2020). In Kenya, 30% of the smallholder farmers (SHFs) use mobile money for payments, and more than 67% of SHFs use mobile money for deposits (Masyuko & Nyamwamu, 2022). Looking closely at the individual indicators, Kenya must show a more strategic vision in categorizing FOs and provide an understanding to help prioritize and select digital agricultural technologies for investment and alignment with the national digital infrastructure framework. In this regard, this study has been conducted to provide recommendations and informed findings along these themes.

Extant literature shows that for most FOs, financial resources are inadequate, in addition to a staffing shortage in terms of skills and capacity. Although Kenya is at the forefront of innovative digital agricultural business models, a roadmap supporting FOs to transition from one archetype category to another is lacking. Following the need for standard global guidelines to improve business performance, adopting standards such as IWA 29 can help enhance smallholder farmers' livelihoods through increased opportunities for trade, improved supplier relationships, and greater customer satisfaction. Building professionalism and breaking into the global food supply chain is vital to the IWA 29 guidelines.

1.3 The Purpose and Scope

Digital technologies enable FOs to manage their activities more effectively (Fountas et al., 2020). A roadmap can help them consistently identify and prioritize the right disruptive bundle of technologies suitable for different FO archetypes and align with the national digital infrastructure contexts outlined by USAID DECA, GSMA, and others. This roadmap study explored the context, challenges, and opportunities that align with categorizing the FO archetypes and AgTech category. In addition, the study sought to understand AgTech's choice based on the different categories. Further, the study identifies appropriate technologies and maps the FOs and BDS providers, including their types and identifying priority investment areas to make recommendations that can provide relevant interventions. Ultimately, the roadmap should help determine the right bundle of technologies appropriate for different FO archetypes and disrupt the status quo to benefit FOs and their members.

The main activities of the rapid assessment carried out by agriBORA include:

i. Review preliminary findings from previous studies and literature
ii. Stakeholder engagement to identify the priority AgTech areas for investments, identifying the challenges faced by different FO archetypes in Kenya in adopting digital tools
iii. Make recommendations on appropriate AgTech bundles for each FO archetype

1.4 A Brief Description of the Assessment

Digital technologies have become increasingly important in facilitating engagement as they provide access to information, services, and products, which can improve efficiency, productivity, and income. In addition, these technologies are powerful catalysts for inclusive economic and sustainable development and growth (Dalberg, 2019). Transformation in agricultural operations has brought to the fore the formation of FOs and exposed the role of BDS providers in supporting the FOs to improve professional performance and operations. However, the decision-making process for the FOs and supporting institutions (BDS) gets complicated with the plethora of digital tools. Moreover, the FOs are,

by default, at different stages of growth and need customized products and services relevant to their archetype. The AMEA Kenya Local Network identified this issue, and this study aims to address constraints by identifying and recommending considerations to make in selecting appropriate AgTech bundles for different FO archetypes and BDS providers.

AMEA is a global network that brings stakeholders together to accelerate FOs professionalization. BDS are critical in helping FOs grow, improve productivity, strengthen resilience, and access necessary finance (ISF Advisors, 2023). To achieve this important role, FOs and BDS providers leverage digital technology to enhance their engagement and performance. Digital technologies have become increasingly important in providing access to information, services, and products, which can improve the efficiency, productivity, and income of the FOs. However, each FO is unique in the growth stage, and there are several such AgTech solutions in the ecosystem, thus making it difficult for the BDS and FOs to invest in the professionalism of FOs effectively. As such, AMEA envisions creating a Roadmap that guides stakeholders in selecting AgTech bundles for investment relevant to the FO archetype.

BDS means "services by third parties providing temporary support to the business operations of (small and medium) business to enable them to develop and grow". In order to provide targeted BDS there is a need to segment the FOs in terms of their needs, however, there is no accepted way of segmenting FOs and Agri-SMEs, with most BDS programs using a rudimentary approach based on turnover (ISF, 2023). AMEA's Toolbox Working Group has therefore worked on defining three FO archetypes (nascent, intermediate, and advanced) thus forming the basis of categories used in this study (see figure below).

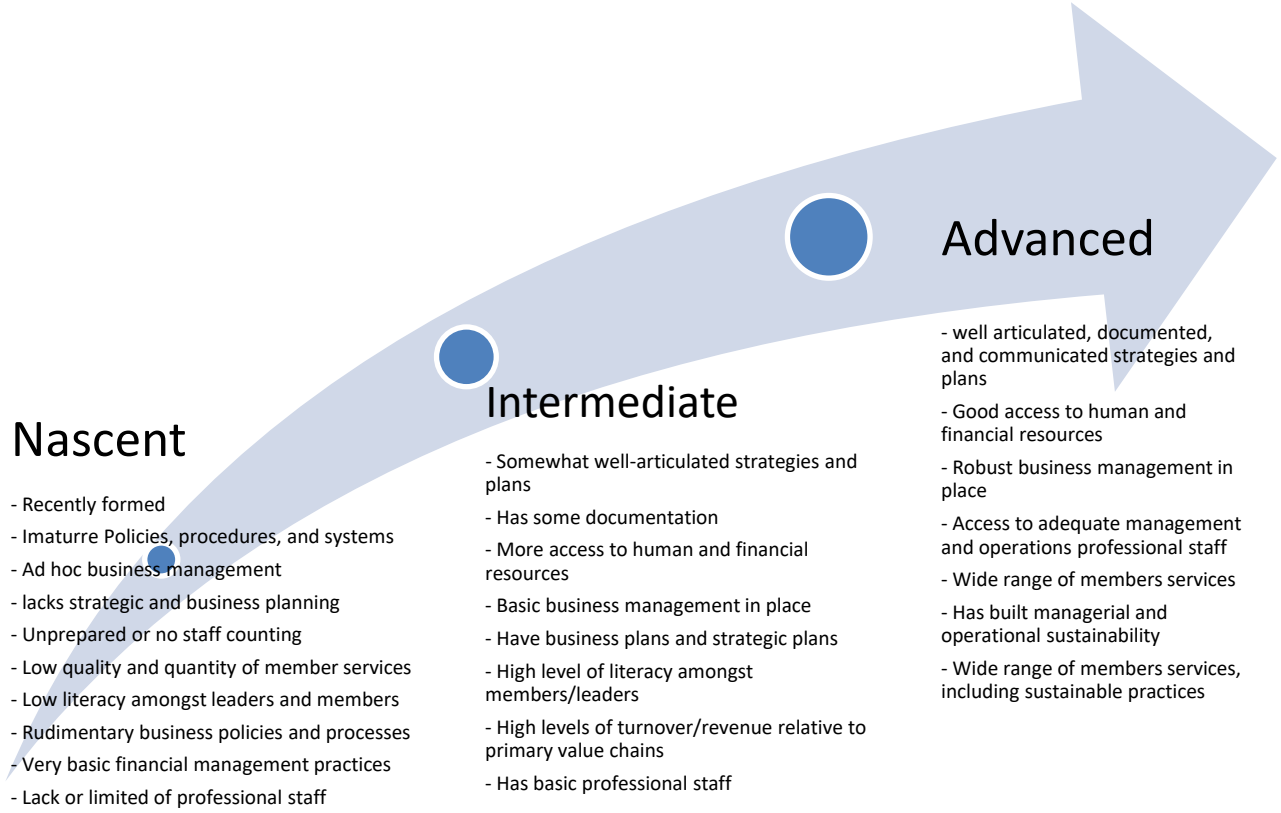

Figure 1: FO categorization

A categorization is crucial for supporting farmer organizations' transition to better financing, higher profits, higher shared value, and better returns for members. Moreover, it enables BDS service delivery

to be more targeted and efficient. The information contained in this report included recorded and transcribed Key Informant Interviews (KIIs) with 34 persons: 22 BDS providers and 12 FOs with a wide range of experiences—including community leaders, government officials, and industry experts—who have first-hand knowledge of FO development and digital development in Kenya.

1.5 Target Audience and Stakeholders

This report is not only important for guiding the AMEA network on the development of the AgTech Roadmap, but also gainful to other stakeholders such as:

- Farmer Organizations (FOs): This category guides various stages of FO development, and this report offers them insights and recommendations on technology selection and investment, making informed decisions, and prioritizing technology adoption.

- Business Development Service (BDS) providers: The report is intended to give guidance to BDS providers who offer business support, training, and coaching services to FOs and other agricultural enterprises by assisting the BDS providers with a pathway to understanding the technology needs and priorities of FOs, enabling them to offer targeted assistance and support.

- Agricultural Entrepreneurs: They are part of FOs or engaged in the agricultural sector and the report can help them understand the technology landscape, prioritize technology investments, and align their strategies with national digital infrastructure initiatives.

- The NGO, investor, and donor community: This could contribute to their strategic plan and framework for leveraging agricultural technology to address the challenges faced by farmer organizations and demonstrate a clear pathway for improving productivity, efficiency, and sustainability in the agricultural sector, which aligns with the goals of many NGOs, investors, and donors working in Kenya. By supporting the implementation of the roadmap, these stakeholders can contribute to enhancing farmer livelihoods, promoting food security, and driving inclusive and sustainable agricultural development in the country.

2 OVERVIEW OF THE AGTECH LANDSCAPE

2.1 Current Trends and Advancements in Agricultural Technology

Kenya has been experiencing significant advancements in digital technology development. Various factors, including the need for increased productivity, improved efficiency, and enhanced sustainability, have driven the adoption of digital technologies in agriculture.

One notable trend is the increasing use of mobile technology and digital platforms in agricultural activities. Mobile phones have become indispensable tools for farmers, enabling them to access information on weather patterns, market prices, and farming techniques (Mutune et al., 2021). For instance, Platforms such as iCow and M-Farm provide farmers with valuable insights and connect them to buyers, helping them make informed decisions and improve their profitability (Ejang, 2021). Another significant advancement is the adoption of precision agriculture techniques. For instance, farmers leverage GPS, drones, and sensors to gather data on soil conditions, moisture levels, and crop health. This data-driven approach allows for special fertilizers, pesticides, and water applications, minimizing waste and optimizing resource use (FAO, 2020; Olango et al., 2021).

In addition, climate-smart technologies, such as solar-powered irrigation systems and eco-friendly pest control methods, are being embraced to reduce the impact of environmental problems on agriculture and promote resilience to climate change (Wambua, 2019; Mwololo et al., 2021). Furthermore, there has been a growing emphasis on sustainable farming practices. Integrating data analytics and artificial intelligence (AI) is gaining momentum in the Kenyan agricultural sector. For instance, AmtechAfrica, AI-powered systems can analyze large volumes of data to provide valuable insights and predictive models, assisting farmers in making informed decisions regarding crop management, disease detection, and yield optimization (Abiona et al., 2021).

Kenya's current trends and digital technology advancements leverage mobile technology, precision agriculture, sustainable practices, and data-driven decision-making. These advancements hold the potential to revolutionize the agricultural sector, improving productivity, profitability, and sustainability for farmers across the country, and FOs should take advantage of this development and advancements. However, limited access to digital infrastructure, such as internet connectivity and electricity, hinders the widespread adoption of AgTech solutions in rural areas. Moreover, there is a digital skills gap among farmers and agricultural stakeholders, particularly older generations, who lack the necessary digital literacy to effectively use AgTech tools (Dalberg, 2019; Ejang, 2021). Addressing these challenges requires concerted efforts to expand internet connectivity, improve electricity access, and provide comprehensive digital literacy training to farmers and agricultural stakeholders nationwide. Addressing these challenges requires concerted efforts to expand internet connectivity, improve electricity access, and change strategy to use FOs to provide comprehensive digital literacy training to farmers and agricultural stakeholders nationwide.

2.2 Mapping of AgTech stakeholders in the Agricultural Sector in Kenya

The scoping study of AgTech stakeholders in Kenya identifies the diverse players involved in driving agricultural technology adoption and innovation. Farmers and farmer groups serve as end-users and

provide valuable feedback, while AgTech startups and innovators create and deliver tailored solutions. The government and NGOs play a pivotal role in creating an enabling environment through policies, funding, and capacity-building initiatives. By collaborating and synergizing efforts, these stakeholders contribute to the growth and sustainability of the AgTech ecosystem in Kenya, ultimately benefiting farmers and the agricultural sector as a whole. Below is a brief description of these stakeholders:

i. Farmers and Farmer Groups:

Farmers play a vital role in adopting and utilizing AgTech solutions, either as individuals or groups engaged in agricultural production, including small-scale farmers, large-scale commercial farmers, and farmer cooperatives. These stakeholders benefit from AgTech by accessing real-time weather data, precision farming techniques, smart irrigation systems, and mobile applications for market information and crop management. Their active involvement and feedback help shape AgTech solutions to address specific challenges and improve overall productivity, profitability, and sustainability.

ii. AgTech Startups and Innovators:

AgTech startups and innovators are entrepreneurial ventures and individuals driving technological advancements in the agriculture sector. These stakeholders collaborate with farmers, research institutions, and other stakeholders to understand the unique needs of the agricultural sector in Kenya and create tailored solutions. They develop and provide cutting-edge AgTech solutions, such as sensor-based monitoring systems, mobile and web-based enterprise management systems, data analytics platforms, remote sensing technologies, and blockchain-based traceability systems. They also play a critical role in capacity building, training farmers on the effective utilization of AgTech tools and promoting the adoption of new technologies.

iii. Government and Non-Governmental Organizations (NGOs):

The government and NGOs in Kenya serve as key facilitators and enablers of AgTech adoption. The government formulates policies, regulatory frameworks, and incentive programs to support AgTech initiatives. They allocate funds for research and development, establish infrastructure for digital connectivity, and promote digital literacy among farmers. NGOs, on the other hand, often work in collaboration with government agencies and private organizations to provide training, extension services, and financial support to farmers. They help disseminate AgTech information, organize field demonstrations, and create awareness about the benefits of AgTech adoption.

2.3 Specific Key Players and Organizations in the AgTech Sector

In the AgTech sector, several key players and organizations in Kenya are driving innovation and technological advancements to transform agriculture. These entities are actively involved in the research, development, and implementation of agricultural technologies, aiming to improve the sector's productivity, efficiency, and sustainability (Munene & Wanyama, 2020). They include public and private sectors, local, national, regional, and international. Examples include Twiga Foods operating a mobile-based platform connecting small-scale farmers with markets; AmTech Africa, which uses data analytics and machine learning to provide credit scoring and financial services to smallholder farmers; Virtual City develops innovative solutions for supply chain management and traceability; iProcure, a

digital platform that connects smallholder farmers with quality agricultural inputs and services; M-Farm a mobile-based platform that provides farmers with real-time market information, enabling them to make informed decisions about crop prices, inputs, and sales; Safaricom plays a significant role in the AgTech sector through their mobile money service, M-Pesa that enables digital transactions, including payments, savings, and loans for farmers and agribusinesses. The major stakeholders in Kenya include:

Kenya Agricultural and Livestock Research Organization (KALRO), a government agency, is responsible for agricultural research and development. The organization conducts research into various agricultural technologies to enhance productivity and food security, including crop breeding, pest management, and sustainable farming practices. They collaborate with multiple stakeholders to drive agricultural transformation, including governments, research institutions, and private sector players. Also, Kenya Climate Innovation Center (KCIC) supports climate-smart agricultural innovations and startups by providing incubation, capacity building, and access to finance. Alliance for a Green Revolution in Africa (AGRA) is a pan-African organization transforming smallholder agriculture by promoting agricultural innovations, market access, and policy advocacy. The other organizations are Kenya National Farmers' Federation (KENAFF), a farmers' organization representing the interests of smallholder farmers in Kenya. They advocate for policies and programs supporting farmer empowerment, market access, and technology adoption to improve agricultural productivity.

3 METHODOLOGY

This section highlights aspects of the technical approach and methodology applied in the study, including the sampling procedure, data collection methods, and analysis.

3.1 Study Design

The study adopted a qualitative-method design guided by the research questions. The quality of a research design is critical in a research study. For instance, aligning the research approach and specific data collection, analysis, and interpretation is a strategic requirement in the research design process (Wright et al., 2016). Therefore, as follows, this study specifies the research approach, procedures for data collection, analysis, interpretation, and presentation of results is critical for the research design.

3.2 Selection of Participants for the Study

Preliminary desk review and consultations with the AMEA Kenya team and KALRO were instrumental in identifying and accessing the prospective respondents, many of whom are practitioners in the agricultural digital space. A list of 127 BDS and 208 FOs was compiled, forming the study population or sampling frame. The agriBORA team sent introductory emails, and telephone calls were made to the potential respondents informing them of the expected discussion to ascertain if they met the following sampling criteria (Eisenhardt et al., 2016): (a) responsible for influencing the initiation, development, and execution of the different aspects of digital technologies in the organization, (b) have expert knowledge and authority on AgTech, including tools, content, and approaches and (c) have a general interaction with the digital agricultural technologies and actions, experience, and responsibility to support execution, (d) available and willing to participate in the interview. The survey included 34 KIIs comprising 22 BDS providers with varied backgrounds and specialties and 12 FOs representing the three archetypes defined by the IWA 29 categorization, see Annex 1. Four FOs were interviewed for each archetype.

3.3 Identification and Categorization of FO Development Stages

Following IWA29 guidelines, AMEA developed a segmentation approach to categorize FOs into nascent, intermediate, and advanced based on their specific needs for capacity strengthening. This segmentation allows for customizing BDS delivery to address these unique requirements. This tailored approach facilitates the transition of FOs towards improved financing, increased profitability, enhanced shared value, and better returns for their members. Moreover, it enhances the effectiveness and efficiency of BDS delivery by focusing on the specific needs of each segment. The AMEA AgTech Roadmap study followed the defined elements and emphasized their use to guide its implementation.

3.4 Sampling Procedures

Sampling involves selecting a small representative subset from a predetermined population to serve as a data source or respondents in a study (Wilson, 2016). The current assessment study identified the population from which the sample size was derived. The study aligns with established sampling techniques as outlined by Eisenhardt (1989), Yin (2011), Creswell and Creswell (2017), and Peel (2020) which recommend specific sampling guidelines to ensure consistency with the study's conceptual

framework. Furthermore, the sampling design was guided by the need to draw credible inferences and explanations from data. This approach is essential for generalizing the study's conclusions to other populations, settings, and contexts.

The sample size was driven by the need to satisfy theoretical sampling reasons rather than statistical ones. A purposive sampling technique was used to identify the sample target population. The organizations in the sampling frame were grouped into archetype categories with the guidance of the AMEA members who provided the lists of FOs. Given the time limits for the study, the reported groupings were considered the most feasible. However, a question on own assessment was included in the interview to capture potential differences between how external parties see the FOs versus how they evaluate themselves. Further, participants were selected based on their roles, availability, and knowledge of subjects and practices. The different archetypes were subjectively represented, as shown in table 1 below.

Table 1: Sampling by FO archetype

Archetype	Total	Purposive selection for
Nascent	25	4
Intermediate	150	4
Advanced	33	4
	208	

Alternative approaches to this representation would have meant that the full list of all FOs in Kenya was generated. Further, they would need to be categorized through an agreed procedure or standard, which is lacking, and a representative sample taken. Given the constraints of time and the absence of such a list, it was impractical to use such a process. agriBORA, in consultation with AMEA, opted to use the lists provided by the AMEA local network members and their perceptive categorization alongside the defined inclusion criteria to select the four FOs to interview.

3.5 Data Collection Procedures

The qualitative data were collected using face-to-face interviews, and an observation technique complemented the interview results. This study used primary qualitative methods through Key Informant Interviews (KIIs). Before data collection, the research assistants sought participants' consent and explained data use details. A pilot was conducted to help improve the survey tool and ensure it sufficiently collects the required information. The summary of the pre-test findings is described in the results section. The consultancy team mainly used secondary sources (various reports, published and unpublished articles) and KII tools administered via phone calls and virtual meeting tools (Zoom and MS Teams) to collect the data. Besides the notes taken, all the interviews were recorded, and the audio files were transcribed for analysis.

Field notes provided a means of recording quotes. The notes allowed the research assistants to record and preserve the respondents' key quotations about the actual settings.

3.6 Development and Coding of the tool

The KIIs audio interviews were transcribed into Microsoft Word to allow for in-depth analysis. First, the main themes or concepts that are relevant to the research objectives were identified. These themes served as the coding categories since they were derived from the research questions and captured the key elements we intended.

3.7 Data Analysis

Data analysis occurred after collecting all the data (Onwuegbuzie & Teddlie, 2003) and content analysis was employed as the analytical technique. The Codebook was then integrated into Atlas.Ti (A qualitative data analysis Software) to guide coding activity on the transcripts. The scripts were imported into Atlas.Ti and thematically coded based on the code book. Each script was read through, and emerging Quotes were coded into respective codes/sub-theme. Coded work was then extracted from the Atlas.Ti for synthesis and report writing. The IWA 29, along with Key Performance Areas (KPAs) and archetypes, guided the identification of digital technology needs and priorities. The synthesis involved comparing quotes across thematic areas, respondents, and organizations to establish the range and similarities of the participant's perceptions and experiences, and this approach led to the title of key themes identification and how they were bundled in the assignment.

4 FINDINGS OF THE ROADMAP STUDY

4.1 General Observations

This section presents results and discussions for the different questions in this study. All the interview questions have been answered and discussed. The qualitative data analysis results for each interview question, and the analysis findings are presented. The study's questions and objectives guide the presentation of the results. The overall study objective is to consistently identify and prioritize the right disruptive bundle of technologies suitable for different FO archetypes and align with the national digital infrastructure contexts outlined by USAID DECA, GSMA, and other extant literature. Figure 2 summarizes the respondents who participated in the study.

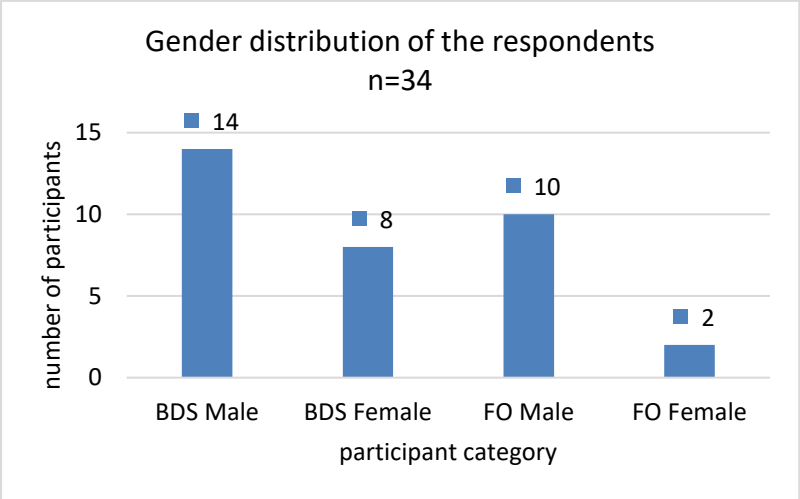

Figure 2: Respondents Distribution by Gender

The study further inquired about the ages of the participants' vis-à-vis their duration of service within the organization, the age of the BDS and FO, and the years the BDS has existed. Three FOs did not want to disclose this information. About 50% of the BDS and FOs had been in existence for less than ten years, while 85% of the participants had been with the organizations long enough (2-28 years) to share the informed opinion about the interaction between BDS and FOs, FO professionalism, and AgTech ecosystem.

An observation of interest is the duration the BDS has existed compared to the period the organization has existed. This study observed that some BDS initial purposes differed from support services to FOs. Figure 3 shows that BDS organizational life varies with the duration of FOs support.

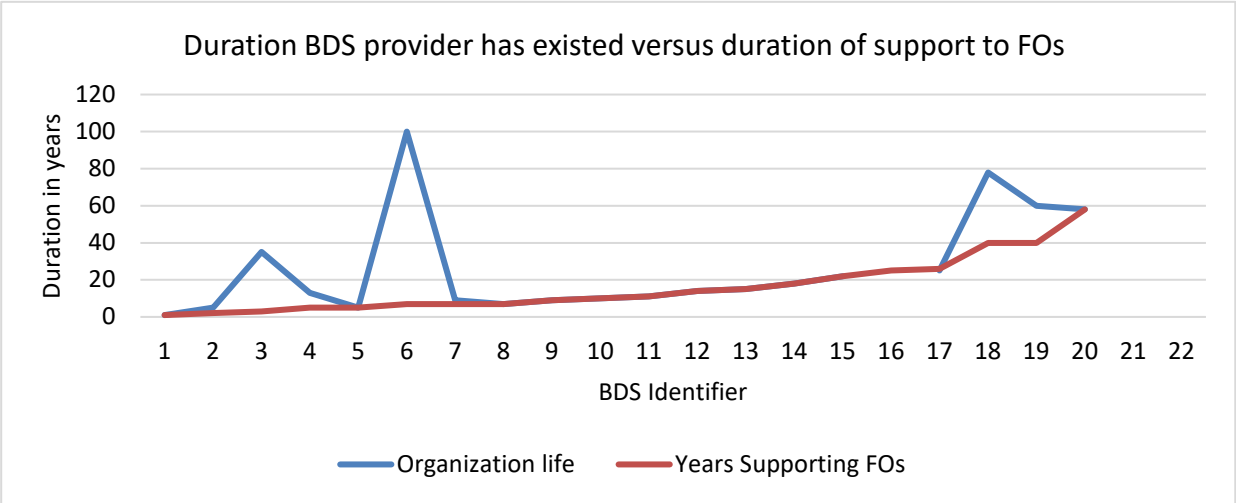

Figure 3: Relationship of the BDS age and the duration of supporting FOs (years)

Regarding the distribution of services by BDS in Kenya, two of the 22 BDS providers did not disclose the counties where they provide their services. However, most BDS (over 9 out of 22) had activities in central Kenya counties. The study results show that most Arid and Semi-Arid counties attracted fewer BDS providers, less than four of the twenty operated in these counties. Figures 4 shows the distribution of the BDS in counties.

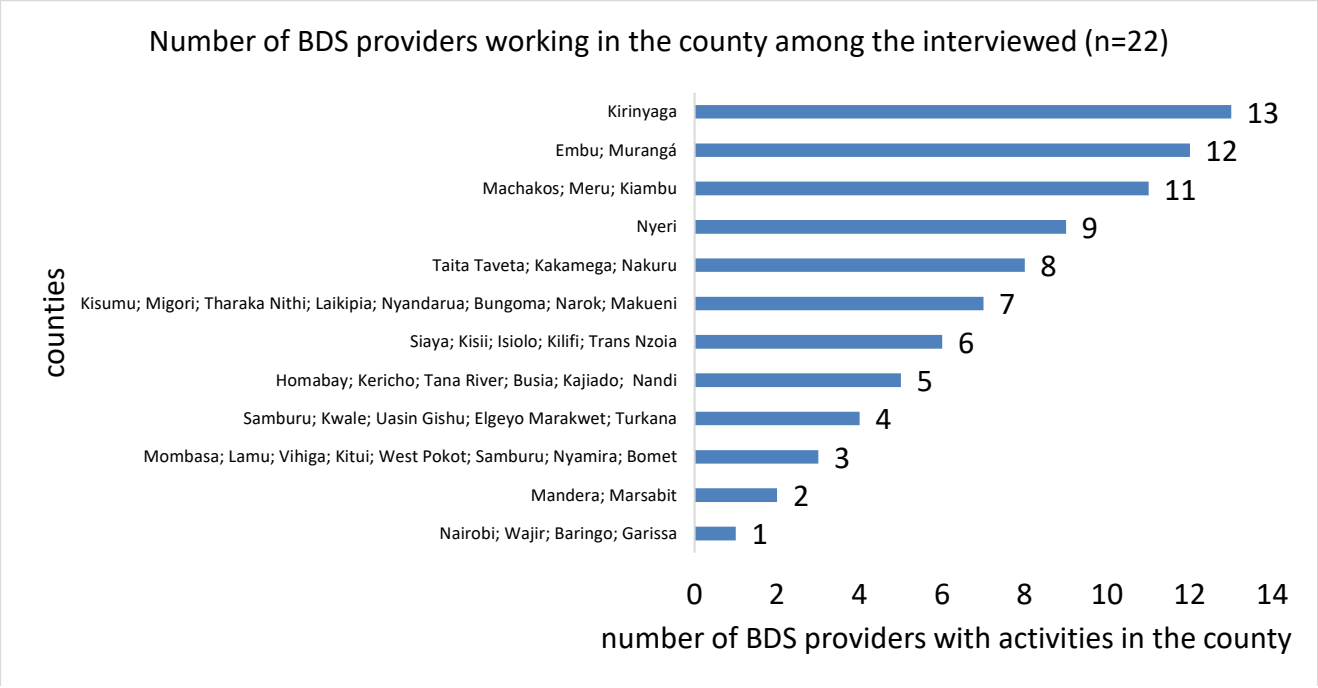

Figure 4: The distribution of BDS providers in Counties in Kenya

Although the BDS providers were spread across most of Kenya, the services offered varied and most did not target their services to different FO archetypes. The FOs interviewed were from Kakamega, Murang'a, Machakos, Kisii, Kisumu, Makueni, and Kericho.

Figure 5 shows the distribution of BDS in Kenya and the counties where they provide services.

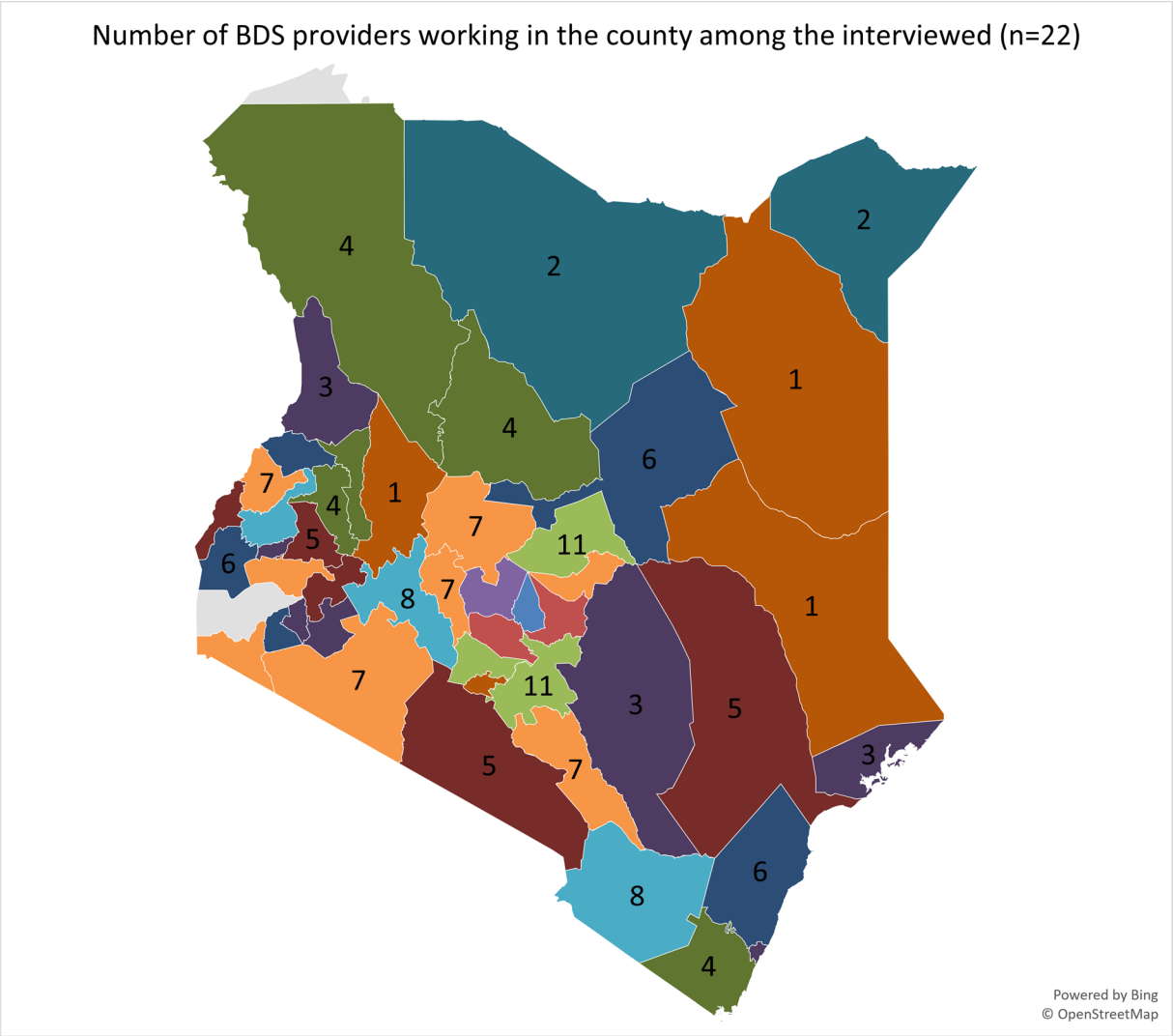

Figure 5: The map showing the distribution of BDS in Kenya

4.2 Key Findings from the Roadmap Study

This roadmap study examined different themes to understand the digital ecosystem, consistently identifying and prioritizing the right disruptive bundle of technologies suitable for different FO archetypes and aligning with national digital infrastructure contexts. Although these FOs comprise diverse governance structures and management, their operations, constraints, and needs are similar but differ in complexity and magnitude. Therefore, the findings provide case study insights and the emerging common issues, implying that the analysis and recommendations are helpful beyond the studied FOs and BDS providers. A summary of the findings across the different aspects of the study is presented in the following subsections.

4.2.1 Assessing FO Needs and Priorities

The study results show that all FO archetypes have distinct, overlapping needs and priorities shaping their digital technology requirements. These needs, challenges, and preferences are similar for the different archetypes but differ by the magnitude and complexity expected by each archetype. Annex 2

indicates the details of the priority AgTech needs of the FOs identified in the study. Subsequently, Annex 3 summarizes the priority concerns that the FOs should have in each KPA from the perspectives of the FO and BDS providers interviewed.

4.2.1.1 Nascent Category Needs and Priorities

i. ***Basic organizational structures***

Based on the interviews, the nascent group was concerned with needs around the basic structure that define the organization, such as purpose, governance system, and business management. To address these needs, the respondents emphasized getting the right personnel to run the FO, draft organizational policies, and prepare a code of conduct to ensure accountability and transparency. In addition, financial literacy and training in business management are other critical needs for the nascent category. Most of their immediate needs are inward-looking and concerned with establishing organizational structures. The argument is that they are setting up systems at this stage, so they need to build a solid foundation to build on as they grow. One respondent said:

"Most FOs have not developed their mission or vision statements, but they would like to have them in place as they advance to help them in governance. They must be strengthened to develop their by-laws and policies and have the vision and mission in place better to understand their existence, governance, long-term purpose, and focus. In addition to maintaining the initial purpose is paramount", nascent FO.

ii. ***Basic digital systems***

Further, their priorities determine the basic digital systems to automate their operations since most services are not digitized. These findings are consistent with previous studies results. For instance, Fabregas et al. (2022) found that providing large-scale information about improved agricultural practices to smallholder farmers requires more work and digital systems in most developing FOs or nascent stage FOs. The study established that traditional dissemination methods like in-person meetings or radio programming could be costly to scale or fail to offer dynamic information. In addition, while most agronomic recommendations focus on maximizing crop yields, farmers consider and evaluate multiple factors, such as the profitability of investments and risks, when making farming decisions, implying that more insights are needed to disseminate the information by employing robust digital technologies. However, at the nascent stage, besides the FOs needing more digital technologies, the ability to operate them effectively and skilled personnel is also required. Although the increased penetration of mobile phones has shifted these trends, it remains challenging for the nascent category due to the inability to employ personnel with appropriate digital skills. It is important for FOs to gradually invest human and financial resources into disruptive technology (which changes the status quo) from the beginning to grow technically at each level of their growth. They could prioritize this with simple solutions like an M-Pesa savings and payment account.

While the nascent FOs are inward-looking, it is essential for FOs in the nascent category to consider digital agriculture extension delivered through social media platforms, USSD, and SMS channels, as it can provide tailored and cost-effective advisory services to farmers and improve their use of information, especially with the proliferation of mobile technologies. This recommendation aligns with previous

study findings asserting that mobile phones allow for low-cost, timely, customized information delivery at scale (Munene and Wanyama, 2020; Mutune et al., 2021).

4.2.1.2 Intermediate Category Needs and Priorities

i. Governance and operational instruments

The intermediate FOs category requires self-improvement and engagement with the larger external community. This category highlighted the need to align the businesses to the ability to offer services to members, such as agronomic advisory and compliance with the broader industry guidelines, for instance, financial management procedures, strategic planning, and markets. One of the respondents had this to say:

"At this stage, an FO has many things to attend to and is working to realize its goals and vision. They are now looking forward to improving its operations by hiring professionals and buying software and relevant digital technologies to help them manage their operation… though most of the time there are financial limitations", intermediate FO

ii. Scalable digital technologies and tools

Most of them were confident that the organization was more convinced of its path at the intermediate stage but lacked essential digital tools to support them in establishing governance structures and operational guidelines. These tools and technologies are necessary for scaling up and gaining more influence on the environment it operates; at this stage, the FOs need to show value for any investment it makes. In addition, they prioritize adopting better and more intelligent technologies and improving their ability to influence finances and assets from potential partners. For instance, the centum platform developed through partnerships between Cordaid, IFC, AATF, and the World Bank delivers Swahili-translated content that help FOs make informed agribusiness decisions. The intermediate FOs currently use tools like QuickBooks and social media marketing platforms but would want to acquire enterprise resourcing planning (ERPs) with time.

This study's results are close to other findings that asserted that data-driven customization is a crucial advantage of digital agriculture, which can improve the quality of customized advice using the data generated. For example, in cases where extensive data on farmer characteristics are available, analysis of large platform data may reveal differential patterns in system usage by farmer characteristics. These patterns could support various tests to inform systems, service iteration, and improvements. Furthermore, when agricultural outcome data is available at a large scale, customizing recommendations based on existing data and models is critical for empirical validation in the farm and improved decision-making.

4.2.1.3 Advanced Category Needs and Priorities

i. Fully automated digital systems

At the advanced stage, FOs highlighted standard operation procedures where their systems and activities run seamlessly. Among them were good group policies to keep the organization on top; consistency and

reliability (ability to provide services according to agreement, relationship with Value Chain actors); and social inclusion. For instance, a respondent from an advanced FO indicated as follows:

"FOs work with project officers from BDS providers and the partners. The critical need is a monitoring system to track these FOs' progress on the training outcomes and value chain performance (i.e., inputs supply, production compliance, yield estimation, sales, and cash flow management). After training by BDS to the FOs, they go into the community and train others; a training which was conducted in Trans Nzoia county is a good example to state—in this case, having websites to communicate with external parties such as out-growers firm's scheme to buy produce from these farmers is a critical need. Especially for large farmers like coffee and macadamia, obtaining agricultural inputs at subsidized rates helps them to use technologies well. Moreover, the training advises them on allocating funds to competing organization needs." advanced FO.

Solutions like SACCO management software by Amtech used by cooperative societies and MFIs in their daily processes, i.e., loan processing (applications, appraisals, disbursements, repayment, and defaults), would be appropriate for this FO segment. The sentiments held by the BDS were not different from those reported by the FOs. For instance, record-keeping, training, knowledge improvement, and leadership were cross-cutting, except the extent and complexity of each varied and increased by archetype. While it is noteworthy that the nascent stage FOs are contented with simple manual systems, the advanced stage are outward-looking and prioritize complex structures and systems compliant with high-level regulations and independent of persons running the activities of the FOS. A BDS respondent emphasized as follows:

"There is a need to research to understand the need before investing in HR or any technology to evaluate if the investment will serve a need that exists or not".

Examples of the commonly used software mentioned among the advanced FOs include QuickBooks, Zero, Navision, Wafu, and HR- payroll software like work pay and Sage. Appendices 2 and 3 describe in detail the priority and alignment of these tools to the KPAs and FO archetypes.

ii. Intelligent and integrated systems

The FOs and BDS providers in this category indicated that enabling direct market access to farmers can allow them to sell their products at better prices, increasing their income. For instance, a study by Ajambo et al. (2023) suggested that such systems provide guaranteed and ready markets for farmer organizations like cooperatives. In the other context, farmers can access competitive markets through such platforms, strengthening their negotiating power, reducing transaction costs, and eliminating reliance on traditional intermediaries. For example, the platforms would allow farmers to view prices transparently, sell products, accept offers, and connect with buyers. In addition to allowing these services for farmers, the platform creates new employment opportunities through farmer micro-collector agents to collect the produce. In the description by one of the FOs, a BDS respondent said that the advanced FOs need to include the following:

> *"System/ software that can weigh, accumulate, provide an instant receipt, and statements reports at any time and can run accounting to the fullest on need basis ...daily, weekly, monthly, quarterly and annually".*

Several solutions were mentioned, including eProd - A software platform that enables farmers to manage their farm operations, including inventory management, production planning, financial tracking, and traceability; Farmforce mobile app - which helps FOs manage and track their agricultural activities, including crop production, input usage, inventory management, and farmer data collection. It also provides tools for traceability and compliance with certification standards; M-Farm - a mobile app that offers farmers real-time market prices for their produce, weather information, farming tips, and access to input suppliers; and Safaricom's Digifarm.

4.2.2 Identifying FO challenges related to technology requirements

4.2.2.1 Nascent Category challenges

Both FO and BDS provider respondents agreed that nascent FOs face several challenges when adopting and utilizing AgTech solutions. However, the most mentioned critical constraints include the following.

i. **Limited finances**: Inadequate financial resources pose a significant obstacle for these developing organizations, preventing them from acquiring the necessary technology to enhance their operations. FOs often need help to secure sufficient capital for their initial setup, operational expenses, infrastructure, equipment, and technology investment. An assessment conducted by the Government found that the lack of finance hampers Fos' ability to scale up operations, implement innovative practices, and improve productivity (Ministry of Agriculture, Livestock, Fisheries, and Cooperatives, 2019 report). In addition, limited finances also restrict their capacity to access training and capacity-building programs, limiting their potential for professional growth. Investing in rural financial infrastructure can overcome the information asymmetries discouraging financial providers from serving Fos. A study by the World Bank in 2014 showed that these challenges have existed in the last two decades, and new approaches attempting to reduce these challenges have been developing in agricultural finance. The use of technology to facilitate financial transactions, such as credit and movable collateral registries, mobile banking, and correspondent banking, are examples of ways technology can help increase financial access by FOs. While rigorous impact evaluations on many of these new developments are pending, some studies provide some insights. Examples include Kenya's M-Pesa and initiatives to introduce registries for movable collateral.

ii. **Weak Digital Infrastructure**: Limited internet connectivity, poor network coverage, and insufficient access to technological resources in remote farmer areas where these FOs are situated pose a significant hurdle for nascent FOs. In a digital era, Fos require access to digital tools, platforms, and information to optimize agricultural practices, improve market linkages, and streamline administrative processes. This finding is consistent with the study by Nderitu (2019), which concluded that without reliable digital infrastructure, Fos struggle to leverage technology for efficient operations, data management, market access, and financial inclusion.

iii. **Weak Business Models**: Nascent FOs often need more robust and sustainable business models. This constraint makes it challenging for FOs to generate sufficient revenue, attract investments, deliver effective marketing strategies and/or have efficient cost management. Nascent FOs can attract members, access markets, and establish strong partnerships. Therefore, FOs experience problems setting and creating long-term impacts in the agricultural sector, and most fail to grow

to the next level. From the BDS perspective, the most pressing challenges for nascent FOs include:

iv. **Low adoption technology:** Results suggest that negative responses to technology decisions influence the integration of digital technologies in the operations of FOs, limiting their ability to benefit from the advancements to the next level. These responses result from risk averseness, resistance to change, and low interest in technology by some of the decision-makers in FOs.

v. **Weak Governance**: Nascent FOs need more governance structures, clearer roles and responsibilities, and lack transparency and accountability, leading to internal conflicts, mismanagement of resources, and difficulty in decision-making. These may limit FOs' ability to mobilize resources, access support, and build trust with stakeholders, affecting their overall adoption of digital technologies and growth and professionalism.

vi. **Low Awareness of Existing Technologies Value:** Most nascent FOs need more awareness of the technologies available for agricultural production, processing, and marketing. This Lack of understanding restricts their ability to adopt and leverage appropriate technologies to improve productivity, efficiency, and quality. With knowledge of existing technologies, FOs may be able to optimize their operations, diversify their products, and compete in the market, enhancing their growth and profitability potential. As said by some BDS participants: *"Lack of awareness and knowledge on technology and what it can do. They always look at technology as a computer. The handset is an essential tool with technology. They need to bundle and store data, create email for an organization, and store it in the cloud. Or even use the cyber, which is also too much effort. They can equally use WhatsApp for mentorship and coaching. In addition, they perceive that they are still developing and lack financial resources to invest in technologies."*

vii. **Weak Digital Capacity:** In this study, digital capacity refers to FOs' ability to effectively utilize and leverage digital tools and platforms for their operations. Most Nascent FOs need more knowledge of digital platforms and better technical skills to help FOs use digital solution.

4.2.2.2 Intermediate Category challenges

At this level, the FO has defined an operational path that, if facilitated by AgTech solutions, can help them grow to professional standards. However, they face several challenges relating to the costs and effectiveness of using these solutions, especially in rural areas, including:

i. **Weak Internet Connectivity**: since studies point to Kenya as a "tech hub" advanced in digital penetration, still poor internet connectivity and unreliable electricity supply in many rural areas where these FOs operate hinder their ability to access BDS support via online resources, market information, and other digital tools essential for their businesses. Limited access to reliable and affordable internet connectivity hampers the functioning and potential of intermediate FOs. Weak internet infrastructure and connectivity gaps in rural areas limit their ability to leverage digital tools, access online marketplaces, and engage in e-commerce. It hinders their communication with stakeholders, access to market information, and adoption of digital platforms, which are crucial for expanding their reach, optimizing operations, and improving market linkages.

ii. **Limited Finances**: Intermediate FOs often face financial constraints higher than the nascent in limited credit access and insufficient working capital. At this stage, the FO operations are rapidly scaling, and limited financial capacity blocks their ability to invest in infrastructure, equipment, technology adoption, and value chain development, thus impeding their growth and competitiveness. Secondly, cost and prioritization become significant hurdles as these FOs must allocate limited financial resources to various operational needs, making investing in emerging technology infrastructure and services difficult.

iii. **Risk Averseness**: Intermediate FOs sometimes exhibit risk averseness due to various factors, including limited experience, uncertain market conditions, and fear of failure. This risk aversion further inhibits their willingness to embrace innovative practices, adopt new technologies, explore market diversification, or invest in value-added activities. According to FAO (2017), the FOs, still more characteristically like the nascent, often stick to traditional methods and conservative approaches, limiting their ability to seize opportunities and adapt to changing market dynamics.

iv. **Fear of Failure**: Fear of failure is related to risk averseness and is a significant psychological barrier for intermediate FOs since members are reluctant to take risks, innovate, or experiment with new approaches for fear of negative outcomes or financial losses. Since they have explored some of the solutions at the nascent stage, past or present bad experiences where the software or digital systems failed to meet expectations need resulting in mistrust and reluctance among intermediate FOs towards innovation and technology. The conservativeness sometimes stifles creativity, hinders the entrepreneurial mindset, and limits the FOs' ability to embrace change and seize growth opportunities.

v. **Low Digital Capacity**: Limited technical skills and digital literacy among intermediate FO members hinder their ability to use digital tools and platforms effectively. They have not grown enough to hire professional services and rely on member skills for AgTech adoption. Therefore, members' low digital capacity results in challenges in adopting and utilizing technologies, managing online transactions, and leveraging data-driven decision-making. This costs the FOs efficiency, competitiveness, and ability to capitalize on the benefits offered by digital solutions. The operations at the intermediate stage involve engagement with contractual stakeholders. However, **contract enforcement protocol** is still a challenge. From one of the respondents: "*FOs should have daily or monthly bookkeeping records, including delivery notes or produce collection notes. Most farmers do not have contracts, even those who have sometimes breached them. For instance, in Muranga and Kirinyaga, where they grow French beans, farmers end up not harvesting on time, and the beans are rejected; hence they suffer losses. Both the buyer and seller should honor those contracts*".

4.2.2.3 Advanced Category challenges

There is no clear-cut line of transition between intermediate and advanced FOs. The advanced FOs in Kenya still face challenges that affect their operations and continued growth, most of which are like their nascent and intermediate counterparts, except the extent of the constraints varies. For instance, weak internet connectivity remains a challenge as they anticipate using more complex digital and AgTech

tools, platforms, and software. The situation becomes complicated for the advanced category since the requirements for well-established digital technologies come with new demands. The advanced FOs category faces the following challenges.

i. **Capacity Gaps**: Despite being advanced, FOs still have capacity gaps in various areas, including organizational management, financial management, value chain development, marketing strategies, and technical skills. Insufficient capacity in these key areas hinders their ability to adapt to market dynamics, effectively manage resources, and implement innovative practices.

ii. **Cyber Insecurity**: Digitization comes with inherent security concerns. Because of their level of investments, insecurity is a key challenge as advanced FOs become targets for cyber-attacks due to their substantial resources. For instance, one of the respondents said, *"In the recent past, coffee cooperatives have been hesitant to adopt digital technology due to concerns about the potential loss of their investments to cyber-attacks."*

iii. **Limited Finance**: The advanced FOs face limitations in accessing financial resources to support technological growth. As organizations grow, the complexity of in-demand features that can effectively serve the needs increases. Insufficient working capital, limited access to credit, and inadequate financial planning hinder their ability to invest in required digital infrastructure, adopt new technologies, and expand their operations, thus slowing their growth and restricting their ability to explore new markets.

iv. **Fear of Technology Failure**: Some advanced FOs fear technology failure, constraining them from embracing and adopting new technologies arising from concerns about effectiveness, reliability, and potential negative outcomes.

v. **Inadequate bundled services**: While there is a need for digital technologies and innovations to respond to the myriad of FOs, service providers have skewed their efforts towards creating composite solutions and bundled services and products. In Kenya, AmTech Africa and Apollo have provided an all-inclusive bundled solution with various services in finance, farm inputs, insurance, market access, and advisory. However, these services still require improvement to be adopted at scale. The advanced FOs prefer all-inclusive solutions for cost-saving and with the expectations of having all the operations managed and visualized from a single platform. One of the respondents emphasized that they need a "*System/ software that weighs, accumulates, provides instant receipt, and statements reports and can run accounting on need basis ...daily, weekly, monthly, quarterly and annually".*

However, according to McCampbell and Migisha (2022), bundling is not necessarily the best as they introduce complex processes requiring extra skill or capabilities to run and often fail to succeed. For instance, TruTrade Africa, a start-up, highlights the value of sticking to a single function, excelling at it, and avoiding unnecessary complexity. Therefore, FOs and BDS providers must carefully select and strategically use digital tools rather than bundled packages. In this regard, AgTech providers must align their offerings with their users' KPA

capabilities and needs. This finding shows a shift towards demand-driven approaches, where providers engage with users over time to understand the impact and consequences of their services. Annex 3 enlists the expectations of the FOs relevant for initiating such a path.

4.2.3 Alignment with national digital infrastructure initiatives

Kenya has a highly developed digital landscape among African nations (McCampbell and Migisha, 2022). The comprehensive framework of laws, regulations, and policies has facilitated the establishment of a conducive environment that encourages the availability and utilization of digital services in the agricultural sector, with a specific focus on rural areas. In addition, the FOs must research and engage with local and regional networks and initiatives aligning with their needs and objectives. According to UNDP (2017), by actively engaging with existing frameworks such as USAID DECA and GSMA, the FOs can leverage the knowledge, resources, and opportunities available considering infrastructural contexts to align their operations with key performance areas, leading to enhanced performance and sustainable development. For instance, the USAID DECA and GSMA reports provide insights into Kenya's digital infrastructure context acknowledging its significant progress in developing the digital infrastructure with high mobile penetration and internet connectivity. However, they also point to challenges such as unequal broadband access, limited rural connectivity, and variations in service quality. Therefore, as there is a need for continued investment in expanding and improving digital infrastructure, current solutions need to align with existing infrastructure. The Kenya National Broadband Strategy also aims to guide broadband expansion, highlighting the importance of connectivity for economic growth and social inclusion. These frameworks collectively address achievements, challenges, and recommendations for Kenya's digital ecosystem development, which is key to the BDS AgTech solutions.

From the study, the FOs at all three archetypes and the BDS providers access opportunities to ensure alignment, including keeping tabs as *"marketing and financial institutions pitch their products and solutions, and they buy into the idea."*

4.2.4 Technology Selection Framework and Implementation Guidelines

4.2.4.1 Criteria for evaluating and selecting AgTech solutions

The study found that in most cases, the service provider comes with a package of digital solutions to sell or test with the FOs but without having included FOs at the design stage. They do not first assess whether the technology will bring value for money for the target FO. Conversely, the FOs often overlook the commercialization of the technologies. Digitization and AgTech solutions should include an investment component and provide value to the farmer organizations. An improved level of awareness both at the AgTech solution creation and at BDS is required. Most digitalization projects depend on donor funds and often lack sustainability strategies. This donor-dependent model contributes to a lack of business acumen and continuation and improvement. A BDS provider recounted, "*Even BDS are unable to scale due to insensitivity to the priority needs of farmers."* Overall, shaping the technology needs of FOs should be driven by stakeholder recommendations, problem-solving requirements, and the level of business growth and complexity. By addressing these needs through adopting strategic digital technologies, the FOs can enhance their operational efficiency and competitiveness. Critical

considerations needed when selecting AgTech are preceded by the overarching question: "Does digital technology solve a need?" The need can originate from external players, such as government agencies, development agencies, marketing, and financial institutions. However, it is more valuable when AgTech prioritizes its solutions requirements in line with the stakeholders' needs. The study findings show that FOs are motivated to acquire technology when they perceive a need for it and when it addresses operational challenges they face. This approach often includes difficulties tracking production records or encountering problems their current systems cannot effectively address. The recognition of a problem often prompts FOs to seek technological solutions.

As BDS seeks innovations of AgTech solutions to support the FOs, the knowledge of the pain points of the FOs and the motivations towards sustainable engagements should guide the design and development of the technologies. For instance, in the advanced FO archetype, the complexity of operations resulting from huge membership or other advanced procedures often determines the technological solutions to adopt. At earlier stages, however, there is a need for FOs to identify requirements in a guided manner. A respondent said, *"In conditional BDS-FO engagements, it is the BDS that tells the FOs what they need… that creates a need on the part of the FO to meet the BDS's demand; hence they invest in the technology as a compliance step. For instance, FO's products buyers dictate which technology they need to invest in and when they should"*

In addition, the operationalization of the AgTech equally matters. For instance, the members' profile and ability to interact and utilize technology is a critical consideration. As stated by one of the participants: *"Most FOs organizations have aged members who are not very versatile due to a low number of younger generations. These types of organizations keep changing the board members because of yearly elections, and it's hard to keep up with the training, and the organization has to deal with the issue of succession."*

Most importantly, by addressing the needs through strategic technology selection, FOs can enhance their operational efficiency and competitiveness. Another cross-cutting consideration is the responsiveness or relevance of the technology to use by special groups. For instance, most designs of digital technologies exclude visually impaired persons.

4.2.4.2 Integration of digital technologies with FO development stages

The interviewed stakeholders emphasized that the FO needs at different development stages ought to form an integral part of the design of the solutions. Essentially, the technology should be customizable to fit the requirements of each level of the FO pathway to professionalism. For example, it is important to consider the categories of services for the different FO archetypes.

4.2.4.3 Considerations for scalability, adaptability, and sustainability

The study results identified the following activities to consider when implementing sustainable AgTech solutions:

- A detailed implementation action plan on what, how, and why each technology choice for the FO archetype. In this activity, the BDS providers decried the difficulty in scaling solutions due to failures among innovators to put forward the farmers' needs, as identified by the FOs.
- Allocation of resources and responsibilities to facilitate the implementation of the action plan.

- Timelines and milestones seeking to enable the assessment and progress monitoring.

4.2.5 Support mechanisms and resources for FOs

The study results highlighted key areas where FOs require support, and these include:

1. **Training and capacity building**

The respondents indicated that the BDS providers should offer training and capacity-building programs to FOs to encourage knowledge sharing, best practices, and adoption. In addition, the BDS providers can also facilitate the exchange of experiences and lessons learned among FOs, fostering peer learning and collaboration. BDS providers should further connect FOs with existing networks, initiatives, and organizations in the agriculture and technology sectors. For example, they can facilitate FOs' participation in programs like USAID DECA, GSMA initiatives, or other relevant platforms. These networks and initiatives provide FOs with access to market opportunities, knowledge resources, and potential partnerships for technological advancement.

2. **Partnerships with BDS providers**

The results show that BDS providers should enter into partnerships and contractual agreements with FOs to offer tailored services and support. Such alliances may involve customized advisory services, technology assessments, feasibility studies, or market research specific to the needs and goals of FOs. Furthermore, the study established that BDS providers can work closely with FOs to understand their challenges, identify appropriate solutions, and implement sustainable technology adoption and business growth strategies.

3. **Access to financing options for acquiring and operating the technologies**

The study results show that the BDS providers can assist FOs in accessing financing options for acquiring and operating AgTech tools. Also, they can help FOs identify appropriate financing sources, such as grants, loans, or impact investors, and guide them through the application process. Moreover, the BDS providers can further assist FOs in preparing financial documents, business plans, and investment proposals to increase their chances of securing financing. However, developing and adopting sustainability to facilitate progressive use of AgTech beyond the funding period require caution, for instance, repackaging the funds as partial credit and planning the repayment period.

4.2.6 Monitoring and Evaluation

4.2.6.1 Monitoring the impact of technology adoption

The results show that monitoring the impact of AgTech adoption among FOs of different archetypes requires a well-defined procedure to assess the outcomes and benefits of technology integration effectively. Subsequently, there should be internal FO capacity and external BDS support to implement impact monitoring. The monitoring process must consist of several key steps, ensuring that the outcome is verifiable.

For instance, established, well-defined, and measurable indicators reflect the impact of AgTech adoption. Also, an important procedure is adopting KPAs and linking them to visible outputs to measure productivity levels, cost reduction, income generation, resource efficiency, market access, and farmer satisfaction. This approach is critical since each archetype of FO may have unique goals and objectives. Therefore, the indicators should capture the specific impacts relevant to their context.

Secondly, the protocol should involve a baseline assessment to establish a starting point for comparison. This assessment can include gathering data on the FO's current practices, productivity levels, and challenges. It helps provide a benchmark against which the impact of AgTech adoption can be measured. Data collection and monitoring should be conducted periodically during the AgTech use and BDS process to track changes and progress. For instance, Nuru, which works with farmer organizations, emphasized that *"it is crucial to assess the capacity of emerging farmer organizations' ability to sustain impactful choices for their members in line with profitability, determined through financial statements, as well as professionalism, assessed through evaluation protocols that reveal operational efficiency and governance"*.

Furthermore, documenting success stories, challenges faced, and lessons learned during the AgTech adoption journey is valuable, especially as the FO grows in the continuum of archetypes. This qualitative information adds depth to the monitoring process. It provides insights into the experiences of FOs and constitutes the shareable lessons professional FOs can share in peer learning programs.

By implementing a comprehensive protocol that includes measurable indicators, baseline assessments, regular data collection, and qualitative feedback, the periodic monitoring process can effectively evaluate the impact of AgTech adoption among FOs of different archetypes. This information can inform decision-making, facilitate knowledge sharing, and guide future efforts to enhance the integration of AgTech within farmer organizations.

4.2.6.2 Feedback mechanisms and opportunities for continuous improvement

With the continued changes in the organization dynamics, performance, and needs, constant revisions or corresponding modifications in the AgTech services and products are adopted. However, feedback mechanisms that consolidate users' opinions are required for greater performance and professionalism.

> *"Feedback should be received after every month, and the changes they have initiated in their organization should be executed through the cluster groups".*

FOs can enhance their organizational capacity, technical expertise, market competitiveness, and overall professionalism in agricultural practices and business management by capitalizing on existing opportunities, such as positive FO attitude towards technology, growing mobile network, and device coverage and use. This can be done in many ways:

- **Policies and initiatives:** Favorable government policies and initiatives that promote FO development exist. They focus on strengthening FOs, providing institutional support, and creating an enabling environment that can enhance their professionalism by recognizing their importance, facilitating access to resources, and promoting sustainability.

- **Technological Advancements:** The availability and adoption of agricultural technologies in Kenya are rising among potential FO members. Embracing AgTech tools, digital platforms, and precision agriculture can improve FOs' efficiency, productivity, and management practices. Technology can enhance data-driven decision-making, strengthen value chains, and improve overall professionalism within FOs.

- **Access to Knowledge and Training:** The advent of mobile networks and increased internet use presents a huge opportunity for FOs and members to access knowledge resources, training programs, and capacity-building initiatives. According to Githinji (2021), such platforms provide opportunities for FOs to participate in training workshops, seminars, and learning exchanges that can enhance their technical skills, business management capabilities, and understanding of market dynamics. Continuous learning and knowledge-sharing platforms contribute to FO professionalism.

- **Market Integration:** FOs have been widely recognized by umbrella unions like Kenya National Farmers Federation (KENAFF) and other agencies as a robust structure. This allows the FOs to integrate into traditional commodity markets and value chains in both domestic and international levels, thus providing FOs with avenues to showcase their professionalism through adherence to quality standards, certifications, traceability systems, and meeting buyer requirements. Market integration can encourage FOs to develop professional business practices and ensure compliance with market demands (FAO, 2015).

- **Networking and Collaboration:** FOs can engage in networking, collaboration, and partnerships by farmer associations, cooperatives, and alliances, that enable them to leverage collective strength, share best practices, access shared resources, and engage in joint marketing efforts. Collaborative platforms can enhance FO professionalism through knowledge exchange, experience sharing, and collective advocacy.

- **Financing:** There are several opportunities for FOs to access funding, grants, and loans tailored to their needs and archetypes and can enable investments in capacity development, infrastructure, and technological advancements. BDS has a role in supporting FOs to the best position for access to capital through such avenues.

- **Policy Advocacy and Representation:** With structured setting and visibility, the FOs can actively engage in policy dialogues and interact with policymakers ensuring FOs' voices are heard and their interests are taken into account in agricultural development strategies (Kenya National Bureau of Statistics, 2019).

5 CONCLUSION AND RECOMMENDATIONS

Based on the roadmap study assessment, the following have been identified as key areas that need to be addressed to improve the performance of archetype organizations, uptake of available digital technologies, and effective decision making

Priority Issues

1. **Transitional Change**

The transition of FOs from nascent to professional is more of a continuum than a series of individual steps. The potential of a FO for professionalism could be distinct at the very nascent stage and should be nurtured.

Interestingly, in many cases there was a discrepancy between how a FO sees itself and how it measures against defined standards. Although it undoubtedly makes sense to categorize FOs, we noticed that the objective categorization based on the formal criteria often did not agree with the FO's subjective categorization. There appears to be no discrete step between categories, the progress towards more professionalism being thus a continuum.

Nevertheless, there is a critical need for standardized procedures to segment and evaluate the FOs to enhance the packaging of AgTech solutions and bundles for their activities. The KPAs and archetype categorization defined by the AMEA network based on the ISO/IWA 29 forms a critical foundational basis for this pathway. However, there is a gap in that the FOs and BDS providers are unaware of these guidelines.

Each FO is unique in the growth stage and there are several AgTech solutions in the ecosystem, thus making it difficult for the BDS and FOs to invest in the professionalism of FOs effectively. Moreover, the FOs have related challenges but different in magnitude based on their level of operation and expectations. For instance, resources are a constraint across the board. Still, while the nascent may facilitate basic operational processes as communication, for the advanced, it is more for integrating its growing complex operations to simplify visibility and make them seamless. The AgTech bundles required and prioritized thus range from simple IT tools and equipment to complex automated and heavily integrated solutions depending on the FO growth stage, its' needs, and the capacity to invest in the solution.

Two questions, therefore, arose throughout the interviews: Does AgTechs product or service solve a need for the FO? And, is it affordable in the sense of presenting value for money? FOs must allocate limited financial resources to various operational needs, making investing in emerging technology infrastructure and services difficult. In our conversation with the stakeholders (BDS providers and FOs), it was noted that for the professionalism of FOs, each KPA has to be addressed differently as follows:

i. **Organization Purpose and Governance**

Conflicts of interest mar most FOs, especially concerning resource use and professional management. It is recommended that the FOs, identifying potential occurrences of such, should hire management professionals whose only tie with the FO is to make it run efficiently, hence reducing conflicts of interest. This will also help in compliance with existing standards and laws. As indicated in previous studies, by hiring professionals to manage FOs, agricultural organizations can benefit from their expertise in agriculture, strategic planning, financial management, market access, and capacity building. These

factors ultimately contribute to improved performance, profitability, and long-term sustainability (FAO, 2017; Weisman et al., 2014).

Further, BDS needs to support FOs with ERP for business forecasting when financial resources are available and with simple and smart technology for bookkeeping to enhance financial transparency and accountability, which in most cases is the biggest cause of conflicts.

ii. Business Management

There is a need for compliance with standards, which is directly linked to how the business is run. Registration of businesses that transform FOs into legal entities should be required. Still, the FOs need to understand why it is important to comply with business legal registration issues. A study by FAO (2015) revealed that compliance demonstrates good governance and responsible business practices, which can enhance the organization's reputation and reduce the risk of legal issues or penalties. According to UNDP (2019), registered farmer organizations can tap into funding opportunities crucial for their development, expansion, and implementation of various agricultural projects, and compliance increases partners' confidence in doing business with the organization, attracting more opportunities for growth and collaboration.

> *"FOs/Farmers need to understand market and pricing dynamics… so they don't feel cheated by whoever is doing business with them, e.g. an avocado could be selling at 100 bob in Europe, and you are buying from farmers at ten bob, that price gap if not well understood becomes a recipe for conflict. They need to know costs associated, levies paid, standards cost that pushes the price gap."*

iii. Human Resources

FOs sometimes engage casual laborers or permanent employees. It is recommended that in the endeavour to grow to professionalism, they are sure to comply with existing labor laws and codes of practice, not only at leadership levels. Alongside such compliance, HR needs assistive tools like tech systems (Data management software, accounting systems, etc.) to operate better. Digital farm record-keeping apps like FarmLogs, AgroBase, and Farmbrite, not necessarily made for FOs, could be customized to help farmer organizations manage their agricultural and member operations more efficiently by tracking inputs, outputs, expenses, and yields, providing valuable data for decision-making and financial management and improve human labor efficiency. By leveraging AgTech tools for human resource management, FOs can optimize workforce utilization, improve communication and collaboration, enhance training and performance evaluation, streamline administrative tasks, and promote a safe and productive work environment (Chataway et al., 2014; FAO, 2019; and IFAD, 2019).

The moratorium on hiring new employees in different organizations has existed for decades. However, staff attrition and lack of succession plan and replacement are major challenges, especially for the nascent category. Therefore, the human resource capacity issue should be considered. In this regard, staff capacity development and succession plans are critical for the different levels to improve the number and quality of the required human resources. Therefore, building capacity for the FOs and BDS would mean the organizations hire more qualified staff. The existing team needs formal on-the-job training. It is critical to note that the lack of succession planning may result in losing essential skills and negatively affect the future growth of the organizations.

iv. Financial Management

Startups need to adhere to the financial plan and have operation bank accounts. At the intermediate stage, they should operate in a network like SACCOs, with a bank account and a financial system for record keeping and tracking, accounts, and accountability. The change should be progressive, for instance, from saving groups to SACCOs.

> *"Most conflicts in any organization start with finance, and the success of any entity is depended on the financial resources they have or can marshal …so financial management system is needed to demonstrate accountability and transparency."*

According to Siddiqui (2021), mobile payment systems have revolutionized financial transactions in the agricultural sector, especially for FOs. These systems enable secure and convenient mobile-based transactions, allowing FOs to easily receive payments from buyers, pay suppliers, and conduct other financial transactions. Popular mobile payment systems among FOs in Kenya include M-Pesa and Equitel. Some SACCOs have also developed apps and e-wallet systems for member use integrated with M-Pesa.

v. Community and Stakeholder Engagement

As the FOs grow, it should be noted that they draw membership from the community around them, and they should, at intermediate or advanced stages, sponsor field days to interact with others, community people, government, and experts to learn from each other on what they are doing better, new technological solutions and innovation and why they have them to improve on their efficiency.

According to Gateri and Waema (2019), partnerships can help FOs and the community leverage technology to access e-extension services providing FOs and communities with access to expert advice, training materials, and best practices in agricultural production and management. These services can be accessed through web platforms, mobile apps, or SMS-based systems, helping FOs enhance their technical knowledge and skills. One example is Digicow, which provides extension services for dairy farmers.

FOs should be sensitive to how the community operates and habitually hold meetings at convenient schedules when the majority can attend (e.g., women have other roles back home or in their farms. therefore, morning meetings are not ideal. Also, avoid mixing youth and older people because their concentration spans are different).

vi. Member Services and Business Activities

FOs are mostly member-based organizations, and members' interests are a priority to the operations of the FOs. For instance, access to accurate and timely market information is crucial for FOs to make informed decisions about pricing, market trends, and potential buyers. Market information platforms like M-Farm and FarmDrive provide FOs with real-time market data, helping them connect directly with buyers and negotiate better prices for their products. The FOs and BDS should embrace them. The FOs should facilitate member access to essential production tools that improve performance, for instance, on soil and crop health, help determine appropriate fertilizer application rates, and monitor soil moisture levels. Some soil testing and monitoring tools that could be procured and managed through the FO for their members include SoilCares, AgroCares, and CropX.

Ultimately, about the two questions raised earlier, agriBORA further recommends that:

One, the roadmap should emphasize enlightening FOs and BDS providers on the consistent "definite" archetype categories and their reflection on the key performance areas as well as on monitoring FOs' progress on the path to professionalism. Since no such universally accepted standard exists, its formation should be prioritized before disseminating the characterization to FOs and BDS providers.

Two, it is important for FOs to invest both human and financial resources gradually into disruptive technology as early as the nascent stage, beginning with simple technologies like MPesa, excel and social media platforms like Facebook and WhatsApp such that they can grow technically at each level of their growth.

Three, the roadmap should emphasize the importance of simplicity, user-centricity, and continuous engagement to ensure the success and impact of AgTech services. For instance, TruTrade Africa, as a successful start-up, highlights the value of sticking to a single function, excelling at it, and avoiding unnecessary complexity. There is a need for FOs and BDS providers to apply a strategic use of digital tools rather than bulked packages and to align their offerings with the KPA capabilities and conditions of their users. This requires a shift towards demand-driven approaches, where providers engage with users over time to understand the impact and consequences of their services.

Four, not all AgTech solutions have to be digitized. There is a need to design models that work with a basic phone and those that are not reliant on phones. Additionally, there is a need to train FO leaders or management on digital and basic computer skills sufficient for the core activities at their growth level. The partnership among Farmer Organizations and between FOs and BDS providers can be successful if it addresses simple needs such as helping FOs establish management protocols and procedures, and when it supports them in areas that harness the power of collective action in production, processing, marketing and trading on agriculture value chains.

Lastly, investment is needed to create a digitized database with all the current active FOs and BDS providers. The list can be updated periodically to host most, if not all, such stakeholders for easy engagements, facilitation, and intervention dissemination. Kenya has an active farmers' umbrella body (KENAFF) that can occasionally host and update the database while giving authorized stakeholders necessary access. The development of the access protocol should be participatory among the stakeholders and could be steered by AMEA and defined in the AgTech Roadmap.

Limitations of the study

This study is good for the purpose and sufficient to form the basic guideline for the roadmap considering the distribution of the areas of activity of the BDS providers and FOs interviewed. However, it is short of the representation of FO archetypes since there was no standardized method to select representative FOs. Moreover, a database of FOs in Kenya is lacking, and the BDS selected were not fully representative of the services offered by BDS providers to FOs. Interpretation and use of these results should always acknowledge these concerns.

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Annex 1: List of Interviewed BDS providers and FOs

No.	Name of Organization	Organization	Type of organization
1	Peter Nduati,	Twalisha Ltd. / Africa Turnaround Ltd.	BDS - Private sector
2	Merciline Oyier,	CordAID	BDS - NGO
3	Lydia Omamo,	NCBAClusa International	BDS - NGO (other VC system actor)
4	Paris Thumi,	Fruitful Agriventures	BDS - Private Sector (Youth - Digital Service)
5	David Ojwang,	SNV	BDS - NGO (other VC system actor)
6	Tim Mwangi,	Prized Veg Limited	BDS Private sector
7	Jane Musindi,	Six Square	BDS - Digital Tech. (Market access)
8	Jan Willem,	eProd	BDS - Digital Tech. (Market access)
9	Henry Kinyua,	Digital Green	BDS - Digital Tech. Provider
10	Betty Musembi,	Solidaridad	BDS - other VC system actor
11	Nicholas Ambanya,	Twiga Foods	BDS - Digital Tech. Provider
12	George Kanyeki,	AgriFrontier	BDS - other VC system actor
13	Irene Kimani	KALRO	BDS - Research and academia
14	Edwin Manyeki,	HEIFER international	BDS - NGO (other VC system actor)
15	Susan Mugure,	DCI international	BDS - other VC system actor
16	Joliff,	Lliffton Analytica	BDS - digital tech service provider
17	M. Kimani,	Lentera Africa	BDS - Digital Tech. provider
18	Edgar Kadenge,	Action Against Hunger	BDS - other VC system actor
19	Apollo Owuor,	Private consultant, Farmer Organization, Horticulture, Former chairman FPEAK	BDS - Private Sector
20	Faith,	KEPHIS	BDS - Public Sector
21	Nicholas Kahiga,	Industrial Promotion Services, IPS/ Aga Khan Foundation	BDS Private sector (other VC system actor)
22	Anthony Mugambi	Kilimo Trust	BDS - NGO (other VC system actor)
23	Severa Kamande Charles	Ngikwa SHG, Maragua	FO - nascent
24	Hesbon Awiti,	Wadudi Youth Group, Kisumu West, Kisumu,	FO - nascent
25	Joseph Ndungu-	Gatanga Digital Young Farmers, Muranga	FO - nascent
26	Beatrice Mutiso,	Kaumoni Young Farmers, Yatta, Machakos-	FO - nascent
27	Josphat Amukayi,	Forward Group, Lurambi Kakamega-	FO - intermediate
28	Simba,	Wote Farmers Group Chairman-	FO - intermediate

29	Kennedy Ochieng',	Kilanguni Horticulture,	FO - intermediate
30	Leah Nyangasi,	Ebuhanga Umoja Women Group, Lurambi, Kakamega	FO - intermediate
31	Samuel Kathyaka,	Machakos Cooperative Union Limited,	FO - advanced
32	David Keter(V/chair)	Sombo FCS-	FO - advanced
33	Alfred Onyansi,	Nyamache Farmers Cooperative Society,	FO - advanced
34	Cosmos Rono,	Torochmwai FCS-	FO - advanced

Annex 2: Priority Technology, software, and platforms for the FO archetypes

	FO archetypes	Important Digital Tech. software / service/ platform	Examples mentioned
1	Nascent	- Financial Management Technology - Marketing Platform - Simple record keeping platform - Database capturing technology - Computers for making posters for advertisement	- Social media platforms (WhatsApp, YouTube, Facebook, tik-tok) WhatsApp is the most preferred and used. - Excel - M-pesa - Other tools like: Tablet, smart phone
2	Intermediate	- Knowledge management information and communication System - Marketing and price information platform - Weather forecast platform - ERP and fleet management (vehicle tracking) - Financial reporting - Legal reporting - Farm management systems - HR- payroll software - DSS (decision support system) - Insurance - Website - Point of sale	- work pay - sage - social media (Facebook, WhatsApp) - QuickBooks - Zero - Navision - digital daily - Kenya advisory call centre - Tools like: Weighing unit
3	Advanced	- ERP software - Management platform - Website - Member communication system - Point of sale - Accounting and finance software - Fleet management (vehicle tracking) - Weather forecast - Bulk messaging - Farm management systems	- Wafu - Webinars - WhatsApp - WeFarm - Digicow - Software that can take farmer deliveries data accounts and instantly provide receipts and generate farmer report - System/ software that weigh, accumulate, provide instant receipt, and statements reports and can run accounting on need basis ...daily, weekly, monthly, quarterly and annually

Annex 3: What the FO archetypes need to prioritize in each KPA

FO archetype / KPA	Nascent	Intermediate	Advanced / Very professional
Organization Purpose and Governance	- Clear value propositions (clear constitution with vision and mission) well packaged to sell to farmer, to recruit them into the group - Well defined group purpose that is solving an existing farmer need ie. like finding market for their product - Governance and transparency, discipline and conflict resolution mechanism need to be clearly spelt-out and enforced for member trust (payments and transaction must be clear to all) - Clear communication channels for updates, Q&A and feedback to farmer members to avoid discords - Proper record keeping and management tools… here technology comes in handy to automate transaction and accounts	• proper structures – e.g., board of management • high accountability/business ethics from leaders and members • implement FO policies • ensure good governance • Well defined group purpose that is solving an existing farmer need • Governance and transparency, discipline and conflict resolution mechanism need to be clearly spelt-out and enforced for member trust • Clear communication channels for updates and feedback to farmer members to avoid discords • Proper record keeping and management tools… here technology also comes in handy to automate transaction and accounts	- Well defined group purpose - Governance and transparency, discipline and clear conflict resolution mechanism spelt-out and enforced for member trust - Clear communication channels for updates, and feedback to farmer members - Proper record keeping and management tools
Business Management	- Remain true to their cause; they must stick to the reason for coming together (specialization and consistency) - Whatever progress that is made it must be addressing the market need	• Have business plans and business strategies • Conduct a training needs assessment and be trained in those area	- Remain true to cause (specialize) - Strategic planning and mission

	for the produce (staffing, software systems, capacity building, financing technologies, hiring) and must be solving their key mandate - Strategic planning and mission - When digitizing, must be concerned about transparency in-terms of registration of farmers, value proposition and any transaction they are do.	• board sitting to review performance • record minutes to track discussions for review in the subsequent meeting which helps in communication internally • be concerned about communication and feedback to their farmer members, they must keep them updated and respond to their questions and concerns openly • call for AGMs and election as stipulated • have all their transaction automated	
Human Resources	- clear about they value proposition which then will inform them about the HR they need to have in place. (Here basically the board of management is running activities)	• develop human resource policies • Employees to have contracts and manuals • training plans for staff members	- have full professional management staff in all areas running their business affairs
Financial Management	- Must have a plan from the beginning to manage finance - Must have a budget to operate with - Make sure going forward that all the books are audited, clear transparency tools… that is why technology comes in	• supporting book keeping and accounting systems- avoid manual system and graduate to quick books and excel linked to different departments • training cashiers on financial management	- Strict adherence to Financial Management plan and operational budget - books are audited, clear transparency tools -

	- Make sure that every cost/ transaction is properly documented and clear feedback to members on financial accounts - Involving FO members – making sure that farmers who are the shareholders have contributed to the decision.	• having insurance for assets • inclusiveness of every member for accountability • Strict adherence to Financial Management plan and operational budget • Make sure their books are audited, clear transparency tools	- every cost/ transaction is budgeted, properly documented and clear feedback to members on financial accounts
Community and Stakeholder Engagement	- Start by mapping out key stakeholders (members, partners, market, line government department, banks, etc) - have an engagement plan with each stakeholder	• having websites to communicate to external parties • out grower's scheme to buy produce from farmers • allocate funds for CSR to the community • improve market linkages with farmers with similar goals e.g., holding webinars for different SMEs that are supported • Continuously mapping out key stakeholders (members, partners, market, line government department, banks, etc) and updating engagement plan with each stakeholder	- Continuously mapping out key stakeholders (members, partners, market, line government department, banks, etc) and updating your engagement plan with each stakeholder
Member Services and Business Activities	- Clear value proposition from the beginning that ensures that the FO is serving a need in the community not just its own	• encourage forming of groups in community – To help with aggregation of the different	- the plans made are fully implemented clearly. - provide innovative solutions to farmer members e.g., efficient

	- Involve membership through updates and feedback mechanism and improve the value proposition to address and respect the member concerns.	produce with one leader to be a link to the different services. • one on one meetings to promote communication and transparency • good transportation • install cool chains infrastructure for perishable products • provide employees with the right attire and equipment • Make sure that the plans made are fully implemented clearly • be innovative to provide solutions to farmer members… e.g efficient transport systems, record-keeping systems etc • Increase their incomes moving forward • Address payment delays	transport systems, record-keeping systems etc