Deep Dive

Digital Agriculture Technologies in Malawi

JengaLab · TechChange · DEVELOPMENT GATEWAY An IREX Venture

DEEP DIVE: DIGITAL AGRICULTURE TECHNOLOGIES IN MALAWI

JULY 2023

Authors:

Development Gateway: An IREX Venture

Martine Koopman

Marco Cattaneo

TABLE OF CONTENTS

BACKGROUND AND CONTEXT

THE DIGITAL ADVISORY SUPPORT SERVICES FOR ACCELERATED RURAL TRANSFORMATION (DAS) PROGRAMME

The DAS Programme provides technical support to information and communication technology for development (ICT4D) activities within IFAD-financed programmes.

The DAS Programme's main objectives are to a) increase the access smallholder farmers have to information and inclusive financial services, and b) increase the use of ICT4D solutions to achieve better targeting, monitoring, and impact measurement for agricultural development. The DAS Programme partners are [Development Gateway](#), [Jengalab](#), and [TechChange](#).

In addition to the DAS programme, IFAD supports several interventions in Malawi. IFAD's Malawi portfolio includes several programmes (Sustainable Agricultural Production Programme [SAPP], Transforming Agriculture through Diversification and Entrepreneurship [TRADE] Programme, Financial Access for Rural Markets, Smallholders, and Entrepreneurship (FARMSE) Programme, and Programme for Rural Irrigation Development [PRIDE]) that make use of various ICT tools (mobile applications, web-based platforms, etc.).

IFAD's DAS Programme supports the Malawi team by:

(1) Providing specific, tailored support for individual programmes (addressing needs); and

(2) Improving monitoring, evaluation, and learning across IFAD teams

To support the IFAD Malawi programme, the DAS team organised a mission to Malawi in October 2022. During the mission, the DAS team held focus group sessions, key informant interviews, and workshops with:

- 113 farmers
- 43 extension workers
- 11 value chain/private sector partners
- 9 development partners
- 8 agritech providers
- 9 other stakeholders
- 32 government partners
- 16 financial service providers

This report is largely based on findings from these 241 conversations as well as desk research conducted on the digital agriculture landscape in Malawi.

THE TRADE PROGRAMME

The government of Malawi, through the Ministry of Local Government, is implementing the TRADE programme in eleven districts (Mchinji, Ntchisi, Dedza, Blantyre, Kasungu, Nkhata-Bay, Rumphi, Karonga, Lilongwe Rural, Thyolo, and Chitipa). TRADE focuses on seven commodities (groundnuts, soybeans, sunflowers, Irish potatoes, dairy, beef, and honey). The programme aims to improve the "value chain commercialisation and resilience of rural poor and smallholder producers."

Specifically, the TRADE Programme seeks to:

- Increase the production and productivity of smallholder farmers in selected value chains.
- Help smallholder farmers and the rural poor to undertake new functions such as processing, storage, and packaging to capture more value.
- Improve horizontal linkages by strengthening the capacities of cooperatives to provide market access functions to smallholder farmers.
- Improve vertical linkages between stakeholders at different functional levels of the commodity chain, including the private sector.

THE DEEP DIVE STUDY

A deep dive into the digital agricultural technologies available in Malawi was one component of the TRADE programme. This deep dive, which complemented a previous assessment by the programme, examined the digital agriculture entrepreneurship ecosystem in the country, taking a particular look at efforts to develop digital extension services.

METHODOLOGY FOR THE DEEP DIVE

This study used various methods to gather quantitative and qualitative data from both primary and secondary data sources.

Secondary research: The DAS team undertook a review of the following:
- *Malawi Digital Agriculture Ecosystem Assessment* developed by USAID and Development Gateway.
- *Digital Agriculture Country Study Annex: Malawi* developed by the Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA), World Bank, and IMC WorldWide
- The TRADE 'Programme Information Needs Assessment' report and the TRADE 'Programme Utilisation of ICT Among Rural Smallholder Farmers' report.

Key informant interviews: During the mission to Malawi, interviews were conducted with seven technology service providers and eight other ecosystem stakeholders. The DAS team also conducted interviews with individual farmers and extension workers. Sixteen focus group sessions with men and women lead farmers, extension workers, and value chain partners were held in four Extension Planning Areas (EPAs).

MALAWI CONTEXT

The points below provide a general background of Malawi:

- Malawi is a country situated between Tanzania, Zambia, Mozambique, and Zimbabwe with a population of 20.1 million. See map to the right for geography and TRADE program areas.[1]
- Agriculture accounts for 22.7% of Malawi's gross domestic product (GDP) and more than 80% of its export earnings. Approximately 75% of the country's population works in agriculture or food production.[2]
- The informal micro-enterprise sector is responsible for 89% of employment.
- 81% of the population is a youth (the median age is 18.5 years old).
- Malawi has a low urbanisation rate, with 82 % of the population living in rural areas.
- In January 2022, there were 4.03 million internet users in Malawi. The internet penetration rate in Malawi was 20.2% in January 2022.[3]
- The penetration of social media in Malawi is low in comparison to other African countries. In January 2022, 4.1% of the population were active social media users (only on Facebook, Instagram, or Twitter. Information about WhatsApp users is unavailable).
- There were 10.23 million mobile connections in January 2022 (51.4% of population). However, there is a big digital divide between urban and rural areas.[4]
- 73% of people above the age of 15 are literate, despite 68% of the total population not having any formal education qualifications.

The limited electrification of Malawi affects productivity at all levels (less than 4% of the rural population and 57% of the urban population had access to electricity in 2017, according to the World Bank).[5]

[1] IFAD. President's report: Transforming Agriculture through Diversification and Entrepreneurship Programme. 2019.
https://www.ifad.org/en/-/president-s-report-malawi-transforming-agriculture-through-diversification-and-entrepre
neurship-programme?p_l_back_url=%2Fen%2Fcorporate-documents%3Fmode%3Dsearch%26catCountries%3D3909
0835%26delta%3D20%26start%3D2

[2] World Bank. Data. Malawi Country Profile. https://data.worldbank.org/country/malawi

[3] Simon Kemp. Data Reportal. Digital Malawi 2022. February 16, 2022.
https://datareportal.com/reports/digital-2022-malawi

[4] ibid.

[5] World Bank. Data. Malawi Country Profile. https://data.worldbank.org/country/malawi

However, Malawi's information and communication technology (ICT) infrastructure has improved significantly following the establishment of an independent regulatory agency and a competitive market for mobile services.

The mobile phone penetration rate remains low at 44% - in 2018, smartphone use was 10% (more recent figures are unavailable). There is a large digital divide between urban and rural areas. There is also a wide gender disparity in mobile phone ownership, especially in the northern and central regions (for every 100 men with a mobile phone, only 60 women own a phone).

AGRICULTURE & POTENTIAL FOR DIGITAL TECH

Agriculture is not only an important contributor to GDP (22.7%) but also a key employer, with about 75% of individuals informally employed within the agricultural sector (higher than the 43.37% average in the Southern African Development Community). The reliance on the agricultural sector, which is predominantly rain-fed, leaves Malawi particularly vulnerable to events such as droughts, floods, and natural disasters. At a high level, there are two major players in the Malawian agricultural sector: smallholder farmers and estates. Smallholder farmers, mainly subsistence farmers, account for 80% of the country's agricultural production but only 20% of its exports. Estate farms are mainly small/medium-sized enterprises and large companies that focus on exports.

CHALLENGES IN MALAWI

Numerous challenges limit the growth of Malawi's agricultural sector and hamper positive outcomes. Firstly, smallholder farmers - the main actors in Malawi's agri-food system - cannot easily access agricultural extension services or digital technology tools, chiefly because they reside in remote areas. Secondly, farmers have low productivity levels because they make limited use of farm inputs such as fertiliser, formal seed, and machinery. Thirdly, smallholder farmers have poor market access (i.e., they struggle to connect with buyers). As a result, they are vulnerable to exploitation by middlemen and suffer high post-harvest losses. With limited access to markets and information about market demand, soil characteristics, and weather patterns, farmers cannot manage their resources effectively. This inability, in turn, negatively impacts food production.

Digital agriculture technologies have the potential to address the aforementioned challenges by transforming how agri-food system actors access information, goods, and services. However, an enabling ecosystem with widely available and accessible digital skill sets and infrastructure is necessary if this potential is to be achieved.

The market for agricultural technologies is relatively small due to the low smartphone penetration in Malawi. Most agritech service providers rely on donor funds (either from one donor that supports the programme or multiple donors on a project-by-project basis) and are not yet sustainable. To become sustainable, the user base (i.e., the number of farmer profiles and their intensity of use) and the type of services offered by providers should grow.

THE FARMERS' PERSPECTIVE

The IFAD DAS team met 17 farmers (nine men and eight women) in Ukwe who are participating in the TRADE programme. Of these farmers, only one man and one woman owned a smartphone (one smartphone was provided by a farming cooperative). The other lead farmers only owned feature phones (phones with limited features and capabilities). The lead farmers in Ukwe generally want to receive basic training to better lead their clubs and cooperatives. They are interested in information about the effects of climate change, market opportunities, and agribusiness issues (like running and registering a club as a cooperative, leadership training, and record-keeping).

The low ownership of smartphones restricts the use of ICT by rural smallholder farmers.[6] Indeed, farmers do not use ICTs in cultivation. Aside from the low smartphone penetration rate, several other factors hinder ICT adoption in the Malawi agricultural sector. Low network coverage was reported as one challenge by 40% of interviewees. Because most farmers depend on harvests and social grants for income, lack of financial support was similarly highlighted as another challenge by 30% of interviewees. The lack of agricultural programmes aired on radio and television (18%) and the lack of exposure and knowledge (12%) were also highlighted as challenges. The lack of broadcast programming and the limited access to specialised knowledge makes it difficult for farmers to understand the importance of ICT in the agricultural context.

Farmers in other Extension Planning Areas highlighted several additional challenges, including smartphone deficiencies (e.g., lack of storage for large apps/digital platforms and short battery life), unaffordability (expensive mobile data costs that are not covered by the government), unintuitive mobile apps, and lack of training on how to use mobile phones. Moreover, they noted the limited access to electricity (to charge mobile phones) and lack of radios – (some farmers organise radio listening groups, but meetings are hampered by transportation problems and the time required to reach group sessions). Many extension workers also have trouble adapting to new technologies.

---

[6] TRADE Programme Utilisation of ICT among rural smallholder's farmers report.

DIGITAL AGRICULTURAL TECHNOLOGIES IN MALAWI

A report by CCARDESA outlined several use cases for ICT in the agricultural sector. These use cases, which are based on a model and framework created by the GSM Association (GSMA), broadly fall into three categories (access to services, access to markets, and access to assets):
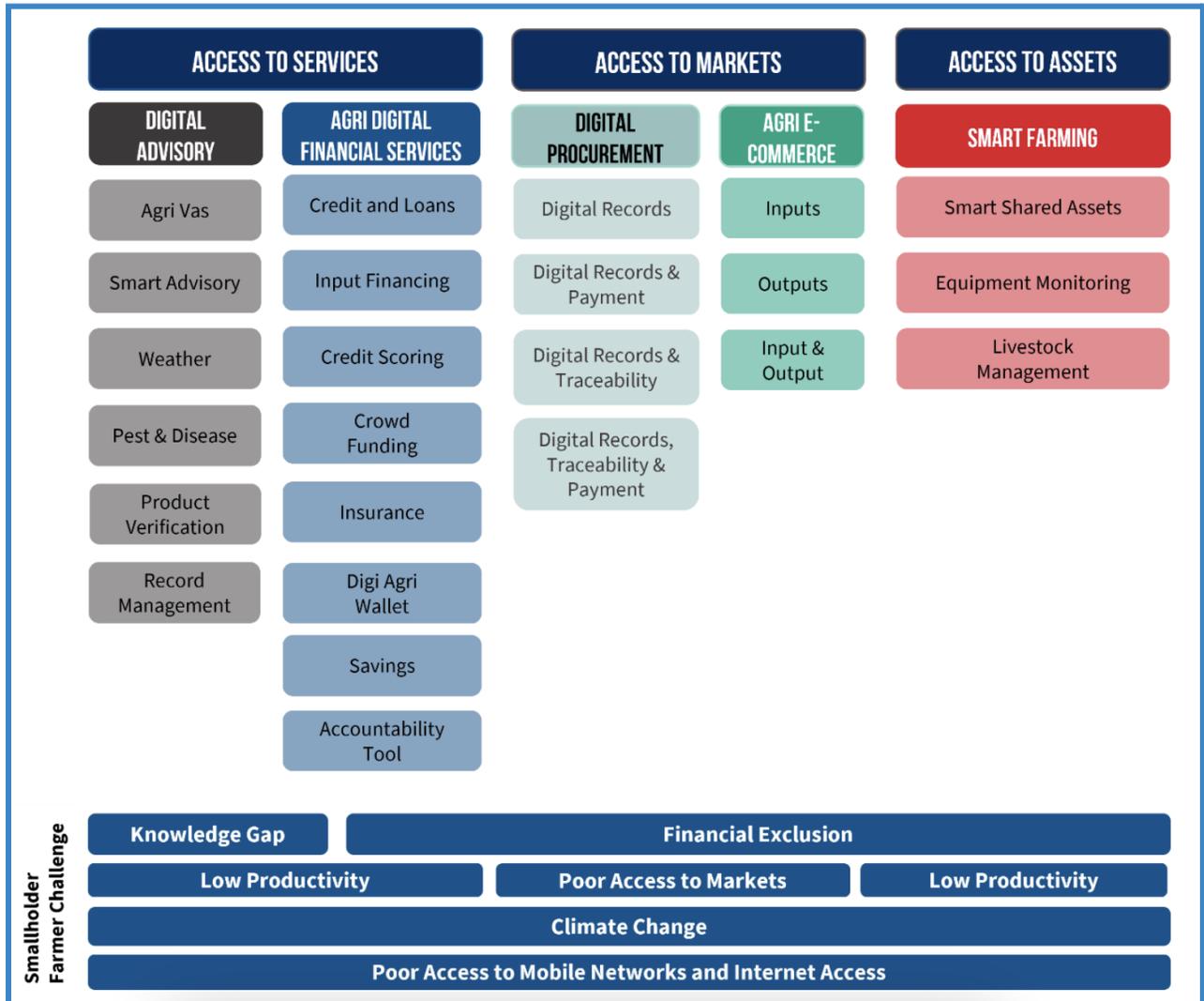
Figure 1 Use case model based on GSMA Framework[7]

The report identified 25 digital technology use cases that could be applied in the agriculture space. The diagram below illustrates the use cases - or innovations - applicable to Malawi.

---

[7] CCARDESSA. Digital Agriculture Country Study Annex: Malawi. 2021/2022
https://www.ccardesa.org/sites/default/files/knowledge-products/CCARDESA%20Digital%20Agriculture%20County%20Study%20-%20Malawi.pdf

From the identified innovations, most (14 of 29 total) were developed for multiple use cases, and 11 were developed for a single use case (Figure 2).
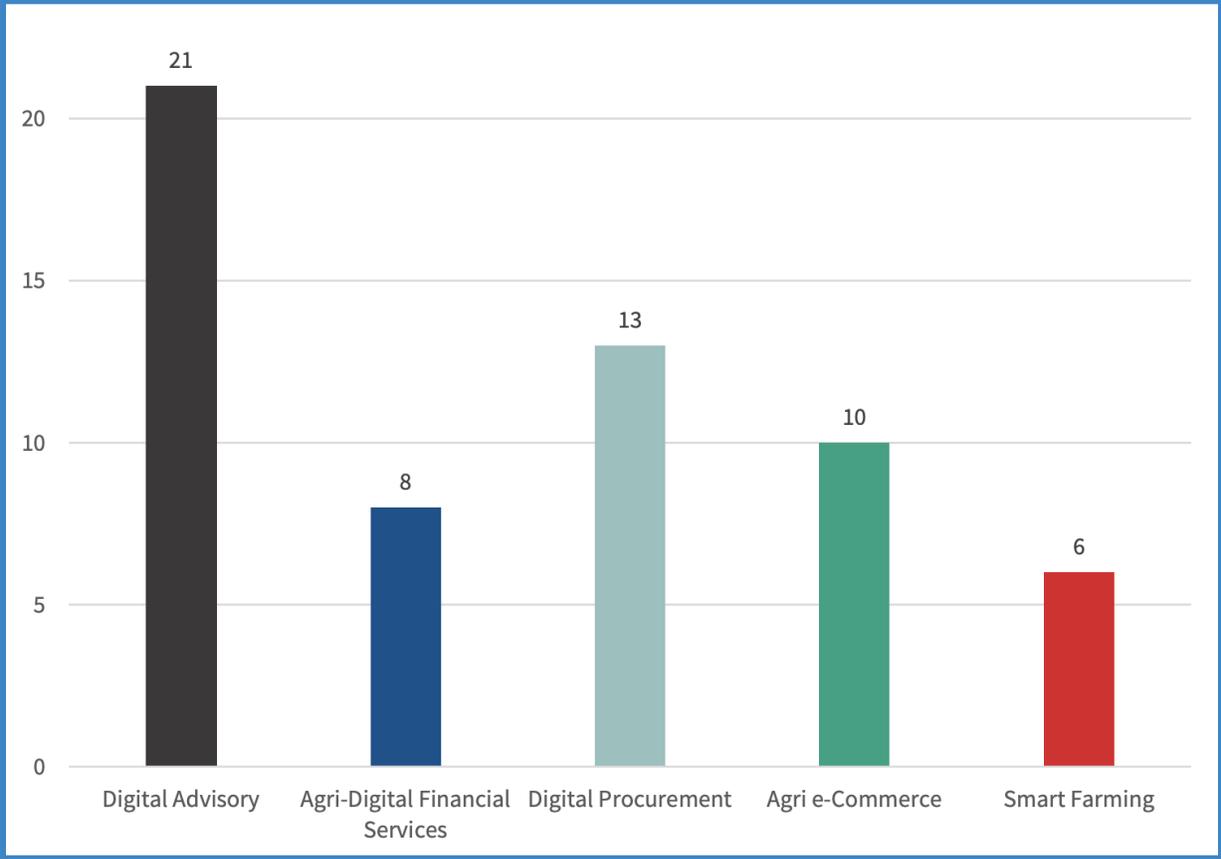

Figure 2 Identified use cases in Malawi[8]

The DAS team performed desk research on the identified innovations. Some innovations are regional in focus and have limited operations in Malawi. Seven agricultural extension service providers were interviewed as part of this TRADE programme research.

---

[8] ibid.

1.1 DIGITAL AGRICULTURE TECHNOLOGIES

This assessment focuses on digital agricultural extension technologies. The DAS team interviewed seven agritech providers during its mission to Malawi.

	Solution & Provider	Dev Stage	Description & Features	Impact	Sustainability/Business Model	Challenges
1	**Zaulimi** by Agricultural Commodity Exchange (ACE Africa)	Scaling stage (demonstrated small-scale success)	Zaulimi provides farmers and extension officers with detailed information on climate and soil requirements, planting and weeding, manure and fertiliser application, pest and disease control, and harvesting and storage. Zaulimi is a locally developed smartphone application. However, a USSD version is in development. The application has an audio option that plays content in Chichewa and English. In addition, it can be accessed offline once installed. The application does not currently support mobile money payments, but integration plans are in place.	The app has approximately 52,437 total users. While no data collection tool that measures the app's impact is in place, users will soon be able to fill a survey once they register on the app. Plans to integrate mobile money payments are also in place.	Zaulimi is not yet sustainable and is supported by Welthungerhilfe. The app is expected to become profitable in two years once the user base has reached a sustainable level. Presently, the Zaulimi app offers advertising packages for six to 12 months. The business model draws revenue from a mix of sources, chiefly farmer profiles. The more farmer profiles the app has, the more attractive it is to other value chain actors (in terms of advertisement). The solution also has the capacity to generate margins from trading and warehousing. Zaulimi is actively working on developing a cashless infrastructure system with TNM mobile money.	Trust issues (need to present national ID upon registration), unaffordability of smartphones, and no mobile money support (lack of cashless infrastructure).

2	**eMlimi** by World Vision and Farm Concern International	Pilot done, at scaling stage.	The app is backed by a technical team from Kenya. However, conversations are underway with a local provider to integrate USSD features. The eMlimi platform is available in Chichewa, Tonga, and English and can be accessed online once installed. There are plans in place to integrate several payment modules.	Roughly 16,000 users. Representing improved livelihoods for over 41,320 people.	Currently eMlimi is not yet sustainable. While the business model is still being determined, World Vision and Farm Concern International are open to working with other partners. In addition, engagements with MTN are underway to increase the number of users.	Digital illiteracy and smartphone affordability.
3	**#321** by Viamo	Sustainable scale	The 3-2-1 Service is a mobile phone-based information system designed to increase access to reliable information about a variety of topics including health, nutrition, agriculture, gender-based violence prevention, microfinance, and weather. The 3-2-1 Service in Malawi has been developed by local committees. It is only in Chichewa language, but Tumbuka will be slowly introduced. Interactive voice response (IVR) features are available to callers with low literacy levels. In addition, content is delivered via SMS and USSD (texts are sent from the user's phone via a menu-driven interface).	Approximately 1.8 million farmers. Dashboard with real-time feedback on content consumption. Monitoring messages are sent about the gender distribution of listeners.	Private-Private-Public Partnership: Airtel + Viamo + Government of Malawi. Subscribers receive eight free calls, after which they are charged 15 kwacha per message (about $0.78). Development partners, governments, and non-government organisations (NGOs) also pay a service fee to use the #321 service. Partners are charged $40,000 per year to send 30 key messages, and content will be revised after one year.	Poor internet connectivity and system downtime prevent people from accessing the platform. In addition, the exclusive contract with Airtel excludes TNM subscribers in Malawi.

| 4 | **Mlimi by** Farm Radio Trust | Proof of concept | Farm Radio Trust developed a new agriculture extension and service platform. Mlimi customises content according to three value chains (maize, groundnuts, and soybeans). Users can register their farms using GPS coordinates and maintain links with off-takers and financial services. Radio listening clubs are used as small smart aggregation centres, with one digital champion for five clubs.

The Malawi Science and Technology University developed the app. The university uploaded the first modules about maize, groundnuts, and soybeans. In future, it will target more marginalised groups by adding audio, radio, and SMS/USSD features. | Currently, it is rolled out in 15 districts with around 2500 ICT hubs. | Currently, it is not yet sustainable. The business model of Farm Radio Trust is based on project funding from development partners or governments.

Digital champions can earn their own income via services. The digital champions can earn incentives by opening accounts as financial agents, measuring GPS coordinates of farms, or collecting data.

Financial services could earn transaction fees. | Low adoption of mobile money because people are afraid due to fraud. Poor digital and financial literacy – farmers need more training and awareness. |
| 5 | **FUM Platform** by Farmers Union Malawi | Proof of Concept | FUM is an internet- based product that can send bulk short messages to registered farmers.The platform bridges the information gap that exists between farmers and other value chain actors like private companies and extension advisory service providers.

Members will be accessed via SMS, USSD, or WhatsApp (for those with a smartphone). | About 300,000 members | Currently, the platform is not sustainable and FUM is looking at options. The users do not pay a user fee. The bulk SMS cost is paid through FUM member subscriptions.

No user fees.
FUM wants to develop a marketplace with user fees to make the platform sustainable. | SMS messages are currently not sustainable; updating the database is cumbersome. |

6	**PRIDE marketplace Platform** – by Technix	Proof of concept	This is a mobile marketing (virtual market) application that will link farmers to buyers, enhancing interaction between the players within value chains. The application provides efficient and transparent market and trade information that informs buyers and sellers on spot market conditions. Android app (mobile phone), web-based application (computer / phone-compatible), web-based backend application, and USSD-based application programming interface.		The platform has not yet been launched. The system is being developed with donor funding. The business model is not yet developed. Options for revenue include micro transaction fees for each deal, micro margins if mobile money transactions are included, or interest fees for credit facilitation (if that will be included).	
7	**Ulimi ndi nyengo platform** by DAES	Proof of concept	An SMS platform that could be used to send extension messages as well as weather forecast messages. The new platform will be able to automate message campaigns. SMS-based extension advice. Automated system to schedule messages about good agricultural practices in selected value chains, weather forecasts, and invitations to events. Two-way SMS communication system	The system will start with the existing farmer database, but the intention is to grow to around 500,000 farmers.	The platform is government owned. DAES can sustain the platform after the SAPP project support stops. DAES is currently developing a road map to grow the new platform to a larger number of farmers (500,000). Different scenarios are possible. A subscription model for farmer clubs and cooperatives, and a project model where development partners /NGOs / contract farmers pay for access to the platform to communicate to farmers, is still under development.	

RECOMMENDATIONS FOR REACHING FARMERS

Based on interviews and desk research, reaching farmers through the use of digital agriculture technologies remains a challenge. Barriers include lack of smartphones, poor access to networks, high data costs, and low (digital) literacy. Pilots and early-stage interventions that rely on donor funding are currently ongoing. To support market development and prepare for a future with higher connectivity and smartphone use, technology providers should continue to develop innovative solutions. In this phase of digital transformation, donor support is needed to develop the market further and reduce the risk for technology providers. IFAD and other development partners in this space should work together with the government of Malawi and private sector partners to holistically support the digital ecosystem. The user base of farmers will expand and more sophisticated solutions will emerge. Until then, traditional technologies like radio, SMS, and IVR should be used to reach rural smallholder farmers. Incorporating platform costs into the government budget could improve sustainability, specifically maintenance costs incurred beyond the implementation phase.

The TRADE programme, and other similarly focused programmes, could, therefore, use a multi-channel approach:

- To directly reach farmers in the selected value chains, radio, SMS, USSD, and IVR should be leveraged. Radio is the most cost-effective approach, but it is not specifically targeted to the farmer groups within the TRADE EPAs. SMS is an option for communicating refresher messages at inflection points in the crop cycle and providing weather notifications. In addition, the Ulimi ndi Nyengo SMS platform developed and owned by the Malawi government - with the support of IFAD and DAES - could be leveraged by the TRADE programme as well. The platform can be used to directly communicate with farmers across Malawi. The TRADE programme could collaborate with DAES to develop messages for the seven target value chains. Due to the low literacy levels among farmers, IVR and systems like #321 of Viamo could also be an effective solution. However, IVR is three times as costly as SMS. As such, USSD could be an ideal information platform for farmers. Farmers can send USSD codes to request specific value chain information or cost-effectively subscribe to relevant alerts.

- The TRADE programme could indirectly leverage extension officers and lead farmers. Most extension workers have smartphones, although network challenges, poor data access, and limited electrification remain common barriers. A preloaded app with video/audio-based extension information about the selected value chains could better support extension workers. Such an app could be used to train lead farmers and extension workers at the EPA level (via speakers for audio or solar Pico projectors[9] for video).

- Lead farmers mostly do not have smartphones. The TRADE programme might consider equipping farmers in one or two EPAs with smartphones that are preloaded with agricultural apps. This could be combined with a performance contract with agreed- upon targets. For example:
  - training in the use of the smartphone/app in group or individual sessions
  - documenting the training of farmer groups
  - Collecting of data on farms from farmer groups

---

[9] A very small projector modules that can be integrated into mobile devices, such as handsets or laptops, or used to create highly portable projector accessories for mobile workers.

o   documenting the uptake of agricultural technologies.
Once an agreed-upon target is met, the lead farmer could then be provided with a smartphone to be returned at a later point in time. Thereafter, results from different EPAs could be compared to evaluate the impact of smartphones among lead farmers.

● The TRADE programme should also work with the government of Malawi, other development partners, and the private tech sector to create an enabling environment and support the digital ecosystem through capacity building in digital skills, reduction of devices and data costs, and creation of awareness about the use of digital technologies in farming improvement.

● In addition to working with the SAPP programme, the TRADE team could partner with PRIDE, a second IFAD-Funded programme. Since TRADE has a secondary focus on increasing market access, the tools developed by PRIDE could be used to improve the farming ecosystem. While the DAS team did not complete a deep dive on digital market access technologies, as this would have been outside the scope of work, TRADE could partner with PRIDE to ensure all seven value chains are included in the app and guarantee the needs of the TRADE farmers are met.