



Photo Credit: Freepik

Malawi Digital Agriculture Ecosystem Assessment

Table of Contents

List of Acronyms	1
Acknowledgements	4
Executive Summary	5
Chapter 1: Introduction to the Study	11
Study background and objectives	12
Methodology adopted	12
Structure of the report	13
Limitations and data gaps	13
Chapter 2: Macroeconomic and Agriculture Sector Context	14
Socio-economic indicators and trends	15
Overview of digital trends in Malawi	16
Relevance of the agriculture sector to the Malawian economy	17
Production systems and key agricultural value chains	17
Gender roles in agricultural production	18
Key challenges facing the agriculture sector in Malawi	19
Chapter 3: Supply of Digital Agricultural Technologies (DATs) in Malawi	22
Evolution of DATs in Malawi and key growth drivers	23
Geography of operations	25
Type of DATs in Malawi and their applicability	25
DAT use cases and challenges addressed	25
Underlying technologies	29
Focused value chains and production phases	29
Sustainability and demonstrated impact	30
USAID Malawi's Current and Previous DAT Interventions	30
Chapter 4: Demand for DATs in Malawi	33
Uptake of digital services by farmers	34
Demographic profile of farmers	34
Digital literacy, readiness, and access trends	34
Integration of DAT solutions in agribusinesses	35
Integration of DAT solutions in government programs	35
Chapter 5: Ecosystem for DATs in Malawi	38
Component 1: Entrepreneurial culture	38
Component 2: Business support environment	39
Component 3: Human capital	41
Component 4: Access to finance	42
Component 5: Infrastructure	45
Component 6: Policy and regulatory environment	47
Summary of key ecosystem gaps and challenges	50
Chapter 6: Recommendations to Promote Growth of DATs	53

Intervention area 1: Build a thriving business support environment for DATs	54
Intervention area 2: Strengthen digital skills and competencies	57
Intervention area 3: Enhance access to innovative, catalytic, and blended finance structure	58
Intervention area 4: Enable availability and accessibility of physical and digital infrastructure at the last mile	59
Intervention area 5: Design and implement policy, legal and regulatory frameworks that are conducive for DATs	60
Intervention area 6: Improve the adoption and use of DATs by the demand side	61
Recommendations to align the Mission's programming with USAID's Digital Strategy	63
Annex 1: List of Stakeholders Interviewed	64

List of Figures

Figure 1: Malawi's GDP and growth rate, 2011-2020	15
Figure 2: Proportion of urban vs rural population in Malawi, 2000-2020	16
Figure 3: Top 10 crops in Malawi by production, area harvested and export value, 2019	18
Figure 4: Overview of gender roles in the value chains of key crops	18
Figure 5: Estimated irrigation potential in Malawi	19
Figure 6: Fertilizer consumption (Kgs/ha of arable land), 2013-2018	20
Figure 7: Number of DATs in Malawi by period of establishment, N=29	23
Figure 8: Number of DATs in Malawi by headquarter country, N=29	25
Figure 9: Number of DATs in Malawi by use cases (primary), N=29	25
Figure 10: Number of DATs across underlying technology, N=29	29
Figure 11: Number of DATs across common crop value chains, N=17	29
Figure 12: Number of DATs in Malawi by production phases, N=29	30
Figure 13: Ownership of digital devices by households, rural vs urban, 2019	35
Figure 14: Components of the DAT ecosystem	38
Figure 15: Malawi Rankings across the 12 pillars of GCI, 2019	39
Figure 16: Impact investments in Malawi by sector, 2005-2015	42
Figure 17: Overview of electricity rates in Malawi, 2015-2019	45
Figure 18: Mobile and internet penetration rates in Malawi, 2010-2019	46
Figure 19: Malawi Ease of Doing Business Rankings, 2020	47

List of Tables

Table 1: Summary of DAT use cases and challenges addressed in Malawi	8
Table 2: Summary of key recommendations across the six intervention areas	10
Table 3: Summary of DAT use cases and challenges addressed	27
Table 4: Summary of USAID Malawi DAT interventions in the last 10 years	30
Table 5: Example of DAT investments in the last five years	43
Table 6: Summary of key policies and regulations and relevance to the DAT ecosystem	48
Table 7: Summary of key ecosystem gaps and challenges	50
Table 8: Overview of intervention areas and recommendations	53

List of Acronyms

ACE	Agricultural Commodity Exchange
ALL-IN	Advancing Local Leadership and Innovation Networks
AfSIS	Africa Soil Information Service
AFDB	African Development Bank
AIP	Affordable Inputs Program
ASIF	Agricultural Storage Investment Facility
ASWAP-SP	Agriculture Sector Wide Approach Support Project
BMGF	Bill & Melinda Gates Foundation
BPO	Business process outsourcing
B2B	Business to business
B2C	Business to consumer
CRS	Catholic Relief Services (Malawi)
CAT	Centre for Agricultural Transformation
CDT	Certificate in Drone Technology
CDI	Clinton Development Initiative
CIAT	Center for Tropical Agriculture
CRM	Customer relationship management
DAES	Department of Agricultural Extension Services
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
DAT	Digital agriculture technology
DFS	Digital financial services
DLEC	The Developing Local Extension Capacity
ESO	Ecosystem support organizations
EGDI	E-government development index
ID	Electronic identification system
ERP	Enterprise resource planning
EU	European Union
FCDO	United Kingdom's Foreign, Commonwealth and Development Office
FISP	Farm Input Subsidy Program
FFBS	Farmer field and business school
FWL	Farmers World Limited
FTF	Feed the Future
FINES	Financial Inclusion and Entrepreneurship Scaling
FAO	Food and Agriculture Organization
GIS	Geographic information system
GCI	Global competitiveness index
GEI	Global entrepreneurship index
GIIN	Global Impact Investing Network
GII	Global innovation index
GAP	Good agricultural practices
GBC	Grain bulking centers
GDP	Gross domestic product

GNI	Gross national income
HCI	Human capital index
HDI	Human development index
ICT	Information and communications technology
IT	Information technology
IVR	Interactive voice response
IFMS	Integrated financial management system
IFPRI	International Food Policy Research Institute
IFAD	International Fund for Agricultural Development
IoT	Internet of things
ITU	International Telecommunication Union
MAIIC	Malawi Agriculture and Industry Investment Corporation
MACRA	Malawi Communication Regulatory Authority
M&E	Monitoring and Evaluation
MFT	Modern farming technologies
MGDS	Malawi Growth and Development Strategy
MIERA	More Income and Employment in Rural Areas of Malawi
MICF	Malawi Innovation Challenge Fund
MIS	Market information systems
ML	Machine learning
MNOs	Mobile network operators
MoAIWD	Ministry of Agriculture, Irrigation and Water Development
MSME	Micro, small, and medium enterprises
MUST	Malawi University of Science and Technology
MWK	Malawian kwacha
NAP	National Agricultural Policy
NCHE	National Council for Higher Education
NRIS	National registration and identification system
NASFAM	National Smallholder Farmers' Association of Malawi
NEPAD	New Partnership for Africa's Development
NGO	Non-governmental organization
NORAD	Norwegian Agency for Development Cooperation
PAYG	Pay as you go
PPP	Purchasing power parity
PICS	Purdue Improved Crop Storage
R&D	Research and development
SSTP	Scaling Seeds and Technologies Partnership Program
SRIEED II	Scaling up Radio and ICTs in Enhancing Extension Delivery II
SMS	Short message services
SAVE	Skills for a Vibrant Economy
SME	Small and medium enterprises
SaaS	Software-as-a-service
SWET	Story Workshop Educational Trust
SANE	Strengthening Agricultural and Nutrition Extension Activity
SDC	Swiss Agency for Development and Cooperation
TNM	Telecom Networks Malawi
UN	United Nations

UNCDF	United Nations Capital Development Fund
UNICEF	United Nations Children's Fund
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
UBR	Unified Beneficiary Register
UIUC	University of Illinois at Urbana-Champaign
USSD	Unstructured supplementary service data
IVCG	ICT-based value chain governance
VSLA	Village savings and loan associations
WE4F	Water and Energy for Food

Acknowledgements

This study was commissioned by the U.S. Agency for International Development's (USAID) Bureau for Resilience and Food Security on behalf of the USAID/Malawi Mission and conducted under the DAI-led Digital Frontiers project. The report was authored by Intellecap Advisory Services Ltd with support from UMODZI Consulting Ltd Malawi who were instrumental in conducting interviews with stakeholders.

The following people contributed to this study:



Josh Woodard
Louis Kawenda
Anna Toness
Scott McNiven



Talia Dweck
Araba Sapara-Grant



Karnika Yadav
Racheal Wangari
Justin Miatu
Allan Obilo
Dennis K. Kigen



Frank Mkumba
Mathias Timothy

This report was also made possible through the contributions of many individuals and institutions, working in the agriculture and digital space in Malawi. We are grateful to everyone interviewed who provided their time, expertise, and data throughout the course of this study.

The views expressed in this report do not necessarily reflect the views of USAID, the US Government or DAI.



Executive Summary

The agriculture sector in Malawi remains a key driver of the country's overall social and economic performance. The sector contributed to more than 22 percent of the gross domestic product (GDP) in 2020.¹ It also accounted for over 90 percent of the national exports² and employed over 76 percent of the country's workforce in 2019³ and is the main source of livelihoods for more than 2 million smallholder farmers.⁴ Agriculture is also crucial for food security in the country with Malawi considered one of the most food insecure countries globally ranked 109 out of 113 countries in the 2021 global food security index.⁵

The sector is however, characterized by numerous challenges that limit the growth potential and improved agricultural outcomes. First, smallholder farmers, who are the main actors in the agri-food system are based in remote areas and with limited access to digital technology tools, which makes it difficult to access important information such as agricultural extension services. Second, limited use of farm inputs such as fertilizer, formal seed, and machinery results in lower productivity. Third, market access is characterized by inefficiencies where smallholder farmers struggle to connect with buyers leading to high postharvest losses and exploitation by middlemen. With limited access to markets and information about future market demand, soil characteristics or weather patterns, farmers are unable to make precise decisions about resource management and this negatively affects food production.

Digital agriculture technologies (DATs) have the potential to address the challenges mentioned above by transforming how agri-food system actors access information, goods, and services. DATs consist of digital innovations that enable smallholder farmers, agribusinesses, governments, and development partners to increase their productivity, efficiency, and competitiveness, thereby contributing to improved agricultural outcomes. Technologies such as mobile phones, drone and satellite imagery, moisture sensors, geographic information system (GIS), internet of things (IoT) and machine learning are playing a critical role in the agriculture sector, enabling actors to address key challenges along the value chains.

DATs present immense advantages and opportunities to advance development of the agriculture sector. DATs can be applicable across several use cases. First, DATs help farmers to make more informed production decisions through accurate, timely and location-specific, weather and agronomic data advisory. Second, DATs reduce information asymmetry across the value chain, enabling farmers to access timely information on prices and markets and directly engage with buyers. Third, DATs can streamline supply chains and reduce operation costs across value chains. Our study identified several DATs use cases in Malawi as summarized in Table 1 below.

The growth, scale up and sustainability of DATs is highly dependent on an enabling ecosystem including the availability and accessibility of the foundational digital infrastructure and digital skill set. This study, commissioned by the United States Agency for International Development (USAID) through DAI seeks to undertake an assessment of the digital agriculture ecosystem in Malawi to identify challenges and opportunities to inform the USAID/Malawi Mission's current and future programming. The key objectives of the study include:

- a) Undertake a stakeholder mapping of the relevant actors within the digital agriculture ecosystem in Malawi, with a particular focus on local actors.
- b) Identify key challenges and opportunities to leverage digital technologies more effectively in the agriculture and allied sectors among stakeholders in Malawi, consistent with USAID/Malawi's priorities.
- c) Identify key challenges and opportunities specific to Malawian women and youth in the agriculture and allied sectors with respect to digital agriculture.
- d) Evaluate macro-level quantitative data and develop recommendations for USAID/Malawi.

¹ World Bank Development Indicators (Agriculture value added % of GDP)

² World Trade Organization – Malawi Trade Profile, 2021

³ World Bank Development Indicators (Agriculture employment % total employment)

⁴ CIAT, CGIAR and CCAFS – Climate Smart Agriculture in Malawi, 2018

⁵ Economist Impact - Global Food Security Index, 2021

Key study findings

Supply of DATs

The study revealed that while the DAT landscape in Malawi is still nascent, it has evolved in the last decade. Out of the 29 DATs mapped in this study, 25 were established between 2011 and 2021. Several factors have driven the evolution of the DAT landscape. These include.

- *Adoption by government:* The government of Malawi has played a pivotal role in adopting and using DATs to enhance service delivery.
- *Enabling policy and regulatory environment:* The government has in recent years established policies and strategies geared towards digitizing the economy with particular focus on critical sectors such as agriculture, health, and financial inclusion.
- *Increased donor support:* Increased donor and development institution programs and interventions supporting uptake of digital agricultural services.
- *Development in the support ecosystem:* Increase in number of organizations supporting the growth of digital interventions including tech companies supporting development of mobile apps, incubators, and accelerators among others.
- *Regional innovation/entrepreneurship support programs:* Development institutions have been launching regional innovation programs that target Malawi as a focus country.

The largest proportion of the DATs operating in the country are, however, foreign owned with most scaling from other African countries. Out of the 29 DATs, only 11 are home-grown and headquartered in Malawi. 13 of the DATs have scaled from other African countries – largely from Kenya and Ghana while the remaining 5 have their headquarters in Europe, America, and Asia.

Given the underdeveloped digital infrastructure, low digital literacy levels and low smartphone penetration, the delivery of agricultural technology services to the last mile has largely leveraged basic technology. Short message services (SMS), and unstructured supplementary service data (USSD) are the most common technologies leveraged to deliver extension and market information to farmers. While there is a growing adoption of mobile phone applications, most of these platforms enable users to access information offline to avoid unstable and costly internet connection challenges. IoT sensors and machine learning (ML) were leveraged by DATs focused on providing advisory based on satellite imagery, for pest and disease management, remote farm management and supply chain management.

The study identified five key use cases for DATs in Malawi. Given the challenges facing the country in enhancing agricultural productivity, a significant proportion of DATs have emerged to provide solutions in this area by providing general agronomic and market information, precision agriculture advisory and farm management services. There are also DATs focused on enhancing market access and linkages, supply chain management and financial inclusion. The different use cases, challenges addressed, and examples of DATs have been outlined in the table below.



Table 1: Summary of DAT use cases and challenges addressed in Malawi

Challenge addressed by existing providers	Challenge addressed by existing providers	Technologies and innovations by DAT providers in Malawi	Examples of DATs
Advisory and information services	<ul style="list-style-type: none"> Inadequate access to agronomic and market information Frequent pests and diseases outbreak Climate change and unpredictable weather patterns 	<ul style="list-style-type: none"> Use of videos, voice notes and pictures to provide farmer trainings and extension services which have an integration of local language. Use of Interactive voice response (IVR) to provide information in local language SMS-based crop or animal disease diagnosis and treatment advice. USSD and mobile applications use by extension field officers Use of satellite data, drones, IoT and machine learning to assist in pests and diseases detection. Leveraging IoT to keep records and continuously monitor livestock. Use of a predictive machine learning technology to map soil properties and provide advisory. 	Esoko, Zaulimi, e-mlimi, Farm Radio and Airtel Mchikumbe provide digital extension services; Aerobotics uses aerial imagery and machine learning algorithms to detect pests and disease; and Geo Gecko makes use of satellites and provides relevant advisory based on earth changes.
Market Linkage and E-commerce	<ul style="list-style-type: none"> High number of middlemen depleting value for smallholder farmers Lack of visibility in the agricultural inputs and outputs markets 	<ul style="list-style-type: none"> Digital database that links farmers to potential suppliers and provides real-time information on market prices through SMS platform. Integration of websites, smartphone applications and SMS to inform farmers about markets and prices. Online retail stores for listing of agricultural inputs and produce. 	Alinafe Online Limited an online retail shop that lists various agricultural inputs; e-mlimi, G-Soko and ACE enable farmers to trade with local and international buyers.
Ecosystem support	<ul style="list-style-type: none"> Lack of aggregation of data and information on the sector Lack of coordination across stakeholders in the sector 	<ul style="list-style-type: none"> Inclusive ICT-based Value Chain Governance (IVCG) platform to streamline the fragmented agricultural value chain Web-based platform for accessing fertilizer prices Cloud-based platform for soil data collection and aggregation Leveraging maps and geo-spatial data to create maps that include data on soil, water among others that can be easily accessed by users. 	Africa Fertiliser aggregates information on agro-input market; Meridia digitally maps boundaries and validates legal land documents; and AfSIS provides accessible soil data.
Financial inclusion	<ul style="list-style-type: none"> Limited access to agricultural crop insurance Limited access to affordable and well-designed credit High cost of inputs such as irrigation equipment 	<ul style="list-style-type: none"> Use of data analytics and drone imagery technology to inform insurance products. Use of weather observations to provide weather-based crop insurance. Use of mobile money to enable small payments for agricultural products over time. Leveraging IoT to enhance adoption of PAYG model to finance inputs 	Pula and Acre Africa, provide crop insurance and Green Impact Technologies provides PAYG solar irrigation pumps.
Supply chain management	<ul style="list-style-type: none"> Lack of traceability of agricultural produce 	<ul style="list-style-type: none"> Web and mobile based platforms that enable digital management of farmers 	Green Fingers and Farmforce

Ecosystem Assessment

The study assessed six key ecosystem components of the business environment supporting the growth and development of DATs in Malawi. The study also identified gaps and challenges across the ecosystem components that hinder the scale up and sustainability of DATs.

- **Component 1 - Entrepreneurial culture:**

Despite an increase in entrepreneurship activities in Malawi over recent years, the country has a generally weak entrepreneurship ecosystem as depicted by the low ranking in multiple global innovation and entrepreneurship indices such as the Global Entrepreneurship Index (GEI) and the Global Competitiveness Index (GCI). Although entrepreneurship is generally perceived positively especially among youth, a high percentage of the population is overly risk-averse and lacks adequate start-up skills and relevant human capital, has limited access to networking opportunities as well as low adoption of technology. Additionally, the prevailing cultural norms in Malawi do not promote entrepreneurship activities since most people prefer government jobs and do not see the benefits of entrepreneurship.⁶

- **Component 2 - Business support environment:**

The study identified about 18 ecosystem support organizations (ESOs) including incubators, accelerators and hubs supporting the innovation and entrepreneurship space in Malawi mostly established in the last 10 years. Some examples include InCube8, mHub, Mzuzu Entrepreneur Hub, Malawi Fruits, and Incubate Malawi. Most ESOs in the country are nascent and cater to the needs of both traditional SMEs and digital start-ups resulting in high competition for support services. Further, most of the support provided is sector agnostic and concentrated in the two main cities in Malawi (i.e., Lilongwe and Blantyre) thus limiting the scale of impact. Donors have been the most prominent source of funding for business support organizations, although some ESOs have also been adopting internal revenue generating structures.

- **Component 3 – Access to human capital:**

The supply of digital skills in the country is low, affecting the operations of DATs in the country as they face competition for specialized digital skill sets from well-established companies like mobile network operators (MNOs). There are very few digital focused centers or programs for training entrepreneurs in Malawi. As such, there is growing evidence of a digital skills deficit, where many people have basic skills but lack important digital skills required for tech-based entrepreneurship. Public, private and development organizations have, however, introduced various interventions to enhance digital skills in the country.

- **Component 4 – Access to finance:**

Access to formal finance remains a major challenge facing agribusinesses and DATs in the country with high interest rates and collateral requirements that hinder uptake. The level of impact investments, which is a major source of high-risk capital in the country is low. Access to early-stage finance and especially patient capital necessary to grow and scale DAT models is limited with very few deals reported. Grant funding by donors is the main source of external funding for digital agriculture innovators/interventions in the country.

- **Component 5 – Infrastructure:**

Malawi has made minimal progress in the electrification rates particularly in the rural areas with high cost of electricity also hindering usage. Access to electricity was reported at 11.2 percent of the total population in 2019, with rural and urban electrification rates estimated at 4 percent and 46 percent, respectively. The country has made significant advancement in its telecommunication infrastructure with enhanced broadband coverage over the last 10 years. 31 percent of the population currently live within 10km of fiber nodes and nearly the entire population lives within 50km of fiber nodes. However, despite advancement in telecommunication infrastructure in the last decade, Malawi has one of the lowest mobile and internet connectivity rates globally. High cost of devices and digital services, low electricity rates as well as unreliability of the networks have contributed to the low mobile and internet penetration rate.

- **Component 6 – Policy and regulatory environment:**

Malawi has demonstrated an improvement in the Ease of Doing business (EoDB) ranking in the past years. For instance, in 2020, Malawi ranked 109 out of 190 countries in the World Bank's ease of doing business and fared well in parameters such as protecting investors, registering property, and accessing credit. The government has been making strides to enhance the policy and regulatory environment for the agriculture and digital economy through enactment of relevant policies and regulations. Examples of enacted policies and strategies include the National ICT Policy 2013, the Digital Economy Strategy 2021-2026, National Broadband Strategy 2019-2023, and the Draft Data Protection Bill 2021, among others. However, high taxes imposed on information communication technology (ICT) services and devices are key regulatory barriers hindering uptake of digital services.

⁶ World Bank Group – Social Enterprise Ecosystem Country Profile, 2017 / Insights from interviews with key stakeholders

Summary of recommendations to enhance growth of DATs

The study provides recommendations across six key intervention areas based on the challenges and gaps identified across the various ecosystem components as well as the demand side. Table 2 below provides a summary of the key recommendations and their relevance to USAID/Malawi based on current programming and priority areas.

Table 2: Summary of key recommendations across the six intervention areas

#	Intervention area	Recommendations	Relevance to USAID/Malawi	Level of feasibility	Implementation timelines (Years)
1	Build a thriving business support environment for DATs	• Run an incubator/accelerator program targeting homegrown and regional DATs with plans to scale to Malawi	High	High	0-1
		• Promote cross learning with other developed/matured DAT ecosystems through exchange programs	Medium - High	High	1-3
		• Establish technology focused innovation hubs for testing and refining agriculture technologies	Medium	Medium	1-3
		• Establish a multi-stakeholder networking platform for actors in the space	Medium	High	0-1
2	Strengthen digital skills and competencies	• Embed digital technology content in educational institutions and build stronger linkage with academia	Low - Medium	Medium	1-3
		• Set up practical digital/technology skills training academies/hubs	Low	Low - Medium	1-3
		• Encourage corporate-DATs linkages to share/leverage skill sets	Low	Low - Medium	1-3
3	Enhance access to innovative, catalytic, and blended finance structures	• Promote blended finance structures that leverage development partners and the private sector to finance agriculture technologies	High	Medium	1-3
4	Enable availability and accessibility of physical and digital infrastructure at the last mile	• Promote availability and use of solar powered home systems	Medium - High	High	1-3
		• Institutionalize open data platforms	Low - Medium	Medium	1-3
		• Promote competition and infrastructure sharing among ICT providers	Low	Low - Medium	4-5
5	Design and implement legal and regulatory frameworks conducive for DATs	• Develop appropriate policies for e-agriculture	Medium - High	High	1-3
		• Advocate for reduced taxes on digital devices and services	Medium - High	High	1-3
6	Improve the adoption and use of DATs by the demand side	• Undertake behavioral change and user testing	High	High	0-1
		• Promote bundling of technologies and services	High	Medium - High	1-3

1



Introduction to the Study

Study background and objectives

Digital agriculture technologies (DATs) have the potential to address the challenges facing the agriculture sector in Malawi by transforming how agri-food actors access information, goods, and services. DATs consist of advanced digital innovations that enable smallholder farmers, agribusinesses, governments, and development partners to increase their productivity, efficiency, and competitiveness, thereby contributing to improved agricultural outcomes. Technologies such as mobile phones, drone and satellite imagery, moisture sensors, geographic information system (GIS), internet of things (IoT), and machine learning are playing a critical role in the agriculture sector enabling the actors to address key challenges along the value chains.

DATs present immense advantages and opportunities to advance the development of the agriculture sector. DATs can be applicable across several use cases. First, DATs help farmers to make more informed production decisions through accurate, timely, and location-specific, weather, and agronomic data advisory. Second, DATs reduce information asymmetry across the value chain enabling farmers to access timely information on prices and markets and directly engage with the buyers. Third, DATs streamline supply chains and reduce operating costs across value chains.

The growth, scale-up, and sustainability of DATs is highly dependent on an enabling ecosystem including the availability and accessibility of the foundational digital infrastructure and digital skills. This study, commissioned by the United States Agency for International Development (USAID) through DAI seeks to assess the digital agriculture ecosystem in Malawi to identify challenges and opportunities to inform USAID/Malawi Mission's current and future programming. The key objectives of the study include:

- a) Undertake a stakeholder mapping of the relevant actors within the digital agriculture ecosystem in Malawi, with a particular focus on local actors.
- b) Identify key challenges and opportunities to leverage digital technologies more effectively in the agriculture and allied sectors among stakeholders in Malawi, consistent with USAID/Malawi's priorities.
- c) Identify key challenges and opportunities specific to Malawian women and youth in agriculture and aligned sectors concerning digital agriculture.
- d) Evaluate macro-level quantitative data and develop recommendations for USAID/Malawi.

Methodology Adopted

This study adopted a mixed-methods approach to gather quantitative and qualitative data from both primary and secondary data sources.

- *Secondary research:* At the onset of the study, we undertook an extensive literature review of more than 100 documents to i) assess the existing challenges in the agriculture and allied sectors, ii) collect data on quantitative parameters across the different ecosystem components, iii) map existing DAT providers, development programs and stakeholders active in the digital agriculture ecosystem, iv) identify key policies and regulations that impact the digital agriculture ecosystem, and v) develop a long list of potential stakeholders to engage for primary research. Data gathered also helped in building the primary research tools by focusing the discussion areas to validate existing data and/or fill in gaps identified during the secondary research.
- *Stocktaking of DATs:* We developed a database of 29 DATs currently operating in the country evaluating their business models, technology adopted, and impact metrics whenever data was available. We leveraged this database to draw insights presented in Chapter 3 – Supply of DATs. The database developed is in no way exhaustive but provides a foundation to further understand the sector.
- *Key informant interviews:* The report also relies on insights from one-on-one interviews conducted with 35 ecosystem stakeholders including DAT providers, farmer organizations, government agencies, mobile network operators (MNOs), and development agencies. The comprehensive list of stakeholders interviewed is outlined in Annex I.

Structure of the report

The report is organized into six chapters:

- *Chapter 1* introduces the study and outlines the background, objectives, the methodology adopted and key limitations and data gaps.
- *Chapter 2* gives a macroeconomic and agriculture sector overview in Malawi. It outlines the socioeconomic indicators and trends, the digital trends in the country, the relevance of agriculture to the economy and the key challenges facing the sector.
- *Chapter 3* assesses the supply of DATs in the country highlighting key business models, technologies adopted and the applicability of the DATs.
- *Chapter 4* explores the demand side of DATs and analyses the uptake by key agri-food value chain actors.
- *Chapter 5* evaluates the DAT ecosystem components – entrepreneurial culture, business support, human capital, access to finance, infrastructure and policy and regulatory environment. It also outlines the key ecosystem gaps and challenges hindering the uptake of DATs.
- *Chapter 6* lays out potential recommendations and intervention areas for boosting the growth of DATs in the country. It particularly highlights relevant recommendations for USAID/Malawi's current and future programming.

Limitations and data gaps

Given the nascency of the digital ecosystem in the country, the availability of data across the key ecosystem components as well as the supply and demand side is limited. Data gaps particularly on digital literacy, and digital skills availability were notable. Further, available data is largely not disaggregated across various dimensions – gender, age, and geography. These gaps underscore a need to improve data collection to enhance policy, business, and investment decision-making and track the progress pertaining to the development of the digital ecosystem in the country.



2

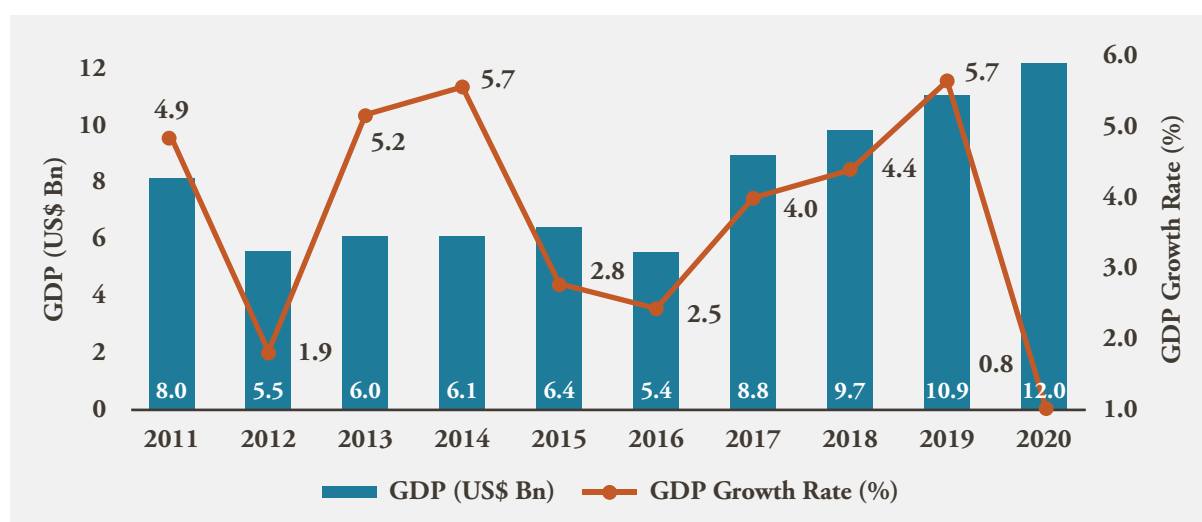


Macroeconomic and Agriculture Sector Context

Socio-economic indicators and trends

Malawi, a low-income country located in Southern Africa, has made significant economic and structural reforms to boost economic growth in the past decade. Malawi's gross domestic product (GDP) reached US\$ 12 billion in 2020 – a more than 50 percent increase from 2011.⁷ The country witnessed consistent economic growth between 2016 and 2019 as it implemented the strategies set out in the Malawi Growth and Development Strategy III (2017–22). Economic growth, however, declined from 5.7 percent in 2019 to 0.8 percent in 2020⁸ largely attributed to the outbreak of the COVID-19 pandemic that disrupted economic activities particularly in the tourism, accommodation and food, transportation, and agriculture sectors. Malawi's economy is, however, projected to grow at 3.3 percent in 2021 and 6.2 percent in 2022.⁹

Figure 1: Malawi's GDP and growth rate, 2011-2020



Source: World Bank Development Indicators

Despite the progress made in building its human capital, poverty and inequality rates remain high. As of January 2021, Malawi had an estimated population of 19.5 million with the country witnessing an annual average population growth rate of 2.8 percent in the last 10 years.¹⁰ Malawi's Human development index (HDI) value increased from 0.333 to 0.483 between 1990 and 2019, representing a 45 percent increase.¹¹ The country, however, ranked 174 out of 189 countries in the 2019 HDI ranking, putting it in the low human development category in terms of life expectancy at birth, literacy rates and standards of living.¹² More than two-thirds of the population currently live below the poverty line. Between 2009 and 2019, about 69.2 percent of the population was living below the international poverty line of US\$ 1.90 in purchasing power parity (PPP) per day.¹³ The high poverty rate is mainly driven by overreliance on the agriculture sector, which is characterized by low productivity due to frequent weather-related shocks (cyclones and drought), volatility in the global tobacco market (Malawi's main export crop), limited opportunities in the non-farm sectors, rapid population growth, and low coverage of social protection programs.

⁷ World Bank Development Indicators (% GDP annual growth)

⁸ Ibid

⁹ AFDB – Malawi Economic Outlook, 2020

¹⁰ World Bank Development Indicators (Annual population)

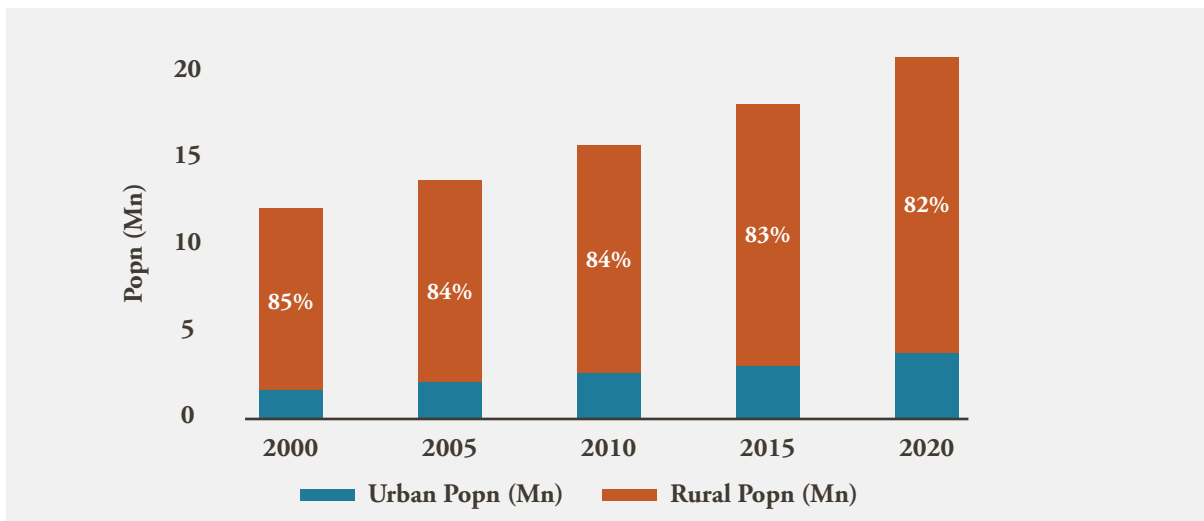
¹¹ UNDP – Malawi Human development index, 2019

¹² Ibid

¹³ Ibid

The rural population accounts for the most significant proportion of the people in Malawi, although that proportion has been decreasing due to urbanization. As of the end of 2020, over 15.6 million people were living in rural parts of the country, representing 82 percent of the total population.¹⁴

Figure 2: Proportion of urban vs rural population in Malawi, 2000-2020



Source: World Bank Development Indicators

Overview of digital trends in Malawi

- The country is increasingly adopting digital technology as a critical transformation enabler across different sectors of the economy.** In the health sector, digital technology has led to the introduction of mHealth applications, providing various health services such as maternal and child health and child nutrition services, and digital diagnostic applications for primary and community health workers. In the financial services sector, digital financial services, including payments, saving and insurance, are gaining momentum driven by the growing mobile money ecosystem. As articulated in the national Digital Economy Strategy 2021 – 2026, the country is keen to leverage digital technology to grow the business process outsourcing (BPO) sector by launching digitized contact center services.
- The government of Malawi is at the forefront of promoting the growth of the digital economy and has launched innovative digital public platforms to enhance public service delivery.** Recently, the government launched an electronic identification system (ID) – Malawi National Registration and Identification System (NRIS). NRIS is a national innovative biometric identity for Malawian citizens that contributes to the government’s efforts to guarantee the fundamental right to identity, entitlement, and enjoyment of full citizenship. Over 9 million Malawian citizens have registered for the ID so far.¹⁵ The government is in the process of integrating the national identity register with other functional identity registers such as e-migration, Unified Beneficiary Register (UBR), and the revenue authority platform to efficiently provide citizens with relevant services. Through the Ministry of Finance, the government is also setting up a computer-based Integrated Financial Management System (IFMS) that will strengthen government revenue collection and payments platforms and foster interoperability with more than 11 service delivery public and private sector platforms. Other digital platforms that the government is planning to launch include a sharable geographic information system (that enables GIS maps and data to be easily accessed by public and private players), an electronic document management system, an e-Learning platform for the public sector, enhanced electronic communication systems, and electronic marketing and security systems.
- Malawi has been comparatively slow to embrace e-commerce and digital trade.** Low internet penetration (15.5 percent)¹⁶ in the country has led to slow development in business to business (B2B) and business to consumer (B2C) transactions. Malawi’s ranking in the United Nations Conference on Trade and Development (UNCTAD) B2C E-Commerce Index dropped from 134 out of 151 countries in 2018¹⁷ to 140 out of 152 countries in 2019.¹⁸ Further, Malawi ranked 31 out of 44 economies in the Africa regional index 2018.¹⁹ According to the World Bank’s Global Findex database 2017, only 2 percent of the total population use the internet for online purchases²⁰ which accounts for 15 percent of internet users in the country.²¹

¹⁴ World Bank Development Indicators (Rural population % of total population)

¹⁵ World Bank, Malawi Economic Monitor-Investing-in-Digital-Transformation, 2021

¹⁶ World Bank Development Indicators, 2020

¹⁷ UNCTAD: Malawi Rapid eTrade Readiness Assessment Report, 2019

¹⁸ World Bank: Malawi Economic Monitor - Investing in Digital Transformation, 2021

¹⁹ UNCTAD: Malawi Rapid eTrade Readiness Assessment Report, 2019

²⁰ World Bank: Global Findex Database, 2017

²¹ UNCTAD, B2C E-Commerce Index, 2019



Photo Credit: Unsplash

- **Malawi businesses are adopting digital technology, including utilizing social media (Facebook, Twitter, Instagram, and WhatsApp) and other digital marketing tools.** Only a few companies in the country have a significant social media presence.²² Low digital literacy rates, high levels of taxation on digital devices and services and low internet penetration are some of the factors contributing to the slow adoption of digital marketing tools by businesses. However, with increased broadband penetration (85 percent 4G coverage),²³ it is becoming essential for businesses to have a website to reach out to potential customers. Companies are beginning to adopt digital platforms to market their products and services. For instance, some businesses have adopted Kwacha Basket, an online marketplace, to sell their products.²⁴

Relevance of the agriculture sector to the Malawian economy

The agriculture sector in Malawi remains a crucial driver of the country's overall social and economic performance. The sector contributed to more than 22 percent of the GDP in 2020.²⁵ It also accounted for over 90 percent of the national exports²⁶ and employed over 76 percent of the country's workforce in 2019.²⁷ The sector has, however, experienced mixed performance in the last decade with its contribution to GDP declining from 29 percent in 2011.²⁸ The growth rate has also fluctuated, experiencing its highest growth rate in 2013 (6.6 percent) and its lowest in 2016 (-2.3 percent).²⁹ An increasing population, high land degradation rates, overreliance on rain-fed agriculture and extreme weather patterns such as droughts, floods and cyclones, have continued to suppress agricultural output in the country.

Effects of Cyclone Idai on Malawi

Following a year of drought in 2018, Malawi's southern and central regions were hit by Cyclone Idai in March of 2019, which severely affected the agriculture sector. The cyclone and its associated floods caused estimated losses of US\$ 220 million.³⁰ It affected over 975,600 people, displacing 86,976, and resulting in the death of 60 people.³¹ It also destroyed over 63,000 acres of land and killed 23,000 animals.³²

Production systems and key agricultural value chains

Smallholder farmers remain a dominant force on Malawi's agriculture landscape producing over 80 percent of the country's food and 20 percent of its exports.³³ Smallholder farmers constitute about 2 million farm families and cultivate on about 4.5 million hectares of land, accounting for close to 85 percent of the available agricultural land in the country.³⁴ Smallholder farming in the country is, however, mainly subsistence-oriented and dominated by the production of maize and other food crops and few cash crops, primarily tobacco and tea. On the other hand, estate/commercial sub-sector is the leading producer of capital-intensive cash crops - mainly tea, tobacco, coffee, sugar and cut flowers.

Cereals and tuber crops are crucial to Malawi's agricultural and food economy, while tobacco is the dominant foreign exchange earner. Maize is a major food crop in the country grown by a significant proportion of smallholder farmers and accounting for over 37 percent of the total land cultivated by smallholder farmers.³⁵ It is also the fourth largest produced crop after sweet potatoes, cassava, and sugarcane. Tobacco – in its raw form - is the largest cash crop earner in the country, accounting for 60 percent of agricultural exports in 2019.³⁶ Other important cash crops include raw sugar and tea accounting for 10 percent and 9 percent of the agricultural export earnings, respectively, in 2019.³⁷

²² Insights from interviews with key stakeholders

²³ World Bank: Malawi Economic Profile – Investing in Digital Transformation, 2021

²⁴ Insights from interviews with key stakeholders

²⁵ World Bank Development Indicators (Agriculture value added % of GDP)

²⁶ World Trade Organization – Malawi Trade Profile, 2021

²⁷ World Bank Development Indicators, 2020

²⁸ Ibid

²⁹ Ibid

³⁰ Concern Worldwide - The impact of Cyclone Idai on the poorest, 2020

³¹ Ibid

³² Ibid

³³ FAO, Malawi Profile

³⁴ Ibid

³⁵ FAO, Malawi Export Statistics

³⁶ Ibid

³⁷ Ibid

Figure 3: Top 10 crops in Malawi by production, area harvested and export value, 2019

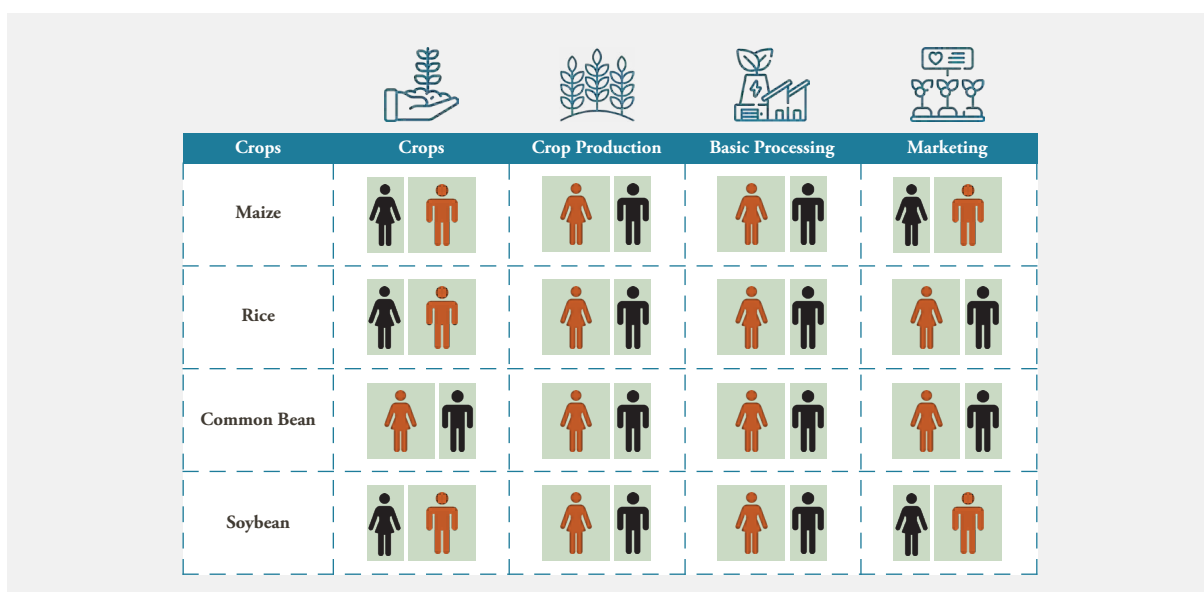
Top 10 crops by production quantity (Mn tonnes)		Area Harvested (Mn Ha)		Top 10 crops by export value (US\$ Mn)	
Sweet Potatoes	5.9	Maize	1.7	Tobacco, Unmanufactured	498.4
Cassava	5.7	Groundnuts with shell	0.4	Sugar Raw Centrifugal	84.3
Sugar Cane	3.1	Sweet Patatoes	0.4	Tea	80.1
Maize	3.0	Beans, Dry	0.3	Groundnuts, Shelled	39.5
Mangoes, Mangosteens	2.1	Pigeon Peas	0.3	Nuts Nes	31.2
Potatoes	1.2	Cassava	0.2	Peas, Dry	24.2
Tomatoes	0.6	Soybeans	0.2	Cake, Soybeans	21.8
Pigeon Peas	0.5	Sorghum	0.2	Soybeans	17.4
Bananas	0.4	Tobacco	0.1	Cotton Lint	4.5
Plantains and others	0.4	Cow Peas, Dry	0.1	Rubber Natural Dry	3.9

Source: FAOSTAT

Gender roles in agricultural production

Women play a significant role in Malawi's agriculture and food systems. It is estimated that women account for 70 percent of all farmers, undertake 70 percent of all agricultural activities and produce about 80 percent of subsistence crops.³⁸ Across the key agricultural value chains in Malawi, women are mainly involved in crop production and processing. According to a study by USAID and Alliance for a Green Revolution in Africa (AGRA), women especially play a more prominent role than men in the production and processing of maize, rice, common bean, and soybean.³⁹ Women also play a bigger role in the input decision and marketing of common bean.⁴⁰ However, while men play a bigger role in the input decision for rice, the marketing is mainly done by women. For soybean, men play a bigger role in the input decision and marketing⁴¹.

Figure 4: Overview of gender roles in the value chains of key crops



Source: Adopted from the Malawi Early Generation Seed Study, 2015

NB: Orange colored infographic represents the dominant gender under each role

³⁸ CIAT, CGIAR and CCAFS – Climate Smart Agriculture in Malawi, 2018

³⁹ USAID, AGRA, and Rutgers University: Malawi Early Seed Generation Study, 2015

⁴⁰ Ibid

⁴¹ Ibid

Women participation in agricultural value chains is, however, constrained by several factors. The primary constraint is access to land, where traditional land rights restrict women from owning land. Only about a third of the agricultural land in Malawi is owned by women.⁴² Additionally, on average, a plot of land owned by a woman is 12 percent smaller and 25 percent less productive than that of their male counterparts due to differences in level of knowledge and access to farm inputs that improve productivity.⁴³ Other factors affecting participation of women in the agricultural value chains include limited access to financial resources, low education levels among women and reduced labor availability due to gender roles where women are mainly the caretakers of their families.⁴⁴ Lower education levels limit the ability of women to adopt modern and technology-based farming practices. Further, the social expectations that require women to perform unpaid care and domestic work significantly affect their labor productivity. This further explains the difference in agricultural productivity between men and women farmers.

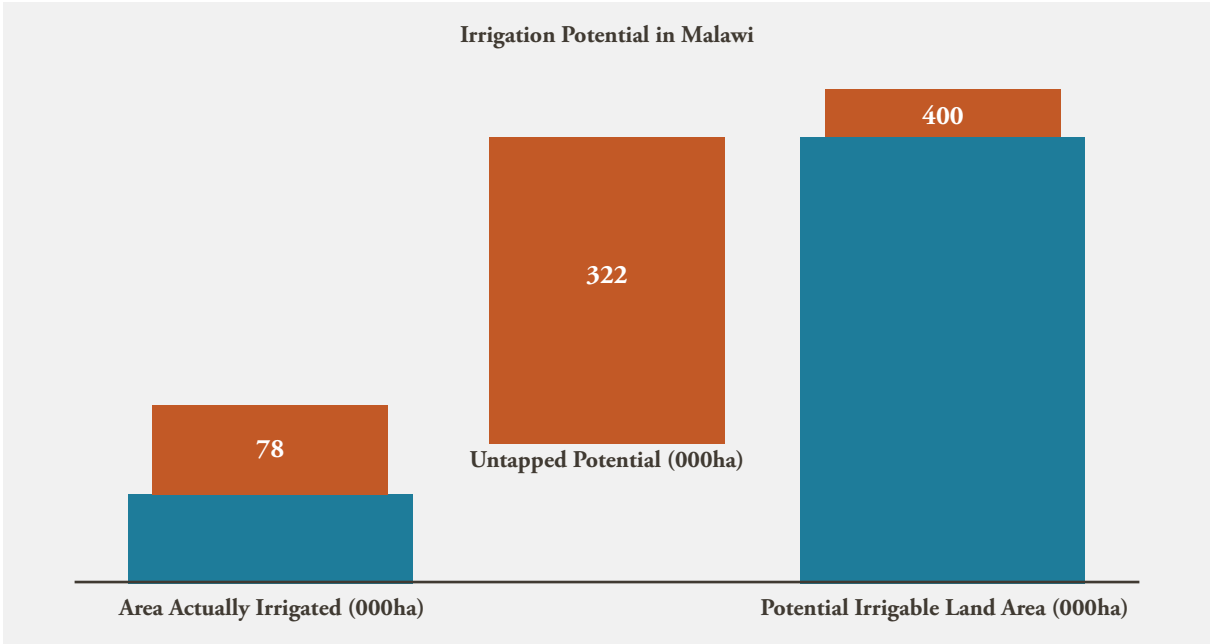
The gender gap in agricultural productivity in Malawi is estimated to cost about \$100 million per year.⁴⁵ This means that closing the gender gap in agricultural productivity could potentially increase Malawi’s GDP by US \$100 million (about 1.85 percent of Malawi’s GDP), increase annual crop output by about 7.3 percent, and lift about 238,000 people out of poverty.⁴⁶ Some of the ways of closing the gender gap and enhancing agricultural productivity for women farmers include improving women’s access to labor-saving technologies both on-farm and off-farm, expanding the customary rights of occupancy over the use of land, and developing training programs to educate men and women on the importance of cooperation in the use of family resources.⁴⁷

Key challenges facing the agriculture sector in Malawi

Despite the sector’s importance in the overall social and economic wellbeing of the country, multiple challenges hinder it from achieving its full potential. These challenges cut across the entire value chain from production, transportation, storage, and marketing. The section below describes some of the sector’s key challenges and their underlying causes.

Malawi’s dependence on rain-fed agriculture makes it highly susceptible to climate change. More than 95 percent of agricultural production in the country relies on rain-fed systems.⁴⁸ As a result, both the sector, and the economy are highly impacted by any climatic changes. In 2015, for example, major floods experienced in the country resulted in a significant fall in the GDP. Losses from droughts which recur every 5-25 years are estimated to be between 1.1 percent to 22 percent of the agricultural GDP.⁴⁹ The full potential of irrigation in the country has not been explored with only 20 percent of the potentially irrigated area currently under irrigation.⁵⁰ Consequently, this has hindered agricultural productivity in the country. It is estimated that productivity in the country can increase by 36 percent when irrigation is adopted.⁵¹

Figure 5: Estimated irrigation potential in Malawi

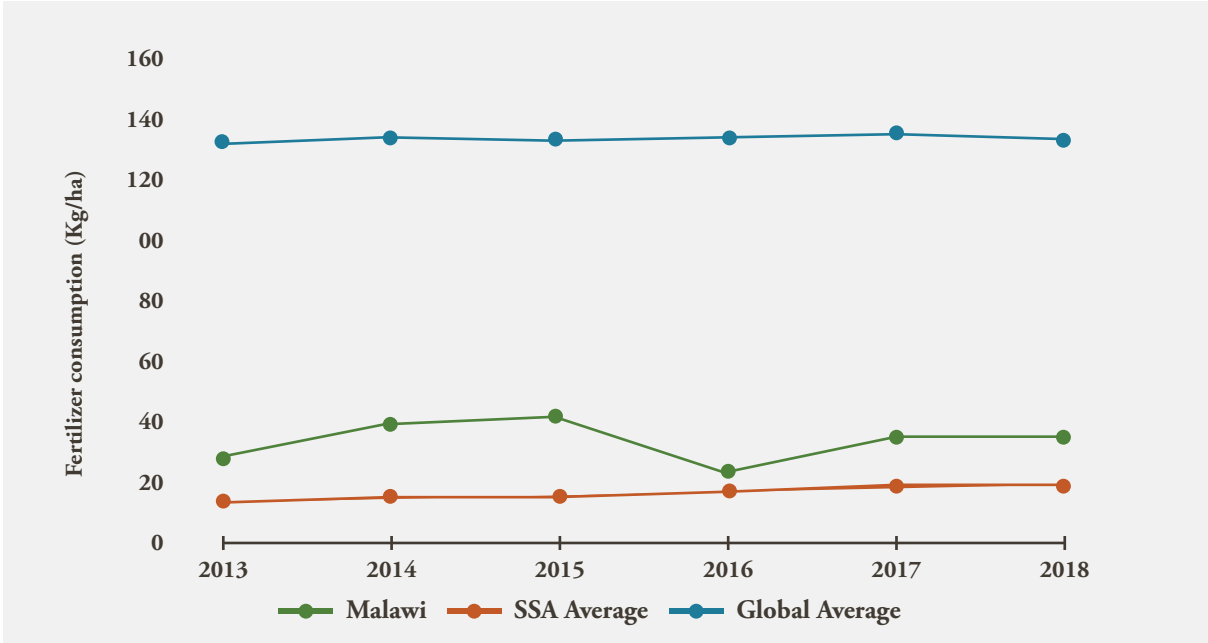


Source: CCARDESA

⁴² UMFULA/DFID- Gender, Agriculture and Climate Change in Malawi, 2017
⁴³ World Bank - Caught in a Productivity Trap: A Distributional Perspective on Gender Differences in Malawian Agriculture, 2013
⁴⁴ UMFULA/DFID- Gender, Agriculture and Climate Change in Malawi, 2017
⁴⁵ UN Women, UNDP, and UNEP - The Cost of the Gender Gap in Agricultural Productivity in Malawi, Tanzania, and Uganda, 2015
⁴⁶ Ibid
⁴⁷ UN Women, UNDP, and UNEP - Factors driving the gender gap in agricultural productivity: Malawi, 2018
⁴⁸ USAID: Malawi Climate Change Risk Profile, 2017
⁴⁹ CIAT, CGIAR and CCAFS – Climate Smart Agriculture in Malawi, 2018
⁵⁰ CCARDESA - <https://www.ccardesa.org/malawi>
⁵¹ FAO Aquastat - <https://www.fao.org/aquastat/statistics/query/results.html>

The use and adoption of modern agricultural inputs are limited, resulting in low productivity levels. Overall fertilizer usage in the country fluctuated from 43kgs/ha in 2015 to 36kgs/ha in 2018 after a constant increase experienced from 2012.⁵² This increase between 2012 and 2015 was to a great extent attributed to the implementation of the national Farm Input Subsidy Program (FISP) launched in 2006.⁵³ The program was designed to provide fertilizer and seed subsidies to low-income smallholder farmers. Anecdotally, challenges facing the implementation of the FISP resulted in fluctuations in overall fertilizer consumption, including the drop from 2015. While the rate of use is high compared to many African countries and Sub-Saharan African average that stood at 20kgs/ha in 2018,⁵⁴ it is still low considering the intensity of land use. Less than 50 percent of smallholder farmers use fertilizer, while about 70 percent do not use the recommended quantities and types.⁵⁵ On the other hand, Malawi's seed sector is dominated by informal systems – largely farm-saved seed. On average, about 30 percent of farmers use certified seeds – ranging from 49 percent for hybrid maize and 14 percent for pigeon peas.⁵⁶ The causes of low use of high yielding inputs by farmers include the high cost and fluctuating price of the inputs, unavailability of inputs, and limited knowledge and awareness on use.

Figure 6: Fertilizer consumption (Kgs/ha of arable land), 2013-2018



Source: World Bank Development Indicators

Low agricultural extension services have resulted in limited adoption of good agricultural practices (GAPs). There are approximately 1,900 extension officers in Malawi, which translates to a ratio of one extension officer per 1,388 farming households.⁵⁷ The government employs the largest proportion (98 percent) of extension officers under the Department of Agricultural Extension Services (DAES).⁵⁸ With such a low number of extension officers, effective delivery of extension services to farmers is constrained. However, several approaches, such as farmer-to-farmer extension, farmer field schools, farmer groups, and digital technologies, have however, been adopted to enhance delivery. Further, for effective delivery of extension services, there is a need for continuous training of extension agents on new and emerging agricultural practices and technologies. However, providing these training is limited due to budgetary constraints.

The small and highly fragmented land sizes and declining soil fertility resulting from land degradation and soil erosion continue to hinder productivity. With a growing population and emerging category of urban middle-class farmers, agricultural land for smallholder farmers has been steadily diminishing. The average farm size is 0.7 hectares, with about 60 percent of smallholder farmers cultivating less than one hectare of land.⁵⁹ Shrinking farm sizes have led to unsustainable agricultural intensification as soils become degraded. The high reliance on forests for firewood and charcoal as the main source of household cooking and heating has led to the depletion of the forest cover further degrading the land and lowering soil fertility.

⁵² World Bank Development Indicators (Fertilizer consumption Kgs/ha)
⁵³ AGRA and IFDC – Assessment of fertilizer distribution systems and opportunities for developing fertilizer blends in Malawi, 2018
⁵⁴ World Bank Development Indicators (Fertilizer consumption Kgs/ha)
⁵⁵ Lilongwe University of Agriculture and Research - Optimizing Fertilizer Use within the Context of Integrated Soil Fertility Management in Malawi, 2017
⁵⁶ USAID, AGRA, and Rutgers University: Malawi Early Seed Generation Study, 2015
⁵⁷ The African Seed Access Index: Malawi Profile, 2017
⁵⁸ Ibid
⁵⁹ CCARDESA <https://www.ccardesa.org/malawi>

Crop pests and diseases are an ongoing threat to the agriculture sector in Malawi. Pests and disease contribute to an average crop loss of up to 30 percent, with some crop varieties like cassava and sweet potatoes experiencing severe yield losses of up to 90 percent in the event of an outbreak.⁶⁰ The continued application of traditional agricultural practices has contributed to the frequent occurrence of pests and diseases, impacting production yields. The losses resulting from pests and disease are significantly costly to smallholder farmers, and in the case of a major outbreak, can create shocks at a national level and erode resilience in the farming system therefore perpetuating and deepening poverty.⁶¹

High post-harvest losses experienced in the country stifle agricultural output and significantly reduce farmer incomes. Between 5 and 12 percent⁶² of agricultural production (equivalent to US\$ 120 million) is lost post-harvest annually due to poor handling, management, and storage techniques. Losses are significantly higher in cereals, such as maize, rice and wheat. Over 19 percent of all the produced maize is lost post-harvest with poor harvesting/drying and storage techniques contributing to the largest proportion of these losses at 6.3 percent and 8.5 percent, respectively.⁶³ The country lacks adequate modern warehousing and storage facilities with farmers relying primarily on traditional granaries to store their produce.

Smallholders in Malawi face multiple challenges that hinder them from effectively accessing markets and reaping full benefits from their produce. These challenges include lack of adequate, competitive and guaranteed markets for products, unorganized farmer structures, unscrupulous intermediaries, poor marketing infrastructure (including market information systems), poor road infrastructure, and price volatility of some commodities.⁶⁴ The transportation cost between farmgate and central markets is exceptionally high due to poor feeder roads in the country with transportation costs estimated to account for close to 45 percent of the total cost of commodities.⁶⁵ Given these challenges farmers are unable to reach markets directly and often rely on middlemen to buy their commodities at farmgate usually below the market price. According to an International Food Policy Research Institute (IFPRI) study, 75 percent of maize farmers and 90 percent of soybean farmers sell their crops below the official minimum farmgate prices set by the government of Malawi Kwacha 200/kg for maize and Malawi Kwacha 300/kg for soybeans.⁶⁶

Underlying the many challenges facing smallholder farmers in Malawi is inadequate financial services. Only 21 percent and 19 percent of the rural population in Malawi have access to financial and mobile money accounts, respectively.⁶⁷ Further, only 9 percent and 8 percent of the rural population borrow or save from a financial institution, respectively.⁶⁸ With limited access to formal financial service providers, farmers rely on input suppliers (through credit sales), organized sources of informal lending, such as community-based organizations like the church, farmers' organizations, and middlemen to meet their credit needs. The limited availability of crop insurance products in the country also means farmers are not adequately covered for losses arising from frequent climate and weather-related occurrences.



Photo Credit: Unplash

⁶⁰ World Bank Group: Malawi Agricultural Sector Risk Assessment, 2015

⁶¹ Ibid

⁶² IFPRI-Measuring Postharvest losses at the farm level in Malawi, 2017

⁶³ African Postharvest Losses Information System; <https://www.aphis.net/en>

⁶⁴ USAID, Demand Analysis Report of Malawi, 2015

⁶⁵ Journal of Social Economics Research - Interfaces between road infrastructure and poverty in Africa – The Case of Malawi, 1994-2013, 2017

⁶⁶ IFPRI, Report on a Study to Crowdsource Farmgate Prices for Maize and Soybeans in Malawi, 2020

⁶⁷ World Bank, Global Findex database <https://globalfindex.worldbank.org/>

⁶⁸ Ibid

3

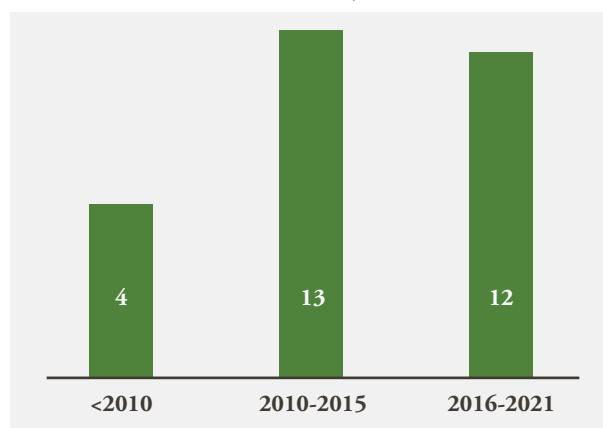


Supply of Digital Agricultural Technologies (DATs) in Malawi

Evolution of DATs in Malawi and key growth drivers

While still nascent, the DAT landscape in Malawi has evolved in the last decade. Malawi has witnessed an increase in the number of DATs operating in the country in the last 10 years, with close to 90 percent of the DATs established between 2011 and 2021, as shown in the figure below.⁶⁹ Our study mapped 29 DAT interventions in the country operated by social enterprises, government agencies and development institutions. Despite the increase in the number of DATs, several bottlenecks, as discussed in chapter 5 have constrained the ability of the DATs in the country to scale up, maximize impact and reach commercial sustainability.

Figure 7: Number of DATs in Malawi by period of establishment, N=29



Source: Intellectap analysis

Several factors have driven the evolution of DAT landscape.

- The government of Malawi has played a pivotal role in adopting and using DATs to enhance service delivery.** In particular, the government has been working with DATs to improve the delivery of extension and market information services through the Esoko and Airtel M'chikumbwe platforms. Esoko is a digital agricultural services platform that provides a range of services including data collection and profiling services, biometric profiling, analytics, and communication services (delivery of weather forecasts, agronomic advice and information on market prices using SMS, voice messages and a call center). While Airtel M'chikumbwe provides farmers with access to practical information about agriculture and Airtel Money through interactive voice response (IVR) and SMS. As of 2017, more than 1,000 government agents had been trained to instruct farmers how to use the platform.⁷⁰ The government has also partnered with Pula, an agricultural insurance and technology firm, to insure 400,000 farmers who will benefit from the 2020/21 Affordable Input Program (AIP) – the successor of the Farm Input Subsidy Program.⁷¹ Pula combines data and technology to design and deliver digital agricultural insurance products to help build resilience among smallholder farmers.
- Enabling policy and regulatory environment and implementation of government strategies:** The government has established policies and strategies geared towards digitizing the economy in recent years. For instance, the recently launched digital economy strategy (2021-2026) seeks to enhance the performance of critical sectors (such as agriculture) by adopting digital innovations. In particular, the strategy prioritizes digital solutions (such as digital extension services and digital platforms) to improve competitiveness and create new employment opportunities in the agriculture sector. The national ICT policy of 2013 seeks to enhance ICT utilization in the priority growth sectors such as agriculture and increase ICT services to rural areas and vulnerable and disadvantaged groups. The policy recognizes the importance of agriculture in the economy and recommends the utilization of ICT in agricultural extension services, research and development, and agricultural marketing. Other policies include the National Agricultural Policy of 2016, which seeks to establish effective, demand-driven agricultural innovation systems for research and technology generation, and dissemination. The government is also conceptualizing a National Agriculture Management Information System as a central public platform for agriculture data in the country.

⁶⁹ Intellectap analysis based on database of DATs developed

⁷⁰ GSMA Airtel M'chikumbwe 212 report, 2017;

<https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2017/07/IM%E2%80%99chikumbwe-212-A-mobile-agriculture-service-by-Airtel-Malawi.pdf>

⁷¹ <https://allafrica.com/stories/202010160640.html>

- **Increased donor and development institution programs and interventions support the uptake of digital agricultural services.** We mapped close to 20 programmatic interventions launched by donors and other philanthropic organizations with components that enhanced access and uptake of DAT services in the last 10 years. The main donors in the space include the Food and Agriculture Organization (FAO), USAID, Clinton Development Initiative (CDI), European Union, GIZ, UNDP, World Bank, and United Nations (UN) Women. Around 55 percent of the donor programs have been directly working with existing DAT providers to implement the interventions, with the rest working with their implementation partners to design, launch and run their digital solutions and platforms.⁷² World Vision and Vision Fund, for example, developed and launched a mobile application known as e-mlimi that provides market linkages by aggregating farmers and buyers. USAID has also previously worked with private stakeholders in the country, including Umodzi Consulting and Esoko to help smallholder farmers to access market information via mobile phones.⁷³
- **Interventions supporting the demand side to access digital devices through free or flexible repayment structures.** The government, donor institutions and private stakeholders are working to enhance access to phones by farmers, which are essential for the uptake of DATs. While some like Food and Agriculture Organization (FAO) have distributed free phones to farmers, others have introduced flexible financing structures. For example, with funding from the Foundation for a Smoke Free World, Telekom Networks Malawi (TNM) partnered with Strategic Impact Advisors and two local farmer-based organizations to implement a project where they trained 1,000 smallholder farmers (50 percent who already owned a mobile phone) and distributed 346 mobile phones to the farmers through a 3-month payment plan. The intervention led to a 25 percent increase in mobile phone penetration among the farmers trained, with some of the farmers purchasing a second phone.
- **Development and growth in the business support ecosystem.** More than 20 organizations and programs support the growth of the country's entrepreneurship and innovation ecosystem, including technology companies supporting development of mobile and web applications as well as incubators, accelerators, and hubs. These organizations have been supporting the growth of DATs through capacity building, investment readiness, fundraising, mentoring, and networking services.
- **Growing, launch and implementation of regional innovation/entrepreneurship support programs.** Malawi is emerging as a key focus country for regional programs supporting innovators. Such programs provide financial and non-financial support for innovators to scale across geographies and customer segments. For instance, the Water and Energy for Food (WE4F) East Africa program by GIZ seeks to increase food production and incomes of smallholder farmers in seven East African countries, including Malawi, by promoting the growth and scale-up of innovative solutions in the water and energy for food space. Similarly, the 2021 UNCDF/IFAD/BMGF agritech challenge aims to identify and support agritech and agri-fintech startups with innovative solutions that can positively impact smallholder farmers in seven countries, including Malawi.



Photo Credit: Unsplash

⁷² Intelicap Analysis

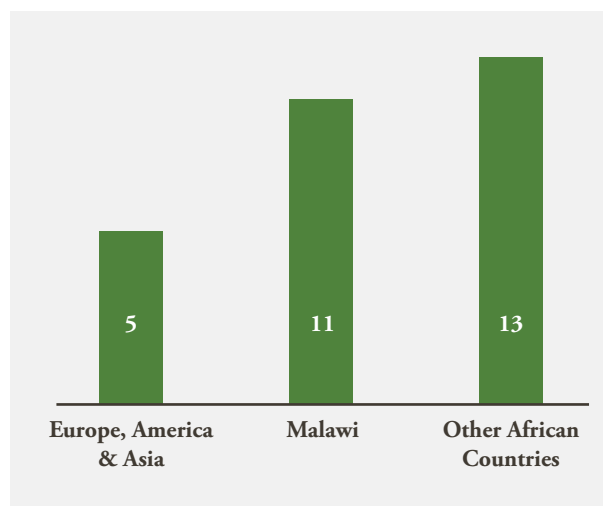
⁷³ Infrastructure Consortium for Africa; <https://www.icafrica.org/en/news-events/infrastructure-news/article/mobile-phones-transform-malawi-farmers-4138/>

Geography of operations

Many of the DATs operating in the country are foreign innovators, with most scaling from other African countries. Only 37 percent of the DATs identified were homegrown and headquartered in Malawi.⁷⁴ Innovators that have emerged from other African countries – mainly from Kenya and Ghana - constitute the largest proportion of the DATs operating in the country. We also mapped a few DATs with headquarters in Europe, America, and Asia. Inadequate digital infrastructure, limited access to finance and business support, and regulatory barriers are some of the challenges hindering local DAT development. The largest proportion (80 percent) of the Malawi headquartered DATs were, however, established between 2016 and 2021 an indication of improvement in the ecosystem and continued focus on the space.⁷⁵

*“Limited access to various types of capital is one of the main challenges limiting establishment and scale-up of DATs in the country”
DAT provider*

Figure 8: Number of DATs in Malawi by headquarter country, N=29



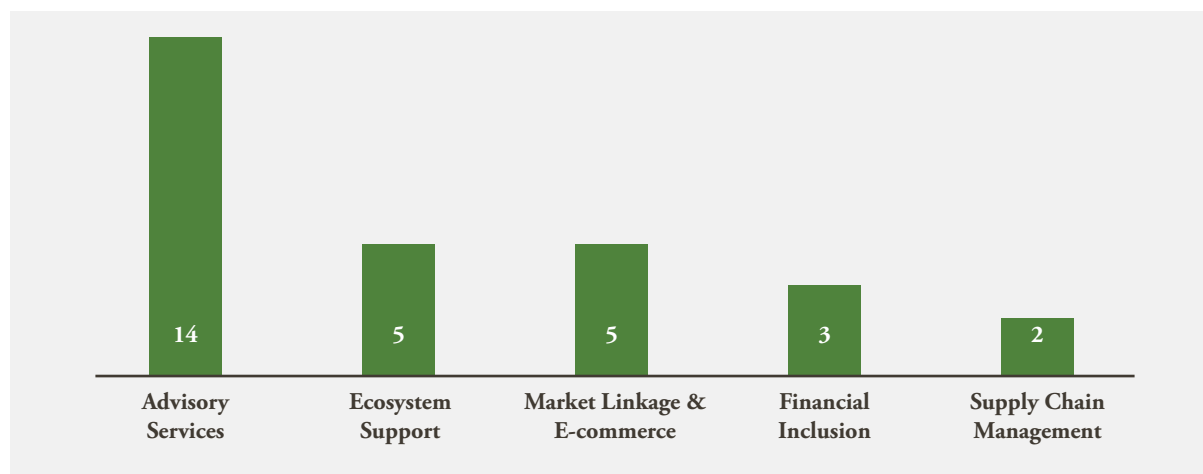
Source: Intellectap analysis

Type of DATs in Malawi and their applicability

DAT use cases and challenges addressed

Most of the DATs focus on solving multiple challenges across agricultural value chains, with digital agricultural advisory being the dominant service/solution provided. Over 70 percent of the DATs in Malawi fall in more than one use case as they seek to solve various challenges for the farmers.⁷⁶ Given the challenges facing the country in enhancing agricultural productivity, a significant proportion of DATs have emerged to provide solutions in this area. Over 48 percent of the DATs mapped primarily focus on providing agricultural advisory and information services, particularly general agronomic and market information- accounting for close to 70 percent of the DATs under this category.⁷⁷ Other DATs in the category provide farm management services and precision agriculture advisory.

Figure 9: Number of DATs in Malawi by use cases (primary), N=29



Source: Intellectap analysis

Market linkage and e-commerce platforms have focused on solving access to markets for both agricultural inputs and outputs. DATs in this category focus on enhancing market visibility by providing farmers direct links to buyers where they can negotiate on price, quality, and quantity of produce. DATs like Esoko integrate a digital database that links farmers to potential suppliers and provides real-time information on market prices through SMS. The Agricultural Commodity Exchange (ACE) has designed an online trading platform in which market participants,

⁷⁴ Intellectap analysis based on database of DATs developed

⁷⁵ *ibid*

⁷⁶ *ibid*

⁷⁷ *ibid*

from smallholder farmers to institutional buyers, can post “offers to sell” and “bids to buy” commodities over and above having a market price information system in which market participants can receive information on the internet and mobile phone.

Ecosystem support DATs have focused on digitally aggregating information and data on the sector and bringing together stakeholders in the ecosystem to enhance decision making. The Africa Soil Information Service (AfSIS), for example, has a cloud-based platform for soil data collection utilizing satellite imagery and a high spatial resolution drone dataset for mapping crops. This enables farmers to identify the best crops for a specific region, the type of fertilizer to offer the crops planted and understand the pests and diseases that can affect the crops. The AfricaFertilizer, on the other hand, collects and processes market data on agro-inputs for use by various stakeholders. With the support of the African Development Bank (AfDB), the government also established an inclusive ICT-based Value Chain Governance (IVCG) platform linking multiple agricultural value chain stakeholders, including farmers, financiers, warehouse owners, agro-dealers, and off-takers.

A few DATs have focused on providing agricultural insurance and flexible payment plans of farming inputs. Leveraging internet of things (IoT) and data analytics, DATs like Pula have designed and delivered innovative agricultural insurance products to help smallholder farmers endure yield risks, improve their farming practices, and bolster their incomes over time. Some DATs have also adopted Pay as You Go (PAYG) systems to enhance uptake of agricultural equipment. Green Impact Technologies, for example, offers credit services through their solar-powered water pumps where farmers pay as they continue using the system, which enhances the affordability of the pumps. The payments are made through Airtel Money, and a confirmation code is sent to the farmer through SMS.

Some DATs have focused on providing supply chain management solutions to enhance traceability of produce, logistics and management of farmers. Farmforce has, for example, created a bush-proof (capable of working offline in the most remote areas) web and mobile platform, which creates a fully traceable supply chain where clients have visibility down to the field level. GreenFingers Mobile has also created a mobile-first Software-as-a-Service (SaaS) technology platform that manages and finances large groups of smallholder farmers, enabling them to adopt a B2B2C model and access services such as warehousing, logistics and linkage to the market.



Photo Credit: Unsplash

The table below summarizes the key models adopted by DATs across the use cases.

Table 3: Summary of DAT use cases and challenges addressed

Use cases	Challenge addressed by existing providers	Technologies and innovations by DAT providers in Malawi	Outcome/ disruptive element of the DATs
Advisory and information services	<ul style="list-style-type: none"> • Inadequate access to agronomic and market information • Frequent pests and diseases outbreak • Climate change and unpredictable weather patterns 	<ul style="list-style-type: none"> • Use of videos, voice notes and pictures to provide farmer training and extension services that integrate local language. • Integration of interactive voice response (IVR) channel where farmers subscribe to and listen to audio versions of the messages even with the most basic phones. • Integration of SMS-based crop or animal disease diagnosis with treatment advice. • Use of USSD and mobile applications to connect with field officers • Leveraging satellite data, drones, IoT and machine learning to provide precision agriculture advisory to assist in pests and disease detection. • Leveraging IoT to keep records and continuously monitor livestock. • Use of a predictive machine learning technology which maps and processes soil properties to provide information on the best crop for a specific region, based on the soil profile. 	<p>DATs in this category provide access to agronomic and market information, reducing the reliance on extension workers who are not enough to cover all the farmers. In addition to accessing information, farmers are also trained remotely. Precision agriculture advisory also provides customized recommendations on soil, weather, and pests that help farmers decide which crops to grow and when.</p> <p>Example of DATs in this category: Esoko, Zaulimi, e-mlimi, Farm Radio and Airtel Mchikumbe provide digital extension services; Aerobotics uses aerial imagery and machine learning algorithms to detect pests and disease; and Geo Gecko makes use of satellites and provides relevant advisory based on earth changes.</p>
Market Linkage and E-commerce	<ul style="list-style-type: none"> • High number of middlemen depleting value for smallholder farmers • Lack of visibility in the agricultural inputs and outputs markets 	<ul style="list-style-type: none"> • Integration of a digital database that links the farmers to potential suppliers and provides real-time information on market prices through SMS platform. • Integration of websites, smartphone applications and SMS to inform the farmers of the markets available and their respective prices for the produce they have harvested. • Online retail stores for listing of agricultural inputs and produce. 	<p>By disintermediating the markets, these DATs provide farmers with a range of potential buyers and help them realize better prices for their produce. Further, they offer a digital shop where farmers can shop for their inputs.</p> <p>Example of DATs in this category: Alinafe Online Limited, an online retail shop that lists various agricultural inputs; e-mlimi, G-Soko and ACE enable farmers to trade with local and international buyers.</p>
Ecosystem support	<ul style="list-style-type: none"> • Lack of aggregation of data and information on the sector • Lack of coordination across stakeholders in the sector 	<ul style="list-style-type: none"> • Inclusive ICT-based Value Chain Governance (IVCG) platform to streamline the fragmented agricultural value chain • Web-based platform for accessing fertilizer prices • Cloud-based platform for soil data collection and aggregation 	<p>Aggregation of market information and data, as well as analytics on the same, helps enhance decision making for key stakeholders.</p> <p>Example of DATs in this category: AfricaFertilizer</p>

Use cases	Challenge addressed by existing providers	Technologies and innovations by DAT providers in Malawi	Outcome/ disruptive element of the DATs
		<ul style="list-style-type: none"> Leveraging maps and geo-spatial data to create maps that include data on soil, water among others, that users can easily access. 	<p>aggregates information on agro-input market; Meridia digitally maps boundaries and validates legal land documents, and AfSIS provides accessible soil data.</p>
Financial inclusion	<ul style="list-style-type: none"> Limited access to agricultural crop insurance resulting in high losses Limited access to affordable and well-designed credit High cost of inputs such as irrigation equipment 	<ul style="list-style-type: none"> Integration of data analytics and drone imagery technology to estimate crop growth and compensate farmers with lower-than-expected yields. Use of weather observations to provide weather-based crop insurance to create credit paths for unbanked smallholder farmers. Use of mobile money to offer an accessible and alternative platform to safely deposit and make small payments for agricultural products over time. Leveraging IoT to enhance adoption of PAYG model to finance solar-powered water pumps. 	<p>By leveraging technology to provide crop insurance, these DATs help cover farmers against losses due to pests and diseases and extreme weather occurrences. Further, through the flexible payment plans, the DATs enhance the affordability of agricultural inputs and leverage mobile money to make the collection of small payments less cumbersome. Additionally, leveraging IoT makes it easy for the providers to monitor the use of equipment and switch on/off based on payment status.</p> <p>Example of DATs in this category: Pula and Acre Africa provide crop insurance, and Green Impact Technologies provides PAYG solar irrigation pumps.</p>
Supply chain management	<ul style="list-style-type: none"> Lack of traceability of agricultural produce 	<ul style="list-style-type: none"> Web and mobile based platforms that enable digital management of farmers. 	<p>Supply chain management DATs improve the traceability of produce which is essential especially for the export market.</p> <p>Examples of DATs in this category: Green Fingers and Farmforce.</p>

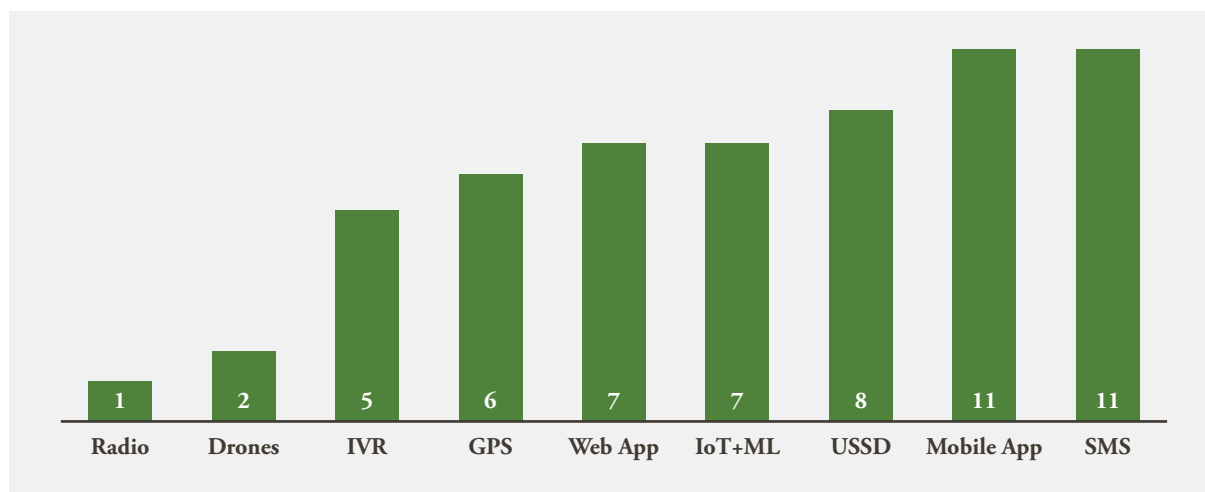


Photo Credit: Pexels

Underlying technologies

Given the low digital literacy levels and smartphone penetration, delivery of agricultural technology services to the last mile has largely leveraged basic technology. Short message services (SMS), and Unstructured Supplementary Service Data (USSD) are the most common technologies leveraged to deliver extension and market information to farmers. At the same time, there is growing adoption of mobile phone applications. Most of these platforms enable users to access information offline to avoid unstable and costly internet connection challenges. IoT sensors and machine learning (ML) were leveraged by DATs focused on providing advisory based on satellite imagery for pest and disease management, remote farm management and supply chain management.

Figure 10: Number of DATs across underlying technology, N=29

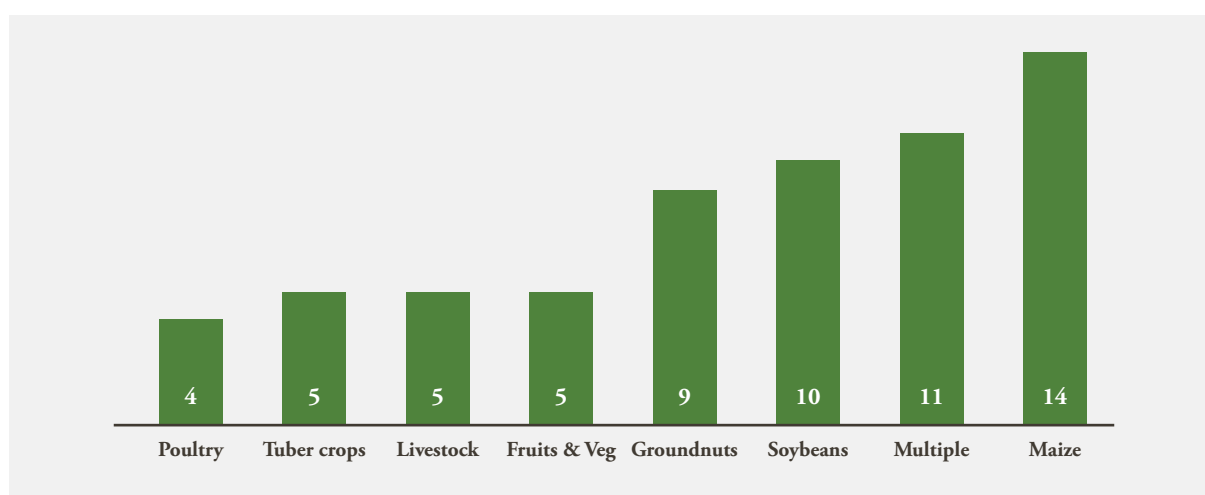


Source: Intellectap analysis

Focused value chains and production phases

The largest proportion of the DATs provides services across multiple crop value chains. Given the importance of cereals such as maize, sorghum and rice and legumes like soybeans, and groundnuts, a large proportion of the interventions have focused on enhancing performance across these value chains. Several interventions have also focused on supply chain management for the livestock, and fruits and vegetable value chains. Common tuber crops include sweet potatoes and cassava.

Figure 11: Number of DATs across common crop value chains, N=17



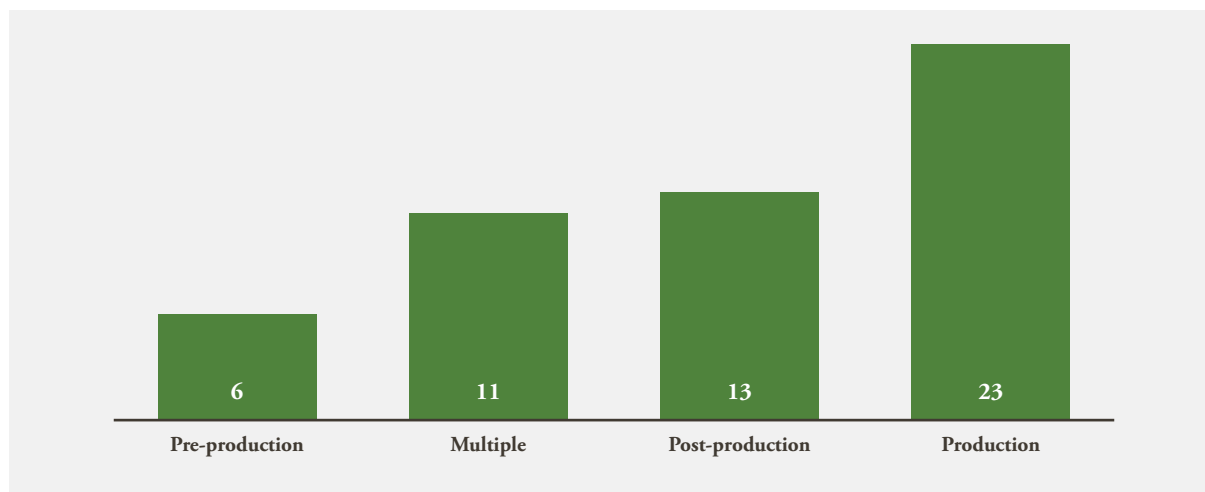
Source: Intellectap Analysis

Note: Some DATs operate across multiple value chains. Data is also for only 17 DATs

A significant proportion of DATs focus on multiple production phases. Close to 40 percent of the DATs offer services that fall under more than one value chain phase.⁷⁸ DATs offering services in the production phase for example also provide services focused on enhancing market linkages.

⁷⁸ Intellectap analysis based on database of DATs developed

Figure 12: Number of DATs in Malawi by production phases, N=29



Source: Intellectap Analysis

Note: Some DATs operate across multiple production phases

A large proportion of the DATs focus on the production phase with only a few that focus on pre-production. Close to 80 percent of the identified DATs focus on providing agricultural extension, farm management, pests and disease detection and insurance coverage services to enhance production.⁷⁹ Post-production focused DATs have largely concentrated on provision of market and price information services as well as market linkage and supply chain management platforms. Solutions focused on the pre-production phase include land mapping and documentation and soil testing services that inform production decisions.

Sustainability and demonstrated impact

As highlighted earlier, the largest proportion of DATs in the country were established in the last decade. However, several bottlenecks have constrained the sustainability and scale up and potential of the DATs. Some barriers include the donor reliant revenue models, limited access to commercial funding, inadequate value chain partnerships, underdeveloped digital infrastructure, and low-income levels of smallholder farmers discouraging uptake. A large proportion of the DATs providing services to farmers, for example, offer subsidized or free services given the reliance on donor funding. This has a significant impact on sustainability after donor support ends, as customers find the subscription fees too high and discontinue use.⁸⁰ Significant scale (in terms of customers reached) is witnessed for DATs that collaborate with MNOs as they can leverage the large customer (subscriber) base that already exists (e.g., the Airtel M'chikumbe service).

USAID Malawi's current and previous DAT Interventions

USAID Malawi has been working with key implementing partners to implement digital agriculture interventions essentially to enhance access to extension services. The table below provides a summary of these interventions as reported in existing program documents.

Table 4: Summary of USAID Malawi DAT interventions in the last 10 years

Name of project/ intervention	Description of the project/intervention
Strengthening Agricultural and Nutrition Extension Activity (SANE)	<p>Project duration: November 2015 - November 2020</p> <p>Project value: US\$ 70 million</p> <p>Description: SANE operated in Malawi's 10 Feed the Future (FTF) Expanded Zone of Influence (E-ZOI) districts, (Dedza, Lilongwe, Chikwawa, Nsanje, Blantyre, Machiga, Mchinji, Ntcheu, Balaka and Mangochi.)</p> <p>DAT solution/services: Focused on strengthening the capacity of the Government of Malawi's Department of Agricultural Extension Services (DAES). They mobilize and work with service providers to deliver agricultural and nutrition extension services effectively and in a coordinated manner by incorporating mobile technology when collecting and disseminating agricultural information in the field as a way of aggregating farmers' needs. They then convey them from the household level to district and national levels where programmatic and policy decisions occur. AgReach Extension Helper app makes extension services more accessible and extension systems more efficient to improve extension 'workers' ability to teach farmers on how to adopt beneficial technologies and practices.</p> <p>Status of the DAT: In 2021, the AgReach Extension Helper app was rolled out to</p>

⁷⁹ *ibid*

⁸⁰ *Insights from interviews with key stakeholders*

Name of project/ intervention	Description of the project/intervention
	<p>200 extension workers and extension managers within the USAID zone of influence in Malawi.⁸¹ The roll-out of the app has facilitated improved communications and linkages among the farmers, extension workers, extension managers and all other relevant stakeholders.</p> <p>Impact:</p> <ul style="list-style-type: none"> • Capacity of extension service provided strengthened. • Institutional linkage between research and extension strengthened and Policy environment improved. • Initial findings demonstrated the ‘app’s potential to centralize, streamline, and validate data from the field. <p>Implementing partners: University of Illinois at Urbana-Champaign (UIUC), Ministry of Agriculture, Irrigation, and Water Development, Department of Agricultural Extension Services (DAES), Catholic Relief Services Malawi (CRS)⁸²</p>
<p>Malawi Agriculture Diversification Activity</p>	<p>Project duration: October 2017-September 2018 Project value: US\$ 5.6 million Value chains of focus: Soybean and groundnuts in 8 districts DAT solution/services: The program focused on a daily extension campaign on radio, video extension services messaging, a call-in center for nutrition and agronomic expertise, and interactive SMS for training participants. Further the program enhanced access to finance for input loans for smallholder farmers, use of technology such as drip irrigation, mechanization, solar pumps and expanding distribution. It also enhanced extension and farmers’ adoption of key inputs including inoculants, drip irrigation, Purdue Improved Crop Storage (PICS) bags, soil kits and improved seed for groundnut and soy production yields and quality. Status of the DAT: As of August 2021, the daily extension campaign program on radio had reached over 1 million farmers.⁸³ The program is continuing to collaborate with farmer organizations such as Farmers Union of Malawi (FUM) to reach out to as many farmers as possible. Impact:</p> <ul style="list-style-type: none"> • Improved livelihood for women in the orange-fleshed sweet potato value chain. • Resiliency of smallholder farming system strengthened. <p>Implementing partners: Syngenta Foundation, Alliance for Green Revolution in Africa, South Africa Trade and Investment Hub, Rural Livelihood and Economic Enhancement Program, International Fund for Agriculture Development, Farmer Radio Trust.⁸⁴</p>
<p>Scaling Seeds and Technologies Partnership (SSTP) program</p>	<p>Project duration: July 2013 -July 2018 Project value: US\$ 46.8 million Description: The project focused on the following regions Machinga, Mzuzu, Karonga, Kasungu, Lilongwe, Blantyre, Shire Valley and Salima Agricultural Development Divisions, targeting Beans, cassava, cowpea, maize, pigeon pea, rice, and sweet potato value chain DAT solution/services: The objective of SSTP was to increase access to innovative agricultural technologies such as the adoption of improved varieties of seeds, complementary technologies, and the management of inputs. SWET was awarded a grant to disseminate information about improved seed varieties and access to markets through this program. This was done across four districts, using radio, TV, village cinema, and community mobilization. The SSTP program worked closely with the technology platforms to assess yield gaps in the focus districts. Impact: Increased the production of high-quality seeds by over 45 percent in three years and supported 40 percent more farmers to gain access to seeds and complementary innovative agricultural technologies.⁸⁵ Implementing partners: Alliance for Green Revolution in Africa⁸⁶</p>

⁸¹ USAID/Feed the Future: Extension Strengthening through Improved Accountability and Data Validation: The Extension Helper App in Action; <https://agrilinks.org/post/extension-strengthening-through-improved-accountability-and-data-validation-extension-helper>

⁸² USAID/Feed the Future: Strengthening Agriculture and Nutrition Extension in Malawi (SANE), 2019; https://pdf.usaid.gov/pdf_docs/PA00W6VB.pdf

⁸³ MBC- Farm radio campaign reaches 1 million farmers; <https://www.mbc.mw/radio-2/item/4882-farm-radio-campaign-reaches-1-million-farmers>

⁸⁴ USAID, Agriculture Diversification Activity, 2017; https://pdf.usaid.gov/pdf_docs/PA00TJB9.pdf

⁸⁵ USAID/Feed the Future: Mid-term performance evaluation of the scaling seeds and technologies partnership in Africa, 2017; https://pdf.usaid.gov/pdf_docs/PA00N5FH.pdf

⁸⁶ USAID/Feed the Future, Scaling Agricultural Technologies, 2017; https://pdf.usaid.gov/pdf_docs/pdacx950.pdf

Name of project/ intervention	Description of the project/intervention
<p>The Developing Local Extension Capacity (DLEC)</p>	<p>Project duration: 2014 Description: The project took place in two districts, Kasungu, and Dowa, engaging 16,00 farmers in producers' group. DAT solution/services: The objective of DLEC was to create and disseminate a total of eight community-based digital videos to Farmer Field and Business School (FFBS) producer group members and their community and increase the productive engagement of 65,000 poor women in sustainable agriculture and contribute to their empowerment. Status of the DAT: Stakeholders and other programs in Malawi, such as the Strengthening Agricultural and Nutrition Extension Activity (SANE) program, have adopted the approach of integrating video content into the FFBS model.⁸⁷ Impact:</p> <ul style="list-style-type: none"> • Women's access to extension services increased from 29 percent at baseline to 82 percent. • Nearly 70 percent of women adopted at least three improved agriculture practices. • Access to output markets increased from 42 percent to 63 percent. <p>Implementing partners: CARE and Digital Green⁸⁸</p>
<p>Feed the Future Malawi Mobile Money Program</p>	<p>Project Duration: 2012- 2016 Project Value: US\$ 3 million Description: The program focused on districts of Lilongwe, Balaka and Machinga, migrated 160 Village Savings & Loan Association (VSLA) in Lilongwe district to Mobile transactions. DAT solution/services: The program sought to increase mobile money adoption in Malawi and enhance product development through collaborative, targeted interventions that demonstrate the advantages of mobile money. Impact:</p> <ul style="list-style-type: none"> • The project supported a total of 9 pilots to transition cash payment streams to digital payments. Partners have included agriculture value chains, the government of Malawi, and financial institutions. • Trained nearly 10,000 people in digital and financial literacy. <p>Implementing partners: CARE International, FHI 360 and Save the Children International⁸⁹</p>
<p>Malawi Market Linkages Initiative (M-MLI) and Bridging Activity</p>	<p>Project Duration: 2011- 2013 Project Value: US\$ 1.1 million Description: The program was implemented in Northern, Central, and Southern regions of Malawi, on the grain value chain. DAT solution/services: The program focused on the Malawi trade corridors. It was implemented by strategically installing grain bulking centers (GBCs) and integrating financially sustainable real-time market information systems (MIS) to be utilized by farmers and traders. With access to accurate market information through the MIS platform, farmers and traders could maximize the market prices and appreciate the benefits of storage. Status of the DAT: The market information system (MIS) platform has since been adopted by other programs such as the Smallholder Agriculture Market Support (SAMS) program. Impact: Developed, strengthened, and facilitated the certification of at least 20 privately managed GBCs in the northern, central, and southern regions of Malawi. Facilitated training for producer associations. Seven farmers obtained bank loans by leveraging their stored crops in the GBCs.⁹⁰ Implementing partners: ACDI/VOCA</p>

⁸⁷ DLEC Malawi Country Engagement Concept Note, 2017

⁸⁸ USAID/Feed the Future, Developing Local Extension Capacity, 2017

⁸⁹ USAID/Feed the Future Malawi Money, 2015

⁹⁰ <https://www.acdivoca.org/projects/market-linkages-initiative-mlil>

4



Demand for DATs in Malawi

The demand side analysis focused on three key agri-food ecosystem actors (i.e., farmers, agribusinesses, and government agencies) and provides insights into digital literacy, digital readiness, and access trends.

Uptake of digital services by farmers

Demographic profile of farmers

The largest proportion of farmers in the country are more than 50 years old with a significant proportion of the households led by women.⁹¹ The average age of a smallholder farmer is 52 years old.⁹² Further, each smallholder farming family consists of about 5 members, where at least two members of the family are within the working age of between 14 and 50 years.⁹³ Almost one-third of smallholder farming families are headed by women.

Most farmers live below the poverty line and solely rely on income from farm activities. Smallholder farmers generate a gross annual income of about US\$ 1,840 on average, with on-farm income being their main source of economic activity.⁹⁴ Crop production represents half of the total annual income, but on average only 13 percent of the overall agricultural output is sold by smallholder farmers, highlighting the subsistence-oriented nature of the smallholder farming in Malawi. Smallholder farmers also generate about 19 percent of their income through non-agricultural wages or self-employment indicating that smallholder farmers aim to diversify into non-farm related activities. However, despite the average income earned by smallholders, about 59 percent of smallholder farmers in Malawi live below the national poverty line.⁹⁵

General literacy levels remain significantly lower amongst the rural population, especially among women. The number of years of schooling in Malawi is higher in urban areas than in rural areas for both men and women. On average, women in urban areas have 6.7 years of education against 2.7 years for rural women while urban men have 7.6 years versus 3.4 years for rural men.⁹⁶ Further, 16 percent of rural women have never attended school against 9 percent for rural men, and only one percent of rural women have attended high than secondary school level.⁹⁷ The overall literacy rate for the rural population stands at 80 percent for men and 68 percent for women.⁹⁸ This further widens the divide as use of digital technologies requires basic literacy and numeracy in addition to specialized technical knowledge and skills.

Digital literacy, readiness, and access trends

Ownership of digital devices among the rural population remains significantly low, with huge disparities existing between men and women. Radio and basic feature phones are the most common digital devices accessible to the rural population with 41 percent and 32 percent access rate respectively.⁹⁹ Access to mobile phones capable of browsing the internet is 21.3 percent in rural areas compared to 51 percent in urban areas.¹⁰⁰ Access to digital devices and services also differ significantly between men and women in rural areas with 47 percent and 26 percent mobile phone ownership, respectively.¹⁰¹ In addition, only two per cent of rural women have access to the internet compared to 11 percent of men.¹⁰² The low-income levels that characterize a majority of the rural population hinder them from obtaining digital devices and using digital services – which are currently costly with their income usually directed to other basic needs.

Limited access to digital devices has contributed to low digital literacy levels. According to a recent survey, Malawi was ranked 31 out of 34 African countries¹⁰³ in digital literacy. As highlighted, access to and use of digital devices is low. Further, the rural population tends to use mobile phones mainly for communication. This presents a challenge for introducing advanced digital mobile-based agriculture applications that often require more advanced digital skills. Familiarity with digital devices and frequently browsing the internet is considered an essential foundation of digital literacy.

⁹¹ Emmanuel Olatunbosun Benjamin, *Smallholder Agricultural Investment and Productivity under Contract Farming and Customary Tenure System: A Malawian Perspective*, 2020

⁹² *ibid*

⁹³ *ibid*

⁹⁴ FAO, *Small Family Farms Country Factsheet*, 2018

⁹⁵ *ibid*

⁹⁶ Government of Malawi, *Malawi Demographic and Health Survey*, 2016

⁹⁷ *ibid*

⁹⁸ *ibid*

⁹⁹ MACRA: *National Survey on Access and Use of ICT by Households and Individuals*, 2019

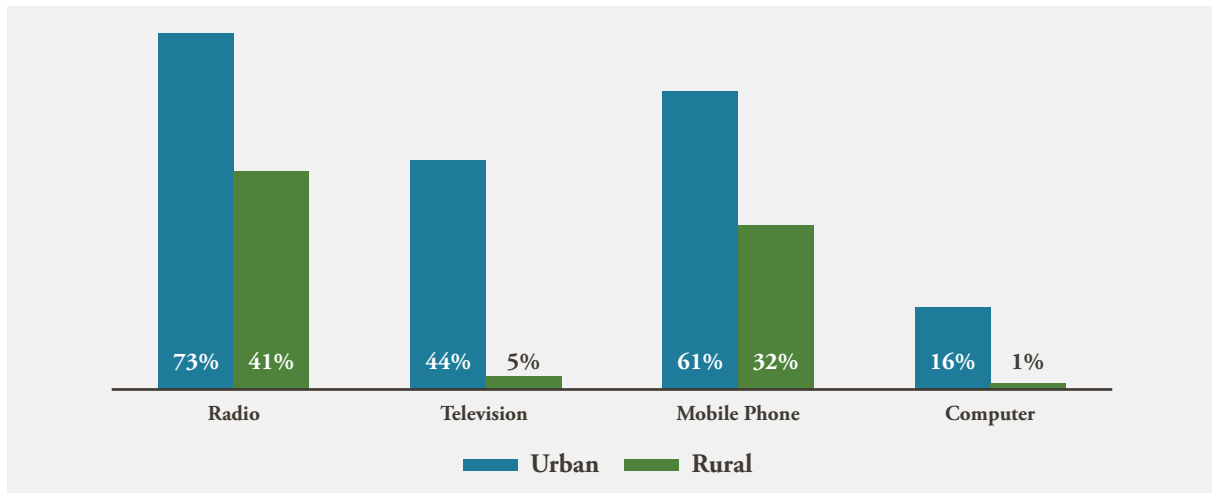
¹⁰⁰ *ibid*

¹⁰¹ Government of Malawi, *Demographic & Health Survey 2015-2016*

¹⁰² *ibid*

¹⁰³ Afro barometer, *Africa's digital and promise of e-learning*, 2020

Figure 13: Ownership of digital devices by households, rural vs urban, 2019



Source: MACRA - National Survey on Access and Use of ICT by Households and Individuals, 2019

Integration of DAT solutions in agribusinesses

Digital technology plays an important role in transforming agribusinesses. Digital technologies provide an opportunity for agribusinesses to streamline their operations, create new business models and enhance efficiency in the production and distribution of goods and services. They provide business-to-business solutions such as specialist customer relationship management (CRM), enterprise resource planning (ERP), and core banking solutions to enhance business efficiency. As such, technology is essential in running the day-to-day operations of agribusinesses. According to the FinScope MSME 2019 survey, the usage of technology and IT skills by businesses in Malawi is still in its infancy.¹⁰⁴ About 65 percent of the businesses own and use business technological equipment such as a mobile phone, website, fax machine and a computerized record-keeping system. The usage of mobile phones by businesses is the highest at 99 percent, which is largely used for communication.¹⁰⁵ Few businesses use technology-enabled equipment, such as printers, email, cash registers, and computers. Further, few businesses market their products or services via television, websites, or e-commerce platforms.

However, the use of technology across agribusinesses in the country remains low with most using basic technologies. According to the FinScope MSME 2019 survey, about 90 percent of agro-processing enterprises and 57 percent of agriculture/farming enterprises use mobile phones in their business operations.¹⁰⁶ Only one percent of the agro-processing enterprises and three percent of agriculture/farming enterprises use other digital tools.¹⁰⁷ With regards to use of technology for marketing by businesses in various sectors, the agro-processing and agriculture/farming enterprises record the lowest usage at less than one percent.¹⁰⁸ Our research also identified very few DATs providing B2B services, particularly in supply chain management.

Case study on integration of DAT solutions in agribusinesses in Malawi

Thanthwe Enterprises is an agribusiness that produces and markets fresh and meat products using climate-smart technologies. Thanthwe uses an integrated agricultural approach, which combines horticulture, agro-processing, and community outreach services. Thanthwe's uses livestock waste as compost and enrich the soils to cultivate vegetables and use vegetable by-products from horticultural products as feed for the livestock. The company's target markets include supermarkets, hotels and individuals mainly based in Lilongwe. The company has integrated technology in the marketing of its produce. It lists the products and the prices on the company's website for easy access by customers. To make their orders, the customers must create or log in to their account and place their orders through the website.

Integration of DAT solutions in government programs

The government of Malawi agriculture agencies recognize the role of DATs and have incorporated interventions in their programming. The government has particularly been working with advisory DATs such as Esoko and Airtel Mchikembe to enhance extension delivery, as well as Pula for crop insurance of farmers under the subsidy program. The Ministry of Agriculture combines radio programming with mobile and internet-based platforms, stand-alone video shows, and TV to support agricultural extension. Under the digital economy strategy, the government has also laid out several actions to incorporate DAT in their programs further. This includes the e-verification of inputs under the subsidy program, digitization of food safety certification, piloting IoT-enabled storage to monitor national storage facilities and developing an open repository of common extension content and development of an open-GIS data repository.

¹⁰⁴ FinMark Trust, Imani Development and AESA, FinScope MSME 2019 survey report

¹⁰⁵ *ibid*

¹⁰⁶ FinMark Trust, Imani Development and AESA, FinScope MSME 2019 survey report

¹⁰⁷ *ibid*

¹⁰⁸ FinMark Trust, Imani Development and AESA, FinScope MSME 2019 survey report

Case studies on integration of DAT solutions in government programs

Case study 1: Partnership between the government of Malawi and Pula¹⁰⁹

Target beneficiary: Smallholder farmers

In 2020, the government of Malawi partnered with Pula, an agricultural insurance and technology company, to insure 400,000 farmers who had been earmarked to benefit from the 2020/21 government's Affordable Inputs Program (AIP). Through the company's early yield's insurance index product, the farmers were insured against weather, pests, and diseases which would ensure they receive compensation for any losses resulting from any of these factors. By leveraging technology, the company can remotely monitor crop performance, undertake yield prediction, and provide advisory services to the farmers.

Case study 2: Partnership between the government of Malawi and Airtel Malawi¹¹⁰

Target beneficiary: Smallholder farmers

In 2015, the government of Malawi, through the Ministry of Agriculture, Irrigation and Water Development (MoAIWD), collaborated with Airtel Malawi to launch "Mchikumbwe 212", a platform for audio agriculture content and access to market information. This service offers information on maize, soya, groundnuts, poultry, sweet potatoes, and livestock in dramatized and dialogue formats. The service also provides basic financial literacy information aimed at assisting farmers in calculating gross margins and determining the profitability of their farming as a business. The cost of this service is relatively inexpensive: the first three calls are free each month, and users after that pay MWK 40 (US\$ 0.05) for the fourth call. All subsequent calls made in that month are free of charge. As of December 2016, the service had acquired almost 400,000 registered users.¹¹¹

Case study 2: Partnership between the government of Malawi and Esoko¹¹²

Target beneficiary: Smallholder farmers

Esoko is a data collection and digital agricultural services platform. Through a strategic partnership with the government, Esoko can provide services to smallholder farmers, including up-to-date information regarding weather forecasts, agronomic advice, and insurance coverage. The platform also includes market prices over SMS to smallholder farmers. The data collected via the Esoko platform is useful to the government as it helps identify the profile of smallholder farmers in terms of their needs. This, in turn, helps in designing interventions that meet the specific needs of the farmers.

Note: Esoko has partnered with Umodzi Consulting Malawi – a key contributor to this report - to implement this initiative.

¹⁰⁹ <https://allafrica.com/stories/202010160640.html>

¹¹⁰ USAID Feed the Future -Malawi Desk Study of Extension and Advisory Services, 2017

¹¹¹ M'chikumbwe 212 – GSMA 2017 Report.







¹¹² <https://esoko.com/>



Ecosystem for DATs in Malawi

While there has been some growth in the DAT landscape in Malawi, as evidenced by the establishment of DATs in the last decade, the DAT ecosystem faces several challenges that hinder the DATs from successfully scaling and attaining sustainability. This section covers six key components of the digital agriculture ecosystem in Malawi, outlining each component's status and key gaps and challenges that need to be addressed to enhance scale and sustainability.

Figure 14: Components of the DAT ecosystem

	1 Entrepreneurial culture	Refers to attitudes and perception towards entrepreneurship in the country. The digital agriculture ecosystem benefits from a culture that encourages risk taking.
	2 Business support environment	Availability and quality of ecosystem support organisations such as incubators, accelerators and hubs providing business, financial and technical advisory to DATs.
	3 Human capital	Availability of relevant talent and capacities including digital skills needed for operation of DATs.
	4 Access to finance	Availability of various forms of financing – grant, debt, and equity suitable to various stages and needs of DAT companies.
	5 Infrastructure	State of digital and physical infrastructure relevant for growth of DATs.
	6 Policy and Regulations	The key policies and regulations that can influence digital agriculture technology in the country.

Component 1: Entrepreneurial culture

Despite increased entrepreneurship activities in Malawi over recent years, the country has a generally weak entrepreneurship ecosystem, as depicted by the low ranking in multiple global innovation and entrepreneurship indices. The Micro, Small and Medium Enterprises (MSME) sector engages almost 92 percent of the Malawian population in the form of self-employment, family, or partnership businesses.¹¹³ As of 2019, there were about 1.6 million MSMEs in the country – majority of whom are micro (74 percent) and rural-based (78 percent) enterprises.¹¹⁴ The country ranked 133 out of 137 countries in the 2019 Global Entrepreneurship Index (GEI),¹¹⁵ 128 out of 141 in the Global Competitiveness Index (GCI),¹¹⁶ and 137 out of 158 in the Global Innovation Index (GII).¹¹⁷

“With limited formal employment opportunities, the entrepreneur spirit is high as more young people get out of college, although starting off is a big challenge for most of these young people due to lack of start-up capital”
USAID implementing partner

“The public has realized the need to venture into entrepreneurship, Malawi still lags behind in realizing solutions in agriculture sector thus the public is supporting new innovative ideas to solve challenges in the sector”
USAID implementing partner

“While young people are buying into innovation and entrepreneurship, the cultural set up perceives entrepreneurship as high risk and for the less educated”
ESO

According to the rankings, although entrepreneurship is generally perceived positively, especially among youth, a high percentage of the population is overly risk averse. It lacks adequate start-up skills and relevant human capital, limited access to networking opportunities as well as low adoption of technology. The low score for technology absorption implies that the perceived usefulness of technology as a driver of entrepreneurship in Malawi is low. This also indicates that most entrepreneurship activities in Malawi are not technologically driven. Further, the rankings point to limited availability of risk capital, which hinders growth and scale-up of the entrepreneurship ecosystem. Additionally, the prevailing cultural norms in Malawi do not promote entrepreneurship activities since most people prefer government jobs and do not see the benefits of entrepreneurship.¹¹⁸

¹¹³ Journal of Contemporary Management: Examining the Effectiveness of Entrepreneurship Policy Implementation in Malawi, 2019

¹¹⁴ FinMark Trust, Imani Development and AESA, FinScope MSME 2019 survey report

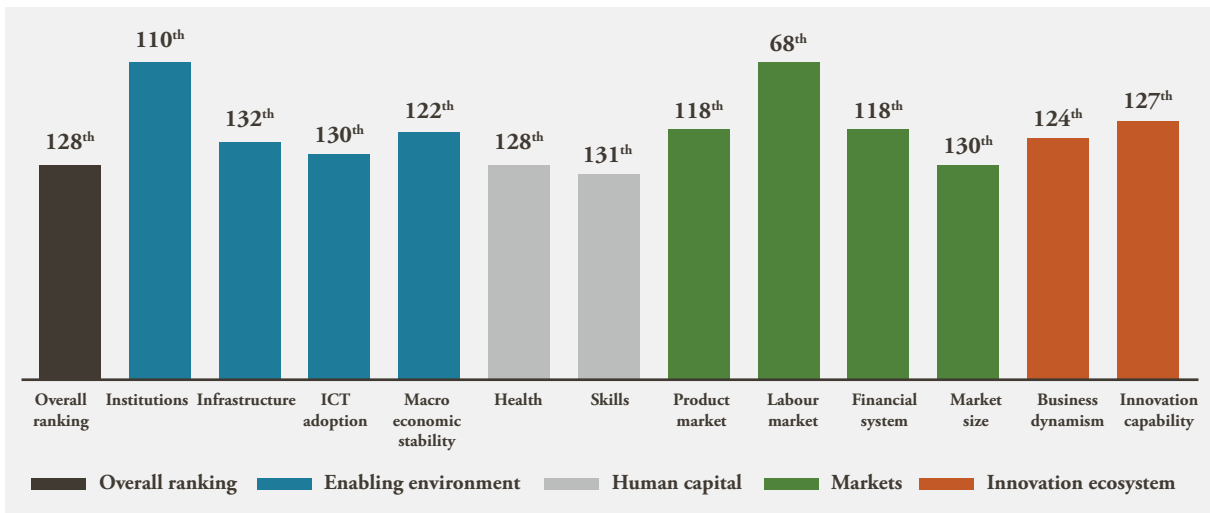
¹¹⁵ The GEI rankings is based on three sub-indices – entrepreneurial attitudes, entrepreneurial abilities, and entrepreneurial aspirations. The country scored 11.6/100 points in GEI ranking.

¹¹⁶ The GCI rankings takes into consideration twelve pillars including ICT adoption, innovation capability, skills, health, product market, infrastructure, institutions, financial system, macroeconomic stability, labor market, business dynamism and market size

¹¹⁷ GI takes into consideration five pillars including ICT, skills, R&D, industry, and finance

¹¹⁸ World Bank Group – Social Enterprise Ecosystem Country Profile, 2017; Insights from interviews with key stakeholders

Figure 15: Malawi Rankings across the 12 pillars of GCI, 2019



Component 2: Business support environment

Most ecosystem support organizations (ESOs) in Malawi are nascent and cater to the needs of both traditional SMEs and digital start-ups resulting in high competition for support services. This study identified about 18 incubators, accelerators and hubs supporting the innovation

“Incubators and accelerators are still few mostly based in the major cities resulting in low impact. Further, there is a need to link these organizations with other players outside the country for peer learning to improve on their capacity”
USAID implementing partner

and entrepreneurship space in Malawi, mostly established in the last ten years. Some examples include InCube8, mHub, Mzuzu Entrepreneur Hub, Synergi, Accesserator, Kweza Arts, AfriCUBE, Malawi Fruits, and Incubate Malawi. These organizations provide services ranging from business model refinement, business plan development, market access, mentorship, financial management training and investment readiness support, as well as networking opportunities and co-working spaces. A few of these organizations like Mzuzu Hub, InCube8, and Growth Africa also provide grant funding to enterprises participating in their programs.

Most of the support provided is sector agnostic and concentrated in the two main cities in Malawi, thus limiting the scale of impact. While a few sector-specific ESOs, such as Malawi Fruits and Centre for Agricultural Transformation (CAT), that cater to agriculture-focused enterprises have emerged, most of the ESOs provide support to entrepreneurs working in various sectors. Such generic support may not be effective especially for product testing and refinement.¹¹⁹ Further, most of the support is concentrated in Lilongwe and Blantyre where most ESOs are based. However, a few ESOs, such as Mzuzu Entrepreneur Hub, have expanded outside the two main cities. The country also lacks enough ESOs to support digital-based innovations with few technology-focused hubs, such as mHub and TechnoLAB.



Photo Credit: Pixels

¹¹⁹ Insights from interviews with key stakeholders

Case studies of selected business support organizations

mHub

mHub is Malawi's first technology and innovation hub located in Lilongwe, but with a co-working space in Blantyre, Malawi, as well as in Lusaka, Zambia.¹²⁰ It is a social enterprise that spearheads the development of sustainable local technology solutions through nurturing upcoming entrepreneurs with business and technical skills. The hub facilitates structured mentorship opportunities for young entrepreneurs by providing them with a platform for engaging with experts and researchers in technology and business. The hub also provides a platform that allows the entrepreneurs to exchange ideas with academia, industry, researchers, and the community to develop relevant technology solutions.

mHub also provides a co-working space that allows young entrepreneurs to engage in innovative thinking, and interact, exchange ideas and network with other entrepreneurs and potential customers. Furthermore, mHub trains young entrepreneurs. As of 2021, mHub has trained over 40,000 youth in ICT and business skills.¹²¹

Malawi Fruits

Malawi Fruits was established in 2011 to support the establishment and growth of sustainable agriculture-focused community businesses in the north of Malawi through the provision of start-up finance, training, and capacity building. Malawi Fruits works in a three-stage development program: supporting the farmers to grow cash crops for the first time, irrigating the land so that farmers can grow two or more crops per year, and providing crop processing facilities to add value to the crops and further improve the income of farmers. It uses a social enterprise model to initiate and operate commercial operations in crop growing and processing. The training and support to smallholder farmers is delivered by a social enterprise partner known as Modern Farming Technologies (MFT). Smallholder farmers contract with MFT to supply farm equipment and then pay for the equipment over time using the proceeds from their increased crop sales. Through Malawi Fruits' innovative rent-to-own model, farmers can get Poly tunnels and solar-powered irrigation pumps on an affordable basis. The productive assets (farm equipment, irrigation pumps and Poly tunnels) allow the farmers to grow crops and earn income throughout the year and become resilient in climate change challenges.

Working with donors, academia has been playing an important role in developing business support organizations in Malawi. For instance, United Nations Children's Fund (UNICEF) Malawi partnered with the University of Malawi/Malawi Polytechnic's Chichiri Campus in Blantyre to establish the Innovation Hub (Mphika wa Luso). The Hub is based at the University of Malawi. It provides a platform for youth entrepreneurs to interact, exchange ideas, and collaborate with academia and industry stakeholders on innovations that address local challenges.¹²² Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and New Partnership for Africa's Development (NEPAD) have also provided support to various private technical colleges to establish incubators.

While there are various events and networking platforms for stakeholders in the innovation and entrepreneurship ecosystem, these lack a multi-stakeholder and action-oriented approach. Malawi has seen an emergence of various networking assets (events, conferences, and networking groups), such as the Start-up Grind Blantyre (a series of monthly networking events where entrepreneurs within Blantyre meet to share successes and failures of their start-ups). The annual Entrepreneurship Stakeholders Forum (organized and hosted by Mzuzu Entrepreneur Hub),

"Most of the entrepreneurship focused events are not designed in a way to meet the needs of the entrepreneurs/innovators they are just information events not networking events. There is lack of inclusivity in most of the conferences and events"
ESO

"There are a number of events and conferences in the country, the only challenge is most are just talk shows with minimal implementation of outcomes"
USAID implementing partner

the annual Global Entrepreneurship Week Malawi, the annual Youth Entrepreneurship Summit and the recently concluded Innovation Summit are other examples. ESOs such as InCube8 and mHub also provide networking opportunities via the co-working spaces where entrepreneurs meet, exchange ideas, and collaborate. InCube8 has also partnered with local venture capital firms and public funding organizations to offer networking opportunities via industry nights, breakfast meetings and cocktail gatherings. Interactions with stakeholders during the study, however, highlighted that most of the networking platforms lack a multi-stakeholder approach and fail to drive action-oriented discussions that focus on solving challenges in the ecosystem.

Donors have been the most prominent source of funding for business support organizations, although some ESOs have also adopted internal revenue-generating structures. Donors and philanthropic organizations such as Tony Elumelu Foundation, GIZ, UNICEF, and the United Kingdom's Foreign, Commonwealth and Development Office (FCDO) have been at the forefront of providing grant funding for running accelerator and incubator programs in the country. Additionally, the ESOs incorporate other revenue structures such as co-working space fees, conference fees and consultancy services. For instance, InCube8 is planning to adopt a hybrid revenue-generating model consisting of co-working space fees and consultancy/business advisory fees. It will establish CUBE, a co-working space known, where members and non-members will pay rental fees for the co-working space, and InCube8 will also offer business development services, such as financial management consultations, business plan development and business advisory services.¹²³

¹²⁰ mHub Website - <https://mhubmw.com/>

¹²¹ mHub Website - <https://mhubmw.com/>

¹²² <https://www.austinmadinga.com/unicef-innovation-hub-opens-in-blantyre/>

¹²³ Insights from interviews with key stakeholders

Component 3: Human capital

The supply of digital skills in the country is low, affecting the operations of DATs as they face competition for specialized digital skillset from well-established companies like MNOs. As depicted in the global entrepreneurship and innovation rankings, the scores for human capital and start-up skills are very low, implying that the country's supply of entrepreneurship skills (including digital skills) is inadequate. The poor human capital and inadequate start-up skills reflect the country's quality of education. Malawi ranks 142 out of 174 countries in the 2020 Human Capital Index (HCI) rankings with a score of 0.41.¹²⁴ This implies that a child born in Malawi today will be 41 percent as productive when she attains the age of 18 as they could potentially be if they enjoyed complete education and full health.¹²⁵ Children in Malawi are only able to complete about nine years of schooling by the time they attain the age of 18. As such, most Malawian entrepreneurs are not educated beyond secondary school.¹²⁶ In 2020, Malawi was ranked 127 out of 134 countries by the Portulans Institute Network Readiness Index. Notably, Malawi was ranked 125 under the index's people pillar, which measures the usage and skills of digital technologies by individuals, businesses, and governments.

"The graduates from the universities lack practical skills needed to work in tech businesses and thus need a lot of training and hand holding support"
DAT provider

"We have to take between 6 months and 1 year to train fresh graduates before fully onboarding them"
DAT provider

There are very few digital-focused centers or programs for training entrepreneurs in the country. There is growing evidence of a digital skills deficit, where many people have basic skills but lack important digital skills required for tech-based entrepreneurship. Consequently, many individuals and businesses are unable to leverage digital platforms and services and launch digital solutions.¹²⁷ Further, with the persistent rural-urban digital divide, as well as a gender divide in access and use of digital technology, digital skills remain significantly lower amongst the rural population and women.

Public, private and development organizations have introduced various interventions to enhance digital skills in the country. The government, for example, introduced computer studies as an examinable subject in the Malawian Secondary School curriculum in 2005. However, only three percent of students were able to access computers as of 2015.¹²⁸ Access rate to computers is even much lower for students in rural areas. Other challenges affecting the rollout of the ICT curriculum in secondary schools include inadequate teacher capacity, limited opportunities for professional development among teachers, lack of access to electricity and supportive ICT infrastructure, poor internet connectivity, and a limited number of computers, tablets, and other devices.¹²⁹ Apart from the government initiatives, there are also donor-funded and private sector initiatives that aim to improve the digital skills uptake in Malawi. In 2017, the World Bank approved US\$72.4 million under the Malawi Digital Foundations Project to help Malawi to build the digital foundations needed to connect to the global digital economy.¹³⁰ The project aims to expand internet access by leveraging private sector infrastructure investment by making it more affordable and available in all parts of the country. The project also aims at improving infrastructure and skills necessary for the government to scale up programs, such as digital skills training for the youth.

Public, private and development organizations have introduced various interventions to enhance digital skills in the country. The government, for example, introduced computer studies as an examinable subject in the Malawian Secondary School curriculum in 2005. However, only three percent of students were able to access computers as of 2015.¹²⁸ Access rate to computers is even much lower for students in rural areas. Other challenges affecting the rollout of the ICT curriculum in secondary schools include inadequate teacher capacity, limited opportunities for professional development among teachers, lack of access to electricity and supportive ICT infrastructure, poor internet connectivity, and a limited number of computers, tablets, and other devices.¹²⁹ Apart from the government initiatives, there are also donor-funded and private sector initiatives that aim to improve the digital skills uptake in Malawi. In 2017, the World Bank approved US\$72.4 million under the Malawi Digital Foundations Project to help Malawi to build the digital foundations needed to connect to the global digital economy.¹³⁰ The project aims to expand internet access by leveraging private sector infrastructure investment by making it more affordable and available in all parts of the country. The project also aims at improving infrastructure and skills necessary for the government to scale up programs, such as digital skills training for the youth.

Projects/interventions supporting digital skills development

Africa Drone and Data Academy

In 2020, UNICEF launched the Africa Drone and Data Academy to equip youths in the country with skills to develop, pilot and integrate drones into a supply chain system as well as to analyze data from the drones.¹³¹ In this project, the Malawi University of Science and Technology (MUST) is partnering with Virginia Tech to provide students with specialized training in drone technology. Between January 2020 and July 2021, about 140 students were enrolled in a 10-week course in six cohorts where they gained a Certificate in Drone Technology (CDT) from Virginia Tech after successfully completing the program. The first cohort of students came from Malawi and other African countries. The program has also established its first campus (the Drone & Data Academy) located in Lilongwe, Malawi. The academy provides technology education for post-undergraduate African students in the physics of drone flight, communications, mechatronics, autonomy, data analysis, GIS, and entrepreneurship.¹³² The curriculum offered at the academy has been tailored to the needs of young entrepreneurs operating in the global south. It consists of a module on drone basics, a module on drone logistics and planning, and a module on drone data, GIS, and analytics. In 2022, the academy will run a two-year master's degree program in drone technology in conjunction with MUST.

Financial Inclusion and Entrepreneurship Scaling (FINES) project

In 2020, the World Bank approved US\$86 million under the Financial Inclusion and Entrepreneurship Scaling (FINES) project in Malawi, with a focus on building strong capabilities that would improve the capacity and knowledge of entrepreneurs to leverage technology in business.¹³³ The project implementation is divided into three stages.¹³⁴ In the first stage, a large number

¹²⁴ World Bank - The Human Capital Index, 2020

¹²⁵ Malawi Human Capital Index, 2020

¹²⁶ WEF, The Global Competitiveness Report, 2019

¹²⁷ Insights from interviews with key stakeholders

¹²⁸ Centre for Youth Development - Improving Access to ICT Program in Malawi - Centre for Youth Development, 2021

¹²⁹ Digitalization in teaching and education in Malawi, ILO 2021 report

¹³⁰ Digitizing Malawi for a Brighter Digital Future, World Bank 2017

¹³¹ <https://www.unicef.org/malawi/african-drone-and-data-academy-malawi>

¹³² <https://www.unicef.org/innovation/AfricanDroneAcademy>

Projects/interventions supporting digital skills development

of SMEs are provided with generic training programs, mainly personal initiative skills and light touch mentoring. The SMEs that show improvement (measured by an objective assessment after the program) graduate to the second stage, where they are offered specialized business skills training and one-on-one consulting. The SMEs that successfully complete the second stage move to the third stage, where they are provided with financial support and linked to the markets.

Skills for a Vibrant Economy (SAVE) Project

In 2021, the World Bank approved US\$100 million to improve skills development programs in Malawi under the Skills for a Vibrant Economy (SAVE) Project.¹³⁵ By working in collaboration with the industry and private sector, the project will provide skills development support through digital skills programs offered by nine higher education institutions, seven national technical colleges, and about 30 skills development institutions in Malawi. The project targets about 45,000 university students and 65,000 technical and vocational students, with most of the target beneficiaries being female students.¹³⁶

Component 4: Access to finance

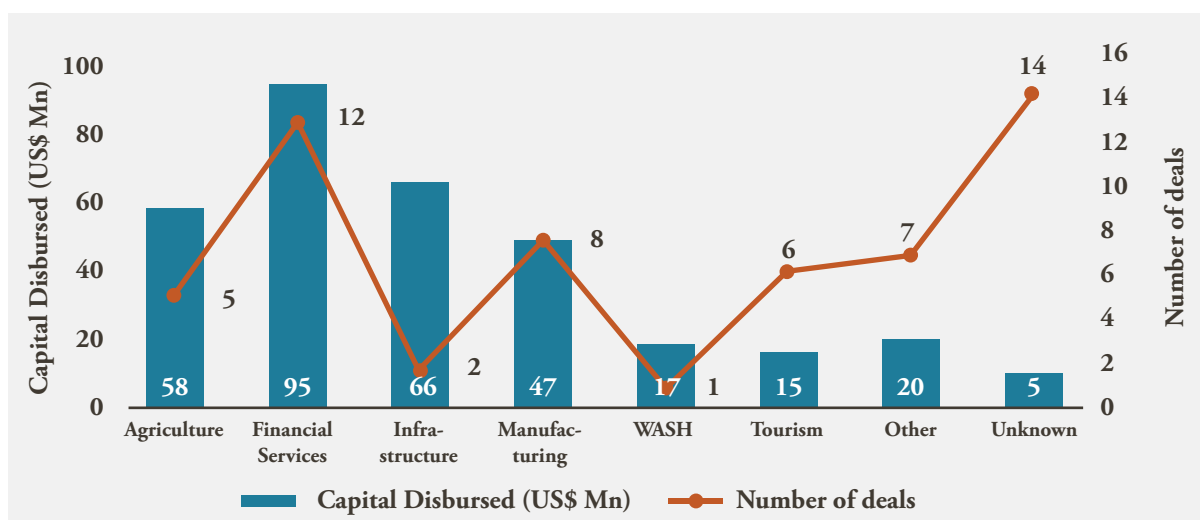
Access to formal finance remains a major challenge facing agribusinesses in general, with high interest rates and collateral requirements that hinder uptake. The level of domestic market lending to the private sector, particularly in the agriculture sector remains low. Bank lending to the agriculture and allied sector, for example, accounted for only 17 percent of total bank lending in 2020.¹³⁷ The high cost of finance, which ranges between 20-40 percent,¹³⁸ make it challenging for companies with commercial debt to generate positive returns. Further, banks in Malawi often have high collateral requirements that many agribusinesses, including DAT providers, are not able to meet.¹³⁹ This challenge is greater and more significant for youth agribusinesses who lack networks with capital providers.¹⁴⁰ As such, most DATs are financed through a combination of personal savings and funds from friends and families.¹⁴¹

“Our main sources of capital are personal and funds from friends, we have not raised any external financing so far. MFIs and banks have very lengthy procedures as well as collateral requirements which make it hard to access credit.”
DAT provider

“Few capital providers provide financing to DATs. Since we are new to the Malawian market there is unwillingness by financial institutions to provide financing to us”
DAT provider

The level of impact investments – which is a major source of high-risk capital - in the country is low. While up-to-date estimates on the size of the impact investing market in Malawi do not exist, a 2016 study by the Global Impact Investing Network (GIIN) mapped 68 impact investment deals valued at US\$ 324 million reported in Malawi between 2005 and 2015.¹⁴² This represented less than two percent of the total impact investing in Southern Africa and less than one percent of the banking portfolio. This is attributed to the low number of impact investors in the country, including Accesserator, Kweza Equity Partners and AgDevco. Agriculture accounted for 40 percent of the total deals and only 18 percent of the total value of investments, primarily deployed into agro-processing and input producing companies.¹⁴³

Figure 16: Impact investments in Malawi by sector, 2005-2015



Source: GIIN - The Landscape for Impact Investing in Southern Africa

¹³³ World Bank FINES project appraisal document

¹³⁴ Brookings – Funneling support to promising enterprises in developing countries, 2021

¹³⁵ World Bank press release - Malawi: World Bank Approves \$100 Million to Improve Skills Development Programs, 2021

¹³⁶ ibid

¹³⁷ Reserve Bank of Malawi: Annual Report 2020

¹³⁸ FinMark Trust: Access to Finance in Malawi, 2014

¹³⁹ Insights from interviews with key stakeholders

¹⁴⁰ ibid

¹⁴¹ ibid

¹⁴² GIIN: The Landscape for Impact Investing in Southern Africa, 2016

¹⁴³ ibid

Access to early-stage finance and especially patient capital necessary to grow and scale DAT models is limited, with very few deals reported. Malawi lacks angel investors and angel investor networks that can provide seed funding

*“There is lack of angel investors and venture capital firms that provide funding and mentorship to early-stage tech-based enterprises like us”
DAT provider*

and mentorship for early-stage enterprises. This hinders the growth of homegrown DATs and leads to an over-reliance on grant funding from donors.¹⁴⁴ Some of the incubators and accelerators, such as FasterCapital, Growth Africa, Mzuzu Hub and mHub provide seed funding ranging between US\$ 5,000 and 30,000.

The table below presents investment deals made by early-stage capital providers into DATs with operations in Malawi in the last five years.

Table 5: Example of DAT investments in the last five years

#	Company Name	Description	Investor	Funding type	Amount (US\$ million)
1	Farmers World Limited (FWL)	In 2019, AgDevCo supported FWL in rolling out its innovative ‘agronauts’ program – an app and web-based platform engaging 25,000 farmers. Leveraging technology, ‘agronauts’ advises registered farmers on crop-specific agronomic practices and analyses sales, customer satisfaction and extension support and training requirements.	AgDevCo	Technical Assistance	0.5
2	GreenFingers Mobile	The South headquartered agritech offers a mobile-first software-as-a-service (SaaS) technology platform that manages and finances large groups of smallholder farmers. The company operates in 4 other countries, including Malawi. In 2018, the company raised undisclosed equity funding from Hivos Fund to scale its operations across different African countries.	The Hivos Food & Lifestyle Fund	Equity	Undisclosed
3	Aerobotics	Aerobotics is currently focused on building tools for fruit and tree farmers. Using artificial intelligence, drones and other robotics, its technology helps track and assess the health of these crops, including identifying when trees are sick, monitoring pests and diseases, and analytics for better yield management. The company is headquartered in South Africa with operations in different African countries, including Malawi.	Naspers Foundry	Equity	17
4	Pula	In 2021, Pula, a Kenyan based insurtech start-up raised series A funding. Pula specializes in digital and agricultural insurance to de-risk millions of smallholder farmers delivers agricultural insurance and digital products to help smallholder farmers navigate climate risks, improve their farming practices, and bolster their incomes over time. The company operates across 13 African markets, including Malawi.	TLcom Capital, Women’s World Banking	Equity	6

¹⁴⁴ Insights from interviews with key stakeholders

Grant funding by donors is the primary source of external funding for digital agriculture innovators/interventions in the country. Donors, such as United Nations Development Programme (UNDP), FAO, Norwegian Agency for Development Cooperation (NORAD) World Bank, GIZ and Swiss Agency for Development and Cooperation (SDC), have launched multiple interventions in the last five years to drive development and uptake of DATs. Some of the interventions and projects include Scaling up Radio and ICTs in Enhancing Extension Delivery II, R4 Rural Resilience Initiative (R4), Agriculture Sector Wide Approach (ASWAP -SP II) and the More Income and Employment in Rural Areas of Malawi (KULIMA-MIERA) program. The largest proportion of donor interventions has focused on enhancing the delivery of agricultural information services through radio, television, text messages and apps.

Case study on donor funded DAT interventions

Scaling up Radio and ICTs in Enhancing Extension Delivery II (SRIEED II)

Launched in 2020, SRIEED II provided Farm Radio Trust (FRT) with Euros 1.7 million to enhance agricultural extension. The objective of the project is to increase access and coverage of agricultural extension services for small-scale farmers using radio and other communication tools. This new project has a broader focus and pursues the following objectives:

- Expanding and improving the quality of the existing agricultural information services using ICT and multimedia.
- Increasing the number of farmers entering the agricultural market through digital platforms.
- Improving the policy context by, among other things, increasing public and private investment in digital agricultural information (radio and multimedia).

The project aims to reach out to 3.5 million smallholder farmers and provide them with agricultural extension services. There is cooperation with the Ministry of Agriculture, private companies, and non-governmental organizations for national awareness campaigns. FRT will also collaborate with the Flemish institute for technological research to support classical agricultural information with satellite images via remote sensing data.

Financial Inclusion and Entrepreneurship Scaling (FINES)

Launched in 2021, FINES is a US\$ 86 million project funded by the World Bank. The project seeks to facilitate commercial credit to SMEs, and patient capital and longer-term loans to viable tech start-ups channeled through the Malawi Agriculture and Industry Investment Corporation (MAIIC). MAIIC is a local development finance institution (DFI) developed by the government in collaboration with the private sector. MAIIC will invest equity, quasi equity, and other flexible debt instruments in innovative high growth potential start-ups and SMEs leveraging other investors for risk sharing. Investments will be made either directly into the enterprises or indirectly through investment contributions in seed funds, accelerators' follow-on funds, and VC funds investing in high-growth SMEs. MAIIC will also leverage the ecosystem to develop and fund a pipeline of innovative high, growth potential start-ups and SMEs. MAIIC will partner with ecosystem providers (incubators, accelerators, hubs, and other local or foreign entities based in Malawi) to conduct training and boot camps to help foster more innovative firms. Concessional loans of no more than US\$ 30,000 will be provided to MSMES graduating from ecosystem programs.



Photo Credit: Pshere

Component 5: Infrastructure

Malawi's road and rail networks are inadequate both in quality and extent, significantly affecting the agriculture sector. Malawi has 15,415km of classified roads, out of which 28 percent is paved, and 72 per cent of the network is earth or gravel.¹⁴⁵ Road transport remains the primary

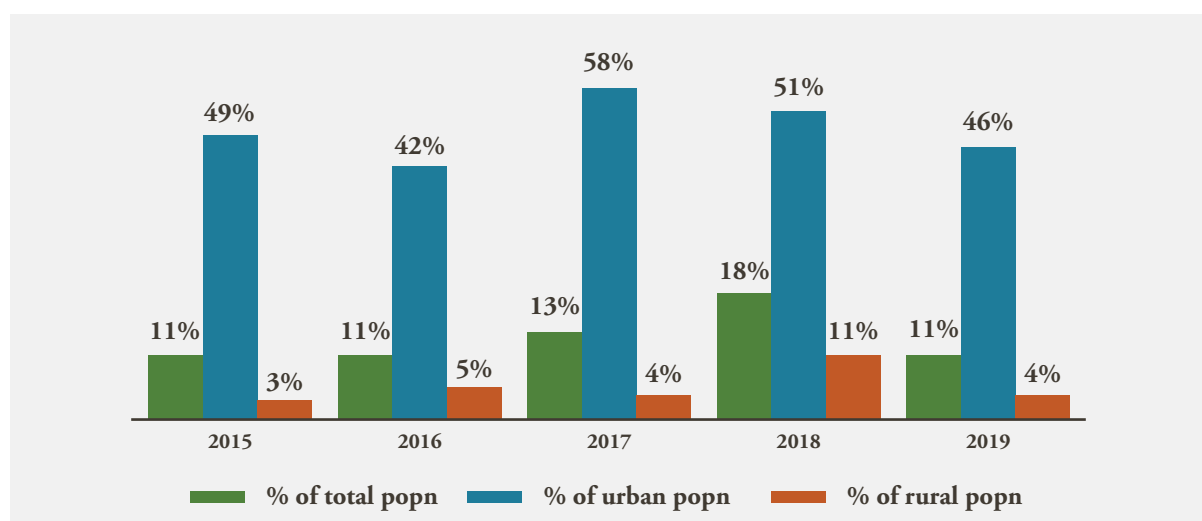
"The road infrastructure in the country is very poor. Onboarding customers in the far north of the country is a hurdle, thus the company's services are mostly concentrated in Central Malawi"
DAT provider

mode of transport in Malawi, handling more than 70 percent of the internal freight traffic and 99 percent of passenger traffic, with 90 percent of international cargo traffic also using roads despite the long distances to ports.¹⁴⁶ However, most district-level roads are still in poor condition and are vulnerable to changes in climate, particularly in rural areas. Transport costs in Malawi take up an estimated 55 percent of the cost of agricultural production compared to 17 percent in other developing countries.¹⁴⁷ The poor road infrastructure impacts last-mile logistics for smallholder farmers creating both an opportunity and challenge for market linkage and transport/logistic DATs.

Malawi has made minimal progress in the electrification rates, particularly in the rural areas with the high cost of electricity also hindering usage. Malawi is one of the least electrified countries globally. Access to electricity was reported at 11.2 percent of the total population in 2019, with rural and urban electrification rates estimated at four percent and 46 percent, respectively.¹⁴⁸ The decline in electricity rates between 2017 and 2019 can be attributed to system-wide load shedding as low rainfall left the system unable to meet demand.¹⁴⁹

Local electricity production - estimated at 485 MW - falls short of local demand - estimated to reach 1,873 MW in 2030¹⁵⁰ - with costly and slow grid extensions excluding non-urban populations. Renewable sources contribute to the largest proportion (76 percent) of energy supply, primarily made up of hydropower being the main source at 91 percent, solar energy at 6 percent and bioenergy at 3 percent.¹⁵¹ The cost of electricity – estimated at US\$ 0.12/kWh as at June 2021¹⁵² - also remains unaffordable for many people with most of the population only using electricity for lighting.

Figure 17: Overview of electricity rates in Malawi, 2015-2019



Source: World Bank Development Indicators

The country has made significant advancements in its telecommunication infrastructure with enhanced broadband coverage over the last decade. Thirty one percent of the population currently lives within 10km of fiber nodes, and nearly all population lives within 50km of fiber nodes.¹⁵³ Most of the population has access to 2G networks, while 78 percent of the population has 3G coverage, and 85 percent has access to 4G signal.¹⁵⁴ Through the Malawi Digital Economy Strategy 2021-2026, the government has committed to increasing broadband coverage to 95 percent by 2026. It also plans to increase broadband speeds

"A lot of investment is being done in infrastructure developments such as cables, fiber, towers, among others. MNOs are also utilizing their competitors to enhance availability of services in rural areas. Generally, there is tremendous investment and improvement in data infrastructure in Malawi"
MNO

"The government is focused on addressing gaps in technology infrastructure e.g., through installation of fiber networks, lobbying MNOs to reduce data bundles, and drafting of digital policies"
Government agency

¹⁴⁵ Malawi Roads Authority: Strategic and Business Plan, 2017-2022

¹⁴⁶ ibid

¹⁴⁷ ibid

¹⁴⁸ World Bank Development Indicators, 2019

¹⁴⁹ Rocky Mountain Institute - Malawi Sustainable Energy Investment Study, 2019

¹⁵⁰ World Bank: Malawi Economic Monitor – Improving service delivery in energy and water, 2020

¹⁵¹ International Renewable Energy (IRENA): Malawi Energy Profile, 2018

¹⁵² <https://www.globalpetrolprices.com/>

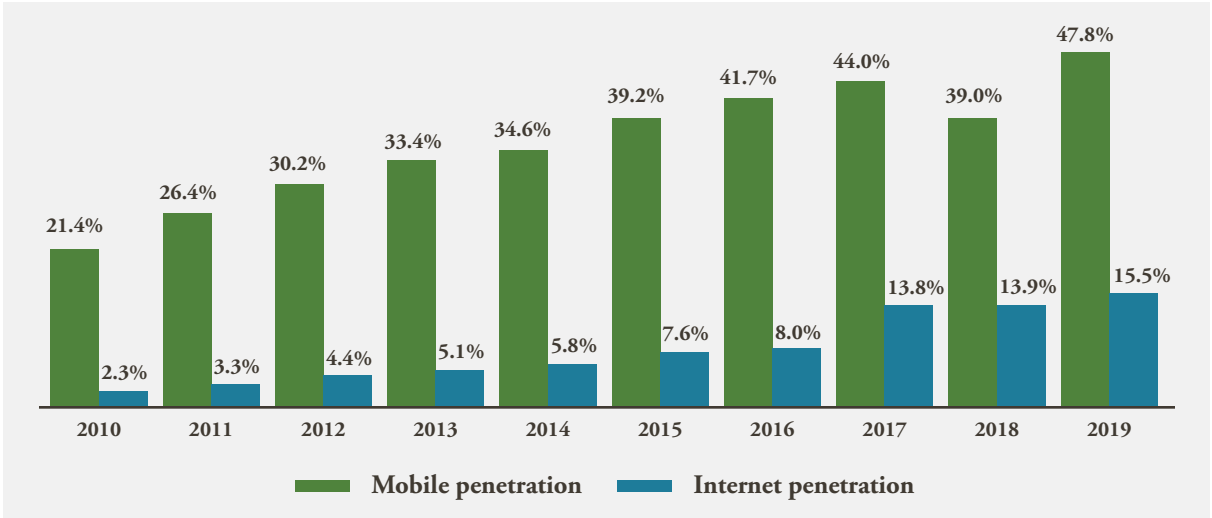
¹⁵³ World Bank: Malawi Economic Profile – Investing in Digital Transformation, 2021

¹⁵⁴ Malawi Digital Economy Strategy – 2021-2026

from 1Mbps in 2018 to 2.3Mbps in 2023 for urban areas and 0.5Mbps to 1.2Mbps for rural regions.¹⁵⁵ Although the country has decent levels of mobile network coverage, fixed-line coverage is low at only 6 percent of the population.¹⁵⁶ This implies that only a very small proportion of the population uses internet at home and at their workplaces. Fixed line broadband has substantial advantages such as significantly lower prices per unit of data. It is also often offered on an unlimited basis, resulting in high usage per connection, which enables access to a wider range of services. This makes it essential in bridging the digital divide.

Despite increase in the last decade, Malawi has one of the lowest mobile and internet connectivity rates globally. Malawi had an estimated 8.9 million mobile subscribers and 3.4 million internet users in 2019.¹⁵⁷ Airtel and Telecom Networks Malawi (TNM) Limited are the dominant players in the telecommunication space accounting for 71 percent and 61 percent, respectively, of total mobile subscribers.¹⁵⁸ Mobile phone penetration grew by more than 120 percent, while internet penetration grew by more than 570 percent between 2010 and 2019, as shown in the figure below.¹⁵⁹ Malawi has also witnessed an improvement in the type of devices used. In 2017, device ownership stood at 10.2 percent for smartphones and 29.6 percent for feature phones compared to 0.4 percent for smartphones and 21.4 percent feature phone ownership in 2010.¹⁶⁰ Mobile and internet connectivity rates in the country are, however, lower than the Sub-Saharan African average that stood at 87 percent and 29 percent respectively in 2019.¹⁶¹

Figure 18: Mobile and internet penetration rates in Malawi, 2010-2019



Source: World Bank Development Indicators

The high cost of devices and digital services, low electricity rates as well as the unreliability of the networks have contributed to the low penetration rate.¹⁶² Affordability of devices such as mobile phones, laptops and tablets is

“High costs of data bundles, slow internet connection and limited access to electricity sources are some of the challenges that discourage our members from using digital services”
Farmer Cooperative

a significant barrier to uptake of digital services. The cheapest mobile device in Malawi costs 24 percent of an average Malawian’s monthly income against the recommended rate of 5 percent by the United Nations (UN) Broadband Commission.¹⁶³ Further, data prices constitute a significant proportion of monthly income with one gigabyte (GB) of data costing an average of US\$ 4.76 and where the cost of 20GB plan exceeds monthly Gross National Income (GNI) per capita, making it unaffordable for most Malawians¹⁶⁴. Taxes and tariffs, which account for 23 percent of the device purchase price and 26 percent of data cost, are the main driver of the high cost of devices and data prices.¹⁶⁵ Additionally, as highlighted earlier, electricity rates, particularly in rural areas are low which hinders uptake of digital services. Further, network quality is volatile in most areas as many cables running cross-border consistently require maintenance. Most of the rural population is also yet to enjoy high-speed networks as underserved communities are not commercially viable for network operators. To extend and enhance connectivity in the underserved areas, in 2020, the government set up a Universal Service Fund whose objective is to provide subsidies as incentives for MNOs to give access to areas that are not economically viable or that are marginally viable without subsidies.¹⁶⁷

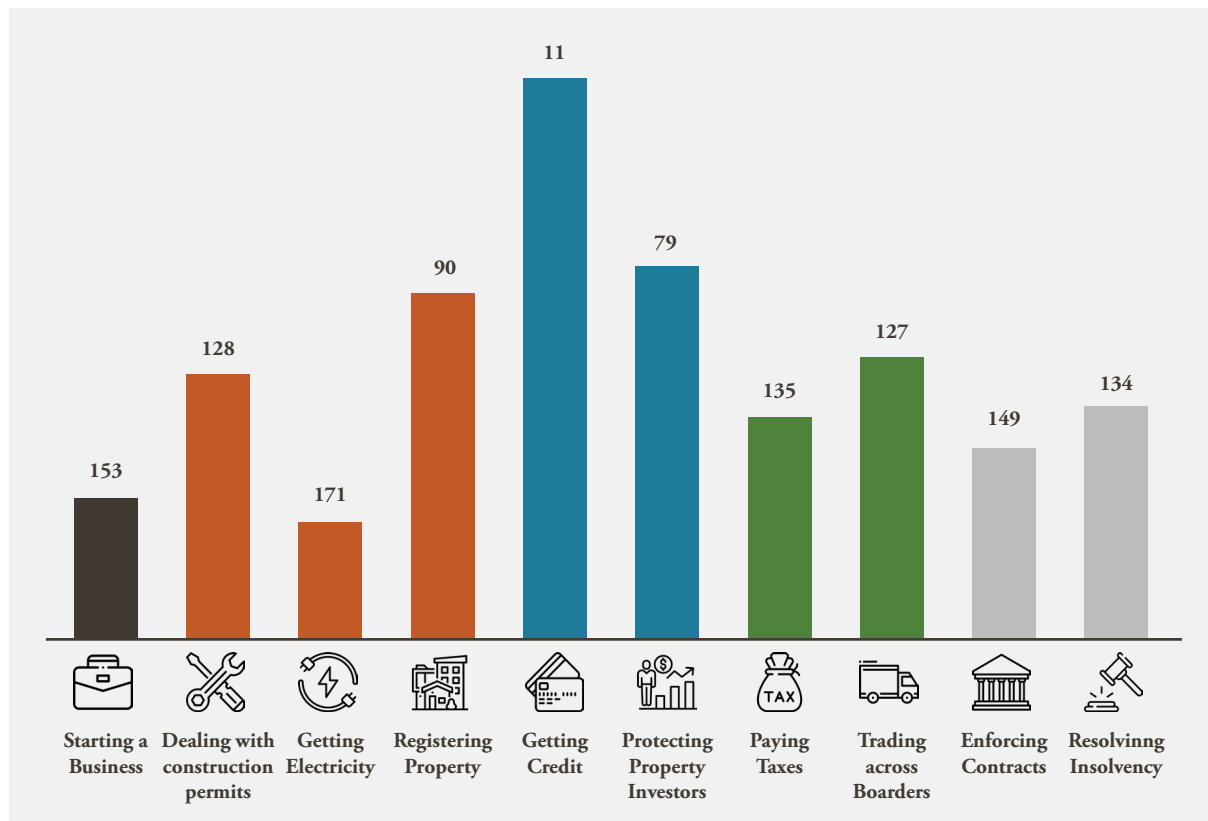
¹⁵⁵ Malawi Broadband Strategy, 2019-2023
¹⁵⁶ Malawi Digital Economy Strategy – 2021-2026
¹⁵⁷ World Bank Development Indicators, 2019
¹⁵⁸ MACRA: National Survey on access and use of Information Communication Technologies by households and Individuals in Malawi, 2019:
 Note- Most subscribers are registered to more than one network
¹⁵⁹ World Bank Development Indicators, 2019
¹⁶⁰ GSMA: Malawi Digital Identity Country Report, 2019
¹⁶¹ World Bank Development Indicators, 2019
¹⁶² Insights from interviews with key stakeholders
¹⁶³ Malawi Digital Economy Strategy – 2021-2026
¹⁶⁴ World Bank: Malawi Economic Profile – Investing in Digital Transformation, 2021
¹⁶⁵ ibid
¹⁶⁶ Malawi Communications Act, 2016

While several institutions provide access to open platforms for agricultural data, this is outdated and not presented in an easily retrievable form. Donors and development institutions such as World Bank, AFDB and FAO, and research institutions such as IFPRI and Center for Tropical Agriculture (CIAT), have publicly available data sets on various agricultural parameters such as production, export, and input usage. Most of the data is, however, not disaggregated across multiple dimensions such as regions and gender and in some instances is outdated. The Malawi's Ministry of Agriculture, Irrigation and Water Development (MOAIWD) is however, in the process of conceptualizing a National Agriculture Management Information System (NAMIS) that will aggregate up to date data collected internally as well as externally by other stakeholders such as development partners, research institutions and other government agencies.¹⁶⁷ NAMIS will then make the data available to end-users.

Component 6: Policy and regulatory environment

Overall, Malawi has demonstrated an improvement in the Ease of Doing business (EoDB) ranking in the past years. In 2020, Malawi ranked 109 out of 190 countries in the World Bank's ease of doing business. The country also experienced an average growth rate of 5.3 percent in the ease of doing business score over the period 2015-2019.¹⁶⁸ Malawi offers a favorable regulatory environment for enterprises, specifically on the aspect of access to credit. In the 2020 ease of doing business index, the country ranked favorably (11 out of 190 countries) in getting credit, with a score of 90 points out of 100. Getting credit information, the strength of legal rights and credit bureau coverage were the best performing indicators when applying for a loan. However, the country ranked poorly in getting electricity, resolving insolvency, starting a business, enforcing contracts, and paying taxes. It takes approximately 127 days involving 6 different procedural steps for a business to get connected to electricity, and this costs about US \$1,709.¹⁶⁸

Figure 19: Malawi Ease of Doing Business Rankings, 2020



The government has been making strides to enhance the policy and regulatory environment for the agriculture and digital economy. The government of Malawi has enacted several policies and regulations to boost that are crucial for the DAT ecosystem. Policies and regulations such as the National ICT Policy 2013 and National ICT Master Plan 2014; National Broadband strategy 2019, and the Cyber Security Strategy 2016 seek to enhance the ICT infrastructure and the digital skills in the country. Still, the recently launched Digital Economy Strategy seeks to, among other things, leverage digital solutions to solve challenges in key sectors, including agriculture. The current data protection bill lays out governing principles for protecting consumer data creating confidence among consumers using digital services. Further, the New Trademarks Act of 2018 protects individuals' innovations and inventions. The relevance of ICT in driving the agriculture sector has also been articulated in the National Agricultural Policy and the Malawi Growth and Development Strategy (MGDS) III. Some of these policies and regulations are summarized in the table below.

¹⁶⁷ Development Gateway - Conceptual Framework for the Design of the National Agriculture Management Information System (NAMIS), 2019

¹⁶⁸ The World Bank Ease of Doing Business, 2019

¹⁶⁹ The World Bank Ease of Doing Business, 2019

Table 6: Summary of key policies and regulations and relevance to the DAT ecosystem

#	Name of policy/ regulation/ strategy	Relevance to the DAT ecosystem
1	Digital Economy Strategy 2021-2026	As outlined in the strategy, the government targets three priority areas - increasing digital inclusion, promoting access to the digital economy, and establishing the basic foundation of the digital economy. Correcting market conditions to ensure that service providers offer more affordable data, reducing the purchase costs of the devices to drive high-value participation in the digital economy, improving digital literacy and increasing availability of relevant skills needed to participate in the digital economy will ensure that these priority areas are achieved. Under the strategy, the government aims to fully harness the potential for ICT in critical sectors, such as agriculture, and set objectives of adopting technological solutions, such as e-verification of quality of inputs under the Affordable Inputs Program (AIP), piloting IoT-enabled storage monitoring of national storage facilities, digitally based extension services, and develop an open-GIS data repository. Achieving these priority areas will spur the growth of DATs in the country.
2	Draft Data Protection Bill, 2021	This Bill safeguards consumer data collected by public and private sector institutions. The Bill provides principles for governing the processing of personal data that ensure that individuals' data is kept in an accurate, safe, secure, and lawful manner, and is used only within the ambit of the law. DATs thus need to follow the principles laid down in the Bill regarding user information collected.
3	National Broadband Strategy 2019-2023	Developed under the Digital Malawi Project, the strategy's objective is to provide strategic direction for promoting universal broadband access and focuses on enhancing access speeds, increasing access network coverage into underserved areas, enhancing availability and affordability of broadband, among others. Strengthening the digital infrastructure is crucial in driving the growth of the DATs.
4	New Trademarks Act, no. 2 of 2018 ("The Act")	The Act intends to protect the rights of individuals regarding their inventions and innovations. The Act requires that goods and services be classified according to the Nice Classification for purposes of registration. The registration term of a trademark is 10 years, with subsequent renewals made after the period. The Act has unique features, including protection of well-known marks, service marks, registration of geographical indications and collective marks, registration of marks in terms of Banjul Protocol and strict penalties for infringement. In the event of breaches, a 10-year prison term is imposed on the offenders. Therefore, the Act is a step in the right direction, especially in promoting the growth of DATs in the country. However, there are challenges associated with the existing legal framework. Some of these challenges include lack of public awareness on the existence of the patents, non-compliance with existing patent laws, and lack of general knowledge about the importance of the patents.
5	Electronic Transactions and Cybersecurity Act 2016	The Act covers data protection and privacy, security and digital economy, the administration of electronic transactions, formation and validity of electronic transactions, and electronic commerce, among other provisions. Regarding data protection and privacy, the Act requires that the digital players only collect personal data with consent from the data subject. Also, processing the data is only permissible for the performance of a contract to which the data subject is a party to or at a request of the data subject before signing the contract. DATs should thus also adhere to the rights of the subject. If the subject wants to obtain the data, this should be provided without constraints or unreasonable delay and at no expense. Further, the subjects should be informed whether data relating to them is being processed, and the purposes of processing the data should be disclosed.
6	The National ICT Policy 2013 and National ICT Master Plan 2014	The national ICT policy of 2013 seeks to improve utilization of ICT in the priority growth sectors such as agriculture and increase provision of ICT services to rural areas and vulnerable and disadvantaged groups. The policy recognizes the importance of agriculture in the economy and, therefore, recommends the utilization of ICT in the agribusiness industry, agricultural extension services and research in agricultural production and processing. The National ICT Master Plan 2014 operationalized the ICT Policy. The strategy outlines critical interventions to support the development of e-agriculture, including enhancement of online Integrated Agricultural Market Information System and development of an e-commerce strategy for the agriculture sector.

#	Name of policy/ regulation/ strategy	Relevance to the DAT ecosystem
7	Malawi Growth and Development Strategy (MGDS) III (2017-2022)	The strategy is medium-term designed to contribute to Malawi's long-term development aspirations. The strategy's objective is to move Malawi to a productive, competitive, and resilient nation through sustainable agriculture and economic growth. The plan identifies transport and ICT infrastructure as key priority areas to spur economic growth. Towards this, the strategy aims to increase access to information and communication services through promoting the participation of community broadcasting stations, private couriers, and privately owned telecommunication service providers. This aims to enable start-ups providing DATs services to disseminate information on modern farming techniques in the local languages to reach a wider audience. ¹⁷⁰
8	The National Agricultural Policy (NAP) of 2016	The overarching goal of this policy is to achieve a farmer-led agricultural transformation and commercialization that entails treating farming as a business. One of the priority areas of NAP is to establish a practical, demand-driven agricultural innovation system for research and technology generation and dissemination. The policy also seeks to promote innovative and high-quality agricultural extension and advisory services involving public and non-state extension service providers. Achieving these priority areas will lead to an increase in the development and adoption of agricultural technologies.

High taxes imposed on ICT services and devices and lack of regulatory sandboxes are key regulatory barriers hindering uptake. The low levels of mobile and internet pen-

“High taxes imposed on ICT services have a huge impact on uptake of our solution”
DAT provider

etration are largely attributed to the high taxes imposed on ICT services and devices.¹⁷¹ The government sets a 17.5 percent value added tax (VAT) on mobile phones and services, 16.5 percent VAT on internet services, and 10 percent excise duty on mobile phone text messages and mobile data transfers.¹⁷² Other taxes include 3.5 percent tax on ICT provider turnover¹⁷³ and 5 percent private copy levy on media devices, including mobile phones.¹⁷⁴ Through the Digital Economy Strategy, the government has committed to reduce and/or eliminate some of these taxes to spur growth. The country also lacks regulatory sandboxes, which are necessary to enable entrepreneurs, and other players in the DAT ecosystem to test out innovations without being constrained by the regulatory environment.¹⁷⁵ Additionally, the slow levels of implementation of the legal and regulatory frameworks developed derails progress.¹⁷⁶



Photo Credit: Pshere

¹⁷⁰ The Malawi Growth and Developing Strategy (MGDS) III, (2017-2022)

¹⁷¹ Insights from interviews with key stakeholders

¹⁷² <https://advox.globalvoices.org/2020/08/05/digital-rights-remain-under-threat-in-malawi-despite-historic-win-for-democracy/>

¹⁷³ Malawi Digital Economy Strategy, 2021-2026

¹⁷⁴ <https://www.mra.mw/press-releases/collection-of-levy-on-media-storage-devices>

¹⁷⁵ <https://www.empowerafrica.com/regulatory-sandboxes-in-africa/>

¹⁷⁶ Insights from interviews with key stakeholders

Summary of key ecosystem gaps and challenges

Despite the evolution in the DAT landscape, several ecosystem gaps and challenges exist that hinder the scale-up and sustainability of key players. This section summarizes the critical gaps and challenges across the various ecosystem components based on primary and secondary research insights.

Table 7: Summary of key ecosystem gaps and challenges

#	Component	Key gaps and challenges
1	Ecosystem support organizations	<ul style="list-style-type: none"> • Inadequate sector and technology-specific support: Most ecosystem support providers identified are sector agnostic, offering general business advisory services to entrepreneurs across different sectors. This in effect dilutes the value of the business support service provided to DATs who are often in need of technical and sectoral specific support • Limited collaboration within sector stakeholders: While networking opportunities exist in the country, they operate in silos with little coordination and information sharing. The networking platforms also often hold annual convenings, limiting the frequency of interactions. • Lack of enough ecosystem support organizations targeting idea stage business: The lack of adequate ESOs providing research and development support for idea-stage businesses limits development of home-grown innovations. This is a particularly pressing challenge for youth-led businesses that lack expertise, networks, and finances to develop and refine their ideas. • Geographical disparity in access to business support services: Support hubs are concentrated mainly in and around the main cities of Blantyre and Lilongwe. This locational bias creates a rural-urban divide with a significant proportion of DATs in rural areas unable to access the support. Given the inadequacy in the digital infrastructure – low mobile and internet penetration, online business support programs that would cater to enterprises across multiple geographies are non-existent.
2	Human capital	<ul style="list-style-type: none"> • Supply-demand mismatch in skills: There is a fundamental skills mismatch between what is taught in the academic institutions and what is needed by the DATs. Upon graduation, the graduates still need hands-on practical learning to efficiently work in the DATs' technical and operations departments. This, therefore, means that the DATs must provide the education at their own cost, further increasing their operating costs. • Inadequate digital-based curriculums limiting the pool of digitally skilled talent: Academic institutions have not embraced digital content in their school curriculums. As such, a limited number of students graduate with digital-based courses annually. On the other hand, there are many digital businesses/startups across multiple sectors. This results in high competition for the digital talent not just among the startups but also with well-established corporates like MNOs who can pay higher than the startups.
3	Access to finance	<ul style="list-style-type: none"> • Stringent and rigid underwriting frameworks by traditional financiers: Commercial banks in the country perceive agriculture as a risky sector and thus utilize strict underwriting frameworks to access creditworthiness. Further, to cover for the perceived risks, banks charge high-interest rates and put in high collateral requirements that most agribusinesses cannot meet. • Limited early-stage financing in the country: Malawi has a very limited presence of venture capitalists and angel investors who play a crucial role in providing start-up capital to innovative businesses and technical and business mentorship. The most significant proportion of innovators in the country thus relies on personal funds to start and grow their businesses, hindering scale and sustainability. • Limited adoption of digital financial services (DFS): DFS services, such as digital credit, have played a significant role in enhancing access to finance for both individuals and businesses in regional economies, such as Kenya and Uganda. The development of digital credit in Malawi, however, remains low.
4	Infrastructure	<ul style="list-style-type: none"> • Low electricity access levels: The country's access to electricity is significantly low, particularly in rural areas. Additionally, electricity blackouts are frequent in these areas. This presents a significant obstacle and inconvenience for mobile phone users as they need to find alternative places to charge the mobile phones continually. • Low levels of mobile and internet penetration: The penetration of digital infrastructure in terms of mobile broadband and internet is still low despite progress in the last decade. Additionally, poor network services result in constant disruptions, further discouraging uptake. • Lack of centralized and up to date open data platforms for agriculture

#	Component	Key gaps and challenges
		<p>data: The country lacks central and easily accessible public data platforms. In the absence of such data, stakeholders in the sector cannot make informed policy, business, and investment decisions. Stakeholders thus spend considerable time, effort, and financial resources on data collection, often from the same set of farmers.</p> <ul style="list-style-type: none"> • Underdeveloped physical infrastructure: The poor state of physical infrastructure and services in the country including road and rail networks, and logistics services hinders DATs from reaching the last mile effectively. Further, lack of adequate warehousing and cold storage facilities is a major bottleneck for DATs seeking to enhance market linkage as they cannot preserve the value of products over time.
5	Policy and regulatory environment	<ul style="list-style-type: none"> • Lack of specific e-agriculture policies and regulations: There is a lack of an overarching approach for e-agriculture with the role of ICT in agriculture documented across multiple policies and strategy documents. • High levels of taxation on ICT services and devices: High taxes have resulted in increased costs for the devices – mobile phones and computers –and the digital services, making them unaffordable for most of the population. • Lack of regulatory sandboxes for testing innovations: Regulatory sandboxes play a crucial role in promoting the incubation and testing of products in a relaxed regulatory environment. This would enable innovators, especially those providing digital financial services amongst the agri-stakeholders, to test and refine their products.

6



Recommendations to Promote Growth of DATs

The challenges in the DAT landscape present potential opportunities to enhance digital literacy, digital readiness and access trends for DAT solutions and services in the country. The section below outlines the current opportunities and key intervention areas to boost the sector. We have also highlighted the relevance of each of the recommendations to USAID/Malawi, based on current programming and priorities and opportunities to align with USAID's Digital Strategy 2020-2024. The recommendations have also considered the envisioned role of digital technologies in the agri-food systems as articulated in the Global Food Security Strategy 2022-2026. The recommendations cut across the various ecosystem components as well as the demand side.

Table 2: Summary of key recommendations across the six intervention areas

#	Intervention area	Recommendations	Relevance to USAID/Malawi	Level of feasibility	Implementation timelines (Years)
1	Build a thriving business support environment for DATs	• Run an incubator/accelerator program targeting homegrown and regional DATs with plans to scale to Malawi	High	High	0-1
		• Promote cross learning with other developed/matured DAT ecosystems through exchange programs	Medium - High	High	1-3
		• Establish technology focused innovation hubs for testing and refining agriculture technologies	Medium	Medium	1-3
		• Establish a multi-stakeholder networking platform for actors in the space	Medium	High	0-1
2	Strengthen digital skills and competencies	• Embed digital technology content in educational institutions and build stronger linkage with academia	Low - Medium	Medium	1-3
		• Set up practical digital/technology skills training academies/hubs	Low	Low - Medium	1-3
		• Encourage corporate-DATs linkages to share/leverage skill sets	Low	Low - Medium	1-3
3	Enhance access to innovative, catalytic, and blended finance structures	• Promote blended finance structures that leverage development partners and the private sector to finance agriculture technologies	High	Medium	1-3
4	Enable availability and accessibility of physical and digital infrastructure at the last mile	• Promote availability and use of solar powered home systems	Medium - High	High	1-3
		• Institutionalize open data platforms	Low - Medium	Medium	1-3
		• Promote competition and infrastructure sharing among ICT providers	Low	Low - Medium	4-5

#	Intervention area	Recommendations	Relevance to USAID/Malawi	Level of feasibility	Implementation timelines (Years)
5	Design and implement legal and regulatory frameworks conducive for DATs	• Develop appropriate policies for e-agriculture	Medium - High	High	1-3
		• Advocate for reduced taxes on digital devices and services	Medium - High	High	1-3
6	Improve the adoption and use of DATs by the demand side	• Undertake behavioral change and user testing	High	High	0-1
		• Promote bundling of technologies and services	High	Medium - High	1-3
		• Enhance access to digital devices and services	Medium	Medium	1-3

Intervention area 1: Build a thriving business support environment for DATs

As highlighted previously, the existing business support services cannot meet the needs of DATs. There is a need to enhance the capacity of business support providers to deliver sufficient and quality services to drive the scale up and the wider impact of DATs. Key areas of support include prototyping and testing local technologies, promoting collaboration across DATs and other stakeholders, developing sustainable go-to market strategies, business plans and facilitating more commercial funding. Further, there is a need for support providers to work with agribusinesses, particularly youth-led businesses, to enhance their uptake of digital solutions. Highlighted below are some of the recommendations to build a thriving support environment.

Recommendations

1. Run an incubator/accelerator program targeting homegrown and regional DATs with plans to scale to Malawi

Given the current generic support, running a DAT-specific incubator/accelerator program would be crucial in providing customized support to DAT companies. This could be launched by existing ecosystem support organizations or set up as a stand-alone organization. The program can be tailored to target groups, such as youth and women, since they are underrepresented among business owners and businesses that are not based in the main cities. It can also target locally owned DAT providers and regional DAT providers with plans to scale to Malawi to provide the handholding support needed to localize and scale their businesses. Such a program can focus on providing linkages to end-users such as farmers, agribusinesses and government and working with the DATs to refine the business models based on feedback from the farmers. It can enhance access to sector-specific mentors and facilitate access to markets by enabling linkages with key potential business users. It could also provide milestone-based grants and financing and boost commercial funding by mapping and creating connections with investors such as venture capitalists, among others.

Relevance for USAID/Malawi: High

The Mission's current Country Development Cooperation Strategy (CDCS) outlines a need to build an enabling environment for youth development and is currently targeting youth and women in its interventions. This very relevant recommendation for the Mission aligns with the work currently being undertaken by International Center for Tropical Agriculture (CIAT) and Umodzi Consulting on behalf of the Mission. The partners are working on a Youth Business Acceleration and Investment Facility (YBAIF) that seeks to provide business advisory support, and access to finance to youth and women-owned businesses in the country. The facility mainly focuses on supporting businesses in marginalized, highly populated, and fragile districts that would benefit immensely from digital technologies. Based on the ongoing research by CIAT and Umodzi, the largest proportion of youth businesses are in the agriculture sector with major challenges facing these businesses, including inadequate business and financial management skills, limited access to local and international markets, poor product quality, poor understanding of business registration processes, and limited access to finance. Further, these businesses have broadly not adopted technologies in their business operations. YBAIF seeks to work with existing ESOs such as incubators and accelerators to support the youth and women businesses across the need areas identified.

Role of USAID/Malawi and other key stakeholders

The role of the Mission will be to facilitate YBAIF's implementing partners in their implementation of activities related to supporting DATs. Specifically, CIAT and Umodzi need to support the identified ESOs to design and run an incubator/accelerator program that targets DATs. Since most of the ESOs lack the necessary technical expertise, the partners also need to build the capacity of the ESOs to ensure they can provide tailored support to the DATs. Equipping the existing ESOs will be crucial in ensuring they can support the DATs beyond the YBAIF's workplan.

Feasibility and potential challenges

This is a highly feasible recommendation that can be implemented by USAID/Malawi leveraging the YBAIF work-plan (which is currently under development). Potential challenges envisioned in implementing this recommendation include.

- *Limited capacities of the incubator/accelerator:* Most incubators/accelerators lack the requisite skillsets and qualified staff to provide mentorship and coaching services to the DATs. Further, leveraging industry mentors to provide technical mentorship support may be difficult unless compensation is provided.
- *Accessibility to DATs:* Early-stage DATs are emerging outside the major cities where the end-users are majorly located. Deliberate efforts thus need to be undertaken to ensure the reach and participation of such DATs in such an incubator/accelerator program to ensure maximum impact.

2. Promote cross-learning with other developed/mature DAT ecosystems through exchange programs

Malawian based digital agriculture innovators, especially youths, could benefit from linkages to more developed regional ecosystems, such as Kenya and South Africa, which host several well-established business support structures and early-stage financiers. Building partnership with these regional incubators and accelerators further provides an opportunity for digital businesses in Malawi to access global networks that could enable their success. It also builds a platform for Malawi DATs to interact with regional peers for peer-to-peer learning sessions.

Relevance for USAID/Malawi: Medium-High

One of the potential intervention areas identified under YBAIF is accelerating South-South collaboration and tapping into learning from other regions and countries. USAID/Malawi is also keen to promote learning and information exchange for the DATs and other ecosystem stakeholders.

Role of USAID/Malawi and other key stakeholders

USAID/Malawi can facilitate the implementing partners (CIAT and Umodzi) to identify potential partners/ESOs that they can work within some more mature markets and organize for online and physical knowledge exchange and learning sessions. The partners can also facilitate some of the DAT providers to travel to those countries and have a first-hand experience, exposure and interaction with DATs that have scaled and attained sustainability in other countries.

Feasibility and potential challenges

The success of this recommendation will heavily rely on willingness from partners in other countries to participate and share their experiences. Further, the dynamics of different countries may lower the relevance level, for example, the digital literacy in Kenya is way higher than in Malawi; thus, agricultural technology that is fully embraced in Kenya may not be applicable in Malawi.

3. Establish technology-focused innovation hubs for testing and refining agriculture technologies

Agricultural technology businesses – especially youth and women-led – in the ideation and concept development stages are the most underserved by business support organizations. This leads to a high failure rate as most of these businesses are unable to kick start their operations due to a lack of support in prototyping, testing, and refining their products/ideas.¹⁷⁷ Agricultural Research and Development (R & D) is a crucial aspect of the digital innovation ecosystem. An innovation hub that provides agriculture-specific technical and business advisory for idea-stage businesses can be established in collaboration with the universities and technical colleges to support the growth of homegrown solutions. Such a hub can focus on R & D, including prototyping of innovations and can be a source of a pipeline for incubators/accelerators to support the operationalization and scale-up. Despite the importance, an inadequate mechanism to support innovation hubs in the country was noted as a cross-cutting issue during the 2021 Malawi Innovation Conference, with few donors focused on funding such hubs.¹⁷⁸

Relevance for USAID/Malawi: Medium

The Mission currently works with local indigenous think tank (MwAPATA) and universities such as Lilongwe University of Agriculture and Natural Resources (LUANAR) that focus on research and development of agriculture innovations. The Mission also intends to provide funding to mHub – an innovation hub operating in the country – to promote the development of innovations in the agriculture sector and has already initiated the procurement process. Mhub is working with the Ministry of Education to enhance technology uptake by running youth-focused innovation hubs that will enhance job creation.

Role of USAID/Malawi and other key stakeholders

The Mission's role will be to identify, fund and support universities, technical colleges, and other organizations with the capacity to establish such innovation hubs and to monitor and collect data on the impact generated by the innovation hubs. Additionally, the Mission can play a critical role in mobilizing more donors to channel their funding towards agricultural digital technology R&D. The funded organizations' key role will be to identify innovative ideas/concepts in the digital agriculture space and provide infrastructure, technical and business advisory to grow the ideas.

¹⁷⁷ Insights from interviews with key stakeholders

¹⁷⁸ Insights from USAID/Malawi

Feasibility and potential challenges

While technology-based innovation hubs have been critical drivers of development for the digital economies in other advanced African countries, they have continued to face several challenges that have hindered their sustainability and impact. Some of these challenges would derail the implementation of this recommendation.

- *Innovation hubs are largely not financially self-sustaining:* They have struggled to develop sustainable revenue models and rely heavily on grants from donors and other philanthropic organizations to fund their operations. Further, hubs face complex trade-offs between their mission (what they want to achieve) and the desires of their funders which keep changing with the change in funders. The limited ability of innovators to pay for services makes the intervention hard to monetize.
- *Limited capacities of the innovation hubs:* The hubs may not be equipped with the technical and business expertise needed to support the innovators. As such, capacity building of the hubs is also critical.
- *Lack of adequate pool of innovators:* Hubs face challenges in identifying and reaching out to idea and concept stage innovators. Most don't have a digital presence and are usually based in rural/remote areas.

4. Establish a multi-stakeholder networking platform for actors in the space

There is a need to establish an action-oriented approach to enhance networking and knowledge sharing for players working in the space. In addition to bringing stakeholders together to network and share insights and learnings on their programs and interventions, they can also work together to design and implement solutions and influence policy. To address the multiple challenges existing in the ecosystem, such a platform can establish working groups based on various thematic areas. Such groups can include representatives from donors, DATs, policymakers, finance service providers, research, and academia among others. Malawi has already seen traction in this regard, where it hosted the first-ever innovation conference in the country in November 2021. The conference brought innovators, network providers, academia, and civil society organizations (CSOs) together.

Relevance for USAID/Malawi: Medium

Given its focus on developing multi-stakeholder approaches for inclusive development and networks with key stakeholders, USAID/Malawi is well placed to bring together key players and establish working groups to drive the growth of digital agriculture innovations in the country.

Role of USAID/Malawi and other key stakeholders

The Mission can lead the process of identifying and engaging like-minded donors such as UNDP, FCDO and World Bank, and the government, and other policymakers to establish a working group. Taking inputs from other participants in the group, the Mission can further define the objectives, scope and activities of the working group and oversee implementation of the same. Additionally, the Mission needs to ensure consistent representation in all innovation-focused networking forums and conferences to share their experiences and learn from other stakeholders.

Feasibility and potential challenges

The success of such networking and knowledge sharing platforms depends on the stakeholders; commitment and alignment of objectives across the different working groups/platforms. The clear scope and vision of the working group regarding promoting innovation will thus need to be laid down at the onset. Further, collaboration across the different working groups needs to be encouraged.



Photo Credit: Unsplash

Intervention area 2: Strengthen digital skills and competencies

The sector's growth is highly reliant on the availability of critical digital skills needed by various agri-food system stakeholders. Low levels of basic digital skills limit the usage and application of digital solutions and services. Additionally, an inadequate supply of digital talent is a key roadblock for establishing and growing innovative home-grown digital agriculture companies. Critical digital-focused job roles include chief technology officers, software engineers and developers needed to develop and refine DAT solutions, and data scientists and engineers needed to extract and create value from data generated from the DAT solutions. Building a tech-savvy workforce is crucial in supporting productive employment, job growth and livelihoods generation.

Recommendations

1. Embed digital technology content in educational institutions and build stronger academia-industry linkages

Pushing for the incorporation of digital technology content in the curriculums of Malawi learning institutions, particularly the agricultural universities and training institutions can play a significant role in developing a digitally equipped workforce. Academic institutions can work with stakeholders such as the MNOs, DATs, NGOs, and donors to develop a curriculum suited for the market. This will help reduce the supply-demand mismatch in the skillset and build a market-driven curriculum.

Relevance for USAID/Malawi: Low – Medium

USAID/Malawi education office has been working to build digital literacy for differently abled persons. They worked with eKitabu to develop video storybooks in Malawi sign language for young children. Further, under the Strengthening Higher Education Access in Malawi Activity (SHEAMA) project, USAID seeks to increase Malawi's skilled and employable workforce especially rural adolescent girls and young women (AGYW) and vulnerable young men. The project partners with five universities to expand Open and Distance Learning (ODL) opportunities. Additionally, the project is working with the universities and the private sector to develop and market-responsive courses that seek to increase jobs and entrepreneurial opportunities. Given the relevance of digital skills in the economy, the project can explore working with the universities and the private sector to develop relevant digital-focused courses.

Role of USAID/Malawi and other key stakeholders

The role of the Mission under this recommendation will be to facilitate the engagement between the private sector and the universities to understand the private sector needs related to digital skills. This can be through round table discussions and one-on-one discussions. Based on the insights gathered from the talks, the universities can then develop relevant digital skill-focused courses and seek approval and accreditation from the National Council for Higher Education (NCHE).

Feasibility and potential challenges

Public universities in the country are semi-autonomous and are thus allowed to work with other stakeholders to design relevant courses that meet the market's needs. However, programs or courses, need to be approved and accredited by the NCHE which can be time-consuming. Accreditation would also be pegged on the universities having qualified members of staff capable of teaching the courses, and thus, the institutions would need to build the capacity of their staff.

2. Set up practical digital/technology skills training academies

With the inadequate opportunities to learn practical digital skills in the existing secondary and tertiary education levels, there is an opportunity to establish a practical digital skills training academy that targets fresh graduates and youths interested in pursuing a career in the digital space. Such an academy can combine theoretical and practical methods of designing, developing, and running digital agriculture technologies to deliver in person and online trainings. This would equip the candidates going through the program to start their digital ventures or get employment with digital companies. This would, in turn, contribute to a reduction in the levels of unemployment and increase the digital skills available in the country.

Relevance for USAID /Mission: Low

The current USAID/Malawi CDCS does not focus on technology skills building and thus a low relevance for the Mission on this recommendation.

Feasibility and potential challenges

Setting up such a technical digital-based academy will require heavy investment in physical infrastructure and relevant practical skills amongst the tutors. Some of these skills may not be available locally and would thus need to leverage skills from more developed markets.

3. Encourage corporate-DAT linkages to share/leverage skill sets

As most DATs face challenges in attracting and retaining affordable skilled human resources, can engage corpo-

rates such as MNOs to support to the enterprises over a specified period. As part of their corporate social responsibility (CSRs), such companies can second their staff to support improving the operations of the DATs, especially if the DATs provide potential linkage areas with the companies. Companies can also provide internal learning opportunities for the DATs where officials can spend some time working in the companies to gain practical skills.

Relevance for USAID/Malawi: Low

This recommendation will be largely driven by the private sector and thus has a low relevance for the Mission.

Feasibility and potential challenges

The success of this recommendation would be heavily reliant on voluntary action from the corporates, who may not want to engage regularly without appropriate incentives and a clear value proposition developed for them.

Intervention area 3: Enhance access to innovative, catalytic, and blended finance structures

The use of blended and catalytic finance structures could help de-risk investments that are traditionally thought to be risky such as the case for investments in agribusinesses and DATs. Providing de-risking/concessional capital could help financial providers to (i) lower the cost of capital that is associated with the high perceived risk of the sector; (ii) customize the financial products to the needs of the borrowers and (iii) fund technical assistance support tied to capital disbursement.

Recommendations

I. Promote blended structures that leverage development partners and the private sector to finance agriculture technologies

This is where concessionary development-oriented funding is used to mobilize additional private capital. There are many financial instruments and combinations of financial instruments that can be used to blend. For example, blending grant financing with concessionary debt, where the grant could provide technical assistance to the DATs while the debt provides softer terms such as longer grace periods and lower interest rates. Blended structures may be in the form of:

- *Results-based financing:* This involves providing capital with predefined outputs or outcomes and rewarding achievement of the results, as is the case with social and development impact bonds. In this case, impact investors and banks provide upfront capital to the business to achieve pre-determined outcomes related to increased agricultural productivity. Outcome funders such as governments, donors, and other philanthropic organizations then pay the investors based on how a set of predefined outcomes have been achieved.
- *First loss guarantee:* In this case, commercial banks and impact investors provide debt funding to innovative businesses while philanthropic or donor organizations offer a guarantee for capital providers to be reimbursed a certain percentage of the investment in case of default. Guarantee-based structures have the potential to unlock capital from traditional capital providers for higher risk investments.

Relevance for USAID/Mission: High

The Mission's CDCS outlines the need to promote access to finance for SMEs, especially youth and women led. Therefore, the Mission is keen to explore innovative structures that can be leveraged to reduce the barriers that inhibit access to finance for these SMEs and tech-based startups such as DAT providers.

Role of USAID/Malawi and other key stakeholders

There is potential for USAID/Malawi to spearhead the development of such a blended structure working with other existing stakeholders. The Mission can provide funding to develop such a structure/fund and provide initial catalytic funding that would be leveraged to attract additional funding from the private sector such as impact investors and commercial banks. USAID/Malawi can also explore providing catalytic financing (in the form of grants or technical assistance funding) into already existing mechanisms, such as the Malawi Innovation Challenge Fund (MICF) that provides matching grants to finance innovative projects in the agriculture sector, and Malawi Agriculture and Industry Investment Corporation (MAIIC), a local DFI that finances high growth tech start-ups and SMEs across multiple sectors including agriculture.

Feasibility and potential challenges

The complexity of establishing blended structures is one of its major limitations. It takes a lot of time, effort, and financial resources to coordinate with various stakeholders. For example, determining the outcomes for the case of impact bonds require a lot of consultations. Clear roles and value propositions for all stakeholders must also be defined to ensure success. Most blended finance structures also require extensive monitoring and impact assessments which could be expensive. Additionally, given the limited number of investable businesses in the sector, the fund would need to focus on funding businesses across multiple development sectors and not just agriculture to ensure critical mass. Regulatory agencies such as Reserve Bank of Malawi also need to be consulted to ensure the funds are in line with the country's lending guidelines, particularly those relating to interest rates charged by commercial banks.

Intervention area 4: Enable availability and accessibility of physical and digital infrastructure at the last mile

Accessibility and affordability of mobile and internet devices and services, access to reliable electricity, and good quality networks is imperative to maximize the impact of DATs across the agri food value chain. Further, investments in physical infrastructure will help lower the operating costs for DAT providers operating in rural areas.

Recommendations

1. Promote availability and use of solar-powered home systems

Renewable energy solutions such as solar home powered systems have played a critical role in enhancing access to electricity across Malawi's regional peers such as Kenya and Tanzania. These off-grid solutions provide access to affordable electricity as they are more cost-effective and faster to deploy than extending the national grid. Solar home systems have leveraged innovative models such as PAYG to enhance uptake by breaking the repayment into affordable amounts for the customers. There is an opportunity to scale up these players in the market.

Relevance for USAID/Malawi: Medium – High

Through the Power Africa project, USAID/Malawi is focused on enhancing energy access at the industrial and household levels. The project focuses on promoting the development and use of renewable energy and has so far supported the installation of 120MWs solar photovoltaic (PV) and 350MWs hydropower plants.¹⁷⁹ Power Africa has also provided financial assistance and operational support to three solar home system (SHS) companies to help them scale operations and product sales leading to an increase in household connection to electricity.

Role of USAID/Malawi and other key stakeholders

To enhance its support to the off-grid solar home systems sector in Malawi, the Mission can explore launching a project similar to the Power Africa Off-grid Project (PAOP). Established in 2018, PAOP works across nine African countries to accelerate private sector-led off-grid electrification. The project seeks to build an enabling ecosystem that includes enhancing the policy and regulatory environment, access to finance and market intelligence, and directly build the business and technical capacities of SHS providers. USAID/Malawi can identify and fund an implementing partner(s) to develop and implement a project that seeks to solve the ecosystem and business barriers that hinder the scale up of SHS companies.

Feasibility and potential challenges

Solar home systems in the country are currently heavily taxed, making them expensive for the end-users. Enhancing uptake of these systems may be a challenge given the low-income levels of the target population that reside in rural areas. However, according to the Digital Economy Strategy 2021-2026, the government is focused on reducing the taxes imposed on the SHS providers over the strategy implementation period to enhance uptake.

2. Promote competition and infrastructure sharing among ICT providers

Currently, infrastructure sharing in the country is limited, with a high level of duplication of infrastructure by public and private players. The market is also dominated by the two largest network providers with the largest share of the infrastructure. The high leasing costs for smaller players have resulted in an inefficient market hostile to competition. Infrastructure sharing can enhance efficiency by significantly reducing the initial investments required to provide digital services in rural areas and accelerate network coverage in these areas.

Relevance for USAID/Malawi: Low

This recommendation is not relevant for USAID/Malawi as it falls under the Malawi Communications Regulatory Authority (MACRA), which has the mandate to instruct and require infrastructure sharing among providers.

Feasibility and potential challenges

The recommendation's success depends on buy in from the providers and effective enforcement of infrastructure sharing regulations by the government.

3. Institutionalize open and central data platforms

Most DATs spent a significant amount of time and financial resources collecting and generating data needed to refine their technical and business models, including data on soil distribution, weather forecasting, pests and disease management, input and output prices, and data on the socio-economic characteristics of users. The continued development of data infrastructure and growth of DATs in the country can deliver farm-level, geospatial, and real-time data, and analytics to inform evidence-based policy, investments, and business decisions for multiple stakeholders in the sector. Developing a data stack that is easily accessible by the public is key to exponentially scaling DATs by reducing the upfront costs required to collect data. The World Bank One Million Farmer Initiative in Kenya is an example of an intervention seeking to enhance data access. The Initiative provides a platform where disruptive agricultural technologies can access data collection, data analytics and digitization of farmer profiles at no cost.

¹⁷⁹ USAID Power Africa Malawi fact sheet; <https://www.usaid.gov/powerafrica/malawi>

Relevance for USAID/Malawi: Low - Medium

USAID/Malawi has provided funding towards the conceptualization and roll out of the National Agriculture Management Information System that will aggregate various agricultural data including production statistics, trade and marketing, climate change and meteorology, water and irrigation, and farmer demographics. The system, implemented and managed by MOAIWD will aggregate data from multiple data owners, including government agencies, donors, and non-governmental organizations (NGOs), which will then be packaged to be easily retrieved and used by users for decision making. To ensure that data is captured in a standardized manner from the various sources, the data owners need to align their Monitoring and Evaluation (M&E) systems to the NAMIS framework.¹⁸⁰

Role of USAID/Malawi and other key stakeholders

USAID/Malawi needs to work with its implementing partners and contribute to the data collection efforts of NAMIS by continually sharing relevant data from the different programs. The Mission and the implementing partners must ensure that the data is standardized and aligned to the set M&E frameworks.

Feasibility and potential challenges

The effectiveness of such data systems and platforms will depend on the ability to provide relevant and up to date information to the users. All data collaborators thus need to be willing to share data as per the agreed-upon guidelines and timelines. Further, since different data owners have been collecting data based on their needs and areas of operations, harmonizing these different data points into one acceptable platform could be tasking and complex.

Intervention area 5: Design and implement policy, legal and regulatory frameworks that are conducive for DATs

The legal and regulatory frameworks for the digital economy in the country need to accommodate the rapid market changes. Further, regulatory barriers such as prohibitive limiting uptake need to be reduced/eliminated.

Recommendations

I. Develop and implement appropriate e-agriculture policies and strategies

While the role of digital agriculture has been documented across multiple agriculture and ICT policies and strategy documents, there is a need to develop an e-agriculture specific policy and strategy that articulates the envisioned role of the government and other private players in the growth of the sector. Such policies can include regulatory benefits for innovators providing digital agriculture services and solutions that demonstrate impact to smallholder farmers. The e-agriculture strategy guide¹⁸¹ developed by FAO and International Telecommunication Union (ITU) provides a framework for countries to develop their national e-agriculture strategies. This framework can thus be leveraged to develop the Malawi e-agriculture strategy. Further, there is a need to push for the enactment of laws that support the use of technology in agriculture, e.g., enactment of a seed bill that encourages the use of scratch cards to determine the quality of seed. Such a bill would be critical in curbing the proliferation of fake seeds in the country. Additionally, advocacy for implementation and enforcement of the New Trademarks Act, 2018, seeks to protect individuals regarding their inventions and innovations.

Relevance for USAID/Malawi: Medium – High

USAID/Malawi is the current chair of the country's agriculture and trade donor committees. Through these committees, the Mission works with policy think tanks to advocate for a favorable policy and regulatory environment in the agriculture sector and provides inputs to the development of the policies and regulations. Therefore, the Mission is well placed to advocate for the development and implementation of e-agriculture specific policy, strategy and regulatory frameworks that advance the growth of innovations in the country.

Role of USAID/Malawi and other key stakeholders

The Mission can facilitate a study on the enabling legal and regulatory frameworks for digital agriculture in the country to identify key gaps and challenges facing the implementation of the existing frameworks and key considerations for developing new frameworks. Based on the findings, the Mission can then convene different stakeholders such as policy institutions, relevant government agencies and other donors to initiate discussions on the development of relevant policies and strategies as recommended by the study.

Feasibility and potential challenges

The success of this recommendation relies on the willingness and ability of the government agencies to enforce the enacted policies and regulations effectively.

2. Advocate for reduced taxes on digital devices and services

The government can support the growth of the digital economy by reviewing the current tax regime, levies, and tariffs to enable greater access to digital devices and services. While the digital economy strategy 2021-2026 has articulated the government's focus to eliminate and reduce some of the prohibitive taxes, this is yet to be implemented. There is a need for advocacy for this to be achieved.

Relevance for USAID Malawi Mission: Medium - High

Similarly, leveraging its position as chair of the agriculture committee, the Mission, working with policy think tanks and other stakeholders, can leverage its existing relationship with the government to advocate for favorable digital devices and services taxes.

Role of USAID/Malawi and other key stakeholders

The Mission can initiate benchmarking studies on digital taxation policies in other developed markets to borrow learnings and best practices and leverage the learnings to advocate for more favorable taxes in the country.

Feasibility and potential challenges

The success of this recommendation relies on the willingness and commitment of the government to revise the tax regime.

Intervention area 6: Improve the adoption and use of DATs by the demand side

The demand side and particularly smallholder farmers who have been the main customer segment for the DATs operating in the country need to be supported to access and use the digital services provided. Incorporation of digital technology in agribusinesses is also low due to limited awareness of the existing DATs and how those can be incorporated into the business operations and low digital literacy levels particularly among youth and women business owners.

Recommendations

1. Undertake behavioral change and user testing

The development of DATs needs to fully consider the end-users' – farmer and agribusiness – needs and context. This would thus require technology providers to work with the end-users to enhance product/service features in to enhance usability and acceptability. DATs also need to work with other stakeholders such as government agencies and NGOs to train the end-users, particularly farmers, given the low level of digital literacy and low adoption of sophisticated technologies amongst the rural population to stimulate demand.

Relevance for USAID/Malawi: High

The Mission is keen to raise awareness and education on digital agriculture technologies, reduce misinformation related to the use of technology, and address barriers that limit uptake by the last mile, especially among the farmers and rural population.

Role of USAID/Malawi and other key stakeholders

USAID/Mission can identify and support community programs and interventions targeting behavior change and digital literacy training for farmers, youth, and women agribusinesses. Additionally, the Mission can work with existing implementing partners to incorporate DATs in their current programming, targeting smallholder farmers, e.g., under the Advancing Local Leadership and Innovation Networks (ALL-IN) that seeks to enhance digital innovations' use to improve market access for horticultural produce in the country. Other stakeholders such as NGOs and CSOs would be crucial in designing and implementing digital literacy training programs that address the needs of the target audience – farmers and agribusinesses.

Feasibility and potential challenges

Changing the perception and behavior of users, particularly smallholder farmers in Malawi, to accept and adopt DAT service in agricultural practice requires time and resources in engaging a more significant number of users. Therefore, there is a need to identify change champions i.e., more progressive farmers to train the others and ensure continuous follow-up over a longer time.

2. Promote bundling of technologies and services

Agri-food value chain stakeholders face multiple challenges across the supply chains and thus benefit from holistic DAT service/product offering. Bundling technologies that address multiple needs such as access to inputs, markets, and financial services, would thus enhance uptake. Bundling of services would also enable the providers to achieve a broader scale and more robust financial viability and maximize the value proposition for farmers by directly connecting them to the supply chain. Building a platform that enables collaboration between different technology providers is thus crucial.

Relevance for USAID Malawi Mission: Medium - High

The Mission is eager to explore how different challenges facing agri-food stakeholders can be holistically addressed through technology and how different DAT solutions/services can be packaged to achieve maximum impact for the end-users.

Role of USAID/Malawi and other key stakeholders

In 2021, the Feed the Future ALL-IN initiative launched a project focused on addressing market access challenges in the horticulture sector in Malawi leveraging ICT. The interventions under the project include the development of a mobile phone-based app that connects buyers and sellers and an interactive IVR based agricultural extension hotline.¹⁸² This project is implemented by Lilongwe University of Agriculture and Natural Resources and will run until 2023. USAID/Malawi can work with the implementing partner to explore how other critical technologies e.g., those that enable access to inputs and financial products such as crop insurance and credit, can be incorporated as part of the project to test the viability of such an offering. Additionally, the Mission can facilitate an ESO such as an accelerator or tech hub to develop an online platform that enables listing of DATs providing multiple services to enhance collaboration across the DATs.

Feasibility and potential challenges

Bundling agricultural technologies would entail connecting existing software, databases, and services from multiple providers, and thus, interoperability of the systems is key when building one central platform. Further, due to the low-income levels, smallholders may not be willing to pay for a bundled service package charged higher than a single service offering.

3. Enhance access to digital devices and services

Given the critical role of mobile phones in the advancement of digital technology, interventions to enhance uptake by farmers are key. Innovative approaches and strategies to expand ownership that do not rely on free distribution thus need to be explored. These approaches can include a) device asset financing implemented as lease-to-own, or payment instalments plans implemented through organizations working with farmers such as farmer cooperatives, exporters, processors, or input providers b) Coordinated bulk purchases by stakeholders such as MNOs who can sell the phones at discounted prices and in instalments and c) development of financial products such as mobile phone loans or savings product by financial institutions. Further, shared/community models can leverage intermediaries such as mobile money agents or extension officers to promote sharing of devices.

Relevance for USAID/Malawi: Medium

In previous projects, USAID/Malawi has worked with MNOs to enhance the accessibility of mobile phones by farmers where MNOs provided free SIM cards, and the farmers purchased the mobile handsets at a reduced fee. The Mission is keen to work with other players to explore how other innovative mobile phone ownership mechanisms can be implemented.

Role of USAID/Malawi and other key stakeholders

The Mission can work with key stakeholders such as MNOs, financial institutions, farmer cooperatives and agribusinesses to explore the viability of the different mobile devices financing mechanisms. The Mission can provide funding for research and conceptualization of the mechanisms while the other stakeholders purchase and distribute the phone to the farmers.

Feasibility and potential challenges

Although flexible financing structures for mobile phones are meant to enhance affordability for farmers, the purchase of such devices still constitute a massive expense for smallholder farmers and can result in over-indebt-



¹⁸² USAID Feed the Future ALL-IN project brief, 2021

edness. Further, clear business cases for establishing such financing structures need to be developed to ensure viability for all the stakeholders involved.

Recommendations to align the Mission's programming with USAID's Digital Strategy

USAID's global digital strategy 2020-2024 seeks to foster an inclusive digital future and is centered on two core objectives:

- a) Improve measurable development and humanitarian assistance outcomes through the responsible use of digital technology in USAID's programming; and
- b) Strengthen country-level digital ecosystems' openness, inclusiveness, and security. The strategy specifies the need to deploy USAID programmatic investments to strengthen critical components of the digital ecosystems, including: an enabling policy and regulatory environment, robust digital infrastructure, capable digital workforce and service providers, and empowered end-users.

The digital agriculture ecosystem in Malawi presents multiple opportunities across the ecosystem components, as has been highlighted in the previous section. In line with the focus areas outlined on the digital strategy, USAID/Malawi can explore some of the identified opportunities in their current and future programming. Below are some recommendations for the Mission to align its programming to the digital strategy.

- *Develop a mission order specific on digitalization:* The Mission needs to develop an internal order to guide the design and implementation of digital activities across programs and broadly in the ecosystem in line with the global digital strategy.
- *Develop shareable tools, resources, and data:* Currently, programs are run independently with limited sharing of tools, resources, and data. In alignment with the Digital Strategy, the Mission needs strategies to ensure data standardization and sharing across programs. The Mission and its implementing partners need to fully implement USAID's Development Information System (DIS) for program performance monitoring and management. Data and learnings generated across programs should also be leveraged to inform future programming for the Mission.
- *Develop internal human capital:* For the Mission to exploit the opportunities in the digital agriculture ecosystem fully, it is critical to build the team's capacity. It will thus be vital for USAID/Malawi to onboard Digital Development Advisors (DDA) to guide the team on implementing the identified interventions. Further, training of the Mission's critical staff and implementing partners on how digital tools can be leveraged to achieve maximum impact should be conducted. Training on advanced methods of analyzing data can, for example, equip the Mission's staff with relevant insights that inform programmatic decisions.
- *Integrate digital activities in current and future programs:* The Mission's program design teams and activity planners should explore the integration of digitalization in current and future programming where feasible.
- *Build a multi-stakeholder approach:* Digital transformation will require coordination across multiple stakeholders. As the Mission incorporates digital strategies in its programming, it will be crucial to engage with other stakeholders such as the implementing partners to understand their current state regarding access and use of technology and address any challenges that might hinder effective program implementation.
- *Allocation of adequate funds:* Financial resources are critical for USAID/Malawi to achieve the desired digitalization objectives in the agriculture sector. The Mission should thus allocate funds to design and implement digital interventions.



Photo Credit: Freepik

Annex I

List of Stakeholders Interviewed

#	Organization	Organization Type
1	World Food Programme	Donor/Implementing partners
2	World Bank	Donor/Implementing partners
3	DAI	Donor/Implementing partners
4	AGRA	Donor/Implementing partners
5	Palladium	Donor/Implementing partners
6	Catholic Relief Services	Donor/Implementing partners
7	Churches Action for Relief and Development (CARD)	Donor/Implementing partners
8	Eastern African Grain Council (EAGC) - G-Soko	DAT
9	Noble Agriculture Technologies	DAT
10	Green Impact Technologies	DAT
11	Shakesolutions Limited	MNO/ICT providers
12	Airtel	MNO/ICT providers
13	Double Vision ICT Lab	MNO/ICT providers
14	Department of Agriculture Extension Services	Government agency
15	Thumba Cooperative	Farmer organization
16	Champhira Cooperative	Farmer organization
17	Nambamba Cooperative	Farmer organization
18	Dzaone Cooperative	Farmer organization
19	Modernized Climate Information and Early Warning Systems (MCLIMES)	Government agency
20	Naming'azi Irrigation Scheme	Farmer organization
21	Sopani Cooperative	Farmer organization
22	Bua Cooperative	Farmer organization
23	King'oma Club affiliate to Cheka Cooperative	Farmer organization
24	Mwinama Cooperative	Farmer organization
25	Growth Africa	Ecosystem support organization
26	TakenoLab	Ecosystem support organization
27	MHub	Ecosystem support organization
28	Mzuzu E Hub	Ecosystem support organization
29	Agricultural Commodity Exchange for Africa (ACEA)	DAT
30	International Food Policy Research Institute (IFPRI)	Research/Academia
31	Kasekese Cooperative	Farmer organization
32	Computer Clinic/	MNO/ICT providers
33	Lync systems	MNO/ICT providers
34	Konnes Tech Systems	MNO/ICT providers
35	Inspire Learning	DAT