SITUATIONAL ANALYSIS REPORT

Assessment of Digitalization in the Agricultural Systems of the Southern African Development Community

Centre for Coordination of Agricultural Research and Development for Southern Africa | World Bank Group

December 2021

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ACRONYMS AND ABBREVIATIONS

ACP	Africa, Caribbean, and Pacific States
AFA	AgriFin Accelerate Program
AFAAS	African Forum for Agricultural Advisory Services
AFTA	African Free Trade Agreement
AI	Artificial Intelligence
AIDI	Africa Infrastructure Development Index
APPSA	Agricultural Productivity Program for Southern Africa
AR4D	Agricultural Research for Development
AU	African Union
B2B	Business-to-Business
B2C	Business-to-Consumer
CCARDESA	The Centre for Coordination of Agricultural Research and Development for Southern Africa
COVID-19	Coronavirus pandemic
DACS	Digital Agricultural Country Study
DAT	Disruptive Agricultural Technology
DE4A	Digital Economy for Africa Initiative
DIAL	Digital Impact Alliance
DRC	Democratic Republic of Congo
EGDI	E-Government Development Index
EU	European Union
FANR	Food, Agriculture and Natural Resources Directorate
FAO	Food and Agriculture Organization of the United Nations
GCI	Global Competitiveness Index
GDP	Gross Domestic Product
GFRAS	Global Forum for Rural Advisory Services
GHG	Greenhouse Gas
GII	Global Innovation Index
GIS	Geographic Information System
GNI	Gross National Income
GPS	Global Positioning System
GSMA	Global System for Mobile Communications
HCD	Human Centered Design
ICDL	International Computer Driving License
ICKM	Information, Communication and Knowledge Management
ICT	Information Communication Technology
ICT4AG	ICT for Agriculture
IDIA	International Development Innovation Alliance
IFC	International Finance Corporation
IFPRI	International Food Policy Institute
IMC	IMC Worldwide
IOT	Internet of Things
IS	Information Society
IT	Information Technology
ITU	International Telecommunications Unit
KII	Key Informant Interview

MSMES	Micro, Small and Medium Enterprises
NELK	New Extensionist Learning
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organization
NREN	National Research and Education Networks
OECD	Organization for Economic Co-operation and Development
OSI	Online Service Index
R&D	Research and Development
RCOL	Regional Centers of Leadership
RUFORUM	Regional Universities Forum
SAA	Sasakawa Africa Association
SAAS	Software as a Service
SADC	Southern African Development Community
SARFAAS	Southern African Forum for Agricultural Advisory Service
SME	Small and Medium Enterprise
SMS	Short Message Service
SSA	Sub Saharan Africa
TOR	Terms of Reference
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
USSD	Unstructured Supplementary Service Data

1 INTRODUCTION AND CONTEXT

1.1 IMPORTANCE OF AGRICULTURE IN SADC

The Southern African Development Community (SADC) established in 1992 is an inter-governmental organization to promote sustainable and equitable economic growth and socio-economic development through efficient productive systems, deeper cooperation and integration, good governance, and durable peace and security among the 16 Member States. The members include Angola, Botswana, Comoros, Democratic Republic of Congo (DRC), Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, United Republic of Tanzania, Zambia, and Zimbabwe.

Each country's agriculture sector varies in its gross domestic product (GDP) contribution signaling the varied economic importance of agriculture across the region.

FIGURE 1 THE 16 COUNTRIES IN THE SADC REGION

The agriculture sector is of major social and economic importance in the SADC region, contributing between 2% and 27% of GDP and approximately 13% of overall export earnings[i]. However, the contribution of the sector fluctuates with the impacts of climate and weather over successive years. In the region, agriculture has a major influence on food security, economic growth, and social stability. 70% of the population depends on agriculture for food, income, and employment[ii].

TABLE 1 SHARE OF AGRICULTURE VALUE ADDED TO TOTAL GDP (%), 2009-2019. SADC (2020) SELECTED ECONOMIC AND SOCIAL INDICATORS

SADC Member States	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Angola	6.6	6.2	5.8	6.1	6.5	7.5	9.1	9.8	10.0	8.6	11.3
Botswana	2.8	2.5	2.5	2.7	2.3	2.1	2.2	2.0	2.0	2.0	1.9

Comoros	33.3	19.4	19.2	19.0	19.6	19.2	18.8	18.7	18.5	18.2	17.6
DRC	22.4	21.4	20.9	20.4	19.3	18.6	18.4	18.6	19.7	8.1	9.4
Eswatini	9.3	10.2	9.7	10.2	10.3	9.4	9.5	8.9	8.3	8.2	8.6
Lesotho	5.1	4.8	4.5	4.8	5.0	3.9	3.8	5.6	5.4	4.4	4.3
Madagascar	26.5	22.2	21.8	21.6	20.1	20.2	19.7	20.4	20.7	15.0	14.0
Malawi	30.4	29.6	28.8	29.9	29.9	29.9	28.7	27.9	28.2	27.3	26.9
Mauritius	3.9	3.6	3.7	3.7	3.4	3.3	3.2	3.2	3.1	2.8	2.9
Mozambique	30.0	26.8	25.8	24.9	23.5	23.9	22.9	22.9	25.0	24.6	26.0
Namibia	8.3	8.5	8.1	8.1	7.5	7.7	6.2	6.3	7.1	7.0	6.6
Seychelles	1.5	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.1	1.3	1.3
South Africa	2.7	2.4	2.3	2.2	2.1	2.2	2.1	2.2	2.4	2.2	1.9
Tanzania	26.5	25.6	25.0	26.6	26.8	25.8	26.7	27.4	28.8	27.9	26.5
Zambia	11.2	9.4	9.6	9.3	8.2	6.8	5.0	6.2	7.2	2.8	3.2
Zimbabwe	12.7	9.6	8.7	7.0	7.1	8.7	8.3	7.9	8.3	7.4	6.5
SADC Region	**7.3**	**6.4**	**6.3**	**6.6**	**6.9**	**7.4**	**7.7**	**8.1**	**8.2**	**6.9**	**7.3**

The core focus for the SADC region's agriculture sector is for greater food security, stable food availability[1], equitable food access[2], and nutritional value and safety for consumers.

1.2 OPPORTUNITIES FOR DIGITAL INNOVATIONS IN AGRICULTURE

Increasing the efficiency of agriculture for smallholder farmers would provide multiple benefits including, increased food availability and freeing up labor to drive more profitable sectors of the economy. The agriculture sector is ripe for innovative solutions to help tackle challenges of food security, hunger, inclusiveness, and sustainability at national, regional, and international levels. Digitization is expected to play an increasingly significant role in achieving global food security, improving livelihoods in rural areas, and is undergoing expansion at an exponential rate.

A recent high-level report entitled 'Charting Pathways for Inclusive Growth' by the Pathways for Prosperity Commission identifies five possible pathways for prosperity being unlocked by technological innovation, the first of these is to raise value from agriculture. Advancements in data analytics, biotechnology and communications will drive growth by improving yields on the farm and by enabling more efficient services and logistics. Agriculture will be a key pillar for inclusive development as many tasks cannot easily be automated. The implications of which suggest continued demand for low-skilled workers and improved terms for trade for farmers, as costs and prices in other more easily automated parts of the economy fall more quickly.

Digital innovations and technologies have the potential to transform agri-food systems by accelerating and integrating stakeholders and their work across the value chain. The use of digital tools by governments for distributing subsidies or managing inventory of emergency food reserves are strategies already being utilized in Africa. These tools, when part of an integrated and national effort, could raise incomes for smallholder farmers, increase their crop production, and enhance food security.

Governments can play a significantly vital role in supporting policy and data infrastructure that encourages the private sector to invest in digital tools. Together with development partners, a valuable digital agricultural

[1] Consistent local supply of appropriate food types, either imported or produced locally.
[2] Local population have the means to purchase or barter for the food they require for appropriate diet and nutrition. Availability and accessibility of food should be of sufficient nutritional value and safe to consume.

transformation can be deployed in partnership with the private sector. Also notable is the impact of the Covid-19 crisis, which has forced many governments to deliver more real time data to help inform the state of food and agriculture during lockdowns, more data sharing between public and private sectors, and beginning momentum to transform the agri-food system across the region. Governments also have a special role in navigating through uneven digital access, digital literacy across populations, low data accuracy and usability, and limited tailoring of content for local contexts. They also suffer as challenges are particularly acute in the public sector, including the shortage of digital talent and aligning digital use cases with manual systems and succeeding in the interoperability continuum.

Over the past ten years, digital agriculture solutions have reached sufficient scale in some parts of the world to become commercially attractive and provide tangible impacts for smallholder farmers such as, Hello Tractor, WeFarm, and Viamo. However, the digital agriculture sector is still in its infancy. Donor financing remains critical to the development of the sector, particularly in some SADC member states (not South Africa) that lag parts of East Africa (Kenya, Rwanda) and West Africa (Nigeria, Ghana) where commercial finance is more accessible. There is a very broad range of digital agricultural tools; from agricultural advisory services to the use of satellite geodata, sensors and machine learning to understand and make sense of big data analytics. Together all can help build more profitable agricultural livelihoods, ensure more climate smart efforts to combat climate change effects, encourage conservation of biodiversity and a diversification of foods as part of changing and emerging diets. Whilst there have been some notable successes, smallholder farmers are still to experience widespread benefits.

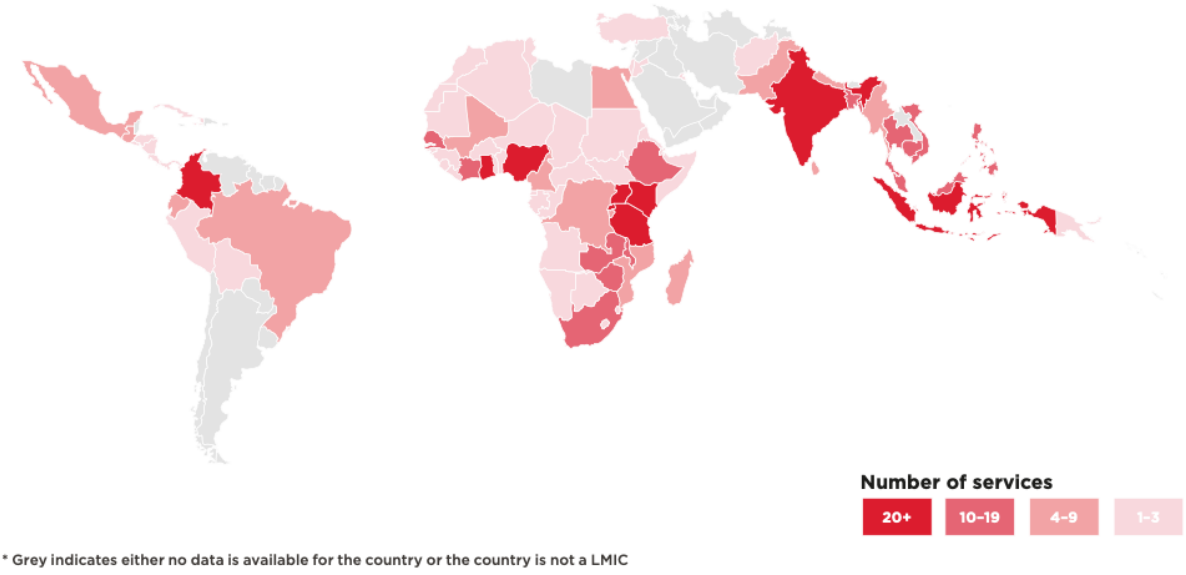

FIGURE 2 GLOBAL MAP OF ACTIVE DIGITAL AGRICULTURE SERVICES. GSMA (2020) DIGITAL AGRICULTURE MAPS

Global System for Mobile Communications (GSMA) AgriTech Digital Agriculture Maps provides a valuable insight into the large numbers of innovations already present. Their global dataset for 2020 illustrates over 700 active digital agriculture services globally in 2020, with a 92% increase since 2009. In Sub-Saharan Africa (SSA) 437 services were tracked by GSMA's AgriTech mapping exercise, with SSA seeing the largest growth in the update of digital agriculture tools. Digital financial services have experienced considerable growth, predominantly through mobile money. The GSMA framework for use cases, and the subsequent 24 sub-use cases identified, address five key challenges including the agricultural knowledge gap, network and internet

connectivity, financial exclusion, poor access to markets and climate change. This versatile framework has guided the use cases in this study and is illustrated in figure 4 in section 3.3.

DIGITAL SKILLS AND AGRICULTURE

The African Union (AU) has already recognized the importance of human capital investment, particularly in digital skills. In February 2020, the AU adopted the Digital Transformation Strategy for Africa, which seeks to harness digital technologies and innovation to transform Africa's economies, generate inclusive economic growth, and stimulate job creation[3]. The pandemic has accelerated the need to enable digital skills advancement across the board from enhancing the capacity of the general consumer population to specialized skills for business, industry, and agriculture.

While the importance of digital skills has been recognized, there has been less of a focus—particularly in emerging markets—on the scale of demand for these skills, and the models that can be used to teach them. The number of emerging studies examining the demand for digital skills in SSA are an important step in beginning to address that gap. It is important to recognize that digital skills are challenging globally, according to the European Commission (2020) as many as 42% of citizens in Europe are without basic digital skills even though most jobs require such skills. Some 37% of people in the labor force – farmers, bank employees and factory workers alike – also lack sufficient digital skills despite the increasing need for such skills in all jobs. In contrast, the Annual Global CEO Survey (2021) by PWC suggests 79% of Chief Executive Officers are concerned about the availability of key digital (Fourth Industrial Revolution) skills, and in Africa that figure jumps to 87%.

The International Finance Corporation (IFC) (2019) in Digital Skills in Sub-Saharan Africa, suggests that digital skills are essential to the future workforce in Africa. By 2030, over 230 million jobs in Africa will require digital skills, which will result in 650 million training opportunities[iii]. Digital skills are not only critical to finding or keeping jobs. They are also critical to closing the digital divide. According to the International Telecommunications Unit (ITU) Digital Skills Insights 2019, in developing countries, 53% of the population is offline, and in least developed countries almost 80% of the population is not using the Internet. This stands in stark contrast to the highly digitized economies and societies in middle- and higher- income countries. It is often wrongly assumed that the lack of internet services in remote areas is the main reason for the gap in internet use. Most of the global population (93%) lives in an area that is covered by at least a 3G mobile signal or service (82 % covered by a 4G signal), based on data provided by national telecom operators. Hence, there are other reasons why many people do not use the internet. These include quality of the connection, cost of the data packages, cost of devices to access the internet, and lack of education and skills.

A recent report by the IFC (2021), Demand for Digital Skills in Sub-Saharan Africa, looking in detail at five countries in SSA including Côte d'Ivoire, Kenya, Mozambique, Nigeria, and Rwanda quantified the demand for digital skills in each country, assessed the market opportunity presented by that demand, and identified successful emerging training models for the provision of digital skills. Demand for digital skills training **will surge in the coming decade**, as jobs that previously did not require digital skills will begin to do so. The Covid-19 pandemic has accelerated the speed of change. By 2030, some level of digital skills will be required by 50-55% of all jobs in Kenya, 35-45% of all jobs in Côte d'Ivoire, Nigeria, and Rwanda, and 20-25% of jobs in Mozambique. Most of the demand for digital skills will be from occupations outside ICT specialties and will be generated by enterprises adopting digital technologies. Seventy percent of demand is expected to be for

[3] As part of the strategy's implementation, the World Bank established the "Digital Economy for Africa Initiative (DE4A)" with a goal of ensuring that every African individual, business, and government is digitally enabled by 2030.

foundational skills, followed by 23% for non- Information Communication Technology (ICT) intermediate skills.

In combining the opportunities for Agriculture and the need for employees with digital skills, it is clear that a global digital revolution is underway. This is epitomized by farmers in need of dynamic digital information on the prices of different commodities, the acceleration of online e-commerce and increasing use of Internet of Things (IoT) and robotics in all sectors including Agriculture. Part of this will require retraining the workforce as part of the commonly referred to Fourth Industrial Revolution, and deftly described in the 2019 edition of the World Development Report, where technology is generating jobs and influencing the nature of markets. This important publication highlights why governments should get involved in building human capital, that workers will engage in life-long learning, that learning will persist outside the workplace, the importance of tertiary education will rise exponentially, where informality and creating new social contracts will become more important and persist. The jobs of the future will require specific skills such as know-how, problem solving and critical thinking but also perseverance, collaboration and empathy, the softer less formal skills.

THE CHALLENGES AND OPPORTUNITIES FOR AGRICULTURE AND THE FOOD SYSTEM

Agriculture is subject to frequent and persistent droughts, prolonged dry spells, floods, cyclones, wildfires, pests and diseases, fluctuating input prices, periodically imposed export and import restrictions, and human and wildlife conflicts which all affect the stability and supply of nutritious food. The Covid-19 pandemic has caused major disruption in daily food supply chains within the region and has forced a rethink as to the resilience of these supply chains. The pandemic has also forced an acceleration of food distribution and food retailing online to stabilize these supply chains. Grassroots food deliveries emerged during periods of lockdowns where restrictions on the free movement of consumers were in force. Concurrently, the breakdown of supply chains of food and the combination of Covid-19 have created the conditions for political skirmishes, interruptions in food supply and consequently civil unrest in both South Africa and Eswatini, signaling the fragility and lack of resilience in some parts of the regional food system.

Agricultural methods are labor intensive, low skilled, involve poor transmission of information and retained knowledge, driven mainly by smallholder farmers cultivating small plots of land that are distributed over a wide area, and with significant fragmentation and barriers to obtaining access to high quality, relevant inputs, and profitable output markets. The production system has large inefficiencies, with heavy consumption of land, use of water, lost production, and wasted food products, which highlights the unsustainable nature of the sector. Farmers are dependent on information to help them to apply good agricultural practices and raise their productivity. A lack of access to this information creates deep and damaging inequalities in the sector and contributes to cycles of poverty, hunger, and overuse of natural resources.

The Regional Food Security Update 2019/20 issued by the SADC Food Agriculture and Natural Resources Directorate predicted the continuing major impact of Covid-19 on food and nutritional security, and agricultural livelihoods. It suggested 43 million people in the region could be food insecure and called for urgent resourcing and scale up of interventions by SADC governments and their humanitarian partners[4]. There was also poor seasonal rainfall dampening overall harvest prospects which was then exacerbated by excessive flooding in the North-Eastern parts of the region. Despite this, crop production estimates for Malawi, Namibia

[4] This is about 61% higher than the previous season and 42% above the past 5-year average according to the 2019 Regional Vulnerability Assessment and Analysis Synthesis Report. The impact of the reduced crop production on household food security will be more severe in those areas which were already experiencing high numbers of food insecure populations the previous seasons (SADC Food Security Quarterly Update 2019/20, Issue 3, April 2020 FANR, SADC).

and South Africa were predicted to increase in most crops, including maize the main staple. African migratory locust outbreaks were recorded in Botswana and Namibia and Fall armyworm and foot and mouth disease remained challenges in the region, all putting strains on the food system.

It is also important to recognize that the food system itself is complex and has many different stakeholders who exchange vast amounts of information and supply inputs including seeds, fertilizers, agrochemicals, farm machinery, crop and livestock health services, crop and livestock insurance, and finance amongst many other areas including marketing, logistics and retail. These latter components of the food system can play a significant role in building up a vibrant and functional ecosystem for food in the SADC region. Furthermore, Youth are more attracted to combining elements of the agricultural commodity value chain than simply restricting themselves to on-farm production alone. The opportunity to drive enterprise and provide products, services, knowledge, and information is more attractive than farming the land itself and they can see a future in it based on service provision and the development of products that meet farmers' needs. Furthermore, youth are more likely to have the mindset that ecosystems exist to mobilize and incentivize diverse participants to collectively address the end-to-end needs of consumers, the very things that typify a successful digital ecosystem.

A recent World Bank report, Future of Food: Harnessing Digital Technologies to Improve Food System Outcomes, suggests that as countries generate wealth, per capita expenditure on food rises and diets also change. The Food and Agriculture Organization of the United Nations (FAO) (2017) The Future of Food and Agriculture: Trends and Challenges report suggests that the share of income spent on cereals declines relative to higher consumption of meat, fresh fruits, vegetables, and processed and convenience foods. With the increasing demographic shift from rural to urban, the nature of supply and demand and patterns of food consumption are changing in scale and nature simultaneously. These changes not only lead to transformation and value addition beyond the farm but have multiplier effects in creating new enterprises and jobs in the broader food system. Urban consumption patterns favor food products with large amounts of labor embedded in them, such as fast food, retail-bought convenience food, and foods prepared by street vendors. Within these ecosystems, actors are more likely to integrate parts of the value chain to capitalize on these changes in consumer habits.

Whilst farming or agriculture employs more people than any other sector, the food system also accounts for a large share of manufacturing and service jobs. In Malawi and Tanzania, food and beverages account for more than 40% of total manufacturing employment[iv]. Even in the European Union (EU), the food and beverage industry represent a larger share of employment than other sectors such as fabricated metal, machinery, equipment, and automotive[v]. Also highlighted is the integration of digital technologies within a company which requires significant investment but also sees increases in output and in employee numbers.

With the recent attention to global agricultural production practices and their unsustainable nature, the greenhouse gas (GHG) emissions from agriculture and land use are broadly accepted to represent 70% of total allowable emissions from all economic sectors to limit global warming to 1.5°C by 2050[vi]. The inability to manage this rise in temperature will continue to drive further droughts (projected to rise by 40% in some regions)[vii] and create greater volumes of food loss and waste claiming a significant proportion of agricultural output while also exacerbating the contribution to GHGs. Accompanying the need for increased productivity is a degradation and loss of biodiversity, and the spread of transboundary pests and diseases of plants and animals which are increasingly resistant to antimicrobials. Furthermore, the incidence of zoonoses is predicted to rise and spread globally as we have seen with the recent pandemic.

1.3 YOUTH UNEMPLOYMENT AND THE AGRICULTURE SECTOR

The potential for the agriculture sector in the region has already been stated in the sections above, but to unleash this potential the sector needs a thriving labor market that integrates the youth. Some of the SADC countries have a persistent youth unemployment rate that can be addressed through the opportunities within the agriculture sector.

Table 2 highlights the youth unemployment rate in the SADC member states, which is persistent over the ten-years of readings.

TABLE 2 YOUTH UNEMPLOYMENT RATE (% AGES 15-24) (%) IN SADC, 2008-2017

SADC Member States	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Angola	33.7	28.1	22.8	16.9	17	17	17	16.9	18	19.1
Botswana	32.5	32.6	35.2	35.2	35.4	35.6	35.4	35.3	35.7	35.7
Comoros	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	10
DRC	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Eswatini	53	53.1	53.1	53.1	53.3	53.4	53.5	53.5	54.1	54.8
Lesotho	47.7	46.2	36.3	28.9	32.9	34.5	34.9	38	39	38.5
Madagascar	5.5	5.9	6.4	3.8	1.0	1.5	2.0	3.0	3.0	3.0
Malawi	9.6	9.2	8.9	8.6	8.2	7.8	7.9	7.8	7.9	8.0
Mauritius	18.9	21.8	23.2	22.1	24.4	23.4	24.6	26	23.6	23.3
Mozambique	38.5	38.5	38.5	38.5	38.6	39.8	43.2	43.2	43	42.7
Namibia	46.1	46.6	45.3	42.6	34.3	40.8	38.7	40.1	45.2	45.5
Seychelles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
South Africa	45.6	48.4	51.2	50.3	51.7	51.4	51.3	50.1	53.4	57.4
Tanzania	6.9	4.9	5.9	7.1	6.5	5.8	3.7	3.7	3.8	3.9
Zambia	15.5	20.9	26.8	20.1	15.3	15.3	15.3	15.2	15.3	15.4
Zimbabwe	7.9	8.2	8.4	8.5	11.5	11.5	11.4	11.4	11.4	11.4

The World Bank predicts that there will be two billion Africans south of the Sahara by 2050; 330 million new entrants to the labor market by 2025[viii]. These people the World Bank says have already been born. In Scaling Up Disruptive Agricultural Technologies in Africa, it is suggested that the agri-food system is the only sector capable of absorbing about 70% of these new entrants [ix]. However, for this to happen an integration and a functional ecosystem of actors including input suppliers of seed, fertilizer, finance, or advisory services must integrate into an ecosystem in ways that low-skilled men and women, often slightly aging and isolated, can engage. Furthermore, with limited connectivity and access to information and markets, the barriers remain high.

1.4 ACCELERATION OF DIGITALIZATION AND DIGITAL AGRICULTURE AND THE RECENT IMPACT OF COVID-19

The United Nations (UN) Secretary-General's Roadmap for Digital Cooperation (2020) emphasizes the importance and the risks of digital technologies in general: *"As the world grapples with the coronavirus disease (Covid-19) pandemic, it is witnessing first-hand how digital technologies help to confront the threat and keep people connected. Digital technologies do not exist in a vacuum – it has enormous potential for positive change but can also reinforce and magnify existing fault lines and worsen economic and other inequalities".*

Digital agricultural innovations have also increased due to the impact of Covid-19, which has highlighted the systemic challenges faced by smallholder farmers. The disruptions in food supply have caused major impacts on the finances and food security of both commercial and subsistence farmers in all regions of the world and limited their ability to plan effectively.

A recent and rapid survey, Feed the Future: Results of a Rapid Analysis of Digital Solutions Used by Agriculture Market System Actors in Response to Covid-19, conducted of United States Agency for International Development's (USAID) digital agriculture innovations suggests that few new digital solutions have been launched specifically in response to the pandemic except for a few newly launched e-commerce platforms. However, many digital service providers and agribusinesses have accelerated, adapted, and increased their digital services. Some who work with producers to buy and trade have accelerated the launch of new functionalities on their business-to-business (B2B) platforms. Digital advisory service providers have adapted their Short Message Service (SMS) to include new information on the locations where inputs could be purchased or marketplaces that could be accessed. Market actors also increased their use of digital solutions and in some cases adopted them for the first time, using services such as WhatsApp and digital payments.

The Commonwealth Secretariat's 2021 survey assessed the economic response to Covid-19. The pandemic has disrupted global trade, the investment environment and resulted in border closures, lockdowns, travel bans and working from home. Policy makers recognize the need for greater and deeper digitalization to adjust to the 'new' economic landscape, among other things. The survey identified the following key points:

- Many countries had previously prioritized using technology and enhancing physical connectivity, digital connectivity, regulatory connectivity, B2B connectivity, and supply side connectivity. They were advancing the business environment, digital policies, digital infrastructure, sectoral policies, and regulatory policies and boosting trade and investment by integrating technology. Some of these countries have developed a clear roadmap for the development of their digital ecosystems, others have not.

- The survey highlighted the changing macroeconomic environment due to the pandemic and reinforced the importance of digitalization to sustain economic development and catalyze an economic, sustainable, and inclusive recovery. Low speed of the internet and lack of training for the public to use online platforms were significant barriers. Private sector focus has shifted to capacity building and training to use digital technologies, and the need to access financing for digital infrastructure. Government priorities have shifted to investment in basic and digital infrastructure, microfinance assistance for micro, small and medium enterprises (MSMEs), capacity building assistance and reviewing relevant policies. The survey revealed a need to review trade and investment policies to incentivize MSMEs to thrive in a digitally conducive investment environment. Employment levels have declined due to the pandemic across sectors and remittances have also fallen. The gender digital divide is even more apparent.

- Countries require basic and digital infrastructure, enabling policies and regulations and strengthened coordination of sectoral interventions on digitalization for post-Covid-19 economic recovery.

2 NATURE OF THE STUDY

2.1 INTRODUCTION TO CCARDESA AND APPSA

The Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA) is a sub-regional organization that was approved by the Council of Ministers of the Southern Africa Development Community (SADC) in 2010 and launched in 2011.

CCARDESA promotes innovative research, technology generation and adoption of sustainable agricultural development through partnership and capacity development. CCARDESA also coordinates the Agricultural Productivity Program for Southern Africa (APPSA) a regional program supported by the World Bank to promote collaboration and to encourage technology generation and dissemination across national borders of participating countries of SADC. Originally this program operated in Malawi, Mozambique and Zambia and was launched in 2013. In 2019 Lesotho and Angola joined the program and will be implementing it to 2025.

APPSA supports the objectives of the World Bank's Africa Action Plan, which identifies regional integration as an important element for achieving higher economic growth and poverty reduction. Specifically, APPSA aims to increase the availability of improved agricultural technologies in participating countries in the SADC region through Regional Centers of Leadership (RCoL) for specific regional commodities, regional collaboration in agricultural research, technology, and innovation:

- Establishing RCoL on commodities of regional importance.
- Supporting regional collaboration in agricultural research, technology dissemination, and training.
- Facilitating increased sharing of agricultural information, knowledge, and technology among participating countries.

APPSA has a World Bank IDA grant component for CCARDESA and in collaboration with the Food, Agriculture and Natural Resources Directorate (FANR) of the SADC Secretariat, CCARDESA has appointed IMC Worldwide to carry out a situation analysis of the status of digitalization in the agricultural systems of SADC region and assist CCARDESA and SADC to establish a digital platform for networking amongst its stakeholders.

2.2 PURPOSE, SCOPE, AND TERMS OF REFERENCE

CCARDESA is a key player in Agricultural Research for Development (AR4D) activities and wants to take the AR4D agenda forward by ensuring that Agricultural Transformation embraces digitalization because it has the potential to provide productivity and sustainability gains for the whole agricultural sector. Significant changes in agricultural systems are anticipated because of the convergence of new digital technologies which have the potential to change farming along whole value chains. The demand for region-specific digital technologies for agricultural innovations, coupled with a conducive enabling environment, calls for a systematic assessment of levels of availability of relevant digital systems and the extent to which such technologies are accessible in each of the SADC countries.

The purpose of this assignment is to undertake a stocktaking analysis of the status of digitalization in the agricultural systems of the SADC region paying special attention to agricultural research for development, agriculture education, agriculture extension and market linkages.

The specific objectives for the assignment based on the Terms of Reference (ToR) are:

1. Assess the extent to which the national and regional policies and regulatory frameworks of the SADC countries provide a conducive environment (policy space) for agricultural digital innovations.
2. Provide a tool (digital or analog) to identify the policy opportunities and gaps that need to be addressed if the SADC region is to fully take advantage of the digital transformation. This tool should be tailored to help countries to compare and harmonize their policies to allow digital innovations and formation of networking platforms in agricultural systems.
3. Map the various agricultural digital innovations available in each country, and assess their availability, affordability, usability, and potential for scalability by smallholder farmers.
4. Map the various agricultural digital players in each country and identify their roles in the digitalization value chain.
5. Evaluate the extent to which the current agricultural syllabi in agricultural Universities and colleges embrace digital agricultural skills, innovations and applications that encourage youths to become digital entrepreneurs.
6. Identify and propose opportunities for establishing an attractive networking platform for the SADC countries.
7. Propose and Develop a Digitalized Agricultural Platform for the SADC member countries (Community of Practice or Tool) to be launched in the region.

According to the CTA definition, digitalization implies **the use of digital technologies, innovations, and data to transform business models and practices across the value chain and address bottlenecks in productivity, post-harvest handling, market access, finance and supply chain management to achieve greater incomes for smallholder farmers, improve food and nutrition security, build climate resilience, and expand the inclusion of youth and women to boost employment**. This definition is the working definition used in this study and differs from the term disruptive agricultural technologies (DATs) used by others such as the World Bank who refer to both digital and non-digital innovations that enable smallholder farmers to leapfrog their current constraints, improve yields, incomes, nutritional status, and climate resilience. These technologies include mobile apps, digital identities for farmers, solar applications for agriculture, portable agriculture devices, and bio-fortified foods. Where there is commonality is that these technologies can accelerate agri-food outcomes three-to-five times by cutting out middle actors or obtaining more efficient agri-food outcomes.

While digital transformation comes with the promise of positive outcomes, such as efficiency, cost savings, convenience, and increased safety of remote transactions, it also brings barriers and risks that could negatively affect the adoption of digital solutions, such as cyber threats, cyberbullying, fraud, exclusion of marginalized populations, lack of emphasis on sustainability and biodiversity that are unable to access and use these digital solutions.

Although the pandemic has exposed the shocking realities of inequality in access to and use of the internet and the affordability of digital services in their many forms, there is widespread support for the potential that digitalization can change farming along whole value chains at regional level. The African Free Trade Agreement (AFTA) provides drivers for greater trading between African nations. There is recognition that regionally specific digital innovations, and a conducive policy environment as well as an understanding of digital and entrepreneurial skills development will enable digital technologies to play their part.

Digitalization is a gradual process that builds a functioning, yet dynamic and evolving digital ecosystem. The process requires a broadly established and well-understood internal rationale, changes to organizational mindsets and behaviors, some surrender of control so that different actors can engage with one another easily to align structures, processes, and staff with the appropriate investment of time and resources. It also requires a strategy to address the current pain points in a system, as well as its limitations, and needs to maintain a humility as to the human-based nature of consumers and operators in the system. This principle will be important as some of the elements, policies, innovations, and digital skills are considered in this report.

2.3 STRUCTURE OF THE REPORT

This following report is structured as follows:

Section 1: Provides an introduction and presents the context of the SADC region, the importance of agriculture to the member states, the opportunities and challenges within the agriculture sector and food system, and the recent impact of Covid-19.

Section 2: Presents the nature of the study and provides background on the Client, outlines the ToR and the purpose of the study, and defines the term digitalization.

Section 3: Provides an explanation and justification of the methodology followed by the study team. Outlined in this section is the general framework, which follows the GSMA framework of use cases, the ecosystem approach that informed the study, further information on the tools and team involved in the data collection, and the limitations of the study are also included.

Section 4: Presents the results of the Broader Policy Environment element of the study. Background is provided on the benchmark assessment and the results of the benchmark are put into context for the study. This section also includes the results of the policy and legislation stock take, and the stakeholder interviews.

Section 5: Presents the results of the Digital Agriculture Innovations element of the study.

Section 6: Presents the results of the Digital Agricultural Skills and Entrepreneurship Training element of the study.

Section 7: Provides a discussion on the results of each of the three elements. Key reflections and broader areas of study are presented. This section also highlights potential opportunities for CCARDESA in establishing, coordinating, and encouraging the growth of an emerging digital agricultural ecosystem in the SADC region.

Section 8: Provides a conclusion which addresses the state of agricultural systems currently and prepares a pathway for some possible next steps.

3 METHODOLOGY

3.1 GENERAL FRAMEWORK

IMC Worldwide, CCARDESA, and the World Bank agreed to the framework, approach, and methodology for the assessment during induction meetings held in March and April 2021. CCARDESA facilitated introductions to 14 Information, Communication and Knowledge Management (ICKM) Focal Points in the 16 SADC member states. There were no ICKM focal points for Comoros and Madagascar at the time of the study. The study team worked with 16 experienced national consultants with specialisms in agriculture and digitalization in each of the countries.

To deliver on the objectives of the assignment, the work was divided into four core deliverables across all 16 countries:

1. Establishing knowledge and information on available public national and regional policies, identifying opportunities and gaps, and a benchmarking tool for the region.
2. Mapping various agricultural digital innovations and actors available in each country including factors related to roles, access and use of services, affordability, and scalability.
3. Mapping the extent to which the current agricultural syllabi in agricultural universities and colleges embrace digital agricultural skills, including incubators and accelerators that encourage youths to become digital entrepreneurs.
4. Creation of a Digitalized Agricultural platform within the CCARDESA website that will strengthen the role as a coordinator for CCARDESA in the digital agriculture ecosystem and to facilitate taking along all stakeholders together.

3.2 AN ECOSYSTEM APPROACH

Achieving and sustaining any agricultural development outcome often depends on the ability of multiple interconnected actors to work together. A digital ecosystem comprises stakeholders, systems, and an enabling environment that empowers communities to use digital technology to access services, engage with one another and drive economic advancement. The recent USAID digital strategy explains this in more detail.

Key actors within an ecosystem include governments, civil society, private sector, universities, individual entrepreneurs, and innovators to work effectively together. For innovations to be successful, they must be efficiently generated, developed, tested, reiterated, refined, and ultimately scaled for development impact. The ecosystem in which innovation exists requires coordination, collaborative action, and resources to ensure that it can operate at multiple levels - local, national, and regional - and inclusive of relevant sectors. Adopting an ecosystem approach recognizes the different actors, relationships and resources that have important roles in taking good ideas to scale. It also demands effectiveness in each part of the innovation system which is moderated by other parts of the system (e.g., innovators being able to access capital) and an understanding that a change in one part of the ecosystem leads to changes in other parts of the system (e.g., increases in internet connectivity will accelerate testing new technologies).

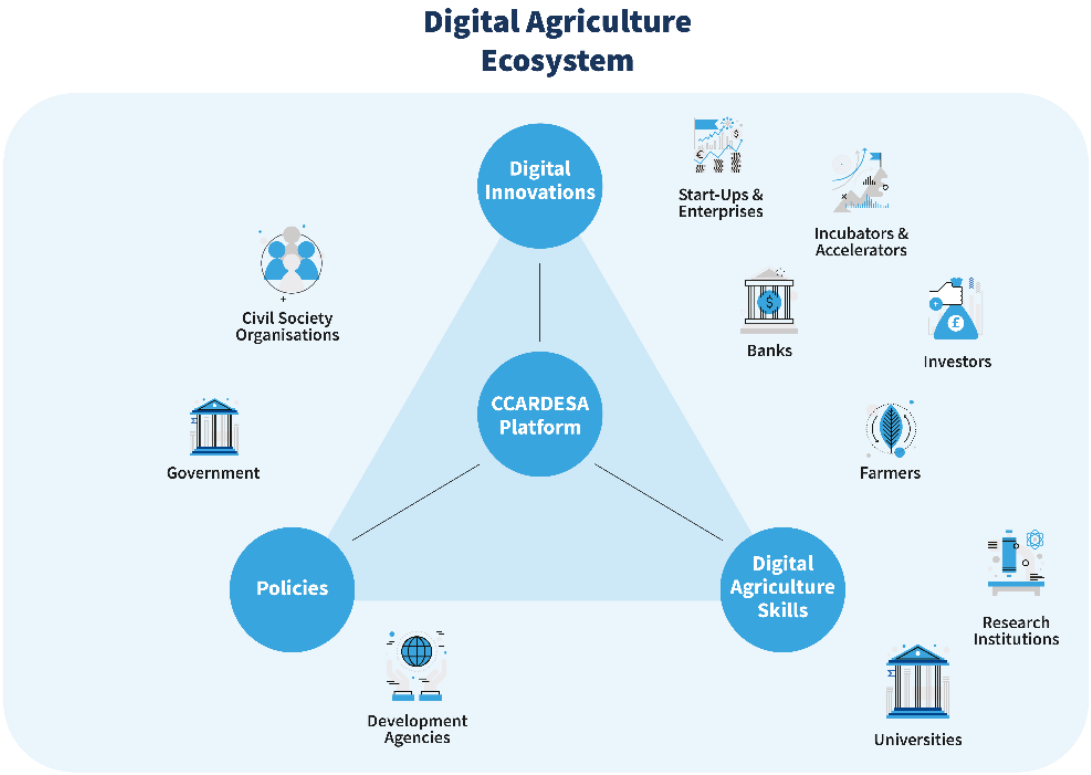

FIGURE 3 DIGITAL AGRICULTURE ECOSYSTEM FOR ASSESSMENT

Within the scope of the regional assessment, eight countries were pursued in further detail and termed “Deep Dives” where further time and resources were focused. The selection included a Lusophone, Francophone and Anglophone country, an island nation, and those countries in which the greatest number of innovations could initially be identified.

3.3 OVERALL METHODOLOGICAL APPROACH

TYPOLOGY

The agreed framework used to characterize digital innovations for this study is based on the GSMA framework presented in Digital Agriculture Maps: 2020 State of the Sector in Low and Middle-Income Countries. The framework is based on five key use cases, illustrated in figure 4. The digital technologies effectively mitigate the challenges facing farmers and address the pain points within the value chain for actors in the agricultural sector. This more inclusive model combines the main use cases of the technology, the increased attention and importance of finance and mobile money as a driver of digital agricultural innovation, and the challenges farmers are facing. Other models have characterized use cases based on single domains but less on a vibrant ecosystem of services.

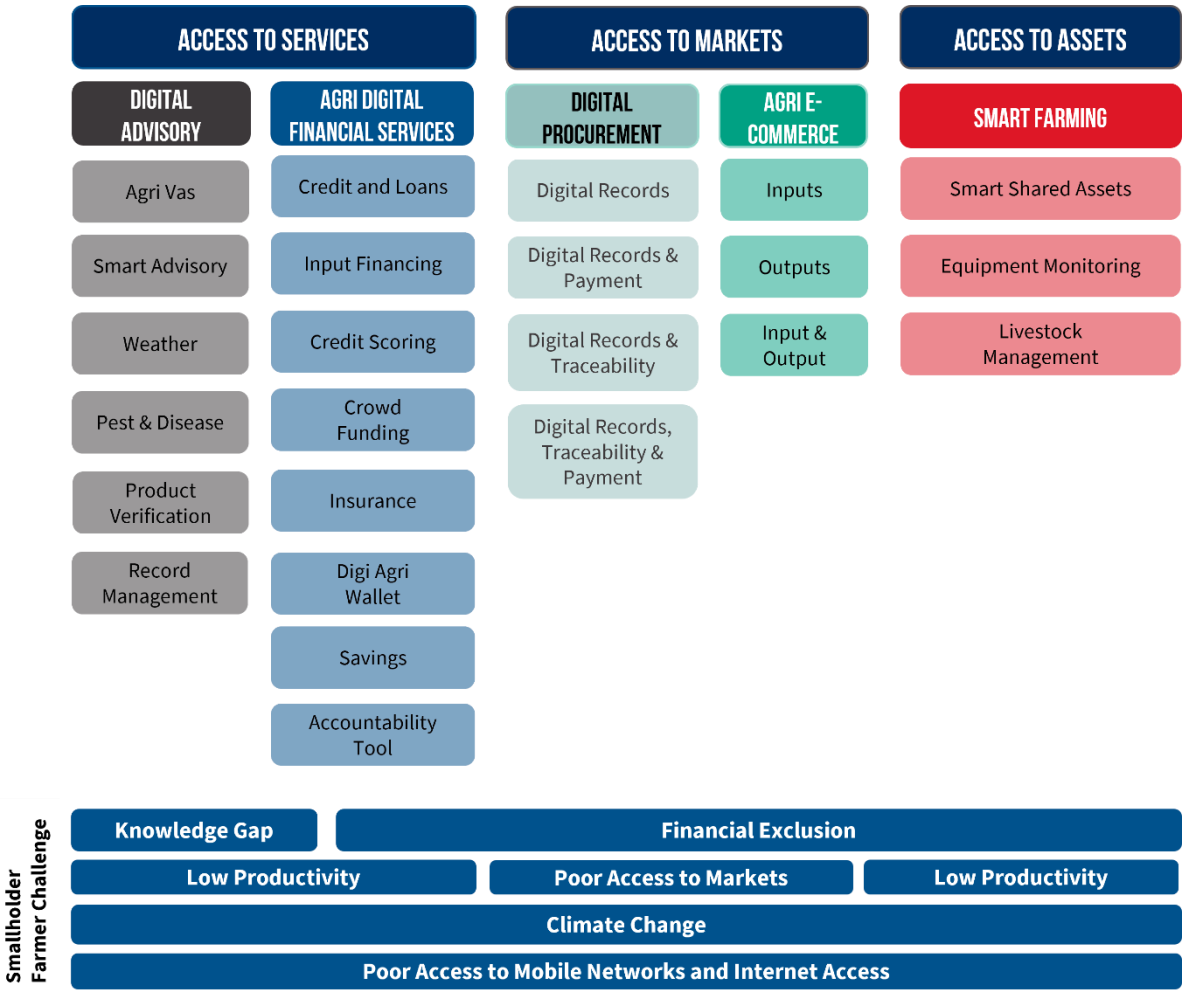

FIGURE 4 USE CASE MODEL BASED ON GSMA FRAMEWORK

TOOLS

The overall approach to this study is based on a systematic and multi-step process which utilized a series of data collection and compilation efforts both quantitative and qualitative that are described below.

a) Qualitative semi-structured interview guides to understand the relevant policies, digital agricultural innovations and digital skills training in Universities and Colleges across the region, through discussion with CCARDESA ICKM Focal Points (Key Informant Interview (KII) Guide for ICKM focal points can be found in Annex 6).

b) Desk and in-country research to identify and verify appropriate innovations and identify contact points for a quantitative survey (Full list of identified innovations can be found in Annex 5).

c) Quantitative survey tool administered to provide further detailed information on digital agricultural innovations at a national and at a regional level and translated where necessary into French and Portuguese (Innovators Survey can be found in Annex 7; KII Guide for Innovators can be found in Annex 11 and 12).

d) Quantitative survey tool to collect data on the digital skills training at Universities and Colleges in each SADC country in the region though collaboration with Regional Universities Forum (RUFORUM) Where challenges were faced with response rates, the survey tool was administered

verbally through key informant interviews and the results supplied into the survey data set with the respondent's permission (Digital Skills and Syllabi Survey can be found in Annex 8; KII Guide for Universities and Colleges can be found in Annex 10).

e) Qualitative semi-structured interviews with incubators and accelerators to assess training and entrepreneurship efforts in different countries (KII Guide for Incubators can be found in Annex 9).

f) Qualitative semi-structured interviews with other stakeholders, where appropriate (Stakeholder KII Guide can be found in Annex 13; Full list of interviewed stakeholders can be found in Annex 2).

GENERAL ECOSYSTEM

The study team collected key digital ecosystem statistics for each country through a desk review of country reports and stakeholder websites (World Bank, ITU, GSMA, etc.). Using this information, a benchmark assessment was conducted based on foundational pillars identified from the Kenyan Digital Economy Blueprint. The general methodology and indices was informed by a similar benchmark study produced by Smart Africa and the Digital Impact Alliance. The assessment elucidated the progress SADC countries are making in unlocking a functioning digital economy and was used to provide a context to the wider findings of this study. This regional reflection of the results and insights obtained across the SADC region is complemented by a series of 16 supplemental Digital Agricultural Country Studies (DACS), each providing an early baseline reflecting what was available in the policy, digital innovation, and skill training areas for possible further study.

POLICIES

For the broader policy section, the study team identified available public policies, strategies and legislation around ICTs, digitalization, data, cybersecurity and privacy, e-commerce and transactions, and agricultural sector policies through desk-based research and discussions with in-country consultants. The team undertook qualitative semi-structured interviews with CCARDESA ICKM focal points to identify additional policies, including draft versions that may be inaccessible online, and to understand practical challenges around the policy environment within ministries and the barriers in implementing digital solutions in agricultural systems. A full list of all ICKM focal points interviewed can be found in Annex 1.

Available policies were reviewed to understand their complexity, basic goals and strategies, and the relationship with agriculture within the public sector. The team also took stock of relevant digital laws, although the list included in this report is not exhaustive but focused mainly on electronic transactions, electronic commerce, cyber security, data protection, and open data. Findings from stakeholder interviews were then analyzed to provide a deeper understanding of the challenges faced within the public sector and to what extent digitalization is being prioritized by governments.

INNOVATIONS

National consultants validated identified innovations (national and regional) and presented where possible contact information for potential survey respondents. The survey tool was tested with ten innovators in Zambia prior to deployment and refined based on their feedback to ensure it was working. All identified innovators were invited to complete a voluntary digital survey in English, French, or Portuguese. To ensure a good proportion of responses to the survey, all innovators were rigorously followed up by consultants either in-person or by telephone for several weeks. A full list of identified innovations can be found in Annex 5.

Self-reported survey results were cleaned by removing duplications, clustered where there were open answers, and names were systematized across the region. Responses were then coded for data analysis. Data was analyzed in Excel. All innovations received a unique number and were uploaded to a database. The database forms the basis for the interactive part of the web portal of CCARDESA and the detailed information is presented in a separate needs assessment and requirements report submitted to CCARDESA (further information can be found in Annex 15).

Qualitative semi-structured interviews with innovators and other relevant stakeholders complemented data from the surveys with additional effort in deep dive countries. In deep dive countries **further information on the breadth and depth of the innovations** being applied, their benefits, results, scale, costs, challenges, inclusivity, and value for money were pursued. Interview respondents were selected based on sampling across the scale stage of the technology, geographic location, and type of intervention. The KII Guides for all interviews can be found in the attached annexes (Innovators, Annex 11 and 12; Stakeholders, Annex 13) and the list of stakeholders interviewed can be found in Annex 2. It is anticipated that the interactive web presence will require active and on-going content management, maintenance, updating of new content and monitoring the functionality of the network once it is live.

The DACS contained digital innovations identified using the GSMA framework (in figure 4). These were presented individually by country and have been consolidated for this regional situational landscape.

In graphs and tables, the following color coding was used to illustrate the different use-cases.

DIGITAL SYLLABI

Digital and entrepreneurial skills training was assessed through a voluntary quantitative Survey Monkey tool sent to 54 Universities and Colleges in the region (a total of 58 different faculties were contacted). To encourage larger participation, some institutions had multiple contact points. A full list of all Universities contacted can be found in Annex 3 and the survey circulated can be found in Annex 8. The majority of those contacted were the Faculties of Agriculture contact points facilitated via collaboration with the RUFORUM members in the SADC countries. However, some additional Universities were contacted through networks within the IMC study team and not all of these were strictly agricultural faculties but aimed to provide good representation amongst the SADC member states. Where there were challenges in response rates, qualitative key information interviews were supplemented via networks of the IMC study team. The study team also carried out key informant interviews with representatives of faculties of agriculture at selected Universities and Incubators to complement the survey results. The KII Guide for Universities and Colleges can be found in Annex 3. Seventy-one (71) incubators and accelerators were approached by the IMC study team to take part, a full list of incubators approached can be found in Annex 4. Semi-structured interviews were also conducted with incubators and accelerators to identify digital skills training and training for entrepreneurship and digital innovators. The KII Guide used with the incubators can be found in Annex 9 and the full list of all stakeholders interviewed can be found in Annex 2.

LIMITATIONS TO THE METHODOLOGY

The planning, data collection, analysis and reporting of this study was completed between April to December 2021. Due to the Covid-19 pandemic much of the data collection and delivery of this assignment was completed remotely across the 16 SADC member states. The inability of some national consultants to conduct in-person meetings or interviews, and restrictions around national travel due to Covid-19 protocols limited the data collection and led to delays in some areas. Furthermore, the scope of this assignment was extremely broad covering digital agricultural policies, innovations and skills and syllabi, which meant that the study team had to prioritize the research accordingly. The digital ecosystem is highly variable across the SADC member states and therefore in those countries where the digital environment may be at the embryonic stages, there is little data to be collected specific to agricultural systems.

Delays in meeting the previous CCARDESA ICKM focal points for South Africa and the focal point for Tanzania hampered the progress of the study in those two countries. For Tanzania, formal letters were requested to facilitate the meeting and the cooperation of the focal points which created a considerable delay.

Whilst every effort was made to carry out a systematic assessment, there were several delays to the data collection which may have been due to several reasons. A lower-than-expected response rate to voluntary data collection tools required frequent follow ups, more than was originally anticipated as part of the work plan. The impact of the Covid-19 pandemic more generally resulted in consultants and innovators taken ill at different times. There was also significant insecurity in two of the countries over the course of the study period. Every effort was made to collect data to provide information on the stages of innovations, the accessibility of innovations to farmers, how many farmers were engaging, and the potential of these innovations for scalability. However, this data is all self-reported and as such must be interpreted with some caution.

The methodology pursued to identify policies sought to provide an audit of the policies in the public domain illustrating to what extent digitalization is embraced by governments, and the relationship and implications for the agriculture sector. The report did not seek to analyze the content of policies or strategies or assess whether they are effective or have achieved their objectives. There were several challenges in obtaining the documents and determining if they were accurate, final, or implemented. The impact of the pandemic has affected the priorities of governments and their implementation of related policies. The lockdowns associated with the pandemic have constrained open and full consultation of policies that have been drafted and may have delayed their finalization. Additionally, much of the documentation the team found is split between ministry websites and illustrates the siloed nature of policy formulation in this space. Documents and assessments produced by development partners were scrutinized but did not form part of the stock take itself.

The current regional digital agriculture picture is a snapshot in time, as new digital innovations are being created at a rapid pace some may also be declining because of the Covid-19 pandemic or for other reasons. Due to Covid-19 restrictions in the country, physical meetings could not take place. People had to work from home, which significantly affected their ability and willingness to participate in online interviews and in survey instruments. The efforts of the national consultants to convince innovators to participate in the survey required significant energy and effort taking longer than expected and caused some delays in the data collection phase. Many innovators were very busy and mentioned that participating in another survey or interview did not equate to new opportunities for their innovation. There was also suspicion and caution by innovators and public sector stakeholders to engage with local consultants. The data collected provides a reasonable overview of the current landscape, but this overview is not exhaustive and must not be interpreted as such. Furthermore, in some countries the violent exchanges and political uncertainty, as well as the toll of

the Covid-19 pandemic was significant, and this correlated with a significant decrease in the willingness of people to participate in the study and the challenges they faced to dedicate their time to work that was unpaid whilst simultaneously juggling childcare, home schooling and illness in their families.

Across the region, the response rate of universities to the survey tool and interviews was 47% which was a reasonable response rate. However, the response rate is variable between countries and the number of participating universities in some countries was much lower than expected given their diversity and maturity and contrasted highly with much smaller nations in the region. Survey participation was voluntary and self-reported. A number of Universities declined the invitation to fill out the survey. The lower-than-expected response is believed to be due to the enormous additional workload on staff as a direct result of the pandemic forcing many to move all activities online and the time and pressures this entailed. As a result, University staff struggled to find available time for the survey. The level of digital skills represented therefore is believed to be much lower than the reality for the region. During the key informant interviews it was also established that some Universities and Faculties struggled to see their role as part of an ecosystem actor in digital innovations. This aspect is worthy of further investigation, as Universities may be invited to engage and participate as part of an ecosystem where they can shape their roles and relevance.

The stakeholders engaged in this study are not intended to be considered exhaustive. All data collection tools that required stakeholder participation were voluntary and there were cases where the study team did not receive a positive response in participating in the study. **The data collected for this study is intended to provide an early baseline of information on these dynamic topics that can be used for possible further study and are intended to provide an indication of some of the trends present in the region around digitalization in agricultural systems**.

The digital agricultural space is highly competitive, crowded and most innovators struggle to employ profitable business models and reach levels of scale that make them sustainable. An understanding of these issues including availability, accessibility, affordability, usability, and potential growth were pursued through self-reported data or data collected through interviews. It is important to understand that bias will likely arise in such circumstances and that the data reported may be less accurate and sometimes inflated to provide a positive reflection on the innovation or company. Whilst the research team have made every effort to triangulate the data collected, there are limitations to the accuracy of some of the more commercially sensitive data and instances where this data was not willingly shared by some of the innovators and entrepreneurs due to its sensitivity and confidentiality. Not least, the impact of the pandemic has created greater reliance on digital agriculture and therefore figures which may seem high may not be sustained into the future, or alternatively if the pandemic has impacted digital agricultural tools and innovations negatively, these may arise and grow again in the future. Finally, as digital innovations mature, they may have to employ different business models at different stages or a combination of business models to create sustained value and to attract investment. It is important that CCARDESA appreciate that the reports compiled under this study will be snapshots in time and that this picture will change over time. If other parts of the world are an example, this is likely to be at a rapid rate and therefore building an ecosystem of very diverse actors will not only require time but resources to ensure that the ecosystem adds value to all the actors and is advancing economic opportunities for all of them.

COMPLEMENTARITY AND SUPPLEMENTATION

The study team included other organization's research where available, to avoid duplication and to reflect ongoing work within the SADC region. As such the following organizations were approached to share their

digital landscape information which is reflected in the overall output of digital innovations in the SADC region. These sources include:

- GSMA's Digital Agriculture Maps of 2020 in the SADC countries.
- The World Bank database on "Disruptive Agricultural Technologies"
- CTA Database (2019) Digitalization in Agriculture Report and Wageningen University Knowledge Hub
- Cornell University's Database of Agriculture in the Digital Age which provides evidence of specific innovations and the effects on smallholder farmers.

4 THE BROADER POLICY ENVIRONMENT

4.1 THE GENERAL DIGITAL ECOSYSTEM

In 2020, the AU adopted the Digital Transformation Strategy for Africa (2020-2030) which presents a vision of an integrated and inclusive digital society and economy in Africa. It recognizes the digital economy as a key factor in stimulating economic growth and jobs, reducing inequality, and promoting sustainable growth. The Strategy, illustrated in figure 5, is based on foundational pillars, critical sectors to drive the digital transformation, and cross cutting themes to support the digital ecosystem.

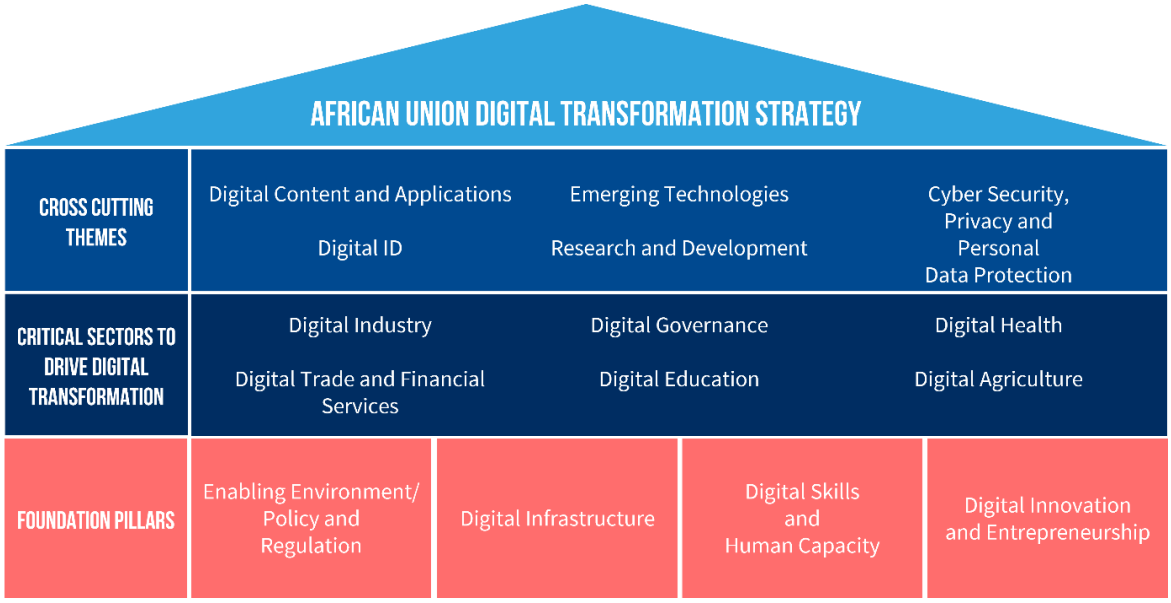

FIGURE 5 OVERVIEW OF AFRICAN UNION (2020) DIGITAL TRANSFORMATION STRATEGY FOR AFRICA

The transition to, and importance of, a digital economy is illustrated in the prevalence of this agenda within regional institutions, donors, and multilateral organizations. Where agendas previously focused on ICTs, providing hardware and universal access, the focus is now on enabling a digital economy with a more holistic view of digital and ICTs. The digital economy considers sectors beyond the Information Technology (IT) industry and encourages a whole-of-government approach to have more emphasis on the overall ecosystem and economy[x].

This is embodied in the OECD Going Digital Integrated Policy Framework and Toolkit with promotes a holistic approach that seeks to balance opportunities and risks of digital transformation across the economy and society. The Toolkit is focused around seven policy dimensions:

1. **Access** to communications infrastructure, services and data
2. Effective **use** of digital technologies and data
3. Data-driven and digital **innovations**
4. Good **jobs** for all
5. **Social** prosperity and inclusion
6. **Trust** in the digital age, and
7. **Market openness** in digital business environments

These policy dimensions cut across the economy and society with several themes: data and data flows, development, digital government, digital technologies, gender, growth and well-being, information industries, productivity, skills, and SMEs. These dimensions and themes should not be considered in isolation but require coordinated policy action across-government and the economy. The OECD approach in Measuring the Digital Transformation, is heavily reliant on available data, statistics, and indicators to inform future policies that are fit for digital transformation. As digital transformation and the concept of a digital economy is relatively young, many countries will struggle to have sufficient data and indicators that are applicable to such an advanced framework.

ASSESSING A DIGITAL ECONOMY

The World Bank identifies two approaches on how to assess a digital economy: top-down approach or bottom-up approach[xi]. A top-down approach measures the economic activities undertaken using technology in areas such as consumption, investment, government spending and by three key stakeholders: government, citizens, and businesses. This approach is similar in nature to measuring a national economy but is feasible due to the availability of economic data on technology. Instead, the World Bank suggests that a bottom-up approach is more suitable. The trade-off with a bottom-up approach is that it may not assess the entire digital economy but focuses only on the enabling foundations or pillars that help to advance a digital economy. If these foundational enablers are in place and good, then it is likely that a country is on the path to developing a successful digital economy.

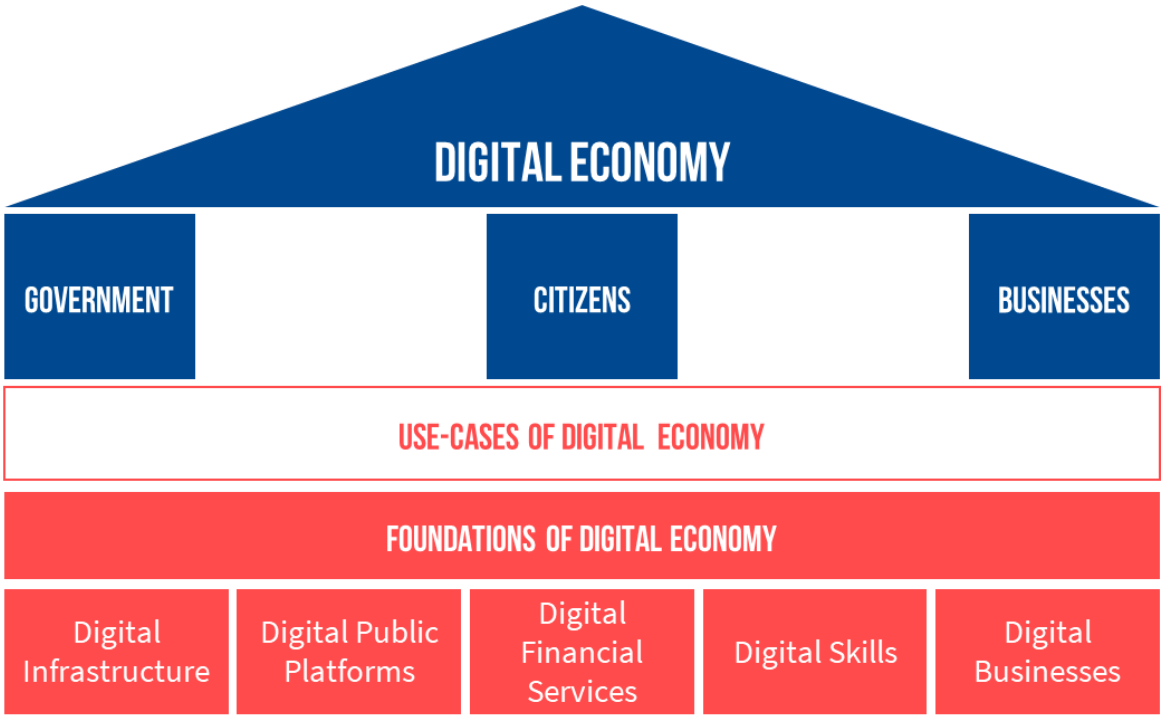

FIGURE 6 WAYS OF ASSESSING A DIGITAL ECONOMY AND WORLD BANK DE4A INITIATIVE FOUNDATIONS

Under the World Bank Digital Economy for Africa Initiative (DE4A), this bottom-up approach has been followed with a focus on five key foundational areas for assessment: digital infrastructure, digital public platforms, digital financial services, digital business, and digital skills. Several cross-cutting areas are also identified: digital economy regulation, competition policy, gender, cybersecurity, consumer protection and data protection. Figure 6 presents the two approaches suggested by the World Bank, top-down in blue and bottom-

up in red; the foundational pillars used for DE4A are also illustrated. The DE4A initiative builds and supports the work of the AU's Digital Transformation Strategy for Africa.

The Pathways for Prosperity Commission has also produced a Digital Economy Kit which intends to promote and assist in building a holistic national vision that harnesses digital technologies throughout the economy and helps prepare countries to be digitally ready. The Kit aims to support countries in building a shared national vision and prioritizes four key pillars: infrastructure, people, finances, and policy and regulation. These pillars are interconnected through sector ecosystems, technologies, and business models and are necessary for the next stages of inclusive digitally led growth.

KEY PILLARS FROM PATHWAYS TO PROSPERITY DIGITAL ECONOMY KIT			
INFRASTRUCTURE	**PEOPLE**	**FINANCES**	**POLICY AND REGULATION**
- Electricity and physical communications infrastructure - 'Soft' infrastructure of foundational digital systems, including ID systems, digital finance, and e-government. - Effectiveness of policy and regulation in generating competition among infrastructure providers and enhancing affordability. - Fair coverage of infrastructure (urban vs. rural). - International interoperability of national infrastructure.	- Addressing gaps in capabilities for users, providers, and government (i.e. building capacity of digital skills in individuals). - Labour markets able to absorb digital transformation through policies and regulation. - Social protection systems to cushion transitions.	- Inclusive financial intermediation will be critical as households, businesses and governments upgrade and innovate with digital technologies. - Households will need affordable digital products. - Businesses will need access to finance. - Governments will need to finance public goods.	- Competition policy - Taxation - Intellectual property - Data standards and interoperability. - Cybersecurity and data protection.

FIGURE 7 KEY PILLARS OF DIGITAL ECONOMY KIT FROM PATHWAYS TO PROSPERITY

These frameworks, kits, and initiatives presented are all underpinned by digital transformation and highlight foundational pillars that enable a digital economy. While their uses vary there is a clear pattern that emerges of certain themes or areas that are deemed most critical for digital preparedness and the importance of the three stakeholders: government, businesses, and citizens.

This study does not assess the digital economy of the sixteen SADC member states which is beyond the current scope but identifies an assessment tool that provides an overview on the progress or level of development towards a digital economy to provide context to the results of the study and which could be shared across the region.

4.2 THE BENCHMARK ASSESSMENT

To determine the degree to which SADC member states are unlocking a digital economy, a benchmark assessment was conducted. The approach was adapted from Unlocking the Digital Economy in Africa: Benchmarking the Digital Transformation Journey by SMART Africa and the Digital Impact Alliance (DIAL). SMART Africa's mandate is to encourage Africa's transformation into a knowledge economy through the usage of ICTs, and therefore this assessment would be most compatible to the SADC Region. The assessment areas in the report are based off the five foundational pillars of the Kenyan Digital Economy Blueprint, illustrated in figure 8, and are similar in nature to the African Union's Digital Transformation Strategy foundation pillars (Enabling Environment; Policy and Regulation; Digital Infrastructure; Digital Skills and Human Capacity; Digital Innovation and Entrepreneurship).

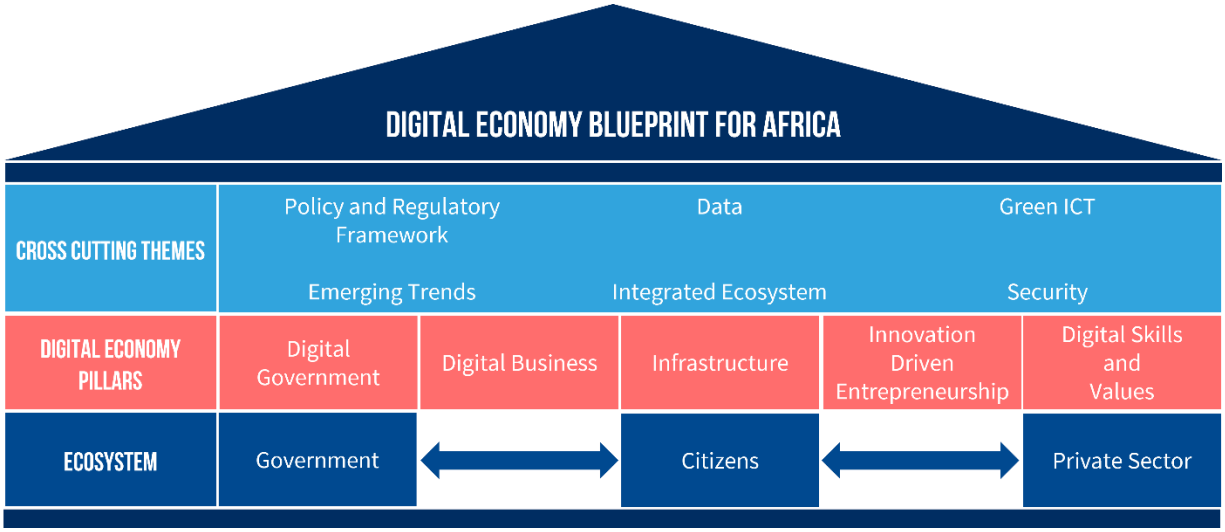

FIGURE 8 OVERVIEW OF KENYAN DIGITAL ECONOMY BLUEPRINT

A sixth pillar was added to the benchmark to include Policy and Regulatory Frameworks to align it with this study and as a regular cross-cutting area mentioned in other frameworks. These six pillars are presented in table 3.

TABLE 3 PILLARS FOR THE BENCHMARK ASSESSMENT

Digital Government	Digital Business	ICT Infrastructure	Innovation Driven Entrepreneurship	Digital Skills	Policy and Regulatory Frameworks
The presence and use of digital services and platforms to enable public service delivery.	The development of a robust marketplace for digital trade, digital financial services, and digital content.	The availability of affordable, accessible, resilient, and reliable infrastructure.	The presence of an ecosystem that supports homegrown firms to generate world-class products and services that help to widen and deepen digital economic transformation.	The development of a digitally skilled workforce that is grounded on sound ethical practices and socio-cultural values.	The presence of policies and regulations that are dynamic, flexible and promote the digital economy.

To measure the level of each pillar and provide a whole picture of each SADC country, specific indicators were selected for the benchmark assessment. Whilst the indicators were based on the SMART Africa/DIAL report,

adaptations were made to some of the indicators for a more specific focus on the digital elements. For example, the ICT Infrastructure pillar uses the ICT Composite Index score, rather than the general Infrastructure indicator from the Africa Infrastructure Development Index (AIDI) that included elements such as roads. For the Digital Skills pillar, only the digital skills among active population score was used for this benchmark rather than the general Skills score in the Global Competitiveness Index (GCI) which includes factors not related to digital. The indicators and data stream used and the maximum score available is illustrated in table 4.

TABLE 4 INDICES USED FOR THE BENCHMARK ASSESSMENT

Benchmark Pillar	Index	Data Stream	Maximum Score
Digital Government	E-Government Development Index (EGDI) 2020	Online Service Index (OSI)	1
Digital Business	GCI 2019	Business Dynamism Component	100
ICT Infrastructure	AIDI 2020	ICT Composite Index	100
Innovation Driven Entrepreneurship	Global Innovation Index (GII) 2021	N/A	100
Digital Skills	GCI 2019	Digital skills among active population	100
Policy and Regulatory Frameworks	ITU G5 Benchmark 2021	N/A	100

Each SADC country received a total score based on the specific scores of each pillar, outlined above. These figures were then compiled into an index (this was done by dividing the scores by the maximum possible score). Angola is provided as an example in table 5 below of how the scoring and adjustment was made. Detailed results of the benchmark assessment can be found in Annex 14.

TABLE 5 BENCHMARK ASSESSMENT RESULTS FOR ANGOLA (PROVIDED AS AN EXAMPLE)

Angola	Score	Index
Digital Government (OSI, 2020)	0.488	0.49
Digital Business (GCI, 2019)	36.72	0.37
ICT Infrastructure (AIDI, 2020)	9.934	0.10
Innovation Driven Entrepreneurship (GII, 2021)	15	0.15
Digital Skills (GCI, 2019)	24.094	0.24
Policy and Regulatory Frameworks (ITU, 2021)	44.5	0.45
Total		**1.79**

The benchmark is based on a mix of indicators from 2019-2021, outlined in table 4. Some data was not available for all assessment areas for Comoros, the DRC, Eswatini, Lesotho and Seychelles. This was accounted for and adjusted when ranking the countries.

4.3 BENCHMARK ASSESSMENT FINDINGS

The benchmark identified where SADC countries are making progress, and where they may be behind. The results of the benchmark and the subsequent ranking do not provide much insight alone, but when this information is coupled with other key identifiers, such as the percent of the population working in agriculture and the contribution that agriculture makes to GDP, there are notable findings.

TABLE 6 OVERALL BENCHMARK ASSESSMENT RESULTS AND RANK FOR THE SADC MEMBER STATES

Country	Benchmark Index Score (Adjusted)	Overall Benchmark Ranking
South Africa	0.5891	1
Mauritius	0.5839	2
Seychelles	0.5155	3
Global Median	0.5064	
Eswatini	0.4222	4
Tanzania	0.4138	5
Botswana	0.4114	6
Zimbabwe	0.3895	7
Namibia	0.3809	8
Lesotho	0.3802	9
African Median	0.3595	
Zambia	0.3506	10
Malawi	0.3483	11
Madagascar	0.3005	12
Angola	0.2985	13
Mozambique	0.2919	14
Democratic Republic of the Congo	0.2782	15
Comoros	0.2497	16

The top ten countries that ranked highest in the benchmark all have an agriculture sector that contributes less than 10% to GDP, except for Tanzania (27%). The top two, South Africa and Mauritius, also employ less than 5% of their population in the agriculture sector. It suggests that the countries that are predominantly agriculture based have made slower progress to unlock the digital economy, although this is only less than half the SADC countries and could also be explained by some unavailable data for the bottom two countries, DRC, and Comoros. These top ranked countries could provide a good example of what is relevant and necessary as they score well in the benchmark. Many of these countries also have relevant digital strategies and policies published but there is also a limitation in that the share of agriculture in the economy or for employment is significantly less than the rest of the region.

Unsurprisingly the top three ranked countries are the richest in the region, appearing in the top four for Gross National Income (GNI) per capita in table 7. The benefits that could be achieved if the digital transformation agenda is directed towards the agriculture sector in these countries is evident as many of these countries rely on the sector for food security, employment, or economic growth. However, the challenges in achieving a fully developed digital economy are also apparent when most of the population is employed in agriculture which is likely located in rural areas with low connectivity and low digital skills levels.

TABLE 7 BENCHMARK ASSESSMENT OVERALL RANKING RESULTS

Ranked SADC Countries	% GDP (Agriculture)	% Employment (Agriculture)	GNI per capita (USD)
1. South Africa	2%	5%	12,640.00
2. Mauritius	3%	6%	26,800.00
3. Seychelles	1%	N/A	29,840.00
4. Eswatini	9%	12%	8,080.00
5. Tanzania	27%	65%	2,760.00
6. Botswana	2%	20%	17,100.00
7. Zimbabwe	7%	66%	3,800.00
8. Namibia	7%	22%	9,810.00
9. Lesotho	4%	44%	3,190.00
10. Zambia	3%	50%	3,560.00
11. Malawi	27%	76%	1,090.00
12. Madagascar	14%	64%	1,620.00
13. Angola	11%	51%	6,320.00

14. Mozambique	26%	70%	1,310.00
15. Dem. Rep. of Congo	9%	64%	1,100.00
16. Comoros	18%	34%	3,200.00

The results of the benchmark identified that there are two clear front-runners within the SADC region that are at a higher level in unlocking the digital economy. The role of the agriculture sector economically is much smaller in these two countries and distinguishes them from the rest of the sixteen SADC countries.

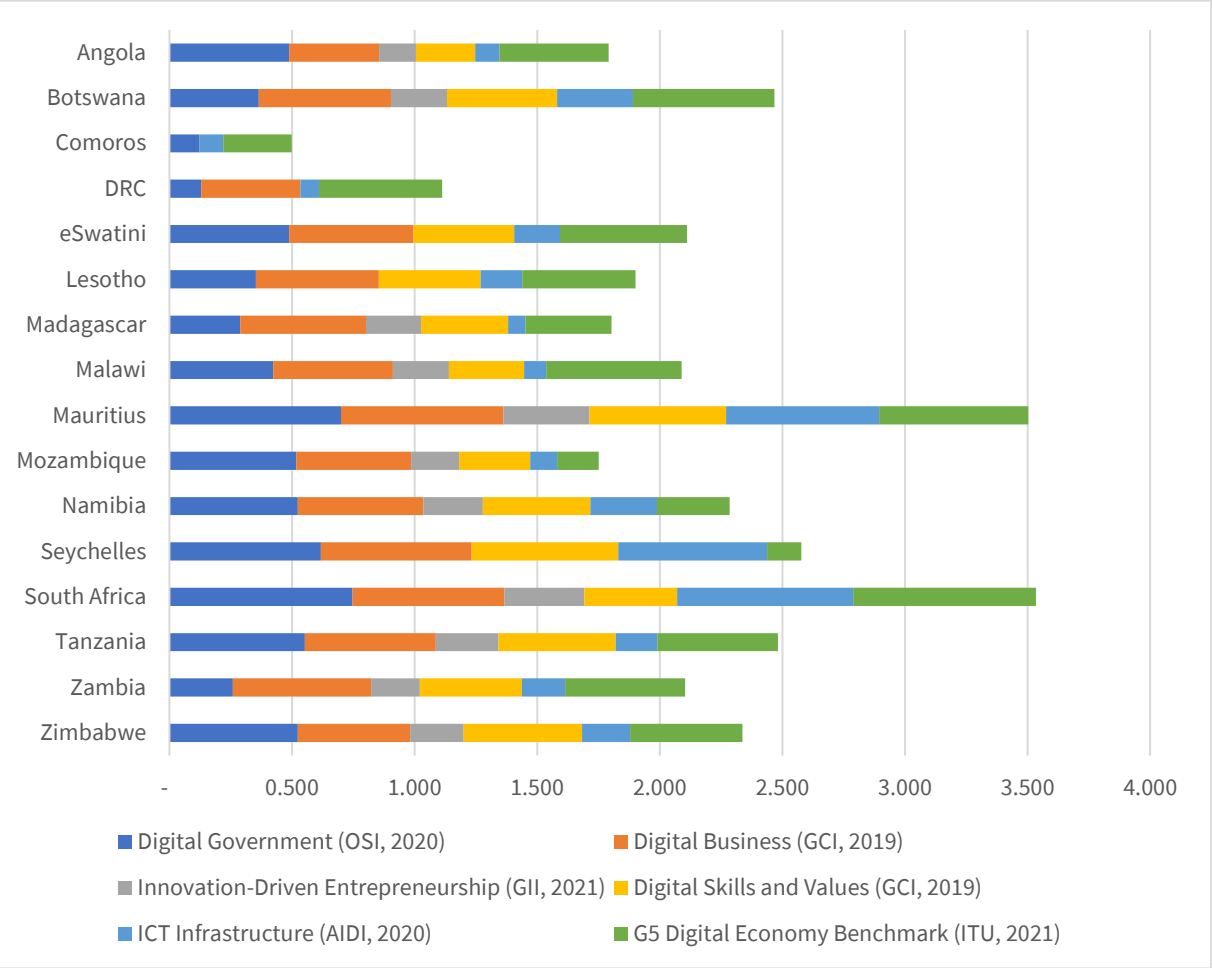

FIGURE 9 BENCHMARK ASSESSMENT SCORES[5]

Figure 9 illustrates the total scores for each country and the split between the foundational pillars[6]. The calculation for the total score is explained briefly in table 5 and the results from the benchmark assessment for each country can be found in Annex 14. The maximum score available on the benchmark is 6.

Figure 10 illustrates the total score only, and not the split between the different pillars. This is the same information as in figure 9, but it is now adjusted to factor in the missing or unavailable data for some countries. The total scores in figure 10 inform the ranking of the overall benchmark in table 6. The adjusted figures provide a better benchmark for the range of the information included. While there is some variation in the clustering of countries to figure 9 before, the general pattern is still present.

[5] Figure 9 is representative of the score that the countries achieved under each assessment area. They have not been adjusted to account for unavailable or missing data for some countries.
[6] The total score is made up of the combination of scores from all six pillars, where available.

Figure 10 shows the variation within the region and highlights how far ahead South Africa and Mauritius are, scoring highest in the benchmark. However, the variation among the remaining SADC countries presents five clear clusters. South Africa, Mauritius and Seychelles all score between 0.5-0.6. Eswatini, Tanzania and Botswana score between 0.4-0.5. Zimbabwe, Namibia, Lesotho, Zambia, Malawi, and Madagascar score between 0.3-0.4. Angola, Mozambique, and the DRC score between 0.2-0.3. Comoros is an outlier coming last at 0.166.

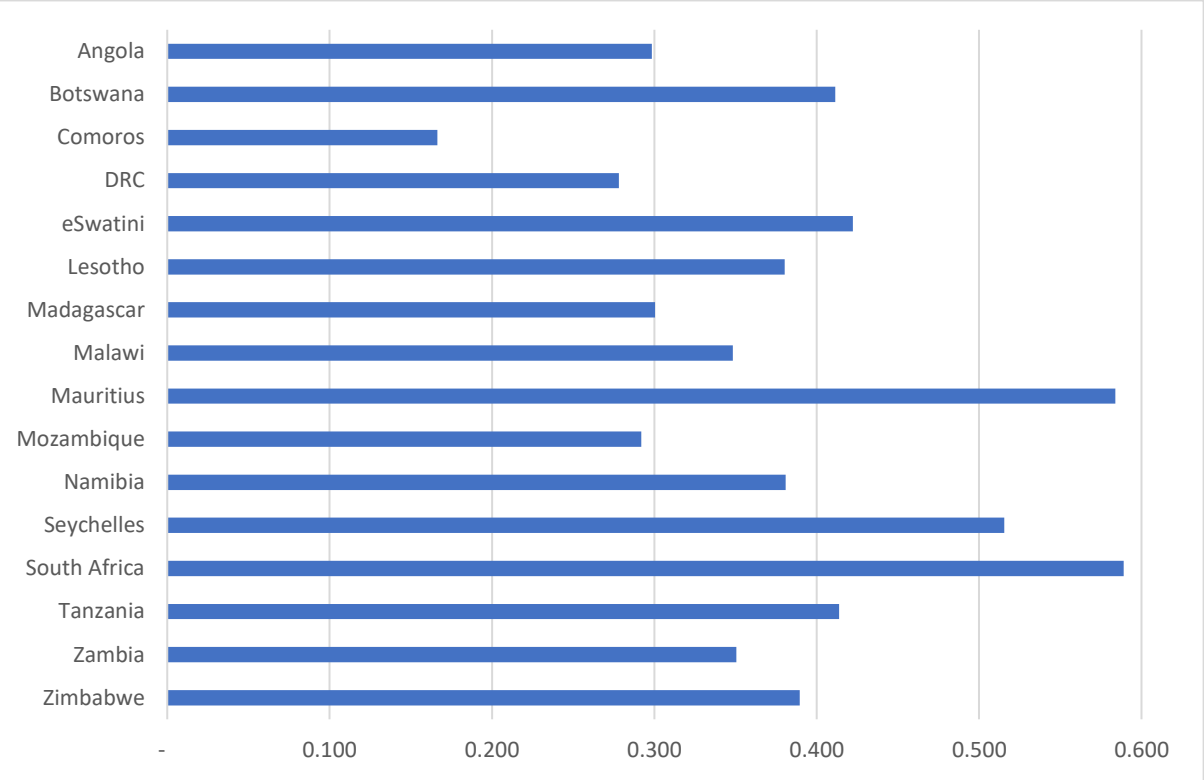

FIGURE 10 BENCHMARK ASSESSMENT SCORES ADJUSTED FOR MISSING OR UNAVAILABLE DATA

The results of the overall rankings in table 6 provide valuable insights as to where potential best practices in the policy arena may lie in the region. Going a step back and looking at each foundational pillar individually identifies further notable findings. The rankings in table 8, for each pillar, are based on the scores each country received under that specific indicator (see table 4 for details of indices).

TABLE 8 BENCHMARK ASSESSMENT PILLAR RANKINGS

Rank	Digital Government	Digital Business	Innovation Driven Entrepreneurship	Digital Skills	ICT Infrastructure	G5 Digital Economy Benchmark
1	South Africa	Mauritius	Mauritius	Seychelles	South Africa	South Africa
2	Mauritius	South Africa	South Africa	Mauritius	Mauritius	Mauritius
3	Seychelles	Seychelles	Tanzania	Zimbabwe	Seychelles	Botswana
4	Tanzania	Zambia	Namibia	Tanzania	Botswana	Malawi
5	Namibia	Botswana	Botswana	Botswana	Namibia	Eswatini
6	Zimbabwe	Tanzania	Malawi	Namibia	Zimbabwe	DRC
7	Mozambique	Madagascar	Madagascar	Zambia	Eswatini	Tanzania
8	Angola	Namibia	Zimbabwe	Lesotho	Zambia	Zambia
9	Eswatini	Eswatini	Zambia	Eswatini	Lesotho	Lesotho
10	Malawi	Lesotho	Mozambique	South Africa	Tanzania	Zimbabwe
11	Botswana	Malawi	Angola	Madagascar	Mozambique	Angola
12	Lesotho	Mozambique		Malawi	Angola	Madagascar
13	Madagascar	Zimbabwe		Mozambique	Comoros	Namibia

14	Zambia	DRC		Angola	Malawi	Comoros
15	DRC	Angola			DRC	Mozambique
16	Comoros				Madagascar	Seychelles

The top five ranked countries in each pillar are an unexpected mix of ten countries and is less consistent than the top three which tends to be between Mauritius, Seychelles, and South Africa. The top five ranked countries are presented below in table 9 as they may be useful to examine for possible learnings. Further information for each country is included in the DACS Annexes produced for all sixteen SADC countries alongside this report.

TABLE 9 BENCHMARK PILLARS, TOP FIVE RANKING

Rank	Digital Government	Digital Business	Innovation Driven Entrepreneurship	Digital Skills	ICT Infrastructure	G5 Digital Economy Benchmark
1	South Africa	Mauritius	Mauritius	Seychelles	South Africa	South Africa
2	Mauritius	South Africa	South Africa	Mauritius	Mauritius	Mauritius
3	Seychelles	Seychelles	Tanzania	Zimbabwe	Seychelles	Botswana
4	Tanzania	Zambia	Namibia	Tanzania	Botswana	Malawi
5	Namibia	Botswana	Botswana	Botswana	Namibia	Eswatini

Some notable findings from these top five rankings include:

- **South Africa**, which ranks highest overall in the region, only features in the top five rank across five individual pillars. It scored poorly on digital skills and comes tenth in the ranking for this pillar.
- **Botswana** which ranked sixth overall features five times in the top five rank across the individual pillars, coming third in the G5 benchmark, fourth in ICT infrastructure, and fifth in digital business, innovation driven entrepreneurship and digital skills.
- **Seychelles**, which came third overall, maintains a top three rank in all the pillars except the G5 benchmark where it ranked last. Data was not available for the innovation driven entrepreneurship pillar.
- **Tanzania**, which ranked fifth overall, featured in the top five rank in three individual pillars: third in innovation driven entrepreneurship, fourth in digital government and digital skills.
- **Malawi**, which ranked eleventh overall, ranked fourth in the G5 benchmark.
- **Zambia**, which ranked tenth overall, ranked third in the digital business pillar, its only presence in the top five rank of individual pillars.
- **Zimbabwe**, which ranked seventh overall, ranked third in the digital skills pillar, its only presence in the top five.

The benchmark assessment identified four clusters of countries:

Group 1: South Africa, Mauritius, and the Seychelles.
Group 2: Eswatini, Tanzania and Botswana.
Group 3: Zimbabwe, Namibia, Lesotho, Zambia, Malawi, and Madagascar.
Group 4: Angola, Mozambique, the DRC, and Comoros.

The benchmark assessment and the overall rankings illustrate some key front-runners in the region that are perceived to have better foundational pillars required for a digital economy. Most of these front-runners are

less dependent on agriculture for economic growth, and to some extent employment. These countries are mostly present in Groups 1 and 2.

However, the pillar rankings in table 7 suggest that learnings for some of these themes around digitalization will come from a mix of countries rather than just the top two groups. This is illustrated well in figure 11, where South Africa, Namibia and Mozambique are directly compared. These three countries are selected because South Africa ranked first in the overall ranking, Namibia ranked in the middle, and Mozambique ranked last (with a full set of indicators) [7].

Figure 11 intends to show the disparity across foundational pillars within the region. For example, South Africa above, scores lower than Namibia in the benchmark on Digital Skills. The only country that scored highly in all assessment pillars and exceeded the Global and African medians in the benchmark (see figure 12 below) was Mauritius.

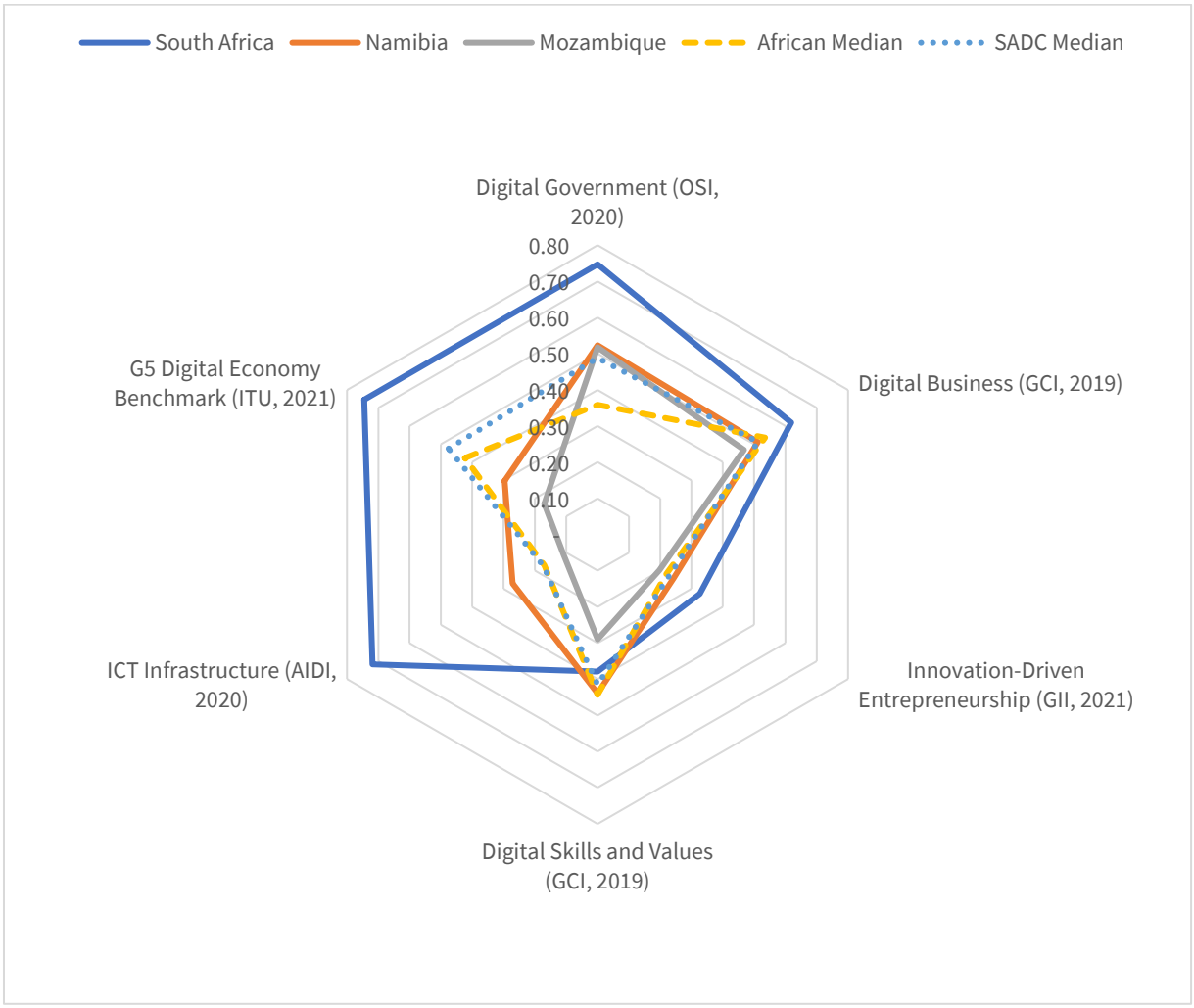

FIGURE 11 BENCHMARK ASSESSMENT RESULTS FOR HIGHEST, MIDDLE AND LOWEST RANKED SADC COUNTRY

Mauritius could provide some best practices but there are limitations due to the contextual factors that differentiate it from the rest of the region, such as its low engagement with the agriculture sector, its high import rate of food, the fact that it is an island state and one of the richest nations in the SADC. Therefore, the

[7] In the benchmark ranking the DRC and Comoros follow Mozambique but both countries had unavailable data for more than one indicator so for illustrative purposes Mozambique was selected for the figure.

wider region should be considered when looking for learnings, collaboration, or examples as there may be similarities shared between neighboring countries with similar country contexts to enable more efficient implementation.

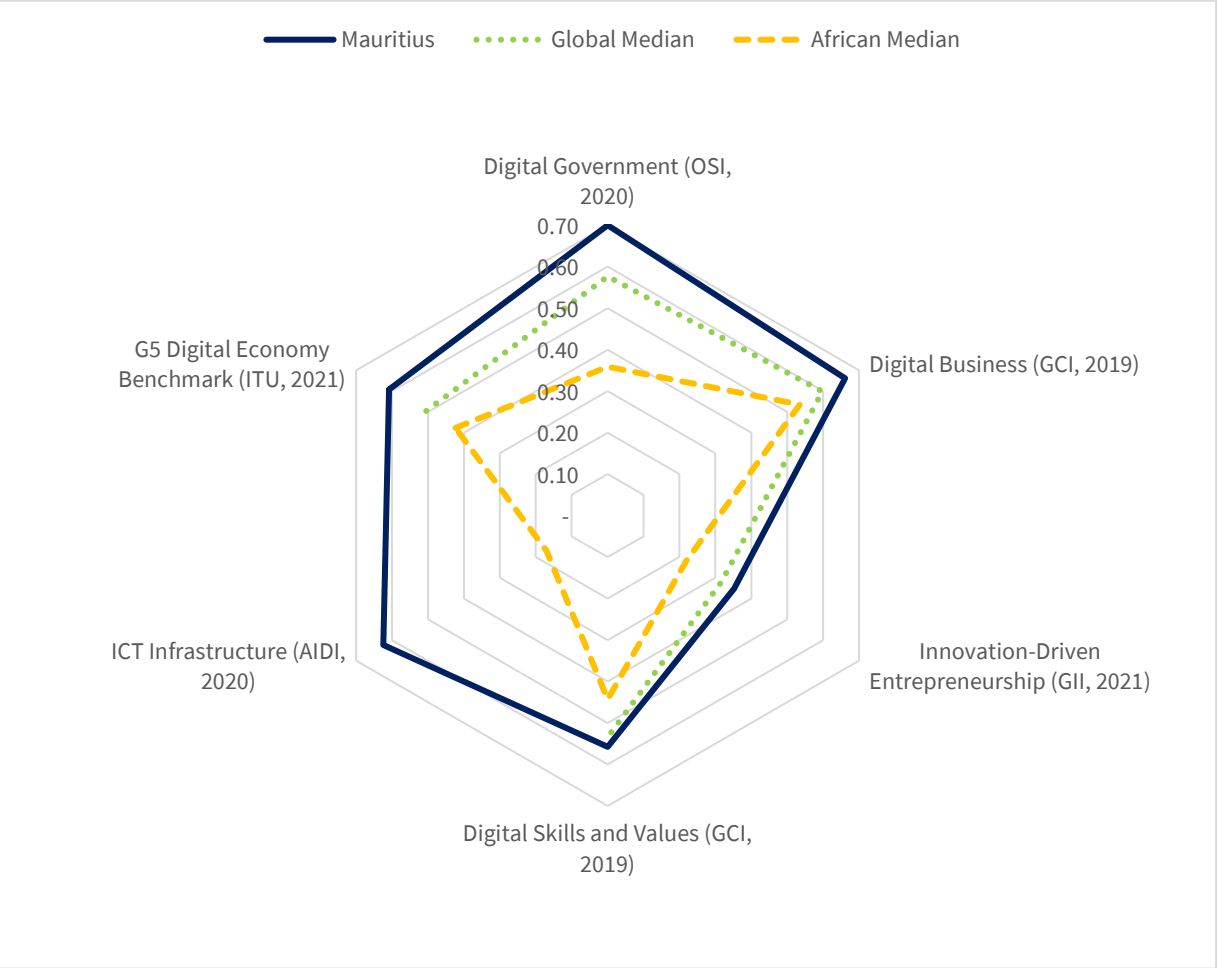

FIGURE 12 MAURITIUS BENCHMARK ASSESSMENT RESULTS

Another key observation made apparent through the clustering is that the countries towards the bottom of the ranking, such as Group 4, are not Anglophone countries. The findings from the benchmark cannot provide any justification, but it is a theme that should be revisited in the following section to understand what the broader policy and legal environment is like across these groupings.

4.4 STOCKTAKE FINDINGS

GENERAL DIGITAL POLICIES AND STRATEGIES

Governments across the SADC region are embracing the digitalization agenda. However, the breadth and depth of this varies among the sixteen countries. The clustering of the policies and strategies obtained for the study in Table 10 is broad and does not provide detail on when these documents were published or their intended implementation time periods. It also does not include national strategies or development plans, which for some countries do speak to a Digital Economy or plans for data or security policies. However, it does provide an overview of what was relevant from the research conducted.

TABLE 10 STOCK TAKE FINDINGS OF AVAILABLE GENERAL DIGITAL POLICIES AND STRATEGIES

Country	ICT / Information Society	e-Government	Broadband	Security	Data	Digital Economy
Angola	✓	✓				
Botswana	✓	✓	✓	✓		
Comoros						✓
DRC	✓					✓
Eswatini	✓	✓		✓		
Lesotho	✓					
Madagascar						
Malawi	✓	✓	✓	✓		✓
Mauritius	✓	✓	✓	✓	✓	✓
Mozambique	✓	✓				✓
Namibia	✓	✓				
Seychelles	✓					✓
South Africa	✓	✓	✓	✓	✓	
Tanzania	✓	✓				
Zambia	✓		✓	✓		✓
Zimbabwe	✓					
Total ✓	14 / 16	9 / 16	5 / 16	6 / 16	2 / 16	7 / 16

The stock take of available policies, strategies, roadmaps and legislation identified that almost all the SADC countries have a version of an ICT or Information Society (IS) policy. Only Comoros and Madagascar did not have an available ICT policy for review, but Comoros did have the newer "generation" of ICT document in the form of a Digital Economy Strategy. In addition to Comoros, five other countries had a specific Digital Economy Strategy or Policy in place. Most ICT or IS policies focused on infrastructure, universal access, increased competition, and investment from the private sector through improved regulatory or legal frameworks, encouraging the local ICT sector to reduce reliance on imports of software and hardware, and improving human capital. Many of the first iterations of the policies would also include the objective of becoming an ICT hub for the region but this agenda tended not to be re-included in other documents or updated iterations of similar policies. The exception is Mauritius, which regularly cites an ambition to become a hub for the region, and Tanzania, which considered the objective successful in their second ICT policy as they now serve neighboring landlocked countries with the benefits of high-capacity submarine cables due to their broadband network roll out[xii].

E-government strategies were the next most common document identified across the region with examples in nine countries. As with all the findings for the broader policy environment, these are not exhaustive, and it is likely that there are more policies or strategies in existence that have not been made available digitally. It should also be recognized that most of the general ICT policies include elements of e-Government, broadband and connectivity plans, and to some extent sections on cybersecurity. Therefore, a lack of some of these strategies does not necessarily mean that these areas are completely omitted in plans.

Assumptions should not be made based only on the presence of a policy or strategy as the study did not assess or determine whether the policies were implemented effectively or what outcomes resulted from them. The stock take aimed to determine to what extent a government prioritizes digitalization in strategies and plans and whether the breadth of this agenda extends across economic sectors, including agriculture.

LEGISLATION

The legal landscape across the region is presented in Table 11, but only includes legislation that has been enacted or published formally at the time of the study, and not draft bills. Where draft bills were present these

have been noted in the table but do not count towards the total score.

TABLE 11 STOCK TAKE FINDINGS OF AVAILABLE LEGISLATION RELEVANT TO STUDY

Country	E-Commerce Law	Cybersecurity Law	Data Law
Angola	✓	✓	✓
Botswana	✓	✓	✓
Comoros			
DRC			
Eswatini	DRAFT	DRAFT	DRAFT
Lesotho	DRAFT	DRAFT	✓
Madagascar	✓	✓	
Malawi	✓	✓	DRAFT
Mauritius	✓	✓	✓
Mozambique	✓		
Namibia	✓		
Seychelles	✓		✓
South Africa	✓	✓	
Tanzania	✓	✓	
Zambia	✓	✓	✓
Zimbabwe		DRAFT	DRAFT
Total ✓	10 / 16	8 / 16	7 / 16

The stock take identified that around half of the countries in the SADC region had available legislation on the three key focus areas related to the topic of digitalization and which would have the largest impact on innovators: **e-commerce, cybersecurity, and data laws**. E-Commerce Law encompasses legislation related to electronic communications and transactions which was present in most of the SADC countries.

Most countries had some form of cybersecurity law or data protection law in place even if there was no specific policy or strategy available. Although it should also be noted that some countries had legislation in place for these two areas that are quite old and are likely in need of updating. Only two countries lacked any available relevant legislation, Comoros, and the DRC. Zimbabwe also lacked available relevant legislation, but two draft bills were identified for cybersecurity and data protection.

Mauritius is the only country to have available examples for all researched documents (**policies, strategies, or legislation on ICTs, communication, information societies, e-Government, broadband, cybersecurity, data protection or open data, or a digital economy**). This illustrates a strong relationship between the presence and availability of these documents with the benchmark assessment where Mauritius scored consistently in the top two for all assessment pillars.

Table 12 presents the ten countries that ranked in the top five of each of the assessment pillars in the benchmark assessment. While the table does not provide a clear or direct relationship between the presence of policies and legislation and the benchmark assessment, it does present the five countries that had the most complete "set" of documents that were reviewed for this study: Botswana, Malawi, Mauritius, South Africa, and Zambia. The table illustrates that this relationship evident in Mauritius is not replicated in the other countries that scored well in certain criteria. Seychelles ranked in the top five for the digital government pillar and the ICT infrastructure pillar but lacks a specific policy or strategy on e-Government or Broadband. It is not imperative for there to be several specific sector strategies as it is likely that some of these elements were included in the ICT Policy or other National Strategies or Development Plans. However, the role of government and policies for digitalization, and subsequent strategies or roadmaps, is to facilitate the creation and implementation of innovative digital initiatives, reduce the obstacles in regulatory and legal frameworks for

digital tools and the data they generate, and respond to the needs and demands of communities through research and development or educational systems to improve skills[xiii].

The presence of a document or piece of legislation does not suggest that a country has a more mature digital economy. The presence of policy, regulatory or legal frameworks may not always translate into awareness, effectiveness, or enforcement of these frameworks. Policies provide one part of the wider ecosystem needed for enabling innovations. Concurrently, a lack of policies or legislation does not inhibit the creation of digital innovations, technologies, or greater digitalization.

TABLE 12 STOCK TAKE FINDINGS OF AVAILABLE DOCUMENTS ACROSS THE TOP FIVE RANKED COUNTRIES

	Botswana	Eswatini	Malawi	Mauritius	Namibia	Seychelles	South Africa	Tanzania	Zambia	Zimbabwe
Policies and Strategies										
ICT	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
E-Government	✓	✓	✓	✓	✓		✓	✓		
Broadband	✓		✓	✓	✓		✓			
Cybersecurity	✓	✓	✓	✓			✓		✓	
Data				✓		✓	✓			
Digital Economy			✓	✓		✓				✓
Legislation										
E-Commerce	✓	DRAFT	✓	✓	✓		✓	✓	✓	
Cybersecurity	✓	DRAFT	✓	✓			✓	✓	✓	DRAFT
Data	✓	DRAFT	DRAFT	✓		✓			✓	DRAFT
Total ✓	7 / 9	3 / 9	7 / 9	9 / 9	4 / 9	4 / 9	7 / 9	4 / 9	5/9	2 / 9

DIGITAL IN AGRICULTURE POLICIES OR STRATEGIES

The stock take findings present a region that is in transition. Despite the variation across the 16 countries in the benchmark assessment and the mixture in the maturity and content of the policies, strategies, and legislation it seems that most of the SADC countries are slowly including digitalization, and in some more advanced cases embedding it in national plans. However, no SADC country has published a digital agriculture strategy or roadmap. There are good examples in the region where some integration has occurred although it is not always clear who is leading on the agenda, whether it's a collaboration of ministries or not. Even for countries where the agriculture sector contributes less than 3% to GDP, such as Mauritius, effort has been made to integrate agriculture into innovative and emerging technology strategies or vice versa. From reviewing documents and receiving feedback from key stakeholders it also seems that there are some further strategies, policies and legislation in the pipeline that have yet to be published, including for agriculture specifically. It is likely that the Covid-19 pandemic may have delayed some of these projects, but also acted as a further incentive for greater embedding of digitalization within the economy.

The stock take also identified and illustrated where some good examples are within the region and where there is room for shared learnings. There is also some relationship between the scores in the benchmark assessment, the ranking overall and how developed the broader policy environment appears. However, the presence of policies, strategies and legislation does not speak to effective implementation or enforcement of these things. But it can suggest where greater focus and prioritization of digitalization is occurring in the region and signal where some examples can be reviewed for further examination.

There were **no examples available of a digital agriculture strategy or policy in any of the sixteen SADC countries**. Integration of digitalization within available agriculture specific policies or strategies was also limited. However, two notable countries are Tanzania (Box 1) and Zimbabwe (Box 2) which did include examples of **integrating digital into policies and strategies which included examples of ongoing**

innovations being used, greater emphasis on e-learning, encouraging investment for greater connectivity, as well as extending the use and uptake of ICTs. What is encouraging about both these countries having agriculture policies that specifically include digital or ICTs beyond just greater use is that Tanzania's agriculture sector makes up 27% of GDP and employs 65% of the workforce. While Zimbabwe's agriculture contribution to GDP is much lower (7%), the sector does employ 66% of the population which is one of the highest in the region. Both countries **also scored in the top half of the benchmark assessment for maturity in a digital economy with Tanzania fifth and Zimbabwe seventh**. However, in all the examples cited for these two countries under agriculture, digitalization was not fully embedded within the agriculture strategies.

BOX 1 EXAMPLES OF INTEGRATION OF DIGITALIZATION IN AGRICULTURE POLICIES IN TANZANIA (EXTRACT FROM TANZANIA DACS ANNEX)

The Tanzania National Strategy for Growth and Reduction of Poverty II (NSGRP II) 2010, which is not an agriculture specific document but features a whole section on agriculture as a priority sector, recognises the importance and benefit of integrating ICTs within the entire value chain. Specifically, it mentions the benefit of ICTs to provide information on prices, market and advisory services, and climate-smart solutions. The Tanzania Agricultural Sector Development Programme (ASDP) 2006 which predates the NSGRP II includes a section on information and communication and states that a "critical component in the provision of improved agricultural services involves the integration of [ICTs]". The focus within the ASDP features heavily in improving extension services and the management of information systems.

The Tanzania Agricultural Sector Development Programme Phase II (ASDP II) 2017 is the most comprehensive document reviewed in Tanzania that makes reference to ICTs and modern technologies. Many of the practical mentions of modern ICTs are to facilitate greater dissemination of information on agricultural practices and livestock information. Similar to ASDP, there is a focus on e-extension services but this is also extended to e-learning, market information, and developing innovative ICT-based approaches to financial advisory services. There is a much more holistic approach to "leveraging ICT tools and methodologies" in ASDP II that will support:

- The development and implementation of the ICT system and its backbone architecture (comprehensive agricultural data, network services and integrated and optimised solutions). This backbone would include:
    - Consolidation of the government's current agricultural data centres into one state-of-the-art facility
    - Provision of the improved ICT infrastructure and standardised security services to external suppliers (i.e. firms) of e-services such as e-voucher and e-wallet
    - Intercommunication between integrated solutions
    - Data collection, processing and cataloguing
- The equipping of agricultural advisors/extension in selected areas with ICT tools (low-cost tablets for advisors, smartphones for lead farmers) and methodologies to enable enhanced access to technical and economic information and relevant information sharing networks.

The most common appearance of digitalization in agriculture occurs in national development plans, general ICT policies or digital economy strategies rather than agriculture strategies. One explanation for this is that for some countries the national development plans were created more recently than the available agriculture policies, but this was not necessarily the case for all. Many of the Ministries of Agriculture in the SADC countries are split into various departments or directorates that work on specific topics or areas, such as agricultural extension or research and development. These departments adopt digitalization strategies independently. For example, in Botswana the Department of Vet Services has a successful and modern traceability system on livestock,[xiv] but this is not evident in other subsectors of agriculture.

Silos within Ministries are problematic and can lead to a lack of sharing of knowledge or solutions, duplication of efforts, or a confusion on the overall goal. One example of siloed work is in **Zambia,** which has a clear and comprehensive National ICT Policy (2006) based around 13 pillars, one of which is Agriculture. The policy makes commitments to improve infrastructure in rural areas, institute policy measures to integrate

and encourage the use of technologies into the sector, increase the competitiveness of farmers and their products using technology, and to promote the development of ICT entrepreneurs at SME level to strengthen the development and application of ICTs in agriculture. Several strategies are suggested to achieve those goals. These strategies go beyond increasing physical access and connectivity of digital technologies to farmers to other key aims such as increasing information, reducing the knowledge gap, improving skills, and encouraging uptake of technologies by farmers[8].

BOX 2 EXAMPLES OF INTEGRATION OF DIGITALIZATION IN AGRICULTURE POLICIES IN ZIMBABWE (EXTRACT FROM ZIMBABWE DACS ANNEX)

The Zimbabwe National Agriculture Policy Framework 2019-2030 acknowledges that ICTs are being used within the agricultural sector to overcome barriers. Examples of innovations include AGRITEX working on the development of a SMS platform that is able to deliver pre-planting, growing, harvesting, post-harvest and marketing information, and providing agricultural information, financial services, crop insurance and market linkages with ECONET Services through Ecofarmer; and e-Mkambo, Zimbabwe Farmers' Union bulk SMSs, and emails and newsletters. However, it is not without challenges as penetration of ICTs remains low and limited network access in rural areas is a particular hindrance. Encouragingly, the Policy promotes greater collaboration with the Ministry of ICT and Cyber Security to help digitise the entire agriculture sector to improve service delivery. Some additional initiatives mentioned include:

- Public and private investment in soft and hard market infrastructure (feeder roads, structured wholesale and retail markets, cold and dry storage and ICT platforms)
- Modernisation of research facilities, agricultural equipment and ICT equipment
- Institutionalising in-service ICT literacy programmes in all agricultural institutes
- Encourage extension workers and farmers to take part in the development of technologies and platforms.
- Improve access to markets in agricultural value chains by smallholder farmers through the application of ICT
- Invest in ICT permits and levies
- Enhance the capacity of AGRITEX to translate climate information and make use of ICT platforms for farmers.
- Oversee development of subsector strategies (e.g. ICT in Agriculture strategy)
- Build the capacity of government departments, farmer organisations and market players in data collection, analysis, storage and dissemination or exchange.
- Utilise a digital platform to deliver subsidised inputs and set up a flexible electronic voucher system.

This Policy was produced shortly after the National ICT Policy and follows the vision of embedding ICTs within the agriculture sector. Much emphasis is made on agricultural extension services and the ability to digitise them, but the solutions provided lack detail.

Despite the prioritization that agriculture received in the first ICT Policy, this same prioritization is not reflected in the Second National Agricultural Policy of Zambia 2016. It seems that in the Zambian ICT Policy there were ambitious goals and strategies that were specifically adapted to the agriculture sector, but this has not been reflected well or carried over into more recent agriculture strategies and plans in Zambia. This could be a result of departments and ministries working in silos without adequate collaboration, hindering information sharing and resulting in duplication of policies or even a lack of awareness or enforcement of these agendas. There is little mention of the specific benefits that ICTs and digital technologies can bring into the agricultural sector. The only references made are in the general measures to increase agricultural productivity and production. The limited reference to ICTs suggests that it has not been embraced well into the agricultural systems of Zambia despite the focus received in the first ICT Policy.

The case of Malawi illustrates how creating a complete set of policies may not lead to improved application of digital solutions. **Malawi was one of only a few of the SADC countries to have a recent and specific Digital**

[8] Many of the first iterations of an ICT policy or strategy focus heavily on the IT sector and increasing physical access to hardware, rather than the broader cross-sectoral and digital elements of the new "generation" of digital economy strategies.

Economy Strategy[9]. However, **it ranked 11th overall in the benchmark assessment and scored poorly in all pillars except the G5 Digital Economy Benchmark**. Since 2013, Malawi has produced several policies, plans and strategies that relate to ICTs and digitalization, for a more detailed overview please revert to the separate *Digital Agriculture Country Study Annex for Malawi*. Unlike some other SADC countries, Malawi has not produced updated versions of these documents until the recent Malawi Digital Economy Strategy (2021-2026). The Digital Economy Strategy includes a specific focus on agriculture including the use of innovative technologies such as the IoT, smart farming, open data and making specific references to online platforms.

TABLE 13 MALAWI'S 2026 DIGITAL ECONOMY OBJECTIVES FOR AGRICULTURE

2026 Objective	Actions required
Farmers access high quality inputs and plug into a rich commercial market supported by a variety of platforms	Develop e-verification to ensure quality of inputs distributed through the Affordable Inputs Program
	Digitize food safety certification processes to improve access to export markets
	Pilot IoT-enabled storage monitoring of national storage facilities
Digitally delivered services support modern farming practices to increase productivity	Provide government extension workers with tablets to use and promote adoption of digital support applications
	Develop an open repository of common extension content and farmer feedback to support demand driven innovation
	Develop public sector delivered mobile applications for digital extension services that support USSD and voice functionality for increased update by farmers
	Subsidize the costs of asset sharing services when delivered to farming cooperatives and associations
Rich and updated data provides the latest view on agricultural activity and supports innovation, monitoring, and investment	Target additional funding to expedite the implementation of the National Agriculture Management Information System and prioritize integration with Esoko for pricing information
	Develop an open-GIS data repository under National Statistical Office

What sets this strategy apart from the previous ICT and digital plans proposed is the approach to the economy, while recognizing the key priority sectors to the Malawi economy. The agricultural objectives (listed in table 13) look across the entire value chain and have a specific focus on improving the efficiency and productivity of smallholder farmers with clear solutions and technologies, rather than simply stating that greater access to ICTs and digital technologies will result in agricultural efficiencies. The Digital Economy Strategy for Malawi addresses some key foundational concerns such as access, use, and skills, but also extends the focus on digital to wider sectors and functionalities of the economy that have specific and knock-on effects for the agriculture sectors. It also highlights clear partnerships across government and the private sector. This strategy is the most digitally mature and ambitious plan that Malawi has put forward and provides a clear response and solution to unlocking the digital economy, and therefore the digital agriculture economy.

Only seven countries had some form of a digital economy strategy, three of these countries came from Group 4 which consists of Francophone and Lusophone countries. The stock take findings did not provide much evidence to contradict the findings of the benchmark. However, it is curious that countries that seem to have struggled the most in developing the key foundational pillars for a digital economy and lack supporting policies and legislation have published one of these more innovative strategies. One possible explanation for

[9] Table 11 illustrates seven SADC countries had a digital economy strategy, but the documents reviewed were clustered into groupings under specific criteria. Some of the documents allocated to this pillar therefore are not titled a "Digital Economy Strategy" but their aims are more in line with the general approach that encourages whole of government involvement and across sectors and themes rather than the more traditional and rigid ICT Policies or Strategies that focused largely on the IT sector and achieving Universal Access.

this could be that these countries were significantly lagging behind in digital development and have attempted to leapfrog the previous iterations of digital policies or strategies (e.g., ICT, e-Government, etc.) to focus on the newer agenda and approach to a digital economy that takes on a whole-of-government approach. **Further investigation would be needed to ascertain the incentives of these strategies, but they are an encouraging step for countries that risk falling behind the region**.

4.5 STAKEHOLDER FINDINGS

Despite the variation of scores on the benchmark assessment, the available legislation, and the maturity of strategies or policies, all 16 countries of the SADC region shared common challenges and barriers faced by stakeholders in implementing digital solutions for agriculture. These challenges can be grouped together into six themes that reoccurred in almost all the interviews or were referenced as challenges within the available policies and strategies:

1. Operating in silos across government and within ministries. This challenge was already referenced in section 4.4 as it was evident when reviewing available documents that where strategies were suggested for agriculture in national development plans, they would then not feature in sectoral policies. It is also apparent within Ministries. In South Africa, departments within the Ministry of Agriculture are at risk of working in silos with examples of duplication in preparing the same policy under a different directorate which can then lead to contradictory and misaligned policies. There seems to be limited communication across ministries with most of the ICKM focal points interviewed unaware of more general strategies and whether agriculture was included as part of these plans. It is possible that if this remains unchecked the development of the agriculture sector could fall further behind which would impact half the countries in the region that employ over 50% of their population in this sector.

2. Lack of a guiding policy or strategy. A clear finding from the stock take was that there is no available digital agriculture strategy in the SADC region. For some countries, sourcing general agriculture policies and strategies was a challenge as they were not available online. Others had available documents but were outdated with no updated versions available. For many countries there was limited evidence of an available and usable agriculture strategy that provided a guiding vision or outlined the necessary funding and timelines for implementation. Another common finding from the interviews with the focal points was the struggle for adequate funding for the sector generally, and specifically for digitalization. In Angola, according to the focal point, efforts have been made to implement ICTs within the agriculture faculties but without any guiding policies to sustain them. In Eswatini, during the Covid-19 pandemic, funding has been particularly challenging as agriculture is deprioritized for the health sector and security. In Zambia, the lack of a guiding policy was perceived to be the responsibility of different ministries to support the national plans. A vision or roadmap for the sector allows for greater collaboration with a wider range of stakeholders, clear objectives and aims shared across Ministries and internal departments or directorates and provides justification for sufficient funding and timelines.

3. Poor infrastructure and network coverage, especially in rural areas. The first two challenges are specific to the public sector only, but poor infrastructure and network coverage is a challenge for all agriculture stakeholders. Poor or inadequate infrastructure impacts policymakers and public sector research officials because the systems required are not in place or limit the ability to digitize information, for example. Low network coverage, especially in rural areas, can impact extension officers as was the case for an example from South Africa where extension officers use a “digital pen” which records GPS coordinates and provides other

real-time information but is reliant on a linked device, available data, and a stable network connection to work. Another significant barrier is the high cost of data which is felt by innovators, entrepreneurs, beneficiaries, and government officials, and is usually exacerbated by limited or poor infrastructure as a result of low service provider availability. This can provide even further barriers, as with an example from the Seychelles where services such as digital advisory were provided by mobile network operators but due to network availability of that operator, some farmers are not included and therefore were unable to access that information. These connectivity issues are largely outside the remit of the Ministry of Agriculture and require greater collaboration with stakeholders within and across government and in the private sector but are a key barrier to greater digitalization across a country, not just a sector.

4. Low digital skills or training. As with poor connectivity, low digital skills or training is a challenge for all agriculture stakeholders, from the policymakers to the extension workers and to the smallholder farmers. Greater efforts need to be made to provide digital skills and training across all levels of education, the degree to what level is targeted varies from country to country with some targeting school level trainings and others only focusing on tertiary education institutes and policymakers. The focus must be on all levels, but if greater digital intervention is likely then efforts need to be made to educate or train the farming population, the majority of which are over 50 years old.

5. An aging farming population. The two key barriers that come from an aging farmer population are the low digital skills as mentioned above and the knock-on effect this has on uptake of technologies. Radio remains a popular tool to reach farmers of all abilities due to its accessibility but because of the Covid-19 pandemic, examples were shared in Botswana, Lesotho and the Seychelles of some farmers using social networks such as Facebook or WhatsApp to advertise and sell their crops. Although the detailed statistics of the users was not shared, it is likely that the majority of these were urban farmers or younger farmers. However, it does present an opportunity for further exploration in some countries especially Botswana and Eswatini which experienced an increase in younger people joining the sector. This has triggered an increased uptake in digital approaches and greater pressure from the youth to digitalize more works and services generally. Greater involvement of the youth in agriculture could potentially help to increase progress but a barrier remains for some countries to attract individuals to the sector which is seen as unattractive.

6. Lack of security institutions and regulations. The final challenge was cited less times than the other five mentioned above but will become increasingly important as these countries progress into digital economies. In Zimbabwe, innovations are being used for information on weather and climate but currently there are no policies to govern the technologies and the creation of data that results from it. In Mozambique, when asked about any unintended consequences from the use of digital technology, cases of fraud were cited. There is a fear that companies, particularly digital financial services, collect data and can share this information without the user's consent. Access to credit is a key barrier for farmers which could be addressed through digital solutions but requires privacy and security assurances. With greater digitalization more focus should be placed on ensuring trust, privacy and protection of consumers and businesses. Digital technologies, especially more advanced ones, rely heavily on the collection, dissemination, and analysis of data. The stock take identified that data policies, cybersecurity strategies and even legislation related to these topics was much more in the early stages of development across the region or was outdated and needed updating to bring in line with new technologies and risks associated with the Fourth Industrial Revolution technologies. If strategies, standards, and legislation to address issues around privacy and security are not implemented, it risks hindering the growth of the sector and the opportunities that digitalization presents in the agricultural systems.

5 DIGITAL AGRICULTURAL INNOVATIONS

This section provides a landscaping analysis to assess the numbers, scope, trends, and characteristics of digital agricultural innovations in the SADC region. A more detailed assessment of each country is presented in separate DACS Annexes which are supplements to this report. It is important to note that the rapid and dynamic nature of digital innovations is such that the landscape of these actors is in constant flux, and to keep in mind this picture is evolving all the time.

In total 216 innovations were identified in the region; a full list is provided in Annex 5. All identified innovations were invited to take part in the survey. 109 innovations participated in the survey, a response rate of 50% (109 of 216). However, the response rate varied considerably across different countries as did the level of detail provided. The top three countries completing surveys were Lesotho (90%), Malawi (92%) and Mauritius (86%) and the bottom three Tanzania (37%), South Africa (28%) and Comoros (20%).

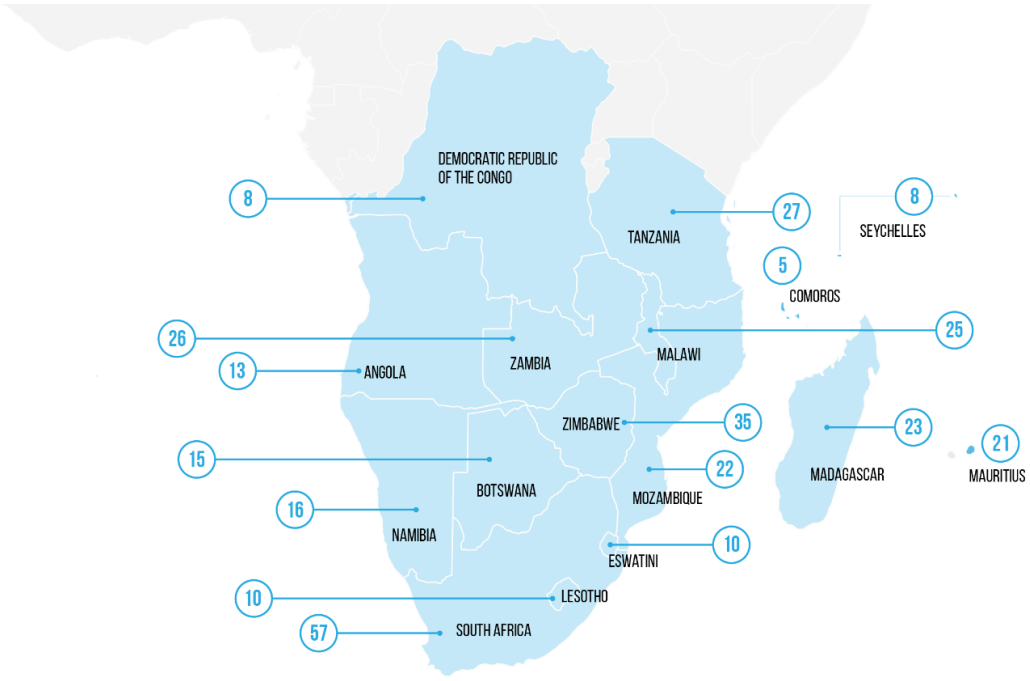

FIGURE 13 OVERVIEW OF ALL DIGITAL AGRICULTURAL INNOVATION IN THE SADC REGION

Figure 13 illustrates the number of innovations identified across the different SADC countries. The countries with the highest numbers of innovations included South Africa (57), Zimbabwe (35), and Tanzania (27).

5.1 MAPPING THE DIGITAL AGRICULTURAL INNOVATIONS

Figure 14 below, illustrates the different use case categories and their frequency represented by the 216 identified innovations. Survey respondents identified the use cases for their innovations and elsewhere desk research or verifications by national consultants enabled the use cases to be assigned. Some surveys were returned but were incomplete, particularly where proprietary data on user numbers and revenue models, or the amount of funding received by the innovation was requested.

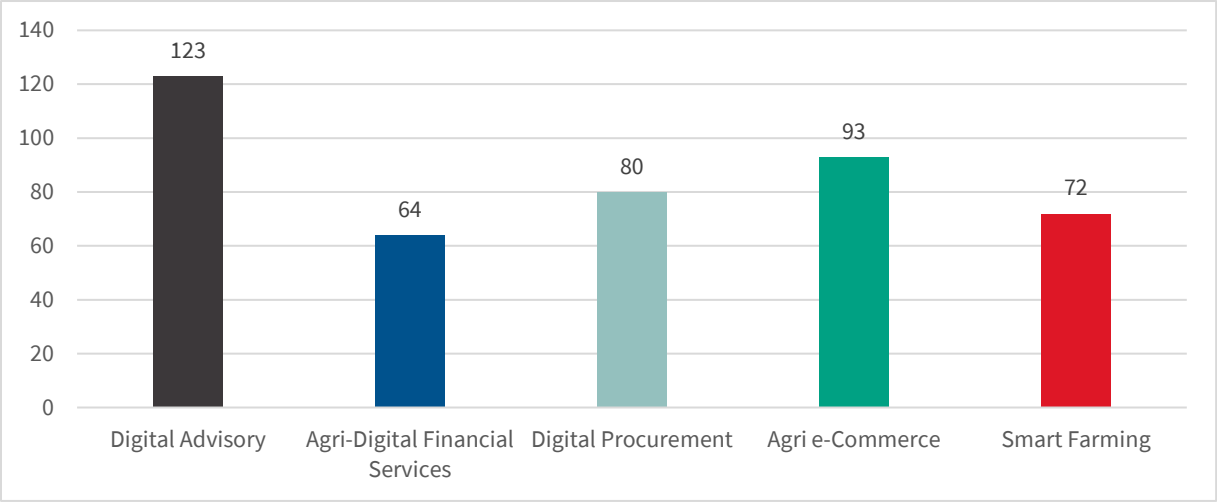

FIGURE 14 USE CASES IN THE SADC REGION

The most common use case was digital advisory, followed by Agri e-commerce and digital procurement. There were fewer innovations observed in the Agri digital financial services use case. This may be due to a higher number of agriculturally focused innovations in the study and a recognition that although the rural population do use digital financial services, it was not possible to quantify how many are using them and whether financial services are used for personal or business purposes. As a result, the proportion of fintech innovations in this study is likely to be slightly underestimated. Those with an agricultural livelihood using such innovations is also very difficult to determine from the available data.

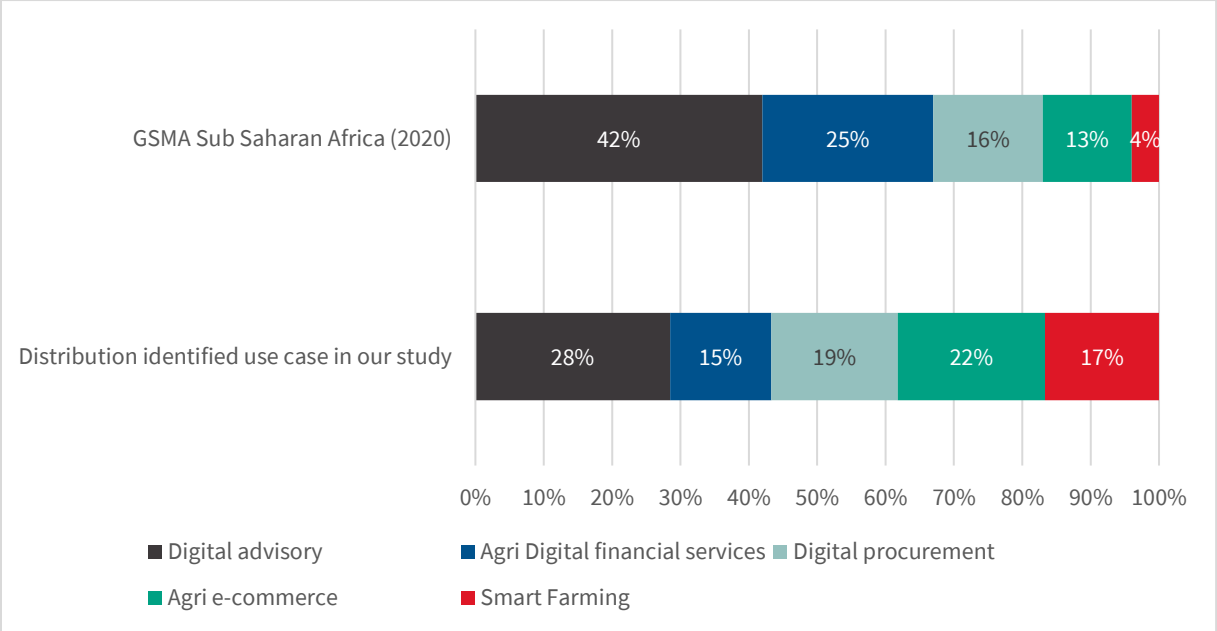

FIGURE 15 COMPARISON DISTRIBUTION OF USE CASES FROM GSMA STUDY (2020) AND THIS STUDY (2021)

The GSMA typology used enabled a comparison of results from the SADC region with SSA results from GSMA's 2020 Agri Maps (see figure 15). Some apparent differences between the two studies are: the higher proportion of smart farming and Agri e-commerce innovations in SADC compared to SSA as a whole, and a lower proportion of digital advisory and Agri digital financial services. Smart farming may be advancing faster than other regions since satellite information and sensors have become more available and accessible. It is also

possible that newer smart farming innovations have been launched in the past 12 months that were not present in the 2020 data capture calculations carried out by GSMA.

REGIONAL VERSUS LOCAL

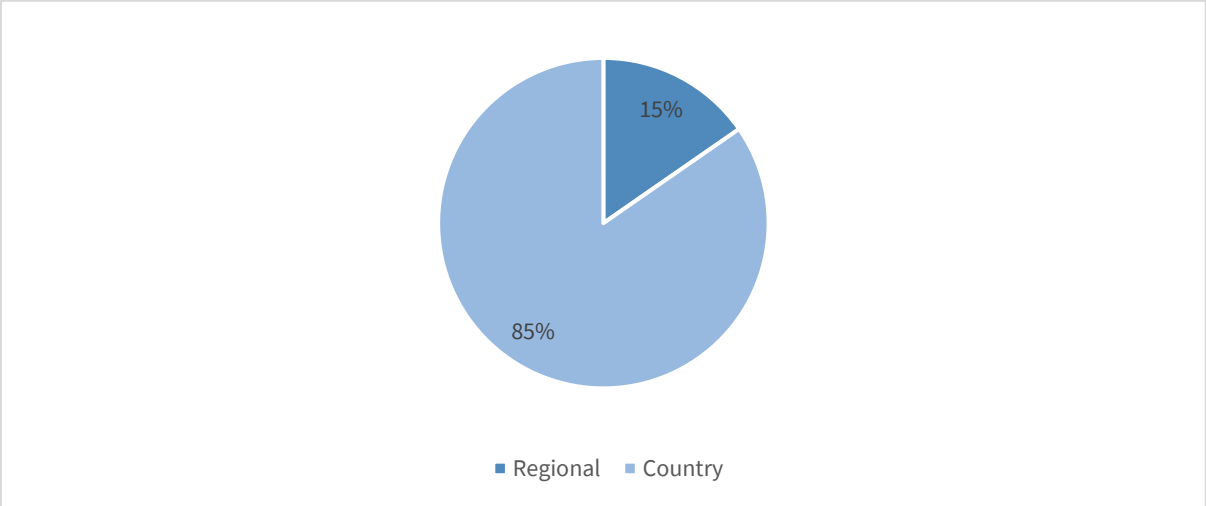

FIGURE 16 SPREAD OF IDENTIFIED DIGITAL AGRICULTURAL INNOVATIONS DEPLOYED IN A SINGLE COUNTRY VS. REGIONALLY

From the 216 digital agricultural innovations identified, most (182) are active in a single country, whilst 34 are regionally deployed (active in two or more countries). Only one innovation is present in all the SADC countries, GeoFarmer, while Smart Farmer is active in eight of the 16 SADC countries.

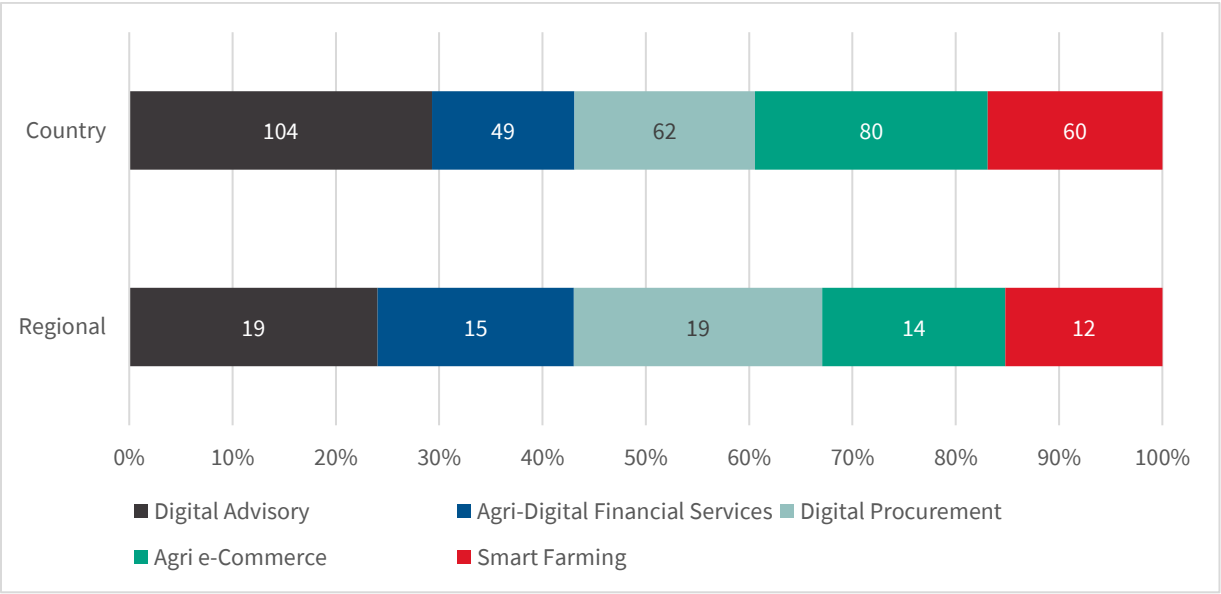

FIGURE 17 USE CASE DIVISION BETWEEN IDENTIFIED INNOVATIONS DEPLOYED IN A SINGLE COUNTRY AND REGIONALLY

Figure 17 compares the relative distribution of all identified innovations that are deployed regionally with those found locally. The regional innovations have a higher proportion of Agri digital financial services and digital procurement than those at a national level.

In figure 18, the distribution of all identified use cases is illustrated through comparison across countries:

- Digital advisory - Malawi (36%), Madagascar (33%) and DRC (33%) emerged at the top. All three countries have a high reliance on the agriculture sector.
- Agri digital financial Services - Comoros (38%), Eswatini (21%), Mozambique (21%) and Tanzania (21%) form the joint top three. Comoros is an outlier as information was compiled from desk research and no survey responses were completed.
- Digital procurement - Seychelles (39%), Mauritius (36%) and Lesotho (28%) form the top three. Island nations appear to have a larger proportion of digital procurement and lower proportion of digital advisory interventions. Madagascar is the exception. Island nations have a higher dependency on imported goods, and digital procurement and e-commerce systems were expected to be higher in these countries.
- Digital e-commerce - Tanzania (25%), Mauritius (24%) and Angola (24%) emerge at the top, but it is difficult to explain this finding based on the available data.
- Smart farming - Botswana (27%), South Africa (26%) and Angola (24%) emerge at the top. The first two were expected, but the result was surprising for Angola, because of their low score in the benchmark assessment. It might be that a Dutch program Geo4AW supporting projects in different countries including Angola might have influenced the result.

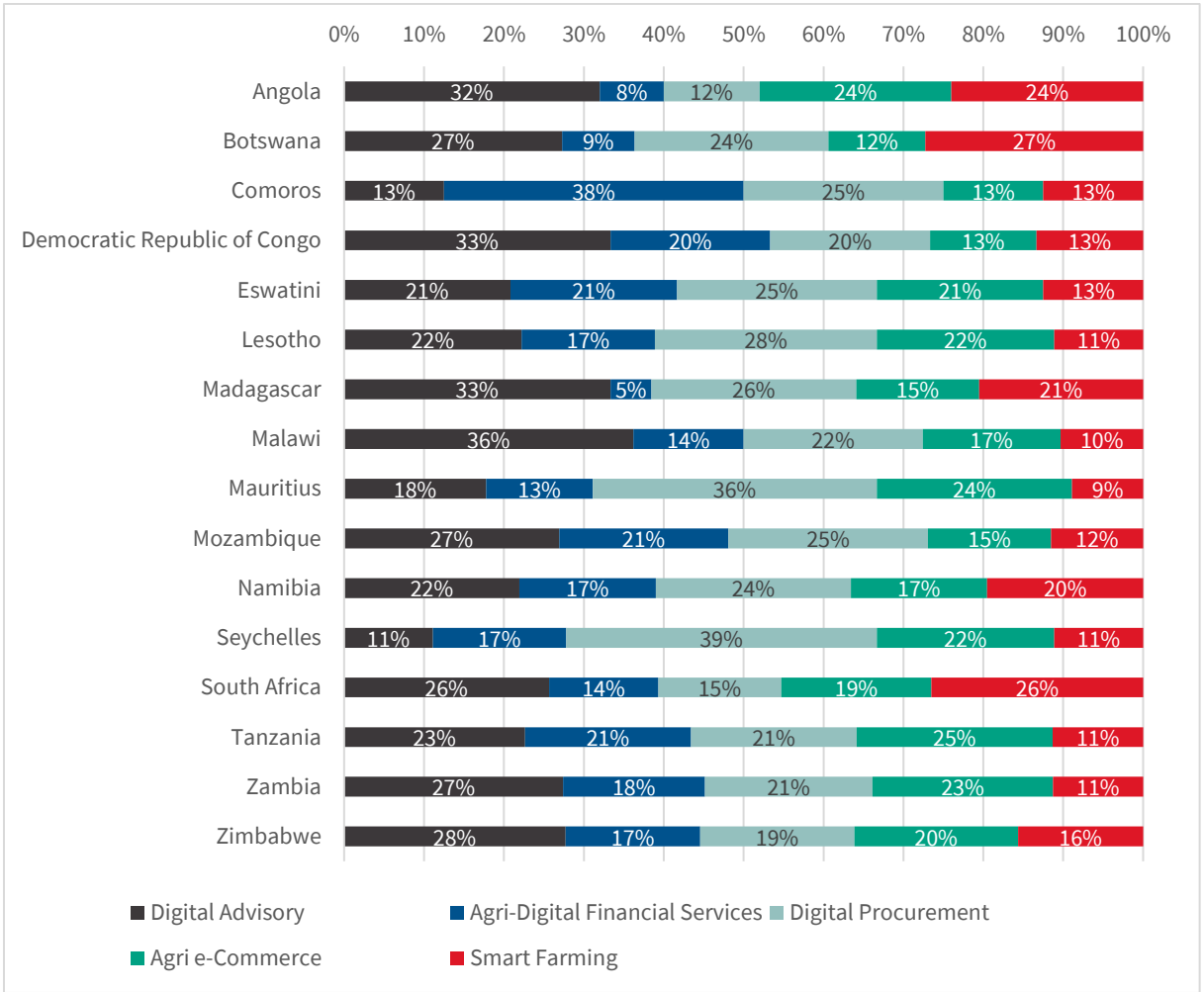

FIGURE 18 DISTRIBUTION OF USE CASE IN IDENTIFIED INNOVATIONS PER COUNTRY

The results of use cases and their distribution across the four country groupings established through the benchmark assessment undertaken in section 4.2 provides further insights.

Group 1: South Africa, Mauritius, Seychelles
Group 2: Eswatini, Tanzania, Botswana
Group 3: Zimbabwe, Namibia, Zambia, Malawi, Lesotho, and Madagascar
Group 4: Angola, Mozambique, DRC, and Comoros (this is an outlier, but still used in the clustering)

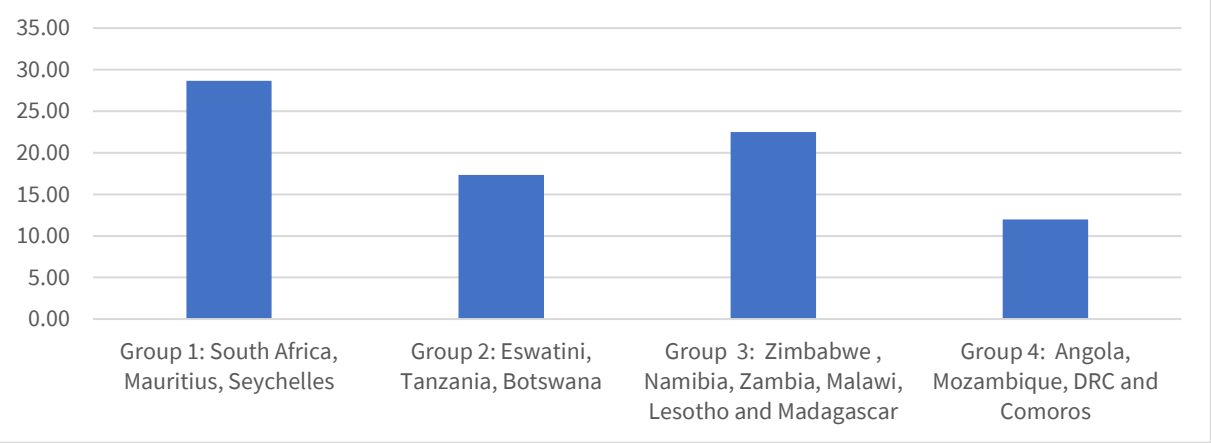

FIGURE 19 AVERAGE NUMBER OF IDENTIFIED INNOVATIONS BASED ON BENCHMARK ASSESSMENT GROUPS

Figure 19 illustrates the average number of innovations per country[10] for each group. Group 1 has a much higher number of innovations than the other groups. Group 3 has more innovations on average than group 2, but this might be partly due to the incomplete overview of innovations in Tanzania. Group 4, consisting of Francophone and Lusophone countries, have the lowest average number of identified innovations but this might also due to the incomplete overview in Comoros (see the limitations paragraph in section 3.3) .

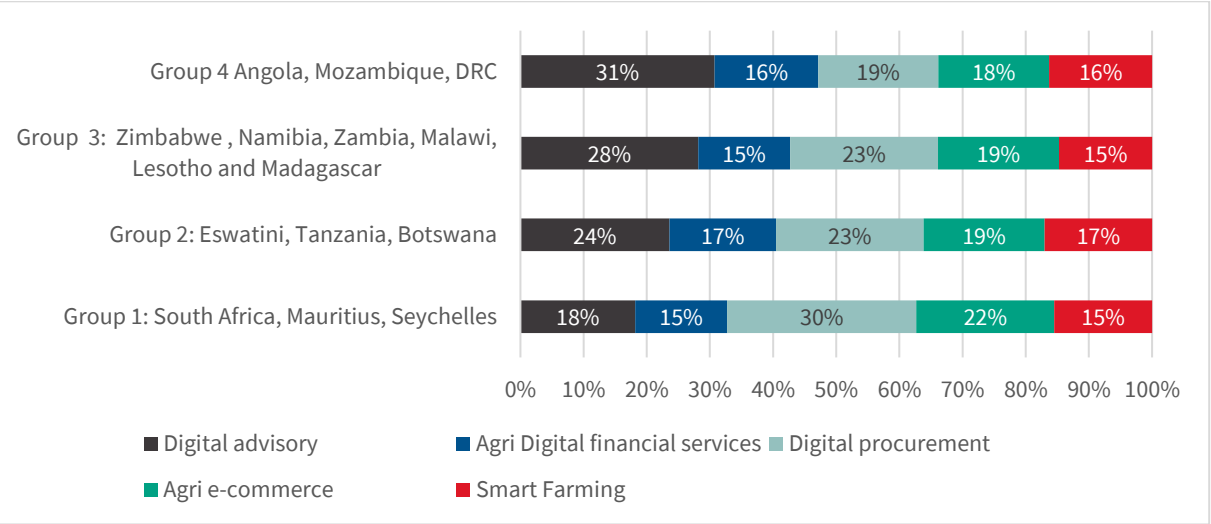

FIGURE 20 DISTRIBUTION OF USE CASES BASED ON BENCHMARK ASSESSMENT[11]

Figure 20 gives the distribution of use cases to each of the four country groups.

[10] The average is calculated by taking the total number and dividing by the number of countries.
[11] Comoros is removed as an outlier from group 4

Based on the distribution the following observations can be made:

- For digital advisory services, group 4 has the highest proportion (31%), followed by group 3. For both groups this is the top use case. Group 1 and 2 have a much lower proportion.
- For Agri digital financial services, there is no clear order between groups, but it is difficult to explain this finding based on the available data.
- For digital procurement, group 1 has the highest proportion, but the other groups don't differ much. For group 1 and 2 this is the top use case.
- For Agri e-commerce, group 1 is again on top followed by group 2, but groups 3 and 4 are not far behind.
- For smart farming, group 2 has the highest percentage, but it is difficult to explain this finding based on the available data.

BUNDLED SERVICES

The study illustrates that almost half of the innovations address a single use case and just over 50% address at least two or more use cases. Ten innovations go as far as to address all five use cases in their service, representing roughly 10% of the available innovations identified.

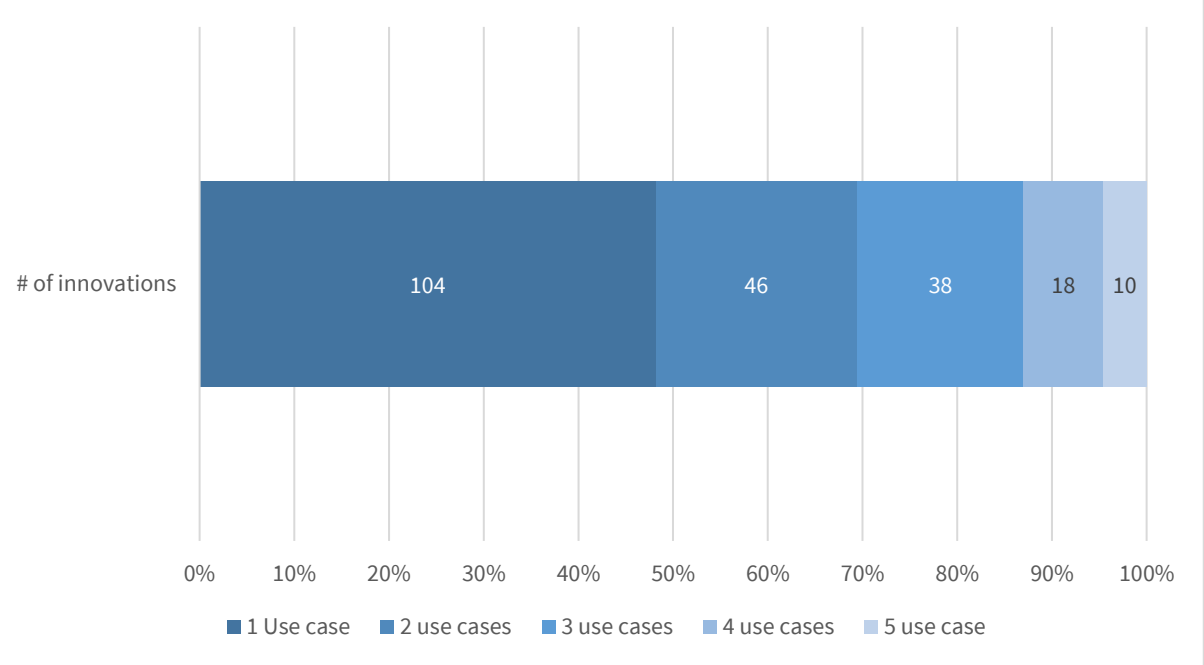

FIGURE 21 PREVALENCE OF USE CASES IN THE IDENTIFIED INNOVATIONS

However, when comparing the distribution across use cases of regional vs local innovations as bundled services, regional innovations have more bundled services than local innovations for three or more use cases. Three of the innovations with five use cases are regional innovations: Agromate, Kres, and Smart Farmer.

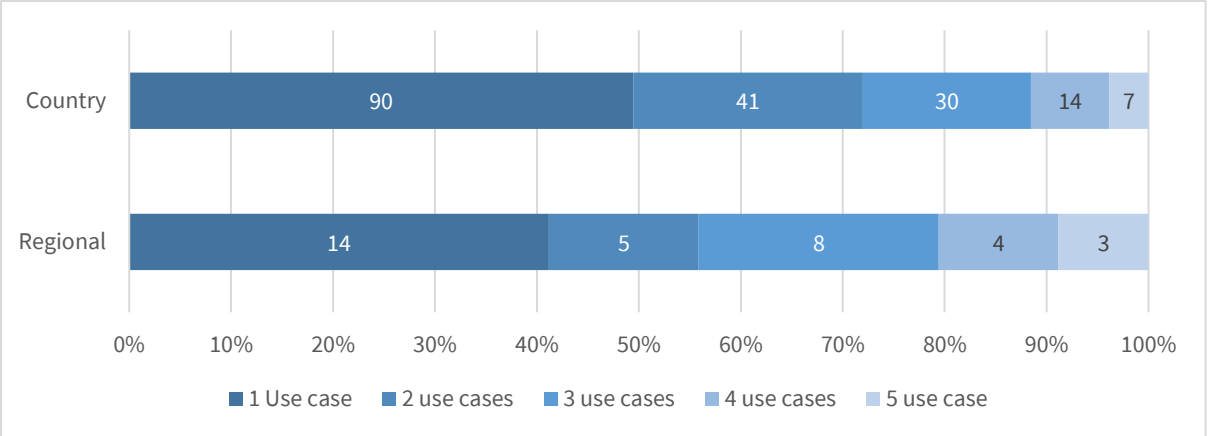

FIGURE 22 DIVISION OF PREVALENCE OF USE CASES IN THE IDENTIFIED INNOVATIONS DEPLOYED IN A SINGLE COUNTRY VS REGIONALLY

LANGUAGE

The surveys deployed were created in English and translated into French and Portuguese to be deployed where appropriate to ensure that respondents gave as accurate information as possible. If we apply language across the SADC country results (See figure 23) the Francophone and Lusophone countries have fewer innovations, but the distribution among use cases is relatively consistent. In general, the Francophone and Lusophone countries have a high dependency on agriculture and exhibit higher proportions of Digital Advisory use cases. Anglophone countries have a higher proportion of Agri e-commerce use cases. Francophone countries have a higher proportion of Digital procurement use cases, as highlighted previously for the two island nations which are part of this cluster.

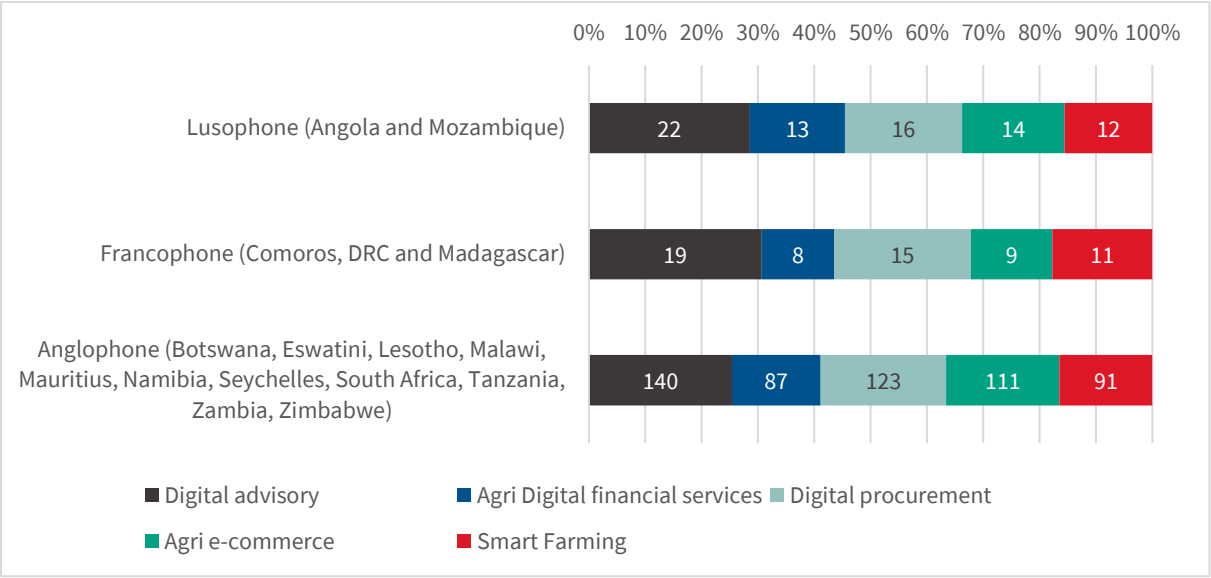

FIGURE 23 DISTRIBUTION OF USE CASE IN ANGLOPHONE, FRANCOPHONE AND LUSOPHONE COUNTRIES

5.2 SURVEY RESULTS

The graphs above present trends and findings from all identified innovations. The following section presents results from the 109 survey respondents.

SUB USE CASES

The GSMA use case model is further subdivided into sub use cases in Figure 24. The five most frequent sub use cases cited in the surveys are digital records (55) under digital procurement, Agri Vas (44) under digital advisory, outputs (43) under Agri e-commerce, smart advisory (38) under digital advisory, and inputs (36) under Agri e-commerce.

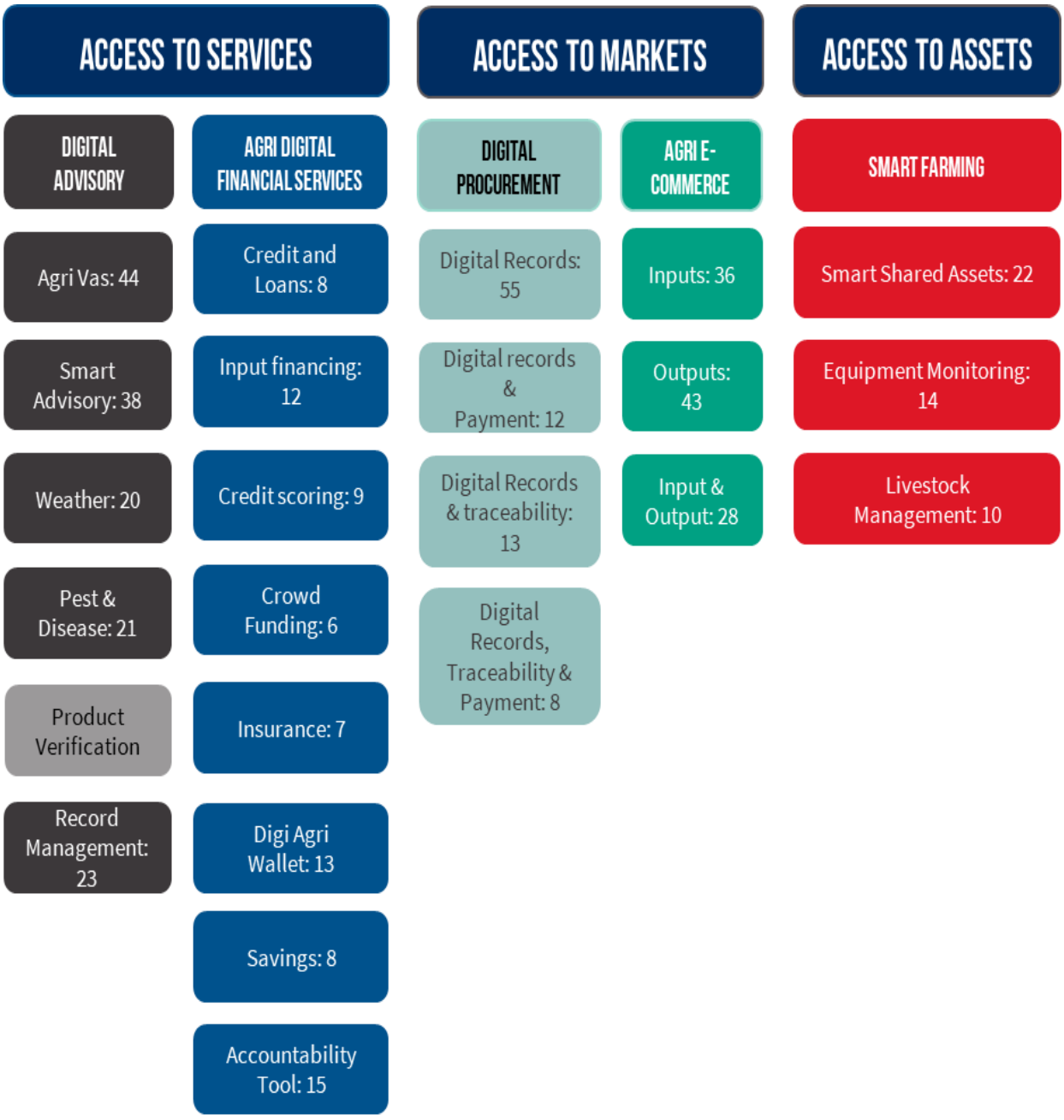

FIGURE 24 SUB USE CASES IDENTIFIED BY SURVEY RESPONDENTS BASED ON THE GSMA FRAMEWORK

Among the survey respondents there is a slightly higher proportion of respondents sharing information on regional innovations (20%) than in the total identified innovations (that had only 15% regional innovations). This is illustrated in figure 25.

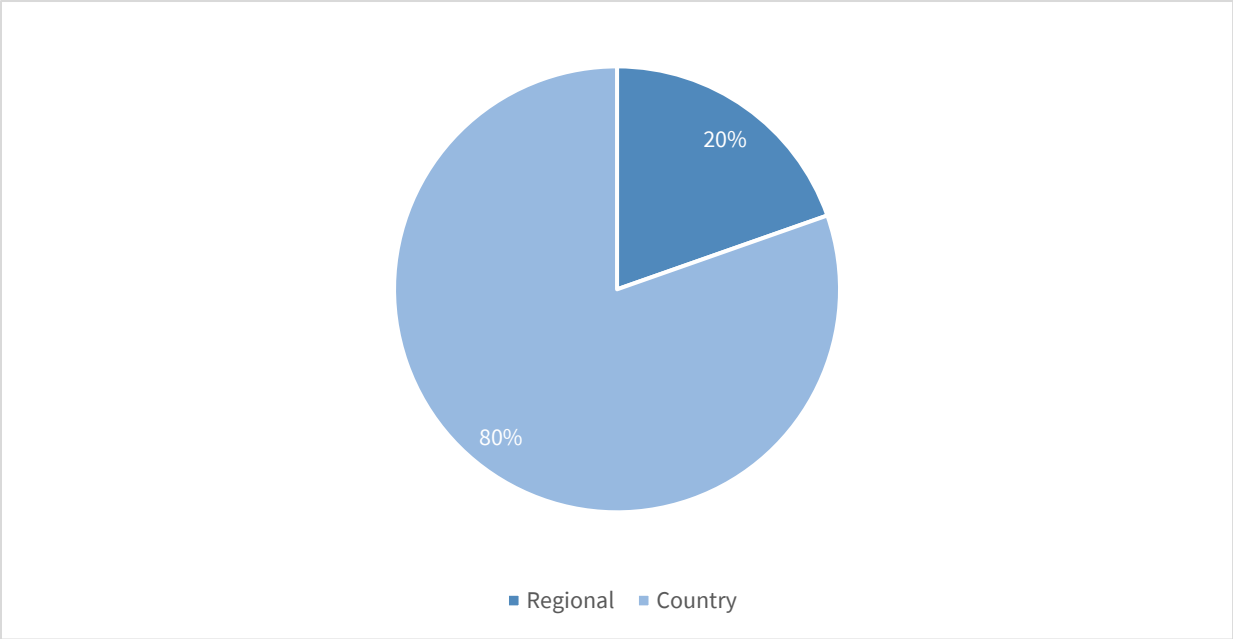

FIGURE 25 LOCAL VS REGIONAL INNOVATIONS AMONG SURVEY RESPONDENTS

LAUNCH YEAR

The innovations in the SADC region are relatively young. More than 60% were developed in 2018 or later (see figure 26).

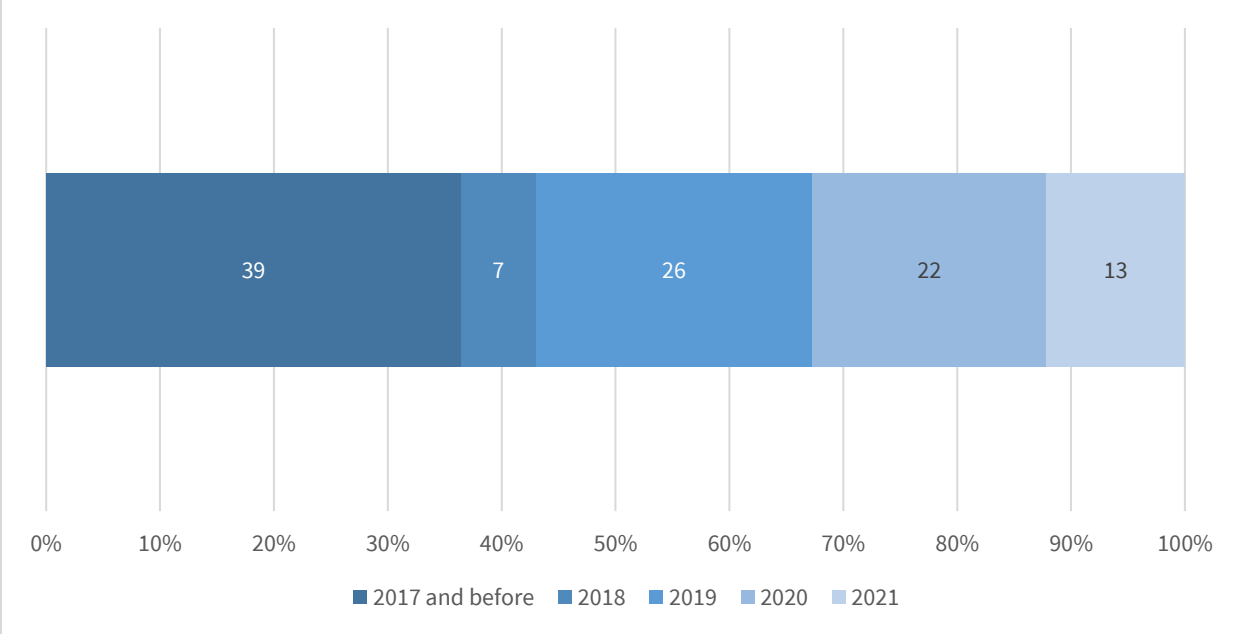

FIGURE 26 ILLUSTRATION OF NUMBER OF SURVEYED INNOVATIONS LAUNCHED PER YEAR

TYPES OF ORGANIZATION THAT DEVELOP INNOVATIONS

The biggest group of survey respondents are from the private sector who are the predominant driving force creating innovations. Governments and Non-Governmental Organizations (NGO) follow at some distance but are often partners, consumers or users of the innovations. This is illustrated in figure 27.

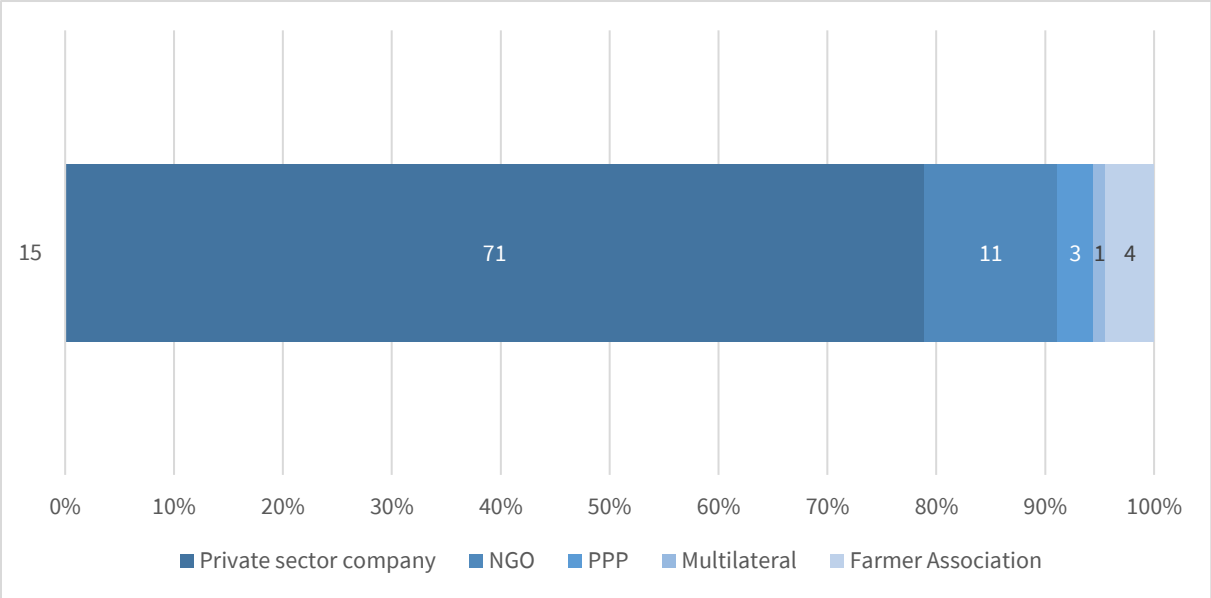

FIGURE 27 THE TYPE OF ORGANIZATIONS RESPONSIBLE FOR INNOVATIONS AMONG SURVEY RESPONDENTS

CHALLENGES ADDRESSED

The survey respondents identified the agricultural challenges their solutions were addressing (see figure 28), with the most common addressing knowledge gaps. This correlates with the highest proportion of innovations providing digital advisory solutions. Low productivity and poor access to markets were the next most frequent challenges being addressed by innovations.

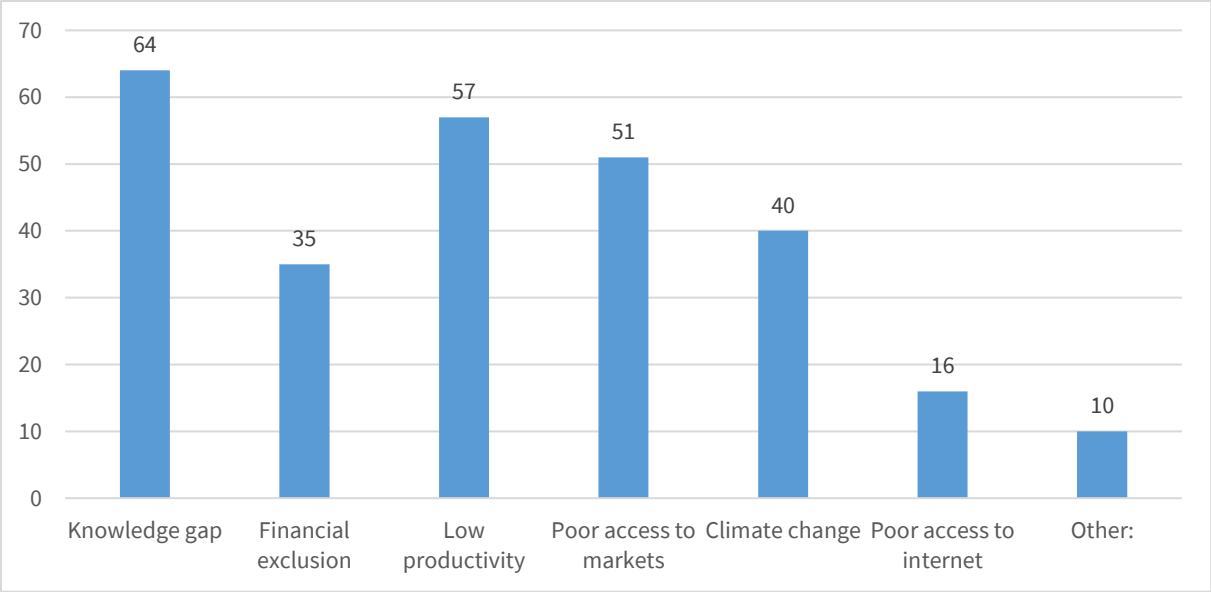

FIGURE 28 AGRICULTURAL CHALLENGES ADDRESSED BY SURVEYED INNOVATIONS

Survey respondents also relayed the challenges they faced during the deployment of their innovations (presented in table 14). The most frequent challenge cited was struggling with the level of digital literacy in users of their innovations. This constrains the ability of innovators to scale-up their solutions. If farmers are not digitally literate, they cannot consume digital channels, tools, and instruments. This then affects the second most cited challenge: farmer uptake.

TABLE 14 CHALLENGES FACED BY SURVEYED INNOVATORS WHEN APPLYING THE INNOVATION

Which of the following challenges have you faced in applying this innovation within your agriculture work?	
Digital literacy	65
Farmer uptake/use/behavior change	47
Operational constraints	36
Lack of mobile network coverage	35
User affordability	29
Access to device (sharing with family with others)	28
Understanding the market and user needs	27
Data collection issues (High cost of collecting data and skills and processes to collect and process data)	27

Survey respondents elaborated further on the additional challenges they faced, including the cost of localization (contextualization and translation) of content. Content is more often available in English and in academic formats that may be difficult for farmers to understand. To deliver actionable and understandable content to farmers is an expensive undertaking. A further factor that hinders rapid growth is farmer on-boarding. Collecting farmer profiles, especially geo data of their farms, is an expensive process (time, labor, and money). Innovators' opportunities are greatly enhanced by platforms where they can offer their services to farmers that have already invested in creating profiles for themselves.

INNOVATION ALONG THE VALUE CHAIN

The innovations are not equally distributed along the value chain. Storage, Post-Harvest Processing and Transport are less common in the digital innovations surveyed than the other parts of the value chain. Most innovations have targeted more than one part of the value chain, illustrating that many commodity value chains are fragmented in more than one place.

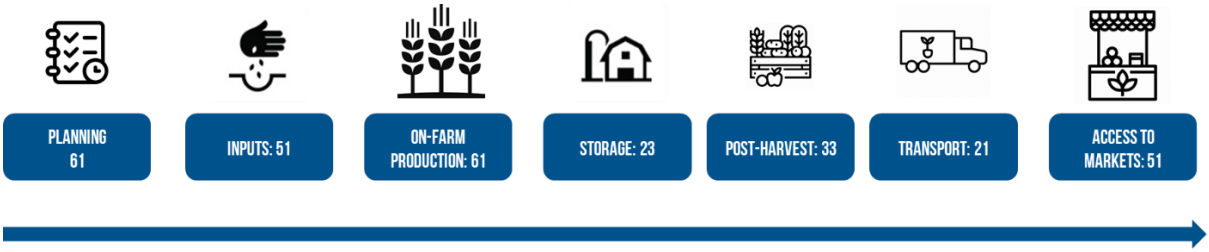

FIGURE 29 DISTRIBUTION OF SURVEYED INNOVATIONS OVER THE VALUE CHAIN

SCALING INNOVATIONS

The study shared the six stages of a scaling innovation model from the International Development Innovation Alliance (IDIA) Insights with survey respondents. They were asked to determine which stage their innovation relates to best, based on a description of each phase as illustrated below (Figure 30).

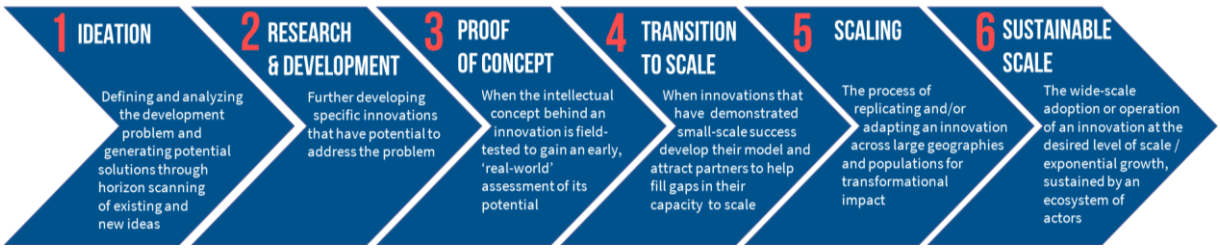

FIGURE 30 SIX STAGES OF SCALING MODEL

The results showed that regional innovations are at a more advanced stage in scaling. For regional innovations more than 50% have reached the Scaling phase (stage 5 in figure 30), while for local innovations this was just above 30%.

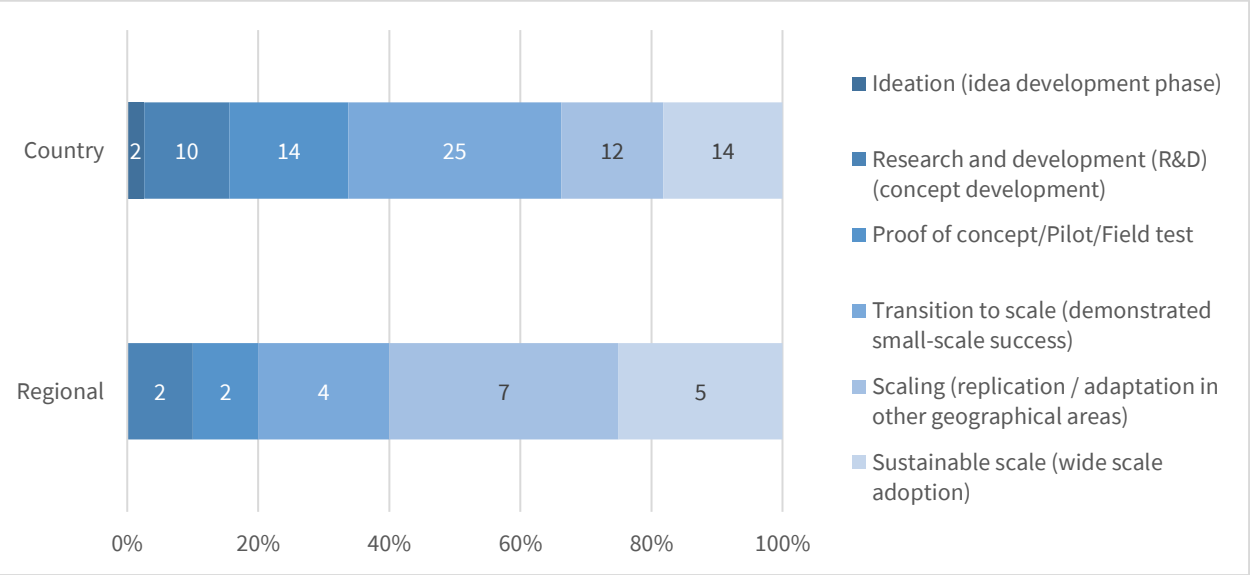

FIGURE 31 SCALING STAGES IDENTIFIED BY SURVEYED INNOVATIONS DEPLOYED IN A SINGLE COUNTRY VS REGIONALLY

Innovations that have reached sustainable scale have more users than those at earlier stages. These findings are tentative because a relatively large number of survey respondents failed to complete this question fully[12]. Interestingly, innovations in the Research and Development stage had on average more users that those at the Proof-of-Concept stage. This may be because some innovations may be being tested by existing users of a (different) primary innovation. The big difference between Scaling and Sustainable scale stages may also have been skewed by the large number of registered users of Viamo in the SADC region (8,500,000).

TABLE 15 AVERAGE NUMBER OF REGISTERED USERS IN SURVEYED INNOVATIONS FOR EACH PHASE OF SCALING

At what stage in the scaling process is this innovation?	Average # registered users
Ideation (idea development phase)	0
Research and development (R&D) (concept development)	1,927
Proof of concept/Pilot/Field test	1,383
Transition to scale (demonstrated small-scale success)	8,689
Scaling (replication / adaptation in other geographical areas)	97,791
Sustainable scale (wide scale adoption)	835,465

SUSTAINABILITY AND BUSINESS MODEL

Four revenue models were commonly cited in survey responses, illustrated in figure 32. Most frequently cited was a business subscription fee model, followed by an individual subscription fee model and a transaction fee model. Grant funds from donors were also commonly used to develop digital agricultural innovations.

[12] Survey respondents may have been unwilling to share what may be interpreted as proprietary or competitive insights, or more likely, they had inadequate data to substantiate this.

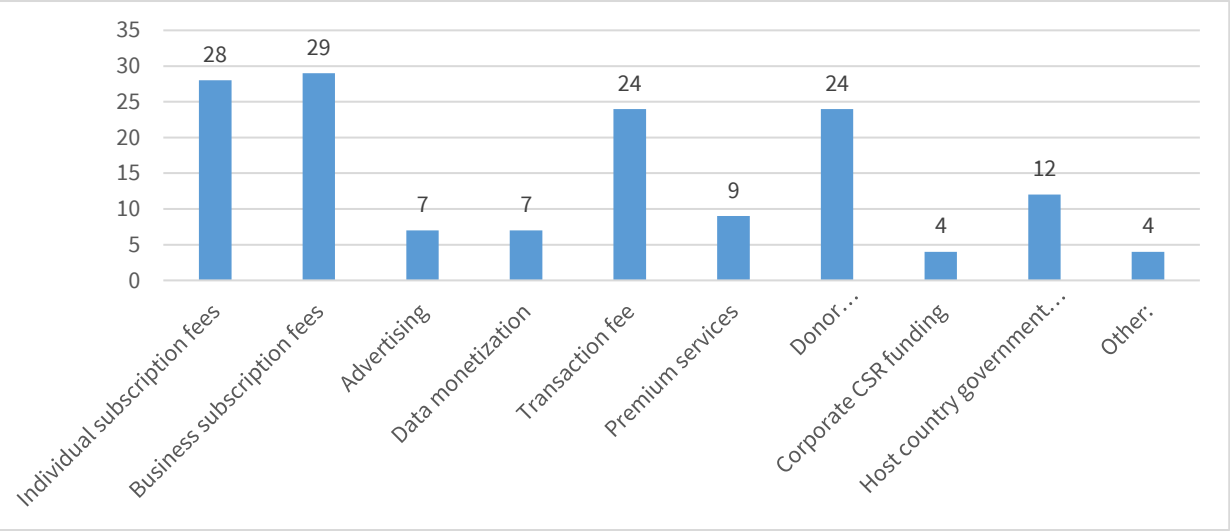

FIGURE 32 REVENUE MODEL FOR SURVEYED INNOVATIONS

Figure 33 shows the finance mechanisms used to support the innovations. The figures are based on the average per country (e.g., For Group 2 the average is based on 3 countries and for Group 4 the average is based on four countries).

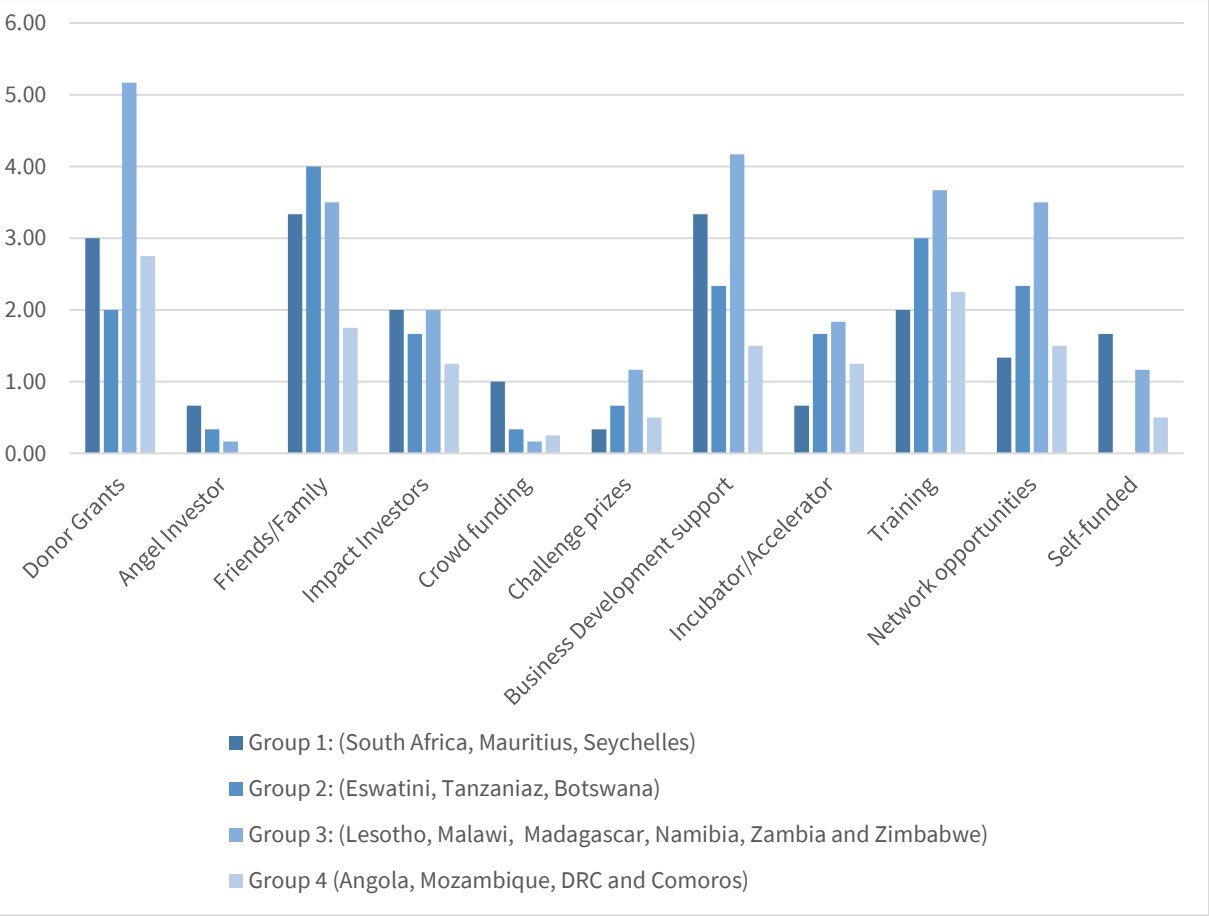

FIGURE 33 FINANCIAL MECHANISMS TO SUPPORT THE INNOVATION

Some observations from figure 33: Group 3 (5.17 average) and Group 4 (2.75) both have donor grants as the most mentioned finance mechanism to support innovations. Group 3 is best able to attract donor funding from

all groups. This is exemplified by Malawi who scored highly and has attracted donor grants for several innovations (10), Zambia (7) and Zimbabwe (6) also score highly. For Group 1, Business Development Support (3.33) and Friends and Family (3.33) are the most common mechanism for financial support. For Group 2 this is Friends and Family (4).

All Groups received some support from impact investors, although Group 1 and 3 use impact investors more often than Group 2. Support from Angel Investors is mentioned less by all respondents but featured most in Group 1 responses. Self-funding is also most common in Group 1. Business Development Support, Incubators and Accelerators, Training and Network opportunities are most common in Group 3.

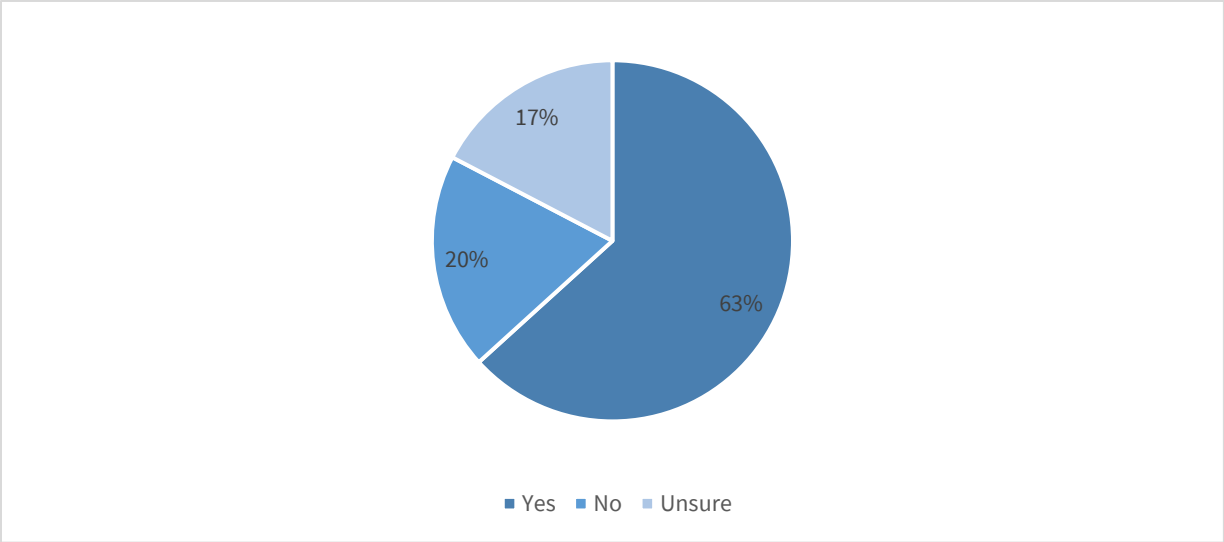

FIGURE 34 SHARE OF RESPONSES FROM SURVEYED INNOVATIONS ON WHETHER FURTHER DONOR GRANT FUNDING IS REQUIRED

Most of the survey respondents mentioned that their innovation would not be sustainable without further grant funding and only 19% mentioned that they are not in need of further donor funding. From survey respondents within the sustainable scale stage, almost 60% mentioned they are still dependent on grant funding from donors (11). Two (2) of those at the sustainable scale stage that are not reliant on grant funding are digital wallets (Mukuru and t.money), and two are government supported (DAES v1 in Malawi and Seasonal Forecast in Lesotho).

Innovators who are in Transition to Scale, Proof of Concept, Research and Development or Ideation phase received the most support from incubators (75% of incubator support is going to these phases) and they often use self-funding, funding by friends and family, or they receive challenge prizes (all three answers were 70% of the respondents in the earlier phases) than the Scaling or Sustained Scale phases.

Growing beyond the transition to scale stage is more complicated. Evidence in the form of data is a huge deficit for these businesses which enables innovations to successfully obtain finance beyond early stage to later stages to be able to grow and scale further. To move from start-up to scale up stages there is a need for rapid onboarding of new farmers (and hence additional funding) to cover operational costs and become sustainable without further and additional requirements for funding.

TARGET GROUP OF THE DIGITAL INNOVATION

Innovations either use an indirect model to reach farmers through intermediaries such as agribusinesses or target the primary user groups directly. Figure 35 shows the distribution among different target groups. Farmers are mostly seen as primary end users followed by farmer cooperatives and extension workers. Government agencies, agribusinesses and NGO staff are more often seen as intermediaries.

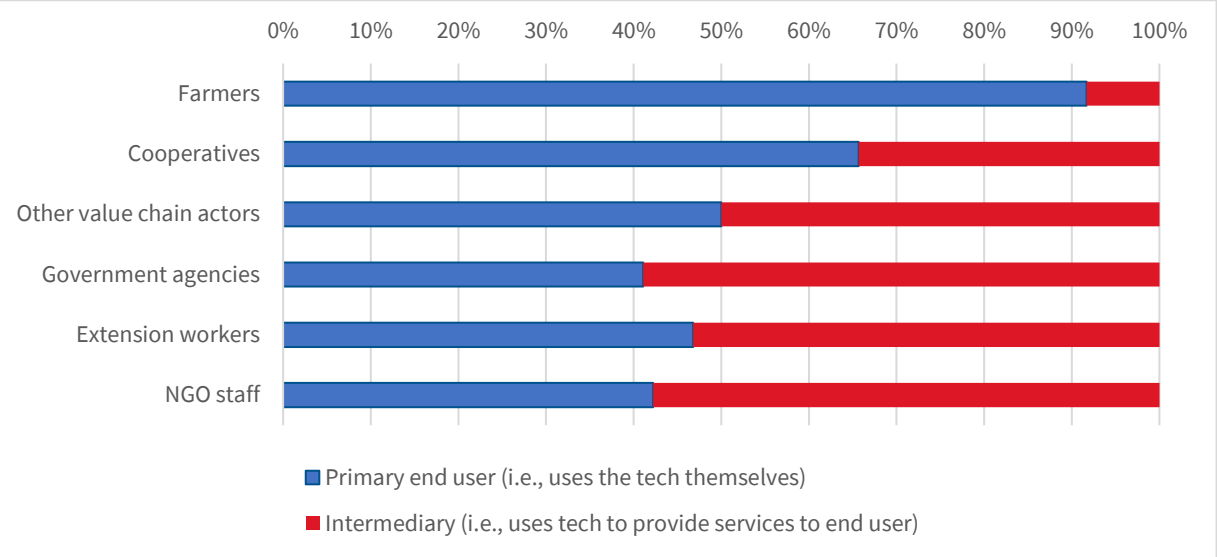

FIGURE 35 TARGET GROUP OF SURVEYED INNOVATIONS (PRIMARY END USERS VS INTERMEDIARY END USERS)

DIGITAL INCLUSION

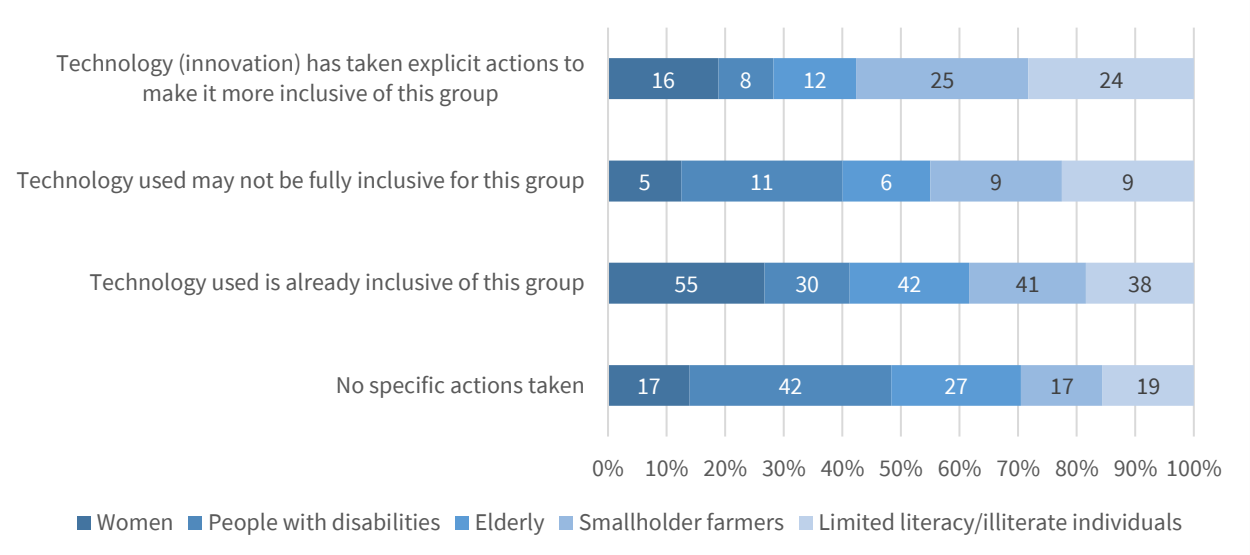

FIGURE 36 MEASURES TO MAKE SURVEYED INNOVATIONS MORE INCLUSIVE

In the survey, respondents were asked to describe if their innovation was inclusive of women, people with disabilities, the elderly, smallholder farmers and those with low or limited literacy levels. If any explicit actions were recorded, they were predominantly for the inclusion of smallholder farmers and those with low or limited literacy levels. A large group reported no explicit actions towards greater inclusivity.

RESULTS

Respondents were asked to share the results of their impact, but many struggled to share information through the survey. Data collection on the ground is a further expense and remote data collection is not yet commonly accepted by farmers (or trusted). To become data driven both in terms of planning ahead and financing requirements, further steps are necessary. Accessing finance is necessary for scaling, particularly to expand beyond borders and facilitate regional trade, commerce, and a regional ecosystem. Impact investors are particularly well placed for this as they understand the need for rapid testing and iteration characteristic of these types of businesses.

6 DIGITAL AGRICULTURAL SKILLS AND ENTREPRENEURSHIP TRAINING

6.1 AGRICULTURAL SYLLABI UNIVERSITIES

Digital and entrepreneurial skills training was assessed through a quantitative Survey Monkey tool sent to 54 Universities, the majority of these were Faculties of Agriculture that are part of the RUFORUM network, but some institutions were contacted that were not strictly agricultural focused to try and provide a complete picture of the region (a total of 58 different faculties were approached). 26 Universities responded to the survey, however 7 Universities responded that they did not teach any digital skills and therefore did not provide further responses. The response rate was 47% which was a reasonable response rate but lower than expected. Some KIIs were also conducted to complement survey responses. Figure 37 illustrates the distribution of the participating universities in the SADC countries that completed surveys. A full list of all Universities and Colleges approached can be found in Annex 3, the relevant survey can be found in Annex 8, and the KII guide can be found in Annex 10.

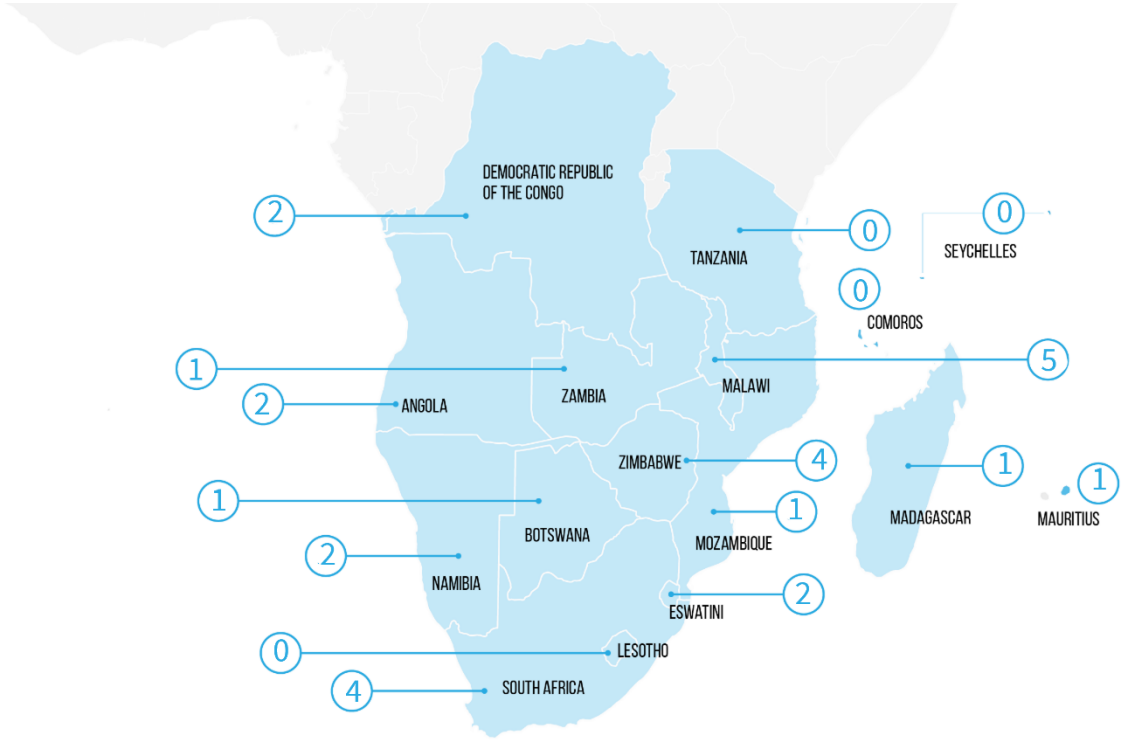

FIGURE 37 OVERVIEW OF UNIVERSITIES THAT RESPONDED TO THE SURVEY

DIGITAL LITERACY SKILLS TAUGHT BY UNIVERSITIES IN THE SADC REGION

Based on data collected through the survey and KIIs, it is evident that the universities in the SADC member states provide digital skills training associated with the International Computer Driving License (ICDL) standard, which was the framework around which the survey was designed due to the familiarity with using it in the tertiary education sector across Africa (Association of African Universities, personal communication).

The ICDL is a digital skills standard developed by the ICDL Foundation to raise digital competence standards in the workforce, education, and society. The ICDL Base Modules that include computer essentials, online essentials, word processing and spreadsheets seem to be taught by most of the universities in the SADC region. The universities also proceed to provide ICDL Standard Modules that cover the use of databases, presentations, online collaboration, and IT security. Advanced ICDL modules of word processing, spreadsheets, databases, and presentations are also taught. Additional digital skills such as graphic design, digital marketing, desktop publishing and mobile technologies did not appear to be part of the mainstream curriculum in most of the universities that responded.

Figure 38 shows the distribution of ICDL modules across the SADC region. Ten of the 26 respondents teach basic skills level modules, seven teach standard skills level modules and only five teach the advanced skills level modules.

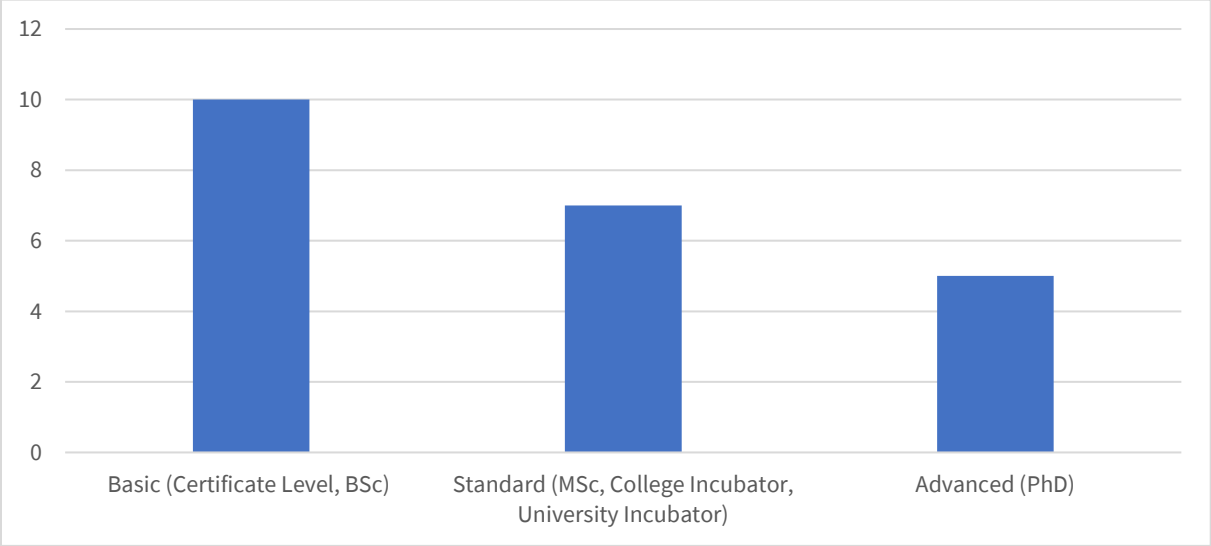

FIGURE 38 DISTRIBUTION OF ICDL MODULES ACROSS THE SADC REGION

HOW THE DELIVERY OF THE DIGITAL SKILLS TRAINING IS ORGANIZED IN SADC UNIVERSITIES

It is important to ensure that the content of the curriculum caters for the different needs of the faculties. Digital skills training is often taught by a central department in most of the responding SADC universities. While this is an efficient way of managing the training, it often misses the specificity that agricultural training requires. For example, the application of databases and spreadsheets might differ between a medical student and an agricultural student. The examples used in delivering the digital skills content must be robust enough and be relevant to specific disciplines. The dynamism of (and continuous changes in) the IT tools and applications also require that students be trained to invest in self-instruction and engage in continuous learning and skills upgrading. **During the discussions with most of the universities it seemed that the agricultural faculties were not assuming direct responsibilities for building the digital skills capacities of their own students but were relying on a central department within the university**.

The university digital skills curriculum could be kept up to date through collaborations with ICDL Africa, a subsidiary of the ICDL Foundation (not-for-profit certifying authority of ICDL). ICDL Africa guides the implementation of the ICDL standards in the African context and manages the accreditation of a network of ICDL Accredited Test Centers. Students could be encouraged to obtain ICDL certification as part of making

them work-ready. Collaboration with ICDL test centers would be possible in the following SADC countries that have ICDL Test Centers: Botswana, DRC, Eswatini, Lesotho, Malawi, Mauritius, Mozambique, Seychelles, South Africa, Tanzania, Zambia, and Zimbabwe.

The ongoing health pandemic has led to the growth in the use of online delivery methods for continuous and flexible digital skills training for university students.

DIGITAL AGRICULTURAL SKILLS TRAINING IN SADC UNIVERSITIES

Digital agricultural skills training requires that IT tools or applications be taught using the viewpoint of agricultural needs or relevance. The applicability of fundamental IT literacy for agriculturalists and agricultural development must be emphasized. The relevance of new and emerging skills areas to the agricultural sector must be clearly articulated and demonstrated practically during the delivery of digital agricultural skills training. The digital agricultural skill areas include cybersecurity, IoT, Artificial Intelligence (AI), mobile technologies, digital marketing, desktop publishing, and Big Data.

Figure 39 illustrates that Big Data for agriculture, Internet of Things for agriculture, digital entrepreneurship and coding for agricultural systems are widely taught. Other topics are less common.

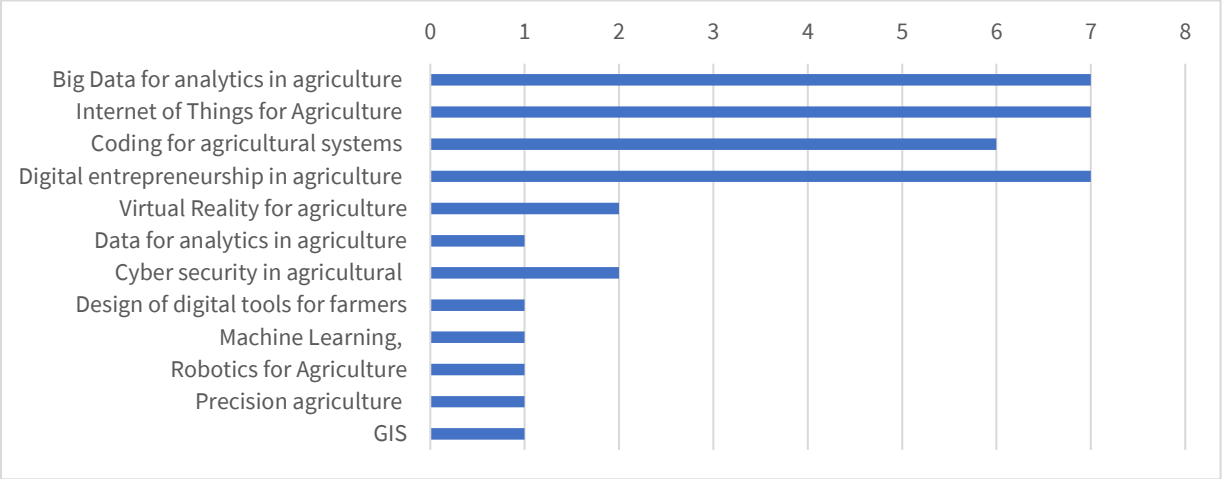

FIGURE 39 DIGITAL AGRICULTURAL SKILLS TAUGHT AT SURVEYED UNIVERSITIES AND COLLEGES IN SADC

Several universities reported that they taught most of these skills, except for Botswana, Comoros, Eswatini, Lesotho, Seychelles, and Tanzania who either did not complete the survey or **were explicit that they did not teach digital skills**. However, it was still unclear from the analysis how the curriculum was structured to accommodate the training of these new skill areas. Some universities (e.g., LUANAR in Malawi and Africa University in Zimbabwe) reported that the digital agricultural skills were taught as part of other courses. There is a clear opportunity for Universities to learn from innovation hubs and incubators and work more closely to support the continuous training of students in new and emerging areas through greater collaboration between the two types of institutions. Online delivery methods also present an important opportunity for continuous and flexible digital agricultural skills training for university students. Furthermore, there are opportunities to develop specialist modules to ensure that skills development can also be tailored for policy makers in digital agricultural fields.

The ICDL Insights modules could be used as a standard for introducing trending and emerging topics such as cloud computing, AI, IoT, Big Data, blockchain and industry 4.0.

COLLABORATING TO IMPROVE DIGITAL AGRICULTURAL SKILLS TRAINING FOR SADC

The responding universities did not mention any national or regional university-to-university collaborations to support the delivery of digital agricultural training. The students' training needs for the new areas require specialized instructors, specialized equipment, the establishment of complex simulated virtual environments, access to specialized and expensive equipment and reliable access to the internet and related devices. Evidently there are opportunities for collaborations among the SADC countries for setting up regional digital agricultural skills centers of excellence, joint resource mobilization, joint curriculum development, staff, and student academic mobilities for capacity development.

DIGITAL ENTREPRENEURSHIP TRAINING IN SADC COUNTRIES

The way that digital entrepreneurship in agriculture is taught must adapt to the new opportunities presented by evolving digital technologies. Digital agricultural entrepreneurship therefore aims to expose students to new agricultural entrepreneurial projects, new agricultural products and services, new ways of generating revenue for agricultural initiatives, new opportunities to collaborate with agricultural platforms and partners, and new areas for agricultural competitive advantages.

Universities in eight SADC countries reported that they were delivering some form of digital entrepreneurship skills training in the areas of E-extension, Smart Farming, Digital Content Creation, ICT-Enabled Advisory Services, Intelligent Agriculture/Geomatics, Digital Procurement, Agri-e-commerce, Agriculture Innovation, Agribusiness Agricultural Extension, Agri Digital Financial Services, Technologies in Sheltered Farming, Precision Farming, Small and Medium Enterprises, and Agricultural Management.

Figure 40 shows the distribution of digital entrepreneurship training with Digital Advisory and Smart Farming as the most common subjects.

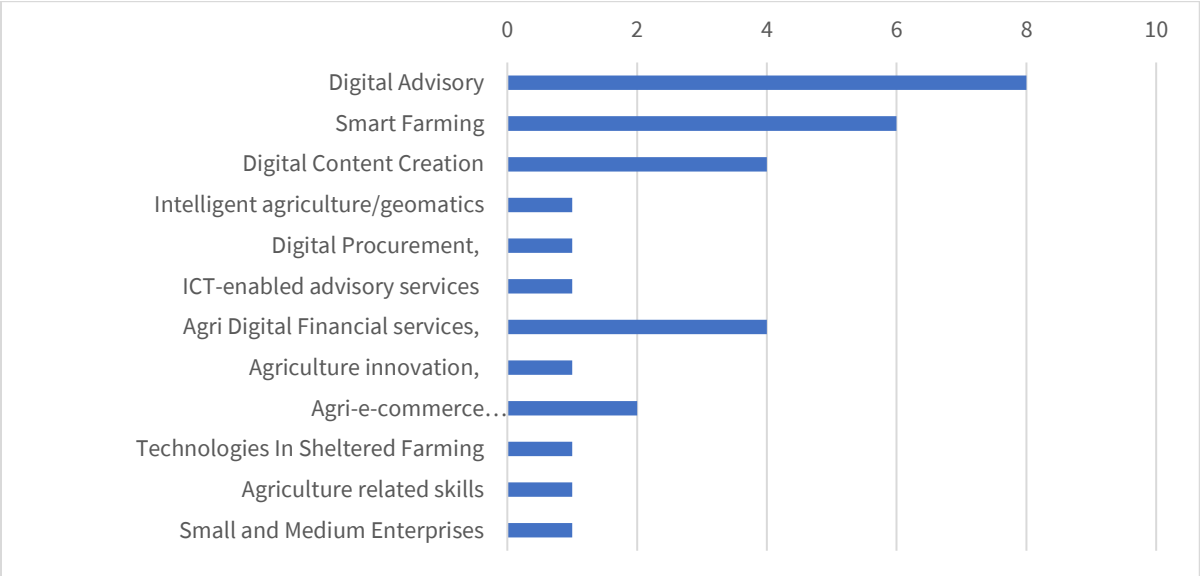

FIGURE 40 DIGITAL ENTREPRENEURSHIP TRAINING COURSES REPORTED AT UNIVERSITIES

Based on the more qualitative discussions with selected universities, **an opportunity for refining the digital entrepreneurship curriculum for agricultural students and practitioners is apparent.** There is currently no standard that is being used to guide training in this area which would be beneficial.

LAST MILE INTERNET CONNECTIVITY SOLUTION FOR UNCONNECTED AREAS

The importance of building strong communications infrastructure for higher education and research institutions in the SADC region cannot be over-emphasized. Such infrastructure is needed to support advanced service digital agricultural delivery through high-speed telecommunications networks. The Research and Education Networks in the SADC member states (NRENs) are key institutions that provide internet bandwidth services, cloud services and other value-added services to research and education institutions at reduced costs.

The development of strong campus networks and the strengthening of NRENs are key so that SADC higher education institutions and innovation hubs can effectively provide all types of digital services for teaching digital agricultural training, digital agricultural entrepreneurship, and advanced research activities. **During the discussion with the responding universities, it was emphasized that CCARDESA could support the appeal to SADC Governments to prioritize the 'last mile' solutions in the SADC countries so that the rural areas have equal access to the internet as those in the urban areas.** Most of the SADC countries have established NRENs but they have not achieved "maturity" status of development because of limited support from their governments.

6.2 INCUBATORS AND INNOVATION HUBS

INCUBATORS, INNOVATION HUBS AND TRAINING CENTERS IN THE AGRICULTURAL SPACE: AN OVERVIEW OF THE SADC REGION

The demand for emerging skills in the current international labor market is fostering the creation of large numbers of business support organizations[13] such as incubators, innovation hubs and training centers or programs. These institutions have the role of preparing young people for future jobs, innovations, entrepreneurial initiatives, and to meet the demand of employers in need of a workforce that can move fluidly across projects, teams, and work locations, especially considering the impacts that the Covid-19 pandemic has created in the international labor landscape. As demonstrated by the ITU Digital Skills Insights 2019, digital skills have been recognized as crucial in the response to the demand of the SSA labor market.

In October 2019, a qualitative and quantitative study by AfriLabs and Briter Bridges, Building a Conducive Setting for Innovators to Thrive, mapped hubs across Africa. They identified 643 different hubs across more than 50 countries which included coworking spaces, incubators, accelerators, and hybrid innovation hubs affiliated with government, universities, or corporates. According to GSMA, the number of identified hubs has grown by 51% over the period 2016-19. Of the 643 identified by AfriLabs, 41% were incubators, 24% innovation hubs, 14% accelerators and 39% co-working spaces.

Within this study, these institutions have also been considered key stakeholders in providing a range of digital skills training for agricultural development, the agribusiness sector and in preparing students, researchers, and entrepreneurs to progress their ideas and aspirations in the current SADC agricultural labor market. Of the 62 Agri-incubators targeted by this study, 29 responded to requests for interview and participated in KIIs resulting in a reasonable response rate of 47%. A full list of incubators approached can be found in Annex 4,

[13] In this study we have referred to these types of business-support organizations as i*ncubators*, with the express acknowledgment that they have differences in targets related to the youth they train/incubate, their management and business models, and the funding available for investment in startups/enterprises.

the KII guide for incubators can be found in Annex 9, and the full list of stakeholders interviewed including incubators can be found in Annex 2.

Figure 41 illustrates the distribution of existing agri-incubators and the number of agri-incubators that participated in a KII[14] (e.g., for Tanzania 7 agri-incubators were identified of which 4 participated).

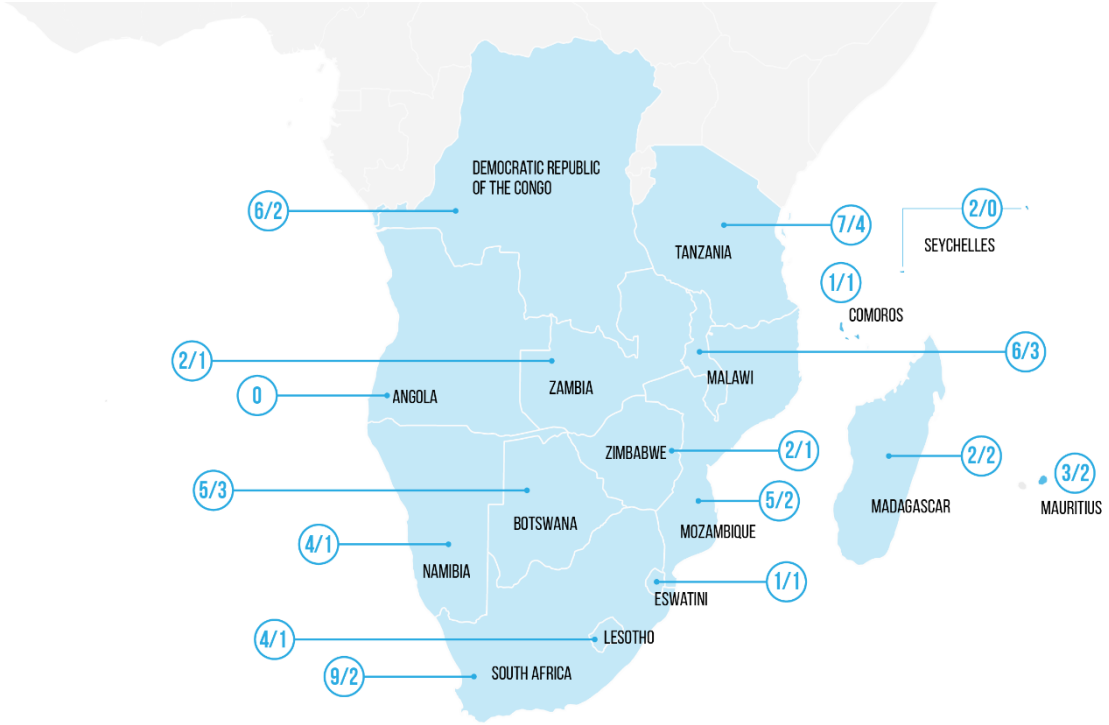

FIGURE 41 DISTRIBUTION OF IDENTIFIED AGRI-INCUBATORS VS PARTICIPATING AGRI-INCUBATORS

Of the 29 agri-incubators examined in nine countries in the SADC region, 48% cited their support came from government, while the incubators belonging to the six remaining countries were independent organizations or initiatives with a dependence both on donors or partner funds, or business models that supported revenue generation to cover their operational costs without the need for additional support from external entities.

There were several different revenue-generating business models mentioned by the agri-incubators including charging fees in the provision of incubation services, delivering trainings and events (hackathons, bootcamps, pitch days, etc.), rental income from co-working spaces or conference rooms, and fee-based consultancy support for studies or market research and other business-related activities.

Regarding the support from government to the incubators, this was not necessarily based only on funds, but other relevant forms of help such as seed funding for the start-ups incubated, the provision of in-kind offices and spaces for the co-working and the provision of land to facilitate the piloting of agri-related entrepreneurial initiatives.

[14] Survey respondents in Botswana and Eswatini universities provided incomplete surveys and as such they are not mentioned in the map since the information provided was limited or they do not provide digital skills.

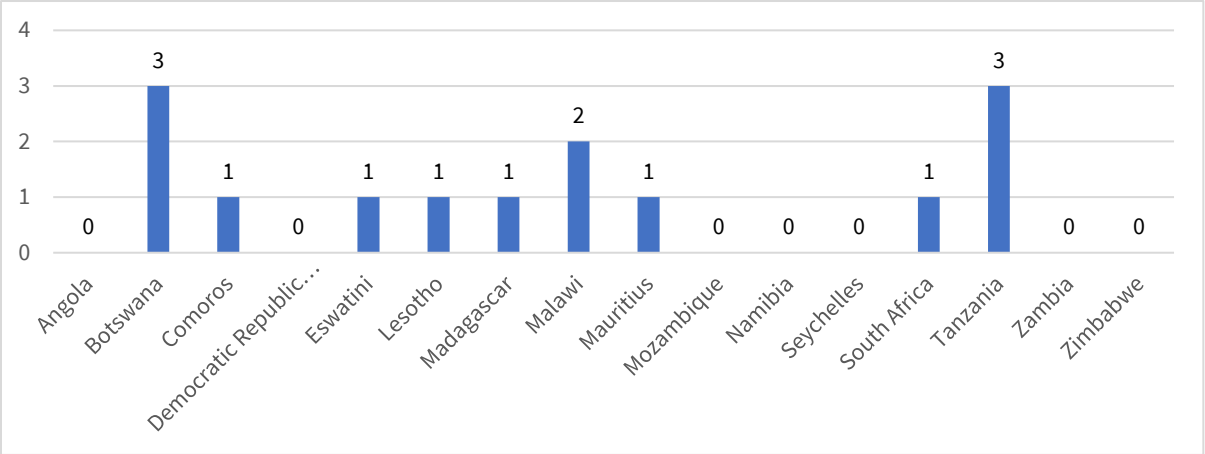

FIGURE 42 AGRI-INCUBATORS SUPPORTED BY THEIR GOVERNMENTS

THE ROLE OF SADC AGRI-INCUBATORS IN UPSKILLING YOUNG PEOPLE WITH DIGITAL SKILLS FOR THE AGRICULTURAL SECTOR

Despite the acknowledgment on the importance of building digital skills for the agricultural sector by most agri-incubators interviewed, the incubation space of the SADC Region is not ideally prepared with the necessary skills and equipment to teach digital agriculture skills. Excluding Angola and Seychelles, of the 14 countries examined, six do not teach digital agriculture skills and some even suggested that they were not familiar with the meaning of *digital agriculture*. With respect to general digital skills training, only four incubators do not teach any digital skills, illustrating how incubators are better equipped with providing expert advice and more general curriculum on IT or digital training rather than tailored digital agriculture skills training.

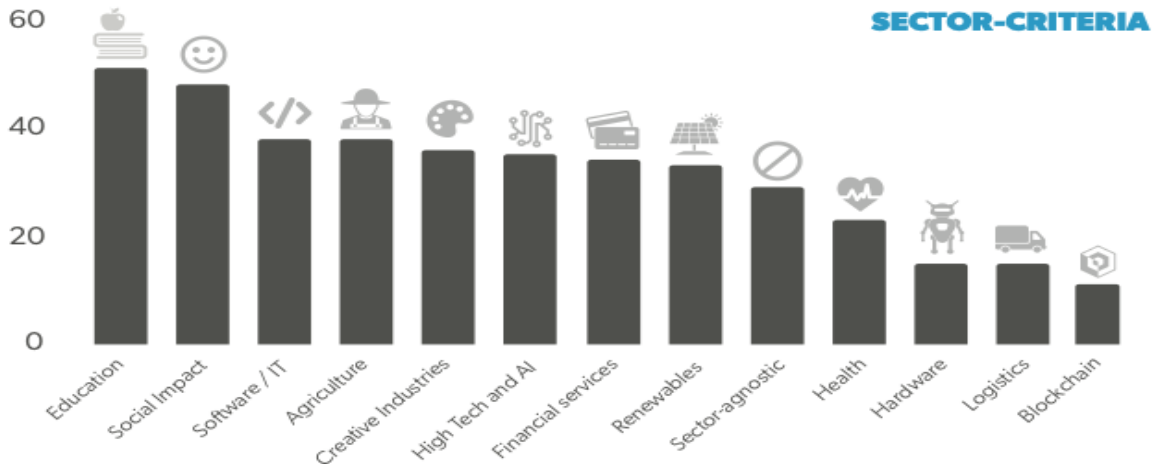

FIGURE 43 GRAPH FROM AFRILABS AND BRITER BRIDGES (2020) REPORT[xv] SHOWING BREAKDOWN OF SECTOR SPECIFIC HUBS

Sectors delivering high social impact in education and agriculture were amongst the highest number of hubs specializing, as identified by AfriLabs and Briter Bridges 2019 report.

Most incubators in countries that teach digital agricultural tools do not provide specific digital agricultural training but tools for incubee businesses are mentioned during wider digital skills training, including those not specifically aimed at agriculture.

Occasionally, specific training courses on precision agriculture or drones for farm management are customized to support a digital agriculture entrepreneur in need of the skills (customized training), but these are rare services provided by a few incubators.

In general, both digital skills and digital agriculture tools are taught by external consultants or partners of the incubators who provide a digital training portfolio or organize specific masterclasses on digital agriculture.

None of the incubators interviewed have internally dedicated digital agriculture experts but do have IT developer staff or digital experts to assist youth with general digital skills.

TABLE 16 DIGITAL SKILLS TRAINING AND DIGITAL AGRICULTURAL SKILLS TRAINING ACROSS RESPONDING INCUBATORS IN SADC

	Digital Skills Training	Digital Agri Tools
Botswana	✓	✓
Comoros		
DRC	✓	
Eswatini		
Lesotho		
Madagascar	✓	
Malawi	✓	✓
Mauritius	✓	✓
Mozambique	✓	✓
Namibia		
South Africa	✓	✓
Tanzania	✓	✓
Zambia	✓	✓
Zimbabwe	✓	✓

TABLE 17 CURRICULAR COMPONENTS OF THE DIGITAL SKILLS TRAININGS AND DIGITAL AGRI TOOLS TAUGHT IN THE AGRI-INCUBATORS INTERVIEWED

	Digital Skills Training	Digital Agri Tools
Botswana	Capacity building sessions like Robotics and Coding, Online marketing, Communication (ex. Video production), social media, ICTs for production records and finance, ICT for record keeping	Digital Advisory Agri-e-commerce Smart Farming Digital Procurement
Comoros	None	None
DRC	Website development, Digital marketing, FinTech, IT tools to manage the business	None
Eswatini	None	None
Lesotho	None	None
Madagascar	Use of the internet, social media, and data collection to sell products, Digital communication and marketing, Multimedia	None
Malawi	Climate change adaptation enterprises through ICTs, Digital marketing, Product development for prototype development, digital marketing, 3D/2D Design, Software languages (machine learning, phyton, etc.), Hardware engineering, ICT for biomedical	Digital Advisory Agri Digital Financial services Digital Procurement Agri-e-commerce Smart Farming
Mauritius	On Demand (e.g., IoT training), Digital Marketing Workshops, Modern technologies for SMEs in the agricultural sectors	Digital Advisory
Mozambique	Digital transformation trainings: -Registering farmers info	Digital Advisory Digital Procurement

	-Capturing geolocation in the field -Registering trainings into digital platforms -Surveys to capture information Digital marketing	
Namibia	None	None
South Africa	Business resources and tech tools, Digital marketing skills, Coding academy, Robotics, 3D printing, hardware, chatbox, Mobile and web development	Digital Advisory Agri Digital Financial services Digital Procurement Agri-e-commerce Smart Farming
Tanzania	ICT for Financial records, impact tracking and access to market, Agri technical mentorship, Prototypes Design, Digital marketing, IoT, Programming, Data Science/AI, Mobile and web development, Use of Apps for agriculture, Design of solutions for farmers, Digital Literacy, SEO / web marketing / social media, TAHA: how to join this web platform (www.taha.or.tz), Marketing Intelligence	Digital Advisory Agri Digital Financial services Digital Procurement Agri-e-commerce Smart Farming
Zambia	Financial management for SMEs, Financial management software	Agri Digital Financial services Digital Procurement Agri-e-commerce Smart Farming
Zimbabwe	AI/machine learning, SEO trainings, Business and market strategies in the digital space, Coding, mobile app design and monetization of digital content, e-commerce, cloud technologies marketing, social media management, digital payments, digital systems for invoices records, online processes, legal contracts, Content management (WordPress), Digital market Analysis, social media	Digital Advisory Agri Digital Financial services Digital Procurement Agri-e-commerce Smart Farming

7 DISCUSSION

7.1 THE BROADER POLICY ENVIRONMENT

KEY REFLECTIONS FROM BENCHMARK ASSESSMENT, STOCK TAKE AND CHALLENGES WITHIN THE AGRICULTURE SECTOR

The focus on the broader policy environment for this study has identified three key focus areas, also referenced in the findings. These focus areas result from the benchmark assessment, the stock take of policies, strategies and legislation, and the challenges identified by stakeholders in the agriculture sector more specifically.

The benchmark assessment is an effective tool to measure progress within the region and identify countries that may require greater intervention in specific policies or legislation to accelerate digital transformation in agricultural systems.

The benchmark assessment enabled the identification of countries within SADC that are unlocking positive pathways towards a digital economy and a vibrant ecosystem of different actors. Four clusters of countries at different points in their progress were identified in applying the benchmark:

Group 1: South Africa, Mauritius, and the Seychelles.
Group 2: Eswatini, Tanzania and Botswana.
Group 3: Zimbabwe, Namibia, Lesotho, Zambia, Malawi, and Madagascar.
Group 4: Angola, Mozambique, the DRC, and Comoros.

Countries that have been the most successful to date at advancing their policy and enabling environments all have agriculture sectors contributing less than 10% of GDP and employ less than 5% of their population in productive agriculture. There may be many more people engaged in the food system itself including retail, processing, trade, storage, logistics, marketing, and food preparation. These front-runners provide good areas of potential learning in certain foundational pillars necessary for a vibrant digital economy. The clusters formed through the benchmark help to identify the progress countries have made and where greater efforts may need to be directed.

The benchmark illustrates the variation in the strengths and weaknesses across the region. The specific areas of this diversity were explained in further detail through scrutiny of the foundational pillars making up a vibrant digital economy. An example to illustrate this comes from South Africa which does not offer a strong example for digital skills, despite being ranked first overall, as it ranks tenth under this specific pillar. The value of the foundational pillar breakdown provides an opportunity to see which country provides a good example to learn from in each of the pillars. Some caution is also necessary given the complexity around development because a strong candidate such as Mauritius, which excels in the ranking and is identified as advanced even at a global level, is still unproven because it is at an earlier stage in developing its agriculture sector to build greater self-sufficiency in its national food system.

A whole-of-government approach is necessary for a thriving digital economy that enables engagement of stakeholders in the policy process and can alleviate cross-sectoral challenges, such as connectivity and digital literacy skills. Furthermore, greater efforts are necessary to understand whether the legal

and regulatory standards in place for digital commerce, privacy and data fulfil their objectives for all stakeholders.

The policy and legislation stock take clarifies what countries' activities are, and if they are embracing a digital economy. In terms of legislation, half the countries have some form of legislation on e-commerce, cybersecurity, or data but there is mixed information on the extent to which these are implemented or enforced. It is also possible that these require updating to encompass emerging technologies and modern digital solutions. This is particularly pertinent to the sixth challenge identified by stakeholders in section 4.5; the lack of security institutions and regulations. With greater digitalization more focus should be placed on ensuring trust, privacy, and protection of consumers and businesses. Digital technologies, especially more advanced ones, rely heavily on the collection, dissemination, and analysis of data. More directly related to legislation is the regulation and standards that are currently missing to enable greater interoperability between the private sector, public sector and across regional bodies.

A digital economy strategy enables the private sector to engage in policy formulation and play a role in whether policies are delivering an enabling environment. The observation from our analysis suggests the predominance of a siloed approach by different ministries and departments suggesting gaps, overlaps and inherent inefficiencies. This nature of siloed policymaking hinders the entrance of partnerships with the private sector.

Digital Agriculture policies or strategies were not available in any of the 16 countries within SADC and the integration of digital into existing agriculture strategies and policies was limited. An agriculture sector specific digital strategy and roadmap is necessary with clear objectives, milestones, timelines, and funding requirements to tie in the sector performance with a digital economy advancement.

None of the countries investigated had a clear digital agriculture strategy. A lack of a guiding policy or strategy was a barrier for stakeholders to implement innovations or digital solutions that would be sustainable. The FAO states that "committing piecemeal resources to ICT4Ag on an *ad hoc* basis result in higher costs and lower impacts" and that any effective roadmap will require "a holistic, multi-stakeholder approach as ICTs are also driving other sectors critical for agriculture, namely banking, weather monitoring, insurance, logistics and e-governance"[xvi]. A clear agriculture sector specific strategy or roadmap can address some of the key challenges raised by stakeholders consulted during this study. It is important to recognize adequate funding for the sector will be necessary to implement new solutions and resource the transition to a more digitally aware approach. The OECD notes in Digital Opportunities for Better Agricultural Policies that the estimates for the costs of developing digital tools for policymaking are not insignificant and these actual costs need to be factored into overall budgeting and planning with ongoing skills and management requirements necessary for such a transition.

In addition, the sector specific strategy – and most particularly for agriculture - would need to be adapted to leave no one behind especially those at greatest risk of exclusion. While low digital skills are an issue that needs to be addressed in a digital economy strategy, as it is cross-sectoral, specific and explicit focus will be required for the aging rural farming population that consists largely of women, but also the elderly and those with low literacy levels. One way to achieve this is through hyper-localized relevant content that is translated into working languages or images through gamification approaches tailored to a specific country.

BROADER REFLECTIONS AND FURTHER AREAS FOR DEVELOPMENT

This section presents broader reflections, areas for development, and possible intervention areas where CCARDESA and SADC could play a greater role. The reflections are presented in alignment with different country groups identified by the benchmark assessment. These suggestions are not exhaustive, and some may be relevant and useful in all the SADC countries.

Group 1: South Africa, Mauritius, and Seychelles

Specific focus and investigation should be made to understand what is working within these countries in the implementation of their policies and legislation, how it is working, and the levels of enforcement with regards to the policy and legal frameworks for the purpose of extending learning across the region. Special emphasis should be focused on promoting privacy and data standards to encourage greater engagement by the private sector. Mauritius has an advanced policy environment and could prove a useful example when looking at learnings.

Groups 2 and 3: Eswatini, Tanzania, Botswana, Zimbabwe, Namibia, Lesotho, Zambia, Malawi, and Madagascar

A whole-of-government approach needs to be championed with the development of a digital economy strategy. Focus within the strategy should be on the cross-sectoral barriers such as infrastructure, connectivity, the cost of data and access to data, digital skills more generally at primary and secondary level, and greater integration across sectors to break down the siloed nature of current policy making. Malawi is included in this grouping which already has a good example of a digital economy strategy and so it is likely that much learning could be shared across the other countries clustered. Within these environments heavily dependent on Agriculture, a specific digital agriculture strategy should be formulated, and consultation with public and private sectors should guide that strategy. There should be clear milestones and monitoring to help share learnings across the region.

Group 4: Angola, Mozambique, the DRC, and Comoros

These countries ranked lower down the benchmark, and based on the data collected, appear to be least advanced in the region. However, these countries are in transition and could leapfrog the more conventional stages of policy development as three of these countries had digital economy strategies published which suggests a level of prioritization of this agenda. This shows great opportunity for these countries that are heavily dependent on the agriculture sector for economic growth and employment. The momentum must be continued and directed towards the agriculture sector which may require much investment to support the transition as many of the foundational pillars are underdeveloped. Explicit focus also needs to be on producing hyper-localized content that is relevant to audiences in these contexts and ensuring that innovations and solutions are provided in other languages, especially French and Portuguese or indeed indigenous languages, and with image-based interfaces.

Areas for development for the general digital agriculture ecosystem in SADC

1. CCARDESA can play a valuable role in advancing the digital policy environment in the region by coordinating public and private actors and encouraging a different mindset around the development of a functional digital ecosystem.

2. CCARDESA can convene diverse stakeholders to push for engagement towards the deliberate goal of a digital agriculture strategy in countries dependent on agriculture for GDP and employment and enable them to shape a vibrant and dynamic digital agriculture ecosystem through the development of a clear roadmap. Part of this approach could be to encourage policy makers to create farmer platforms to enable them to engage more with other stakeholders, but the platforms created should be designed to be self-sustaining.
3. Deliberate support to help those countries whose first language is not English should be supported in creative ways. Hyper-localized content and channels in local languages should be advanced to enhance digital extension advisory services.
4. CCARDESA is well positioned to leverage the support of development partners which in turn, have a greater likelihood of being able to work with a 'whole-of-government' approach and promoting important principles such as open data, digital data standards, privacy, and continued security.
5. Building digital skills in policy makers is going to be key to advance this agenda by CCARDESA hosting an interactive platform which can connect the supply of these trainings with the demand from policy makers.
6. Furthermore, all digital agricultural innovations in the region must find the balance between human centered design (HCD) principles to meet the needs of end users such as smallholder farmers (to adopt digital innovations), and the need to drive the demand for more digital innovations and digital entrepreneurial jobs to enhance the efficiency in the agriculture sector for commercial and economic gain.

7.2 DIGITAL AGRICULTURE INNOVATIONS

KEY REFLECTIONS ON DIGITAL AGRICULTURAL INNOVATIONS

Digital Agricultural innovations are used in all SADC countries, but the number of innovations and the application in different use cases differs markedly between countries based on their digital maturity.

A total of 216 digital agriculture innovations were identified in the SADC region. They were unevenly distributed across the 16 members of SADC with South Africa, Zimbabwe and Tanzania having the highest overall in number. All 216 identified innovations were distributed across all five GSMA use cases in the typology framework used, illustrating a significant diversity of use cases across the region. Overall, digital advisory was the most common use case among the identified innovations followed by Agri e-commerce and digital procurement. If compared with an earlier study of GSMA (for SSA as a whole), this study shows a higher proportion of smart farming and of Agri e-commerce innovations and a lower proportion of digital advisory and Agri digital financial services.

Four country groups highlighted through the benchmark assessment revealed differences in both the number of innovations per group and the distribution of use case by group. Group 1 (South Africa, Mauritius, Seychelles) had the highest number of innovations in the group, followed by Group 3 (Zimbabwe, Namibia, Zambia, Malawi, Lesotho, Madagascar) and then by Group 2 (Eswatini, Tanzania, Botswana). Group 4 (Angola, Mozambique, DRC, Comoros) has the least number of innovations in the group. Group 1 and Group 2 have digital procurement as the most common use case and have a slightly larger proportion of the innovations in the category of smart farming applications. These use cases focus on more sophisticated users, and B2B

business models underpinning their innovations. These business users are generally both more digitally literate and more business savvy. In Group 3 and Group 4 digital advisory services were the most common innovations and are focused on addressing the knowledge gap that is still persistent amongst the most predominant users, farmers.

Digital agricultural innovations are evolving and proliferating at a rapid pace in the region and CCARDESA has an important role in building trust around the exchange of data and data quality in the region to strengthen the nature of the digital agricultural ecosystem and its functionality. This also must be balanced with the observation that many innovators shared information on use cases, the numbers of active, registered, and recurrent users. Actual customer satisfaction levels vary unevenly and with figures that may be questionable. This highlights the value of reliable data and trust within the ecosystem to facilitate collaboration rather than holding on to data for fear of being outcompeted.

Most innovations are active in a single country (84%) suggesting that material improvements in the enabling environment in specific countries are likely to have a greater impact on the advancement of agricultural digitalization in those countries. **CCARDESA could leverage the support of development partners such as the World Bank to help advance progress towards the enabling environment and facilitate work across different government departments.**

In the region, digital advisory and agri e-commerce have the highest number of proportional use cases highlighting the value of a digital ecosystem in each case. For digital advisory, efforts must be made to enable human centered design principles to address the needs of end users such as farmers (B2C); encourage and enable an on-going pipeline of relevant, high-quality content; ensure hyper-localization of content in local languages; and ensure the involvement of input providers and agribusinesses who can supply agronomic inputs to farmers. At the same time, interoperability, privacy and data quality will be important. CCARDESA can also advance agri e-commerce similarly, by crowding in actors with experience in financing digital agricultural enterprises, as well as bringing in those with experience in financial payments and transactions, digital records and receipts, B2B and B2C actors. They can also facilitate engagement by policy makers to enhance the enabling environment and ensure the participation of traders, distributors, processors, aggregators, off-takers and commodity exchanges across the value chain.

Countries with the greatest maturity towards a functioning digital ecosystem were found to have the highest number of innovations. Those with the largest number of innovations identified were generally addressing later stages of the value chain (post-farm production and towards the farm-to-fork end of the food system).

Half the innovations addressed a single use case and half provided multiple use cases suggesting that a proportion of digital enterprises are beginning to address gaps they have identified in the digital agricultural ecosystem already. With such a high proportion of single use cases further iterative cycles of testing and refinement will be necessary to begin to bundle service offerings and establish revenue generating business models. **CCARDESA could facilitate opportunities for those less mature enterprises to learn about pathways for growth and sustainability from digital enterprises who have already made this leap.**

Low digital literacy hinders the adoption of new technologies especially in an aging rural population.

The most common challenge that survey respondents encountered was low digital literacy levels of their users. If farmers have limited access to digital solutions or are unable to use them, because they lack digital skills, further uptake is likely to be significantly impeded. Innovators should be encouraged to take deliberate actions to ensure innovations are inclusive of those with lower (digital) literacy levels to enable both a raised

awareness of the benefits of digital agricultural innovations but also to enable their use. This is likely to be significantly easier for young farmers who are more digitally literate. **CCARDESA can coordinate efforts to narrow the gap between digital literacy and skills amongst farmers by working with other departments of government, incubators and accelerators specialized in education to innovate in this space and address the pain points.**

Digital content should be hyper-localized, relevant to local constraints and deployed through channels that facilitate and enable action by farmers.

The content information that digital channels provide should also be locally relevant and actionable by the farmer. Content is still perceived to be too academic, difficult to understand, and in turn less actionable for farmers to use. Knowledge transfer from academic research to pragmatic farming practices is a complex process. Whilst digital solutions are the channels to bridge the last mile, the inclusion of relevant, accurate, and continuously up-to-date content is an expensive and time-intensive process. Most agricultural research content is created in English and approved content is usually only available in a national language, but not all farmers understand either of these. Countries whose first language is not English are likely to be at a real disadvantage in terms of content generation and/ or adaptation. Local translation into indigenous languages is complex and expensive. The trick is to design a scalable system that is still able to contain hyper-localized and relevant content about value chains, specific inputs that are available, soils, etc. To use digital agriculture innovations, digital skills are critical. Where digital literacy is low, access to and use of digital agricultural innovations is likely to be lower.

Some respondents overcome the challenge of digital literacy by creating networks along different value chains with local field agents, trusted agro-dealers, or lead farmers with higher digital literacy and smartphone ownership. These valuable intermediates (or agents) can share the information with other farmers. Alternatively, equipping extension officers to build their capacity to serve the large number of farmers can bridge the divide. If feedback channels are available to communicate with farmers, this will help close the knowledge gap and increase on-farm productivity. Donor grants to develop local language content as a public good will make an important contribution to overcoming this challenge and simultaneously help innovations to scale further.

Of some concern, is the observed disparity between Anglophone and Francophone or Lusophone countries, which is worthy of further investigation by CCARDESA. Understanding if this is because these countries are earlier in their digital agricultural journey will be important in understanding how best to address this gap. It is also important to note that results suggested that 60% of innovations were launched in 2018 or more recently, suggesting their relative infancy.

The most significant challenge innovators are addressing are knowledge gaps particularly around low productivity and poor access to markets signaling the dependency of many innovations on appropriate, relevant, and high-quality content. CCARDESA is well placed to facilitate partners that can provide content, especially research institutions and extension divisions, in languages and channels that can be accessed and understood by farmers. A potential farmer database to bring actors together may help, as well as collaboration between public and private sectors especially with departments such as education to enable digitally savvy consumers to drive the demand for digital agricultural innovations. The role of integrating digital into public extension divisions will likely also provide cost efficiencies.

Not all parts of the value chain are equally well resourced from the results obtained across the region. **CCARDESA could facilitate incentives and schemes to encourage more innovative digital solutions in areas such as e-storage, post-harvest processing and value addition, logistics, transport, food standards and safety, marketing, and export opportunities across the region**. They are well positioned to leverage the support from donors and development partners.

There is a missing middle in terms of funding for innovators that move from start-up to scale-up.

Survey respondents use different financial mechanisms to underpin their innovations. Innovators from group 1 countries make more use of angel investors and impact investors than respondents from the other country groups. Most innovations are still not yet fully sustainable. Many innovations are still dependent on donor grants for further investments in new functionalities and services. Respondents report the challenges moving beyond the start-up phase. Especially in being able to access appropriate finance and develop their capacities to expand their users or customer base. On-boarding of new farmers is also expensive and often requires face to face meetings. Even if innovations were at further stages of sustainable scale, they still reported a need for further investment. Another challenge is the cost of accurate, and timely data collection to measure impacts which is a further limitation to accessing further finance. Without evidence of results of their innovations it might be difficult to attract more funding to scale further.

Data on the outcomes and impacts for farmers is patchy and for many digital enterprises the cost of data collection is also significant both in terms of time and financial resources. Investigation on how best to collect and share data to facilitate learning and more commercial financial investment will be closely linked.

Self-reported data suggested that 30% of local innovations are at a stage of scaling where they are replicating or adapting their innovation across larger geographies or a population for transformative impact. Whilst some caution must be taken in reflecting on this proportion due to biases of self-reported data, there may be more to learn from the 50% of regional innovations at this stage or further. The most predominant business model was business subscription fees (B2B) followed by individual subscriptions (Business-to-Consumer, B2C) and transaction fees, additional business models such as Software as a service (SaaS) could be considered. Sustainability seems to be a more complex picture with most innovations suggesting that they will continue to rely on grants or donations and only 20% no longer needing the support to sustain their operations.

7.3 DIGITAL AGRICULTURAL SKILLS AND ENTREPRENEURSHIP TRAINING

KEY REFLECTIONS ON DIGITAL SKILLS, DIGITAL AGRICULTURAL SKILLS, AND ENTREPRENEURSHIP TRAINING

Existing education providers need to align and expand their offerings to meet the surge in demand for digital skills referenced in section 1.

For traditional providers to keep pace with the speed of technological changes and provide relevant skills, they can partner with dedicated digital skills providers. The unmet training demand provides a significant business opportunity for private local, regional, and global training providers and will require partnerships across the education ecosystem to deliver.

Digital Skills in the Digital Economy supplied by Universities and Colleges

The digital ecosystems of the SADC member states are characterized by differences in the reliability of the associated internet infrastructure, digital policies, digital innovations, and digital skills. Much of this policy implementation relies on appropriate digital skills amongst policy makers. Countries that seem to have the most mature digital economies, including digital policies, have little data on the effectiveness of implementation. Enhanced digital skills and evaluative skills in policy makers is important to ascertain if policies indeed provide the enabling environment for digitalization. From the available data collected, most Universities teach basic and intermediate digital skills (ICDL), a proportion teach standard level digital skills and a smaller proportion teach advanced digital skills. These are taught in central departments of the institution as this appears an efficient way of deploying the teaching. However, Agriculture faculties have not yet embedded this and miss the specificity of the agriculture sector and the solutions necessary.

What are the drivers of digital skills adoption in the SADC countries?

Digital skills adoption in the SADC countries will be driven by activities in the broader economy rather than agriculture *per se*. Skills adoption will also come from the prioritization of investments in improving internet infrastructure, access to devices, and availability of digital skills training programs. According to the IFC (2021) Demand for Digital Skills in Sub-Saharan Africa, the demand for digital skills will be driven by growth in the oil, gas and services sector (E.g. in Mozambique) and is expected to increase digital skills adoption. In addition, the establishment of the Mozambique NREN will increase access to ICT in higher education institutions and this is also likely to boost digital literacy and its acceptance. The agricultural sector in Mozambique is projected to have a 10-15% rate of digital skills adoption by 2030. These drivers will open opportunities to accelerate these skills to benefit the agriculture and food systems sectors in all countries whether they be more mature, highly reliant on agriculture, or looking to enhance and grow their more regenerative agricultural sectors and build more resilience in their food supplies.

The demand for digital agricultural skills in the SADC Region

This same recent IFC study (2021) also revealed that across the five SSA countries (Mozambique, Rwanda, Nigeria, Ivory Coast and Kenya), 57 million jobs will require digital skills by 2030. Foundational digital skills (i.e., web research, mobile communication, online communication, e-learning and e-banking) are expected to account for 70% of the total demanded digital skills by 2030. Interestingly, advanced digital skills would be less in demand because the industries in SSA utilizing advanced skills are still at the infancy of growing these components of their businesses and therefore the demand for them is emerging rather than already established. According to the IFC study there will be a need for about 114 million training opportunities across the five countries resulting from the 57 million jobs requiring digital skills. Extrapolating this evidence across the SADC region suggests a similar trend and that digital skills will be a huge growth area to drive employment across multiple sectors.

The mandate for digital skills training in the SADC region

The training programs that are most needed are the **foundational programs that enable people to use digital tools in their day-to-day activities**. Appropriate training programs that take into consideration the local languages and the local contexts will be a priority particularly for agriculture which demands relevant and local content. Furthermore, it is likely that these programs dealing with low levels of literacy will require image or gamification-based approaches to enhance understanding of information by farmers more visually. If farmers are to be trained how to use their mobile devices appropriately, the training content must be in the

local languages, more easily understandable by farmers, and using imagery to guide action. This will require innovating, translation of content, and its adaptation. Short and easy to consume content and users being supported to adopt long-life learning practices to continuously stay ahead of the technology will be the priority.

Twenty months after Covid-19 was declared a public pandemic, most African Universities seem to still be in a predicament about how to move towards a sustainable environment of technology-supported teaching, learning, research, collaboration, and use of technology in administrative operations. Strategic partnerships need to be created to facilitate the delivery of digital skills training. Universities in the SADC region must be encouraged to consider partnering with the private training providers to keep the training curricula up to date and relevant. Training ought to be affordable so that those who need them are not excluded. **The SADC universities should be key stakeholders in designing and delivering the digital skills, but they should be open to work with diverse partners because not everyone requiring the skills would have access to a university. Specialist modules could be developed to ensure policy makers, who usually lag innovation, keep ahead of it and to plan accordingly. The importance of working with incubators to enhance entrepreneurial aspirations through digitization is also incredibly important. CCARDESA has an important and essential role to play in this space in enabling the impact of the digital skills revolution to benefit agriculture.**

Why SADC governments must participate

The governments in the SADC region stand to benefit by participating because a huge industry for developing digital skills is emerging. This is an opportunity to strengthen the educational and training providers in preparing future workforces over the next 20-30 years. It is also an opportunity to create jobs in foundational digital skills training provision. For a country to transition to a mature digital ecosystem it will be important to invest in annual budgets to make that possible. Leveraging the role of the private sector in supporting digital skills training is therefore very important. **It was suggested by Universities that CCARDESA support the appeal to SADC governments to promote last mile solutions in SADC member states so that rural areas could have greater access to the internet.**

Fostering digital agriculture in incubators by means of collaboration with ecosystem stakeholders

A recurring theme identified in this study included, fostering the improvement of digital agriculture training with a sense of urgency and through closer cooperation and exchange of competences between the incubators and other stakeholders of the ecosystem.

Clearly the level of development of digital agriculture training is not uniform in the SADC Region. In some incubators (not including South Africa and Zimbabwe) advanced digital training for agriculture such as precision agriculture, digital financing, procurement platform development or IoT solution prototyping for agriculture are offered. In contrast, Universities appear to be more advanced in terms of digital training curricula (excluding Madagascar) such as AI for agriculture, programming/coding for agricultural systems and design of digital tools to help farmers with crop calendars and weather forecasting. Incubators rarely have any agri-digital trainings on offer.

With CCARDESA's links to Universities and Colleges they could enhance engagements between incubators and entrepreneurial agricultural graduates to enable incubators to specialize with the correct complement of subject matter specialists with an intrinsic knowledge of the pain points in specific commodity value chains and a solution mindset.

Partnerships between universities/university incubators and leading business support organizations

In the field of digital agriculture, mutual learning will be significantly enhanced by providing complementary expertise where it is lacking and sharing IoT/precision agriculture equipment for students and entrepreneurs. It will also promote a greater "entrepreneurship culture" within the Universities. The development of strong campus networks and the strengthening of NRENs are key to fostering higher education institutions and innovation hubs to effectively provide all types of digital services for teaching, digital agricultural training, digital agricultural entrepreneurship, and advanced research activities.

Closer cooperation between incubators/university incubators and the private sector

It is also important to boost the digital agriculture entrepreneurship sector through the acquisition of advanced skills in the space and an alternative model of sustainability for the incubators (especially those who are not supported by the government). Involving the private sector through regional or local agriculture/digital agriculture companies might offer internships for students and help aspiring entrepreneurs to acquire new skills. In addition, it will help a more entrepreneurship-oriented approach adapted to the current labor market where youth can innovate in a context where agriculture is still regarded as old fashioned (which may discourage youth to get into digital agriculture initiatives). Collaborations with private sector entities may also facilitate new forms of fundraising/investments such as open innovation experiences and the funding of specific training/incubation programs for youth[15].

Finally, digital agriculture must be guided by local priorities, policies, and capacity development in an on-going manner and must be promoted among incubators and innovation hubs to prepare the local youth to invest in the sector and develop new services for the local farmers and agricultural stakeholders. Government has a role in improving access to the digital communication channels for the population and farmers (Unstructured Supplementary Service Data (USSD) is still one of the most popular tools for farmers). This will go some distance in preparing the market demand for new solutions and enable farmers to exploit the opportunities. Collaboration across government departments, the private sector, and the incubation ecosystem towards the telecom operators (public and/or private) to improve the internet connection and make it available for the innovators (the entrepreneurs) and the users (the farmers and local population) is also required to facilitate the access to these services and promote entrepreneurship (internet is still very expensive in countries like Madagascar). **CCARDESA's role of raising awareness of SADC governments to prioritize the expansion of internet connectivity to rural and remote communities is critical in ensuring digital agriculture becomes a reality.**

Fostering and encouraging vibrant regional collaborative networks

There is a clear opportunity to strengthen the collaborations among universities, innovation hubs, governments, private and public sector players by establishing a **regional collaboration framework** that promotes interactions between SADC member states so that digital agricultural capacities and entrepreneurship are built in a uniform and sustainable manner.

Continuous lifelong learning will dominate the necessity to stay abreast of technology development and continued innovation. **CCARDESA can encourage Faculties of Agriculture to own the agendas of digital agricultural skills training in collaboration with other actors in the digital ecosystem.** Whilst the

[15] An interesting example has been provided by one training program that we have interviewed in South Africa, AGCO, an international manufacturer and distributor of agricultural machinery company that funded a skill development program in agribusiness (the Africa Agribusiness Qualification) in partnership with GIBS university in South Africa and Harper Adams University in the UK.

pandemic has accelerated the opportunity to enhance digital skills training, it has also accelerated the need for on-line continuous delivery of flexible digital skills training that is specialized.

DIGITAL ENTREPRENEURSHIP IN THE AGRICULTURAL SECTOR: PATHWAYS TO FACILITATE THE ACCESS OF YOUTH WITHIN THE SADC REGION

Digital agricultural entrepreneurship is focused on transforming traditional agriculture through digital entrepreneurship. Digital technology provides opportunities for farmers to find buyers for their produce, new farming methods and tools, innovative chances for connecting and collaborating with other farmers and other stakeholders, new sources of markets, new opportunities for continuous learning and new opportunities to out-compete other farmers.

However, youth aspiring to become successful farmers face diverse challenges that include access to land, access to finance, limited opportunities for education and skills, limited access to markets, inability to access quality inputs, under-developed infrastructure in rural areas and competing priorities (e.g., household duties). Female youth face specific challenges related to economic exclusion, exclusion from inheriting or owning land, social marginalization, time limitations associated with home duties, safety risks (gender-based violence) and limited access to technology.

Based on learning from others, the Mercy Corps' AgriFin Accelerate Program (AFA) has defined pathways that facilitate digital entrepreneurship in the agriculture sector. The profiles of promising youth farmers vary, and this means that the support necessary to be successful also varies. Female youth in particular needs special support. Youth that focus their entrepreneurial activities on value addition in the agriculture sector face specific challenges. However, digital technology offers good opportunities for mentoring, capacity building, access to digital financial services, access to quality inputs and equipment and access to markets. Support solutions that focus on individual youth farmers have been proven to be more expensive than platform-based solutions that congregate the youth, input and equipment providers, digital finance solution providers, capacity building platforms and technology-enabled market access platforms.

With goals for steady incomes, support to their families, and commitments to hard work, smart investments and accessing new methods, youth farmers need support in developing their capacities to access finance, access markets, access inputs and equipment. They also need access to empowerment platforms that can assemble various contributors to form a connection with the youth farmers, "creating efficiencies and reducing costs through aggregation and cross-subsidization". Digital agricultural platforms limit the risks for partners and lowers the costs of access and involvement for youth farmers.

Pathways to facilitate youths to become digital entrepreneurs must recognize the opportunities and outcomes sought by the youth and outline the support to be provided to youth.

To effectively support youth to be successful in digital entrepreneurship in agriculture the recommended pathways must recognize the different youth persona. The pathways to success need to address the common and specific challenges to the diverse youth farmers. The AFA study suggested tapping into the youths' social networking tendencies, promoting longer-term perspectives, encouraging land prospecting and planning, delivering support at the point of committing to farming, use of technology to strengthen group dynamics and services, promoting value chain entrepreneurship, encouraging women-centric support platforms, promoting the right value chains, building financial identities through digital savings and planning services, building peer-

to-peer mentoring networks, encouraging employment along the value chain, and tapping into influencers to promote benefits of digital finance systems.

The AFA Program study recommended that the private sector and development partners could support youth by designing programs and interventions that respond to the diverse and full range of youth identities, by adapting value chain methodologies to respond to challenges faced by the youth, using and promoting digital solutions to reach youth at large scales and promoting and strengthening value-adding opportunities in agriculture.

The CTA Handbook, An ICT Agripreneurship Guide: A Path to Success for Young ACP Entrepreneurs, outlined several success factors necessary for digital agricultural entrepreneurship. These include idea generation, building key skills, overcoming early challenges, understanding agricultural value chains, reviewing and improving the team's capacity, developing business plans and formalizing, sustaining and scaling the business. Some common mistakes and solutions are provided, and these relate to the single founder syndrome, solution-in-search-of-a-problem, not listening to the customer, choosing the wrong platform, inappropriate location, bad choices of team members, too much focus on raising money, poor understanding of finance and accounting, and poor understanding of the legal and regulatory environment.

The pathway to success for digital agricultural entrepreneurship must address the negative view of agriculture, limited and inaccessible capital, and poor business climate as these are among the chief obstacles to young agricultural entrepreneurs. Strong partnerships are recommended with local media stations and organizations to create recognition and gain support. The pathway to success depends on governments prioritizing agriculture by scaling up youth-oriented funding schemes for entrepreneurs. Governments must also provide incentives for agriculture and efforts to optimize the sector through digital technologies. These incentives could be grants, concessional loans with sector-sensitive repayment terms, and capacity building opportunities. The private sector is called upon to not only view agriculture as a high-risk enterprise but to design innovative products to service the agricultural sector to meet food security goals. The proposed success pathway recognizes the importance of Intellectual Property skills building and support to protect the innovations coming out of the African, Caribbean, and Pacific regions. Financial and business skills are also indicated as a priority for the success of digital agricultural entrepreneurs.

Pathways that will facilitate digital entrepreneurship in agriculture:

1. **A digitally enabled partners' platform to support the youth and facilitate their integration and participation.** This must be informed by the suitability of the platform's access by the target youth. The partners to be included on the platform include quality inputs suppliers, suppliers of leased/shared hi-tech equipment, providers of platforms that give access to market information and direct access to markets, digital finance systems suppliers, digital training providers and mentors, and youth empowerment networks. With a role in fostering and coordinating the digital agriculture ecosystem, CCARDESA can ensure some relationship with a platform enabling youth engagement or indeed could combine on its website the two functionalities, thus increasing the draw of the ecosystem.
2. **Programs for the youth should integrate digital literacy** so that youth benefit from the emerging digital economy. Abundant platforms such as WhatsApp and Facebook could be used to deliver information, education, farming tips and practical skills.
3. **Capacity development is fundamental to the success of youth in digital agricultural entrepreneurship**. However, capacity development provided by educational institutions located in towns take the youth far away from their farms and this is retrogressive for the youth farmers. A recent AFA (2019) case study, Digital Pathways for Youth in Agriculture, revealed that there were education-

agriculture skills mismatches, with higher education said to be creating "off-farm aspirations that were not satisfied by farm-based employment opportunities". Gaps were identified in the training curriculum which did not include practical agricultural, business, nor finance skills. Youth need specific training related to being successful digital agricultural entrepreneurs. The study recommended that partner engagements should focus on supporting youth with "bundles of services and targeted approaches delivered digitally". Three types of digital platforms were found to be effective in getting bundled services to youth farmers and these were television and radio, USSD enabled phones and internet-enabled devices.

Based on this study's results from selected Universities and incubators, youth digital entrepreneurship can be facilitated through different approaches:

1. **Provide access to information and knowledge specifically for youth.** Enhancing and enabling opportunities for youth to **access knowledge and information** on the institutions and channels to enable their engagement in digital agriculture is key. These may include:

    - Creating platforms that also provide information on where to solicit online training courses, associated entrepreneurship-building programs, and opportunities of scholarships, hackathons, and competitions.
    - Fostering websites or video channels showcasing case studies of youth success stories in the digital agriculture entrepreneurship space to encourage their participation.
    - Improving access to digital agriculture skills development for students, and teachers by sharing the details to encourage participation by youth.
    - Supporting training manuals for skills development in local languages or tailored to the local agricultural context.
    - Engaging farmers associations and their associated farming youth to learn new methods and best practices in farming techniques.
    - Fostering peer to peer learning of successful digital agricultural solutions in the local areas.
    - Leveraging social media channels to advertise these opportunities and any competitions available for youth engagement.
    - Disseminating through radio, social media, TV, and newsletters highlighting technologies and innovations produced by laboratories and research centers to promote R&D activities in the digital agricultural sector.

2. **Improve the digital agriculture curricula and training and its relevance to youth interests.** Appropriate models may include:

    - Building capacity and skills of higher education teams to recognize emerging digital trends.
    - Digital agriculture entrepreneurship modules in higher education institutions and incubators for youth.
    - Ensure resources and budgets are available to implement training programs for youth.

3. **Enhance agri-entrepreneurship with appropriate technology and equipment to include tools and spaces to integrate modern digital techniques in the wider traditional agricultural system including:**

    - Provision of computers and data collection equipment (soil analysis equipment, toxicological equipment, weather analysis equipment, drones, IoT solutions, etc.).
    - E-advisory platforms to support agricultural extension services.

- E-commerce digital channels to improve the access to markets for agri-entrepreneurs.

4. **Leverage and provide funds and scholarships specifically for youth.** A fund dedicated to supporting youth in testing out their ideas and opportunities would be very helpful to get them started. This could specifically help to:

    - Establish partnerships for trainings on how to improve the access to finance for digital agriculture entrepreneurs and guarantee the sustainability of the business.
    - Make modest seed funding available through competitions or hackathons.
    - Develop crowdfunding solutions.
    - Develop fundraising approaches and relationships with funding institutions aimed at youth employment.
    - Test youth solutions with the intention of scaling them to other areas once proven.

5. **Facilitate the access to knowledge for the agri-entrepreneurs.** Creating adequate digital infrastructure in rural areas, where many young people live, to efficiently support the implementation of digital education in schools and learning institutes is not enough. Access to knowledge and information remains an obstacle even where there is adequate access to internet or digital infrastructure. Often youth cannot properly use the information channels, and in other cases the ecosystem does not provide them with the possibilities to access important knowledge.

    Some idea and suggestions to help young people become more aware of the opportunities that the digital agricultural space might offer to them are presented:

    - Foster the development of a robust capacity building platform to provide youth the knowledge to get into the sector (online trainings available, incubators/accelerators programs and facilities, opportunities of scholarships/funds, hackathon, and competitions, etc.).
    - Develop a website/video channel with case studies of youth success stories in the digital agriculture entrepreneurship space.
    - Facilitate access of learning materials to support the skills of both students and teachers in the digitalization of agriculture by making available online the universities and incubators curricula.
    - Support in identifying the opportunities in the digital agriculture sector by developing training manuals for these skills and improving the technical skills of trainers within the local context.
    - Empower farmers associations to better target youth in rural areas, but also to help integrate the digital tools to promote best practices in terms of farming techniques and new crops.
    - Support knowledge sharing activities by encouraging peer-to-peer learning and benchmarking visits of successful AgriTech solutions in the region.
    - Make available the digital agriculture-related research findings in a language that is widely used by the local populations (e.g., Kiswahili in Tanzania instead of English) and using social media and/or video as dissemination channels.
    - Disseminate knowledge on latest technologies and innovation through the creation of modern laboratories and research centers to promote R&D activities in the digital agricultural sector.

E-EXTENSION AND YOUTH ENTREPRENEURSHIP: AN EMERGENT OPPORTUNITY

E-extension is significantly early in its development across the African continent and somewhat underdeveloped. Extension services themselves are very weak and integrating ICT technologies are hard with

defined curricula to support extensionists. Nevertheless, the African Forum for Agricultural Advisory Services (AFAAS) promotes advisory and extension services contributing to sustained productivity and represented a key stakeholder in this analysis. AFAAS is currently integrating ICT capacity building into its agenda as a priority, despite the lack of resources available for a consistent digital transition, and a means to empower its members. SARFAAS, the regional network of the Southern Africa Region disseminates to the field level but is still not fully operational.

AFAAS currently uses part of their website to encourage networking and information provision through https://www.afaas-africa.org/knowledge/ and uses email, social media, WhatsApp groups and sub-groups to disseminate information. Their D4AEAS Strategy is seeking to integrate AFAAS (extension and advisory services workers) and farmers into a digitally empowered state. Farmers are beginning to become digitally empowered, well trained, informed, and more productive and efficient in their farming activities.

The D4AEAS strategy has 4 pillars:

- Pillar 1: Building capacities of individuals and organizations
- Pillar 2: Developing and valuing relevant content
- Pillar 3: Developing and valuing relevant platforms and tools
- Pilar 4: Favoring rational and efficient decision-making

Malawi and Madagascar are active in the implementation of the strategy though capacity building and trainings, in particular the adoption of climate smart agriculture tools. AFAAS is trying to digitize the climate smart agricultural contents, which will be curated on a digital platform. AFAAS also hosts a hackathon to advance three solutions: a tool to manage extension workers, a CSA database to host the knowledge, and a weather and crop calendar information platform. AFAAS plans and manages the e-extension and the capacities existing in different regions and topics. The tools under development are open source for the countries that want to use them (even if developed by startups or private sector entities), with the scope of having a huge impact in promoting the access to extension services and develop the involvement of youth in the sector within the African context.

Another important stakeholder that promotes e-extension services is the parent-based Global Forum for Rural Advisory Services (GFRAS), a member-based organization which enhances the performance of agricultural advisory services for farm families and rural producers and contributes to the sustainable reduction of hunger and poverty.

GFRAS promotes the New Extensionist Learning Kit (NELK) for individual extension field staff, managers, and lecturers. It is based on The 'New Extensionist' - Roles, Strategies, and Capacities to Strengthen Extension and Advisory Services, a GFRAS position paper that discusses new capacities for rural advisory services and extension to address the current challenges in agriculture and to contribute better to agricultural innovation. The NELK opens a global view of extension advisory services that reinvents and clearly articulates the role of extension advisory services in the rapidly changing rural context. The Learning Kit contains 13 modules designed for self-directed, face-to-face, or blended learning and can be a useful tool for individual extension field staff, managers, lecturers and non-governmental organizations, and other training institutions. The development process was designed and managed as an iterative journey of broad consultations, discussions, and feedback from a wide range of stakeholders.

Another project supported by GFRAS is the USAID funded Feed the Future Developing Local Extension Capacity (DLEC) project, which is led by Digital Green in partnership with the International Food Policy Institute (IFPRI).

This project focuses on the improvement of extension programs, policies and services created through locally tailored, partnership-based solutions by mobilizing active communities to advocate for scaling proven approaches. DLEC accomplishes this objective through three interrelated sets of activities:

1. Country Diagnostics to make recommendations and inform strategies.
2. Action Research Engagements to test interventions and build an evidence base.
3. Communities of Practice to share and advocate for proven best-fit practices in extension.

A pilot project of the Sasakawa Africa Association (SAA) to build the e-Extension platform for small farmers in the context of the Covid-19 crisis and future prospects has been also launched. The project focuses on e-Extension and e-Learning services to mitigate the effects of Covid-19 and strengthen the resilience of African food systems. Three priority areas of support are "technology transfer" and "labor-saving agriculture" using ICT to reduce contact between people and secure social distance, and "access to input materials" as a response to the lack of effective logistics in lockdowns. Furthermore, the ideal e-Extension platform envisions not only improving agricultural productivity, but also resolving the "information asymmetry" that can occur in the entire value chain by actively utilizing ICT technology[xvii]. **CCARDESA could encourage the D4AEAS Strategy activities in the other SADC countries. Learning from experiences in Malawi and Madagascar could help scale the initiative further offering an additional digital agricultural entrepreneurship pathway**.

8 CONCLUSION

In SADC, approximately 70% of the region's population (363M people in 2020[xviii]) depend on agriculture for food, income, and employment. Globally, the agriculture sector employs 26% of the world's population. However, in 2020, 91 million more people faced hunger than in previous years, and 2.37 billion people did not have access to adequate food due to the disruption of food supply chains. The impact of Covid-19 on the world economy, agricultural food supply chains and its relationship to social stability was recognized. The already high food prices and rising fuel prices will worsen the current situation globally.

There is more urgency in ensuring that agriculture feeds the world's growing population, through conscious land use, lowering greenhouse gas emissions, judicious use of water and other natural resources, improving climate resilience, and providing living wages to the millions of smallholder farmers who make a significant contribution to global food production. Furthermore, innovations in the food sector are required to increase the efficiency and resilience of food production, to drive greater environmental sustainability but also to deliver greater traceability, food safety and more effective nutrition. Small scale producer's whose livelihoods depend on crop yields are disproportionately affected by climate risks. The exposure is both short-term as extreme weather events increase in frequency and severity, and long-term due to shifts in climatic patterns including temperature and levels of precipitation.

All these factors have accelerated the aspiration by countries to kickstart a digital economy approach to increase efficiency in public sector operations but also to facilitate the introduction of digital solutions in the agricultural sector. These solutions address low productivity, address supply chain inefficiencies by integrating traceability and logistics technologies, increase access to financial products and services through digital devices, and enhance resilience to climate change by using digital and data solutions to improve decision making on resource management allocations.

This study focused on key actors within the digital economy for agriculture, including governments, civil society, private sector, universities, individual entrepreneurs, and innovators to provide the first multi-element baseline to understand how these actors may continue to engage to drive digital integration and progress.

For digital innovations to be successful, they must be efficiently generated with end users, developed, tested, reiterated, refined, and ultimately scaled for development impact. The ecosystem in which innovation exists requires coordination, collaborative action, and resources to ensure that it can operate at multiple levels - local, national, and regional - and inclusive of relevant sectors. Adopting an ecosystem approach recognizes the different actors, relationships and resources that have important roles in taking good ideas to scale. It also demands effectiveness in each part of the innovation system which is moderated by other parts of the system (E.g., innovators being able to access capital) and an understanding that a change in one part of the ecosystem leads to changes in other parts of the system (E.g., increases in internet connectivity will accelerate testing new technologies).

THE BROADER POLICY ENVIRONMENT

The situational analysis helped identify an effective assessment tool (Section 4.2) tracking progress towards a digital economy to provide context for the results of this regional study.

The analysis illustrates a region in transition towards an enhanced digital enabling environment in the 16 countries. There were varying levels of maturity and content in examined policies, strategies, and legislation. Most countries are including some digitalization in their planning. In a smaller proportion of more advanced countries, digitalization is being embedded in national plans. The benchmark assessment highlighted a correlation between a more advanced policy enabling environment and the maturity of the digital solutions available on the ground. The clusters of countries within different benchmark rankings help to identify the progress countries have made and where greater efforts may need to be directed. There are several good examples within the region to learn from. The top ten countries that ranked highest have agriculture sectors contributing less than 10% GDP, except for Tanzania. It is observed that countries with a higher proportion of GDP from agriculture have made slower progress in unlocking their digital economies.

Countries presenting as the most successful to date may have greater numbers of people engaged in the food system itself including retail, processing, trade, storage, logistics, marketing, and food preparation. These front-runners provide good areas of potential learning in certain foundational pillars necessary for a vibrant digital economy. Despite this, **there is no single country in SADC that has developed and published a digital agriculture strategy or roadmap at the present time**.

Despite the progress in an enabling environment, all 16 countries share common challenges and barriers faced by stakeholders in implementing digital solutions for agriculture. These include the limitation of policies and strategies formulated within single Ministries to effectively address aspects such as digital rural infrastructure and connectivity, rural financial services for farmers, the cost of data and its affordability (particularly for the illiterate and elderly). Advocating for a whole-of-government approach to develop a robust Digital Agriculture Strategy and roadmap for the Ministry of Agriculture, with consultation with other Ministries such as ICT, Finance, Water and Education would recognize the interdependence of these elements for society and create strategies more likely to be successful.

CCARDESA is well placed to support advancing digital policy environments for member states by facilitating learning sessions from each other, developing dedicated digital agriculture strategies that benefit from a more integrated whole-of-government approach and ensuring inclusive hubs or ecosystem hubs where actors from multiple disciplines and institutional backgrounds can formulate partnerships and collaborations.

One such way in which governments may be able to support the development of the ecosystem is to follow the approach taken to develop farmer registries such as the 1M farmer platform in Kenya or decentralized Smart AgriHubs developed by the European Union across member states and leveraging existing institutions in the agriculture sector. This will encourage successful digital solutions to be deployed to deliver more benefits to farmers by bringing end users into the design process for many AgriTech providers. It will also encourage governments to create the enabling environment required to scale and sustain the benefits.

INNOVATIONS

In the landscape analysis across the SADC region a total of 216 innovations were identified (Section 5) and illustrates the rapid proliferation of digital solutions. However, many of these are at an early stage with only 30% ready to scale, replicate, or achieve some level of sustainability. Whilst digital advisory is the most common use case, there were high incidences of agri e-commerce platforms and digital procurement solutions. The results showed a higher proportion of smart farming and agri e-commerce solutions for the

region when compared to Africa as a continent but a lower proportion of both digital advisory and agriculture related digital financial solutions.

Countries with the greatest maturity towards a functioning digital ecosystem were found to have the highest number of innovations. In countries with a more advanced digital economic environment, there were more B2B models than B2C models. Businesses appeared to have greater digital literacy and business awareness. In countries less advanced, digital advisory services addressing knowledge gaps were more prevalent. Most innovations were created at a specific country level (84%), highlighting the potential positive impact that improving the enabling environments could make. Half the number of innovations were addressing single use cases suggesting the need for further iteration and testing to develop viable and revenue generating business models to sustain their activities.

There was variation in the quality and quantity of the information about these solutions. The numbers of active, registered, and recurrent users and customer satisfaction levels therefore should be interpreted cautiously. This is also the case for social and financial impact on farming communities and households where data appeared to be patchy. The importance for solutions to generate quality data and information is apparent, but also to use it to build better relationships within a digital ecosystem. **CCARDESA is well placed to leverage its relationships with actors such as the World Bank to resource the enabling environment to ensure that digital solutions for agriculture can persist, grow, and evolve to create impact for farmers.** Furthermore, there are many technical assistance providers who can be included in the ecosystem to help the growth and investor-readiness of some of these solutions through incubators, accelerators, and University and innovation facilities.

Digital advisory solutions were the most common identified and designing with the user in mind is critically important. Content that is accessible and affordable to farmers cannot be underestimated. Hyper-localizing content, ensuring it is not too academic and fostering strategic relationships with input providers, financiers, traders, distributors, aggregators, commodity exchanges, processors and investors at a local ecosystem level are important objectives. Crowding in actors who can finance solution providers, as well as combine offers with rural financial services, are important. If greater digital advancement is desirable, digital skills to advance capacity all levels (from policy makers to farmers to agribusinesses to youth entrepreneurs) is a critical investment. It is important for a partner like CCARDESA to build trust within the ecosystem including generating more transparency, privacy, ownership of data and (cyber)security for its use. Ensuring that all parts of each value chain are well represented will facilitate robust food supply chains for the region and encourage value addition in the food system sector.

Many solution providers still have dependency on donor funds, but all need appropriate finance to develop their capacities and expand their user bases. The importance of the ecosystem was also highlighted by the innovators who use investors to support their business models which are predominantly business subscription fees (B2B), followed by individual subscription models (B2C), transaction fees and SaaS models. The cost of measuring their impacts is high but without this evidence, their ability to attract funding is limited.

CCARDESA plays a valuable role in ensuring that SADC members states, and institutional members, can work closely to stimulate the local ecosystem, connect actors so that constraints can be addressed, work to crowd in investors to help digital agriculture solutions grow, and improve the data and information on their impact so that they can scale.

DIGITAL SKILLS

It is likely that digital skills adoption in the SADC member states will be driven by activities in the broader economy rather than agriculture *per se*. However, in the SADC region digital skills will be a huge growth area to drive employment across multiple sectors.

The unmet training demand for digital skills in the region (Section 6) provides a significant business opportunity for private local, regional, and global training providers and will require partnerships across the education ecosystem to deliver. **CCARDESA has an important role to play in mobilizing Universities, Incubators and Accelerators to work much more closely together to deliver appropriate digital skills**. Whilst many Universities in the region teach basic and intermediate digital skills (ICDL), a proportion teach standard level digital skills and a smaller proportion teach advanced digital skills. These are taught in central departments of the institution as this appears an efficient way of deploying the teaching. However, Faculties of Agriculture have not yet embedded this.

The training programs that are most needed are the foundational programs that enable people to use digital tools in their day-to-day activities. **Appropriate training programs that take into consideration the local languages and local contexts will be a priority particularly for agriculture which demands relevant and local content**. Furthermore, it is likely that these programs dealing with low levels of literacy will require image or gamification-based approaches to enhance understanding of information by farmers more visually. If farmers are to be trained how to use their mobile devices appropriately, the training content must be in the local languages, more easily understandable by farmers, and using imagery to guide action.

The level of development of digital agriculture training is not uniform in the SADC region. In some incubators advanced digital training for agriculture such as precision agriculture, digital financing, procurement platform development or IoT solution prototyping for agriculture are being offered. In contrast, Universities appear to be more advanced in terms of digital training curricula such as AI for agriculture, programming/coding for agricultural systems and design of digital tools to help farmers with crop calendars and weather forecasting. **With CCARDESA's links to Universities and Colleges they could enhance engagements between incubators and entrepreneurial agricultural graduates to enable incubators to specialize with the correct complement of subject matter specialists with an intrinsic knowledge of the pain points in specific commodity value chains**. Collaborations with private sector entities may also facilitate new forms of fundraising or investments, such as open innovation competitions and courses and the funding of specific trainings or incubation programs for youth.

Digital agriculture must be guided by local priorities, policies, and capacity development in an on-going manner and must be promoted among incubators and innovation hubs to prepare the local youth to invest in the sector and develop new services for the local farmers and agricultural stakeholders. Government has a role in improving access to digital communication channels for the population and farmers (USSD is still one of the most popular tools for farmers). This will go some distance in preparing the market demand for new solutions and enable farmers to exploit opportunities. Continuous lifelong learning will dominate the necessity to stay abreast of technology development and continued innovation.

ENTREPRENEURSHIP AND EXTENSION

Digital technology provides valuable opportunities for young farmers to identify buyers for their produce, try new farming tools and methods, connect, and collaborate with other farmers and ecosystem stakeholders,

find new sources of markets, and continuously learn. Evidence suggests that support solutions for individual youth farmers are more expensive than platform-based solutions that bring together the youth, input and equipment providers, digital finance solution providers, capacity building platforms and technology-enabled market access platforms. CCARDESA has a valuable role to encourage youth to build their capacities to access finance, market inputs and equipment to improve production.

As with the AFA Program, the private sector and development partners can support youth with programs and interventions that respond to youth identities, and challenges faced by youth. Using digital solutions to reach youth at a large scale, they can strengthen value-adding opportunities in agriculture. Three types of digital platforms were found to be effective in getting bundled services to youth farmers and these were television and radio, USSD enabled phones and internet-enabled devices. Governments can also promote and scale youth-oriented funding schemes for entrepreneurs and provide incentives (loans or capacity building). CCARDESA can call upon the private sector to design innovative products to service the agricultural sector to meet food security goals.

There are several examples of e-extension being employed by AFAAS by integrating ICT capacity building into its work trying to curate climate smart agricultural on a digital platform and support a Hackathon to advance solutions. Furthermore, the Sasakawa Africa Association e-Extension platform envisions not only improving agricultural productivity, but also resolving the "information asymmetry" that can occur in the entire value chain by actively utilizing ICT technology. CCARDESA can leverage information workshops on these approaches and encourage member states to discuss and strategize the best solutions.

From 2030 onwards, the FAO expects there to be a fall in agriculture-contributed GDP for the poorest countries by the end of the century[xix]. A complex network of global actors' dependent on agricultural products for food security or as inputs for economic activity will also be affected as the recent crisis in food prices has demonstrated. With the high dependence on agriculture of the SADC region and the continuing impact of climate change, the digitization of agriculture is a priority.

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9 ANNEXES

TABLE OF ANNEXES

ANNEX 1 LIST OF INTERVIEWED ICKM FOCAL POINTS

Country	Name	Institution	Position
Angola	Alberto Sili Mateus	Agronomy Research Institute	Research Assistant
Botswana	Lorato Bailang	Ministry of Agriculture Development and Food Security	Public Relations Officer
Democratic Republic of Congo	Jean-Louis Tshisambu Mamba	Ministry of Agriculture	Assistant to the Director Head of Department
Eswatini	Bongani Mvubu	Department of Agricultural Research & Specialist Services	Research Officer
Lesotho	Rethabile Nchee	Department of Agriculture Research	Research Officer
	Mamoholi Mphutlane	Department of Agriculture and Food Security	Information Officer
Malawi	Hector Mulaidza	Department of Agricultural Extension	Communications Officer
Mauritius	Goolaud Akhilalandjee	Food & Agriculture Research & Extension Institute	Assistant Director
Mozambique	Carlos Pilimone	Institute of Agriculture Research of Mozambique	Researcher and Head of Technology Transfer
	Américo António Humulane	Agricultural Research Institute of Mozambique (IIAM)	Socioeconomic Researcher & Executive Secretary
Namibia	Mirjam Fabian	Ministry of Agriculture, Water & Land Reform	Trainer
Seychelles	Sandra Sinon	Agricultural Agency (SAA)	Agricultural Information Management Systems
South Africa	Sandile Ngcamphalala	Grain SA	Program Manager
Tanzania	Dr Richard Kasunga	TARI Agricultural Research Institute	KM & Communication Manager
	Vidah Mahava	Makutupora Agricultural Research Centre, Arusha	Coordinator Technology Transfer & Partnerships
Zambia	Dorcas Kabuya	National Agricultural Research Services	Senior Reporter
	Jones Malama	Agricultural & Research Institute	Communications Focal Person
Zimbabwe	Lloyd Sondayi	Ministry of Agriculture	Biometrician

ANNEX 2 LIST OF INTERVIEWED STAKEHOLDERS

	Full Name	Organization	Position	Country	Type
1	Dr Ribeiro João António	MINAGRIF	Direcção Nacional de Agricultura e Pecuária	Angola	KII
2	Taco de Nies	Kres	Founder	Angola	Innovation KII
3	Fransien Wolters	Mavo Diami / World Vision	Project Coordinator World vision	Angola	Innovation KII
4	Dr Israel Legwaila	Incuhive - BUAN	Coordinator	Botswana	Incubator KII
5	Mr. Kelebogile	LEA	LEA Head of Innovation	Botswana	Incubator KII
6	Isaac Bok	LEA	Executive coach agriculture	Botswana	Incubator KII
7	Ms. B. Kgomanyane	LEA	Head of Communications and Stakeholder Engagement	Botswana	Incubator KII
8	Kirby Maganga	Virtual Ranching Farming (Pty)Ltd	Founder	Botswana	Innovation KII
9	Budzanani Tacheba (PhD)	Botswana Innovation hub	Director	Botswana	Incubator KII
10	Vanessa Moahi	Brastorne	Project manager mAgri	Botswana	Short KII
11	SAID HACHIM Fouad	INNOV'LAB	Coach formateur	Comoros	KII Incubators
12	En-Ichat SAID MOHAMED SOUEF	UCCIA	Chargée de la Coopération Internationale et Consulaire	Comoros	KII Incubators
13	Jonathan Mukundi Makolo	Kobo Hub	Software Project Manager	DRC	Incubator KII
14	Noel Sei	Kobo Hub	Hub Manager	DRC	Incubator KII
15	Espoir Bisimwa	Bukavu Agribusiness Incubation Centre	Lecturer	DRC	Incubator KII
16	Bukasa Katabvayi	Centre d'incubation de YANDA, SOTRACEN sarl	Coordinator	DRC	Incubator KII
17	Bheki Ginindza	Ministry of Agriculture	Research and Specialist Services, National Plant Protection Service	Eswatini	KII
18	Siphelele Mhlanga	Royal Science and Technology Park, Incubator Unit (Biotechnology) and R&D Division	Business & Research Officer	Eswatini	KII
19	Thembumusa Simelane	Ministry of Agriculture	Information Department	Eswatini	KII
20	Lynn Kota	Eswatini Water and Agricultural Enterprise [Smallholder Market-Lead Project]	Coordinator	Eswatini	KII
21	Patrick Mkhaliphi	Eswatini Sugar Association	Irrigation Officer and Data Collection Division	Eswatini	KII
22	Willis Shabangu	National Agricultural Marketing Board [AMIS]	Coordinator	Eswatini	KII
23	Melusi Simelane	Ministry of Economic Planning	Central Statistics Department, Agricultural Statistics	Eswatini	KII
24	Mangaliso Sihlongonyne	National Maize Corporation	Agribusiness Manager	Eswatini	KII
25	Ndoda Msibi	Ministry of Agriculture	National Plant Health Inspectorate Services	Eswatini	KII
26	Madoda Mdziniso	Ministry of ICT	Department of Research, Science, Technology and Innovation	Eswatini	KII
27	Ayanda Z	Royal Science & Technology Park	Director	Eswatini	KII Incubators
28	Dr Lohanivo Alexio Clovis	l'Ecole Supérieure en Agronomie et Environnement de Diego (ESAED)	Directeur	Madagascar	Incubator KII
29	Njakamarosoa Randriambololona	Nexta	Training Manager	Madagascar	Incubator KII
30	Cheick Aboubacar Diarra	PEJAA	Expert Technique de IITA	Madagascar	Stakeholder KII
31	Donatien Ravelonjatovo RATENONY	CGARD	Coordinator	Madagascar	Innovation KII
32	Sylvie RAKOTONIAINA	Tranoben'ny Tantsaha Mpamokatra	Coordinator	Madagascar	Innovation KII
33	Osman Bwanali	One Acre Fund	Client Engagement Associate	Malawi	Stakeholder Survey
34	Madalitso Makwandu	Green Livelihoods	Executive Director	Malawi	Stakeholder Survey
35	Austin Tebogo Moyo	Mzuzu Entrepreneur Hub	Programs Manager	Malawi	Stakeholder Survey
36	George Kalungwe	Zodiak Broadcasting Station	News Editor and Programs Producer	Malawi	Stakeholder Survey

37	Khumbo Phiri	Airtel M'Chikumbe	Head of VAS	Malawi	Innovation KII
38	Peter Lungu	DAES Android App (Ministry of Agriculture, Department of Agriculture Extension Services)	Team Member	Malawi	Innovation KII
39	Towera Munthali	FAO	Communication Lead	Malawi	Stakeholder Survey
40	Virginia Chirwa	FAO	Innovation Program Management Lead	Malawi	Stakeholder Survey
41	Lumbani Kumwenda	mHub	Training, Monitoring and Evaluation Manager	Malawi	Stakeholder Survey
42	Julius N'goma	Mzuzu Entrepreneur hub	Chairperson	Malawi	Stakeholder Survey
43	Litness Chaima	Mzuzu Entrepreneur hub	Program Manager	Malawi	Stakeholder Survey
44	Lyson Kampira	National Commission for Science and Technology	Chief of Technology Transfer	Malawi	Stakeholder Survey
45	Peter Soko	Self Help Africa	Program Director	Malawi	Stakeholder Survey
46	Linda Mbulo	TNM	Team Lead (Technology and VAS)	Malawi	Stakeholder Survey
47	Assoc. Prof. D. Puchooa	University of Mauritius	Dean of the Faculty of Agriculture	Mauritius	KII Universities
48	Leevana Kisten	SME Mauritius	Senior Business Support Executive	Mauritius	KII Incubators
49	Pankaj Vyas Ram	Farmcity	Farm Manager	Mauritius	KII Incubators
50	Krishna Athal	Turbine	Manager	Mauritius	KII Incubators
51	Alfredo Cuanda	IDEARIO	Founder & Business designer	Mozambique	KII Incubators
52	Rogério Marcos Chiulele	Eduardo Mondlane University	Dean Faculty of Agronomy and Forest Engineering	Mozambique	KII Universities
53	Jose Nelson Soares de Sousa,	Green Innovation Centre GIZ	ICT Advisor for GIZ	Mozambique	KII Incubators
54	Bjorn Hecht	Green Innovation Centre GIZ	Team Leader	Mozambique	KII Incubators
55	Leonora Joodt	Bokomoso Incubator	City of Windhoek	Namibia	Stakeholder Survey
56	Leonora Joodt	Bokomoso Entrepreneurial Centre	Section head for SME Development and Promotion	Namibia	KII Incubators
57	Yamungu Alongo	RUFORUM	Intern	Regional / Global	KII Stakeholder
58	Egeru Anthony	RUFORUM	Program Manager	Regional / Global	KII Stakeholder
59	Brian King	CGIAR	Director of the Big Data Platform and INSPIRE Challenge	Regional / Global	KII Stakeholder
60	Professor Lindiwe Sibanda Majele	ARUA Centre of Excellence in Sustainable Food Systems University of Pretoria South Africa	Director and Chair	Regional / Global	KII Stakeholder
61	Daniele Tricarico	GSMA	Head of Insights AgriTech	Regional / Global	KII Stakeholder
62	Rob Lokers	Wageningen university Digital Agri Hub	Project Coordinator	Regional / Global	KII Stakeholder
63	Sander Janssen	Wageningen university Digital Agri Hub	Team lead	Regional / Global	KII Stakeholder
64	Kiringai Kamau	GODAN	Lead, GODAN South-South Secretariat	Regional / Global	KII Stakeholder
65	Kathryn Bailey	GODAN	Head of Communications	Regional / Global	KII Stakeholder
66	Patrick Bristol	The Guy Morel Institute	Administrative Manager	Seychelles	Stakeholder Survey
67	Palesa Antony	mLab South Africa	Provincial Coordinator	South Africa	KII Incubators
68	Choene Makhasa	mLab South Africa	Project Coordinator	South Africa	KII Incubators
69	Benard Ngwene	AGCO	training manager	South Africa	KII Incubators
70	Collins Nkatiko	Conservation Farming Unit	Chief Executive Officer	Tanzania, Zambia	Stakeholder Survey
71	Gilbert Mwale	E-msika Services Ltd	CEO	Zambia	Survey Workshop
72	Twaambo Chuula	Just Fresh Group Limited	CEO	Zambia	Survey Workshop
73	Kelvin Mupeta	eSoweto Farmers Market Limited	Project Manager	Zambia	Survey Workshop

74	Melanie Wilkinson	Lima Links	CEO	Zambia	Survey Workshop
75	Subi Thomas	iDrone Services	C0-director and founder	Zambia	Survey Workshop
76	Cassandra Mtine	AgriPredict Solutions	CEO	Zambia	Survey Workshop
77	Daliso Chitundu	Agricomm Media	Creative director and founder	Zambia	Survey Workshop
78	Frederick Chito	eVetCare Limited	CEO	Zambia	Survey Workshop
79	Mubanga Chilufya	Viamo	Country Director	Zambia	Innovation KII
80	Nambula Kachumi	Women's Entrepreneurial Access Center	Founder	Zambia	Stakeholder Survey

ANNEX 3 LIST OF CONTACTED UNIVERSITIES AND COLLEGES

Country	University
Angola	University José Eduardo dos Santos
Botswana	Botswana University
Botswana	Botswana University of Agriculture and Natural Resources (BUANR)
Comoros	Institut Universitaire de Technologie des Comoros (IUT)
Democratic Republic of Congo	Universite Catholique De Bukavu
Democratic Republic of Congo	Universite Evangelique en Afrique
Democratic Republic of Congo	Universite' de Kisangani
Democratic Republic of Congo	Universite' Officielle de Bukavu
Democratic Republic of Congo	Université pédagogique Nationale
Eswatini	University of eSwatini
Lesotho	National University of Lesotho
Madagascar	Université de Fianarantsoa
Madagascar	Université Nord Madagascar
Madagascar	University of Antananarivo
Madagascar	Université de Antsiranana
Malawi	Lilongwe University of Agriculture and Natural Resources (LUANAR)
Malawi	Malawi University of Science and Technology
Malawi	Mzuzu University
Malawi	Nkhoma University
Malawi	University of Malawi
Malawi	Directorate of Science, Technology, and Innovation - Ministry of Education
Mauritius	University of Mauritius
Mozambique	Eduardo Mondlane University
Mozambique	Universdade Zambeze
Mozambique	Universidade Catolica de Mozambique (UCM)
Namibia	Namibia University of Science and Technology
Namibia	University of Namibia
Seychelles	University of Seychelles
South Africa	Central University of Technology, Free State
South Africa	North-West University
South Africa	Stellenbosch University
South Africa	Tshwane University of Technology
South Africa	University of Fort Hare
South Africa	University of Free State
South Africa	University of Limpopo
South Africa	University of Pretoria
South Africa	University of South Africa
South Africa	University of Venda
South Africa	University of Mpumalanga
South Africa	South Africa College
South Africa	Crop Culture Group
South Africa	Walter Sisulu University
Tanzania	Nelson Mandela Africa Institute of Science and Technology
Tanzania	Sokoine University of Agriculture and Technology
Zambia	Copperbelt University
Zambia	University of Zambia, The School of Agricultural Science
Zambia	Mulungushi University
Zimbabwe	Africa University

Zimbabwe	Bindura University of Science Education
Zimbabwe	Great Zimbabwe University
Zimbabwe	Lupane State University
Zimbabwe	Midland State University
Zimbabwe	University of Zimbabwe
Zimbabwe	Women's University in Africa

ANNEX 4 LIST OF CONTACTED INCUBATORS

#	Name of the program/host organization	Description	Country
1	INAPEM ICT Incubator	In launching the INAPEM ICT incubator, Chevron and INAPEM are making a commitment to join leading African ICT countries that have invested in ICT incubators. The INAPEM ICT incubator is the first in a series of incubators that INAPEM is looking to launch. Other public institutions also have plans to set up incubators. The INAPEM ICT Incubator has great potential to be point of reference for best practice in setting up incubators that deliver impact to entrepreneurs and the economy.	Angola
2	Botswana Innovation Hub	Botswana Innovation Hub is an innovative and networked organization that promotes technology, entrepreneurship and commercialization. Botswana Innovation Hub is under the Ministry of Tertiary Education Research Science and Technology with a Board of Directors from diverse disciplines to perform fiduciary duties for the company	Botswana
3	First Steps Venture Centre (FSVC)	First Steps Venture Centre (FSVC) is a technology entrepreneurship development and innovation commercialization program, within the Botswana Innovation Hub. The center is established to support entrepreneurship and innovation through technology transfer. FSVC identifies, develops and nurtures viable technology-oriented start-up businesses with potential to grow locally and into international markets.	Botswana
4	Nest Hubs	Nest Hubs mentor, support and connect entrepreneurs locally, regionally and globally. This is purely done by entrepreneurs for the entrepreneurs with the intention to grow the entrepreneurial ecosystem in Africa	Botswana
5	Botswana University of Agriculture & Natural Resources	The goal of the Botswana University of Agriculture and Natural Resources (BUAN) incubation agripreneur program in collaboration with the Local Enterprise Authority (LEA) is to equip beneficiaries with the much-needed entrepreneurial and technical skills in agribusiness.	Botswana
6	The Local Enterprise Authority (LEA)	The Local Enterprise Authority (LEA) was established by the Small Business Act of 2004, Chapter 43:10 of the Laws of Botswana to carry out on behalf of the Government of Botswana, and more specifically the Ministry of Investment Trade and Industry (MITI), the mandate of entrepreneurship and enterprise development in Botswana.	Botswana
7	Citizen Entrepreneurial Development Agency (CEDA)	The Citizen Entrepreneurial Development Agency (CEDA) was set up by Government of Botswana to provide financial and technical support for business development with a view to promote viable and sustainable business enterprises. The company was established in response to a recommendation made by the National Conference on Citizen Economic Empowerment (NCCEE) held in July 1999, to introduce the professional management of the Government financial assistance initiatives and to streamline the numerous projects providing similar schemes.	Botswana
8	UCCIA Union des Chambres de Commerce des Comoros	UCCIA is a public professional institution with a mission to serve the interests and support the private sector.	Comoros
9	Kobo Hub	Kobo Hub is an independent association under Congolese law whose mission is to accelerate the emergence and success of local entrepreneurs with projects that value local skills. Kobo Hub supports entrepreneurs and project leaders by providing them with a network of multidisciplinary experts and access to the skills, resources and infrastructure necessary for the success and growth of their start-ups.	DRC
10	Kivu Entrepreneurs	Kivu Entrepreneurs supports the creation and development of innovative start-ups in Goma through entrepreneurship training and a dynamic incubator.	DRC
11	Orange Corners RDC	Orange Corners RDC is a 6-month incubation program including monthly intensive sprints with workshops, masterclasses and meetups dedicated to project owners and startup founders	DRC

12	Lumumba Lab	The LUMUMBA LAB (LLab) is a non-profit association which fights against the digital divide and which campaigns for digital inclusion. • We focus on the use of digital tool • We favor innovations that have a social impact • We work together with the young people of the places where we settle in order to offer timely solutions • We experience the strength and impact of simple initiatives	DRC
13	Ministère de l'agriculture	The Democratic Republic of Congo (DRC), through the Ministry of Agriculture, has received a loan from the African Development Bank Group to finance the implementation of the Youth Entrepreneurship in Agriculture and Agro-Business Project (PEJAB). The PEJAB aims at promoting and creating profitable enterprises by young graduates, integrated in promising agro-pastoral sectors to reduce youth unemployment which is taking dramatic proportions with multiple and incalculable social consequences.	DRC
14	Université Catholique de Bukavu (UCB)/Bukavu agribusiness incubation center	This project aims at creating the Bukavu agribusiness incubation center (BAIC) at the Université Catholique de Bukavu (UCB), in South-Kivu province, DRC. It is offering a favorable environment for interaction, new initiative creation and mutual support. It will span two years, with a total cost of US$ 50000 financed by RUFORUM.	DRC
15	Business Incubator RSTP	This is an initiative of the Royal Science and Technology Park (RSTP) in partnership with the United Nations Development Program (UNDP). The objective is to introduce applications to the market that will help to optimize the utilization of agricultural resources, modernize the agriculture sector and increase the sector's contribution to food security, export revenue, job creation and overall economic development for Eswatini.	Eswatini
16	Royal Science and technology park	The Business Incubator (BI) Swaziland is a not-for-profit business incubator within the Royal Science and Technology Park (RSTP). It is housed on the third floor of the Innovation Park at Phocweni, Swaziland. BI supports small and medium enterprises (SMEs) developing innovative products and services (or ideas) in the Information Technology (IT) sector, including (but not limited to) software, computer hardware, telecommunications and the Internet, but also Electronic, Value-added agriculture, Health and beauty, Renewable energy, Environmental management.	Eswatini
17	NUL Innovation Hub	National University of Lesotho Innovation Fund (NULIF) is an arm of the National University of Lesotho Innovation Hub that seeks to raise funds for Business, Research and Innovation within NUL and the rest of Lesotho, with the sole purpose of creating smart jobs for the 21st century in Lesotho and the region.	Lesotho
18	Bacha Entrepreneurship Project	The project sponsors entrepreneurs in the priority area selected by NSDP: • Agriculture • Manufacturing • Arts and Culture • Science and Technology Before sponsorship is awarded, the recipients must go through an incubation process.	Lesotho
19	MSME E-Learning program	The program offers e-leaning on financial education, financial management, and business management	Lesotho
20	Centre Incubateur Fifamanor Antsirabe via le programme PEJJA mis en oeuvre pricipalement par le Ministère Délégué auprès de la Présidence	The program aims on the one hand to promote the creation of remunerative, income-generating jobs for young people in agriculture and agro-industry; and on the other hand, to reduce the unemployment rate through the transformation and modernization of Malagasy agriculture.	Madagascar

	en charge de l'Agriculture et de l'Elevage		
21	mHub Malawi	mHub is Malawi's first technology and innovation hub located in Lilongwe, Malawi with a working space in Blantyre, Malawi and Lusaka, Zambia. The hub has facilitated over 1 million USD in financing to emerging entrepreneurs over 5 years creating more than 950 jobs and impacting over 5,000 people in diverse value chains. The hub has trained over 40,000 youths with business and technology skills.	Malawi
22	Polytechnic Design Studio	Polytechnic Design Studio is a specialized lab or workshop, which provides space, equipment and materials for users to design, prototype, and deploy innovative technology solutions to real-world challenges.	Malawi
23	Green Innovation Centers for the Agriculture and Food Sector (GIC) of GIZ	GIC is a four-year project (or "a tool to train other entrepreneurs" operated by the GIZ. GIC provides trainings and coaching sessions for existing entrepreneurs (MSMEs) with a 6–9-month training and coaching program aimed at strengthening their business plans and entrepreneurial/digital skills.	Malawi
24	LUANAR Innovation and Incubation Centre	The LUANAR Innovation and Incubation Centre, well known by its brand name the Agribiz Hub is a university led creative space aimed at supporting development and growth of agribusinesses in Malawi and beyond.	Malawi
25	The Centre for Agricultural Transformation	The Centre for Agricultural Transformation (CAT) is designed to be an inclusive science, Technology and Incubation Center of Excellence that will help smallholder Malawian farmers make economically viable, data-driven decisions for diversifying their livelihoods.	Malawi
26	Mzuzu Entrepreneur Hub	Mzuzu Entrepreneur Hub is an organization registered under company's incorporation Act with the aim of providing office space, business incubation programs as well as a platform for upcoming entrepreneurs to access information on investments, trade, banking, business registration, technology and other resources that can help upcoming entrepreneurs to grow their business ventures in the city of Mzuzu. The Mzuzu Entrepreneur Hub also runs Mzuzu Pitch Night which is a platform for entrepreneurs to present their business to potential customers, investors and partners	Malawi
27	Turbine	Turbine is an incubator and start-up accelerator that helps aspiring entrepreneurs turn ideas into start-ups and early-stage businesses into thriving, successful companies. Our vision is for Mauritius to become a vibrant and internationally recognized innovation and start-up hub.	Mauritius
28	Regeneration Mauritius	Regeneration Mauritius is a partnership aimed at making Mauritius a regional hub for sustainable innovation in food systems.	Mauritius
29	Aga Khan Foundation Mozambique /Agricultural Institute of Bilibiza (IABil)	Aga Khan Foundation Mozambique [AKF(Moz)] began operating in Mozambique in 2001 with the establishment of the Coastal Rural Support Program Mozambique [CRSP(M)], which implements integrated interventions in the education, health, agriculture, economic development, civil society, and habitat sectors. CRSP(M) is a Multi-Input Area Development (MIAD) initiative that collaborates with the CRSP (Tanzania) MIAD program in Southern Tanzania. IABil is a public institution dedicated to technical and professional training in the agricultural sector.	Mozambique
30	Technoserve Mozambique (TnsMz)	TechnoServe has been providing technical assistance to Mozambique's industries, agribusinesses, and entrepreneurs with high-growth potential for over 20 years	Mozambique
31	Green Innovation Centres for the Agriculture and Food Sector (GIC) of GIZ	The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is Germany's leading provider of international cooperation services	Mozambique
32	IDEÁRIO Innovation	Helping African emerging creators Start-up, Build-up, and Scale-up asset-light business ventures.	Mozambique

33	DEV Mozambique	DEV Mozambique is a Mozambican company enabling entrepreneurial solutions for food security. DEV Mozambique scouts high growth potential startups and SMEs to facilitate their entry into new national and international markets or access to investment opportunities	Mozambique
34	The Namibia Business Innovation Institute (NBII)	The Namibia Business Innovation Institute (NBII) provides training, mentoring and business support to innovative entrepreneurs looking to establish their own company as well to researchers interested in commercializing their technologies.	Namibia
35	Fablab Namibia	FabLab is a product support and innovation space offering almost free support to MTT and Registered SMEs Supporting idea generation and start-up companies boosting use of raw materials in product, sourcing, locally and growing at home. Also offer paid for services to industry	Namibia
36	StartUp Namibia	StartUp Namibia is a joint Namibian-German technical cooperation project for Sustainable Economic Development, implemented by the Namibian Ministry of Industrialization, Trade and SME Development and Deutsche Gesellschaft Fur Internationale Zusammenarbeit (GIZ). StartUp Namibia is aiming at Improving conditions for the formation and growth of Startups.	Namibia
37	Agra ProVision	Agra ProVision is the professional consultancy business division of Agra Limited, providing expert advice and training	Namibia
38	Agripreneurship Alliance	Agripreneurship Alliance promotes and stimulates youth-driven entrepreneurship in agriculture and agribusiness within developing economies	Regional
39	Generation Africa	Generation Africa is the partnership initiative with a vision to strengthen the ecosystem for youth entrepreneurs in the agri-food sector across the continent.	Regional
40	GIZ – SAIS Investment Readiness Program	GIZ-SAIS is a project implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). The main purpose is to support African start-ups in scaling their digital innovations; these innovations should enable users in the agriculture or food sector to increase their income.	Regional
41	The IITA Agripreneur initiative	The IITA Agripreneur initiative is a youth in agribusiness model that was established to address the issue of widespread youth unemployment and to provide a platform that propels youth toward self-employment in agriculture. The issue of unemployment is a major issue among African countries because their youth, who constitute the largest population segment, feel marginalized from the economic mainstream and despite their best efforts find little means to meet their expectations for a better life. Nor are they contributing in a meaningful way to the development of their country's economy.	Regional
42	Enable Youth	The ENABLE Youth (Empowering Novel Agri-Business Led Employment) program helps young African men and women to incubate and scale-up their agri-business. In addition, ENABLE Youth supports youth in accessing financing to grow their enterprises	Regional
43	African Agribusiness Incubators Network (AAIN)	AAIN invests in nurturing member incubators to answer to the needs of incubates in an ever-changing agribusiness environment to create more jobs and wealth using tested models of agribusiness incubation with 4 core investment areas	Regional
44	UniBRAIN	UniBRAIN is/was an initiative for advancing agribusiness incubation and improved agribusiness education in Africa. It is supported by Royal Danish Ministry of Foreign Affairs (DANIDA) and facilitated by a team of seven partner institutions. One of these partners is the Centre for Coordinating Agricultural Research and Development in Southern Africa (CCARDESA)	Regional
45	RUFORUM Entrepreneurship Challenge Program (RECAP)	Building the capacities of agricultural students in entrepreneurship and leadership to improve their professional insertion.	Regional
46	2SCALE	2SCALE is the largest incubator for inclusive agribusiness in Africa. 2SCALE offers a range of support services to private partners – companies and farmer groups – enabling them to produce, transform and supply quality food products to local, national and regional end-user markets, including Base of the Pyramid consumers.	Regional

47	Nourishing Africa	The Nourishing Africa Hub serves as a platform for entrepreneurs to accelerate their work, connect with funders, markets, talent, and celebrate their successes on the Continent. The portal includes information about data, funding, knowledge, e-learning, African food and chefs, career opportunities, and other resources to enable entrepreneurs to scale their impact	Regional
48	AWAN African Womens Agribusiness Network	Africa Women Agribusiness Network (AWAN) Afrika is a non-profit organization limited by guarantee. Its network that comprises of individual members' businesses including producers, processors, aggregators, export companies and input suppliers among others across the continent and globally. The organization provides women-owned and youth-owned agribusinesses with an E-Hub, which is a repository of information on agriculture along value chains and supply chains.	Regional
49	VALUE4HER	VALUE4HER seeks to increase the performance of women Agri enterprises, through access to markets and trade, finance and investments, knowledge and skills, networking and building women's collective voice.	Regional
50	EU AfricaTheJourney	African-European online hackathon program to find innovative solutions to socio-economic problems that have been further escalated by the Covid-19 pandemic. Ideas we they are looking for: • Pre-organized food distribution systems for a door-to-door distribution to avoid public gatherings. • Distribution systems of seeds for future harvests to help households that may go hungry due to Covid-19. • Mobile payment mechanisms to distribute compensation for vulnerable households. • Other creative ideas on how to provide food for those in need. • Agtech solutions that increase productivity and diversify agriculture. Solutions to transform the delivery of inputs, soil testing, crop insurance, credit, extension advice, and market linkages. • Solutions that help all food producers, smallholder, and commercial farmers alike, adopt sustainable practices to become more climate-smart and therefore protect the entire ecosystem upon which human food production depends.	Regional
51	Blue Economy Incubator	The Seychelles Blue Economy Incubator Program is a start-up incubator that encourages young, ambitious Seychellois entrepreneurs to develop innovative business ventures that will become leading ventures in the blue economy.	Seychelles
52	The Guy Morel Institute	Launched its Entrepreneurship Centre with the mandate to lead entrepreneurship development in the country. The process of building entrepreneurial culture is to equip people with an enhanced capacity to generate ideas and the skills to take these ideas to market. The Centre will build the entrepreneurship capacity of UniSey.	Seychelles
53	Impact Amplifier	Impact Amplifier exists to support both entrepreneurs and larger corporations that are committed to addressing the pressing social and environmental challenges confronting the African continent. They refer to the entrepreneurs they support as 'impact entrepreneurs'. These are individuals, which have developed innovative products and services that positively impact social and environmental challenges with commercially successful business models. These 'impact businesses' create scalable private sector led solutions in the agriculture, health, financial services, education, waste, water and energy sectors.	South Africa
54	Softstart BTI	Softstart BTI provides an integrated package of workspace, shared office services, access to specialized equipment and value-added services like management assistance, access to finance, marketing and networking support. Softstart BTI has full support and sponsorship from the SEDA Technology Programme (STP), a programme under the Small Enterprise Development Agency of the DTI. STP sponsored the Business Incubation initiative from its inception to fast track the links between the government, private sector and academia of South Africa.	South Africa
55	mLab South Africa	MLab Southern Africa is a mobile solutions laboratory and startup that provides the support for entrepreneurs to develop mobile apps. We connect the digital market to digital talent through our three programme areas: Skills Acceleration, Start-up Acceleration and through our Development of Innovative Technologies. All mLab programmes are primarily focused on youth aged 18 – 35. Each programme has unique requirements and participants are selected through online applications, interviews and bootcamps.	South Africa
56	StartUp 90 accelerator	Startup 90 is a business accelerator for seed and early-stage technology startups.	South Africa

57	The Innovation Hub	The Innovation Hub offers a number of incubation programmes in the Bioeconomy (agro processing and pharmaceutical), Smart Industries (ICT and advanced manufacturing) and Green Economy (Water purification, waste management and renewable energy). In addition, The Innovation Hub operates a range of enterprise development, skills development and innovation enabling programmes both in the science park and throughout the Gauteng region.	South Africa
58	Akro	Akro is a company dedicated to helping entrepreneurs turn ideas into businesses. We offer events, venture funding and consulting services, and we have a painfully practical attitude towards entrepreneurship.	South Africa
59	Timbali Technology Incubator	The Timbali Technology Incubator aims to springboard start-up entrepreneurs by addressing key constraints through an innovative incubation model. Timbali technology incubator was founded in 2003 to positively affect rural farmers. The world “Timbali” means not only flowers but “to blossom in siSwati, the language of the region	South Africa
60	The AGCO Agriculture Foundation	The AGCO Agriculture Foundation (AAF), initiated by AGCO Corporation in 2018, is a private foundation with the vision to prevent and relieve hunger through agricultural development. We launched the Foundation to focus our philanthropy on impactful programs that help feed our steadily growing world sustainably and equitably.	South Africa
61	Ndoto Hub	Ndoto Hub is a marketplace of business ideas and opportunities to socially and economically empower young women, bringing them together to access workspace, information, knowledge, markets and networks curated for their business and personal growth. The hub is supported with a digital learning platform and member led community groups.	Tanzania
62	Anza	Anza enables businesses in Tanzania to grow by providing them with access to personalized and strategic capacity building, affordable capital and relevant networks.	Tanzania
63	Startup Grind	Startup Grind supports startups, and small businesses. We connect you to mentors, offer entrepreneurial training & tell local business founders' stories.	Tanzania
64	The Agricultural Business Innovation Center (AIC)	The Agricultural Business Innovation Center (AIC) is a department within the PASS Institute that aims to provide business development services to agribusiness entrepreneurs with a business growth perspective. In addition, the AIC gives priority to agribusiness that involves or is owned by young people and women.	Tanzania
65	BongoHive	BongoHive is Zambia’s first technology and innovation hub. Established in May 2011 and based in Lusaka, the co-founders, all enthusiastic programmers, sought to address the gaps they experienced working within the local technology industry leading to a lack of coordination, skills exposure and productivity. BongoHive has evolved to assist scalable startups of any background by enhancing skills, accelerating growth, strengthening networks, increasing collaboration, providing a forum for ideas exchange and reducing the barriers to entrepreneurship.	Zambia
66	Agribusiness Incubation Trust (AgBIT)	AgBIT is Zambia’s pioneer agribusiness incubator, focused on accelerating innovation and the growth of scalable enterprises in the sector. Established with the initial support of DANIDA through the UniBRAIN Facility, AgBIT is a unique public-private-partnership initiative bringing together the private sector, research and university community to provide the requisite environment critical to enabling the sustainable take-off and growth of agribusiness startups and SMEs. Remarks National consultant: They are operational but in a much weaker position due to lack of funding. As you may know Agribusiness Incubation Trust (AgBIT) Ltd is a public-private-partnership bringing together a consortium of Zambian private sector, universities and research institutions. Its consortium members include the Zambia Agriculture Research Institute (ZARI), Frontier Development Associates, University of Zambia (UNZA), Mulungushi University (MU), and the Natural Resources Development College (NRDC).	Zambia
67	Impact Hub Harare	Home to changemakers, social disrupters and impact Innovators. We offer an ecosystem of resources to take your business to greater heights. Collaborate with like-minded social entrepreneurs to foster impact in Zimbabwe. As social disrupters we want to have a part in reaching the Social Development Goals by 2030.	Zimbabwe
68	Tech Hub Harare	We are passionate about building innovative entrepreneurs from the ground up through incubation and acceleration	Zimbabwe
69	The Tech Village	The Tech Village is an innovation hub and collaborative working space designed to provide resources, a community and the best possible working environment for entrepreneurs	Zimbabwe

70	FEITH	The spirit behind the Farm Export Incubation & Training Hub (F.E.I.T.H). We believe that with enough care and knowledge, smallholder farmers can grow into profitable entities.	Zimbabwe
71	Green Innovation Hub (GiHUB)	GiHub in Harare facilitates the transformation of promising ideas into practical solutions that address real social challenges faced by local communities in which young people are resident. The GiHub offers project financing, incubation, and mentorship as well as connecting young innovators to industry giants.	Zimbabwe

ANNEX 5 LIST OF IDENTIFIED INNOVATIONS

#						Name of innovation	Name of the company	Survey ✓/X	Description of innovation	Operational Countries in SADC
1						236-Mobile Banking Platform	Cassava SmartTech - Steward Bank	X	*236#Bank - Mobile Banking Platform from Cassava SmartTech - Steward Bank. It is a platform where Econet mobile network subscribers can open bank accounts via a mobile phone in minutes. It aims to grow financial inclusion using the mobile platform.	Zimbabwe
2						3C-BIOVIS	National Center for Applied Research in Rural Development (FOFIFA-DRZVP)	✓	3C-BIOVIS of National Center for Applied Research in Rural Development (FOFIFA-DRZVP). 3C-BIOVIS (carrying capacity and plant biomass calculator using satellite imagery) is a calculation tool that allows the quantity of forage resources to be determined from data obtained by processing satellite images. The principle of the tool consists of measuring and transforming the reflectance of plants (NDVI) detected by satellites into yield in tons of dry matter per hectare. 3C-BIOVIS predicts real-time information on the availability of forage resources: (amount of green matter and dry matter measured on a plot) from data extracted by processing satellite images. The results are then used by the tool to calculate the number of animals (cattle, sheep, goats) that can be fed on the plot.	Madagascar
3						3D cartoon: agroecology for future generations	GSDM	X	3D cartoon: agroecology for future generations of GSDM. GSDM has produced a series of 3D cartoons on agroecology for children available in Malagasy, French and English. They are then broadcasted in GSDM's partner schools.	Madagascar
4						Adagin Technologies	Adagin Technologies	X	In 2017, Adagin Technologies was launched combining precision technologies and making them accessible for the agriculture industry. Their solutions combine farming, engineering, and software development to create some of the latest and progressive Agricultural Technologies in the industry. The focus is on aligning solutions to customers' core needs, thereby allowing customers to drive informed decisions and stay competitive in the new Industrial Revolution. Adagin provides precision harvesting and packing technologies from the field at source and understanding each yield and productive performance to increase efficiency and profits. Their smart weigh scales also enable precision traceability and packing from the farm to the fork, and through the value chain to the consumer. Their digital time and attendance solution enables accurate job costing information using smart phone technologies thereby enabling real time insight to labour costs, harvesting agriculture solutions.	South Africa

5		■				Adumo	Adumo Pty Ltd	X	Adumo is South Africa's largest independent payments processor trusted by retailers across Africa. Used by large multi-nationals, independent retailers, entrepreneurs, and informal traders. A payment solution that provides expertise to make smart payment acceptance decisions. their package offers working capital requirements, consumer engagement platforms, business support solutions, an in-store consumer credit platform, retail point of sales software and hardware, customer analytics, electronic voucher distribution and private label card issuing, all from a single provider. Located in 13 countries across Africa, with more than 30,000 active clients	South Africa
6	■				■	Aerial photographs / mapping by drone	CIRAD	✓	The use of drones to get spatial information. Once georeferenced and orthorectified, photo-interpretation techniques were used to classify the different types of land use and occupation at the level of the land.	Madagascar
7	■				■	Aerobotics	Aerobotics	X	Aerobotics was founded by James Paterson and Benji Meltze in 2014, together with a team of agronomists, engineers, product developers, creatives, and customer service experts. Their mission is to provide their customers with intelligent tools throughout every season, so that they can feed the world. The full team compliment comprises of over 80 employees has operating across the globe with head offices in California and in South Africa. The operation has spread over 18 countries with over 100 drone pilots capturing aerial imagery for farmers. They have processed over 100 million aerial images of citrus trees.	South Africa
8		■				AfriMoola	BoxFusion and Nedbank Uhkeshe Enterprise	X	BoxFusion and Nedbank Uhkeshe Enterprise have now partnered to create Afrimoola, a digital mobile money wallet to assist farmers with payment and e-wallet/ Voucher solutions. Afrimoola is a Fintech under the Nedbank Ukheshe Enterprise program. It is a dynamic Fintech and digital ecosystem built on the ethos of financial inclusion. Afrimoola technology is managed by digital transformation technology company, Boxfusion that provides cutting edge software solutions, providing solutions to may South African government departments, companies, and enterprise clients. Boxfusion has a 12-year track record and are 100% public sector focused and are a gold partner of Microsoft. Afrimoola platform offers omnichannel solutions, wallets, eCommerce, digital money movement across networks, banks and boarders, savings and stokvel solutions at the touch of a button for merchants and customers.	Namibia, South Africa, Zimbabwe
9				■		AGBIZ	AGBIZ	X	The agricultural business chamber, an NGO operating in Southern Africa. Agbiz is an association of agribusinesses operating in South and Southern Africa and enable their members to play a constructive role in the agriculture sector of the country, economic growth, development and transformation. They offer opportunities to engage with and	South Africa

									influence policy and legislative environment, to improve commercial and sustainable agribusiness environment including trade and investment and agricultural finance, to encourage emerging agribusinesses and players in the agro-food value chain and to create relevant accessible agribusiness and market intelligence. They have a website offering detailed market updates and advice on all aspects of agribusinesses including the enabling environment and financial support.	
10	■	■	■	■	■	Agricultural Innovation Pilot Project	Anglican Church Diocese of Morogoro	✓	Agricultural Innovation Pilot Project (including Jambo Maisha) from the Anglican Church Diocese of Morogoro (ACDM). The church run agriculture training and capacity building projects that include Digital Solutions, Drone for Crops Management and Drip irrigation.	Tanzania
11	■		■	■		Agricultural Marketing Information System (AMIS)	Ministry of Agriculture Eswatini	✓	The Agricultural Market Information System of Eswatini (AMIS) is part of the establishment of the NOLWATI AGRIBUSINESS hub by the National Agriculture Marketing Board (NAMBOARD) on behalf of the Ministry of Agriculture and in conjunction with other stakeholders such as ESWADE, SNAU, NGOs and private organizations which help with data capturing, system dissemination and content drafting. AMIS hold relevant information on national business trends on international markets, and the web portal provides information to all agricultural stakeholders. The free subscription page enables emails and participation in Blogs and Fora. Farmers who register provide information on plantings, and forecast harvest dates and yields and can receive information via SMS on their cell phones. Currently market price statistics for Eswatini and neighbouring export markets are on fruit, vegetables, and Maize but in the future grains, small and large livestock are planned. They have an Android App which is designed for farmers, businesses, and individuals to upload products, place orders online as well as to get weather updates and a Facebook page. It was launched in 2020 with an average of 350 active users of their web-based services, their App (AMIS) and USSD Platform (AMIS) respectively, and they have 1,024 registered users. AMIS specifically encourages both B2C and B2B models arising from providing a platform to encourage buying and selling based on the most accurate and up to date market information for agricultural commodities relevant to local and export markets therefore encouraging e-procurement and e-commerce transactions and opportunities for leveraging logistics, transport and the use of farm machinery. AMIS is more related to digital procurement and e-commerce as well as digital advisory on pricing and spans digital advisory, digital procurement and Agri commerce use cases and sub-use cases. Addressing a knowledge gap, AMIS enables farmers to access markets more directly and reduce the role of middlemen and have the nearest state of the art data on pricing for agricultural commodities therefore, empowering them to demand fair prices for their harvests. AMIS seeks to ensure	Eswatini

									marketing for post-harvest produce and clearly buying for those purchasers looking for specific commodities. The service was developed through donor funding and central government funding and will likely remain reliant on this for the short to medium term. The service was developed through the public sector with extensive consultation with government, commercial companies and social enterprises and entrepreneurs. The model underpinning the platform is a public-private model managed by the NAMBORD parastatal. The application uses Computers, Smartphones, Basic and feature phones. They have a website, dashboard, and social media platforms (WhatsApp and Twitter). The most significant challenges experienced in the two Eswatini innovations include for AMIS, the affordability of using the App, Platform and USSD services, the uptake of these services by farmers and particularly women and girls and any resulting behaviour changes. AMIS had enabled the government to shut down borders to imports of certain produce, which is in surplus in Eswatini, as determined by farmer production forecasts. AMIS has moved from successful small-scale testing to wider scale adoption.	
12		■		■		Agricultural Produce Brokers	Individual	X	There is growing awareness of the fundamental and vital role fruit and vegetable consumption plays in human health and nutrition in both developing and developed countries. The initiative aims to integrate the fast-growing vendors to market, technology, value addition and supply of affordable quality produce to the Namibian community at a fingertip. Furthermore, the initiative aims to serve as a platform for educating and promoting health consciousness in consumption and will promote sustainable food production, including access to Agri-digital Financial Services through collaborative efforts.	Namibia
13	■					Agricultural Research Council (ARC) Hub App	Agricultural Research Council	✓	ARC Hub App of the South African Government. The ARC Hub app is an all-round information source for Farmers, Extension Practitioners and Researcher. Its features include 158 manuals related to plant production, animal production, agro-processing, plant health as well animal health developed by researchers across the ARC. The app also provides info on training services offered by the ARC, up-to-date weather forecasts and early warning system that allows cross sharing between farmers and researchers. The Hub App was launched in 2018 and has 3,759 active and registered users and provides digital advisory Smart advisory: Data-driven advisory based on tailored, farm-level agro-climatic and crop specific information to support decision making, maximize productivity and reduce costs. Technologies such as sensors, satellites and drones, as well as big data analytics and AI, underpin many of these services., An advisory services app supports and enhances on-farm decision-making through providing accurate and timely information required at every stage of the agricultural value chain, using ARC's	South Africa

									research output developed by ARC researcher across the organization. It uniquely bridges the information gap between research and extension and the intention is that the next phase of it will include digital market information linked directly from the Department of Agriculture to enable farmers to make informed marketing decisions. The service relies on Computers, smartphones, and is delivered through website, dashboard and portal and utilizes cloud-based databases. Challenges faced include product development or translation into a local language for greater understanding by end users to address planning, inputs, on-farm production, storage, post-Harvest processing, Transport and eventually market access. They have reached a level of sustainable scale and widescale adoption and the Hub was developed through government and donor grants which it will remain dependent on for some time. It is challenging to manage stakeholders responsible to assist with integration especially related to market data and the technology used is inclusive of those disadvantaged groups.	
14	■		■	■	■	Agrigistics	Agrigistics	X	Your farm operating system enables tracking employee activities from planting to harvesting using rugged Android devices and RFID tags, Measure the yield for every cultivar and view the profitability of each field on your farm and helps farmers Learn from historic data and improve their strategies. This agricultural monitoring solution has been available since 2018 and allows farmers to oversee their entire farming operation without necessarily being present. It addresses planting, crop protection, harvesting, transportation, and packing. The whole system is accessible using smartphones, with a user-friendly interface and includes both labour monitoring as well as input applications, fuel consumption, packhouse monitoring. It can be implemented on labour intensive farms including software designed for fruit, vegetables, nuts, citrus, herbs, spices, dairy and coffee bean farms. It is proactive integrating seamlessly into farming operations and captures data in an easy and simple way.	South Africa
15	■		■	■	■	Agrihub	Agrihub	X	Agrihub is an independent legal entity that has been established between South African fruit industry representatives and competing software solution providers to service the South African fruit industry's information needs. It was established because the industry's information needs were not fully serviced. Accurate, complete, and timely information is essential to the industry decisions makers at various levels. Three grower's organizations namely, Citrus Growers Organization (CGA), Hortgro, South African Table Grape Industry (SATI) with the Fresh Produce Exporters Forum (FPEF) are the industry shareholders with four competing software solution providers namely, Dipar, Farsoft, Paltrack and Prophet making up the other 50% shareholding. All parties have equal shareholding and a healthy balance between industry and commercial	South Africa

									interests have been struck. Agrihub is currently focused on the dispatch (What has gone where?) statistical information requirements of its various industry stakeholders but it is envisaged that the range of services will be extended over time.	
16	■					Agri-Intel	CropLife South Africa	X	The Agri-Intel website offers easy access to a comprehensive database of all chemical, biological, and natural crop protection and public health products registered for use in South Africa including product labels, SDSs and information on maximum residue limits and withholding periods. Agri-Intel is owned and managed by CropLife South Africa. CropLife SA is a non-profit company representing the plant science industry, including most responsible manufacturers and suppliers of crop protection products as well as industry associated entities such as analytical laboratories and the pest control industry. Agri-Intel provides web-accessible, current, and correct plant protection information to various stakeholders in the agricultural and export industries to assist in the mitigation of production and marketing risks related to the use of plant protection products. Registered users can view this information by selecting Label information (Database)and Residue management (MRLs) from the men.	South Africa
17					■	AgriLed	AgriLed	X	AgriLed is a sustainable off-grid food security solution making use of Controlled Environment Agriculture (CEA) within shipping containers. They produce high-quality crops with great nutritional value using our LED Grow Lamps. They offer Controlled Environment Agriculture (CEA) solutions consisting of hydroponics systems, LED Grow lamps and automation within shipping containers. This solution saves water and space. They combine the CEA system with a community centre which includes access to computers, the internet, education, and waterless sanitation. Or a packing & distribution hub for the commercial farmer. Making use of CEA (Controlled Environment Agriculture) they localize the food supply, which cuts logistic cost. For ease of mobility and remote provision, the Sustainers system is housed in shipping containers, also ideal for the limitations faced in urban environments. The Sustainers system is designed to optimize the nutrition of the plant in the growing stages, and is also in line with several UN Sustainable development goals	South Africa
18				■		Agri-M	Agri-M	X	Agri-M - Input supplier of Staden Plastic System (plastic pipes for borehole equipment), Solar Pumps, Submersible Pumps, KSB Pumps, Centrifugal Pumps, Electrical motors, Irrigation necessities and Drip & Floppy Irrigation using smart meters and sensors.	South Africa

19	■		■	■	■	Agrimate	Box Fusion	X	Agrimate uses NDVI, sentinel 2 Infrared Satellite Images, Computer Vision and Artificial Intelligence to calculate Expected Yields and Credit Losses in Agriculture. This is also integrated into a Value Chain management system that manages the day to-day farming operations giving a 360 view of value chain in real time.	Namibia, South Africa, Zimbabwe
20	■					Agrimotion	Agrimotion	X	Agrimotion strives to set the standard for best practices in soil management and fruit production, through ethical and sustainable solutions.	South Africa
21		■				AgriPay	Zanaco Plc	✓	AgriPay (2019) from Zanaco Plc. AgriPay is a mobile-based (USSD) platform for smallholder farmers. The bundled services include account opening, access to markets, access to information, and a suite of digital financial products and services. The solution is value-chain agnostic and designed to meet the needs of value chain players in the agric space. They have around 7500 users.	Zambia
22	■	■	■	■		AgriPredict Platform	AgriPredict Solutions	✓	AgriPredict Platform (2019) from AgriPredict Solutions. Using mobile phones to provide vital, timely and on-demand agricultural information to small scale farmers to help them manage risk. They have around 51,000 registered users of which around 10,000 active.	Zambia
23					■	Agrishare	Welthungerhilfe	✓	Agrishare app (2019) from Welthungerhilfe (WHH). Agrishare is a free-to-use shared services mobile solution for mechanized agriculture. It links owners of agricultural equipment like tractors, shellers and lorries, to farmers and other actors in the agricultural value chain. This is done through an Android mobile application. It has 53,000 registered users.	Zimbabwe
24		■				AgriTask GIS	AgriTask	✓	Agritask GIS by Hollard is a digital innovation and digital insurance solution for Index/Parametric Insurance connected to Meteosat satellite GIS platform and can remotely activate a smartphone to collect GPS data or points of agricultural plots and finally estimate the plot size. Using this innovation Hollard remotely get information about the size of agricultural plot and use this information to assess farmer eligibility for agricultural credit or insurance access and can enrol farmers. It addresses farmers being able to plan effectively and ensure that they can produce efficiently and gain access to markets. The company Hollard operate in Botswana, Lesotho, Mozambique, Namibia and South Africa and launched Agritask in 2020. They have 10 active users so far and 34,000 registered users. The service enables access to insurance products and in doing so access to financial services. The digital innovation relies on GPS, Smartphones and GEO data. It uses spreadsheets (Excel, to cloud-based SQL, third party SaaS software providers and IBM Watson AI platforms. The innovation is transitioning to scale and was	Botswana, Lesotho, Mozambique, Namibia, South Africa

									developed using donor grants from government or foundations. Currently still dependent on programme support Swiss Capacity Building Facility. Their recent feasibility study on livestock insurance in Namibia, Botswana and Mozambique looks at index-based insurance and agricultural loans and their bundling as part of a potential public sector programme focused on areas prone to drought. Their technology is inclusive of disadvantaged groups.	
25	■				■	AgriTPG	TOPOGIS	✓	AgriTPG of Topogis. Providing plantation statistics using satellite and drone imagery. They are launched in 2019 with a group of young Angolans. Their solution tries to close the knowledge gap. Challenges that they are facing during implementation were: Understanding the market and user needs, Procurement of technology vendors, Data collection issues.	Angola
26		■				Agrofund	Agrofund	X	Agrofund of Agrofund. Agrofund is the first participatory financing platform in the Democratic Republic of Congo. Its mission is to help small farmers who are struggling to find financing from banks to either start or grow their business.	Democratic Republic of Congo
27	■		■	■		AgroMall	Afrosoft Holdings	✓	AgroMall (2016) from Afrosoft. Is an e-Commerce platform whose origins were based on bringing together the agricultural ecosystem by way of interaction, information dissemination and buying and selling of all products and services within the value chain. The solution sits on an engine that is designed to allow versatility and adaptability of any ecosystem to meet the business requirements of any interested organization or industry. There are no registered users at present.	Zimbabwe
28	■	■	■	■	■	AgroMate/ AgriFusion	Chartered Systems Integration	X	AgroMate from AgroMate (Agri Fusion) have created a unique platform that links farmers with off takers and financial institutions which provides the risk management of farmers to guarantee delivery of the product to the off takers. This is the first platform of its kind that addresses financing of farmers, aggregating orders from off takers and allocating them to farmers to plant the crop and applying Agri VAS with Artificial Intelligence for the ongoing monitoring and evaluation of the farming activities. This allows the financier to use this data to calculate expected credit losses for each offtake agreement in real-time. Banks are now able to offer purchase order factoring to finance farmers with a high degree of predictability of the risk and outcomes. This data can also be used for crop insurance to reduce the risk of non-performance of the crop. This innovation has not been validated on the ground and did not fill out the survey.	Eswatini, Mozambique, Namibia, South Africa, Zambia, Zimbabwe
29				■		Agroportal AO	Agro Portal	X	Agroportal AO of Agroportal. This is a digital platform made up of complementary components (website, social networks and newsletters) and which serves as a vehicle for	Angola

									boosting Agribusiness in Angola, providing its users with several totally free services of great use and added value, as well as being a way to develop and promote business or a brand in this segment quickly and efficiently.	
30	■	■	■	■	■	AgroTech Mobile Application (AMA)	AgroTech Smart Farming	✓	Launched in 2020 the Agrotech Mobile Application (AMA) is a mobile application designed with the aim to help Namibian citizens with crop farming, marketing and sales of farming products. As well as meet the government halfway in terms of food security and provide statistics concerning agronomic performance. It is to provide or currently provides digital advisory, agri-digital financial services, digital procurement, agri e-commerce and smart farming. Currently, the android version of the app is completed – and with the funding from Groupe MRP, an Indian-based company, they plan to create the IOS version and also expand to other countries. The app has also won an award from the MTC telecommunications Company under a UNDP Challenge Session on Agriculture and the IoT.Digital Agri advisory covering agricultural and livestock information, weather and climate information and information on market prices. Agri VAS are delivered via voice channels (IVR, helplines), text channels (SMS and USSD) and via apps., website, Portal, messaging platforms. 0Smart advisory: Data-driven advisory based on tailored, farm-level agro-climatic and crops- specific information to support decision making, maximize productivity and reduce costs. Filling predominant knowledge gaps. Technologies such as sensors, satellites and drones, as well as big data analytics and AI, underpin many of these services., Weather information: Specialist services that provide regional and localized weather forecasts. This sub-category may include weather-adaptive and climate-smart advice, Pest and disease management: Digital tools that help farmers diagnose plant disease and develop strategies to treat diseased plants as well as mitigate future outbreaks. Most of the services are accessible via mobile applications and require a farmer to upload a picture of the infected plant for diagnosis. Some services are also accessible via USSD. Also includes national and regional-level pest and disease early warning systems., Record keeping: Digital tools that enable farmers to keep detailed records of livestock, including health and feeding data, to help mitigate diseases and avoid missed conceptions. Record keeping tools are also used to keep details of input usage, procurement, cost and revenue and sales records. Equipment monitoring: The smart monitoring of equipment such as irrigation systems that enable farmers to remotely control, track and look after their equipment and farming operations, leading to a reduction in water consumption and wastage., Smart shared assets: Digital tools that enable the sharing economy for assets such as tractors, drones and other mechanized farming equipment. They provide	Namibia

									smallholder farmers an opportunity to mechanize processes such as crop spraying, crop monitoring and land preparation. The outcomes include improved access to markets, increased efficiency and post-harvest loss, agronomy services within accessible range for farmers. It requires basic and feature phones, computers, cloud-based databases and cloud-based SaaS. Challenged by data collection issues, operational constraints and translation into local languages. Dealing mostly with planning, inputs and on-farm production, post-harvest processing and access to markets. Still at the R&D stage of development. Charge individual business subscription fees, advertise, monetize data, transaction fees, Corporate CSR and government funding. Technology has taken explicit actions to ensure it is inclusive.	
31						Airtel Money	Airtel Seychelles	X	Airtel Money of Airtel Seychelles. Is a mobile money service that allows you to send and receive money, buy airtime for yourself or others, and make payments using airtel money (e.g., utility bills, good and services). Implemented in Seychelles only but Airtel Seychelles is a subsidiary of Airtel Africa which operates in other countries.	Seychelles
32						AkokoMarket	Agro Innova Company Limited	✓	This is an e-commerce online marketplace developed by the Agro Innova Company Limited. Agro Innova Company was established in 2019 in Ghana and operates in Ghana and West Africa and is a private company. This e-commerce online marketplace for farmers) that connects smallholder poultry and livestock farmers. It can also be accessed by dialling to the USSD short code *713*83# or by using the AkokoMarket mobile App. It operates in Mozambique and was also established in 2019, with 364 active users and 246 registered users. It provides agri inputs and sale of inputs to farmers. It also enables farmers to aggregate demand and place bulk orders. Linked to these inputs is an output platform to enable farmers to sell to consumers (B2C) or businesses to sell to enterprise customers (B2B). The combined offering enables farmers to buy inputs from input suppliers and sell their agricultural produce to consumers and businesses.	Mozambique
33						Alfa Sementeira Limitada	Alfa Sementeira Limitada	✓	Alfa Sementeira Limitada of Alfa Sementeira Limitada. The use of drones and other information technology and GIS in the monitoring and development of agriculture.	Angola
34						Alternative Exchange (trading platform) in Eastern and Southern Africa,	Escrow Group	X	Alternative Exchange (trading platform) in Eastern and Southern Africa from the Escrow Group for Tanzania, Zambia and Zimbabwe. This is a registered alternative exchange (trading platform) in eastern and southern Africa. The platform enables members of the public to access financial markets using mobile phones / USSD	Tanzania, Zambia, Zimbabwe

									platforms and apps to shop and choose what they want to invest in, including mobile retail bonds (Government and Corporate), securities, and commodities (piloting).	
35	■		■	■		APMIS	Food and Agricultural Research & Extension Institute (FAREI)	X	The Agricultural Production and Market Information System (APMIS) also developed by the Ministry of Agro Industry and implemented by FAREI (above) is an electronic resource for entrepreneurs, Producers, Traders, Input and Service Providers involved in agricultural production, agribusiness and value addition. It provides pricing and market trends in the agriculture sector in a range of commodities, and also research studies, resources and facilities. It was created by the Ministry of Agro Industry and Food Security and is implemented and maintained by the Food and Agricultural Research and Extension Institute (FAREI). Current commodities include Garlic, Groundnuts, Brinjal and Aubergine varieties and pricing information for retail and wholesale for a range of crops such as Banana, Bean, Brinjal, Cabbage, Calabash, Carrot, Cauliflower, Chilies (large and small), Chouchou, Cucumber, Ladies Finger, Pawpaw and Pomme d'Amour. They have graded and ungraded produce and retail pricing including a very wide range of vegetables. The platform also presents input service providers by location cited including their contact details. In summary the portal was launched in 2010, has 57 listed crops, 3 retail and wholesale markets and 15 years of trends and statistics on areas under cultivation, business opportunities and local resources and facilities in Mauritius.	Mauritius
36	■			■	■	Aquacheck	Aquacheck	X	Aquacheck is an established company which supplies premium quality soil monitoring equipment that has been designed to optimize the management of water. All products including software are manufactured in South Africa, using specialized, premium quality components. This company has a global footprint, supported by some of the world's biggest names in agriculture, we're the producers of soil moisture monitoring equipment and irrigation management software of choice. An all-inclusive package consisting of soil moisture probes, telemetry, software, and agronomy support – AquaCheck provides a fully integrated system to help farmers make the best irrigation decisions. Telemetry devices are manufactured in South Africa. Rugged and robust, they offer three key telemetry options which can accompany your soil moisture probe, depending on location and needs. An example is the AquaLink S-200 & S-300: Solar Powered 2G & 3G Option. It is robust and designed to withstand most weather conditions. The unit is attached to each soil	South Africa

									moisture probe and works on cellular technology – 2G and 3G – to automatically transmit data from the probe to soil moisture management software (such as AquaCheck).	
37	■		■		■	Avagro	Shalom Farm	X	AvaGro is an agricultural solutions provider for smart or precision agriculture and grow flowers and vegetables on a commercial basis using tailor-made solutions under different climatic conditions. They offer solutions based on partnering with farmers and appropriate technology such as greenhouse infrastructure and provide training.	Namibia
38			■			Botswana Animal Information and Traceability System (BAITS)	Ministry of Agricultural Development and Food Security	X	Botswana Animal Information and Traceability System (BAITS) of Ministry of Agricultural Development and Food Security. BAITS is used for animal registration, transfer of ownership, arrival of livestock, veterinary drug treatments and removal of dead/fallen stock. The technology is used with ear tags. Implemented in Botswana only.	Botswana
39	■				■	Carbon Calculated	Carbon Calculated	X	The Carbon Calculated team helps companies understand their carbon footprints as the first step. They provide business leaders with appropriate tools they need to reduce the impact of greenhouse gas (GHG) emissions and, at the same time, provide the business-side advantages of carbon management.	Botswana, South Africa
40					■	CGARD	Center On Geoinformatics Applications in Rural Development	✓	Centre on geoinformatics applications in rural development (CGARDS) of Ministry of Agriculture, Livestock and Fisheries. It is a decision support system based on satellite images. For the Ministry of Agriculture, the tele detection applications of this project will allow to evaluate the agricultural areas; to establish the land use map; to monitor the crops and to predict the agricultural production / yields by using the vegetation indices with other types of data (agro-meteorology, cultivation practices, soil properties,...); to evaluate the damages in case of natural disasters; to improve the planning of the cultivation seasons according to the information obtained thanks to the monitoring system.	Madagascar
41	■	■	■	■		Chiweto Insurance	Enterprise Innovation Hub	✓	Chiweto Insurance from Chiweto for Malawi is in the development phase but intends to launch in 2022 to provide livestock insurance services (life and health insurance).	Malawi
42	■					Chiweto SMS platform	Enterprise Innovation Hub	✓	Chiweto SMS Platform from Chiweto for Malawi is an interactive digital service for sourcing and delivering information such as advisory and agricultural extension service in real time via SMS.	Malawi

43			■			ComCashew	Competitive Cashew Initiative	X	The GIZ project Competitive Cashew initiative (ComCashew) is part of the GIZ program on the “Broad-scale Promotion of Agricultural Value Chains in Africa”. ComCashew (previously known as African Cashew Initiative (ACi) is funded in its third phase by the German Federal Ministry for Economic Cooperation and Development (BMZ). Jointly with private and public actors, ComCashew constitutes a new era of multi-stakeholder partnership aiming to achieve a sustainable poverty reduction in the project countries Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mozambique and Sierra Leone, by enhancing the competitiveness of African cashew smallholders, processors and other actors in the value chain. The cashew value chain offers an important potential for employment and wealth creation, climate change mitigation through climate smart agriculture and the economic empowerment of women and youth, especially in vulnerable rural areas. Therefore, the adoption of a value chain approach to promote all the actors along the cashew value chain is key to a sustainable development of the sector. ComCashew provides support in areas ranging from research, to production, processing, marketing, capacity development and policy advice. Ultimately, new opportunities for employment, especially for women, along the value chain have been created, specifically in rural areas, thereby ensuring an increase in and diversification of income. Traceability software. High-volume transactions like farmer registration, prepayment, purchase, logistics and payments are recorded and synchronized in the field in real time via smartphone. An intuitive laptop application supports data analysis, facilitates operational field support and ensures traceability. SAP Value chain management/ traceability.	Mozambique
44	■					Communication Platform	Farmers Union of Malawi	X	FUM Communication Platform by Farmers Union Malawi is an internet-based product that can send bulk short messages to farmers that have their mobile phone numbers uploaded into the system. FUM is managing the platform in partnership with Agriculture Commodity Exchange for Africa (ACE). Information ranges from crop production techniques such as plant spacing, fertilizer application, storage; market information related to input suppliers, prices of inputs. The platform bridges the information gap that has existed between farmers and other value chain actors like private companies and extension advisory service providers. The platform is cheap and easy to verify. The Platform has contacts of leaders of farmer organizations representing major commodities such as legumes, dairy, cotton, coffee, tea, sugar, beef, and others and District Farmer Unions (DFU) leaders from all Extension Planning Areas (EPAs)in Malawi.	Malawi

45	■	■	■	■	■	Crowd Funding Platform for Poultry Farmers	iFarming	X	iFarming (formerly trading under the name of Namasiku Bainga). Their website is under development and are an emerging agribusiness focused on digital advisory, agri digital financing through crowdfunding, digital procurement, agri e-commerce and smart farming. iFarming has a two-pronged strategy, which includes processing and marketing facilities at key areas across the country, here we will consolidate, process, grade, package and market chicken products from small to medium scale farmers. Via their crowd farming platform, anyone from anywhere in the world can invest in these farmers who will turn have working capital to continue farming and to expand operations. They have included have sensors monitoring the vital conditions and environmental conditions to reduce mortality and increase production. They bring farmers, investors and markets together on one platform, and go into contract with small farmers, who will supply broilers and eggs and they will market the eggs and meat.	Namibia
46					■	Culturafresh	Cultura Fresh Pty Ltd	X	The company uses its water-efficient growing technology where it uses 10% of the water required for conventional land-based agriculture. Culture Fresh is a Western Cape based hydroponic vegetable producer supplying major national retailers with a range of high-quality fresh produce and using smart and precision tools for cauliflower, lettuce and other leafy greens.	South Africa
47	■					DAES v1	Ministry of Agriculture	✓	DAES v1 is an Android App that is designed to target farmers, extensions workers and other government workers and stakeholders. The app provides: agricultural advisory services, extension worker contacts, marketing information and climate and weather forecasts. The app is fully funded by the Government of Malawi Ministry of Agriculture. It is a free service that is available to all, with a smartphone. The innovation has reached sustainable scale with most farmers and extension agents using it, but further scaling is necessary to increase the usage of the app across the whole country so that it can be used by every farmer and agriculture agent.	Malawi
48	■					Dial a Mudhumeni/Advisory Helpdesk	Cassava Smartech (Vaya Digital Farmer/EcoFarmer)	✓	Dial a Mudhumeni/Advisory Helpdesk (2017) from Cassava Smartech (Vaya Digital Farmer/EcoFarmer). Through the Dial-a-Mudhumeni advisory call centres, customers with an Econet line can call 144 to talk to a farming specialist for FREE on any of the following helplines hosted by EcoFarmer's specialist partners (for market prices and horticulture information, tobacco as well as livestock. It is key to note that this service is being reworked by the VDF Team, and they aim to relaunch it with more on offer for their farmers. It was accessible/available to all their 1.4 million farmers.	Zimbabwe

49				■		Diaspora Agriculture Finance Plan	Cassava Smartech (Vaya Digital Farmer/EcoFarmer)	✓	Diaspora Agriculture Finance Plan from Cassava (Vaya Digital Farmer/EcoFarmer). The Diaspora Agriculture Finance Plan allows Zimbabweans that are based in the diaspora to buy agricultural inputs and pay for tillage services for their loved ones back home. It is a one-stop-shop for agricultural inputs such as seeds, chemicals and fertilizers. The number of registered users is unknown as the team is reworking the service at present.	Zimbabwe
50	■					Digital Grow	Fondation Ondjyla	✓	Digital Grow. This innovation from Fondacion Ondivia was established in 2017 is a tool with 2 components active in Angola and Mozambique. It has 1,500 active users and 2,300 registered users and deals with digital advisory through AgriVAS: One to many advisory covering agricultural livestock information and addressing knowledge gaps leading to low productivity. A resource centre - digital library, free access with technical documentation to support family farming, including books, technical articles, videos or practical exercises, being found in 4 languages: Portuguese, Spanish, French and English. The contents of the Digital Library are tailor-made, essentially for the most disadvantaged regions and a virtual Platform that, in partnership with universities and research centres in Africa and Latin America, promotes training at different levels, promoting transfer of know-how and South-South relations. Digital Grow develops technical training tailored and adjusted to the local reality, especially suitable for geographies with weak internet and less sophisticated devices, operating offline. The contents of this training allow the farmer a deeper knowledge of the entire production process and value chain, a better use of resources, a reduction in production costs and an increase in production and income. They use smartphones, a website and dashboard and portal, both local and cloud-based software. Their challenges are understanding the market, and user needs, accessibility, digital literacy and use by marginalized groups. Their funding has come from impact investors and donors and is dependent on them.	Angola, Mozambique
51	■	■	■			Digital Insurance Solution for Index/Parametric Insurance	CelsiusPro	✓	Celsius Pro is a Swiss Insurtech company specializing in index solutions to mitigate the effects of adverse weather, climate change and natural catastrophizes. Since 2016, they are registered private sector company with presence in Mozambique, South Africa and Zambia. End-to-end digital platform to structure and administer index/parametric solutions (e.g., agriculture insurance). Includes an Environmental Monitoring System that sources all relevant remote-sensing (satellite) data for weather, climate and natural disasters. Also digitalizes insurance policy documentation and payments. They provide specialist services that provide regional and localized weather forecasts. This sub-category may include weather-adaptive and climate-smart advice. Digitally enabled agricultural insurance services that help smallholder farmers mitigate the risks associated with external shocks such as weather events and pest and disease outbreaks.	Mozambique, South Africa, Zambia

									Agricultural insurance includes weather index, area yield index, multi-peril, livestock and livestock index insurance products. The solution enables improved efficiency of parametric agriculture insurance processes including access to rural regions basing products on satellite data. Increasing financial inclusion and resilience to climate related natural disasters and crop yield losses. The innovation uses computers, smartphones and basic feature phones, and channels including SMS, smartphone Apps, Website, dashboards, and a portal. Challenges include user affordability, digital literacy and farmer uptake/use/behaviour change, and regulatory and policy environment factors affecting the operational environment. Scaling stage to other geographies.	
52	■					Digitization of agriculture	HOREB (Hygiène, Organisation et Restauration de l'Environnement et de la Biodiversité)	X	Digitization of agriculture of HOREB (Hygiène, Organization et Restauration de l'Environnement et de la Biodiversité). The HOREB initiative, together with CRS and Orange Madagascar, launched a pilot project in the rural communes of Milenake and Ankililoaka, district of Toliara II in the Atsimo-Andrefana region. The beneficiary communities are equipped with smart TVs and an internet connection to interact and exchange directly with agricultural technicians	Madagascar
53	■		■	■	■	Dipar Systems	Dipar Systems	X	Dipar Systems is a technology solutions provider. This private business has been in operation since 1992, and as an independent company since 2002. Focusing mainly on tailor-made solutions for the Fruit Industry. They are experienced in many different aspects of the Fresh Produce Industry, although focused mainly on Information Systems. They have pioneered the use of offline capable, database driven mobile applications in the South-African fruit industry. Their Mobile & Web applications are being used from the development of new varieties all the way through the supply chain including conducting overseas arrival inspections. DiPAR Systems has a number of systems that combine Web, Mobile and Dynamic Reporting to give clients ultimate flexibility with regards to remote access as well as online and offline access. Their Dynamic Reporting Tool further supports the flexibility provided by their applications. They also do customized development for individual clients on request. DiPAR Systems provides system solutions to Farms, Pack-Houses, Cold Stores, Marketing Agents (or Exporter), Quality Inspectors, Inspection Agencies, Breeders, PPECB, Nurseries, Sterile Insect Technologists, Importers and Variety Evaluators or Developers, with electronic data flow between many of these supply chain players and agents.	South Africa
54	■		■	■	■	Drone Crop Spraying Services	Alley Capital Group	✓	Drone Crop Spraying Services (2018) from the Alley Capital Group. They provide pesticide management services using advanced drones for crop spraying. Their solution is climate	Zimbabwe

									friendly and more effective as a tool for protecting food systems compared to traditional methods. Unknown registered users.	
55	■				■	Drone for Development	Farming and Technology for Africa	✓	Drone for Development Madagascar of Farming and Technology for Africa (FTA). Drone for Madagascar (D4D) wants to combine technology and rural development. Through the use and processing of data provided by a drone, D4D wants to provide quick and effective solutions in several areas: agriculture, environment, sanitation, land use, forestry, tourism, etc.	Madagascar
56					■	Drone Survey	Alley Capital Group	X	Drone Survey from the Alley Capital Group. The drone survey provides high resolution maps for aerial survey services applicable to agricultural surveys, general mapping, infrastructure inspections and project or site assessments.	Zimbabwe
57			■			E- Licence application for Exporters of Agri-products and Agricultural ERP	Twenty Third Century System	✓	This is a private sector company operating in Malawi, Mozambique, Namibia, Tanzania, Zambia and Zimbabwe. They are a software solutions company providing services to businesses including agribusinesses and farmers for digital certificates. Their innovation is an e-License application for Exporters of Agri-products and Agricultural ERP where Farmers apply for export licenses online using a clean and friendly user interface was launched in 2020. They have135 active users of which 85 are registered. These licenses enable access to export markets. They use smartphones and computers and have a website and use spreadsheets and cloud-based software. They address a knowledge gap and face challenges around understanding the market, user needs and accessibility by users, language and literacy levels, digital literacy, data collection and the inclusive nature of their application. They are in a scaling stage of their innovation and have used impact investors to develop the innovation but currently rely on donor subsidies and will continue to do so.	Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe
58			■			EAN 128 & PMA SCANNING	Innodis Poultry Ltd	✓	Innodis Poultry Production Dashboard. Innodis is an agri e-commerce wholesaler and smart farming large-scale company which is using digitalization for its internal value chain processes to identify bottlenecks and monitor production. It is also a Poultry production company and is part of the Grocery and Related Product Merchant Wholesalers and was started and incorporated in 2015. From survey information this e-commerce platform seems to have been launched in 2020 and looking carefully at it is focused on imported livestock, seafood and fish, fruit and vegetables and cereals as well as dairy products etc. which are both fresh and frozen. There are many different enterprises and companies under the Innodis brand including importation, distribution and warehousing facilities. They have 10 active users and 15	Mauritius

									registered users. They require computers, basic and feature phones and smartphones, including a website, dashboard, portal and use Excel and cloud-based software SQL. They are challenged with limited traceability, procuring from technology vendors, a lack of technical capacity and operational constraints. They address planning, storage, post-harvest processing, transport and access to markets and are transitioning to scale. The reason for its inclusion is that is has an internal dashboard adapted software from their Chick Supplier partner which enables them to monitor their chicken production platform, but this is at an early stage. They also recently won an award for COVID-response adaptation. (Their survey responses were focused on their e-commerce marketplace product).	
59		■				Ecocash mobile payment platform	Cassava SmartTech	X	Ecocash mobile payment platform from Cassava SmartTech. EcoCash is an innovative mobile payment solution that enables customers to complete financial transactions directly from their mobile phone.	Zimbabwe
60	■			■		EcoFarmer Bulk SMS	Cassava Smartech (Vaya Digital Farmer)	✓	EcoFarmer Bulk SMS (2013) from Cassava Smartech (Vaya Digital Farmer/EcoFarmer). EcoFarmer's Advisory and Advertorial Bulk SMS service allows farmers to keep in touch with existing and potential suppliers and buyers. It is a service that allows agribusinesses to communicate with farmers producing specific commodities in specific regions, advising them on the best production practices and giving them offers via SMS. There are 1.4 million farmers on the platform.	Zimbabwe
61	■					EcoFarmer SMS Advisory Tips	Cassava Smartech (Vaya Digital Farmer/EcoFarmer)	✓	EcoFarmer SMS Advisory Tips (2015) from Cassava Smartech (Vaya Digital Farmer/EcoFarmer). EcoFarmer SMS Advisory Tips is a subscription-based advisory service offering tips to farmers. Farmers have access to the following tips: Maize, Groundnuts, Tobacco, Cattle, Goats, Bees, Sorghum. Tips on each commodity are payable daily, weekly or monthly. It has 6,000 registered users.	Zimbabwe
62				■		e-Farmers	e-Farmers Consultancy	✓	e-Farmers (2018) from e-Farmers Consultancy (2018). e-Farmers mobile platform seeks to address farmers' needs, foster productivity and performance of individual farmers, including members of the agro-value chain, through digital marketing, farmers profiling and advisory services. It operates in Lesotho only.	Lesotho
63		■		■		eKilimo	Master Card	X	eKilimo from Mastercard. A mobile solution developed by the Mastercard Lab for Financial Inclusion. eKilimo is a digital platform accessed via a smartphone that will help introduce efficiency, security and transparency in the agriculture supply chain. eKilimo will help to make transacting faster, safer, and easier for all stakeholders including the	Tanzania

									farmer, the buyer and the agent. Using a digital platform developed by the Mastercard Lab, eKilimo helps by providing price transparency and more direct access to buyers.	
64	■		■		■	Electromagnetic Induction Soil Scanning Services	Revolute Systems	✓	Electro-magnetic Induction Soil Scanning of Revolute Systems. EMI soil scanning, launched in 2017 involves an innovative method of creating highly detailed maps of soil variation. This is done by dragging an EMI scanner behind an ATV across the soil surface, creating maps of variation in soil electrical conductivity, in return indicating where changes in soil texture exist. Used to created target soil sample positions and drainage designs and improve irrigation block planning. Also used to help with soil moisture probe placement and targeted mulching. There are 30 active users and 140 registered users of this technology which focuses on digital advisory, digital record keeping replacing paper-based systems and digitizing transactions between farmers and agribusinesses and smart farming applications. Their digital advisory is Agri VAS based one to many, they also provide climate and weather information on IVR and helplines and text SMS and USSD. The smart advisory is based on tailored farm level agro-climatic and crop specific information and decision support to maximize productivity and reduce costs. Sensors, satellite and drones as well as AI are utilized. Increased productivity by creating detailed map of soil variation, to be used in from planning new developments, and management of existing ones. Can be used for targeted soil samples, drainage design, probe placement, irrigation block design and mulching. The innovations rely on computers, sensors (weather stations, IoT, satellite geodata) and channels include website, dashboard and portal with clous based and Ai platforms and software as a service. Challenges include understanding the market and user needs, affordability, digital literacy, lack of technical capacity within and outside the company and systemic factors such as regulatory policy, lack of mobile coverage, and product translation into local languages. The innovation has reached sustainable scale and widescale adoption. Wide adoption by some of the biggest agricultural co-ops in table and wine grapes, apples, citrus industries in South Africa, with yearly returns by them to do more surveys of their production areas. Challenges include understanding the market and user needs, procurement of technology vendors, digital literacy, data collection issues, operational constraints, trust, and product development into local languages for greater understanding by end users.	South Africa

65	■	■	■	■		eMKambo (eMarket)	Knowledge Transfer Africa Private Limited	✓	eMkambo (eMarket) (2012) from Knowledge Transfer Africa Private Limited. eMKambo is an interactive platform comprising a knowledge centre situated at Mbare Market agriculture market for aggregation and coordination of knowledge and information for sharing. Also: · A call centre (with 16 lines of NetOne, Telecel & Econet) situated at Mbare Agriculture Market, Mbare Harare; · Bulk SMS system; · Mobile App; · social media – WhatsApp, twitter & Facebook v. Website (www.emkambo.co.zw) · Weekly Newsletter – eMKambo Vibe (https://emkambo.wordpress.com) · Local newspaper with weekly columns (Newsday and Herald) targeted at decision makers. · Radio programme –National FM every Monday, Wednesday and Friday at 8:05am. The wide range for physical, mobile phones and internet approaches ensures the interests of farmers and other value chain actors are met. 1.2 million registered users.	Zimbabwe
66			■	■		E-Mola Mobile Money Service	M-Mola SA	✓	Movitel is an MNO with the most extensive fibre optic network in Mozambique established in 2011. It has resulted from a partnership between a Mozambican company SPI (Investment management) and Viettel Telecom (multinational Vietnamese Telecommunications company). They offer multiple services from mobile phone packages, to fixed internet and this includes Money Deposit, Money Transfer, Payments, Money Withdrawal and Credit Purchase. E-Mola is Motivtel's mobile wallet launched in 2016 allowing withdrawals and transfer of money, purchase of Credelec and credit and payment of water, TV, Internet and other bills. The App is available on Google Play and the App store. It enables transactions, easy bank transfers, savings and an opportunity to buy credit with a 120% bonus. Movitel have 184,8651 active registered users and facilitates digital records and digital payments with traceability between farmers and agribusinesses, digitizing transactions between farmers and agribusinesses, integrating digital payments as part of the crop procurement process and supporting traceability between 'farm to fork'. The service bridges a knowledge and financial exclusion gap and facilitates access to markets and is an alternative to poor internet. The solution facilitates input and output platforms to enable farmers to sell their produce and buy their inputs and facilitates B2C and B2B models. The service uses SMS, USSD, Websites, Dashboards and a portal. They use local MS Access databases and cloud bases SaaS services. Challenges include user accessibility, language and literacy levels, digital literacy limitations, lack of mobile coverage, electricity, and trust. The service has	Mozambique

									reached sustainable scale using a business model based on transactional costs. Enterprises and social enterprises have been engaged in the development of the product and is reported to be inclusive of underrepresented groups.	
67	■			■		eMsika	eMsika Services Ltd	✓	eMsika (2016) from E-msika Services Ltd. eMsika is an online agriculture marketplace for farmers and agro-retailers to Find, Buy and Receive farm inputs across the country. They have around 1500 registered users.	Zambia
68			■	■		Emtel Cash	Emtel Ltd	✓	This is an innovation from the Emtel Ltd company, a private company incorporated in Mauritius in 1987. It was the first mobile telephony operator and has now evolved into a one stop shop for ICT solutions including providing unlimited internet connectivity at the household level (Airbox) and the first 4G network in Mauritius. They also have invested in undersea Optical Fiber Cable and this has come into service in 2021 (Emtel is the only operator in Mauritius to own capacity on all three submarine cables going out of Mauritius – LION, SAFE and METISS). Launched in 2015 the MNO based Emtel Cash enables storage, transfer and receipt of money using a mobile phone through a digital and agri-wallet. The system has recently innovated to allow payments to be made to any other mobile phone, irrespective of the host mobile network provider. The initiative has played a role in changing payment habits from cash fuelled by the pandemic and social distancing. The system uses SMS, USSD, Smartphone Apps. They use spreadsheets such as Excel and Cloud-based databases such as SQL. They service all parts of the value chain where payments are needed. They have 3,600 active users and 6,800 registered users and have grown through private financiers. They charge subscription rates and address poor access to markets for farmers and cashless payment systems solutions. They are faced with challenges such as digital literacy, access to device (sharing between friends and family), product development or translation into a local language for greater understanding by end users. Their technology is inclusive of women, youth, the elderly and people with disabilities.	Mauritius
69		■	■	■		eShops	Multiple Internet Payment System (MIPS)	✓	This is a free commerce website with integrated payment solutions launched in 2020 which has a relationship with a number of online shops and thousands of users (visitors and customers) to increase the efficiency of selling products and receiving payments. Several of the operators on the local Food sector are hosted on the platform. This private company has 300 on-line shops (B2B) with thousands of users. They use cloud-based software as a service through third parties and address all parts of the value chain where payments are necessary. They charge transaction fees and deal with financial exclusion and cashless payment systems that are linked to banks. They have found understanding	Madagascar, Mauritius, Seychelles

									the market and user needs challenging as well as digital literacy, shared devices and farmer uptake/use/behaviour change. They believe their technology is inclusive.	
70	■					Esoko Platform	Esoko	✓	Esoko was established in Ghana. It is an agricultural profiling and messaging service that provides automatic and personalized price alerts, buy and sell offers, weather information, agricultural tips and voice-based services. Its services have expanded to include data collection, biometric profiling, analytics, communication services, digital credit, insurance, and payment services. The aim of the innovation is to reduce the cost of communication and improve value chain management for stakeholders in the agricultural sector. Developed in Ghana the innovation is implemented in a number of African countries and is currently being used in Malawi by the Ministry of Agriculture.	Malawi
71	■			■		E-soweto	E-Soweto farmers market	✓	E-Soweto (2020) from E-Soweto farmer's market. E-Soweto Farmers Market is a social enterprise providing live online market price information to all stakeholders in the agriculture sector. They focus on fruits and vegetables. In the vegetable market they closely monitor market prices for Tomatoes, Onions, Carrots, Cabbages, Cucumbers and Potatoes. In the fruits Market updates on Apples, Bananas, Pineapples and Watermelons. User numbers are not available.	Zambia
72		■				eSusFarm	eSusFarm Eswatini	X	eSusFarm is an Agri-fintech the specializes in tracking and providing advanced agricultural statistical data to smallholder farmers and the entire Agri-value chain for the purpose of increasing agricultural productivity, smallholder market and credit access and increase the efficiency of the Agri-value chain. The have a Facebook page in Eswatini, which highlights a USSD String *700# which utilizes the Eswatini Mobile Network. eSusFarm collects agricultural data through a mobile feature phone and enables linking farmers to market, credit provider and an existing track record and enabling them to link to other stakeholders such as tractor services and Transport, Input suppliers (e.g., fertilizers), buyers of produce, banks and insurance companies, development partners, governments, IoT providers and drones and satellite services. The farmer gets connected without the need for Wi-Fi, mobile data or a smart phone. eSusFarm declined to fill in the survey tool.	Eswatini, South Africa
73	■			■		eVetcare Livestock e-Extension	eVetCare Limited	✓	eVetcare Livestock e-Extension (2020) from eVetCare Limited. eVetCare is an online platform that links veterinarians and veterinary input suppliers to farmers that do not have ready access. The underlying principle is to make veterinary services and input accessible to all farmers available all the time (24/7). They have around 160 registered users.	Zambia

74				■		E-vokatra	Tranoben'ny Tantsaha Mpamokatra (TTM)	✓	e-vokatra of Tranoben'ny Tantsaha Mpamokatra. This is a producer's association. E-Vocatra is an e-commerce platform for producers. It is in a concept phase.	Madagascar
75		■		■		E-Voucher System	FAO	✓	This is a UN FAO in conjunction with the Mozambique Government Subsidy scheme. The e-vouchers component aims at increasing smallholders' farmers' access to agriculture inputs (seeds, fertilizers, agrochemicals) and at improving their knowledge on the cost-effectiveness of their use. The logic of intervention address both farmers and agro-dealers with a twofold approach: 1) provide farmers through e-vouchers with direct capital transfer, as a subsidy contribution for the co-payment of input supply; and 2) supporting the establishment of a network of inputs agro-dealers that could reach farmers in most remote areas. This was established in 2015 and has 5,500 active users, although 109,000 households are registered within the e-voucher intervention (including both emergency and development projects). The innovation uses Smartphones, Smartphone App, website, dashboard, and portal and relies on Excel and proprietary MIS. It addresses low productivity and poor access to markets by providing inputs, advisory to access markets. The challenges are digital literacy and efficient data collection and is in the process of scaling to other geographies. There is also a dominant culture of free input provision and distribution through government projects and works against getting farmers to pay towards these acquisitions. There is also not the volume of agro dealer networks to respond to farmers demands in terms of diversification and quality of inputs. The innovation services primary user and has been developed through donor and government grants and continues to rely on this support. The innovation was developed through national government and international philanthropic programmes including local and national government actors, commercial agriculture companies. The technology has been developed with deliberate actions to make it inclusive of underrepresented groups. There are good results obtained through FAO on increased in sales and improved use of agricultural inputs and their availability, increased customers in the form of farmers and greater trust between agro-dealers' farmers and other trading partners	Mozambique
76	■					Extension Suite On-line	Manstratais Agricultural Inteligence Solutions	X	Extension Suite Online is an internet-based application developed by Manstrat Agricultural Intelligence Solutions (Pty) Ltd to provide an important linkage and information transfer mechanism between Agricultural Research and Extension Services, and the farmers that they serve. As such the system facilitates and enhances the transfer of information between these parties by collecting, collating, interpreting, and transforming scientific agricultural related data into useful and user-friendly formats for use by Extension Practitioners and Farmers. The information and content in Extension	South Africa

									Suite Online is well organized allowing the Advisor to find the relevant information quickly and respond to farmers' requests within a short period. There is direct access to experts through Extension Suite Online and if you cannot find a solution on the system you will find a solution from an appointed expert in the relevant field. Manstrat has, through Extension Suite Online, developed the means to, not only reduce the many constraints in the dissemination of relevant and timeous information to farmers via Extensionists, but to do so cost effectively. The online application specifically aims to facilitate easy access to, and the effective dissemination of; agricultural related information and best practices to break down informational, geographical, and political borders and constraints that currently hinder growth. The core system is automatically available as part of any system tailored to the specific needs and requirements of a client and contains a wide range of component	
77	■				■	FAMEWS	FAO	X	FAMEWS of FAO. The FAW Monitoring and Early Warning System (FAMEWS) is a free mobile application for Android cell phones from the Food and Agriculture Organization of the United Nations (FAO) for the real-time global monitoring of the Fall Armyworm (FAW). This multi-lingual tool allows farmers, communities, extension agents and others to record standardized field data whenever they scout a field or check pheromone traps for FAW.	Democratic Republic of Congo
78	■			■		FAREI Digital Repository	Food and Agricultural Research and Extension Institute (FAREI)	✓	The FAREI Website provides advisory on agricultural production and markets in general, publications on the key research agenda areas, agro processing information, promising potato varieties, on-farm trials and information on potato cultivation as well as onion germplasm through e-newsletters. They also provide a video channel where farmers can learn about production system for different crops, biological control for key pests in Mauritius and dairy production. They provide severe weather forecasts warning. Digital innovation is mostly undertaken to support the farming community and stakeholders in agriculture. Since Mauritius is digitally well connected and farmers have access to internet and mobile device, the environment is conducive for innovation. Information, service provision and payment platforms are in the outreach of over 90% of users of the agricultural sector. Web and mobile application are easily accessed and used by most people in Mauritius. It has 3,500 active users and is a Public, Private Partnership Initiative.	Mauritius
79	■	■	■	■	■	Farm City Agripreneur Hub	Farmcity	✓	A private sector social enterprise launched in 2020 providing digital advisory, agri e-commerce and an educational programme for youth. The Agripreneur Hub where this is based has physical infrastructure to host young entrepreneurs on site and provides advisory support. They have a 9,500 m2 organic farm on site and open workspace and	Mauritius

									training facilities and incubate a number of different businesses including Ti Karo, Fish and Veggies and Oyas of Mauritius. They also have tenants and work with Partners including Beau Plan Aquaponics, ICHTHYS Aquaponics and Just Natural. All are working towards a sustainable food system. Farm City have 2 active users and 5 registered users and deals with agricultural advisory through Agri VAS, smart advisory and record keeping. It also provides crowdfunding, input financing and digital and agri wallets, digital records for digital solutions and input and output opportunities for e-commerce, as well as smart farm options with equipment monitoring. They use basic feature and smartphones, website and portal, social media platforms (Fb, Twitter) and messaging (WhatsApp and Messenger). They use Excel and SQL. They address low productivity, financial exclusion and poor access to markets and have been challenged by user affordability. They allege they are at sustainable scale, but the numbers do not bear this out and the Agripreneurs Hub that host them has struggled during Covid lockdowns. They charge individual subscription fees, transaction fees and are also dependent on donor subsidies. FarmCity has also innovated with the promotion and sale of urban agriculture kits through its online shop. The concept, which originated in Mauritius, has been upscaled and marketed in the Singapore branch of the Hub.	
80	■				■	Farm Pin	Incubated by Afro labs and Agro Innovation Lab	X	FarmPin is a small start-up with a big vision to help farmers pinpoint plant performance using satellites the cloud and very smart Agri experts. Incubated by AfroLabs and Agro Innovation Lab they are based in Cape Town. Using their plant health and moisture maps issued every five days and covering the past two seasons, Farmers have already started to see, Crop stress area, Plant moisture distribution zones and where clogged nozzles may be. These services are currently being charged as an annual subscription of ZAR9000 pa.	South Africa
81	■	■	■	■		FARM4TRADE Namibia	The Namibia Agronomic Board	X	FARM4TRADE Namibia of the Namibian Agronomic Board has a website and promotes the agronomic industry enabling facilitation of production, processing, storage and marketing of staple products in Namibia. They provide regulatory services and permits, agronomy with market pricing information, horticultural and research and development services. They have regulatory services to ensure a sustainable crop industry in Namibia. They undertake Board Control and Farms and Facilities Inspections. This is necessary for local marketing mechanisms for agronomic and horticultural crops to ensure that produce imported into or exported out of Namibia is safe and of good quality. They also provide agronomy services on white maize, pearl millet and maize as staples and despite farmers having a secured market through grain trading and marketing mechanisms, Namibia imports these crops. NAB issues permits and marketing mechanisms and	Namibia

									information to enable farmers to produce these crops and import any that are necessary. Similarly, Namibia imports fresh fruit and vegetables, but traders must buy 47% of produce produced locally. NAB provided services geared at facilitation production and marketing and implements the market share scheme. They undertake continued research and produce market intelligence reports and enterprise budget guides. The facilitate opportunities for commodity trade and e-commerce although these offerings are not digital at present.	
82	■			■		Farmer Radio Programs	Farm Radio Trust	✓	Farm Radio Programs by Farm Radio Trust for Malawi is a radio program that educates, informs and equip farmers with required knowledge about sustainable agricultural practices.	Malawi
83	■		■	■		Farmers Online Marketplace	National Institute for Science, Technology and Innovation Seychelles	✓	Farmers Online Marketplace of the National Institute for Science, Technology and Innovation (NISTI) for the Seychelles. An innovative digital marketplace giving Seychelles local producers a new home to connect and build personalized relationships with consumers. This is currently under development.	Seychelles
84	■			■	■	Farmforce	Paltrack	X	Paltrack is a leading supplier of software solutions, product coding and integration services to the South African agricultural industry. Its focus is on supply chain visibility from producer to port and building and source software solutions that meet unique customer's needs through all market verticals. Paltrack's primary clients are in the fruit and aquaculture industries, but the software is agile and customizable for many traceability requirements. Farmforce is a cloud-based platform for managing farming activities, establishing traceability, and ensuring compliance. With the Farmforce app installed on their smartphones or tablets, users in the field can quickly and accurately record information about farming activities – including planting, fertilizing, harvesting, selling and more. This information, and the visibility it is providing, can be shared with other authorized users on their mobile devices or personal computers. Farmforce integrates with Paltrack's farm, packhouse and exporter solutions. The PALFARM features software functionality is intended to satisfy the farmer's requirements with regards to label printing and document generation.	South Africa
85				■		Farmio	Qurima (Pty) Ltd	✓	An ecommerce platform where agricultural buyers flight their requirements and invitations to tender, and producers bid to supply.	South Africa
86	■	■	■			FBSInnova mobile app	Agro Innova Company Limited	✓	AgroInnova Company was established in 2019 in Ghana and operates in Ghana and West Africa and is a private company. FBSInnova is a functional, modular smartphone application that helps smallholder-farmers have on-demand access to Farmer Business	Mozambique

									School (FBS) tools and information, plan and efficiently manage their crops and diversify their production for increased profitability and improved livelihoods. It was established in Mozambique in 2021 with 436 active users and 619 registered users and is a clear digital advisory VAS service provider. The advice covers agricultural and livestock management information, weather and climate as well as market prices. The tech is being used across 8 countries (Ghana, Cote d'Ivoire, Mali, Burkina Faso, Cameroon, Nigeria, Mozambique, and Tunisia). Agri VAS are delivered via voice channels (IVR, helplines), text channels (SMS and USSD) and via apps., Smart advisory: Data-driven advisory based on tailored, farm-level agro-climatic and crop specific information to support decision making, maximize productivity and reduce costs. Technologies such as sensors, satellites, and drones, as well as big data analytics and AI, underpin many of these services., Weather information: Specialist services that provide regional and localized weather forecasts. This sub-category may include weather-adaptive and climate-smart advice, Record keeping: Digital tools that enable farmers to keep detailed records of livestock, including health and feeding data, to help mitigate diseases and avoid missed conceptions. Record keeping tools are also used to keep details of input usage, procurement, cost and revenue and sales records. There is some value in terms of enabling farmers to view farming as a business by enabling them to track farm expenses and revenues to build their creditworthiness, which would lead to greater access to finance although this is not provided with the application. The solution enables smallholder farmers to use digital technologies to maximize their production efficiently, track, learn good production practices, diversify their crops to maximize their returns. The application bridges data gap and maximizes supply chain efficiency. It uses smartphones and has a Smartphone App. It uses spreadsheets such as Excel and MS Access and bridges the knowledge gap, promotes greater financial inclusion. Common challenges are language, literacy and digital literacy level, and the uptake by farmers and behaviour change amongst farmers. The lack of connectivity, network coverage is also challenging as is the financial sustainability of the business model. They are transitioning to scale, and work closely with primary users, tech providers to enable provision of the service to end users and the application has been developed through donor and government support.	
87	■					Films pédagogiques	FIFAMANOR	✓	Films pédagogiques of FIFAMANOR. The technical sheets of the several themes have been digitized in video and shared with the internal and external network of FIFAMANOR	Madagascar

88	■	■		■	■	FINCLUDE	Centre for Financial Inclusion	X	The Financial Inclusion and Cluster Development Project (FINCLUDE) is a pilot project that is being tested in selected areas of Eswatini. It is through an agreement with IFAD and the Government of Eswatini which commenced in 2019 for a period of 6 years to increase the profitability and sustainability of rural economic activities through a comprehensive and multi layered set of interventions. The Centre for Financial Inclusion is a semi-autonomous body under the auspices of the Ministry of Finance to facilitate access to financial services for micro-entrepreneurs and the un-banked population through creating an enabling environment for the sector. FINCLUDE will provide support to stakeholders to develop profitable value chains and support entrepreneurship in commodity-based clusters in different locations that have competitive advantage. The project seeks to increase returns from sustainable farm and non-farm enterprise. The former includes key commodities red meat (beef/goats), piggery, indigenous chicken, vegetables, and legumes. Non-farm enterprises include those which enhance or promote operations of the agricultural value chain such as transport, cold chain storage and hire of tractors. The locations of the project are Manzini and including selected areas in Tiers 1+2, Hhohho including selected areas in Tiers 1+2, Lubombo and selected areas in Tiers 1+2 and Shiselweni and selected areas of Tiers 1 and 2. They did not fill out the survey.	Eswatini
89			■			Food Processing Software	Matrix Software	✓	Matrix Software is a meat and food matrix software solution for stock control, yield management, traceability, productivity, and cost margin management. Matrix Software is a service-led private company that provides software services predominantly to the livestock and meat industry and established in 2019. These are digital, mobile and tablet-based systems for yield and stock control and statistics leading to costings and profitability. Matrix software utilizes android mobile scanners and their associated applications, RFID integrated solutions, automated weighers, and third-party integration. This reduces the initial capital outlays and good implementation support for feedlots, abattoirs, deboning plants, and meat processing plants including others such as fish, poultry, butcheries and retail outlets. Matrix Software has been located/incubated in the AgVentures Hub in South Africa. This regional solution is deployed in 10 SADC countries (Botswana, Eswatini, Lesotho, Mauritius, Namibia, Seychelles, South Africa, Tanzania, Zambia and Zimbabwe), but also in counties as Australia and New Zealand. Matrix Software solutions have reached a stage of replication and adaptation in other geographies and are in the Scaling state of development.	Botswana, Eswatini, Lesotho, Mauritius, Namibia, Seychelles, South Africa, Tanzania, Zambia, Zimbabwe
90	■			■	■	Fruitlook	eLeaf BV	✓	FruitLook in South Africa is a web-based portal with near real-time data based on satellite and remote sensing data modelling for the Western Cape agricultural sector. The FruitLook portal delivers weekly remote sensing data year-round for subscribing	Malawi, South Africa, Zambia

									farmers. FruitLook incorporates a suite of data products covering crop growth, evapotranspiration deficits, and crop nitrogen status provided on a near real-time basis updated weekly. These data products are relevant for orchards, vineyards, pastures, range lands and field crops. The quantitative and spatial information on water, vegetation, and climate is designed to enable farmers to better understand the effects of their water use and their farm management decisions. The FruitLook data and team inform farm operations on management decisions relating to irrigation scheduling and crop production. The service is free of charge and funded by the Western Cape Department of Agriculture and provides metrics such as biomass production, evo-transpiration, water use efficiency which are provided weekly for the largest part of the Western Cape throughout the year. They launched the FruitLook service in 2010 and have 500 active users and 2000 registered users and provide smart data driven advisory based on tailored, farm-level agro-climatic and crop specific information to support decision making, maximize productivity and reduce costs. Technologies such as sensors, satellites and drones, as well as big data analytics and AI, underpin many of these services., Weather information: Specialist services that provide regional and localized weather forecasts. This sub-category may include weather-adaptive and climate-smart advice. They enable resource use optimization and asset management (e.g., irrigation equipment). They use computers, satellite information and earth observation and technologies such as sensors, satellites and drones, as well as big data analytics and AI, to address a knowledge gap by farmers. Record keeping: Digital tools that enable farmers to keep detailed records of livestock, including health and feeding data, to help mitigate diseases and avoid missed conceptions. Record keeping tools are also used to keep details of input usage, procurement, cost and revenue and sales records., Information for farms to develop, manage, measure and report a sustainability strategy for their business. The channels are principally computers, cloud-based databases, website and dashboard. As a private company they have supported themselves, with support also from the Western Cape government. Their challenges include levels of digital literacy, farmer uptake and behaviour change and address pain points around planning, inputs and on-farm production. They are at the level of sustainable scale Implementing on over 300,000 Ha and resulting in water savings on farms and in catchments on average of 10% with as high as 30% in some cases. An integral part of the Western Cape Department of Agriculture's climate change response strategy. Their technology has been developed in conjunction with others and, has taken active approaches to ensure its inclusivity particularly for disadvantaged groups.	

91		■				Fundkiss	Fundkiss Technologies Limited	✓	Fund Kiss is a crowdlending platform to enable Mauritian SMEs to borrow directly from individual and institutional investors through a Regulatory Sandbox License (RSL) from the Economic Development Board of Mauritius. In April 2021 with an official Peer-to-Peer lending license from the Financial Services Commission (FSC) of Mauritius, they are offering financing and good customer experience to their borrowers and their investors. They have funded 178 projects to date, some of the operators in the agriculture and food sector. Improve access to finance. Fundkiss provides unsecured loans that do not require collateral or personal guarantee. Services are offered through a website: provision of short-term financing for SMEs including agricultural operators.; Crowdfunding: Online platforms that enable investment in smallholders by sourcing funds from individuals (investors or sponsors) following a simple KYC process with an ID card and a Utility bill to start lending. The innovation deals with all parts of the value chain, and uses website, dashboard and social media platforms. They use spreadsheets and have reached a level of sustainable scale with both a government grant and private funds. They have 252 active users and 2622 registered users. They address access to finance for SMEs with a good business plan but without collateral or personal guarantee. They have overcome challenges such as understanding the market and user needs, digital literacy, data collection and the financial sustainability of the business model. Their technology is inclusive of women.	Mauritius
92	■		■		■	GeoFarmer	GEOTERRAIMAGE (Pty) LTD	✓	GeoFarmer at GEOTERRAIMAGE Ltd is established in 2017 and has combined innovations in smart farming and digital advisory and e-commerce and are regional in their deployment across the entire SADC region. Whilst GeoTerraImage is a private sector company which provides actionable intelligence through monthly crop monitoring through GeoFarmer-©-Crop monitoring platform to support precision farming, and accurate information to map crop trends and statistics by using a dashboard in a cloud-based environment. The innovative solution provides through the use of computers, satellites and Earth Observation visual maps and illustrations, statistics and trends for each field or farm being analysed (crop type, crop growth stages, land suitability, crop irrigation) and guiding decision making around farm management and practices for more efficient and sustainable production. GeoTerraImage have reached wide scale sustained adoption and operate in Angola, Botswana, Comoros, DRC, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa,	Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia,

									Tanzania, Zambia and Zimbabwe. Through specialized software, proprietary algorithms and application GeoTerraImage use remote sensed data to create spatial information. They combine advanced information and reporting to enable analysis, quantification and monitoring to support key decision making. They charge business subscription fees for their fully commercial product and believe their technology is inclusive of underrepresented groups.	Seychelles, South Africa, Tanzania, Zambia, Zimbabwe
93	■	■		■	■	Global Farmers Connect	Global Farmers Connect	X	Global Farmers Connect operates in South Africa, Zambia, Zimbabwe. Global Farmers Connect is an artificial intelligence tool used to provide farmers with a platform to reach and sell their agricultural products directly to end consumers. Farmers also have access to information about their daily requirements such as farm equipment, greenhouse needs, animal farming, fertilizers, feeds and qualified agronomists' advice.	South Africa, Zambia, Zimbabwe
94					■	Green Excel	Future Vision	X	GreenExcel is a liquid bio-stimulant that can be applied through drip, Micro and other irrigations for irrigated plants or as a drench or in furrow at plating for dry land cultivated plants. The application of GreenExcel as part of a biological farming strategy enables the farmer to improve fertilizer use to increase the root zone.	South Africa
95	■		■	■	■	Greenery S	Freight Farms Inc	✓	Green Agro Farms - IoT Freight Farm System – imported precision agriculture system of Freight Farms Greenery Agro vertical hydroponic farm designed and built inside a shipping container with 320 square feet. This has a state-of-the-art controlled environment system with control of air, light, watering, spacing and management using the Greenery S integrated farmhand software which relies on IoT-connected sensors and auto-updating camera feeds for full visibility and transparency. The system has been used for 500+ crop varieties of leafy greens and provides an annual harvest of 2-4 tonnes. The farmhand shops provide everything necessary for a farming operation including tools, seed, grow plugs, nutrients and cleaning supplies either as individual products or through a subscription service. The objective is targeted production of pesticide-free high value leafy greens available throughout out the year, independent of the season and requested by niche markets such as restaurants. Launched in Mauritius in 2020 it is a private agribusiness utilizing computers and sensors (weather stations, IoT) and uses smartphone App, website, dashboard all focused on farm production. They are transitioning to scale and have been financed by private sources. They have 300 users and produce pesticide free high-quality product for niche and premium markets using traditional markets.	Mauritius

									They have been challenged by raising capital for new imported technology products, procurement of technology vendors, and systematic factors in the operational environment such as regulations and the sustainability of the business model. Their technology is inclusive of women and youth but may be inaccessible for low-income farmers and low literacy audience.	
96	■	■			■	GreenFingers Mobile	GreenFingers Mobile	X	GreenFingers Mobile from GreenFingers Mobile in Tanzania, South Africa, Zambia and Zimbabwe. GreenFingers Mobile is a mobile-first Software-as-a-Service (SaaS) technology platform, to manage and finance large groups of smallholder farmers. Developed by a team of agricultural value chain experts, the platform easily adapts to different crop types and use cases.	South Africa, Zambia, Zimbabwe, Tanzania
97			■			GSMA	Lecofruit	X	GSMA AgriTech programme of Lecofruit. A digital solution for farmer registration, procurement and mobile money payments in the green beans value chain.	Madagascar
98	■					Hippocampus	Hippocampus	X	Hippocampus Education launched in 2020 use machine learning to fine tune learning through adaptive and improving difficulty. Their solution is available on-line and delivered through mainstream channel for students particularly. It is effectively a personal digital tutor and an ed-tech chatbot that incorporates active learning using AI to keep improving.	South Africa
99		■				Holo	Comorian Development Bank	X	Holo from the Comorian Development Bank was launched in 2019 as a mobile banking solution and as an advancement for digital financial inclusion. It has the support of TagPay its technology partner. The service offers all its customers and users a full range of banking services accessible from any type of mobile phone, regardless of the telecom operator or with or without internet. The solution enables deposits and withdrawals of money instantly, transfers, payment or receipt of wages, payment of bills, safe purchasing transactions, reload of phone credit. This electronic account is attached to a phone number and are available on Android and iOS systems or using a simple first-generation phone. The service requires contact with an agent and registration. 7Holo already has 10,000 registered users. The bank has modified their minimum requirements to encourage users to open accounts, have built a broad network of agents and merchants and are adapting their offerings to provide more relevant services. Services are being used for salary disbursements, bills and tier payments, cashing In and Out or money transfers to other Holo clients or to other accounts. Their intention is to introduce QR codes to address merchants who do not want to have terminal POS for accepting payments.	Comoros

100						Humbitec	Humbitec	X	Humbitec of Humbitec. This is an EO company focusing on digital image and GIS processing. The company make use of satellite data to address challenges in various sectors including the health sector, management, agriculture, urban management and governance.	Angola
101						Huri Money	Comoros Telecom	X	Huri Money was launched by Comoros Telecom in 2021 (sole provider of wireless, broadband and fixed line services in Comoros since 2016 and mobile services in 2003) with a mobile platform to enable their customers who were already supported by internet, fixed line and mobile phones with an opportunity to conduct banking transactions. The approach ensures significant efficiencies for all citizens who had to travel even between islands to access physical banks. Now the services will be provided by concessionary organizations on site. The mobile money account enables cash transfers between individuals, payments for products and services and B2B transactions, cashing out, and paying for credit for mobile accounts. The formal launch of Huri Money took place in 2021 together with a mobile platform to enable Comoros Telecom customers to easily conduct banking transactions. The approach will reduce travel times for users since the services will be provided by concessionaries on site. This mobile money account enabling transfers, cashing out, recharging telephone credit and payment services. Their SIM card is at 2,000 KMF without credit. Top-ups are widely available. With Huri you need to add a 50 KMF fee to every 500 KNF face value in all stores, except CT agencies. To top up, enter *123* followed by the voucher code. Check balance by #123#.	Comoros
102						iDrone4ag	iDrone Services	✓	Idrone4Ag (2017) from iDrone Services. iDrone Services is a start-up company providing Agriculture mapping services using Drones. They are working with commercial farmers and private companies in the use of drone for precision agriculture applications. iDrone Services provides drone-enabled crop imagery database and analysis services to the Zambian farmers. The main application platform is to build a Digital Farmers Profile Database (Aerial Image Capture and Data Portal for Agriculture and Food Security in order to Strengthen District Governance). They have 12 users.	Zambia
103						iFarm App	iFarm	X	iFarm App by iFarm. iFarm is an agricultural ICT, logistical and tech services company based in Zimbabwe. The iFarm app has been developed to link farmers to markets and other key stakeholders, including the government of Zimbabwe, banking sector, outgrower schemes, agricultural boards and farmers' unions, seed houses and	Zimbabwe

									agricultural input suppliers, processors, research institutions and insurance companies in the agri-ecosystem.	
104	■		■			InfoHighway	Ministry of Information Technology, Communication and Innovation	✓	Info Highway is a secured infrastructure that shares information over the Government Intranet Network. The function is to provide the infrastructure for sharing of data amongst Government Agencies and is designed as the service platform, which allows multiple Government agencies to share data via E-Services to other agencies. The Info highway uses the publish and subscribe model whereby an agency willing to share data is the publisher and the one requesting data is the subscriber. Only the data that has been allowed to be shared can be transferred to the subscriber. Launched in 2016 it provides digital advisory through Agri-VAS on weather information and digital records enabling data sharing across organizations facilitating decision making. It utilizes computers and smartphones, a website, dashboard and portal and cloud-based databases and software. It has fond digital literacy, product translation into local languages for greater understanding challenging. It is focused on planning and inputs and is transitioning to scale. It has been financed by host country government funds and will remain dependent on this for some time.	Mauritius
105	■				■	In-Services training App	Welthungerhilfe Zimbabwe	X	In-Services training App from Welthungerhilfe. The "In -Training App" is focused on the Ministry of Agriculture extension officers with regards to training and knowledge transfer and thus enhancing the training and development.	Zimbabwe
106					■	InteliSeeds	InteliSeeds	X	Intelliseeds is an integrated brand of InteliChem group, offering complete integrated crop solution service. They are seed suppliers, and advice on disease treatment. They are a local distributor for Syngenta vegetable seeds and also canola, pasture, maize and soy crop market seeds. The supply sunflower, soy and canola through dedicated partnerships. Their IntelliGro Crop Solution specialists complement this work. They also provide seed treatment solutions and their specialists support growers countrywide.	South Africa
107	■					Intelligent Monitoring Systems-IMOSYS	IMOSYS	X	Intelligent Monitoring Systems by iMoSyS for Malawi. iMoSyS provides software, hardware and engineering services to enable connectivity for remote monitoring of Industrial processes, infrastructure, health issues and environmental aspects. iMoSyS provides Farm Management Services and have deployed Smart Irrigation Systems that apply sensor technology and soil analytics.	Malawi

108	■					Iringa – Mitigation, Adaptation, Productivity for Climate Smart Agriculture (IMAP4CSA)	Kilimo Trust	X	Iringa – Mitigation, Adaptation, Productivity for Climate Smart Agriculture (IMAP4CSA) from the Kilimo Trust. Part of Enable's Digital for Development (D4D) programme called Wehubit on scaling up digital solutions in Iringa region, it targets to benefit 12,000 smallholder paddy farmers by mapping in Iringa region. IMAP4CSA is a 2-year project (2019 – 2021) that aims at mitigating and adapting to climate change and increasing rice productivity by providing farmers with actionable information services, based on digital data systems, supporting them in better decision-making in risk management. It is funded by the Belgian governmental cooperation through their development agency Enable and Implemented by Kilimo Trust and Rikolto. The project's aims: · to strengthen farmers' rice-related climate change mitigation practices, · to support farmers in their adaptation to climate change and · to sustainably increase smallholder rice farmers' agricultural productivity and income by scaling-up digital knowledge and information services in combination with the Sustainable Rice Platform standard to smallholder farmers in Iringa region.	Tanzania
109	■			■		Jambo Maisha	Anglican Church Diocese of Morogoro (ACDM)	X	Provision of agricultural extension to smallholder farmers. The innovation makes use of drones for crops management. It is funded by Norwegian Church Aid (NCA)	Tanzania
110					■	Jardins da Yoba	Jardins da Yoba	X	Jardins da Yoba from Jardins da Yoba. Jardins da Yoba is an agribusiness company located in the province of Huila in Angola. Jardins da Yoba uses sustainable production systems with integration of the agricultural and livestock component is strongly committed to environmental sustainability and adequate use of resources. The production and multiplication of seeds is the core activity of our company, as well as the production of vegetables and fruit trees. The production of honey and bee products, as well as, the organic production of sweets and jams, constitute the present and future potential for export and commitment to excellence.	Angola
111	■					**Jembe**	Agrinfo	X	Jembe from Afrinfo A precision ag-tech platform that offers a full stack solution for high precision aerial surveillance imagery to pre-emptively avert crop yield loss due to insects, crop disease, weeds and nutrient deficiencies.	Tanzania

112			■			JuicePro	The Mauritius Commercial Bank Limited	✓	MCB-Juice is an innovation of the Mauritius Commercial Bank established as far back as 1838 with a single bank and now a Group with assets worth 16B $US and 60 branches or kiosks nationwide and active in Madagascar, Mozambique, Reunion Island Mayotte, Paris, Seychelles and the Maldives with a wide network of correspondent banks across the world. Launched in 2020 in Mauritius (and 2019 in the Seychelles), Juice is a mobile based banking system for businesses providing ready access to bank accounts and transactions. The Pro version enables multiple signatories to access and sign/approve as part of the workflow. Smartphone App is available on the App Store, Google Play and the AppGallery. Juice has 4,400 active users and 9,200 registered users and utilizes a subscription model. It is a private company at a sustainable scale in its development. It addresses financial exclusion, cashless payments, and has been challenged both by digital and financial literacy and sustainable business models but its technology is inclusive.	Madagascar, Mauritius, Seychelles
113		■	■			Jumo	Jumo	X	Jumo is a market leading banking as a service platform, launched in 2015, which enables real-time access to funds at the lowest possible operating costs. They offer high quality providers of financial services products to connect entrepreneurs to world's growing markets. They also offer loans, savings and a range of financial choices. They have a core next-to-end generation banking infrastructure. And unify which is a machine learning capability to analyse the data to reduce the cost and risk of lending by building accurate credit scores and target people who do not have a formal financial identity, collateral or credit record. They also use automated algorithms to ensure they don't overextend themselves and have built protective safeguards into the heart of our technology. They have served 18M+ individuals and small businesses, with 120M loans and $3.5b+ dollars disbursed. They are active in Ghana, Tanzania, Kenya, Uganda, Zambia, Cote d'Ivoire and Pakistan with an operational tech hub in Cape Town, Nairobi, Porto and London.	South Africa, Tanzania, Zambia
114		■	■	■		Just Fresh Group Online Market	Just Fresh Group Limited	✓	Just Fresh Group Online Market (2019) from Just Fresh Group Limited. A Food and Agro-inputs supply chain company. They have around 908 users.	Zambia
115	■					Keep an eye on Poultry Business	Agrinfo	X	Lay-Insight, Broiler-Insight, Turkey-Insight and Duck-Insight are strong, innovative management tools for the poultry industry, based on scientific self-learning algorithms, using your enterprise data to further improve and optimize your production and	Tanzania

									business process. They are designed to support managers in taking proper decisions concerning their daily business, as well as the strategic decisions they are facing.	
116	■	■	■	■		Kepya Marketplace	Agro Marketplace	✓	Agro Marketplace from Kepya. Platform for the commercialization of products from the field, market information and logistics.	Angola
117			■	■		Khula	Khula App Pty Ltd	X	Khula Ecosystem comprises of three Apps (Khula Inputs App, Khula Fresh Produce Trader App, Khula-Funders Dashboard). Khula was founded in 2018. Khula provides small-scale and commercial size farmers with software and a marketplace to grow their business, unique solutions for Buyers, Farmers, and funders all under the Khula ecosystem. Khula is an online marketplace and ecosystem for agriculture products. It provides a platform for farmers to list out their products for sale and the consumers to place the order from preferred producers and suppliers. Khula marketplace includes seed, fertilizer, Agro-chemicals, animal health products and more than 3000+ Products and can compare over 3000 products from local and international suppliers. They have a network of 130+ Depots & 190+ Crop Advisors Nationwide giving them the ability to deliver in every province and even major agricultural regions in SA. Over 3000 farmers and 100 suppliers have signed up on the Khula Ecosystem. Khula wants to tackle issues faced by small scall and emerging farmer at once and provide farmers with liquidity, access, and a market. The platform is an ecosystem made with three products. The Inputs App allows farmers to access approved agricultural inputs and services from local and international suppliers. The second is the Fresh Produce Marketplace, targeted at farmers with challenges low market prices, high transport and logistics cost and Expensive Middlemen. It allows farmers to sell produce directly to local and international formal bulk buyers. By allowing farmers to engage and negotiate prices with suppliers, the platform aims to reduce the access middlemen have that has led to the exploitation of farmers. Then, the Funder Dashboard connects institutional investors with farmers who meet their funding mandates. This year, the start-up was accepted into the Google for Start-ups Accelerator Class 6 alongside 14 other African companies. While the company is just announcing this investment, it closed the round last year. It was led by AECI, one of the continent's biggest agrochemical companies. South African impact investor E Squared Investments also participated.	South Africa

118						Khusa (Village Savings App)	Angle Dimension	✓	Khusa (Village Savings App) by Angle Dimension for Malawi is an online platform that allows community savings groups to automate and connect to the formal financial sector. The platform aims to enhance trust and bridge the divide between rural groups with banks, mobile money and Microfinance. Khusa provides real time information, calculates the portfolio and enables payments. It enables groups to digitize their transactions and securely save money.	Malawi
119						Kilimo Klub	Vodacom	X	Kilimo Klub from VODACOM It is about funding smallholder farmers through mobile phone money transfer. mobile innovative solution that will see smallholder farmers receiving support to improve their lives through Information and Communication Technology (ICT) on their phones. The initiative dubbed Kilimo Klub, is an exclusive service targeting smallholder farmers and will enable farmers to access M-Pesa and get empowered financially through the use of M-Pawa, which provides access to the safest and most convenient banking services giving them access to savings and loans facilities.	Tanzania
120						KRES	KRES Network (KRES with partners in Network in Netherlands, Angola, Mozambique including World Vision)	✓	KRES Network. KRES Network (KRES with partners in Network in Netherlands, Angola, Mozambique including World Vision). It is a network with a social enterprise as the operating entity to provide decentralized services. It operates in Angola and Mozambique. It was launched in 2021 and it has 250 smart phone users and 2,800 basic phone users. Empower farmers to adopt regenerative agriculture to improve productive resources (soil) and productivity through digital advisory and market linkage services using conversational engagement (voice Bot, chatbot) and geodata/AI. Realize Rural Agri Entrepreneurs (Farmer Business Advisors) through an industry/sector platform involving private and non-private sector partners acting as liaison between farmers and markets. Innovative digital/e-learning (drills on chatbots) are available and further development to develop capacity of remote Rural Agri Entrepreneurs. Smart advisory: Data-driven advisory based on tailored, farm-level agro-climatic and crop-specific information to support decision making, maximize productivity and reduce costs. Technologies such as sensors, satellites and drones, as well as big data analytics and AI, underpin many of these services., Weather information: Specialist services that provide regional and localized weather forecasts. This sub-category may include weather-adaptive and climate-smart advice, pest and disease management: Digital tools that help farmers diagnose plant disease and develop strategies to treat diseased plants as well as mitigate future outbreaks. Most of the services are accessible via mobile applications and require a farmer to upload a picture of the infected plant for diagnosis. Some services are also accessible via USSD. Also includes national and regional-level pest and disease early warning systems., Agri-record keeping through Plan & Activity Tracker	Angola, Mozambique

									(voice and chat bot based). Accountability tool: Digital tools designed to help farmers view farming as a business by allowing them to track farming expenses and revenues and prove their creditworthiness., Liquidity Financing under design/development for different 'segments' involving FADA, BNI, BDA (Angola) and HUB, Casa do Agricultor (Mozambique). Inputs and outputs: Platforms that enable the sale of agricultural inputs to farmers from input suppliers, as well as the sale of agricultural produce from farmers to consumers and businesses., KRES is not a marketplace. Smart Digital Agent approach to link farmers to markets. Also uses remote sensing, geodata using satellites. The Kres Network was started under the Mavo Diami project in Angola.	
121	■		■			Kulima	Agricomm-media	✓	Kulima-academy (2020) from Agricomm-media. Online agricultural learning for anyone anywhere. They have around 200 registered users. They want to address Improved farm productivity via increased access to research based agriculture information.	Zambia
122	■	■	■	■		Kurima Mari (LimaMali)	Welthungerhilfe	✓	Kurima Mari (LimaMali) (2016) app from Welthungerhilfe (WHH). Kurima Mari is an android application that is designed to enable smallholder farmers access extension advisory and market linkages using a smartphone. It enables the smallholder farmer not to overly depend on extension officers and not to be stranded when seeking markets. It enables smallholder farmers to access the relevant information pre-production such that they can make informed choices about participating in agriculture value chains. The app, which includes Kurima Mari - Beef and Kurima Mari - Poultry, also provides digital support tools such as gross margin calculators and seasonal calendars that ensures farmers make the right choices with regard to input investments and production practices. Operational in Malawi and Zimbabwe, with 84,719 registered users.	Malawi, Zimbabwe
123	■					Kuza One	IDH Mozambique	X	IDH, in partnership with Kuza, has launched a digital microlearning toolkit for farmer capacity building in watershed management, animal husbandry and good agricultural practices in cotton, maize, tomatoes and cabbage under its Mozambique Climate Resilience Program. This toolkit is helping rural farmers on developing skills for planning their production activities, including budgeting. The innovation is being used in the northern region of Mozambique (Cabo Delgado and Nampula provinces) where cotton enterprises are based, and they are the main users. Currently, the digital toolkit is being translated into three local languages, Changana, Sena and Emakwa to cover the regions of the country south, centre and north, respectively.	Mozambique

124	■				■	KWIBI	Fox-Croft Holdings (Pty) Ltd	✓	KWIBI from Fox-Croft Holdings (pty) Ltd which is a private sector company active in Botswana and South Africa. Kwibi is a mobile tracking app that addresses problems facing modern conservation in situations of human-wildlife conflict. The App benefits local communities by providing livestock farmers with advance warning of predators in the area. The app also enables wildlife data collection, wildlife poaching and the illegal wildlife trade. This App is still in the research and development phase but also provides digital advisory particularly on pest and disease management, including plant disease and advisory on strategies to treat diseased plants and mitigate future outbreaks. Most services are accessible via mobile and require farmers to upload pictures of an infected plant for diagnosis. Some services are accessible by USSD, and the information provided also includes national and regional level pest and disease early warning systems. Smart applications using digital tools enable farmers to monitor herds remotely in order to determine their location and track their health including when in oestrus or about to calve. Also enabled are tracking and monitoring feeding habits of fish in aquaculture, disease detection, controlling water quality and automating feeding. The innovation uses Smartphones, a Smartphone App, website, Dashboard and Portal and local databases (MS Access). The innovations address low productivity and mitigating climate change in on-farm production. The innovations are for the primary user and company revenue is based on individual subscription fees, business subscription fees and donor support (which will continue to be required). Stakeholders such as business, entrepreneurs have been involved in its development and the innovations have taken no specific actions to ensure the inclusion of disadvantaged groups so far.	Botswana, South Africa
125			■			Lesotho Smallholder Agriculture Development Project	Ministry of Agriculture and Food Security Lesotho	X	Lesotho Smallholder Agriculture Development Project from the Ministry of Agriculture and Food Security Lesotho. The Project supports the increased adoption of climate smart agricultural technologies in Lesotho's agriculture, enhanced commercialization and improved dietary diversity among targeted beneficiaries.	Lesotho
126	■					Lesotho Soil Information System	Agricultural Research, Department of Soil Conservation, NUL and FAO	✓	Lesotho Soil Information System (LESIS) (2019) from the Department of Agricultural Research. LESIS provides soil maps and related information systems and constitutes the basis for assessing soil quality over time. LESIS further advocates for organized and systematic surveys and monitoring of soils in Lesotho with accurate and up-to-date soil information using state of the art methods and tools of digital soil mapping. It operates in Lesotho only.	Lesotho

127	■		■			Lima Links Farmer Platform	Lima Links Limited	✓	Lima Links Farmer Platform (2016) from Lima Links Limited. Lima Links is a social enterprise set up in August 2016 to connect smallholder farmers to the agricultural marketplace via its technology Platform. They have around 158,000 users.	Zambia
128		■		■		Livestock Wealth	Livestock Wealth (Pty) Ltd	X	Livestockwealth was founded in 2015, is led by South African born entrepreneur, Ntuthuko Shezi, and backed by an experienced advisory board. Livestock Wealth is a registered credit provider with the NCR and is also regulated as a registered agricultural producer agent with the APAC and SAMAC. They generate crowdfunded options to enable farmers to own assets. Livestock Wealth introduced South Africa to Crowd farming back in 2015 and since then have been refining its product offering, streamlining processes, and helping investors grow their wealth the African way. The platform has helped clients to invest in tangible, growing assets at the click of a button. Livestockwealth aims to expand its product range and to become the foremost Crowd farming platform in the world. The crowd funding platform was made popular by their flagship product, an investment in pregnant cows. They have also diversified into: · Macadamia nut tree investments, 6-year tenure, ZAR2000 initial investment and a 95% profit margin · Free Range Oxen, 6 months Tenure, ZAR 11000 Initial investment, and a 5%-7% Profit margin · Connected Garden, 5-year tenure, ZAR8200 initial investment and 61% profit margin The returns on farming are competitive compared to conventional investment options. Investing in living, breathing livestock, and growing crops. These types of assets are always in demand.	South Africa
129					■	LixoDex	LixoDex	X	LixoDex is a developer of fence sensor, PIR sensors, Guard Tracking Units, Trip Wire and Tactical PIR Sensors and RADAR that can be used to deliver critical operational information via mobile phones, tablets, and computers for real-time readings and security. Also used in marine farming systems.	South Africa
130					■	Lynx Fruit Grading Systems	AME Fruit Sizers and Allied	X	Lynx Fruit Grading system are a distributor of Packline equipment for fruits. They offer a cost-effective way forward for a new sizer, retrofit upgrade or complete Packline at a lower cost than complete structural imports. They also offer complete Packline projects as required. Also, a prime distributor of Ellips of Holland Fruit grader weight and vision systems to which they provide online support and backup.	South Africa

131				■		Maano Virtual Farmers Market	World Food Programme	X	Maano Virtual Farmers Market of World Food Programme. Virtual Farmers' Market (VFM) is an app-based e-commerce platform where farmers' surplus and buyers' demand for crops are advertised and traded. VFM provides a transparent, open and trustworthy space for smallholder farmers and buyers to negotiate fair prices and deals.	Zambia
132	■					Macho Sauti	SWISSAID Tanzania	X	Macho Sauti from SWISSAID Tanzania. E-extension in which smallholder farmers use smart phones with the app to collect information mainly through photos of their troubled crops and send them to extension officers/experts for solutions via an Internet platform. An online translator translates the comment from Swahili into English and vice versa. Experts in Tanzania or Switzerland can thus quickly provide personally tailored answers to the most pressing questions. Using GPS, the location of the affected field can be determined precisely so that a disease could for example be prevented from spreading to neighbouring countries.	Tanzania
133	■					m-Agri	Brastorne	X	Brastorne has developed a platform that gives users access to online applications through USSD technology, enabling simple phones to function as low-cost smartphones. There is need for a data connection, client software or SMS subscription; anyone can access advanced apps such as email, chat, Wikipedia, news and marketplaces from anywhere and at any time. Moreover, because agriculture is essential for poorer communities, this platform offers specific mAgri functionality for accessing agricultural information (advice, health book for animals, training opportunities, alerts, commodity prices and weather warnings), markets and short-term financing. It also enables users to sell products and services throughout the country as well as update their profile and run an online business. Brastorne's USSD platform has created harmonization between social good and profitability. The platform has performed well in Botswana generating over 500,000 users who have tried the service and is currently in the process of internalization into additional African markets. The company did not participate in the survey but provided a brochure to provide some answers.	Botswana
134				■		Marakeng App and Marketing Information system	The Department of Marketing within the Ministry of Agriculture and Food Security	✓	Marakeng App and Marketing Information System (2020) from the Department of Marketing within the Ministry of Agriculture and Food Security. To improve smallholder farmers linkages through sustainable e-commerce solutions.	Lesotho
135	■					MauCrop	The School of Innovative Technologies and Engineering of the	✓	MauCrop developed by The School of Innovative Technologies and Engineering of the University of Technology. MauCrop: An AI-Driven Interactive Mobile Application to Advise on Crop Selection and Cultivation for Small-Scale Crop Farmers in Mauritius. Mobile application (MauCrop) to recommend on selection and sowing of crops, give weather	Mauritius

							University of Technology		information, also allow farmers to monitor their yield and expenses. This initiative was launched in 2021 and is still at the proof-of-concept phase. It relies on machine learning approaches to recommend the best crop to be planted based on the location of the plot to provide best yield. The innovation is through the public university, is involved with on farm planning and production is at the R&D stage funded by government. They are working through challenges such as data collection, farmer use, and behaviour change as well as lack of mobile network coverage. Their technology is inclusive of women.	
136			■	■		Maupass	Ministry of Information Technology, Communication and Innovation	✓	MauPass. This is the implementation of the National Authentication Framework which facilitates access to e-services offered by the Government of Mauritius trough the National Computer Board. The MauPass enables the user to log in once and have access to a series of services, some with the security of a two-factor authentication to ensure secure transactions. Some of the services enabled through MauPass involve making payments for government e-services. Launched in 2020 it has 5,000 active users and 37,000 registered users and deals with traceability especially agricultural inputs. Maupass provides a trusted mode of authentication which is critical for access to services. So, one of the facets of anticipated outcomes is improved access to finance. It uses computers and smartphones, an App and website including cloud-based databases and software dealing with financial exclusion and poor access to markets and planning, inputs and access to markets in the value chain. They have been challenged by understanding the market and user needs and digital literacy. They have reached a stage of wide scale adoption that is sustained. Supported by government grants they will remain dependent on these to provide the service.	Mauritius
137	■					Mavo Diami	World Vision	X	Mavo Diami from consortium led by Worldvision Netherlands. The Mavo Diami project funded under the Geo Data 4Agriculture and Water of the Dutch Ministry of Foreign Affairs / Netherlands Space Agency. The aim of this project is to improve the food and income security of more than 100,000 smallholder farmers by accelerating their agri-business performance through informed decisions supported by the Mavo Diami services built on weather, water, soil, and crop signals and other relevant data and indicators. The project is called Mavo Diami, which means 'my land' in Angolan local language (Kimbundo). During the project the Kres network was formed as a social enterprise to carry on beyond the project.	Angola
138	■					M'chikumbe 212	Airtel Malawi	✓	M'chikumbe 212 by Airtel Malawi is a mobile agriculture service launched in 2016. Airtel Malawi with GSMA provides a platform where all agriculture related information can be accessed for free, with the aim to enhance the stretched agricultural extension network.	Malawi

									M’chikumbe aims to transform farming using mobile technology and to increase Airtel’s subscriber base, revenue and brand loyalty in rural Malawi. M'chikumbe 212 is an interactive voice response (IVR) and short messaging services (SMS) content platform that does not require any internet connectivity to be accessed. Farmers, cooperatives, suppliers, trades, government staff and agencies and NGOs are all considered the target audience and users. Since its launch in 2016, the platform was registered over 700,000 users with a reach of about 70% of Malawian farmers. The platform connects buyers with producers, connect farmers, cooperatives and even programs.	
139						Metajua	Metajua	X	Metajua of Metajua. This innovation provides a modular solution with the aim of covering all data flow needs for organizations buying agriculture products from and interacting with smallholder farmers.	Democratic Republic of Congo, Madagascar, Tanzania
140						mKesh	Moçambique Telecom, SA	X	This is a mobile money service from Carteira Movel SA and the mobile money service is licensed and regulated by the Central Bank of Mozambique. Carteira Movel has about 33% of market share covering all districts, 68% mobile coverage and about 7.1M subscribers. The current mKesh data base has 2,660,000 users and 475,000 registered with PINs. And 60,000active users. The Mobile money technology allows people to save, buy, transfer and receive money via a mobile phone, as well as payment of services such as TV, Power through using a mobile phone from Mobile Network Operator - Tmcel. The MKesh distribution network is based on 4,065 agents, 36,000 street vendors, linked to Interbank and almost 1,000 ATMs.	Mozambique
141						Mlimi Hotline (Farmer Call Centre)	Farm Radio Trust	✓	Mlimi Hotline (Farmer Call Centre) by Farm Radio Trust for Malawi is a direct response information service dedicated to help farmers with immediate support, by answering their questions, giving them advice and other information.	Malawi
142						Mlimi Manager	Agricentre	✓	Mlimi Manager by Agricentre is based on the Internet of Things (IoT) and Artificial Intelligence (AI). The innovation aims to collect different types of data on the field and save it in a central data warehouse. The data is on soil fertility, soil moisture and soil PH for farm management. The data housed in the central data warehouse will be used to train different AI models.	Malawi
143						Mobile Drone Crop Spraying Units	Precision Drones	✓	Mobile Drone Crop Spraying Units of Precision Drones Botswana. This is a solution with mobile drone spraying units around the country targeted at small commercial /	Botswana

									emerging farmers and charging per hectare rates for specialist spraying services. They have 20 clients.	
144						Mobile Money (MoMo)	MTN Eswatini	X	MoMo Money by the MTN mobile network operator in Eswatini. The MoMo is a general branchless banking tool, it is not customized for agriculture, nonetheless it is very popular amongst farmers and people in remote rural areas in Eswatini. MTN Eswatini was the first MNO in Eswatini to introduce the product in the country. MoMo currently has more than 500 000 users nationwide, more than 80% of Swaziland's adult population. They did not fill out the survey.	Eswatini
145						Mobis	Agrinfo	X	Mobis from Agrinfo. A cloud-based microfinance management platform designed uniquely to help savings and loans cooperatives go paperless and become more efficient by digitizing how they manage customer data and transactions. Agrinfo works in partnership with farmers associations, financial institutions and input and output suppliers.	Tanzania
146						Mobiz	Mobiz	X	Mobiz was set up in 2014 by digital marketers to introduce a creative way of mobile marketing and by developing a platform that seamlessly integrates hyper-personalization into dynamic pages. This mobile communication engagement is at the next level particularly if SMS campaigns, with graphics and video, advocating sales or on-line payments and surveys are necessary. They work with large MNOs and portals and MS. They deal with digital agri-advisory, bulk SMS and communicate directly to farmers. They work with a marketing cloud that allows businesses to send out a multitude of personalized SMS messages to attract new customers.	South Africa
147						Modisar	MODISAR NET	✓	Modisar of Modisar, founded in 2016. This is a Precision Livestock Farming (PLF) platform that helps farmers to keep accurate records & to continuously monitor their farm animals. It has a mobile app with the following modules: Animal Management, Farm Management, Financial, Intelligent Farm Assistant (#IFA), Inventory Management. The innovation addresses Knowledge gap, Low productivity, Poor access to markets and Poor access to internet. They use a subscription model (individuals and businesses) and have 2500 users.	Botswana

148	■			■		MoKaro	Food and Agricultural Research & Extension Institute	X	MoKaro is an App developed (and hosted by FAREI (see above)) and launched in June 2019 is the first of its kind developed by the Ministry of Agri-Industry and Food Security and the Ministry of Technology, Communication and Innovation in collaboration with the Food and Agricultural Research and Extension Institute (FAREI). It is a tool for farmers and planters to plan agricultural activities and manage their resources for maximum efficiency and minimizing losses. It provides advisory on planting, irrigation, field activities following crop analysis and assessment and farmers also receive information on climatic conditions in Mauritius, agricultural news and alerts. The tool also enables producers to communicate directly with suppliers of inputs such as fertilizers and pesticides. Another smart application is in the pipeline for the livestock sector. The App is available on Google Play here. Providing Agri-VAS, Smart advisory and record keeping, as well as agri e-commerce opportunities for sale of produce and outputs by farmers, improving farm productivity, incomes and market efficiency. It utilizes computers, basic and feature phones, smartphones using SMS, the App, Website, and messaging platforms. It uses Excel and MS Access and has been challenged by understanding the market and user needs, procurement of technology vendors, in house technical capacity and farmer uptake. They also have challenges related to the regulatory environment and financial sustainability of the business model. They are still at the R&D Stage and reliant on public funding or donor grants. The innovation was developed with the input of government as well as social enterprises and entrepreneurs. They have been challenged with creating trust to convince farmers to change their way of doing things.	Mauritius
149						MoKloud	Ministry of Information Technology, Communication and Innovation	✓	This is a government-hosted online space for a citizen to make sharable information, usually held by authoritative sources, about themselves accessible to others. Launched in 2021, it has 200 users to date. Once an authenticated user is on the platform, the user can request for government services and monitor the status of process of the request. Examples of requests that are already available include requesting for recent extracts of a birth certificate or marriage certificate. The documents are made available are genuine, time stamped information about the citizen. The certificates are created through a payment for services. Although not exclusively agricultural, these digital solutions are available to the agricultural community by enabling digital records to be produced with traceability.	Mauritius
150				■		More Than Cashews	YYTZ Agro-Processing	X	More Than Cashews from YYTZ Agro-Processing. Use of blockchain technology in cashew nuts farming for traceability. they developed a blockchain technology with a startup in	Tanzania

									the Netherlands where each pack of roasted cashews has a QR code that you can scan and see exactly which farmer it came from.	
151	■	■	■	■	■	MovelCare	TABECH	✓	MovelCare is a mobile insurance platform that uses USSD and SMS technology to provide insurance access to marginalized populations (rural, low, and irregular income, unbanked, non-internet users, women) without depending on the internet or bank accounts. MovelCare makes insurance paperless, cashless, affordable, and timely whilst allowing for quick claims on any mobile phone. The platform was launched in 2019 and they have 2,000 active users and 3,500 registered users. Agricultural value-added services (Agri VAS): One-to-many advisories covering agricultural and livestock information, weather and climate information and information on market prices. Agri VAS are delivered via voice channels (IVR, helplines), text channels (SMS and USSD) and via apps. They rely on computers, basic feature phones, smartphones. They use channels of Radio, mobile voice (Radio, Mobile voice / IVR / call centres, SMS, USSD, Smartphone app, Video, Website / Dashboard / Portal, Social media platform (e.g., Facebook, Twitter), Messaging platform (e.g., WhatsApp, Messenger), Geo Data Analysis is reliant on Excel spreadsheets and SQL cloud-based databases. These Digitally enabled agricultural insurance services that help smallholder farmers with knowledge, increased financial inclusion, low crop productivity, and poor access to the internet. The insurance mitigates the risks associated with external shocks such as weather events and pest and disease outbreaks. Agricultural insurance includes weather index, area yield index, multi-peril, livestock and livestock index insurance products and aquaculture. The outcome is to ensure the farmer has reduced or eliminated the losses not only post-harvest instead during purchase or transit of seed and chemicals to their livestock and life. Challenges include understanding market and user needs, procuring technology vendors. For users' language, literacy and digital literacy are challenges including technical capacity and, in the teams, challenges with data collection and issues of farmer uptake and behaviour change. Operational constraints including policy enabling environment and lack of electricity, mobile coverage, electricity, and trust. The innovation is transitioning to scale having demonstrated small scale success based on a proof of concept. The technology benefitted from technology investors and revenue is generated via business subscription fees and transactional fees. The innovation was developed with input from entrepreneurs, social enterprises, and insurance companies. The specific challenges include technology and skills for improving the offering, especially for livestock insurance. Weather indexing is an extensive approach requiring	Mozambique

									an ecosystem of knowledgeable actors. The technology is designed with deliberate actions to make it inclusive of underrepresented groups.	
152	■	■		■		MukulimaSoko	MukulimaSoko	✓	This is an innovation from 2018 and is a digital agricultural trading centre that offers several advantages to the players in the sector including: Soko: E-commerce through the grouping of agricultural products for common sale through virtual and physical agricultural relay warehouses in the production environment. Their business model is via a small transaction fee in the market platform.	Democratic Republic of Congo
153		■	■	■		Mukuru App	Mukuru Africa	✓	Mukuru Money Transfer Limited is a private sector company operating regionally (Botswana, DRC, Eswatini, Lesotho, Malawi, Mauritius, Mozambique, South Africa, Tanzania and Zimbabwe). The application addresses a knowledge and access gap and provides access to markets and financial services. The Mukuru App was launched in 2019 and allows customers to create orders for remittances individually and initiate a payment for the transfer to happen. The app can also be used to self-register a customer on the platform and verification takes 24 hours. This enables efficient access to financial services through smartphones. The innovation uses SMS, USSD, a Smartphone App, Website, Dashboard, Social Media Platform, and (Fb, Twitter, WhatsApp, Messenger). The platform uses local and cloud-based databases (Excel, MS Access, SQL) and AI platforms (IBM Watson) for Machine learning. Regionally it has 500,000 users and 1M registered users. Also enables farmers to sell to consumers (B2C) and to enterprise customers (B2B) such as hotels, restaurants and market retailers. Challenges include digital literacy, device sharing, lack of mobile coverage, and financial sustainability of the business model in different locations. The application has reached sustainable scale and is focused on individual users. The business was supported by friends and family and development support and training grants. The revenue model is based on transaction fees and the in-house development of the App and platform which is believed to be inclusive of disadvantaged groups.	Botswana, Democratic Republic of Congo, Eswatini, Lesotho, Malawi, Mauritius, Mozambique, South Africa, Tanzania, Zimbabwe
154	■	■		■		Mulimi Apunzile	E-msika Services Ltd	✓	Mulimi Apunzile (2020) from E-msika Services Ltd. From the same company as eMsika. This is an online advisory information to farmers using live and on demand videos from experts, it is like a Udemy for agriculture. They have around 900 users.	Zambia
155	■	■	■	■		Mutasa Auction Floor (MAF)	Farmers Intersection Pvt. Ltd	✓	Mutasa Auction Floor (2016) from Farmers Intersection Pvt. Ltd. The provision of centralized marketplaces to bring buyers and products to the one space in a competitive transparent environment and to facilitate the flow of market information to promote market responsive agricultural production via the mechanism of online `Dutch Clock'	Zimbabwe

									auctions. 355 users have used the service at some point. Many thousands have expressed an interest.	
156		■				Mvola mobile money service	Telma Mobile	X	Telma Mobile is a Madagascar-based telecommunications company provided with a license in 2015 and they began rolling out their network in 2016. They recently rolled out the Mvola Avance and Epargne products, which offer loans and savings services, respectively, through the pre-existing Mvola mobile money service. This is newer market player since 2016 and has provided real competition to the monopoly provided by Comoros Telecom previously. By the end of 2016 60% were already covered by 4G and they promised to cover all islands by the end of 2017. Telma doesn't block VoIP providers like Skype or WhatsApp calls. They also feature very cheap calls to neighbouring French Mayotte. They might be the smarter alternative once they have full coverage now. At least they brought the incumbent to cut prices. 5With Mvola Avance, customers can borrow from MGA 1,000 to MGA 500,000 (USD 0.30 to USD 157) for 30 days with a flat interest charge of 9 percent. Mvola Epargne allows customers to save between MGA 100 and MGA 10 million (USD 0.20 and USD 3,200) and earn annual interest of 2 percent. These services were developed in partnership with BNI Madagascar, which is controlled by Mauritius-based holding company Ciel Group. As of 2016, Mvola had 2 million customers performing: (1) mobile payments for Telma services; (2) cash uploads; (3) transfers to individuals; and (4) cash withdrawals through partner bank machines and branches. Also as of 2016, Telma Mobile reported 3 million subscribers and annual turnover of MGA 360 billion (USD 112 million). Founded in 2006, Telma Mobile is a member of the Telma Group, a private firm providing mobile phone, internet and infrastructure services. BNI Madagascar reported outstanding loans of MGA 882 billion (USD 273 million) in 2016. Founded in 1977, Ciel operates in 11 African and Asian countries and reports a group profit of MUR 1.5 billion (USD 44.5 million) before tax and non-recurring items as of 2017. Their SIM card is at 2,000 KMF without credit. Top-ups are widely available. They sell one combo bundle called Karibu. It contains 60 minutes to Telma, Mayotte, India, China, Réunion, Saudi Arabia, US and Canada plus 100 SMS and 1 GB in Comoros. It valid for 1 month and sold for 4,000 KMF. Activation is by *445*50#. They sell a reduced welcome package for a 5,000 or 10,000 KMF recharge card with 180 dom. minutes, 15 SMS and 100	Comoros

									MB plus the recharge value. There are data packages called TelmaNet are offered and can be added to the basic service.	
157	■	■	■	■	■	My Bank App	Sir Hackson Processors	✓	My Bank App by Sir Hackson Processors is an app in development that will enable farmers to transact their finances and access other financial services, as well as providing agricultural practices. Sir Hackson Processors currently provides information on agricultural products and vaccinations schedules through SMS. This has not yet launched	Malawi
158		■				MyTMoney	Mauritius Telecom	✓	MyTMoney is an innovation from Mauritius Telecom incorporated in 1998, and in 1996 they have two fully owned subsidiaries Cellplus Mobile Communications and Telecom Plus Limited to offer mobile and internet services respectively. In 2000 France Telecom (now called Orange S.A.) acquired 40%share of the company. The company has a customer base of 1.3M subscribers and has made a successful transition from a state-owned entity to a fully private company. They offer high speed greater bandwidth. Their international network operates vis optical submarine cable SAFE/SAT3 through South Africa to Europe, LION/LION2 EASSy – EIG to Europe and SAFE to India and Malaysia. They provide fixed line, mobile, internet, TV and mobile money services, all their products and services were regrouped under a single commercial brand my.t. Mobile Operator based wallet to store, send & receive money using your mobile phone aiming to change the payment habits by cash specially to avoid contact during pandemic; operator has established linkages to most commercial banks in the country and offers a payment card as well to accompany mobile payment. Existing wide network of merchants to clients. Potentially a model for democratising mobile payments from peer to peer. The My.t wallet launched in 2019, is a fast payment service with a My.t money card, or using one's smartphone, utility bills can also be paid, and money transferred digitally, bills can be shared a up to four subaccounts can be added. This wallet can be linked to a bank account, and cash received from the bank account, cash can also be received with a my.t money card or a QR code, transactions can be viewed. For businesses and merchants, they can receive point of sales devices to accept payments and track sales with instant SMS notifications for all transactions. A number of marketing relationships have been established offering deals such as for the University of Mauritius offering special payment offers for students, or retail and food outlets. The widespread accessibility of the My.t payment system, which is operated by an MNO linked to a set of banks shows potential for registration of small-scale agricultural producers onto an electronic payment system.	Mauritius

									The service is MNO based and delivered through Smartphone App using local databases such as MS Access and addressing all parts of the value chain where payment transactions are needed. They have 200,000 active users and 300,000 registered users. They charge a subscription model and address financial exclusion, cashless payment, payment system linked to banks and provide a mobile/payment card combination for transactions. They also struggle with digital literacy, sharing of devices, and the use of local languages but believe their technology is inclusive of all disadvantaged groups.	
159				■		NAAT APP (Netherlands Alumni Association of Tanzania App)	NAAT	X	NAAT App from the Netherlands Alumni Association of Tanzania. It is an application that will link farmers and livestock keepers with the market It is a new innovation in Tanzania being supported by the Netherlands embassy in Tanzania.	Tanzania
160			■			National Plant Health Inspectorate Services Portal (NaPHIS Portal)	National Plant Health Inspectorate Services (NaPHIS), Ministry of Agriculture	✓	National Plant Health Inspectorate Services (NaPHIS) system is set up by the Government of Eswatini National Plant Health Inspectorate Services that has the responsibility to protect plant resources from pests. They provide science based regulatory services assuring plant health, food security and safe trade of plant products. They aim to prevent the introduction and spread of plant pests and promote appropriate measures for their control and to facilitate safe trade of plants and plant products in accordance with the provisions of the International Plant Protection Convention (IPPC). The work is funded by the European Union. They provide four main services through web access of their site where one can register and apply for the permits or services. Their main role and service offerings include information System and Policy Analysis, Pest Risk Analysis (PRA) and Permits (Import, Re-Export, Transit and Phytosanitary Certificates)., Pest Surveillance, Quarantine and Diagnostics (SQ&D) and Regional Coordination and Inspectorate. NaPHIS was launched in 2020 as an Agri-VAS service with 300 active users of their website and 600 registered users. They are a web-based system for the issuance of phytosanitary certificates, regulated plants, plants products, soil and biological articles with traceability for payment. People and businesses requiring phytosanitary services, documents such as phytosanitary certificates, plant import and transit permits apply online and get the different documents online at the comfort of their home or offices. The platform is accessible through smart phones, tablets, desktops computers and laptops as long they are connected to the internet. The platform has two modules, one for the user (applicant) and the module is for the regulator (government officers). Through the platform, turn-around time has been reduced to few minutes from several day or weeks and both clients and government has saved more in terms of travelling costs. NaPHIS has also enabled a very successful transition from paper based to digitized	Eswatini

									records both at government level but also for primary users. NaPHIS enables access to markets by providing the necessary certification and phytosanitary clearance for produce. This has the benefit of reducing the cost of doing business for farmers, improved ease of selling produce in Eswatini and in neighbouring countries and improved records of export and import information for the government as well as occurrences of pests and disease outbreaks threatening Eswatini's production systems. The service was developed through the provision of either donor funding or central government funding and will remain reliant in the short to medium term on these subsidies. It was developed through extensive consultation in government, with commercial companies, entrepreneurs and social enterprises following digital design principles as far as possible. As suggested the service will continue to operate on a public goods business model where some degree of public subsidy will be required. For NaPHIS challenges have included digital literacy amongst users, the lack of mobile coverage and Wi-Fi/internet across the country due to electricity or power supply failures and the expensive cost of data for cell phones. NaPHIS is a service that provides pest and disease management and weather information as well as providing certification for produce for trade, NaPHIS was designed to fill knowledge gaps, combatting low productivity, and improving quality of produce for trade. NaPHIS has demonstrated its model with small-scale success.	
161	■				■	NDVI field surveys	Precision Drones	✓	NDVI field surveys of Precision Drones Botswana. Provide regular NDVI field surveys to farmers to assess crop health. They have 30 clients.	Botswana
162		■				Nomanini	Nomanini	X	Nomani is a fintech platform that connects financial service providers and consumer goods companies to retail medium and small and medium enterprises. Their digital platform enables digital banking and supply chain financing mechanisms which enable cash collections, merchant credit and savings, and cash deposit, supplier payments and prepaid and bill payments. These aspects are particularly useful for agribusinesses and Agrovet and Agro-input dealers in the agricultural value chain. They are able to leverage value chain relationships to ensure rapid deployment and low-cost acquisition of retail business banking customers and provide digital solutions for banking. Their embedded supply chain financing solution enables financing of stock onto the shelves of traders and pairs stock advances with data to optimize supply chain management.	South Africa

163						Obus	Obus Digital company Limited	✓	An app where buyers can order rice (Grade I) from the nearest shop registered in app selling grade I rice (delivery not exceeding 0.5USD fare by motorcycle). The delivery is by motorcyclist registered in the app.	Tanzania
164						One Money Mobile Wallet platform	Net One	X	One Money Mobile Wallet platform from Net One. OneMoney is a mobile payments solution service provided by NetOne to its subscribers. OneMoney provides a service ecosystem that entails the exchange of money between individuals (peer to peer), businesses (business to business), individuals paying businesses (consumer to business), and businesses paying individuals (business to individual). This service offering provided by OneMoney makes it possible for individuals and businesses to transact in a secure, cashless, and seamless manner.	Zimbabwe
165						Online Import and Export License System	Ministry of Agriculture Lands and Rural Resettlement	X	Online Import and Export License System from the Ministry of Agriculture Lands and Rural Resettlement. The Import and Export License Management System automates the application and issuance of licenses to importers and exporters of agricultural products, thus replacing the manual paper-based system.	Zimbabwe
166						Online seed verification system	Common Market for Eastern and Southern Africa (COMESA)	X	Online seed verification system from COMESA. COMESA has become the first regional trading bloc to launch an online seed label verification system in Africa and globally. The system will assist the region eliminate cases of fake seed and boost trade in quality and improved certified seed.	Democratic Republic of Congo
167						Pay Today	Pupkewitz Holdings (Pty) Ltd	X	PAY TODAY is a leading mobile payment solution in Namibia which enables payment receipts, payments, airtime, payment of utility bills and parking. It is the product of Nedbank and works with any Namibian bank. Using an App from Apple or Google play, a debit or credit card can be added to your account from which payments can be made straight from the mobile phone, for shopping transactions, booking events and bank details can be entered to enable friends and family to make direct payments to you, and from the e-Wallet created it can be used to may bill payments or pay for parking. A PCI DSS Level I compliant card and tokenization system stores card details. The Merchant Account is at Nedbank Namibia and the Paygate ltd is the payment service provider. Works on all devices running IoS version 8 upwards and Android (4 and upwards) operating systems. They have a website and portal, and Facebook page, and also have a dashboard login	Namibia

									and sales on-line or payment gateway for businesses. 1400 businesses are linked to PayToday.	
168	■					PIF-TIC (Point d'Information et de Formation utilisant les TIC)	PIF-TIC	X	PIF-TIC (Point d'Information et de Formation utilisant les TIC) of PIC-TIC. In partnership with the Malagasy government, the PIF-TIC centres aim to train farmers and youth in the use of digital tools (computers, smartphones, tablets, etc.) to improve their ability to access information and the market.	Madagascar
169				■		Plaas	Plaas	X	Plaas of Plaas. Plaas is a platform that enables the virtual market for agriculture that empowers the farmers of Africa to seamlessly trade their animals and crops at market price, that will boost their income and information provided by farmers to enrich the crops will help others to match the standards. The app will help empower the farmers of Africa to seamlessly trade their animals and crops at market prices, which in turn, will boost their income.	Botswana
170			■	■	■	Plan-A-head	Plan-A-head Software	X	Plan-A-head is a private company that develops and supports software management for the agricultural and commercial sector. They offer administration, livestock, and Crop management software solutions. Their systems assist farmers to make more informed management decisions based on their actual data. By linking hardware and apps they streamline the collection of data to avoid unnecessary administration. They provide Farm vehicle management software as an administrative package. Various Livestock packages that include beef, pig, sheep, and dairy management software. The Crop management package offers management solutions on sugar cane, macadamia, vegetables, citrus, grain, and timber management software. Besides south Africa, these services are also provided to other countries including Zambia, Mozambique, Swaziland, Nigeria, Namibia, Sierra Leone, and Kenya.	South Africa
171		■			■	Planet42	Planet42	X	Planet42 provides rent to buy vehicle rental to South Africans, of pre-owned cars and vehicles. They charge monthly payments and can organize payment terms according to budgets. Rental rates include third party insurance and trackers. The service enables mobility for people who cannot secure loans and are able to buy vehicles through a subscription service increasing accessibility and transport options. These options whilst not specifically designed for rural or agricultural customers often enable them to pursue transport options, they would otherwise not have access to.	South Africa
172					■	Portable hydroponic beds	Innovative Green Hands	✓	Innovative Green Hands at the University of Namibia in conjunction with AvaGro and Jayden Nashe Enterprises of South Africa (Portable Hydroponic Beds). This is a very new private sector company in Namibia which was launched in 2021 and deals with Smart	Namibia

									AgriTech dealing with Equipment monitoring. The innovation enables crop production under the harshest conditions through a controlled environment, artificial planting media system, precise water and nutrient applications and including crops such as Spinach, Tomatoes, Peppers, Eggplants, watermelons and Cucumbers. The smart monitoring of equipment such as irrigation systems that enable farmers to remotely control, track and look after their equipment and farming operations, leading to a reduction in water consumption and wastage. The approach enables reduced water footprints in horticulture (esp. button and oyster mushroom) in otherwise arid production systems. The company has been working to address user affordability and a lack of technical capacity. They have received support on training and practical agriculture from Avagro and best practice models to develop their idea into an investible business. To date, the young agripreneurs have designed a prototype portable hydroponic unit capable of producing fresh vegetables for family's that live in towns where space and land are limited. They are now marketing this as part of their product basket.	
173						Portal da Divulgação Nacional de Produção	Government Angola	X	Portal da Divulgação Nacional de Produção of Government Angola. This is a government e-commerce portal.	Angola
174						PRESAN (Programme Régional de Sécurité Alimentaire et Nutritionnelle) plateform	Indian Ocean Commission	X	PRESAN -The Indian Ocean Regional Programme on Food Security and Nutrition (PRESAN) provides a framework for strategic collaboration and implementation of joint activities which include outreach and communications, information sharing, resource mobilization and technical support to improve food and nutrition security amongst IOC Member States Comoros, Madagascar, Mauritius, Reunion and Seychelles. It is supported by FAO and IFAD and enables FAO to provide technical support necessary to respond to urgent needs in the region, such as the reduction of the deficit of the agricultural trade balance. There is opportunity for join resource mobilization activities and technical support for Small Island Developing States (SIDS)	Comoros, Madagascar, Mauritius, Seychelles
175						ProFood App	ProFood	X	ProFood App is a multistakeholder e-commerce platform which is led by a women's-only team and supported by UNDP in partnership with the Namibia University of Science and Technology (NUST) and Green Enterprise solutions. The ProFoodApp digitizes local and traditional food system flows by enabling us to map, visualise and monitor Small Scale Producers (SSP) to understand who is producing what, where and in which quantities. The APP maintains a database of all the SSP nationally, enabling State and Non-State	Namibia

									actors to procure directly from the SSP. This creates an appetite for increasing production of local and traditional foods and empowers communities and producers at the local level. The APP also responds to at least five of the Sustainable Development Goals (SDGs). This is a private sector company, but their innovation is at a very early stage of development.	
176		■	■	■		QuickPay	Multiple Internet Payment System (MIPS)	✓	Quick Pay System of Multiple Internet Payment System (MIPS) is a private sector fintech payment ecosystem established in 2019 which is compatible with third parties, shops and enables a quick pay system by allowing businesses to create a payment ticket and send a link, when the link is clicked, then a payment can be made by a card. This aspect includes digital and agri wallets and an accountability tool and enables acquisition of inputs and outputs as a sub use case. This is a free hosted e-commerce website with integrated payment solution towards increased efficiency for selling and receiving payments.	Madagascar, Mauritius, Seychelles
177	■		■		■	RevScout Mapping Technology	Revolute Systems	✓	RevScout Fruit Load Mapping of Revolute Systems is a real time and Fruit Sizing Software for Pack House Planning. Revolute Systems is a private company in South Africa. Real time fruit mapping launched in 2020, is done through mounting two cameras on ATV/Tractor and driving through orchard rows. The cameras recognise fruit and maps counts with GPS. All data is automatically transferred after the survey to our RevToolbox online platform to view results, compare to other data layers like soil EC and crop health maps, as well as create yield estimations. They currently have 15 active users and 25 registered users and is focused on digital advisory, digital procurement solutions and smart farming. Their digital advisory is Agri VAS based one to many, they also provide climate and weather information on IVR and helplines and text SMS and USSD. The smart advisory is based on tailored farm level agro climatic and crop specific information and decision support to maximise productivity and reduce costs. Sensors, satellite and drones as well as AI are utilised. Digital tools also enable farmers to keep detailed records of livestock, including health and feeding data, to help mitigate diseases and avoid missed conceptions. Record keeping tools are also used to keep details of input usage, procurement, cost and revenue and sales records. Equipment monitoring includes remote control of irrigation systems and farming operations leading to a reduction on water consumption and wastage. The smart tools also enable asset sharing such as leasing of tractors, drones or other mechanised farming equipment. The innovations rely on computers, sensors (weather stations, IoT, satellite geodata) and channels include website, dashboard and portal with clous based and Ai platforms and software as a service. Challenges include understanding the market and user needs,	South Africa

									affordability, digital literacy, lack of technical capacity within and outside the company and systemic factors such as regulatory policy, lack of mobile coverage, and product translation into local languages. The innovation is at the scaling stage of replication in other geographies and relies on individual subscription, business subscriptions and premium services to generate revenue. They are struggling to procure processors for the equipment to seal more units. Medium scale field trials have been conducted in Western Cape fruit growers with efficacy. Their innovation was developed together with Adagin, and engineering technology company simplifying precision technology for all to use and creating innovative solutions for the agricultural industry.	
178	■				■	RevToolbox Data Portal	Revolute Systems	✓	RevToolbox of Revolute Systems is an orchard management software through creating insights and actionable tools for farmers from orchard data. The platform has an advanced satellite monitoring system, giving a near live feed of variation in orchard health. This data is combined with our other services like EMI soil scanning and Fruit variation mapping. Combining this data, farmers can investigate factors effecting yield and effectively intervene. The innovation was launched in 2019, has 30 active and 50 registered users and focuses on digital advisory, smart farming, and Increased efficiency, through high detail mapping of orchard variation in canopy and fruit, as well as digitizing soil and terrain data, effective problem identification can be done interventions plan zone specific. Their digital advisory is Agri VAS based one to many, they also provide climate and weather information on IVR and helplines and text SMS and USSD. The smart advisory is based on tailored farm level agro climatic and crop specific information and decision support to maximise productivity and reduce costs. Sensors, satellite and drones as well as AI are utilised. Equipment monitoring includes remote control of irrigation systems and farming operations leading to a reduction on water consumption and wastage. The smart tools also enable asset sharing such as leasing of tractors, drones or other mechanised farming equipment. The innovations rely on computers, sensors (weather stations, IoT, satellite geodata) and channels include website, dashboard and portal with clous based and Ai platforms and software as a service. Challenges include understanding the market and user needs, affordability, digital literacy, lack of technical capacity within and outside the company and systemic factors such as regulatory policy, lack of mobile coverage, and product translation into local languages. The innovation has reached sustainable scale and widescale adoption. Wide adoption by some of the biggest agricultural co-ops in table and wine grapes, apples, citrus industries in South Africa, with yearly returns by them to do more surveys of their production areas. Challenges include understanding the market and user needs, procurement of technology vendors, digital literacy, data collection issues, operational	South Africa

									constraints, trust, and product development into local languages for greater understanding by end users. The parent company has relied on private funds from bootstrapping and friends and family. The innovations enable them to generate revenue through business subscriptions fees and they developed their innovations with entrepreneurs and commercial agriculture companies and research institutes. There is wide adoption by Western and North Cape fruit producers and their toolbox is seen as the most user friendly and holistic platform available.	
179						ROBOTECH LAB	ROBOTECH LAB	X	Robotech Lab of Robotech Lab. A robotics lab in Tanzania that focuses on training and education and research and development various sectors Farming & Agriculture. They use technologies such as censors to solve smallholder farmers challenges and have worked for World Food Program (WFP) to solve smallholder farmers challenges using censors.	Tanzania
180						Roque online	Roque online	X	Roque online from Roque online. This is an Online platform that connects informal markets of the world with empowering technologies. They did not want to participate to the survey, because they receive too many surveys already, without any feedback on the result.	Angola
181						Rovert Foods	Rovert Foods	X	Rovert Foods of Rovert Foods Convenient and safe fresh and dry foods delivery service within Lusaka, Zambia.	South Africa, Zambia
182						SAGCOT Integrated Knowledge and Information for Agriculture (SIKIA)	Kilimo Trust	X	SAGCOT Integrated Knowledge and Information for Agriculture (SIKIA) from Kilimo Trust. SAGCOT was a 3-year project (2014-2016) that employed the latest technology to provide reliable information on Weather forecast, Agribusiness support, plot specific crop advice and SAGCOT database to increase production and productivity of 125,000 rice farmers and 400 other VC actors in the Southern Agricultural Growth Corridor of Tanzania. The project was implemented in partnership with TechForce Innovations B.V, Netherlands; Milan Innovincy B.V., Netherlands; Kadaster International, Netherlands and Alliance for a Green Revolution in Africa (AGRA), Kenya. The achieved project goals included the delivery of actionable information services, acquired from satellite geodata (e.g., environmental, crop status via Synthetic Aperture Radar (SAR) and plot boundaries information), augmented by more detailed data acquisition under the clouds (multispectral agronomic information) and web-based information.	Tanzania

183	■					Seasonal Forecast	Lesotho Meteorological Services	✓	Seasonal Forecast (2012) from Lesotho Meteorological Services. The purpose of the Agrometeorology sub-section is to support and provide advisories to agricultural production and food security activities in the country. The sub-section assists stakeholders in the provision of meteorological and related services to the agricultural community to help develop sustainable and economically viable agricultural systems, improve production and quality, reduce losses and risks, labour and energy, and decrease costs. It operates in Lesotho only.	Lesotho
184	■			■	■	Seedco Mobile App	SeedCo Group	X	Seedco Mobile App from SeedCo Group. SeedCo has developed a digital platform to disseminate product descriptions for their seed products and related Good Agricultural Practice (GAP) information. The platform can be accessed through a basic feature phone (using USSD), or smartphone app. Farmers are on-boarded to the platform through radio, TV, newspapers and farmer field days. Information can be accessed offline and refreshed when farmers are able to connect, with free Wi-Fi services occasionally provided by Seed Co through mobile units used during their field engagement with farmers. Farmers are able to interact with the platform through sending SMS or photos to Seed Co for a response.	Zimbabwe
185	■	■	■			SEGIA - (Serviço de Gestão de Informação Agrária/ Agricultural Information Management Service)	Iniciativa para Democracia e Cidadania (IDC)	✓	The Agricultural Sector Information Management Service (SEGIA, in Portuguese) is a combined service, conceived by the Iniciativa para Democracia e Cidadania (IDC), an NGO operating in Mozambique since 2013. This is an innovation launched in 2019 in the District of Maxixe, Inhambane Province/Mozambique, when IDC implemented the project for the implantation of "agro-entrepreneurs' incubators", in the lower part of the Inhanombe river. It emerged as a response to the challenge that local communities face in the agricultural and livestock sector. The lack of information and advance notification about natural effects affects production and productivity levels, mainly aggravating food insecurity at local and national level. Their system addressing planning, on-farm production, storage, post-harvest processing and access to markets. This Agri-VAS digital advisory system developed with the aim of mitigating food insecurity by improving production advice to Mozambican communities of small producers and breeders. They use voice channels (IVR, helplines) text (SMS, USSD) and apps. They provide data driven advisory tailored to farm level agroclimatic conditions and crops for decision making and maximizing productivity. They also use sensors, satellites, and drones to provide regional and localized weather forecasts. The provide digital tools to help farmers to diagnose plant diseases and advise on strategies for control and to prevent future outbreaks. Services are accessible via mobile phones, and USSD and enable farmers to keep digital records of livestock, including health and wellbeing, reduce disease and	Mozambique

									track input use, procurement, revenue and sales. They also provide input financing for seeds, fertilizer, agrochemicals, through subsidies from government and organise farmers to group purchase at discounted prices. They would like to use wearable devices and GSP sensors and smartphones, but currently use smartphone Apps, website, dashboards and social media and messaging platform (Fb, twitter, WhatsApp, Messenger) and expect to use radio in the future. Their challenges include understanding the market and user needs, affordability, digital and language literacy, lack of technical capacity, data collection pressures and farmer uptake and behaviour change. They are still at an R&D stage in development of this start-up idea, and primary users use their applications based on individual subscription fees but currently not a profitable model. They have been supported by their own funds, incubators but fundraising is an issue. Their database needs further development and is currently not available on a platform, but their services have taken into account explicitly the needs of disadvantaged groups. They have 53 current users and 213 registered users.	
186	■		■			SHERPA	Blue North Sustainability	✓	SHERPA from Blue North Sustainability is a specialised consulting company supporting businesses in the agriculture and food sectors in proactive clarification, development and implementation of sustainability strategies. SHERPA was launched in 2019 and expertly guides and supports businesses on the challenging & complex journey to achieve true and lasting resilience, viability & sustainability. It is operating in Malawi, South Africa and Zambia. Developed by Blue North Sustainability, SHERPA is an integrated on-line management system specifically designed to support & empower business owners, managers and management-teams within agricultural supply-chains, in the development and implementation of proactive, relevant and impactful sustainability strategies for their businesses. It has 52 active users and 305 registered users providing them with Smart advisory: Data-driven advisory based on tailored, farm-level agro-climatic and crop-specific information to support decision making, maximise productivity and reduce costs. Technologies such as sensors, satellites and drones, as well as big data analytics and AI, underpin many of these services., Record keeping: Digital tools that enable farmers to keep detailed records of livestock, including health and feeding data, to help mitigate diseases and avoid missed conceptions. Record keeping tools are also used to keep details of input usage, procurement, cost and revenue and sales records., Information for farms to develop, manage, measure and report a sustainability strategy for their business. SHERPA is designed to enable farmers to take full ownership of the sustainability strategies for their farms, to be in a proactive position in relation to market access requirements and to be able to comprehensively report to their stakeholders. Sherpa is a bottom-up approach and an alternative to the	Malawi, South Africa, Zimbabwe

									prescriptive "top down" approaches most often used. It puts the control of the sustainability agenda in the hands of the farmer/business management. It covers all aspects of sustainability in a holistic and integrated way, allowing the business to "see", measure and improve the whole system towards greater resilience and viability. The innovation helps build greater resilience and viability and uses computers, landlines, a website, GeoData and cloud-based databases. The advisory addresses a knowledge gap and helping farmers through reporting on multiple prescriptive standards. They have been challenged by digital literacy limitations, access to device, data collection and farmer uptake and behaviour change as well as lack of mobile coverage. They facilitate planning, on-farm production, post-harvest processing and access to markets. They are scaling towards replicating this in other countries, have funded themselves using their own resources and charge individual subscription fees, business subscription fees and an aggregated reporting service vis MS PowerBi over and above SHERPA licenses. They have not taken specific actions for inclusivity. They have worked with Hydrologic based in the Netherlands that also uses ICT solutions to ensure water systems are more weather resistant and climate adaptive. They have also worked with Pixofarm that have developed an App based system to monitor accurate yields on farms. They use noise resistant image processing, machine learning for forecasting and AI for enabling accurate fruit analysis.	
187	■		■	■	■	SIEL ((Système d'Information Economique sur les Légumes) /	Ceffel	✓	SIEL (Système d'Information Economique sur les Légumes) of Ceffel. SIEL is a platform for farmers, collectors and buyers to meet. It allows to identify the price trends on fruits and vegetables, to allow the producers to choose their market, to know the needs in fruits and vegetables and thus to program the cultural calendar.	Madagascar
188	■		■	■		SIEL+	Ceffel (Conseil Expérimentation Formation en fruit et légume)	✓	SIEL + of Ceffel. It is a tool for bringing together supply and demand.	Madagascar
189	■				■	Simulation de dynamique spatiale avec Ocelet	CIRAD	X	Simulation de dynamique spatiale avec Ocelet of CIRAD. Used for several years to simulate the spatio-temporal dynamics of landscapes. This method is based on interaction graphs to simulate the interdependence between landscape elements and allows to integrate this interdependence in the manipulation of spatial information such as mapping. It has contributed to improve the robustness of the mapping of agricultural	Madagascar

									plots, and to simulate their spatio-temporal evolution according to different scenarios based on farming strategies.	
190	■					SKAN - Sharing Knowledge Agrifood Networks	INOVISA	✓	SKAN This is a Sharing Knowledge AgriFood Network - INOVISA - Associação para a Inovação e Desenvolvimento Empresarial. This emergent innovation is created by INOVISA (established in 2013) which is an NGO and includes a platform sharing knowledge between the Portuguese speaking countries on agrifood, forestry and the environment. They have 260 active and registered users and share information on good practices to increase efficiency and productivity using computers, a dashboard and portal but currently face operational constraints.	Angola, Mozambique
191	■					Skudu Exact	Skudu.co.za	✓	This is an innovation implemented in Malawi, Mozambique, Namibia, South Africa and Zimbabwe. Skudu Exact launched in 2019 provides smart advisory: Data-driven advisory based on tailored, farm-level agro-climatic and crop specific information to support decision making, maximise productivity and reduce costs. It addresses planning, inputs and on-farm production. Technologies such as sensors, satellites and drones, as well as big data analytics and AI, underpin many of these services. It enables farmers and agronomists to effortlessly automate and expedite plant nutrition guidelines for multiple blocks and fields and product guidelines are issued specific to crop growth state and ordering and application for soil correction. Skudu's algorithm generates the requirement for lime, gypsum, fertiliser and foliar feed specific to the crop, growth stage and region based on provided soil and leaf sample analyses. They have 400 registered users and 50 active users. Their challenges include bridging time and technical capacity to generate plant nutrition guidance (content). They have also had constraints on farmer uptake and technical usability of the platform. They are transitioning to scale, have been funded by technology investors and charge business subscription and transaction fees.	Malawi, Mozambique, Namibia, South Africa, Zimbabwe
192	■	■	■			Small-Scale farmer seed production	Good Nature Agro	✓	Small-Scale farmer seed production from Good Nature Agro (2014). This is an integrated agriculture digital tool that can monitor production, logistics and supply of the legume value chain products and services. It has 15,000 users in Zambia and Malawi.	Malawi, Zambia
193		■	■	■		Smart Identity e-KYC	Angle Dimension	✓	Smart Identity e-KYC by Angle Dimension for Malawi aims to address know-your-customer (KYC) issues that are prevalent in the financial sector. The innovation is aimed at industries such as banks, telcos, government agencies, insurance companies and NGOs. The Smart Identity solution helps businesses simplify the onboarding of customers and enables the use of a digital ID through facial recognition, fingerprint reader, and QR code scanning.	Malawi

194					■	Smart Solutions for Agriculture by HMT	Harel Mallac Technologies (HMT)	✓	Smart Solutions for Agriculture by Harel Mallac Technologies (HMT). Rapidly emerging technologies that capture, manage, communicate, and use information in digital form are dramatically transforming the way that farming and agribusiness are done across the globe, especially for large commercial farms. Through the Mauritius Research and Innovation Council (MRIC), Harel Mallac Technologies (HMT) has developed an AgriTech platform to unleash the power of IOT and AI for farmers thus accelerating the development of its innovative business solutions in the agriculture sector. The platform supports IoT enabled systems to monitor critical parameters like water content and NPK in the soil medium, automate irrigation and fertilization whilst considering weather forecasts, and monitoring intrusion in real time. The AgriTech platform is powered by an intelligent engine able to forecast yield of the cultivations by consolidating live and statistical data. The platform was launched in 2020. The platform uses computers, sensors (weather stations, IoT of things devices, website, dashboard, Portal RaWAN network. Smartphones and websites are being sued and cloud-based software as a service. The initiative deals with planning and on-farm production. It is currently at the proof-of-concept phase but aiming to start commercialising and has receive a government grant and committed internal resources. They charge individual subscriptions and business subscription fees and have currently piloted with 5 users. The equipment monitoring involves irrigation to enable farmers to remotely control and track and maintain equipment for farming operations and leads to a reduction in water consumption and waste. They have awaited approval by the ICTA regulatory body of the frequency allowed since their sensors are LoRa (long range, low power wireless based). They have also been challenged in understanding the market and user needs. Procurement of vendors has been challenging as is user affordability, internal technical capacity and data collection. Farmer uptake and behaviour change remain challenges. The technology is believed to be inclusive of women.	Madagascar, Mauritius
195	■	■	■	■	■	Smart Village Agri hubs	UjuziNet Edtech Limited	✓	Smart Village Agri hubs from UjuziNet Edtech Limited. They partner with entrepreneurs, agronomists and innovators to convert local agro inputs shops into Smart Village AgriHubs that function as Agricultural Support Centres with all farmers' support tools under-one-roof by using their farm management software integrated to all Village Agri Hubs. With this partnership, they join hands together to incubate small scale and emerging farmers into fully- fledged, future-fit, sustainable enterprises attaining higher improved quality yields, participating in commercial supply chains and enabling multinationals in the food and beverage sector to source a reliable supply of high-quality raw materials from their network of small-scale farmers registered in their Smart Village	Tanzania

									AgriHubs (Kliniki za Kilimo). They provide value through integrated agronomic support services that combine technology and latest research developments to ensure current farming demands are met with knowledge and confidence.	
196	■	■	■	■	■	SmartFarmer	Riskflow DBS	✓	Smart Farmer of Riskflow DBS. This is a private sector company and this innovation was launched in 2019. Smart Farmer is an agriculture value chain connector, linking agricultural communities to value adding services through networks with markets, suppliers, service providers, other farmers and relevant government departments. It achieves this through the provision of user friendly, efficient, and flexible ICT-based services which cut across many functions and access channels. The value of Smart Farmer is in assisting farming communities and other stakeholders in doing things smarter, with transparency, accountability and efficiency, while driving profitability. As a response to the problems faced by agricultural communities, Smart Farmer provides the following services: Peer-to-Peer communication for Farmer-to-Farmer Interaction, Funder-to-Farmer Communication, Government-to-Farmer Communication, Price tracking and reporting, Agricultural alert systems (sending and receiving), Commodities offer and bid facilitation, Location services for service providers, Production information systems e.g., best practices, planning, e-Extension services. The Agri-VAS service assist farmers throughout the production cycle and livestock information and market prices – from planning to sale stages, whether locally, regionally or globally. Smart Farmer offers a new way through which information systems in agriculture are vastly improved. Agri VAS are delivered via voice channels (IVR, helplines), text channels (SMS and USSD) and via apps., Smart advisory: Data-driven advisory based on tailored, farm-level agro-climatic and crop specific information to support decision making, maximise productivity and reduce costs. Most of the services are accessible via mobile applications and require a farmer to upload a picture of the infected plant for diagnosis. Some services are also accessible via USSD. Also includes national and regional-level pest and disease early warning systems., Record keeping: Digital tools that enable farmers to keep detailed records of livestock, including health and feeding data, to help mitigate diseases and avoid missed conceptions. Record keeping tools are also used to keep details of input usage, procurement, cost and revenue and sales records. The other product is the CashFlow Optimiser to deal with open integrated and adaptive web based platform with details of dealers, counterparties, making use of Intelligent Financial Performance Monitoring components. a) The Primary Outcome of this Innovation is improved access to Finance through providing each farmer an Income statement balance sheet and cashflow, to assist them	Botswana, Lesotho, Malawi, Mozambique, South Africa, Tanzania, Zambia, Zimbabwe

									in accessing loans as well as keeping their Bio Data digitally and open for appraisal to Financial Institutions. b) Improved Yields through use of 3rd Party software that we have partnered with on our Platform such as Skudu to provide fertiliser and Insuring Yields through an Area Yield Index based Insurance model from PULA, our insurance partner. The regional initiative is active in Botswana, Lesotho, Malawi, Mozambique, South Africa, Tanzania, Zambia, Zimbabwe with 15,000 active users and 300,000 registered users and is in the transition to scale stage.	
197						SmartFarming SA	SmartFarming SA	X	SmartFarming SA deal with greenhouses, hydroponic systems, aquaculture, aquaponics, poultry farming and horticultural systems such as strawberry and lettuce farming. They deal with the application of modern technologies including systems and computers to manage temperature, humidity, water spray systems, water flow control.	South Africa
198						Soweto Uber	Soweto Uber	X	Soweto Uber of Soweto Uber. This is a webshop for all groceries and food stuff in Lusaka, Zambia. Soweto Uber is linking farmers and consumers.	Zambia
199						Survey 123	ESRI (Environmental System Research Institute)	✓	Survey 123 is a mobile application from ESRI (Environmental System Research Institute), a privately held company that invented the GIS (Geographic Information System) software concept. For a quick overview of the product, Survey123 for ArcGIS is a simple and intuitive forms-based data collection solution. It allows you to create, share and analyse data taken in the field.	Madagascar
200						Swaziland Livestock Information and Traceability System (SLITS)	Eswatini Government, Ministry of Agriculture	X	The implementation of the identification of livestock included a first stage that involved branding cattle with the country identification mark (shield) and a herd mark (dip tank of origin number). The second stage refers to SLITS which is the computerized identification system funded by the Government and supported by FAO. This system is currently under development by the Ministry of Agriculture, as part of the government's endeavour to transition from manual paper-based records to a system of digital records and to create a computerized livestock identification and traceability system that will control and monitor animal diseases, inhibit cross-border thefts of livestock as well as track livestock movements. The combination of first and second stage will combine brand marks with ear tags and will be monitored through a network of veterinary offices, registration, movement and animal health and brands database. Accompanying this will be a computerized system to track all movement and health information of cattle from	Eswatini

									birth to death. The system is expected to improve access to markets of livestock and livestock products, assist with the recovery of stolen animals or in disputes of ownership, contain animal diseases where there are outbreaks, production management and improve efficiency of Government controlled movement permits. They did not fill out the survey.	
201	■			■		SwiftVee	Swif Tech Law	X	Swiftvee' s mission is to reinvent agriculture through technology because the future is food and finding better ways to produce it. They pride themselves in being pioneers of online livestock trading in South Africa and the largest independent livestock trading platform. They are a Google Launchpad company bringing award winning technology to your operation. Our passion is to serve others. SwiftVEE (Livestock) is an Agri-platform addressing water scarcity, food security and market efficiency for the livestock sector. It brings the Agri-sector into industry 4.0. by offering substantial profit margins that facilitate sustainability and social impact. SwiftVEE has been recognised internationally for technology innovation and shortlisted as one of South Africa's top 100 most innovative companies (TT100). Its solution provides intuitive data and analytics with capacity to scale globally. The agricultural technology for industry 4.0 has arrived. SwiftVEE is a proudly South African solution for the global economy. As the world moves towards a digital reality the agricultural industry remains unchanged. Populations continue to rise which intensifies resource scarcity, food security and trade vulnerability. SwiftVEE provides technology to meet these challenges and enhance market efficiency. Through competitive innovation SwiftVEE ensures business is done better with higher profit margins and wider social impact.	South Africa
202				■	■	The SunExchange	The Sun Exchange	X	The SunExchange which was formed in 2015 is the world's first peer-to-peer solar leasing platform, where one can own solar-energy producing cells and build an enterprise by leasing these cells to power businesses, with installations and maintenance taken care of by one of Sun Exchange's carefully selected installation partners. They leverage financial innovation through crowdsourcing to drive sustainable energy to enable social and economic benefits of accessible and affordable energy for all. They have 40+ solar crowd sales achieved and members across 180 countries, with over 1m solar cells sold totalling 5.2GW of clean energy. P2P solar leasing marketplace, where businesses, schools, and even some individuals can benefit from the use of solar power, without paying the potentially crippling installation fees themselves.	South Africa
203	■		■	■	■	ThirdEye	ThirdEye Mozambique	✓	This innovation is established by a Dutch NGO called FutureWater and operates in Central and Southern Mozambique, Kenya and the Netherlands. It is now a private commercial company in Mozambique. The company received support from bilateral	Mozambique

									donors (USAID and SIDA) and the Dutch Government of Foreign Affairs to pilot flying sensors in Mozambique. Over the three years of support, they transferred the skills to local operators who provide services to 3,500 farmers over 1,600 ha and support 400 small scale farmers. They use drones for mapping and subsequent technical advice based on the results of each flight. Flying with special drone cameras, processing the data on the computer, and uploading the already processed maps to the tablet for subsequent crop condition advice to the farmer concerned. These drones are low-cost, high resolution flying sensors at a height of 100 metres and take overlapping images to cover 100s of hectares accurately. The cache of images can be sent through Bluetooth and Wi-Fi. The sensors also measure the reflection of near-infrared light and visible red light so can produce a Normalized Difference Vegetation Index (NDVI) illustrating the photosynthesis of the vegetation and indicating biomass and reflecting values correlated with crop stress due to lack of water, lack of fertilizer, pests, or abundancy of weeds. They have 1,000 registered users. Smart advice: Data-driven advice based on agro-climatic and Agri-climate information tailored to specific farms and crops to support decision-making, maximise productivity and reduce costs. Technologies such as sensors, satellites, and drones, as well as massive data analytics and AI underpin many of these services., Pest and disease management: Digital tools that help farmers diagnose plant diseases and develop strategies to treat diseased plants and mitigate future outbreaks. Most services are accessible through mobile apps and require the farmer to upload a photograph of the infected plant for diagnosis. Some services are also accessible through the USSD system. It also includes early warning systems on pests and diseases at national and regional levels. Equipment monitoring: Smart monitoring of equipment such as irrigation systems that allow farmers to remotely control, track and monitor their equipment and farming operations, resulting in reduced water consumption and waste., Shared smart assets: Digital tools that enable the economics of sharing assets such as tractors, drones, and other mechanised farming equipment. They offer smallholder farmers the opportunity to mechanise processes such as crop spraying, crop monitoring and land preparation. They offer training at different levels, piloting the drones, office skills related to processing imagery and advisory to farmers as well as e-Training modules. The challenges faced include understanding the market and user's needs, accessibility, lack of technical capacity and adoption or behaviour change by farmers. They are in a scale up phase adapting their offering to other geographies and their business model is based on data	

									usage charges, personalized services charges and they were funded by donations, business support and training and networking opportunities	
204		■		■		Tigo Kilimo	Tigo (Mobile phone operator - Telco)	X	Tigo Kilimo from Tigo. Tigo Kilimo is an agricultural value-added service (Agri VAS), operated by the mobile network operator Tigo. The service offers farmers relevant, timely and actionable information via mobile phones across three domains: agronomic practices on major crops, market price information, and weather forecasts. Content can be accessed via three mobile channels: Supplementary Service Data (USSD), Interactive Voice Response (IVR) and helpline.	Tanzania
205	■					Tsetse Control Mapping and Habitat Modelling	Scientific and Industrial Research and Development Centre (SIRDC)	X	Tsetse Control Mapping and Habitat Modelling from Geo-Information and Remote Sensing Institute (GRSI) (part of the Scientific and Industrial Research and Development Centre (SIRDC)). This entailed modelling the Tsetse habitat for the Matusadona area based on mapped Tsetse trap-sites.	Zimbabwe
206		■	■	■		Ubia Soko	AGRIInsight/Twigalpha	✓	Ubia Soko from AGRIInsight/Twigalpha. Ubia Soko is a unique multi-service platform developed by AGRIinsight Ltd where existing and new technologies/algorithms are combined in an innovative way to build a comprehensive business-support solution for farmers' families and servicing businesses	Tanzania
207					■	Vaya Tractor	Cassava Smartech (Vaya Digital Farmer/EcoFarmer)	✓	Vaya Tractor (2019) from Cassava Smartech (Vaya Digital Farmer/EcoFarmer). The Vaya Tractor platform allows farmers to hire, book and pay for farming equipment on their mobile phones by simply dialling *902#. Farming equipment available for hire on the platform includes, tractors, rippers, sprayers, spreaders, planters and disc ploughs, harrows and combine harvesters. This service is accessible to the over 1.4 million subscribers on the Vaya Digital Farmer platform.	Zimbabwe
208					■	Very Small Aperture Terminal (VSAT) for farmers	Botswana Telecommunications Corporation	✓	Very Small Aperture Terminal (VSAT) of Botswana Telecommunication Corporation (BTC). Very Small Aperture Terminal (VSAT), is a small telecommunication earth station that receives and transmits real-time data via satellite information that could be used by farmers	Botswana
209	■					Viamo platform	Viamo	✓	Viamo 321 Platform from Viamo. The Viamo platform is implemented in Democratic Republic of Congo, Madagascar, Malawi, Mozambique, Tanzania, Zambia. Viamo is a global Mobile for Development (M4D) organisation that aims to improve lives via the power of mobile technology. With a presence in more than 20 major markets in Africa and Asia, Viamo is a global social enterprise that specialises in mobile engagement and Information and Communication Technology for Development. Viamo works in	Democratic Republic of Congo, Madagascar, Malawi, Mozambique,

									partnership with organisations to connect them and individuals through digital technology, in order for everyone to make better decisions. Viamo uses IVR technology for Agri-VAS for information dissemination and data collection. It also helps provide market linkages between farmers and consumers. It assists farmers with climate smart information hosted on a hotline that farmers can access on-demand and also provides market price information. Agri VAS are delivered via voice channels (IVR, helplines), text channels (SMS and USSD) and via apps. Launched in 2017 it has 300,000 smartphone users and 8.5M registered users in the SADC region. The challenges they face, relate to understanding the market and user needs, device sharing, uptake by farmers especially women and girls, lack of mobile coverage, electricity. They have reached sustainable scale and charge commercial rates as a social enterprise. Development partners can use the platform for a fee to develop content and disseminate this to the subscribers of the platform.	Tanzania, Zambia
210	■					Video to increase the efficiency and effectiveness of agricultural advisory services and extension	Farming and Technology for Africa (FTA)	X	e-Extension video from Farming and Technology for Africa (FTA). The video is to increase the efficiency and effectiveness of agricultural advisory services and extension. Videos of Access Agriculture were translated in local languages.	Madagascar
211	■		■	■	■	Virtual ranching farming programme	VIRTUAL FARMING PTY LTD	✓	VRFP app of Virtual Ranging Ltd. Virtual Ranching Farming program (VRFP)mainly is an app-based e-commerce platform where Individuals get in farming via mobile phone application and get to own and trade Livestock and Farm produce – Horticulture products. Through Agribussiness Insurance in reputable Insurance companies these farm products will be insured to avoid any loses and cover all risk through this program. This app manages Farmers produce' sellers and buyers' demand for livestock and Horticulture farm produce. Quality cows and farm produce will see Botswana becoming self-reliant on the national food security and international markets.	Botswana, Malawi, South Africa
212		■				Yoco	Yoco	X	Yoco is an African technology company providing payment applications mainly meant to create opportunities for entrepreneurs to get paid and be more successful. It is establishing new markets; building business tools and financial services that work for entrepreneurs. Offers mobile card machines that work with 3g Data, on-line cardless payments, on-line link payments. Also used as a business tool, as a source of capital and allows use of portal and POS integration. It also assists by making payments accessible for small businesses – often for the first time. and has raised over $100M from some of	South Africa

									the world's leading technology investors, who have backed companies like Nubank, Square and Stone. Yoco is popular with rural farmers in south Africa who use their services to transact at local Spaza Shops (convenient shops), which are used as last mile delivery for inputs by large retail and wholesale companies. Yoco has bridged the gap of the unbanked Market specifically in the farming communities.	
213		■				YouFarm	YouFarm	X	YouFarm is a Start Up enterprise and provides farmers with access to finance by getting people to crowdfund and invest in crops and livestock and share the profits with the farmers when the produce goes to market. This enables people without access to land to earn money by partnering up with farmers to engage in the agricultural value chain and production system. The platform is completing beta testing and has over 100 registered farmers and 600 registered crop and livestock investors in South Africa. They provide finance for farmers through an agent model, and through their digital platform, many from all parts of the world can invest. There are three revenue streams, the agents have an annual agency fee of which 20% profit margin is made by the business and a 3% success fee for every project that earns a profit. Profits are shared when produce is sold, farmers take 40% of the profit, investors share 20% and YouFarm Agents take 20% of the profit. They are looking for investment capital.	South Africa
214	■		■	■		Zaulimi	ACE	✓	Zaulimi by the Agricultural Commodity Exchange for Africa (ACE) is an inclusive mobile application which assists farmers and extension officers with essential production and marketing information for selected crops, livestock and baobab. Farmers are presented with detailed crop information on climate and soil requirements, planting, manure and fertilizer application, weeding, pest and diseases control as well as harvesting and storage. The crops featured currently include groundnuts, maize and soya. The content can be accessed offline. Market price information for major crops that are traded through ACE are also featured in the app. The app also contains contact details of ACE field officers, government extension officers and public service providers.	Malawi
215	■	■		■		ZFU EcoFarmer Combo	Cassava Smartech (Vaya Digital Farmer/EcoFarmer)	✓	ZFU EcoFarmer Combo (2016) from Cassava Smartech (Vaya Digital Farmer/EcoFarmer). ZFU EcoFarmer Combo is a bundle of services, including EcoFarmer Maize or Cattle Tips and Weather Indexed Insurance, ZFU Membership, and EcoSure Funeral Cover, which farmers pay a subscription fee towards. They have 6,500 registered users.	Zimbabwe
216	■		■	■		ZimAgrihub knowledge portal	Welthungerhilfe	✓	ZimAgriHub from Welthungerhilfe (2020). An interactive platform that provides a one-stop knowledge portal whereby all agricultural literature, video and audio files can be accessed by all stakeholders of Zimbabwean agriculture. Such stakeholders involve academia, corporate entities, development institutions and government entities. 600	Zimbabwe

									active users (no registration required to use the Hub, so no total of registered users is kept).	

ANNEX 6 KII GUIDE FOR CCARDESA ICKM FOCAL POINTS

1. Name of person(s) interviewed and description of role/responsibility:
2. Organisation:
3. Country:
4. Website:

Policies

5. What are the relevant frameworks or policies in your country as it relates to digital technology and agriculture?
    - Relevant frameworks or policies in country operating. (digital & agriculture)
      (please could you provide documents or links)
    - Do these relate to e-Government or to frameworks for the country which are relevant to public, private and third sector entities or individual entrepreneurs?
    - Are there any policies in development currently?
    - What frameworks or regulatory instruments or legislation are in development currently?
    - Is there legislation (or is it in development) that relates to data privacy laws or the protection of individuals or their data or the use of open data?
    - Are there any ag policies targeting some populations or sectors that have a digital element (vs a digital ag policy)?
6. What are the gaps that have been identified related to policies/frameworks in the country related to digital technology and agriculture?
7. What are the strengths of your country in terms of its ability to make effective use of digitalisation in agriculture
8. Is there an overall national digital or industrial strategy that covers digital tools and innovations?
    - Who are the main departments in government who are responsible for these policies?
    - Are there collaborating divisions within government that combine private sector with aspects such as the regulation of financial products and services?
    - Are there specific policies in the Ministry of Agriculture that relate to aspects of digital advisory services for example?
        - □ Digital weather information?
        - □ Digital e-commerce input provision to farmers?
        - □ Digital soils analysis?
        - □ Food for work or subsidies for the poor to help them feed themselves that are deployed digitally?
9. Are there resources or budgets dedicated particularly to digital advancement?
    - Who pays for these?
    - Is their development dependent on donors?
10. What have been your most significant challenges with establishing digital policies of this nature? (Multiple select, max 3)

- □ Regulatory support and policies/frameworks
- □ Market barriers to digital
- □ Market barriers to innovation in agriculture
- □ Digital landscapes
- □ Digital literacy amongst farmers
- □ Mobile Connectivity/Internet Access
- □ Cost of Data
- □ GDPR Regulations
- □ Investment or lack of finance for Innovative development
- □ Lack of incentives
- □ Challenges to catalyse ecosystem change
- □ Other sectors leading compared to agriculture

11. What are the key challenges enabling environment for digitalisation in the agriculture in your country?

- Probe around enabling environment (government regulation, private sector, market, infrastructure, connectivity)

Digital Agricultural Innovations

12. Are you aware of any digital agriculture innovations in your country?
    If yes, which one. Please could you provide name innovation, company and contact details?

What type of digital innovation?

- □ Digital Advisory
- □ Agri Digital Financial services
- □ Digital Procurement
- □ Agri-e-commerce
- □ Smart Farming
- □ other (specify)

Explanation: Digital Advisory (AgriVas, Smart advisory, weather information, pest & disease management, product verification, record keeping), Agri Digital Financial services (Credit & loans, Input financing, credit scoring, crowdfunding, insurance, digital agri-wallet, savings, accountability tool), Digital Procurement (digital records, digital records + payment, digital records + traceability, digital records + payments & traceability), Agri-e-commerce (inputs, outputs, inputs & outputs), Smart Farming (smart shared assets like tractors, equipment monitoring, livestock & fishery management, blockchain, remote sensing, robotics, Satellite and drone imagery), other.

13. Which key challenges are solved with the innovations? (Multiple select, max 3)

- □ Knowledge Gap
- □ Financial exclusion
- □ Low Productivity

- □ Poor Access to Markets
- □ Climate Change
- □ Poor Access to internet
- □ Other (Specify)

14. What are the biggest opportunities for deploying digital agricultural innovations in your country?

14. Are you aware of inclusive digital agricultural innovations for:

- Women
- People with Disability
- Elderly
- Poor farmer
- Limited literacy/illiterate individuals

15. Have you seen any unintended consequences (positive or negative) regarding use of digital tech in ag in general terms in your country?

Skills Development

15. How are digital agricultural skills acquired in your country? (Multiple select)

- □ Universities - Agriculture
- □ University – ICT
- □ University - Business
- □ Incubators and Accelerators
- □ Agricultural TVET
- □ NGOs
- □ Outside the country
- □ Any others? Please specify.

Could you link us to digital agricultural skills providers?

Contact details.

16. Can you suggest any other resources or resource people that we might want to reference to deepen our understanding of the innovation landscape and digital ag space within your country?

ANNEX 7 SURVEY OF DIGITAL INNOVATIONS

1. Name of person completing this survey

2. What is your email address?

3. Name of the innovation or application/platform

4. Please provide a short description

5. What is the name of the organization/company responsible for the innovation/platform listed above?

6. What is the launch date (year) of the innovation?

7. What is the URL of your website?

8. What is the type of organization responsible for the innovation/platform?
(You can select multiple answers)

- □ Agribusiness
- □ Private sector company
- □ MNO
- □ Government
- □ NGO
- □ Other (please specify)

9. In what country(ies) is the innovation operating

10. What is the primary function of the innovation
(If you have a bundled service concept click more than one option?)

- □ Digital Advisory
- □ Agri Digital Financial services
- □ Digital Procurement
- □ Agri-e-commerce
- □ Smart Farming, other (specify)

Explanation: Digital Advisory (AgriVas, Smart advisory, weather information, pest & disease management, product verification, record keeping), **Agri Digital Financial services** (Credit & loans, Input financing, credit scoring, crowdfunding, insurance, digital agri-wallet, savings, accountability tool), **Digital Procurement** (digital records, digital records + payment, digital records + traceability, digital records + payments & traceability), **Agri-e-commerce** (inputs, outputs, inputs & outputs), **Smart Farming** (smart shared assets like tractors, equipment monitoring, livestock & fishery management, blockchain, remote sensing, robotics, Satellite and drone imagery).

11. What is the primary anticipated outcome of this innovation? (e.g., improved access to finance, increased efficiency, reduced post-harvest lost, etc.)
Please limit your response to 150 words

12. What types of digital devices does it rely on?

- □ Computers
- □ Basic/feature phones
- □ Smartphones
- □ UAVs/drones
- □ Sensors (weather stations, IoT devices, etc.)

- □ Satellites / earth observation
- □ Wearable devices
- □ GPS
- □ Other (please specify)

13. What types of digital channels / technologies are used to transmit or store data/information related to this innovation/platform?
(You can select multiple answers)

- □ Landlines
- □ Radio
- □ Mobile voice / IVR / call centres
- □ SMS
- □ USSD
- □ Smartphone app
- □ Video
- □ Website / Dashboard / Portal
- □ Social media platform (e.g., Facebook, Twitter)
- □ Messaging platform (e.g., WhatsApp, Messenger)
- □ Blockchain
- □ Geo Data
- □ Other (please specify)

14. What types of digital technologies / tools are used for analysis?
(You can select multiple answers)

- □ Spreadsheets (e.g., Excel)
- □ Local databases (e.g., MS Access)
- □ Cloud-based databases (e.g., SQL)
- □ Cloud-based software as a service (e.g., third-party service provider)
- □ Artificial intelligence platform (e.g., IBM Watson)
- □ Machine Learning
- □ Other (please specify

15. Which of the following pain points/challenges does this innovation seek to address?
(You can select multiple answers)

- □ Knowledge gap
- □ Financial exclusion
- □ Low productivity
- □ Poor access to markets
- □ Climate change
- □ Poor access to internet

- □ Other (please specify

16. Which of the following challenges have you faced in applying this innovation within your agriculture work?
(You can select multiple answers)

- □ Understanding the market and user needs.
- □ User affordability
- □ Language or literacy levels
- □ Digital literacy
- □ Access to device (sharing with family with others)
- □ Lack of technical capacity (on our team and/or local partners)
- □ Data collection issues
- □ Farmer uptake/use/behaviour change
- □ Uptake by women / girls (or another marginalized group)
- □ Operational constraints
- □ Systematic factors within the operational environment (e.g., regulations/policy environment)
- □ Lack of mobile network coverage
- □ Lack of electricity
- □ Trust
- □ Financial sustainability business model
- □ Other (please specify)

17. What parts of the value chain is the innovation used in?
(You can select multiple answers)

- □ Planning
- □ Inputs
- □ On-farm Production
- □ Storage
- □ Post-Harvesting processing
- □ Transport
- □ Access to markets

18. At what stage in the scaling process is this innovation? *For more details on each of the six stages described below, refer to the Insights on Scaling Innovation report, which is accessible here. Please select one stage.*

- □ Ideation (idea development phase)
- □ Research and development (R&D) (concept development)
- □ Proof of concept/Pilot/Field test
- □ Transition to scale (demonstrated small-scale success)
- □ Scaling (replication / adaptation in other geographical areas)

□ Sustainable scale (wide scale adoption)

19. Who are the users of this innovation? (and end-user or intermediary)
(You can select multiple answers)

□ Farmers
□ Cooperatives
□ Other value chain actors
□ Government agencies
□ Extension workers
□ NGO staff
□ Other (specify)

20. How many users use your innovation? (Registered and active)
Active users = We collect data on registered users and active users. An active user is a registered user who has used the service in the past 90 days.

21. Did you use any of the following financial mechanisms to support this innovation?
(You can select multiple answers)

Financial support:
□ Friends / Family
□ Angel Investor
□ Impact Investors
□ Donor Grants (Government / Foundations)
□ Crowd funding
□ Challenge prizes
□ Other (please specify)

Non-financial support:
□ Business Development support
□ Incubator / Accelerator
□ Training
□ Network opportunities
□ Other (please specify)

22. What sources of revenue/funding does the innovation currently rely on?
Please only select those that contribute at least 10% to the total
(You can select multiple answers)

□ Individual subscription fees
□ Business subscription fees
□ Advertising
□ Data monetization
□ Transaction fee

- □ Premium services
- □ Donor subsidies/program support
- □ Corporate CSR funding
- □ Host country government funding
- □ Other (please specify)

23. Will any subsidies or donor support be required to continue to sustain this innovation?
    - □ Yes
    - □ No
    - □ Unsure

24. Which of the following actors were significantly involved in **developing** this innovation?
    (You can select multiple answers)
    - □ Community organizations (e.g., local CSO)
    - □ Local (non-national) government body/agency
    - □ National government body/agency
    - □ Donor or philanthropic programs (Internationally based)
    - □ Donor or philanthropic programs (Nationally based)
    - □ Entrepreneurs or social enterprises
    - □ Commercial agriculture companies
    - □ Research Institutes
    - □ Other (please specify)

25. Which of the following actors were significantly involved in **implementing** this innovation?
    (You can select multiple answers)
    - □ Community organizations (e.g., local CSO)
    - □ Local (non-national) government body/agency
    - □ National government body/agency
    - □ Donor or philanthropic programs (Internationally based)
    - □ Donor or philanthropic programs (Nationally based)
    - □ Entrepreneurs or social enterprises
    - □ Commercial agriculture companies
    - □ Other (please specify)

26. If you would like to describe in more detail any of the challenges you faced, please do so here.
    Please limit your response to 150 words.

27. At what level does this innovation aim to have an impact and describe the nature of that impact expected?
    (You can select multiple answers)
    - □ Individual
    - □ Household

□ Community

□ Businesses

□ Government

28. What, if any, results have your innovation had to date?
Please provide details and links to any documents outlining the results, if relevant. Please limit your response to 150

29. To what extent have you taken efforts to ensure that this innovation is inclusive of the following groups?
□ Women

□ People with disabilities

□ Elderly

□ Smallholder farmers

□ Illiterates

30. Are there other organizations you feel we should send this survey to who are involved in innovations?

□ Yes

□ No

If yes, please provide contact details:

Name organization:
Website:
Contact person:
Email Address:

31. Please let us know if there are other people we should speak to about the scale or sustainability of their innovations in your country or in the region?
□ Yes

□ No

If yes, please provide contact details:

Name organization
Website:
Contact person:
Email Address

ANNEX 8 AGRI SYLLABI SURVEY

1. What is the name of your University of Institution?
2. What is the name of your Faculty/Department of Unity?
3. Country:
4. Address of main campus
5. Website

6. Your Name
7. Position or Title
8. Email address

Digital Training Courses Offered

9. Do you teach digital skills training in your institution?

10. Digital Skills Categories are listed below. Please identify which categories are taught at what level (Certificate, BSc, MSc, PhD, College Incubator or University Incubator).

    - □ Computer Essentials – use of devices, file creation and management, networks, privacy and data security.
    - □ Online Essentials – web browsing, effective information search, online communication, e-mail and completing online forms.
    - □ Word Processing – using a word processing application to create documents
    - □ Spreadsheets – using spreadsheet to produce accurate work outputs
    - □ Databases – concept of databases, creating database and using databases
    - □ Presentations – creating presentation
    - □ Online Collaboration – setting up and using online collaborative tools, such as storage, productivity applications, calendars, social media, web meetings, learning
    - □ IT Security – safety on the internet, data and information management
    - □ Graphic Design
    - □ Digital Marketing
    - □ Desktop Publishing
    - □ Digital Environments
    - □ Mobile Technologies
    - □ Other (please specify)

11. From the list above please identify whether training is delivered on site or on-line.

12. Do you teach any of the following new skills categories?

    - □ Big Data for analytics in agriculture
    - □ Artificial Intelligence for agriculture
    - □ Internet of Things for Agriculture
    - □ Programming/ Coding for agricultural systems
    - □ Digital entrepreneurship in agriculture

- □ Cyber security in the agricultural context
- □ Virtual Reality for agriculture
- □ Other (please specify)

13. At which level of training are these courses listed above? (Certificate Level, BSc, MSc, PhD, Incubator (University Faculty) and/or Incubator (College))
14. Are these courses place based i.e., on site, or on-line?

15. What was the year that you implemented the first digital training within your institution?

16. Have you updated the digital training courses since then?

17. Do you align digital training to a specific Institutional ICT or Digital Strategy? If so, can you provide the name of the policy or a link to where it can be found.

18. We would like to learn about the digital training curriculum you use. Please provide us with a contact person that we can approach to find out more about what is included.

19. Please include any further comments that you feel relevant to this section on digital training courses.

Entrepreneurship Training Offered

20. Do you implement entrepreneurship training for digital businesses within your institution?

21. What kind of digital entrepreneurship training does your institution provide?

- □ Agri Digital Financial services
- □ Digital Procurement
- □ Agri e-commerce
- □ E-Extension
- □ Smart Farming
- □ ICT-enabled advisory services
- □ Digital Content Creation
- □ None
- □ Other (please specify)

22. What types of skills building does your institution provide though digital training that are taught?

- □ Launching an enterprise
- □ Finding a job as an employee
- □ Working for the public sector
- □ Working in advancing research (PhD, research institutions, others, etc.)
- □ Other (please specify)
- □ None

23. Please indicate what you feel the most important digital agricultural skills are to equip students to enter the current labour market? *Where your scoring range is 1 = least important to 5 = extremely important.*
    - □ Data collection
    - □ Digital advisory
    - □ Agri digital financial services
    - □ Digital Procurement
    - □ Agri -ecommerce
    - □ E-extension
    - □ Smart Farming
    - □ Other

24. Please rank the quality of the facilities for digital training within your institution. *Where your scoring range is 1 = least important to 5 = extremely important.*
    - □ University or College Incubator/Innovation Space
    - □ Experimental Farms
    - □ ICT Laboratories
    - □ Research Laboratories
    - □ Students' associations space/ Clubs
    - □ Other

25. Are there further comments you would wish to include in this section?

ANNEX 9 KII GUIDE FOR INCUBATORS

Name of person(s) interviewed
Description of role
Responsibility
Organisation Name Email address Website Type ● Incubator ● Hub ● Training Centre ● Other, specify
Year of establishment
Country
1. Describe the organisation ● Specify whether the incubator/accelerator is hosted by an external organisation (e.g., private company, university, etc.) ● Indicate the type of support provided: □ Acceleration/ Incubation and/or others □ Managerial support (e.g., drafting of business plans, incorporation...) □ Physical spaces (including shared services) □ Entrepreneurial and managerial training □ ICTs/Digital agriculture training □ Administrative and legal services □ Intellectual property □ Management support □ Support in the development of networking relationships (e.g., with research centres, institutions □ Support for technology scouting and development □ Support in fundraising/investment readiness □ Other (Specify) ● How many agricultural start-ups have you supported to date? ● How many digital) agriculture experts do you employ? ● How many agricultural start-ups do you have in your current portfolio? ● Could you mention some of them? (All those that exist).
2. What is the category of "youth" benefiting from incubators programs and trainings in: a. **Digital Agriculture** □ Student/Pupil □ Graduate □ Researcher □ Young agripreneur (specify the agricultural value chain in which he/she is operating) □ Aspiring agripreneur □ Other (Please specify) b. **ICTs/Digitalisation** □ Student/Pupil

- □ Graduate
- □ Young entrepreneur (specify the sector in which he/she is operating)
- □ Aspiring entrepreneur
- □ Other (Please specify)

c. Entrepreneurship

- □ Student/Pupil
- □ Graduate
- □ Young/early-stage entrepreneur (specify the sector in which he/she is operating)
- □ Aspiring entrepreneur
- □ Other (Please specify)

3. What digital skills / trainings within your program portfolio are specifically designed for entrepreneurs/agriculture entrepreneurs?

Could you share the syllabi?

4. Does your training program include the following digital agriculture concepts / tools?

Explanation: Digital Advisory (AgriVas, Smart advisory, weather information, pest & disease management, product verification, record keeping), **Agri Digital Financial services** (Credit & loans, Input financing, credit scoring, crowdfunding, insurance, digital agri-wallet, savings, accountability tool), **Digital Procurement (** digital records, digital records + payment, digital records + traceability, digital records + payments & traceability), **Agri-e-commerce** (inputs, outputs, inputs & outputs), **Smart Farming** (smart shared assets like tractors, equipment monitoring, livestock & fishery management, blockchain, remote sensing, robotics, Satellite and drone imagery), other.

- □ Digital Advisory
- □ Agri Digital Financial services
- □ Digital Procurement
- □ Agri-e-commerce
- □ Smart Farming, other (specify)

6. Are these trainings delivered by the incubator or do you collaborate with external organizations (Universities, private schools, consultants, training centres, NGOs, etc.)?

7. In case of collaboration with colleges and universities for agriculture-related business ideas,

With which Universities?

And which activities are implemented?

- □ Selection of business ideas among colleges and universities' students.
- □ Collaboration with researchers to give value to the results/solutions developed and turn them into potential entrepreneurship ideas.
- □ Collaboration with researchers to develop prototypes and/or access data and information to support the youth incubated business projects.
- □ Making accessible the labs/machines (ex. FabLab) of the universities for the youth incubated.
- □ Using the space of the Universities and colleges to implement training/incubation activities.
- □ Others? (specify)

8. Do you benefit from the support of the government (grants, loans, hackathons funds, trainings funds, etc.)? How could you describe the enabling public environment in the support of business service provider organizations like yours?
9. Where do you get the funds to run your organization?
10. How do you think CCARDESA, and other international partners can better support the development of digital skills for youth agricultural entrepreneurship in the SADC region or in your country?

ANNEX 10 KII GUIDE FOR UNIVERSITIES AND COLLEGES

Name of person(s) interviewed
Description of role
Responsibility
Institution Name Email address Website Type ● Agricultural University ● Agricultural College
Year of establishment
Country
Team members on call
1. What kind of facilities do you have regarding ICT infrastructure at the university? (Wi-Fi, computer labs, intranet, servers, etc.)?
2. ● Indicate the type of digital-oriented trainings provided (if any): □ General IT skills □ Data collection / data science skills / AI / Machine Learning □ Digital Agriculture skills □ Others digital skills (specify) ● If digital agriculture skills, do you teach about digital innovation in agriculture? About what type of digital agriculture innovations? □ Data collection □ Digital Advisory □ Agri Digital Financial services □ Digital Procurement □ Agri-e-commerce □ Smart Farming □ Other (specify) **Explanation: Digital Advisory** (AgriVas, Smart advisory, weather information, pest & disease management, product verification, record keeping), **Agri Digital Financial services** (Credit & loans, Input financing, credit scoring, crowdfunding, insurance, digital agri-wallet, savings, accountability tool), **Digital Procurement (** digital records, digital records + payment, digital records + traceability, digital records + payments & traceability), **Agri-e-commerce** (inputs, outputs, inputs & outputs), **Smart Farming** (smart shared assets like tractors, equipment monitoring, livestock & fishery management, blockchain, remote sensing, robotics, Satellite and drone imagery), other. Could you share the syllabi / training material?

3. Do you collaborate with other universities / development partners on digital agricultural skills development in teaching / research?
4. Is there any innovation space/incubator attached to your institution? If not, do you collaborate with external business service providers? Which activities are implemented (for both internal or external incubator)? □ Selection of business ideas among colleges and universities students. □ Collaboration with researchers to give value to the results/solution developed and turn them into potential entrepreneurship ideas. □ Collaboration with researchers to develop prototypes and/or access data and information to support the youth incubated business projects. □ Making accessible the labs/machines (ex. FabLab) of the institution for the youth incubated. □ Use the space of the Universities and colleges to implement training/incubation activities. □ Others? (specify)
5. Do you use e-learning in your teaching? If yes, is the e-learning covering the totality of the program portfolio?
6. What are the current perceived gaps in the digital (agricultural) skills training within your institution?
7. Within the SADC region, which universities are most advanced in digital agricultural skills development?
8. How could CCARDESA and other international partners better support the development of digital (agricultural) skills for students in the agricultural entrepreneurship space in the SADC region or in your country?

ANNEX 11 KII GUIDE FOR DIGITAL INNOVATIONS (COUNTRY)

Name of person(s) interviewed and description of role/responsibility:

Contact Details:

Organisation:

Country:

Name of Innovation:

1. What is your target group?
   - □ Farmers
   - □ Cooperatives
   - □ Other value chain actors (e.g., input suppliers, buyers, mills, etc.)
   - □ Extension workers
   - □ Government agencies
   - □ NGO staff
   - □ Other (Specify)

Probe: Has this target group remained the same from inception or has it changed related to the evolution of the innovation.

2. Can you describe your innovation very briefly?

Probe: Are you deploying a single use case or multiple or bundled use cases to your target groups? What was the rationale for any change?

Are there partnerships involved in the service bundle? If so, what kinds of organisations are involved locally?

3. In your own words, describe the stage at which your innovation is? How do you define scale?

Probe on how they are defining scale (so we can categorise it according to the framework we are using below)

- □ Ideation (idea development phase)
- □ Research and development (R&D) (concept development)
- □ Proof of concept/Pilot/Field test
- □ Transition to scale (demonstrated small-scale success)
- □ Scaling (replication / adaptation in other geographical areas)
- □ Sustainable scale (wide scale adoption)

What is your aspiration for scaling further?

National? Which countries?
Regional? SADC or further afield?

4. What sources of revenue/funding does the innovation currently rely on?

   Please only select those that contribute at least 10% to the total. (See list below).

   - □ Individual subscription fees
   - □ Subscription as a service
   - □ Business subscription fees (subscription as a service model)
   - □ Advertising
   - □ Data monetization
   - □ Transaction fees
   - □ Premium services
   - □ Donor subsidies/programme support
   - □ Corporate CSR funding
   - □ Host country government funding
   - □ Other (please specify)

Probe for what the underlying business model is.

Is this work dependent on donor funding?

What are the long-term plans for sustainability?

Based on your experience are you able to provide any indication on general costs/ investments required in your digital tech approach?

5. What have been your most significant challenges with deploying the innovation?

See if you can tick any of the list below, focus on the most persistent challenges.

- □ Understanding the market and user needs
- □ Procurement of technology vendors
- □ User affordability
- □ Language or literacy levels
- □ Digital literacy
- □ Lack of technical capacity (on our team and/or local partners)
- □ Lack of Enabling Infrastructure (E.g., poor mobile network or unreliable ways of charging equipment)
- □ Data collection issues
- □ Operational constraints
- □ Trust
- □ Farmer adoption of Technology
- □ Financial sustainability business
- □ Suspicion of end users
- □ Other (specify)

What strategies have you used to overcome these challenges?

- □ Probe around enabling environment (government regulation, private sector, market, infrastructure, connectivity)
- □ Human capital with the right skills sets to grow the businesses

6. How do you assess your innovation in terms of availability, affordability, usability and inclusivity?

Have you been able to document any of the following benefits from the use of this technology?

- Number of repeated users?
- Efficiencies or Cost savings (e.g., reduced labour, reduced transportation, marketing, greater access to markets?
- Examples may include (multiple select)
  - □ Improved productivity
  - □ Reduced poverty
  - □ Greater reliance on household food production
  - □ Access to markets
  - □ Sales or marketing of produce
  - □ Access to finance
  - □ Improved aggregation
  - □ Weather information
  - □ Soil analysis
  - □ Improved climate resilience
  - □ Reduction in climate emissions
  - □ Other specify

How have you ensured that your digital technology is inclusive of more marginalised groups?

Examples include women, smallholder, the aged, semi-literate/illiterate, and the disabled

Probe for strong advocacy work in industry and broader innovative ways to extend these to people who don't have access or physically or are priced out of market

7. What have been the enablers for success in the introduction of your innovation?
   - □ Existing digital marketplaces or incubators or ecosystems operating
   - □ Partnering with private sector companies that have scale and credibility in markets and senior level buy in.
   - □ Access to grants or finance
   - □ Working hand in hand with farmers groups or organisations
   - □ Crowdfunding opportunities etc
   - □ Other (please specify?)

8. How do you fulfil your human capital needs for skilled digital operators?

Probe: In recruiting staff do you look for graduates from university or those trained in Incubators or elsewhere, can you explain your answer in more detail please? Or do you rely on training your staff in-house mainly?

9. Do you have any recommendations for CCARDESA regarding reaching scale and sustainability, constraints faced, human capital and/or financing?

ANNEX 12 KII GUIDE FOR DIGITAL INNOVATIONS (REGIONAL)

Name of person(s) interviewed and description of role/responsibility:

Contact Details:

Organisation:

Country (Identify which country was original/HQ and which county they are operational in for the relevant digital innovations):

Name of Innovation:

10. What is your target group?
    - □ Farmers
    - □ Cooperatives
    - □ Other value chain actors (e.g., input suppliers, buyers, mills, etc.)
    - □ Extension workers
    - □ Government agencies
    - □ NGO staff
    - □ Other (Specify)

Probe: Is the target group the same in all countries or different, please describe the reasons for your answer?

11. Can you describe your innovation very briefly?

Probe: Are you deploying a single use case or multiple or bundled use cases to your target groups? Why did you choose this?

Are there partnerships involved in the service bundle? If so, what kinds of organisations are involved?

Please explain the role of these different partnerships as part of the service offering?

12. In your own words, describe the stage at which your innovation is?

Probe on how they are defining scale (so we can categorise it according to the framework we are using below)

- □ Ideation (idea development phase)
- □ Research and development (R&D) (concept development)
- □ Proof of concept/Pilot/Field test
- □ Transition to scale (demonstrated small-scale success)
- □ Scaling (replication / adaptation in other geographical areas)
- □ Sustainable scale (wide scale adoption)

What is your aspiration for scaling further?

National? Which countries?
Regional? SADC or further afield?

13. What sources of revenue/funding does the innovation currently rely on?

    Please only select those that contribute at least 10% to the total (You can select multiple answers).

Probe for what the underlying business model is according to the framework we are using below. Is this the same in each country or different in different countries?

Ask them to explain what guides this to help with our understanding?

- □ Individual subscription fees
- □ Subscription as a service
- □ Business subscription fees (subscription as a service model)
- □ Advertising

- □ Data monetization
- □ Transaction fees
- □ Premium services
- □ Donor subsidies/programme support
- □ Corporate CSR funding
- □ Host country government funding
- □ Other (please specify)

Is this work dependent on donor funding?

What are the long-term plans for sustainability?

Based on your experience are you able to provide any indication on general costs/ investments required in your digital tech approach?

14. What have been your most significant challenges with deploying the innovation?

Probe: Are these challenges different in different geographies?

See if you can tick any of the list below, focus on the most persistent challenges.

- □ Understanding the market and user needs
- □ Procurement of technology vendors
- □ User affordability
- □ Language or literacy levels
- □ Digital literacy
- □ Lack of technical capacity (on our team and/or local partners)
- □ Lack of Enabling Infrastructure (E.g., poor mobile network or unreliable ways of charging equipment)
- □ Data collection issues
- □ Operational constraints
- □ Trust
- □ Farmer adoption of Technology
- □ Financial sustainability business
- □ Suspicion of end users
- □ Other (specify)

Ask are these the same, similar of different in different countries?

How do you adapt to these different environments as a company?

- □ Probe around enabling environment (government regulation, private sector, market, infrastructure, connectivity)
- □ Human capital with the right skills sets to grow the business

If they say yes to any, ask them what strategies they use to overcome these challenges?

15. How do you assess your innovation in terms of availability, affordability, usability?

Have you been able to document any of the following benefits from the use of this technology?

- Number of repeated users?
- Efficiencies or Cost savings (e.g., reduced labour, reduced transportation, marketing, greater access to markets?
- Examples may include (multiple select)
  - □ Improved productivity
  - □ Reduced poverty

- □ Greater reliance on household food production
- □ Access to markets
- □ Sales or marketing of produce
- □ Access to finance
- □ Improved aggregation
- □ Weather information
- □ Soil analysis
- □ Improved climate resilience
- □ Reduction in climate emissions

Other specify

16. How have you ensured that your digital technology is inclusive of more marginalised groups?

Examples include women, smallholder, the aged, semi-literate/illiterate, and the disabled

Probe for strong advocacy work in industry and broader innovative ways to extend these to people who don't have access, physically or are priced out of market

17. What have been the enablers for success in the introduction of your innovation?
    - □ Existing digital marketplaces or incubators or ecosystems operating
    - □ Partnering with private sector companies that have scale and credibility in markets and senior level buy in.
    - □ Access to grants or finance
    - □ Working hand in hand with farmers groups or organisations
    - □ Crowdfunding opportunities etc
    - □ Other (please specify?)
18. What do you think the biggest opportunities are for deploying digital tech for agriculture in SADC?
19. How do you fulfil your human capital needs for skilled digital operators?

    Probe: Do you recruit from universities, if so which ones, or from Incubators or do you focus on in-house training predominantly?
20. Do you have any recommendations for CCARDESA regarding reaching scale and sustainability, constraints faced, human capital and/or financing?

ANNEX 13 KII GUIDE FOR OTHER STAKEHOLDERS

Name of person(s) interviewed and description of role/responsibility:
Organisation:
Type of agribusiness, commercial enterprise, MNO, Donor, Government, NGO, other (specify)
Country:
Website:
1. How is your organisation involved in digital innovations in agriculture?
2. What are the key challenges for digital agricultural innovations?
3. What are the biggest opportunities for digital agricultural innovations?
Digital Agricultural Innovations 4. Are you aware of any digital agriculture innovations? If yes, which one. Please could you provide name innovation, company and contact details?
5. For what type of innovation do you see the biggest opportunities? □ Digital Advisory □ Agri Digital Financial services □ Digital Procurement □ Agri-e-commerce □ Smart Farming □ Bundled services □ other (specify) **Explanation: Digital Advisory** (AgriVas, Smart advisory, weather information, pest & disease management, product verification, record keeping), **Agri Digital Financial services** (Credit & loans, Input financing, credit scoring, crowdfunding, insurance, digital agri-wallet, savings, accountability tool), **Digital Procurement (** digital records, digital records + payment, digital records + traceability, digital records + payments & traceability), **Agri-e-commerce** (inputs, outputs, inputs & outputs), **Smart Farming** (smart shared assets like tractors, equipment monitoring, livestock & fishery management, blockchain, remote sensing, robotics, Satellite and drone imagery), other.
6. Have you seen any unintended consequences (positive or negative) regarding use of digital agricultural innovations?
7. What is the role of policies in digital agriculture innovations? ● Could you give examples of countries with advanced digital agricultural policies? ● What are the enabling and hindering factors in deploying digital agricultural innovations?
Skills Development 8. How do young people acquire digital agricultural skills? □ Universities - Agriculture □ University – ICT □ University - Business □ Incubators and Accelerators □ Agricultural TVET □ NGOs □ Outside the country

□ Any others? Please specify. Do you have examples of leading universities / training providers?
9. Can you suggest any other resources or resource people that we might want to reference to deepen our understanding of the innovation landscape and digital ag space within your country?

ANNEX 14 BENCHMARK ASSESSMENT RESULTS

BENCHMARK DATA – SADC SET (16 COUNTRIES)

Country	Digital Government	Digital Business	Innovation Driven Entrepreneurship	Digital Skills	ICT Infrastructure	G5 Digital Economy
Angola	0.488	36.750	15.000	24.093	9.934	44.500
Botswana	0.365	53.840	22.900	44.893	30.905	57.830
Comoros	0.124				9.580	28.000
DR Congo	0.129				7.517	50.330
Eswatini	0.488				18.672	51.830
Lesotho	0.353	50.097		41.488	17.039	46.170
Madagascar	0.288	51.328	22.500	35.452	7.040	35.170
Malawi	0.424	48.766	22.900	30.709	8.903	55.330
Mauritius	0.700	66.132	35.200	55.747	62.430	60.830
Mozambique	0.518	46.773	19.700	28.988	10.900	17.000
Namibia	0.524	51.208	24.300	43.904	27.103	29.670
Seychelles	0.618	61.488		59.882	60.603	14.000
South Africa	0.747	61.859	32.700	37.882	71.813	74.500
Tanzania	0.553	53.344	25.600	47.769	16.949	49.330
Zambia	0.259	56.441	19.800	41.684	17.544	49.000
Zimbabwe	0.524	45.814	21.900	48.263	19.543	45.830

BENCHMARK SCORES (INDEX)

Country	Digital Government	Digital Business	Innovation Driven Entrepreneurship	Digital Skills	ICT Infrastructure	G5 Digital Economy
Angola	0.49	0.37	0.15	0.24	0.10	0.45
Botswana	0.36	0.54	0.23	0.45	0.31	0.58
Comoros	0.12				0.10	0.28
DR Congo	0.13	0.41			0.08	0.50
Eswatini	0.49	0.51		0.41	0.19	0.52
Lesotho	0.35	0.50		0.41	0.17	0.46
Madagascar	0.29	0.51	0.23	0.35	0.07	0.35
Malawi	0.42	0.49	0.23	0.31	0.09	0.55
Mauritius	0.70	0.66	0.35	0.56	0.62	0.61
Mozambique	0.52	0.47	0.20	0.29	0.11	0.17
Namibia	0.52	0.51	0.24	0.44	0.27	0.30
Seychelles	0.62	0.61		0.60	0.61	0.14
South Africa	0.75	0.62	0.33	0.38	0.72	0.75
Tanzania	0.55	0.53	0.26	0.48	0.17	0.49
Zambia	0.26	0.56	0.20	0.42	0.18	0.49
Zimbabwe	0.52	0.46	0.22	0.48	0.20	0.46
Global Median	0.58	0.60	0.32	0.53		0.51
African Median	0.36	0.54	0.22	0.45	0.17	0.42

BENCHMARK ASSESSMENT INDEX TOTAL (ADJUSTED)

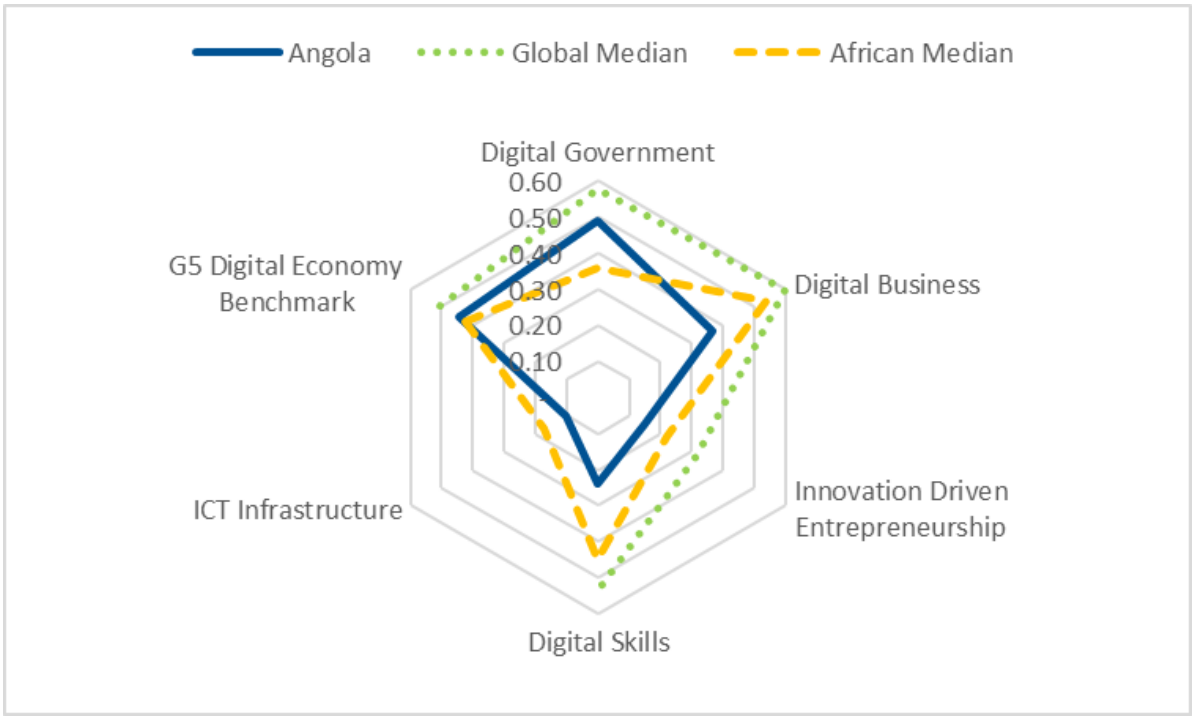
Country	Index Total	Index Total (Adjusted)
Angola	**1.79**	**0.30**
Botswana	**2.47**	**0.41**
Comoros	**0.50**	**0.25**
DR Congo	**1.11**	**0.28**
Eswatini	**2.11**	**0.42**
Lesotho	**1.90**	**0.38**
Madagascar	**1.80**	**0.30**
Malawi	**2.09**	**0.35**
Mauritius	**3.50**	**0.58**
Mozambique	**1.75**	**0.29**
Namibia	**2.29**	**0.38**
Seychelles	**2.58**	**0.52**
South Africa	**3.53**	**0.59**
Tanzania	**2.48**	**0.41**
Zambia	**2.10**	**0.35**
Zimbabwe	**2.34**	**0.39**
Global Median	**2.53**	**0.51**
African Median	**2.16**	**0.36**

BENCHMARK RESULTS - OVERALL RANKINGS

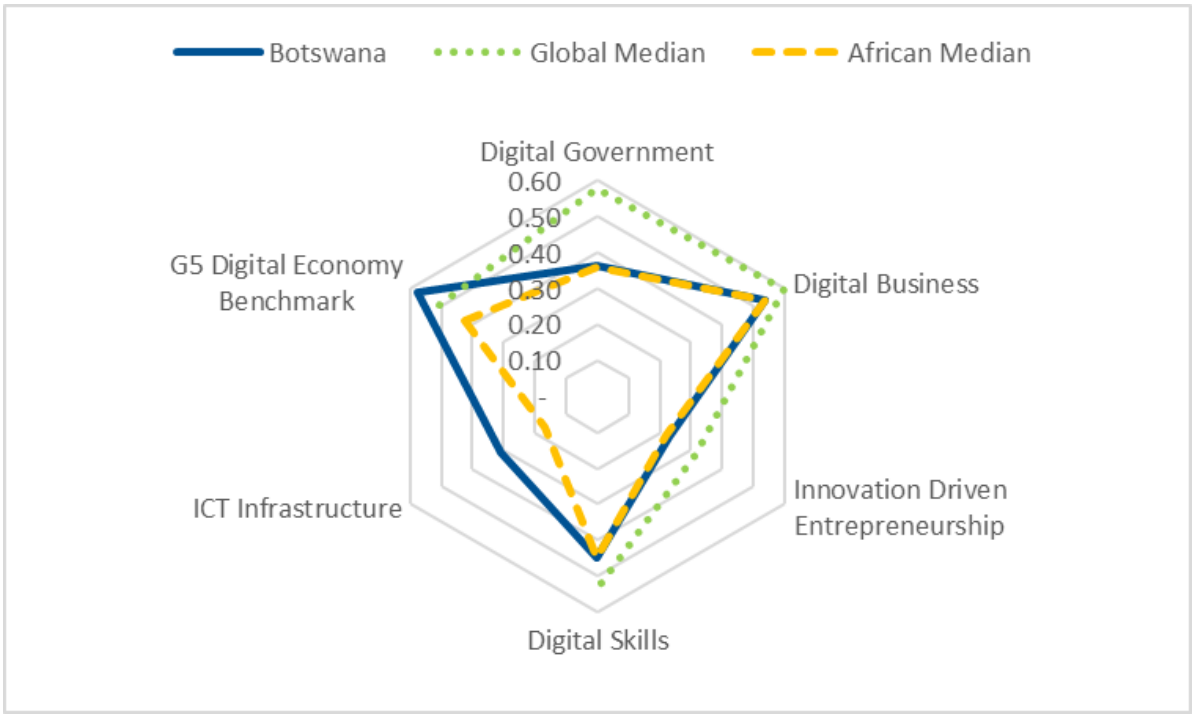
Country	**Index**	**Overall Benchmark Ranking**
South Africa	0.59	1
Mauritius	0.58	2
Seychelles	0.52	3
Global Median	0.51	
Eswatini	0.42	4
Tanzania	0.41	5
Botswana	0.41	6
Zimbabwe	0.39	7
Namibia	0.38	8
Lesotho	0.38	9
African Median	0.36	
Zambia	0.35	10
Malawi	0.35	11
Madagascar	0.30	12
Angola	0.30	13
Mozambique	0.29	14
DR Congo	0.28	15
Comoros	0.25	16

BENCHMARK RESULTS – SADC COUNTRY BREAKDOWN

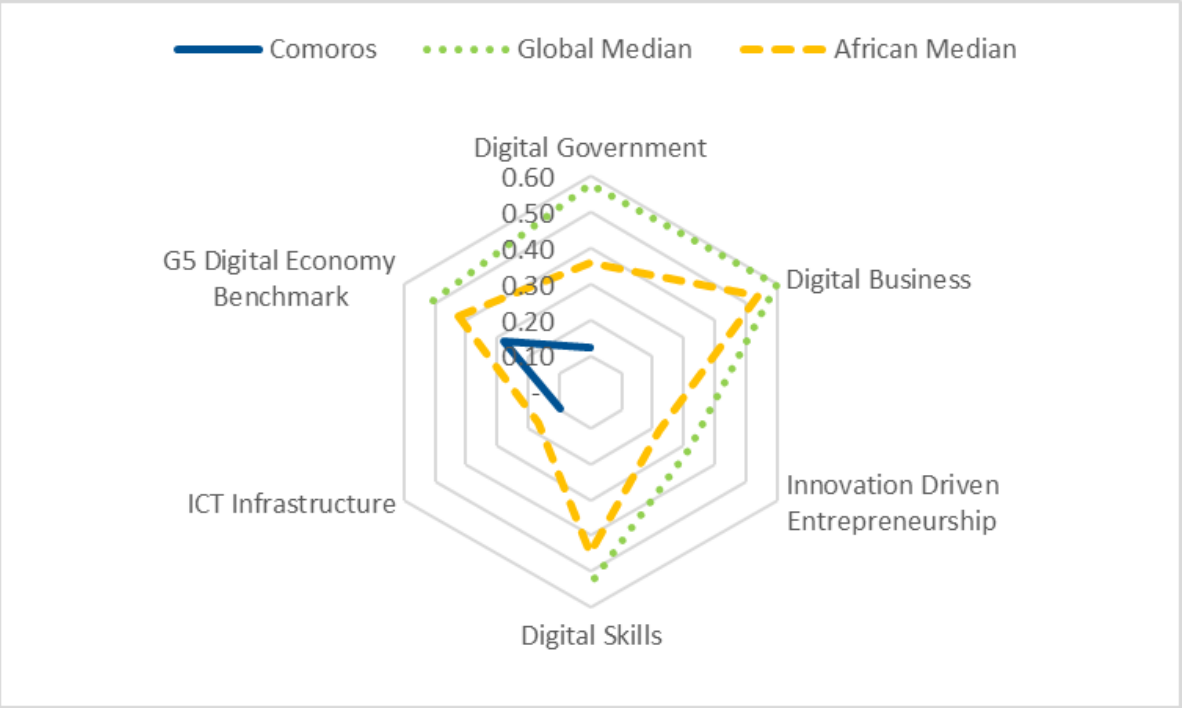
Angola



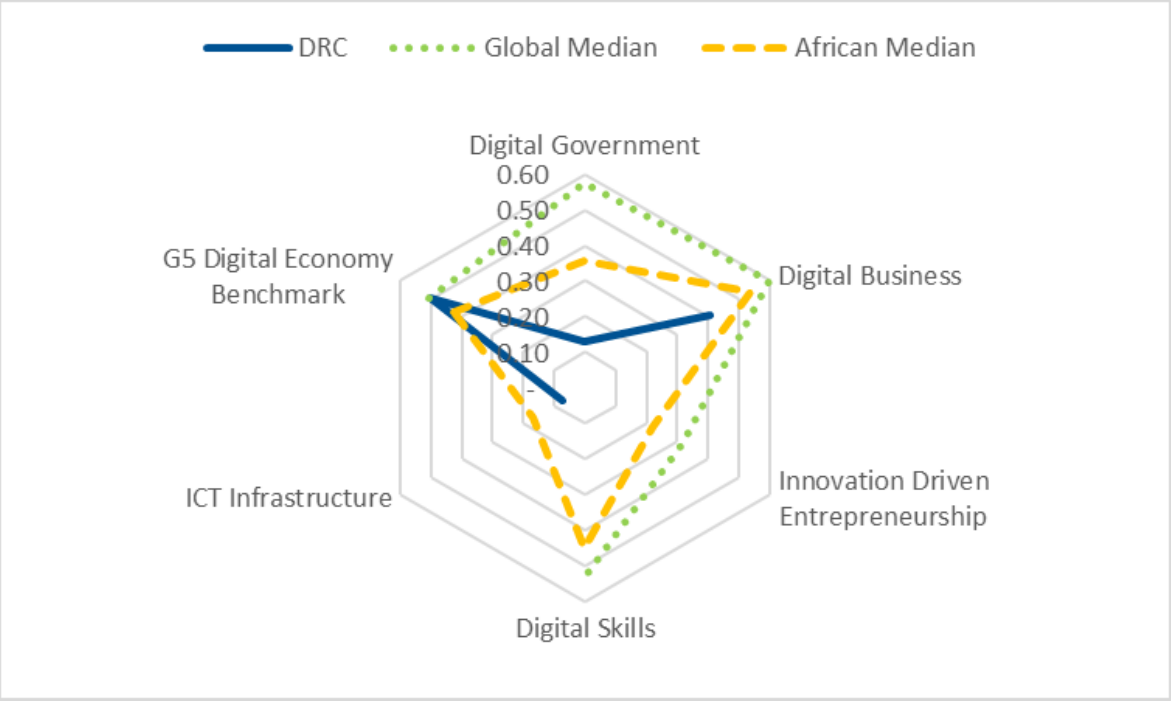
Botswana



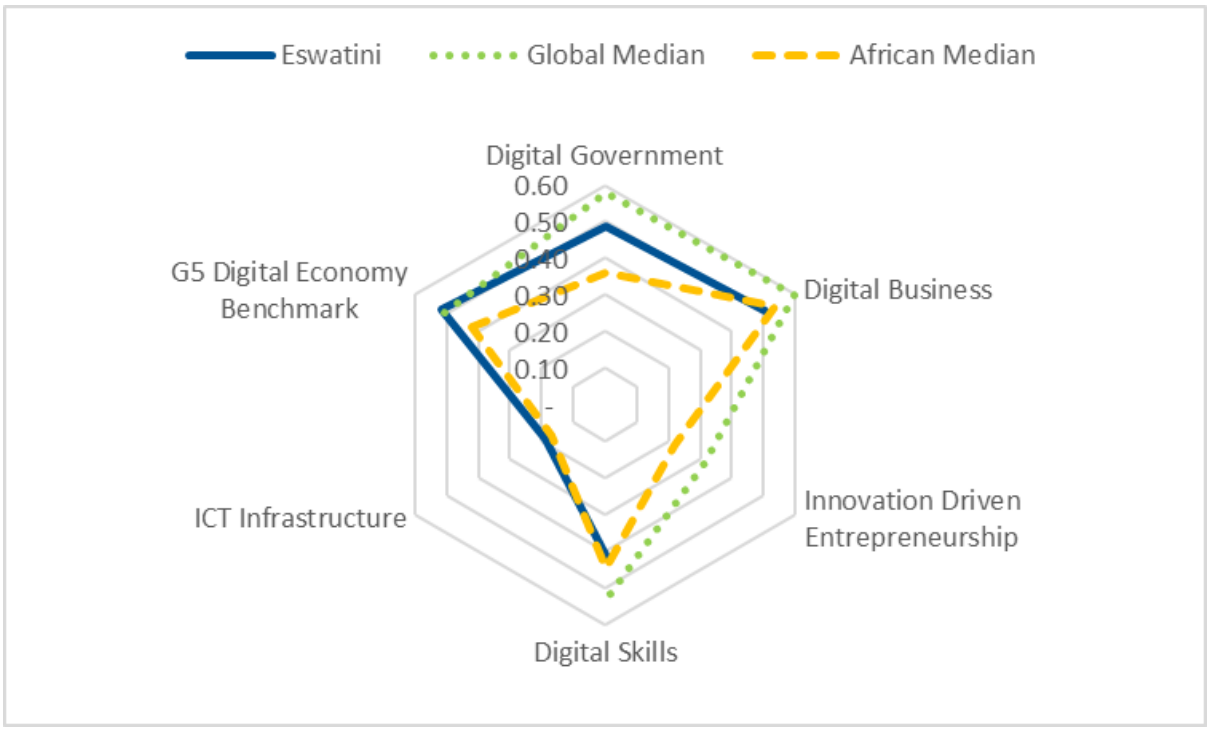
Comoros



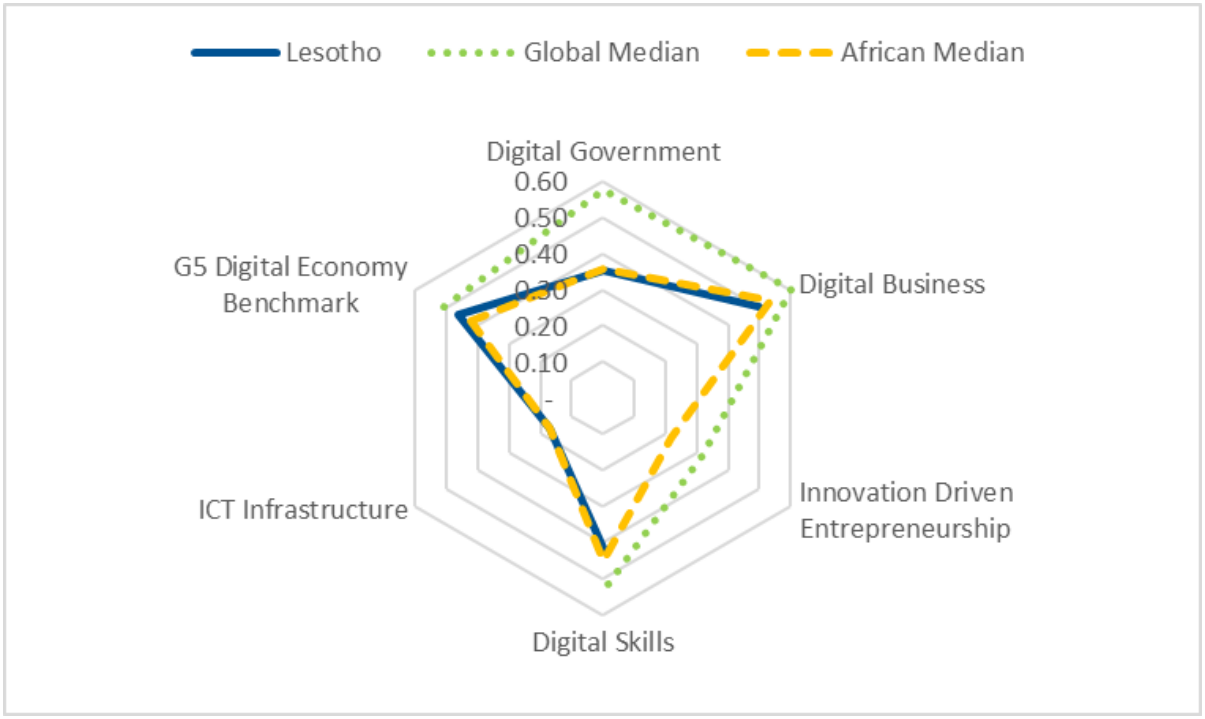
Democratic Republic of the Congo



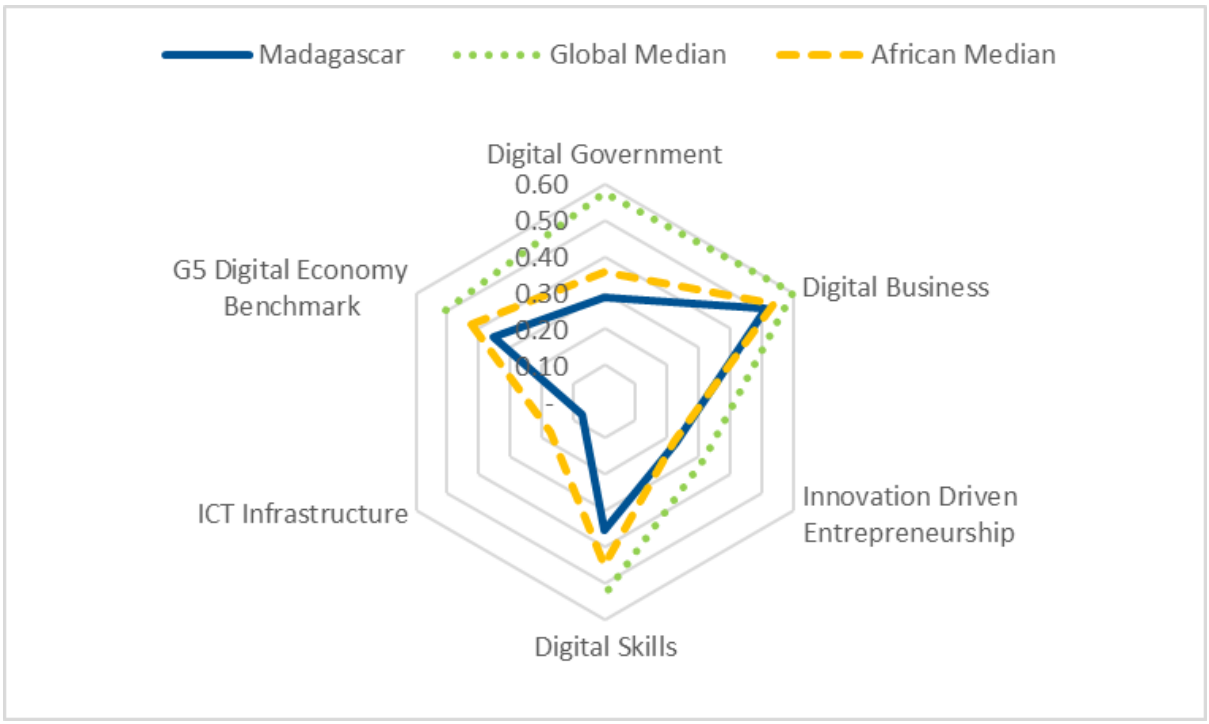
Eswatini



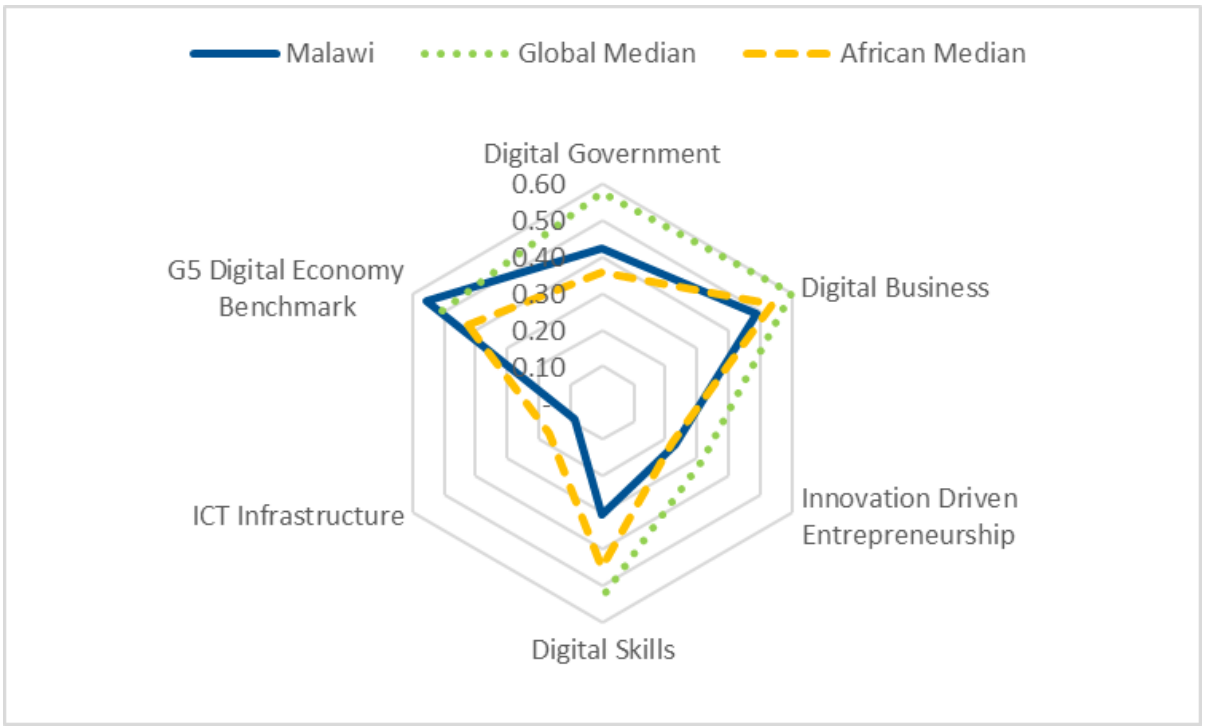
Lesotho



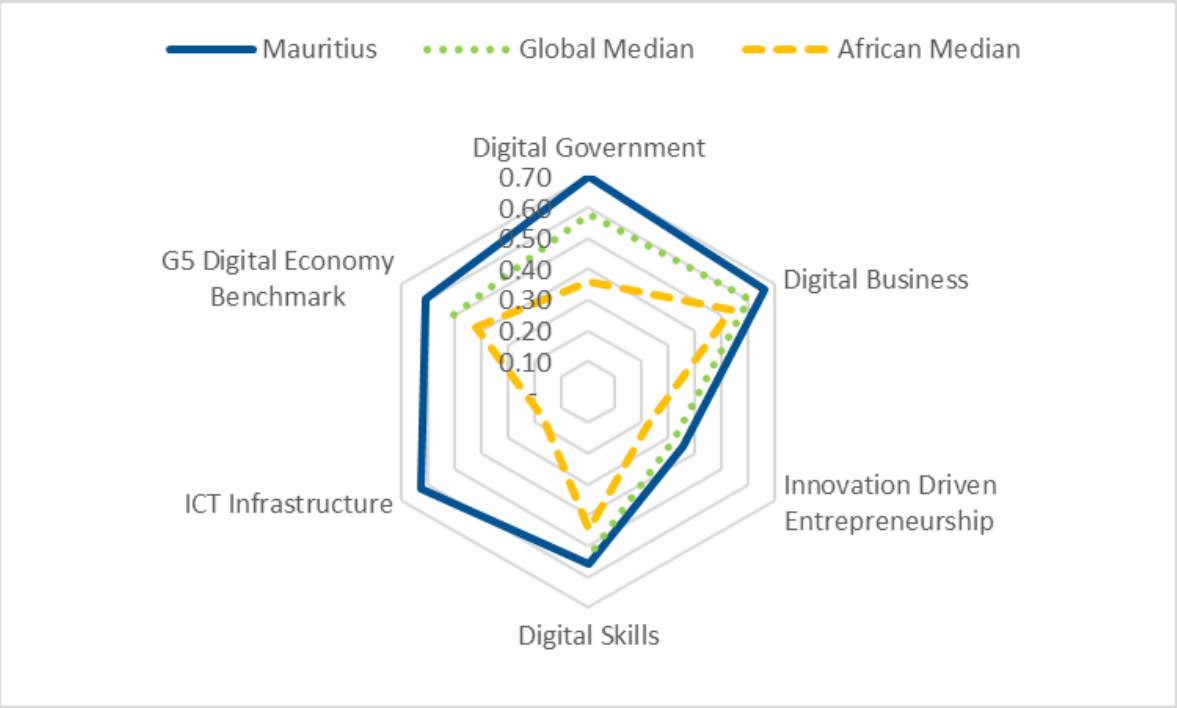
Madagascar



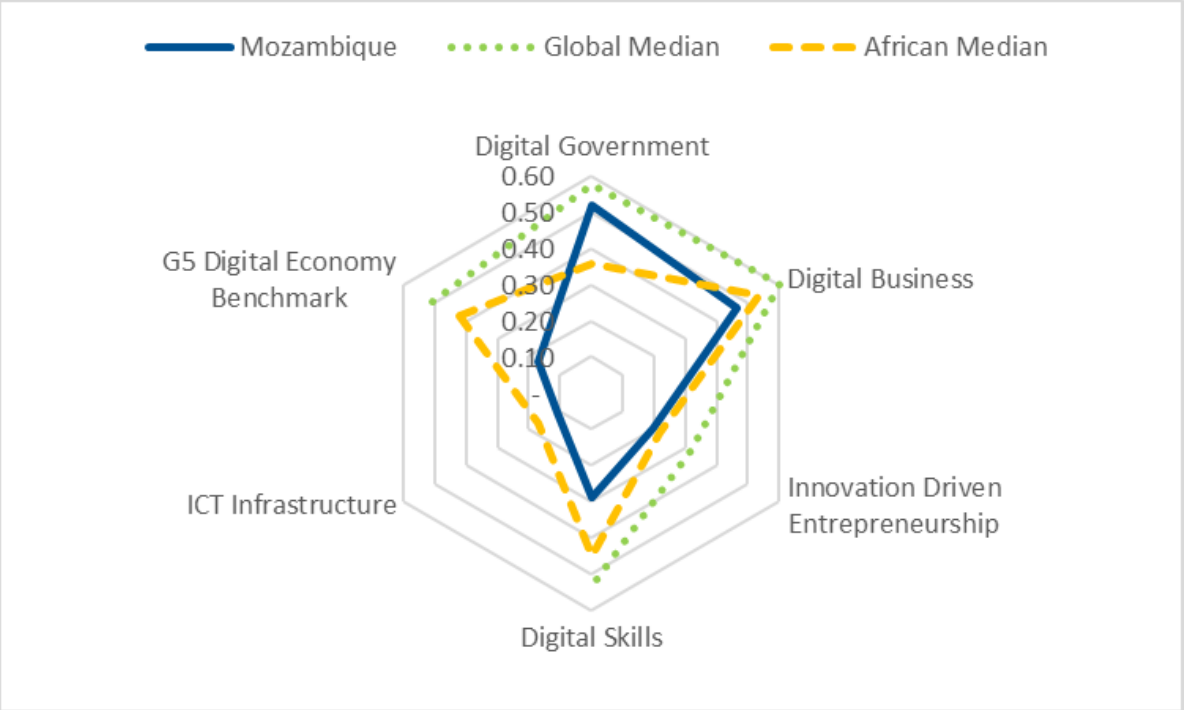
Malawi



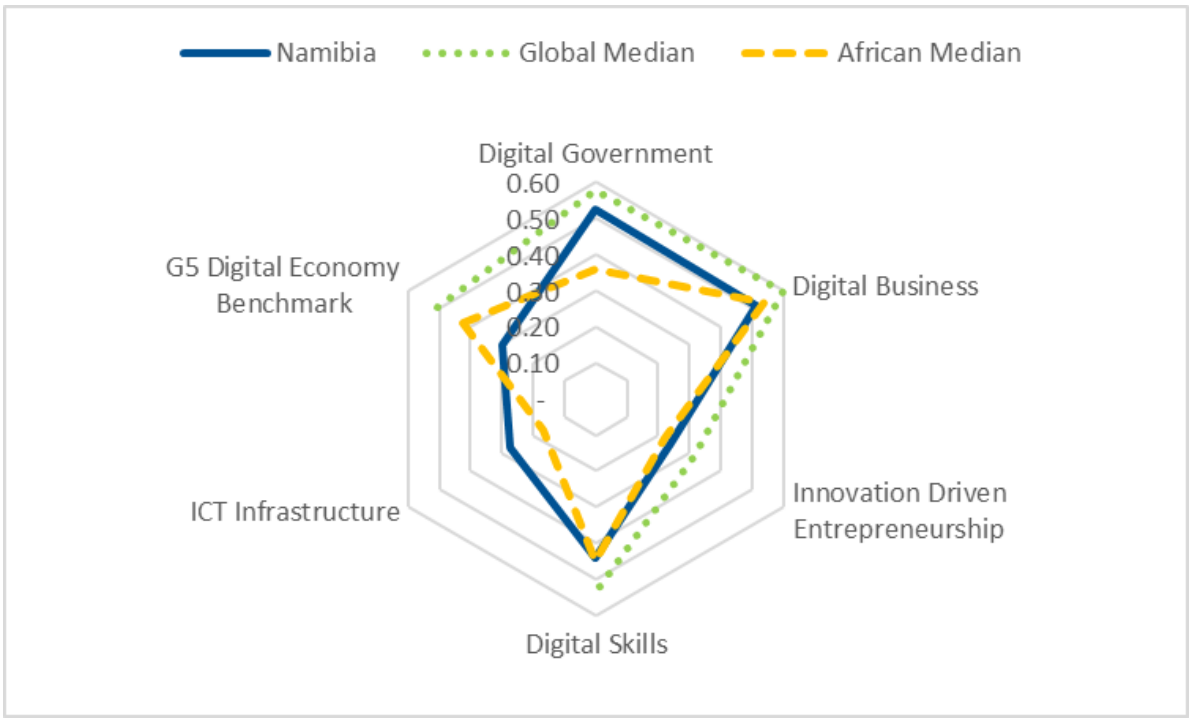
Mauritius



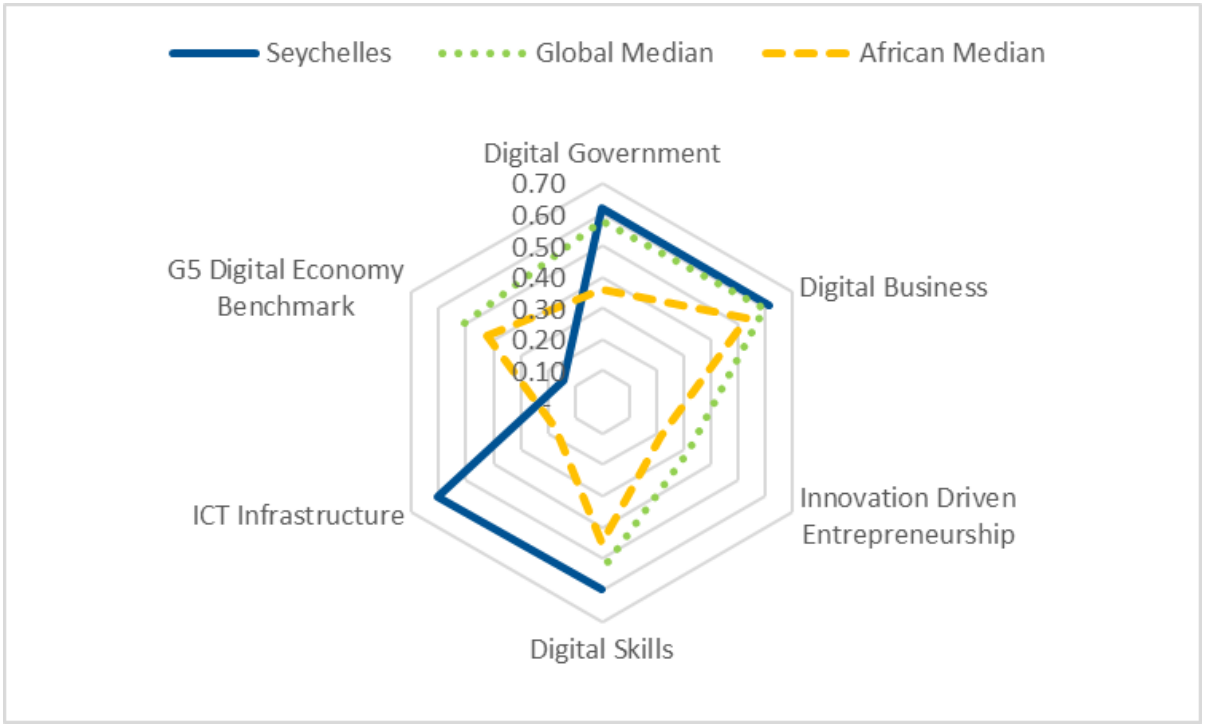
Mozambique



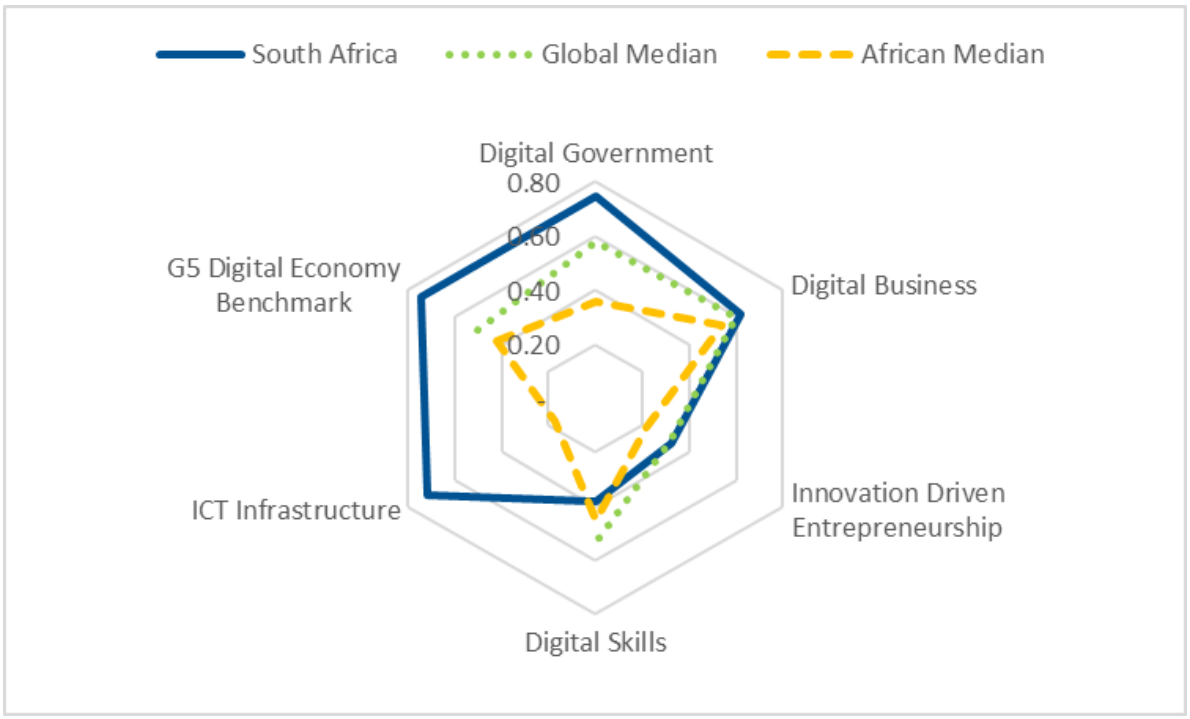
Namibia



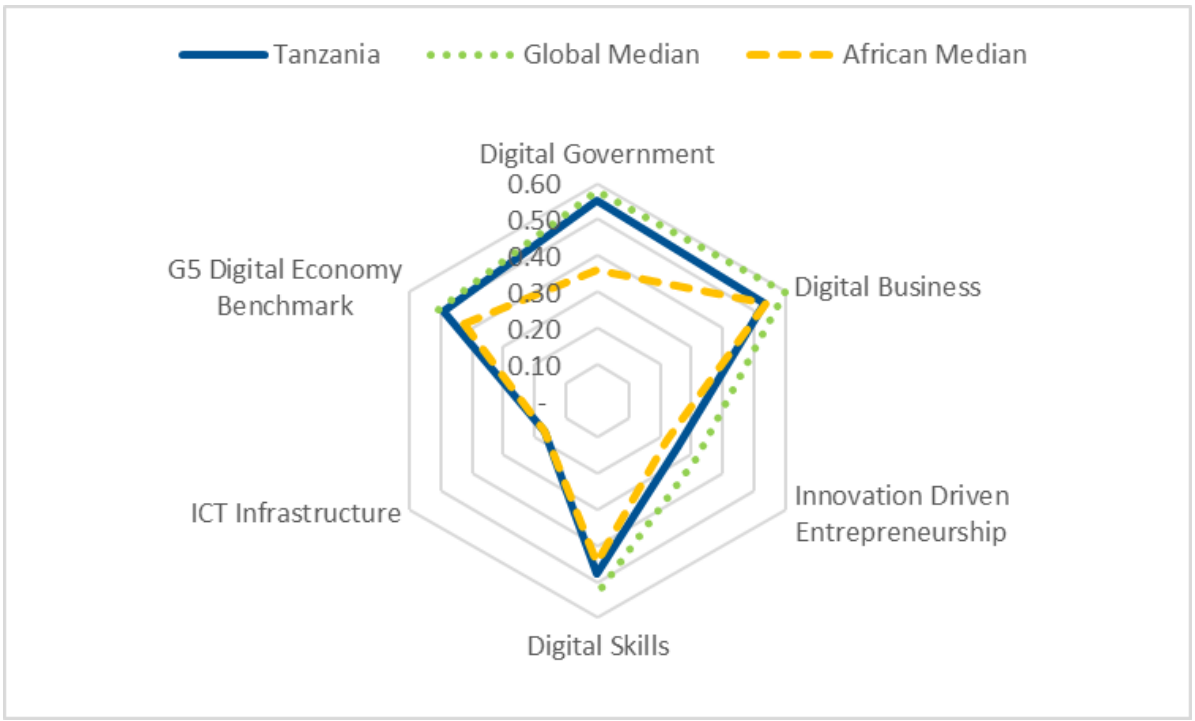
Seychelles



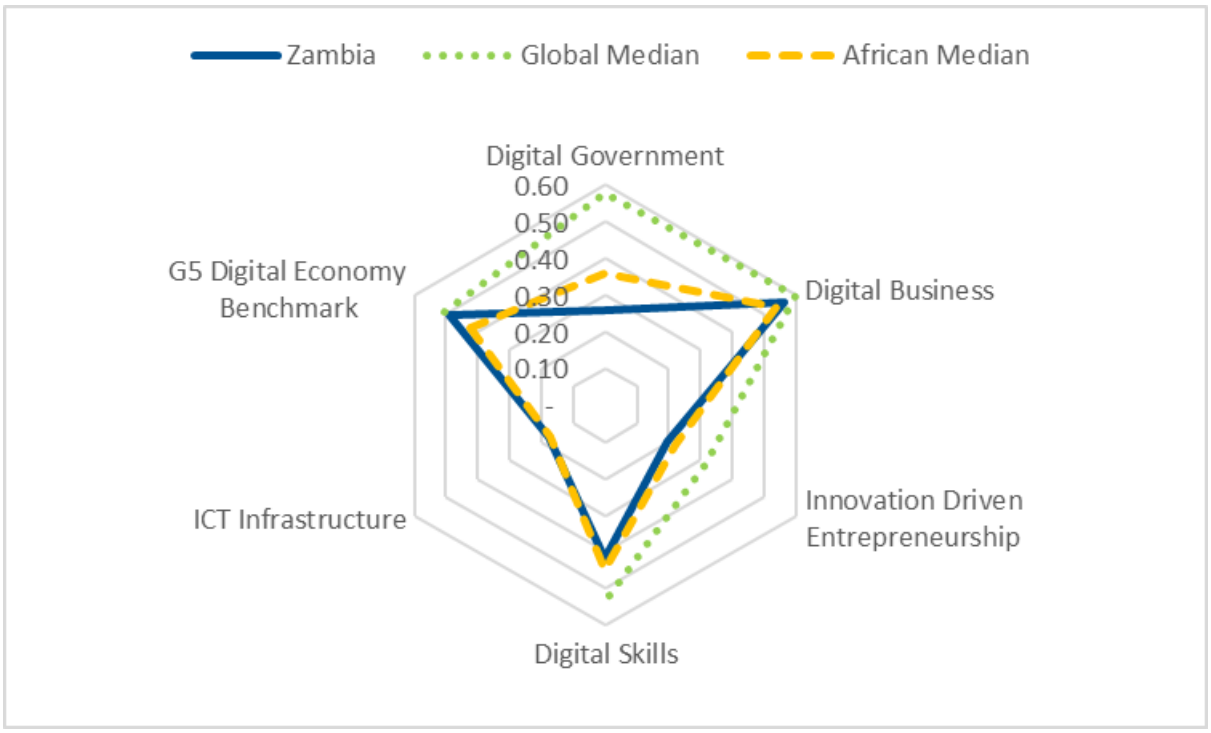
South Africa



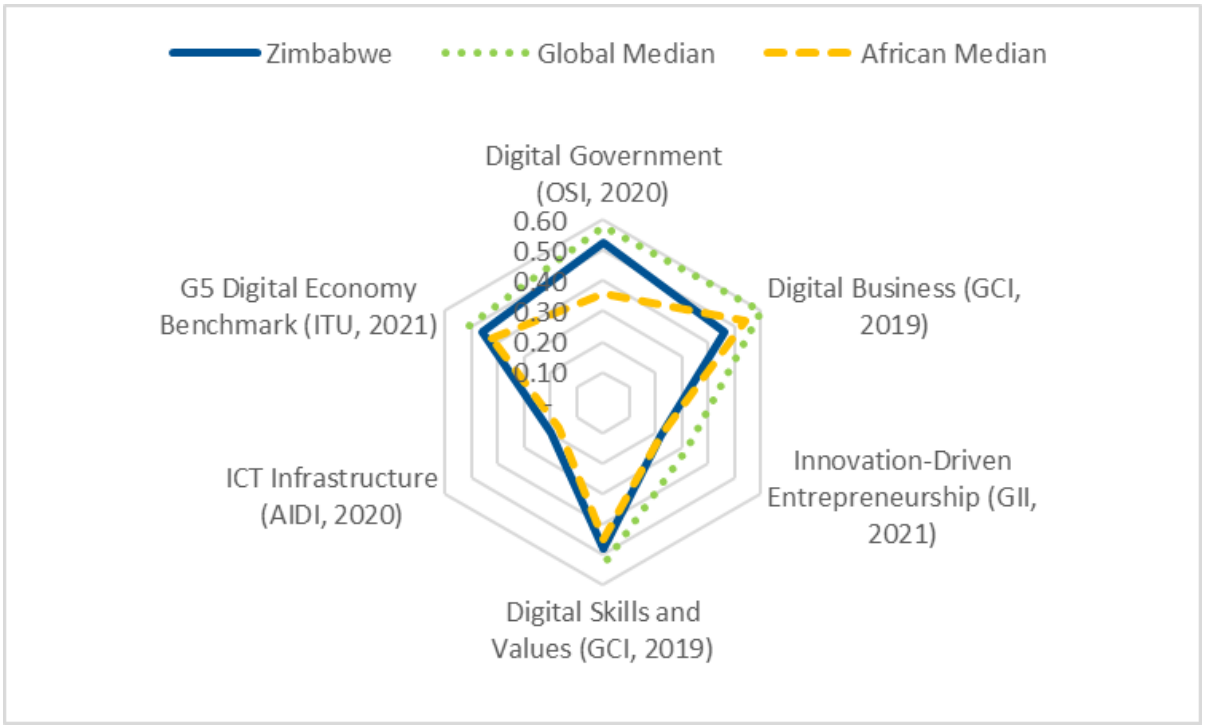
Tanzania



Zambia

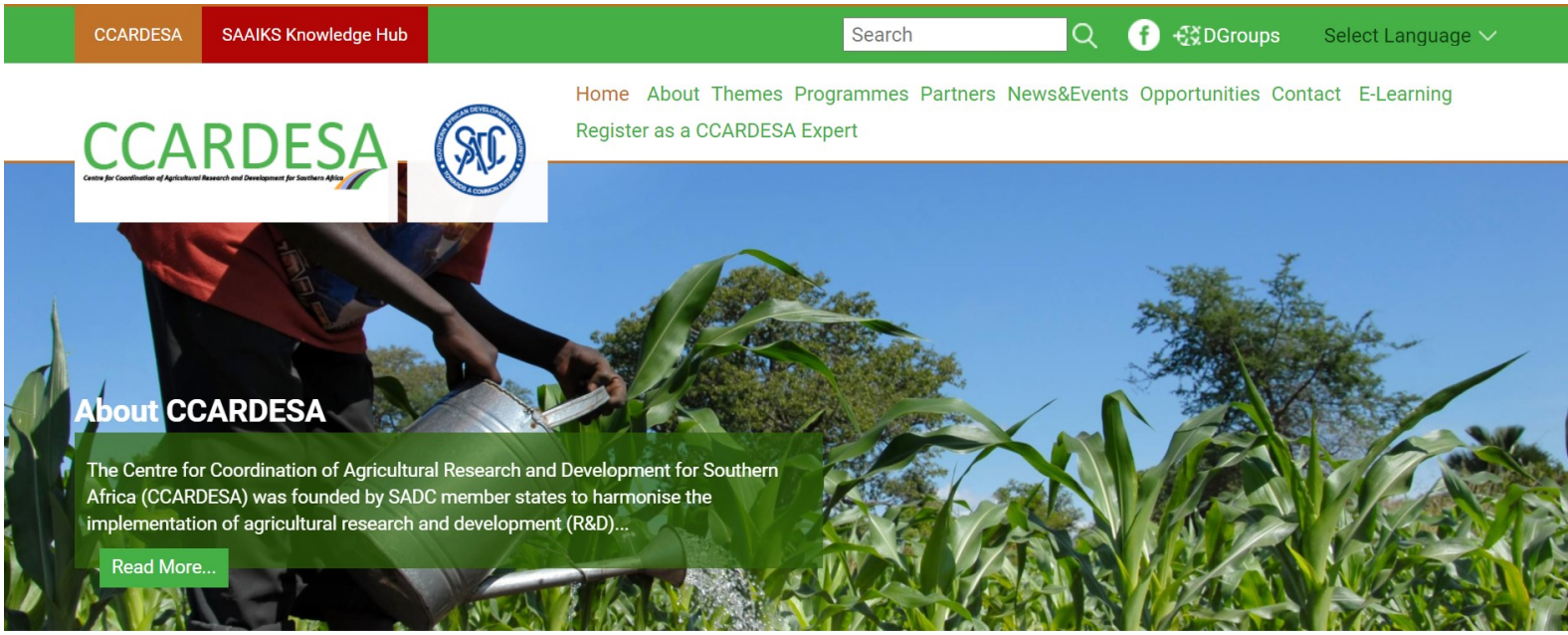


Zimbabwe



ANNEX 15 PLATFORM NEEDS ASSESSMENT AND DIGITAL AGRI HUB REQUIREMENTS DOCUMENT

CCARDESA REDESIGN NEEDS ASSESSMENT & RECOMMENDATIONS



Provided by IMC Worldwide

December 2021

Contents

Needs Assessment Background

The Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA) is a sub-regional organization established as a subsidiary entity of SADC and charged with the responsibility of coordinating agricultural research and development in the Southern African region.

IMC Worldwide, as part of the Agritech Situational Report research, was asked to provide web-based access for the data collected and report findings. It was determined that the best way forward is to support CCARDESA's Knowledge Management and Communications team on integrating this data into their website and provide capacity building and support for CCARDESA KMC team on the redesign and improvements to the site as a whole.

The IMC team in close collaboration with the CCARDESA KMC team performed this needs assessment for their knowledge hub website, in order to provide this information to a vendor to then create a redesign requirements document and approach.

This document is divided into three sections:

- Needs assessment findings (broken out by user needs and CCARDESA needs)
- Summary of Key needs
- Methodology and Approach

Needs Assessment Findings

User needs

User Groups

The following table describes the groups of users, or potential users, of the CCARDESA website and type of information desired.

User (current or potential)	Description	Desired Information
Government CURRENT	Educated civil servants varying from new graduates to grey haired officials, mainly from developing countries.	Need hands on easy to find reports and policies on file
Academia CURRENT	Multidisciplinary researchers and students from developed and developing countries.	Need updated authoritative references on a wide array of policies, information, and articles
Donors CURRENT	Highly educated with a great understanding of institutional and regulatory frameworks around ag-tech policy	Need updated references on a wide array of topical programs and references

NGOs/ Civil Society Orgs CURRENT	Implementing partners and organizations with knowledge of beneficiaries and policies for advocacy	Need updated programs, reports with information on events along with ability to coordinate with similar organizations
Agriculture stakeholders (farmers etc.) POTENTIAL	Potential beneficiaries of programs and resources, knowledge of ongoing agriculture practices	Need helpful information to real-time programs, resources, and access to innovations
AgriTech Innovators CURRENT	Potential beneficiaries of programs and implementation partner. Could come from another stakeholder background	Need helpful information on programs, resources, and ability to coordinate with other stakeholder groups

Analysis of User Survey, Feedback Forms, & Interviews

The overall reaction amongst users was that content was accurate and usable for basic functions. However, there were some challenges with the site as well as a desire for certain things that don't exist yet. The responses related to challenges and desired changes by users are summarized below.

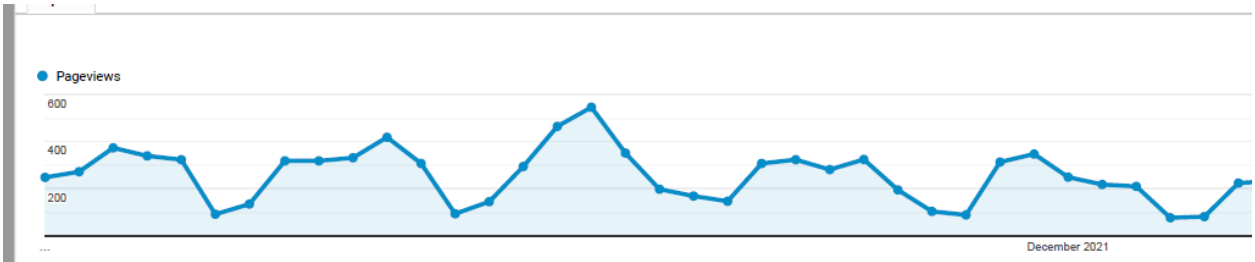
1. Users would like to see more:
   1.1. **Updated content** so when employees refer to the website, it shows the most recent programs and more pictures of staff at work
   1.2. **Improved main page** that highlights important activities and advertisements
   1.3. Including more **information about CCARDESA** for the public (i.e. financial statements, more reports, etc.)
   1.4. **Improved search tools**, generally making things easier to find (i.e. tags for publications for ease of searching)
   1.5. **Graphical content** (i.e charts, graphs, infographics, etc)
   1.6. Relevant content for **other stakeholders** such as farmers or students, cooperating with sister organizations for weather forecasts, showing relevant scholarship or funding opportunities to CCARDESA thematic areas etc.
   1.7. More information shared **between SADC**
   1.8. Case studies
   1.9. **Updated advertisement page** (would like to see expired on a separate page, have updated frequently)
   1.10. More linkage with **social media**
2. Users biggest challenge with the CCARDESA Website
   2.1. Content could be updated more frequently and include more for stakeholders
   2.2. Difficult to search publications and uploaded documents
   2.3. Site is not interactive; users should be able to contribute content, discussions, etc.
   2.4. Getting all content on screen and sized appropriately on a variety of screens

Insights Discovered by Analytics

When reviewing the Web Analytics for the CCARDESA site, the team discovered the following:

1. The **job postings page** is the most visited section of the website aside from the landing page

2. **Events page** is very important and relevant, When CCARDESA posts on their social media about a particular upcoming event, the event landing page goes up significantly
3. Average number of active users remains overall consistent over a years' span, peaking on days of events or close to job advertisement due dates. Peak active user for 2021 was achieved September 01, 2021 with 851 active users.
4. **38.61% of website sessions are occurring on mobile devices.** Most mobile users are based in Botswana (21.43%), South Africa (10.23%) and Zambia (8.38%).
5. Most popular pages by number of sessions over the past month (as demonstrated in Figure 1.) are
    1. CCARDESA (SADC) Forestry Webinar: Achieving Sustainable Forest Management through Research and Development in SADC
    2. Vacancies
    3. German Cooperation partner page
    4. About CCARDESA



Page	Pageviews	Unique Pageviews	Avg. Time on Page	Entrances	Bounce Rate	% Exit
	9,457 % of Total: 100.00% (9,457)	7,737 % of Total: 100.00% (7,737)	00:02:08 Avg for View: 00:02:08 (0.00%)	5,085 % of Total: 100.00% (5,085)	63.94% Avg for View: 63.94% (0.00%)	53.77% Avg for View: 53.77% (0.00%)
1. /	802 (8.48%)	606 (7.83%)	00:01:22	530 (10.42%)	41.32%	39.28%
2. /events/ccardesa-sadc-forestry-webinar-achieving-sustainable-forest-management-through-research-and	481 (5.09%)	403 (5.21%)	00:07:13	382 (7.51%)	30.99%	79.83%
3. /vacancies	206 (2.18%)	151 (1.95%)	00:01:25	92 (1.81%)	57.61%	46.60%
4. /partners/german-cooperation	180 (1.90%)	127 (1.64%)	00:01:37	122 (2.40%)	47.11%	57.22%
5. /about-ccardesa	129 (1.36%)	94 (1.21%)	00:02:04	14 (0.28%)	42.86%	29.46%

Figure 1: CCARDESA Website Pages with highest number of page views with average time per page

Device Category	Acquisition			Behavior		
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration
	36,065 % of Total: 100.00% (36,065)	35,367 % of Total: 100.04% (35,352)	47,877 % of Total: 100.00% (47,877)	64.73% Avg for View: 64.73% (0.00%)	1.96 Avg for View: 1.96 (0.00%)	00:01:56 Avg for View: 00:01:56 (0.00%)
1. desktop	**21,459** (59.85%)	21,133 (59.75%)	29,400 (61.41%)	63.37%	2.11	00:02:14
2. mobile	**13,926** (38.84%)	13,763 (38.91%)	17,895 (37.38%)	67.01%	1.71	00:01:27
3. tablet	**470** (1.31%)	471 (1.33%)	582 (1.22%)	63.57%	1.80	00:01:32

Figure 2: Device Usage 2021

CCARDESA Needs

CCARDESA has identified the following needs and has asked IMC to give them guidance on how to go from the current situation to one where:

- More users are accessing CCARDESA website
- Users expand to include stakeholder user groups like scientists and agriculture specialists
- Users are more engaged while accessing the page
- It is easier for users to find desired information within the website
- Social media is integrated into the CCARDESA website
- It is easier for CCARDESA staff to update the website and access D-Group settings
- Integration of the agritech Situational Report and Database

Integration of the Agritech Situational Report and Database

About the report and data

As part of the research for the situational report, the team captured and classified the different elements researched into a relational database, for eventual inclusion on the CCARDESA website. The intention has been to have this base data available to CCARDESA researchers as well as website user groups for a variety of purposes.

The database offers the following types of data

- Agtech innovations (mobile apps, websites, etc.) by country
- Stakeholder information and knowledge
- Policies, tagged by country, that impact Agtech
- Digital Syllabi for Incubators (trainings, materials, etc) by country
- Digital Syllabi for Universities (skills, trainings, etc.) by country
- Key Informant Guide for Digital Innovations and Actors
- Identifying Innovation Stakeholders for the region (

Situational report represented on the website

The final Situational report will be published as a pdf with an HTML abstract. In addition, the intention is that the revamped website to include ways for the report findings and underlying research to be available in more dynamic and engaging ways.

In general, the following features and content were requested:

- Interactive dashboard in map form for visitors:
- Report accessible via separate landing page
- Form to include new innovations / policies / skills training / incubators
- Dashboard to access Policies / innovation / skills
- Access to discussion platform

For policy data, the following types of features were requested:

- Click on country to see ranking of country in benchmark assessment Digital Economy and key sub indicators (Digital Government OSI, Innovation Driven Entrepreneurship (GII), INC Infrastructure (AIDA), Digital Business (GCI) and G5 Digital Economy Benchmark

- Click on country to get a few key figures: % of GDP made up of agriculture, forestry and fishing sectors, % of total employment made up of agriculture, Total population, GNI per capita, Mobile Connectivity Index GSMA
- Click on country to see which policies are available

For innovations, the following features were recommended

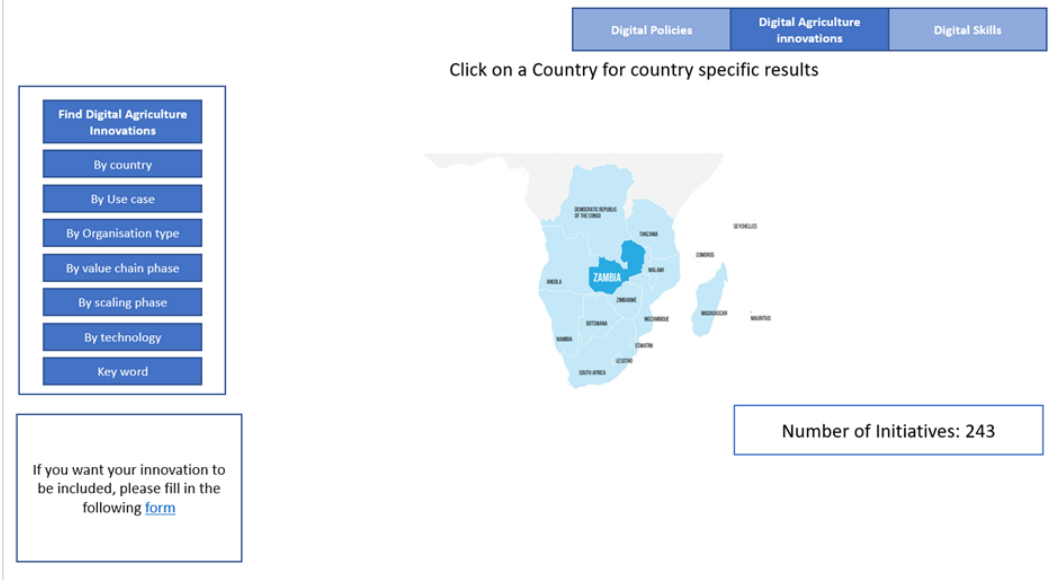
- A dashboard to find innovations via interactive map
- Different filters: by country, by use case by organisation type, by value chain phase, by scaling phase, by technology or by free format word search
- In country overview of different innovations: Name innovation / Organisation / website / Description / use cases

For skills, the team suggested the following:

- Click on country to see available Digital Agri Skills training, Digital entrepreneurship trainings, Type of Skills building and ICDL level
- Per country overview of incubators

For SADC region as a whole

- Access to introduction report
- Access to Regional policy chapter
- Access to Innovation chapter
- Access to digital skills chapter
- Access to conclusion and recommendations



Note: this is not the planned interface, but a sample of what a potential interface could look like.

D-Groups

When speaking to staff in charge of managing the D-Groups section, there were issues with the following:

- Issues adding people who request to join

    - It was described as a manual and tedious process that went to spam folders and old email addresses as opposed to one that was straightforward
- Anyone can request to join which makes it difficult to sort out "bots" from real people wanting to contribute
- Strategy needed for discussion groups
    - How to ensure correct people are in groups
    - How to attract experts/researchers/scientist stakeholders for discussions while also keeping existing group attention

Possible Solutions

- Integrating the discussion group on another platform (social media such as Linkedin or Facebook)
- Providing more questions to prospective applicants to D-Groups
    - Could ask questions on organization or school affiliated with or potential discussion topic to sort out the bots
- Adding additional junior staff to help with the maintenance of D-Groups and its members

Realities of Backend Platform

The team interviewed the current vendors of the platform and reviewed the administrative management. The following needs were noted in this review

- The content management system (CMS) uses Drupal 7. The online community of practice uses DGroups.[1]
- The CMS is hosted on a server managed by the current vendor.
- CCARDESA lacks documentation on the technical and functional specifications of the CMS and server. CCARDESA also lacks information on server and CMS content backups.
- CCARDESA default admin permissions do not provide sufficient permissions to manage the features and configuration of the site. While these permissions must be limited (and those users with that access must be trained in how to manage the CMS), someone from CCARDESA must have such access.
- The platform needs to be upgraded from Drupal 7 to Drupal 9 or 10[2], due to the end of life of Drupal 7 scheduled for November 2022 (this was extended recently due to the global pandemic). Unfortunately, this fact requires a complete rebuild of the site, as all versions of Drupal after 7 have significant feature changes that makes upgrade very challenging. Mobile application will also need updating as a result.
- The CMS and server support contract with the vendor has expired, and they are only providing minimal support for the CMS as a result. Immediate security patches and maintenance is needed. CCARDESA needs to make sure that website support contracts do not expire in the future as this is a security risk.

[1] While an assessment of DGroups was intended to be included in this assessment, the team was unable to as we were unable to get access to the discussion for a nor have an interview with the team managing it other than one person.
[2] Drupal 8 is dependent on an underlying software platform (Symfony 3) which was "end of lifed" in November 2021 – subsequently, the Drupal community has recommended those still on Drupal 7 or earlier to upgrade to Drupal 9 or later.

Summary of Key Needs

Site Redesign Requirements

- Upgrade to Drupal 9 with content migration plan, new information architecture, and new features (as outlined below)
- Improved search features and wayfinding
- Add automated visualization features from underlying data (maps, charts, etc)
- Include accessibility /responsiveness into core UX
- Interactive database support as outlined in Agritech section
- Migration for Mobile App
- Integration of social media and commenting

Other Support Requirements

- Document a service level agreement for responsiveness for maintenance
- Routine use of web analytics for performance improvement
- Social media and commenting moderation and management
- Training for CCARDESA staff on Drupal 9 admin management
- Full technical and functional specification documentation, including location of backups.
- Continue to support focal points to post content regularly

Methodology and Approach

Team

Team Member	Role	Contact
Siobhan Green	Lead	siobhan.green@imcworldwide.com
Jessica Studer	Senior Associate	jessica.studer@imcworldwide.com
Koketso Gatsoswe	CCARDESA PoC for Project	kgatsoswe@ccardesa.org
Sostino Mocumbe	ICKM Officer	smocumbe@ccardesa.org
Bridget Kakuwa	ICKM Officer	bkakuwa@ccardesa.org

Summary of Methodology

- Interview CCARDESA Staff to understand challenges and expectations
- Defined User Groups
- Interviewed Illustrative Users
- Analyzed Google Analytics
- Comparative Analysis of similar website
- Mapped User Needs
- Research & Brainstorming
- Write up Findings and Recommendations

The following is the questionnaire used to interview the illustrative users:

CCARDESA Website User Questionnaire

- Tell me about yourself and your connection to CCARDESA
- Please tell me, if applicable, what you know about the CCARDESA website?
- Do you ever utilize the CCARDESA website? If so, when was the last time?
- How do you access the CCARDESA website for any use?
- How often do you visit the CCARDESA website per week (if not week, then month)?
- How much time do you usually spend on the CCARDESA website, per session?
- What do you use the CCARDESA website for?
- When visiting the CCARDESA website, do you typically find all or part of what you wanted from the site?
- What device do you use to access the CCARDESA website: desktop, laptop, mobile/tablet?
- Is the website compatible with the platform you use to access the CCARDESA website? Are all website features of importance to you shown in the platform you are using?
- What would you like to be added to the CCARDESA website? What would you like to see more of?
- What key information do you need to do your job?
- What format would you like to see data in?
- What challenge(s) are you facing in accessing/ using CCARDESA website?
- Have you used the CCARDESA website as a reference in academic paper, article, presentation, policy/legislative etc.?
- Would you contribute if there was a user-friendly way to add to the CCARDESA website (via Wiki, quiz, etc.)?
- Where else are you getting your information about regional agriculture research and development now? (Academic journals, regulator websites, UN agency sites, etc.)

List of Interviewees

- Botho Maapatsane
- Barthlomew Chataika
- Futhi Magagula
- Bridget Kakuwa
- Tshegofatso Kitso
- Lerang Lephole
- Majola Mabuza (Dr)
- Benedict Makara
- Simon Mukuze
- Simbarashe Mutamiri
- Nelson Ediretse
- Teko Adirile

Resources Reviewed

- Google Analytics
- https://www.k4health.org/
- http://usaidlearninglab.org/
- http://healthcommcapacity.org/
- https://healthcomspringboard.org/
- http://www.thehealthcompass.org/
- http://sbccimplementationkits.org/
- https://www.globalinnovationexchange.org/

- https://www.ilri.org/
- https://faraafrica.org/
- https://www.ifpri.org/
- http://www.fao.org/home/en/
- https://www.cimmyt.org/
- http://www.coraf.org/
- https://www.asareca.org/
- https://www.cgiar.org/
- https://www.fhi360.org/
- https://www.afdb.org/en
- https://www.irri.org/
- https://ciat.cgiar.org/
- https://www.iita.org/
- https://cipotato.org/
- https://www.un.org/en/
- https://aercafrica.org/
- https://www.worldagroforestry.org/
- https://www.worldbank.org/en/home
- https://www.oecd.org/
- https://ceeac-eccas.org/en/
- https://www.4p1000.org/
- https://soilhealthinstitute.org/
- https://soilandfood.org/
- https://www.sustainableharvest.org/
- https://thecarbonunderground.org/
- https://eco-farm.org/
- https://landinstitute.org/
- https://www.timbaktu.org/
- http://www.tnafa.org/
- https://www.bioversityinternational.org/
- https://www.kalro.org/
- http://www.nari.org.pg/
- https://agra.org/
- https://taat-africa.org/
- https://www.afaas-africa.org/
- https://www.icarda.org/
- https://ifdc.org/
- https://www.icrisat.org/
- https://www.iwmi.cgiar.org/
- https://www.africarice.org/
- https://research4agrinnovation.org/
- http://www.worldfishcenter.org/
- https://www.cifor.org/
- http://www.agrodep.org/
- https://www.resakss.org/
- https://www.asti.cgiar.org/
- https://www.gatesfoundation.org/
- http://www.ciesin.org/
- https://eatforum.org/
- https://www.iucn.org/
- https://www.wfp.org/
- https://www.thegef.org/
- https://www.unep.org/
- https://www.iied.org/
- https://avrdc.org/
- https://www.biosaline.org/
- https://www.nepad.org/
- http://www.waapp-ppaao.org/en
- https://www.oecd-ilibrary.org/

Annex 1: Data Tables

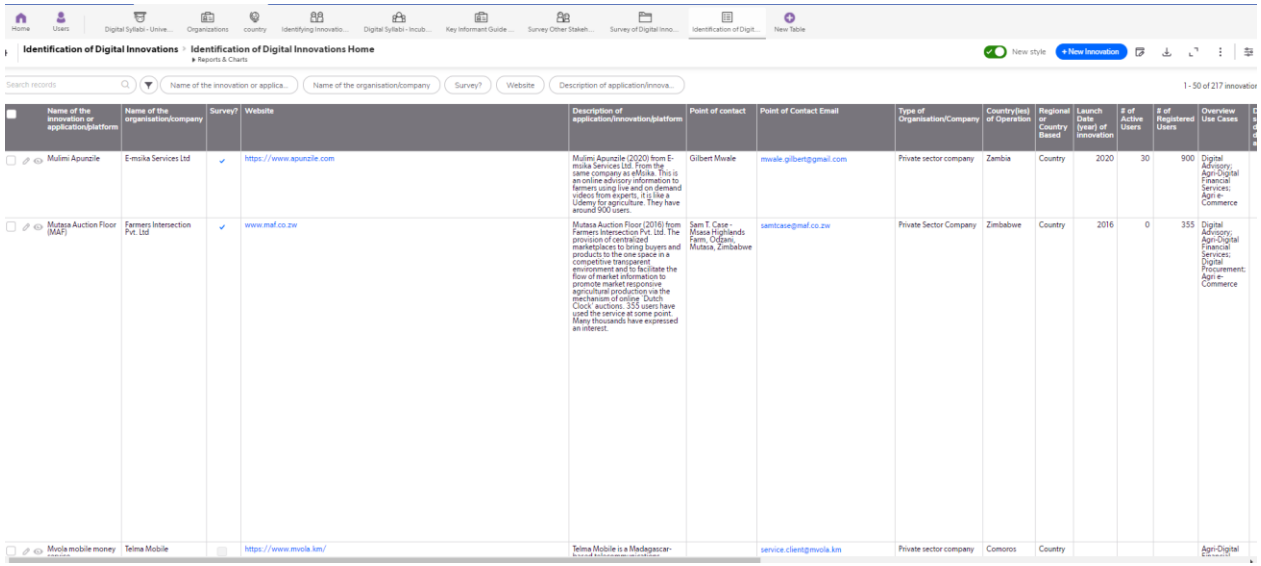
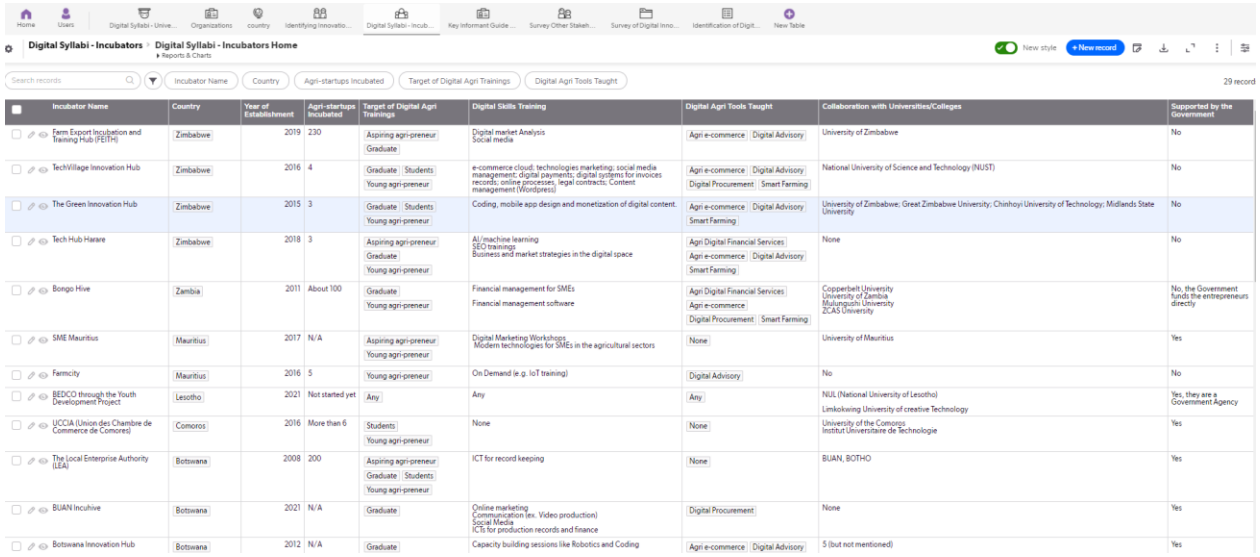


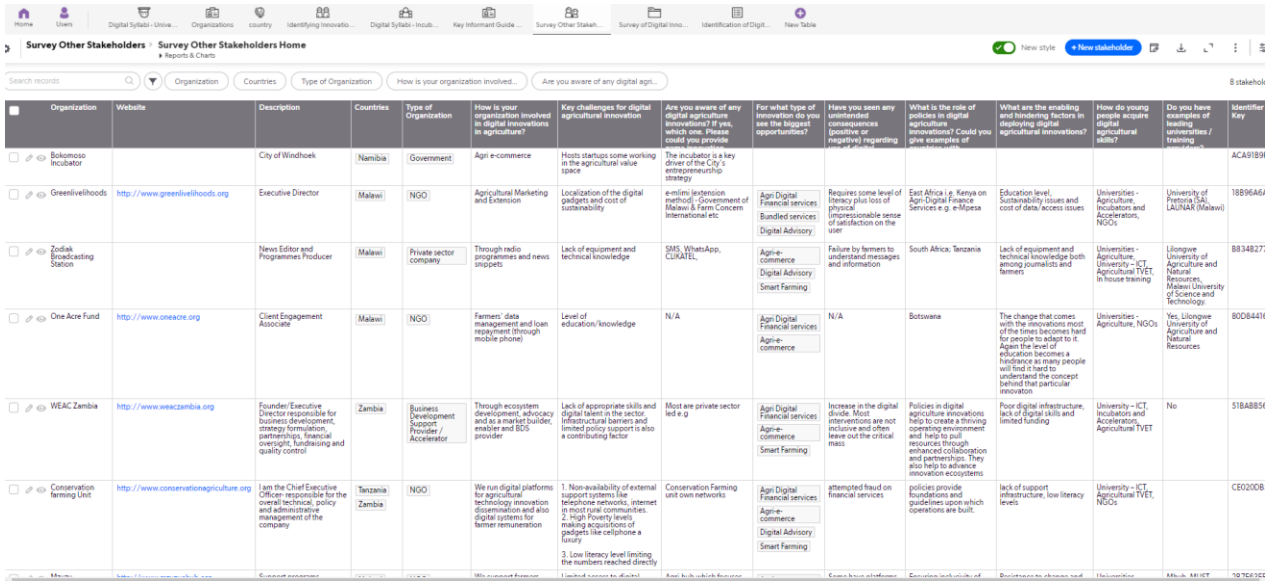
Figure 3: All Digital Innovations Surveyed



Digital Syllabi - Incubators › Digital Syllabi - Incubators Home

Incubator Name	Country	Year of Establishment	Agri-startups Incubated	Target of Digital Agri Trainings	Digital Skills Training	Digital Agri Tools Taught	Collaboration with Universities/Colleges	Supported by the Government
Farm Export Incubation and Training Hub (FEITH)	Zimbabwe	2019	230	Aspiring agri-preneur; Graduate	Digital market Analysis Social media	Agri e-commerce; Digital Advisory	University of Zimbabwe	No
TechVillage Innovation Hub	Zimbabwe	2016	4	Graduate; Students; Young agri-preneur	e-commerce cloud; technologies marketing; social media management; digital payments; digital systems for invoices records; online processes, legal contracts; Content management (Wordpress)	Agri e-commerce; Digital Advisory; Digital Procurement; Smart Farming	National University of Science and Technology (NUST)	No
The Green Innovation Hub	Zimbabwe	2015	3	Graduate; Students; Young agri-preneur	Coding, mobile app design and monetization of digital content.	Agri e-commerce; Digital Advisory; Smart Farming	University of Zimbabwe; Great Zimbabwe University; Chinhoyi University of Technology; Midlands State University	No
Tech Hub Harare	Zimbabwe	2018	3	Aspiring agri-preneur; Graduate; Young agri-preneur	AI/machine learning SEO trainings Business and market strategies in the digital space	Agri Digital Financial Services; Agri e-commerce; Digital Advisory; Smart Farming	None	No
Bongo Hive	Zambia	2011	About 100	Graduate; Young agri-preneur	Financial management for SMEs Financial management software	Agri Digital Financial Services; Agri e-commerce; Digital Procurement; Smart Farming	Copperbelt University University of Zambia Mulungushi University ZCAS University	No, the Government funds the entrepreneurs directly
SME Mauritius	Mauritius	2017	N/A	Aspiring agri-preneur; Young agri-preneur	Digital Marketing Workshops Modern technologies for SMEs in the agricultural sectors	None	University of Mauritius	Yes
Farmcity	Mauritius	2016	5	Young agri-preneur	On Demand (e.g. IoT training)	Digital Advisory	No	No
BEDCO through the Youth Development Project	Lesotho	2021	Not started yet	Any	Any	Any	NUL (National University of Lesotho) Limkokwing University of creative Technology	Yes, they are a Government Agency
UCCIA (Union des Chambre de Commerce de Comores)	Comoros	2016	More than 6	Students; Young agri-preneur	None	None	University of the Comoros Institut Universitaire de Technologie	Yes
The Local Enterprise Authority (LEA)	Botswana	2008	200	Aspiring agri-preneur; Graduate; Students; Young agri-preneur	ICT for record keeping	None	BUAN, BOTHO	Yes
BUAN Incuhive	Botswana	2021	N/A	Graduate	Online marketing Communication (ex. Video production) Social Media ICTs for production records and finance	Digital Procurement	None	Yes
Botswana Innovation Hub	Botswana	2012	N/A	Graduate	Capacity building sessions like Robotics and Coding	Agri e-commerce; Digital Advisory	5 (but not mentioned)	Yes

Figure 4: Digital Syllabi – Incubators



Survey Other Stakeholders › Survey Other Stakeholders Home

Organization	Website	Description	Countries	Type of Organization	How is your organization involved in digital innovations in agriculture?	Key challenges for digital agricultural innovation	Are you aware of any digital agriculture innovations? If yes, which one. Please could you provide	For what type of innovation do you see the biggest opportunities?	Have you seen any unintended consequences (positive or negative) regarding	What is the role of policies in digital agriculture innovations? Could you give examples of	What are the enabling and hindering factors in deploying digital agricultural innovations?	How do young people acquire digital agricultural skills?	Do you have examples of leading universities / training	Identifier Key
Bokomoso Incubator		City of Windhoek	Namibia	Government	Agri e-commerce	Hosts startups some working in the agricultural value space	The incubator is a key driver of the City's entrepreneurship strategy							ACA9189
Greenlivelihoods	http://www.greenlivelihoods.org	Executive Director	Malawi	NGO	Agricultural Marketing and Extension	Localization of the digital gadgets and cost of sustainability	e-mlimi (extension method) - Government of Malawi & Farm Concern International etc	Agri Digital Financial services; Bundled services; Digital Advisory	Requires some level of literacy plus loss of physical (impressionable sense of satisfaction on the	East Africa i.e. Kenya on Agri-Digital Finance Services e.g. e-Mpesa	Education level, Sustainability issues and cost of data/access issues	Universities - Agriculture, Incubators and Accelerators, NGOs	University of Pretoria (SA), LAUNAR (Malawi)	18B96A6
Zodiak Broadcasting Station		News Editor and Programmes Producer	Malawi	Private sector company	Through radio programmes and news snippets	Lack of equipment and technical knowledge	SMS, WhatsApp, CLIKATEL	Agri-e-commerce; Digital Advisory; Smart Farming	Failure by farmers to understand messages and information	South Africa; Tanzania	Lack of equipment and technical knowledge both among journalists and farmers	Universities - Agriculture, University – ICT, Agricultural TVET, In house training	Lilongwe University of Agriculture and Natural Resources, Malawi University of Science and Technology,	BB34B27
One Acre Fund	http://www.oneacre.org	Client Engagement Associate	Malawi	NGO	Farmers' data management and loan repayment (through mobile phone)	Level of education/knowledge	N/A	Agri Digital Financial services; Agri-e-commerce	N/A	Botswana	The change that comes with the innovations most of the times becomes hard for people to adapt to it. Again the level of education becomes a hindrance as many people will find it hard to understand the concept behind that particular innovaton	Universities - Agriculture, NGOs	Yes, Lilongwe University of Agriculture and Natural Resources	80D8441
WEAC Zambia	http://www.weaczambia.org	Founder/Executive Director responsible for business development, strategy formulation, partnerships, financial oversight, fundraising and quality control	Zambia	Business Development Support Provider / Accelerator	Through ecosystem development, advocacy and as a market builder, enabler and BDS provider	Lack of appropriate skills and digital talent in the sector, Infrastructural barriers and limited policy support is also a contributing factor	Most are private sector led e.g	Agri Digital Financial services; Agri-e-commerce; Smart Farming	Increase in the digital divide. Most interventions are not inclusive and often leave out the critical mass	Policies in digital agriculture innovations help to create a thriving operating environment and help to pull resources through enhanced collaboration and partnerships. They also help to advance innovation ecosystems	Poor digital infrastructure, lack of digital skills and limited funding	University – ICT, Incubators and Accelerators, Agricultural TVET	No	51BABB5
Conservation farming Unit	http://www.conservationagriculture.org	I am the Chief Executive Officer- responsible for the overall technical, policy and administrative management of the company	Tanzania; Zambia	NGO	We run digital platforms for agricultural technology innovation dissemination and also digital systems for farmer remuneration	1. Non-availability of external support systems like telephone networks, internet in most rural communities. 2. High Poverty levels making acquisitions of gadgets like cellphone a luxury 3. Low literacy level limiting the numbers reached directly	Conservation Farming unit own networks	Agri Digital Financial services; Agri-e-commerce; Digital Advisory; Smart Farming	attempted fraud on financial services	policies provide foundations and guidelines upon which operations are built.	lack of support infrastructure, low literacy levels	University – ICT, Agricultural TVET, NGOs		CE020DB

Figure 5: Stakeholder data

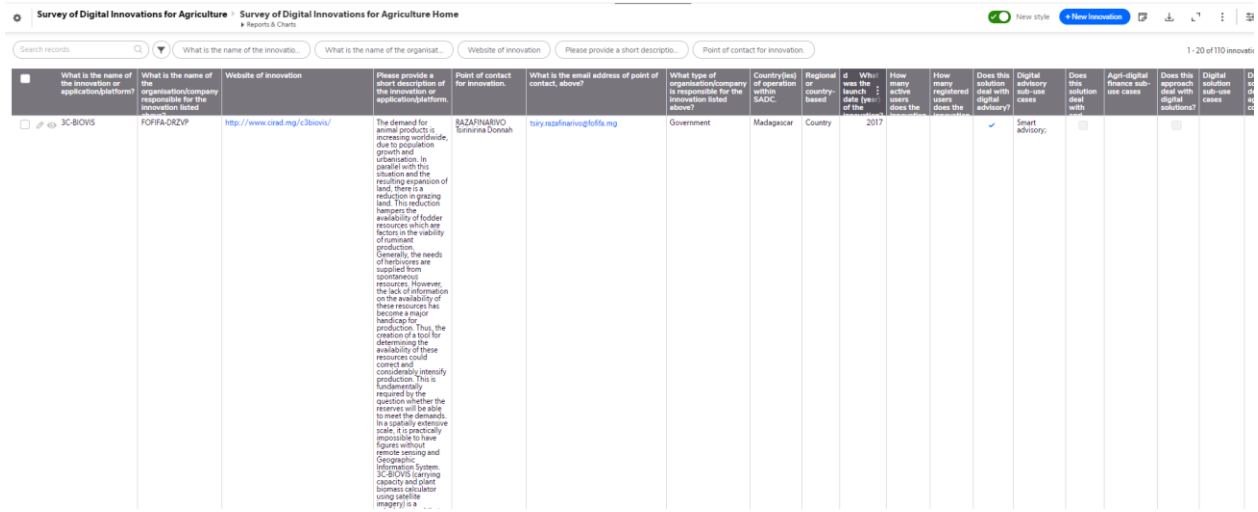
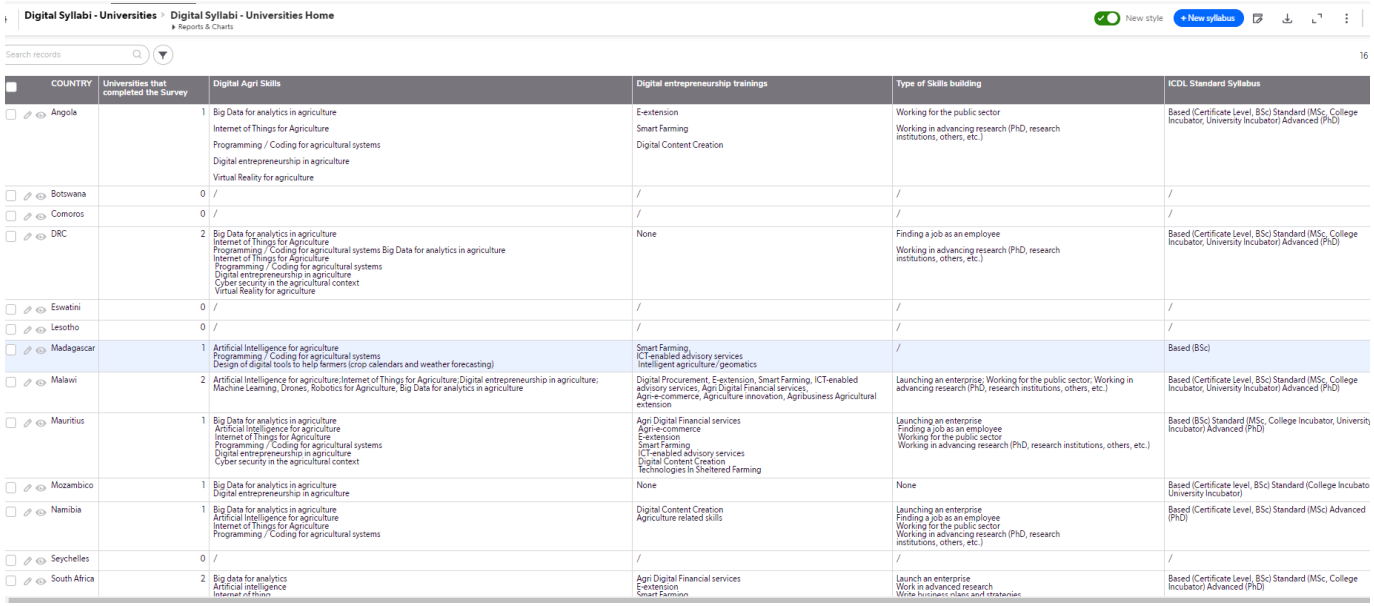


Figure 6: Digital Innovations in Agriculture



COUNTRY	Universities that completed the Survey	Digital Agri Skills	Digital entrepreneurship trainings	Type of Skills building	ICDL Standard Syllabus
Angola	1	Big Data for analytics in agriculture Internet of Things for Agriculture Programming / Coding for agricultural systems Digital entrepreneurship in agriculture Virtual Reality for agriculture	E-extension Smart Farming Digital Content Creation	Working for the public sector Working in advancing research (PhD, research institutions, others, etc.)	Based (Certificate Level, BSc) Standard (MSc, College Incubator, University Incubator) Advanced (PhD)
Botswana	0	/	/	/	/
Comoros	0	/	/	/	/
DRC	2	Big Data for analytics in agriculture Internet of Things for Agriculture Programming / Coding for agricultural systems Big Data for analytics in agriculture Internet of Things for Agriculture Programming / Coding for agricultural systems Digital entrepreneurship in agriculture Cyber security in the agricultural context Virtual Reality for agriculture	None	Finding a job as an employee Working in advancing research (PhD, research institutions, others, etc.)	Based (Certificate Level, BSc) Standard (MSc, College Incubator, University Incubator) Advanced (PhD)
Eswatini	0	/	/	/	/
Lesotho	0	/	/	/	/
Madagascar	1	Artificial Intelligence for agriculture Programming / Coding for agricultural systems Design of digital tools to help farmers (crop calendars and weather forecasting)	Smart Farming, ICT-enabled advisory services Intelligent agriculture/geomatics	/	Based (BSc)
Malawi	2	Artificial Intelligence for agriculture;Internet of Things for Agriculture;Digital entrepreneurship in agriculture; Machine Learning, Drones, Robotics for Agriculture, Big Data for analytics in agriculture	Digital Procurement, E-extension, Smart Farming, ICT-enabled advisory services, Agri Digital Financial services, Agri-e-commerce, Agriculture innovation, Agribusiness Agricultural extension	Launching an enterprise; Working for the public sector; Working in advancing research (PhD, research institutions, others, etc.)	Based (Certificate Level, BSc) Standard (MSc, College Incubator, University Incubator) Advanced (PhD)
Mauritius	1	Big Data for analytics in agriculture Artificial Intelligence for agriculture Internet of Things for Agriculture Programming / Coding for agricultural systems Digital entrepreneurship in agriculture Cyber security in the agricultural context	Agri Digital Financial services Agri-e-commerce E-extension Smart Farming ICT-enabled advisory services Digital Content Creation Technologies In Sheltered Farming	Launching an enterprise Finding a job as an employee Working for the public sector Working in advancing research (PhD, research institutions, others, etc.)	Based (BSc) Standard (MSc, College Incubator, University Incubator) Advanced (PhD)
Mozambico	1	Big Data for analytics in agriculture Digital entrepreneurship in agriculture	None	None	Based (Certificate level, BSc) Standard (College Incubato University Incubator)
Namibia	1	Big Data for analytics in agriculture Artificial Intelligence for agriculture Internet of Things for Agriculture Programming / Coding for agricultural systems	Digital Content Creation Agriculture related skills	Launching an enterprise Finding a job as an employee Working for the public sector Working in advancing research (PhD, research institutions, others, etc.)	Based (Certificate Level, BSc) Standard (MSc) Advanced (PhD)
Seychelles	0	/	/	/	/
South Africa	2	Big data for analytics Artificial intelligence Internet of thing	Agri Digital Financial services E-extension Smart Farming	Launch an enterprise Work in advanced research Write business plans and strategies	Based (Certificate Level, BSc) Standard (MSc, College Incubator) Advanced (PhD)

Figure 7: Digital Syllabi – Universities

Annex 2: Comparative Analysis

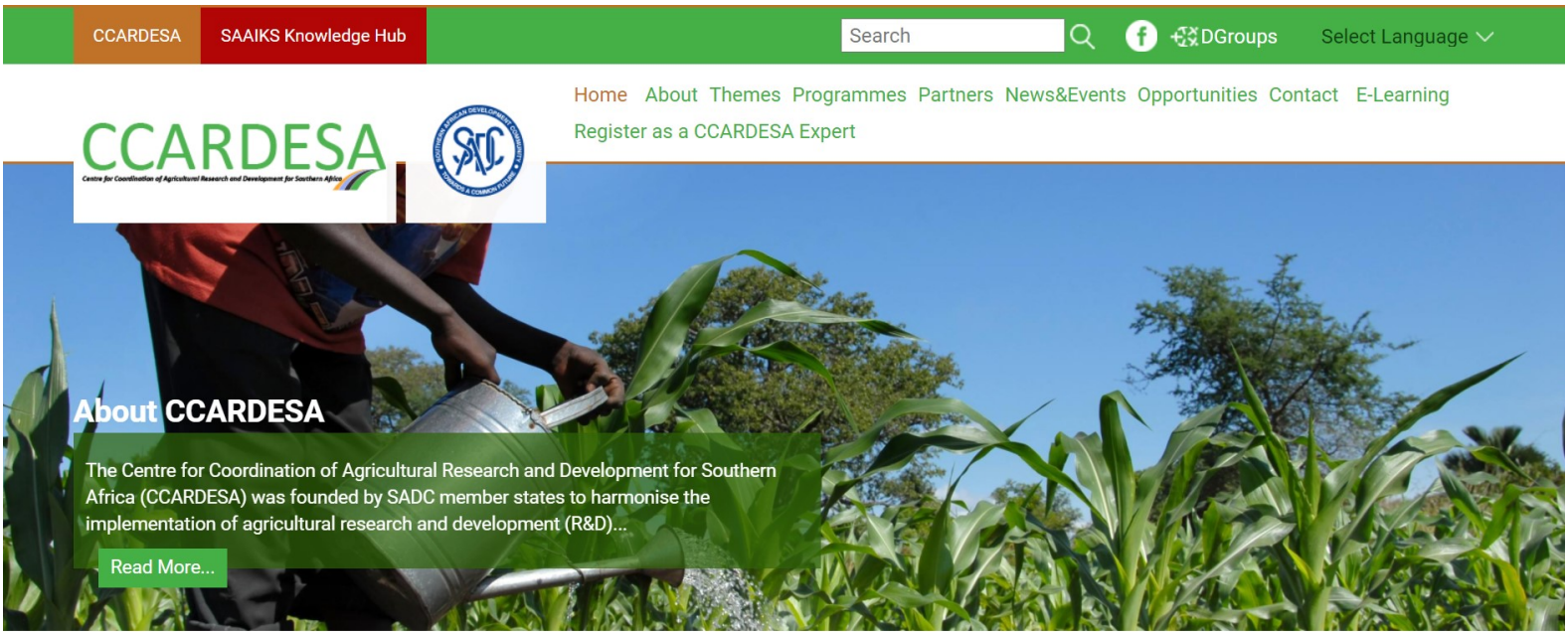
Name	URL	Purpose of site/Description	Org	Features	Audience	Sector / Focus	Platform	popularity	Like	Don't like	collaboration
K4Health	https://www.k4health.org/	Content for global health, supported by USAID and Johns Hopkins. Captures KM materials across the world, including popline - grey and peer review literature on reproductive health	JHC CCP	Content, blog, discussion board, toolkits	Implementing Partner (local & international); USAID	Global Health	Drupal	very well used	great content	hard to navigate	Post our content
USAID Learning Lab	http://usaidlearninglab.org/	KM discussion boards for USAID staff and implementing partners	KDID	Discussion boards	Implementing Partner (local & international); USAID	ALL	Drupal	very well used	Nice features for discussion	hard to navigate	Post our content
H3C	http://healthcommcapacity.org/		JHC CCP		Implementing Partner (local & international); USAID	Global Health	Wordpress	well organized	easy to navigate, programs and publications are easy to access and search bar picks up on tags		
Health Compass	http://www.thehealthcompass.org/		JHC CCP		Implementing Partner (local & international); USAID	Global Health	Drupal		like the trending topics, how to guide, and the ability to upload additional social and behavior change resources	like the trending topics by subject, but could be on landing page	
SBCC Implementation	http://sbccimplementationkits.org/		JHC CCP		Implementing Partner	Global Health	Wordpress			basic, not well organized	
Global Innovation Exchange	https://www.globalinnovationexchange.org/		USAID Dev Lab		Implementing Partner (local & international); USAID	ALL	Drupal		easy to scroll through, like the breakdown of sectors	like the resources page but not the top widgets, clunky looking	
International Livestock Research Institute (ILRI)	https://www.ilri.org/	ILRI is a CGIAR research centre, a global research partnership for a food-secure future	ILRI	livestock matters, research, publications, microsites	Everyone	Global research	Drupal		Easy to navigate, easy to search publications		
Forum for Agricultural Research in Africa (FARA)	https://faraafrica.org/	coordinating and advocating for agricultural research for development (AR4D). FARA serves as the technical arm of the Africa Union Commission on matters concerning agriculture science, technology and innovation.	FARA	Content, blog, discussion board, toolkits	Africa Union Commission	Continental	Wordpress		CCARDESA staff like FARA site	Graphics are a little fuzzy on laptop and mobile	
ifpri	https://www.ifpri.org/	provides research-based policy solutions to sustainably reduce poverty and end hunger and malnutrition in developing countries.	IFPRI	Publications & Tools, Podcasts, Blogs, events, topics, programs, projects	Global, regional, and national	Agriculture	Drupal		Really like the landing page, easy to search through two layers of headers	no complaints	
fao	http://www.fao.org/home/en/	UN Agency to lead international efforts to defeat hunger	FAO of the United Nations		Global, regional, and national	Agriculture	TYPO3		Easy for navigation for research/publication	not many complaints	CCARDESA staff utilize publications and ICT tools
CIMMYT	https://www.cimmyt.org/	Maize and wheat science for improved livelihoods	International Maize and Wheat Improvement Center (CIMMYT)		Global, regional, and national	Agriculture	Wordpress		Basic but it works	Need better quality pictures	
CORAF	http://www.coraf.org/	Increase use of appropriate technologies and innovations in the region, increase the update of strategic decision-making for policy, institutions and markets.	West and Central African Council for Agricultural Research and Development	Videos, content, projects, publications	Regional, national	All	Wordpress		Good landing page, easy to navigate. Interactive map		one of 4 sub-regional orgs under forum for Agricultural Research in Africa (FARA), CCARDESA being another one
asarecca	https://www.asareca.org/	To Contribute to Increased Productivity, Commercialization and Competitiveness of the ECA Agricultural Sector Through Strengthening, Catalyzing and Coordinating Agricultural Research for Development in the ECA Sub Region.	The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA)	Publications, database, projects	Regional, national	Agriculture	Drupal		Easy to navigate, frequently updated content		
Consultative Group on International Agricultural Research (CGIAR)	https://www.cgiar.org/	CGIAR is a global research partnership for a food secure future dedicated to reducing poverty, enhancing food and nutrition security, and improving natural resources	Consultative Group on International Agricultural Research (CGIAR)		World	Agriculture	Wordpress		like the dashboard features	landing page is a bit overwhelming at first glance	
FHI 360	https://www.fhi360.org/	FHI 360 is an international nonprofit working to improve the health and well-being of people in the United States and around the world	Family Health International (FHI360)		United States and the World-governments, the private sector and civil society	Health	Drupal		Nice layout, easy to navigate		
African Development Bank (AfDB) Group	https://www.afdb.org/en	To spur sustainable economic development and social progress in its regional member countries (RMCs), thus contributing to poverty reduction	African Development Bank (AfDB) Group		African Countries	Agriculture & Agro-industries, Climate Change, Economic & Financial Governance, Education, Energy	Drupal		breakout of pages is easy to navigate and the data portal is nice and interactive	landing page could use some graphic (video only takes up 1/4 of the area it's in)	The African Development Bank (ADB), The African Development Fund (ADF), The Nigeria Trust Fund (NTF), 54 African countries (regional member countries), 27 non-African countries (non-regional member countries)
International Rice Research Institute	https://www.irri.org/	To abolishing poverty and hunger among people and populations that depend on rice-based agri-food systems. Aims to improve the health and welfare of rice farmers and consumers; promote environmental sustainability in a world challenged by climate change; and support the empowerment of women and the youth in the rice industry.	International Rice Research Institute (IRRI)		Global	Agriculture (Rice sub sector)	Drupal		basic but works		
CIAT	https://ciat.cgiar.org/ https://alliancebioversityciat.org/	The International Center for Tropical Agriculture (known as CIAT from its Spanish-language name Centro Internacional de Agricultura Tropical) is a not-for-profit research and development organization dedicated to reducing poverty and hunger while protecting natural resources in developing countries.	The International Center for Tropical Agriculture (CIAT)		Global	Agriculture	Wordpress		moved to new website (Alliance) but let website viewers still have access. Enjoy the new website and their "research areas" pop up page		

Name	URL	Purpose of site/Description	Org	Features	Audience	Sector / Focus	Platform	popularity	Like	Don't like	collaboration
IITA	https://www.iita.org/	The International Institute of Tropical Agriculture (IITA) is a non-profit institution that generates agricultural innovations to meet Africa's most pressing challenges of hunger, malnutrition, poverty, and natural resource degradation. Working with various partners across sub-Saharan Africa, we improve livelihoods, enhance food and nutrition security, increase employment, and preserve natural resource integrity.	International Institute of Tropical Agriculture (IITA)		Africa-Southern Africa	Agriculture	Wordpress		Enjoyed the interactive map with different regional hubs	publications could be updated more	
CIP - International Potato Center	https://cipotato.org/	The International Potato Center (CIP) is a research-for-development organization with a focus on potato, sweetpotato and andean roots and tubers. It delivers innovative science-based solutions to enhance access to affordable nutritious food, foster inclusive sustainable business and employment growth, and drive the climate resilience of root and tuber agri-food systems.	International Potato Center		Global	Agriculture	Wordpress		Nice navigation, pleasing to the eye		
United Nations	https://www.un.org/en/	Peace, dignity and equality on a healthy planet	United Nations		Global	Peace, dignity and equality	Drupal		nice but not eye-catching		
AERC | African Economic Research Consortium	https://aercafrica.org/	African Economic Research Consortium (AERC), established in 1988, is a premier capacity building institution in the advancement of research and training to inform economic policies in sub-Saharan Africa	AERC | African Economic Research Consortium		Africa	Education	Wordpress		Nice layout	gallery of videos is nice but takes a long time to scroll between	
World Bank	https://www.worldbank.org/en/home	The World Bank Group is a unique global partnership fighting poverty worldwide through sustainable solutions.	World Bank Group - International Development, Poverty, & Sustainability		Global	Finance, Intl. Development	Adobe Experience Manager (AEM)		easy to navigate		
World Agroforestry | Transforming Lives and Landscapes with Trees	https://www.worldagroforestry.org/	World Agroforestry (ICRAF) is a centre of science and development excellence that harnesses the benefits of trees for people and the environment. Leveraging the world's largest repository of agroforestry science and information, we develop knowledge practices, from farmers' fields to the global sphere, to ensure food security and environmental sustainability.	'World Agroforestry | Transforming Lives and Landscapes with Trees		Global	Forestry	Drupal		resource application and database page is useful	agroforestry world news page not updated	
OECD	https://www.oecd.org/	Working with over 100 countries, the OECD is a global policy forum that promotes policies to improve the economic and social well-being of people around the world.	Organisation for Economic Co-operation and Development (OECD)		Global	Policy forum	Terminalfour			landing page took too long to load	
CEEAC - ECCAS	https://ceeac-eccas.org/en/	The Economic Community of Central African States -CEEAC- mobilizes all its resources and energy to make Central Africa a region of peace, prosperity and solidarity based on a unified economic and political space where each citizen moves freely in order to thus ensures sustainable and balanced development.	The Economic Community of Central African States -CEEAC		Central Africa	Peace and prosperit	Wordpress		lots of information on landing page	layout a little confusing.	
The "4 per 1000" Initiative	https://www.4p1000.org/	The aim of the initiative is to demonstrate that agriculture, and in particular agricultural soils can play a crucial role where food security and climate change are concerned.	The international initiative "4 per 1000"		Global	Agriculture	Drupal			website color scheme not great for eyes especially the white font color for text	voluntary stakeholders of the public and private sectors (national governments, local and regional governments, companies, trade organizations, NGOs, research facilities, etc.
Soil Health Institute	https://soilhealthinstitute.org/	The Soil Health Institute seeks to safeguard and enhance the vitality and productivity of soil through scientific research and advancement.	Soil Health Institute		Global	Soil	Wordpress		Good resources and collaboration with partners page	landing page feels busy and squished	
Soils, Food and Healthy Communities: Farmer-led Research for Food Security and Nutrition in Malawi	https://soilsnfood.org/	The Soils, Food and Healthy Communities project is a participatory, farmer-led nonprofit organization, using agroecological methods to improve food security and nutrition in Malawi.	Soils, Food and Healthy Communities	projects, publications and outcomes, updates	Malawi	Agriculture	Wordpress		Great linkage of social media		
SHI - Sustainable Agriculture + Organic Farming for Poverty Alleviation	https://www.sustainableharvest.org/	Sustainable Harvest International is an environmental non-profit organization. We preserve the environment by partnering with families to improve well-being through sustainable, regenerative farming.	SHI - Sustainable Agriculture + Organic Farming for Poverty Alleviation	About Us, Our Work, Get Involved, Media Gallery, Blog, Donate	Central America	Agriculture	Squarespac e		easy to navigate through, eye pleasing	not a ton of content for visitors	
The Carbon Underground	https://thecarbonunderground.org/	Reverse climate change and create secure food production through regenerative farming, agriculture, ranching and livestock technologies	The Carbon Underground - Reversing Climate Change	About Us, The Science, Initiatives, Partners, Donate	Global	Agriculture	Wordpress		basic but has main programs on landing page	feels a bit busy	
Ecological Farming Association	https://eco-farm.org/	The Ecological Farming Association (EcoFarm) is a non-profit organization facilitating an exchange of knowledge among a diversity of stakeholders and grassroots leadership through its connective educational events. EcoFarm's goal is to transform the food system from the ground up by nurturing safe, healthy, just, and ecologically sustainable farms and communities.	Ecological Farming Association	Home, E-News, Events, EcoFarm Conference, Farmer Resources, Search Jobs, About Us	Agriculture		Drupal		nice layout and icons pages		
The Land Institute	https://landinstitute.org/	The Land Institute, a nonprofit agricultural research organization that's developing a new model for farming called Natural Systems Agriculture.	Natural Systems Agriculture | The Land Institute				Wordpress		Lots of great content		
The Timbaktu Collective	https://www.timbaktu.org/	The Timbaktu Collective is a registered Not-for-Profit Organisation initiated in 1990, working for sustainable development in the drought prone Anantapur district of Andhra Pradesh (A.P.) INDIA	The Timbaktu Collective		India	Agriculture	Wordpress			basic landing page, not much interaction	
TRADITIONAL NATIVE AMERICAN FARMERS ASSOCIATION	http://www.tnafa.org/	Traditional Native American Farmers Association	TRADITIONAL NATIVE AMERICAN FARMERS ASSOCIATION	Home, history, workshops, videos, design source, contact	Arizona and New Mexico	Agriculture	unavailable			website not working	

Name	URL	Purpose of site/Description	Org	Features	Audience	Sector / Focus	Platform	popularity	Like	Don't like	collaboration
Bioversity International	https://www.bioversityinternational.org/	Scientific evidence, management practices and policy options to use and safeguard agricultural and tree biodiversity	Bioversity International: research for development		Global	Agriculture and Forestry	TYPO3		nice but not updated website, no longer active		
KALRO	https://www.kalro.org/	Demand driven research for food security and income generation	Kenya Agricultural & Livestock Research Organization		Kenya	Agriculture	Drupal			pages took a bit to load, publications not updated frequently	
NARI	https://www.nari.org.pg/	NARI, a statutory research organization, to conduct and foster applied and adaptive research into any branch of biological, physical and natural sciences related to agriculture, cultural and socioeconomic aspects of the agricultural sector, especially of the smallholder agriculture, and matters relating to rural development and of relevance to PNG. Besides which, NARI is responsible for providing technical, analytical, diagnostic and advisory services and up-to-date information to the agriculture sector in PNG.	National Agricultural Research Institute		Papua New Guinea (PNG)	Agriculture	Drupal		like the ENSO Rainfall watch interactive on the landing page		
AGRA	https://agra.org/	AGRA is a farmer-centered, African led, and partnerships driven institution that is transforming Africa's smallholder farming from a solitary struggle to survive to businesses that thrive.	Alliance for a Green Revolution in Africa		Africa	Agriculture	Wordpress		easy to navigate, updated fairly frequently		
AFAAS	https://www.afaas-africa.org/	African Forum for Agricultural Advisory Services (AFAAS) is a Continental body that brings National Agricultural Extension and Advisory Services (AEAS) under one umbrella. The AFAAS' goal is to enhance utilization of improved knowledge, technologies and innovations by agricultural value chain actors for improving productivity oriented towards their individual and national development objectives.	African Forum for Agricultural Advisory Services		Africa	Agriculture	Wordpress		Great content and interaction	could have non-blurry pictures	
Taat-Africa	https://taat-africa.org/	to "rapidly expand access of smallholder farmers, majority women, to high yielding agricultural technologies to improve their food production, assure food security and raise rural incomes, and deliver regional public goods by scaling up agricultural technologies across similar agro-ecological zones"	Africa Technologies for African Agricultural Transformation		Africa	Agriculture	Wordpress		fairly easy to navigate	landing page took awhile to load	
ICARDA	https://www.icarda.org/	The International Center for Agricultural Research in the Dry Areas (ICARDA) provides innovative, science-based solutions for rural communities	The International Center for Agricultural Research in the Dry Areas		Global	Agriculture	Drupal		good layout, nice pictures, like the pop up to join the newsletter		
ICRISAT	https://www.icrisat.org/	Equipping the rural poor with long term hope through making farming and agribusiness profitable in the drylands				Agriculture	Wordpress		like the "explore it by" top header which breaks down by topic, crop, location, systems, and resources		
IFDC	https://ifdc.org/	IFDC is an independent non-profit organization that combines innovative research, market systems development, and strategic partnerships to spread sustainable agricultural solutions for improved soil health, food security, and livelihoods around the world.	The International Fertilizer Development Center		Global	Agriculture	Wordpress		easy to navigate	the background video on the landing page makes it glitch a little	
IWMI	https://www.iwmi.cgiar.org/	Research on water management in agriculture, irrigation, groundwater, river basins, wetlands, ecosystems, food security, wastewater and climate change.	International Water Management Institute (IWMI)		Global	Agriculture	Wordpress		nice amount of content and like the integration at the bottom with their social media		
africarice-English	https://www.africarice.org/	AfricaRice is a CGIAR Research Center – part of a global research partnership for a food-secure future.	AfricaRice		Africa	Agriculture	Wix		Appreciate the header page breakdown, easy to find what I'm looking for		
PARI	https://research4agriinnovation.org/	PARI - Program of Accompanying Research for Agricultural Innovation brings together partners from Africa, India and Germany to contribute to sustainable agricultural growth and food and nutrition security in Africa and India.	PARI - Program of Accompanying Research for Agricultural Innovation		Africa and India	Agriculture	Wordpress		decent layout	font is too small	
WorldFish	http://www.worldfishcenter.org/	We are a leading nonprofit research and innovation institution focused on aquatic foods for food system transformation for healthy people and planet.	WorldFish | Aquatic Foods for Healthy People and Planet		Global	Agriculture	Drupal		beautiful background video on landing page that doesn't glitch, easy to look at		
CIFOR	https://www.cifor.org/	CIFOR is a non-profit, scientific institution that conducts research on forest and landscape management globally. CIFOR aims to improve human well-being, protect the environment, and increase equity.	Center for International Forestry Research - CIFOR		Global	Agriculture	Wordpress		nice update on publications section	location of header means when mouse hovers over it it takes up the entire page and isn't easy to exit	
AGRODEP	http://www.agrodep.org/	The African Growth and Development Policy Modeling Consortium is an initiative aimed at positioning African experts to take a leadership role in the study of strategic development questions and the broader agricultural growth and policy debate facing African countries.	AGRODEP | African Growth and Development Policy Modeling Consortium		Africa	Agriculture	Drupal		basic layout	data search engine not working	
ReSAKSS	https://www.resakss.org/	ReSAKSS is a multi-country network, structured around four "nodes"—one at the Africawide level, and three within each of Africa's major regional economic communities (RECs): East and Central Africa (ECA), West Africa (WA), and Southern Africa (SA).	The Regional Strategic Analysis and Knowledge Support System (ReSAKSS)		Africa	Agriculture	Drupal		great landing page tracking and monitoring on landing page	website took a bit to load	
ASTI - Agricultural Science and Technology Indicators	https://www.asti.cgiar.org/	ASTI provides trusted open-source data on agricultural research systems across the developing world. ASTI works with a large network of national collaborators to collect, compile, and disseminate information on financial, human, and institutional resources at both country and regional levels across government, higher education, nonprofit, and (where possible) private for-profit agricultural research agencies.	Agricultural Science and Technology Indicators | ASTI		Global	Agriculture	Drupal		easy to navigate		

Name	URL	Purpose of site/Description	Org	Features	Audience	Sector / Focus	Platform	popularity	Like	Don't like	collaboration
Bill & Melinda Gates Foundation	https://www.gatesfoundation.org/	We are a nonprofit fighting poverty, disease, and inequity around the world.	Bill & Melinda Gates Foundation		Global	all	Sitecore		easy to navigate, up to date		
CIESIN	http://www.ciesin.org/	The Center for International Earth Science Information Network (CIESIN) is a center within the Columbia University which works at the intersection of the social, natural, and information sciences, and specializes in on-line data and information management, spatial data integration and training, and interdisciplinary research related to human interactions in the environment.	Center for International Earth Science Information Network		Global	Education	bluemug			not a great layout and not easy to navigate	
EAT	https://eatforum.org/	We are dedicated to transforming our global food system through sound science, impatient disruption and novel partnerships	EAT - The science-based global platform for food system transformation		Global	Agriculture	Wordpress		easy to navigate	not much to the website	
IUCN	https://www.iucn.org/	The International Union for Conservation of Nature is the global authority on the status of the natural world and the measures needed to safeguard it	International Union for Conservation of Nature - IUCN		Global	All	Drupal		nice breakdown of themes and regions		
WFP	https://www.wfp.org/	The world's largest humanitarian organization, saving lives in emergencies, building prosperity and supporting a sustainable future for people recovering from conflict, natural disasters and the impact of climate change	United Nations World Food Programme (WFP)		Global	Agriculture	Drupal		lots of relevant information, easy to search		
Global Environment Facility	https://www.thegef.org/	It serves as a financial mechanism for several environmental conventions	Global Environment Facility		Global	All	Drupal		beautiful pictures and graphics for landing page, good updated content		
UNEP - UN Environment Programme	https://www.unep.org/	UNEP is the global champion for the environment with programmes focusing on sustainable development, climate, biodiversity and more	UNEP - UN Environment Programme		Global	Environment	Drupal		easy to search and navigate		
IIED	https://www.iied.org/	IIED is a policy and action research organisation promoting sustainable development and linking local priorities to global challenges	International Institute for Environment and Development		Global	Environment	Drupal		navigates easily	could have more content to keep reader engaged	
World Vegetable Center	https://avrdc.org/	The World Vegetable Center promotes healthier lives and more resilient livelihoods through greater diversity in what we grow and eat. Our international research and development activities focus on vegetable production and consumption to create more sustainable food systems that nourish people, not merely feed them.	World Vegetable Center		Global	Agriculture	Wordpress		good content	took a little bit for page to load	
International Center for Biosaline Agriculture	https://www.biosaline.org/	ICBA is an international, non-profit agricultural research center established in 1999 through the visionary leadership of the Islamic Development Bank (IDB), the Organization of the Petroleum Exporting Countries (OPEC) Fund, the Arab Fund for Economic and Social Development (AFESD), and the Government of the UAE.	International Center for Biosaline Agriculture		Global	Agriculture	Drupal		like the breakdown of resources and publications,	could have better search tool	
AUDA-NEPAD	https://www.nepad.org/	The mandate of AUDA-NEPAD is to: a) Coordinate and Execute priority regional and continental projects to promote regional integration towards the accelerated realization of Agenda 2063; and b) Strengthen capacity of African Union Member States and regional bodies, advance knowledge-based advisory support, undertake the full range of resource mobilization and serve as the continent's technical interface with all Africa's development stakeholders and development partners.	NEPAD Planning and Coordination Agency into the African Union Development Agency-NEPAD (AUDA-NEPAD)		Africa	All	Drupal		nice landing page	could have headers at the top versus drop down menu	
West Africa Agricultural Productivity Program RSS	http://www.waapp-pmaan.org/en	WAAPP is designed to make agriculture more productive and sustainable, to improve the conditions of life of consumers through the provision of agricultural products at competitive prices and to support regional cooperation in agriculture in West Africa in accordance with action plans for agricultural policy managers of ECOWAS/ECOWAP and the NEPAD/CAADP.	West Africa Agricultural Productivity Program	Regional Integration in Bridging Food and Income Gaps	Regional- West Africa	Agriculture	Drupal		nice breakdown for navigation	layout could look cleaner	
OECD iLibrary	https://www.oecd-ilibrary.org/	the online library of the Organisation for Economic Cooperation and Development (OECD) featuring its books, papers and statistics and is the knowledge base of OECD's analysis and data.	Organisation for Economic Cooperation and Development (OECD)		Global	All	Cloudflare		easy to search with tags		

REQUIREMENTS SPECIFICATION FOR THE CCARDESA DIGITAL AGRIHUB



Provided by IMC Worldwide
February 2022

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1 BACKGROUND

The Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA) is a sub-regional organization established as a subsidiary entity of the Southern African Development Community (SADC) and charged with the responsibility of coordinating agricultural research and development in the Southern African region.

IMC Worldwide was engaged by CCARDESA and the World Bank to undertake a stocktaking analysis of the status of digitalization in the agricultural systems of the SADC region paying special attention to agricultural research for development, agriculture education, agriculture extension and market linkages. The findings of the report are to be featured on a Digitalized Agricultural Platform (called the Digital AgriHub) within the CCARDESA website that will strengthen the role as a coordinator for CCARDESA in the digital agriculture ecosystem and to facilitate taking along all stakeholders together.

This document is a summary of the needs assessment and presents the requirements for the Digital AgriHub, including the overall purpose, audience, and proposed metrics, technical and functional approach, and presentation and layout including content /information architecture.

2 STRATEGIC PURPOSE AND AUDIENCE

PURPOSE OF THE DIGITAL AGRIHUB

- Provide a way to access report information easily to the proposed audience
- Provide baseline information on SADC AgTech in interactive ways
- Allow users to access country level information on AgTech
- Drive new audiences to CCARDESA Platform

PROPOSED AUDIENCE

TABLE 1 TABLE OF USERS (EXISTING AND DESIRED)

USER	DESCRIPTION	DESIRED INFORMATION
CCARDESA/ SADC staff	Highly educated members of CCARDESA who need to perform research and provide guidance to others. A range of experience with digital technology (especially for agriculture).	Easy access to critical information contained in the report for reuse or sharing

USER	DESCRIPTION	DESIRED INFORMATION
Government	Highly educated civil servants varying from new graduates to experienced personnel, mainly from the region. A range of experience with digital technology (especially for agriculture).	Critical information to help form policies to support innovation. Specific innovations/innovators in their country that can be supported. Digital AgTech policy and digital skills ideas and experiences they can call on to promote innovations.
Academia	Highly educated multidisciplinary researchers and students from developed and developing countries. A range of experience with digital technology (especially for agriculture).	Baseline information on innovations and associated data that can be built upon.
Donors	Highly educated with a great understanding of institutional and regulatory frameworks around ag-tech policy. A range of experience with digital technology (especially for agriculture).	Ideas on what policies, digital skills approaches, and innovations that they can support to build improved digitalization in the agriculture sector. Baseline data to be able to compare performance.
NGOs/ Civil Society Orgs	Middle to highly educated implementing partners and organizations with knowledge of beneficiaries and policies for advocacy in agriculture. A range of experience with digital technology (especially for agriculture).	Ideas on innovations and/or digital skills which can help address specific barriers and challenges of their beneficiaries. Ideas on what policies to advocate for which can promote innovations and digital skills.
Agriculture stakeholders	Low to middle educated agriculture specialists, such as extension workers, large farmers, brokers, and others who work in the value chain. A range of experience with digital technology.	Ideas on innovations and/or digital skills which can help address specific barriers and challenges of those within the agriculture value chain. Ideas on what policies to advocate for which can promote innovations and digital skills.
AgTech Firms	Mix of education levels with a high level of experience with digital technology. A range of experience in the agriculture value chain.	Ideas on competition and potential partners for innovation. Ideas on how to link with agriculture experts (other users). Ideas on what policies to advocate for which can promote innovations and digital skills.

White: Existing CCARDESA Platform core users

Light Blue: Desired additional CCARDESA Platform/Digital AgriHub users

PROPOSED METRICS OF SUCCESS

The following are the proposed metrics of success for the Digital AgriHub

GOOGLE ANALYTICS

1. Rate growth of page views of the Digital AgriHub
2. Compare average time on page on Digital AgriHub to most popular CCARDESA platform pages
3. Compare total users of CCARDESA Platform before and after launch
4. Compare bounce rate of Digital AgriHub pages to most popular platform pages.

QUALITATIVE

1. Perception of staff of usefulness of the Digital AgriHub
2. Perception by core user groups of usefulness of Digital AgriHub
3. Increase in the number of new core user groups using the site.

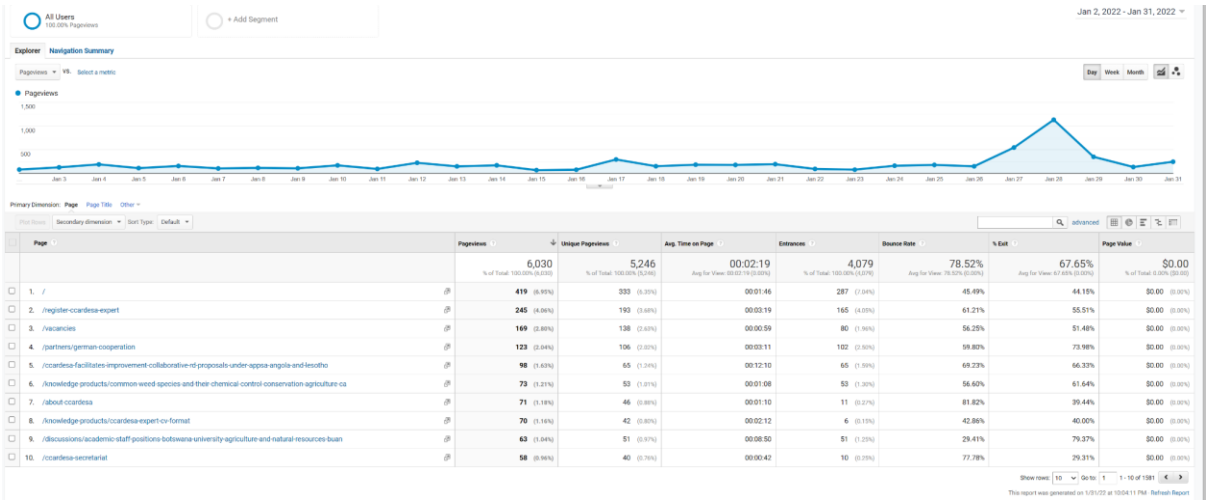

FIGURE 1 SCREENSHOT OF GOOGLE ANALYTICS REPORT FOR CCARDESA PLATFORM

3 FUNCTIONAL AND TECHNICAL SPECIFICATIONS

FUNCTIONAL SPECIFICATION

OVERARCHING

- The Digital AgriHub will have a separate landing page with new sub navigation
- Pages will be mainly content with imbedded maps that will allow for pop ups and links to different pages
- Other functionality that already exists on the CCARDESA platform.

FOR POLICY CONTENT PAGES

- A landing page with overview content and find policies by country via interactive map
- Click on country to see ranking of country in benchmark assessment Digital Economy and key sub indicators (Digital Government OSI, Innovation Driven Entrepreneurship (GII), INC Infrastructure (AIDA), Digital Business (GCI) and G5 Digital Economy Benchmark
- Click on country to get a few key figures: % of GDP made up of agriculture, forestry and fishing sectors, % of total employment made up of agriculture, Total population, GNI per capita, Mobile Connectivity Index GSMA
- Click on country to see which policies are available

FOR INNOVATIONS CONTENT PAGES

- A landing page with overview content and find innovations via interactive map
- Different filters: by country, by use case, by organization type, by value chain phase, by scaling phase, by technology

FOR DIGITAL SKILLS CONTENT PAGES

- University - imbedded map with universities which offer digital skills
- Incubators - imbedded map with incubators which offer digital skills

TECHNICAL SPECIFICATION

The Digital AgriHub will be hosted on the main CCARDESA website as of January 2022. The AgriHub will use the existing features within Drupal Version 7 and modules combined with embedding interactive google maps to extend functionality that does not currently exist on the Drupal.

DRUPAL MODULES

Using Display Suite tool, the AgriHub will have its own display structures, including its own sub-navigation and look and feel. A new content type may be added as well to support the display suite functionality. The sub navigation will use the Nice Menus module.

GOOGLE MAPS

The maps functionality will be managed through configured google maps with uploaded data exported from the QuickBase database.

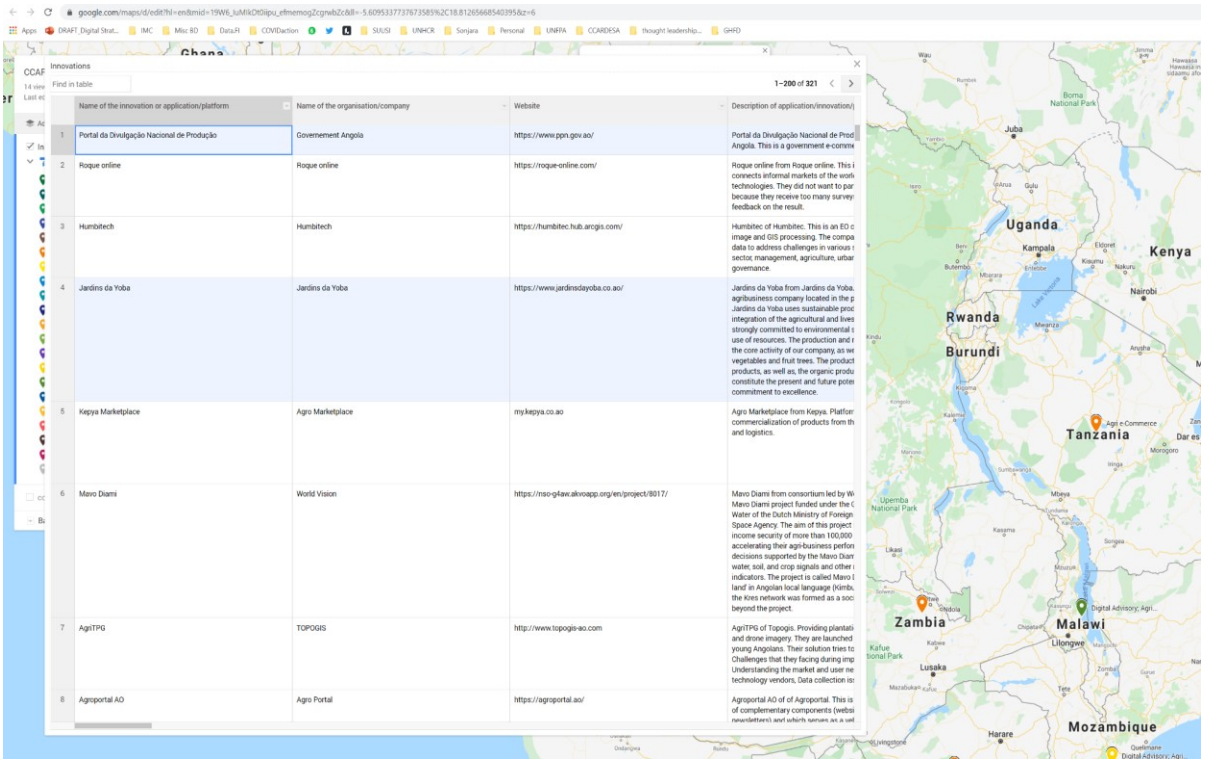

FIGURE 2 SCREENSHOT OF GOOGLE MAP DATA LAYER

4 PRESENTATION AND LAYOUT

INFORMATION ARCHITECTURE

The following Sub Navigation is proposed within the Digital AgriHub

- Summary [landing page]
- Broader Policy Environment
- Innovations
- Digital Skills
    - Universities
    - Incubators
- Countries
    - [one per SADC country]
- Reflections & Implications

CONTENT

The following is the current list of content pages anticipated to be created for the site. The content will come directly from the report wherever possible, with meaningful headers and diagrams from the report to illustrate the meaning.

Wireframe	Subnav	Sub subnav	Page	content
Summary	Summary	Summary	Home Page	Summary of report, links to PDFs, key findings
Theme	Policy	Policy	Policy	Summary of policy findings, map to policies
Theme	Innovations	Innovations	Innovations	summary of innovation findings, map to innovations
Theme	Digital skills	Digital skills	Digital skills Overview	Summary of digital skills findings - overview
Theme	Digital skills	Universities	Digital Skills: Universities	digital skills - unversities summary findings
Theme	Digital skills	Incubators	Digital Skills: Incubators	digital skills - incubators summary findings
Countries	Countries	Countries	Countries Overview	Countries - overview of findings, map
Countries	Countries	Angola	Angola	summary of findings for country, images, map
Countries	Countries	Botswana	Botswana	summary of findings for country, images, map
Countries	Countries	Comoros	Comoros	summary of findings for country, images, map
Countries	Countries	Democratic Republic of Cor	Democratic Republic of Congo	summary of findings for country, images, map
Countries	Countries	Eswatini	Eswatini	summary of findings for country, images, map
Countries	Countries	Lesotho	Lesotho	summary of findings for country, images, map
Countries	Countries	Madagascar	Madagascar	summary of findings for country, images, map
Countries	Countries	Malawi	Malawi	summary of findings for country, images, map
Countries	Countries	Mauritius	Mauritius	summary of findings for country, images, map
Countries	Countries	Mozambique	Mozambique	summary of findings for country, images, map
Countries	Countries	Namibia	Namibia	summary of findings for country, images, map
Countries	Countries	Seychelles	Seychelles	summary of findings for country, images, map
Countries	Countries	South Africa	South Africa	summary of findings for country, images, map
Countries	Countries	Tanzania	Tanzania	summary of findings for country, images, map
Countries	Countries	Zambia	Zambia	summary of findings for country, images, map
Countries	Countries	Zimbabwe	Zimbabwe	summary of findings for country, images, map
Reflections and	Reflections and	Reflections and implications	Reflections and implications	Summary of Reflections and implications

FIGURE 3 SCREENSHOT OF EXCEL LIST OF CONTENT PAGES

LOOK AND FEEL

The Digital AgriHub will use the existing custom CCARDESA theme for the subsite, using a two-column layout, with a right sub navigation at 25% size of the main column.

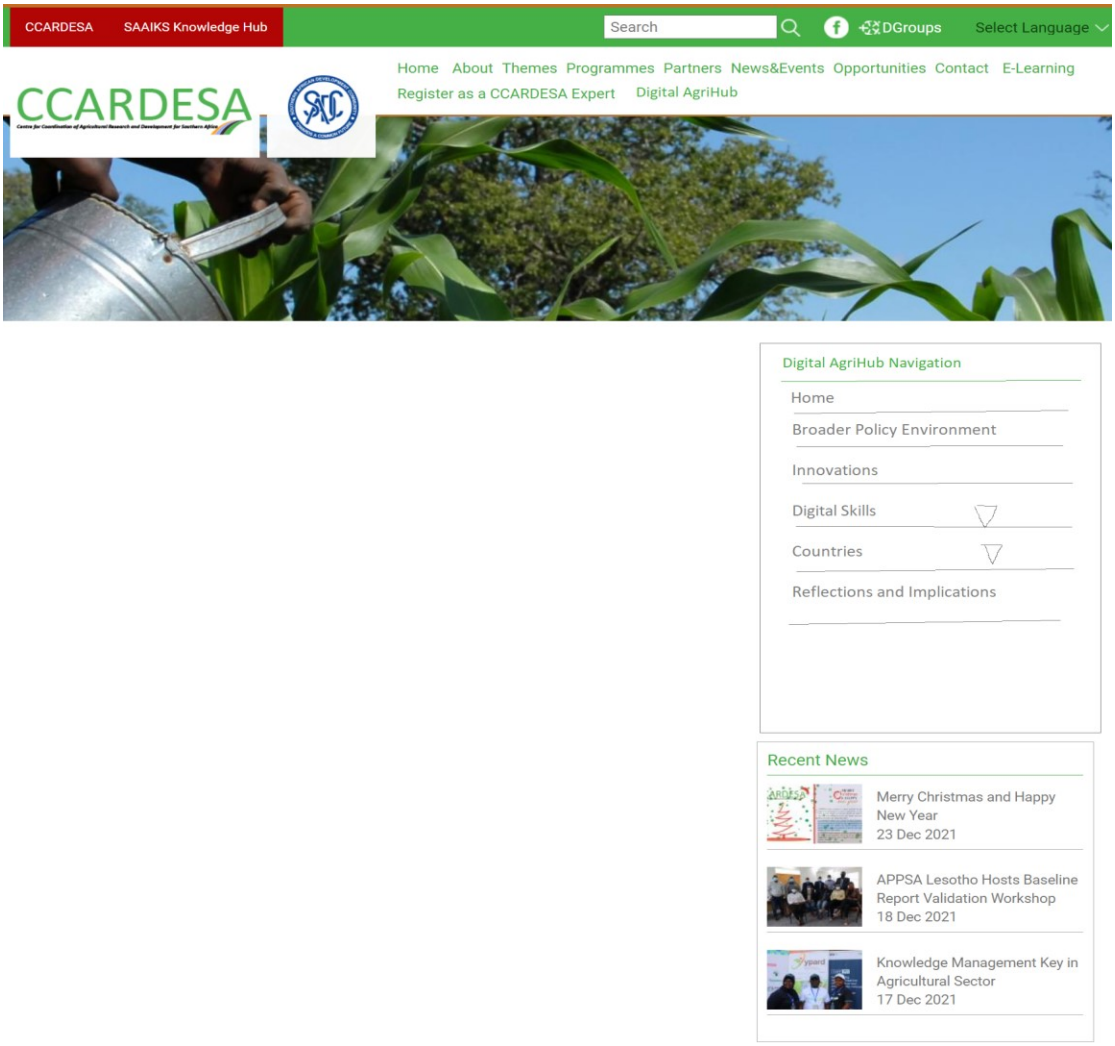

FIGURE 4 SCREENSHOT OF MOCKED UP LOOK AND FEEL PAGE

WIREFRAMES

The Digital AgriHub will have one main design approach, with 4 variations:

- Home page
- Theme Pages (for policy, innovations, digital skills)
- Country pages
- Reflections and Implications

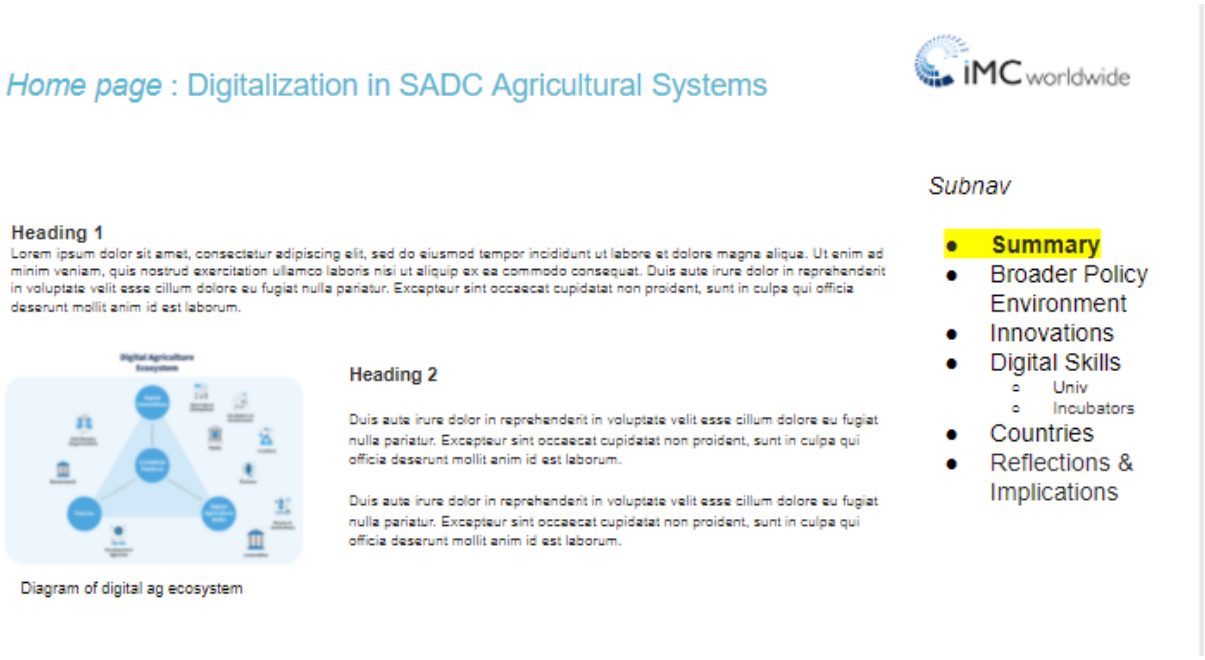

FIGURE 5 HOME PAGE WIREFRAME

FIGURE 6 THEME PAGES WIREFRAME

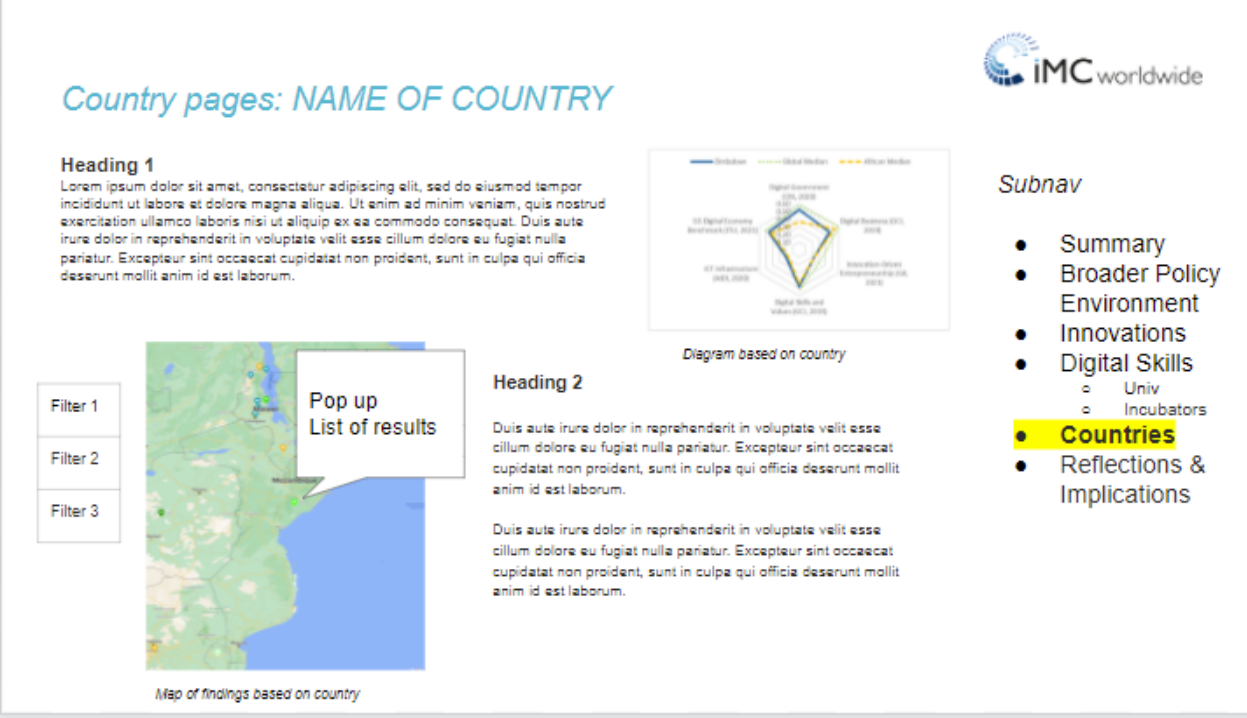

FIGURE 7 COUNTRY PAGES WIREFRAME

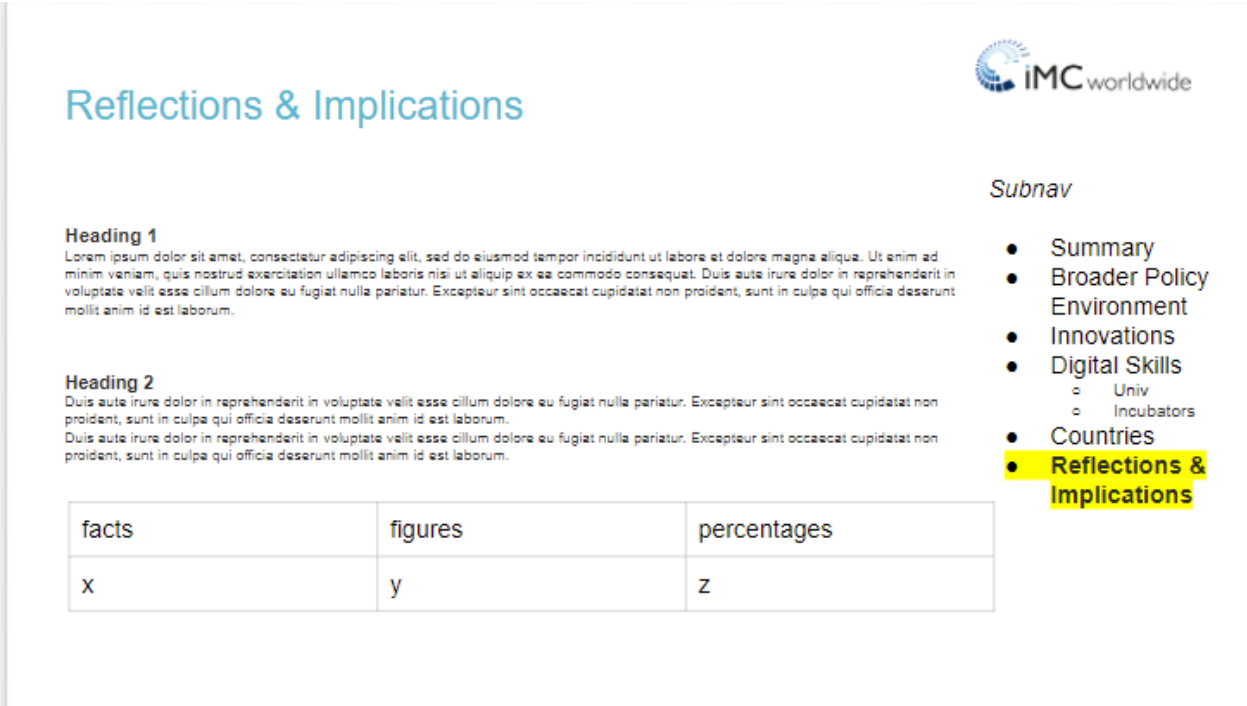

FIGURE 8 REFLECTIONS AND IMPLICATIONS WIREFRAME

5 MAINTENANCE

The Digital AgriHub will represent the results of the report as it was finalized in early 2022, including the interactive data elements. However, as the maps rely on a free google service, and Google sometimes changes the services they offer to the public, there is a good chance that at some point in the future, the maps will need to be redone or edited.

If CCARDESA wishes to update the data, they will technically have the ability to do so via the Drupal site/Google maps. CCARDESA will also be able to edit the content via the normal CCARDESA Platform content management processes.

6 IMPLEMENTATION PLAN

The following is the proposed implementation plan for the Digital AgriHub.

PHASE	DESCRIPTION	TIMELINE
Finalize Design	IMC will work with CCARDESA to finalize the design of the Digital AgriHub via feedback to this document.	31 Jan – 7 Feb
Build	IMC will build the site, allowing CCARDESA CKM to view the build as it is progressing.	7 Feb – 4 March
QA Testing	Before launch of the site, IMC will perform QA testing, including responsiveness, copyediting, and cross browser compliance	4 – 11 March
Soft Launch	Once the site has passed QA, CCARDESA will be able to "soft launch" the site, meaning the site will be added to the navigation to other parts of the CCARDESA platform and made available to the public. The soft launch is usually NOT announced publicly until after UAT.	11 March
User Acceptance Testing	Once the Digital AgriHub has been soft launched, IMC and CCARDESA will provide the site to key stakeholders within and external to CCARDESA for feedback and user testing. IMC is proposing using one or two focus groups, supplemented by interviews by CCARDESA (if needed), to walk through the site and capture structured feedback.	14 – 18 March

PHASE	DESCRIPTION	TIMELINE
Final fixes and QA	IMC will then work with the CCARDESA CKM team to determine which recommendations are immediate fixes before the "hard launch" vs longer term recommendations for the next iteration of the site.	21 – 25 March
Hard Launch	Once the site has passed UAT and associated fixes, CCARDESA will be able to announce the new site to their key stakeholders. An updated version of this document, including relevant system documentation for maintenance, will be provided to CCARDESA at this time.	31 March
Engagement	It is recommended that CCARDESA create an engagement plan, including sending emails to groups contacted via the research, posting on social media, and posting on DGroups to announce the new content to key stakeholders. This phase is a suggestion and is not within the scope or timeframe of the current contract with IMC.	April 2022 Onwards

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