

DIGITAL AGRICULTURE COUNTRY STUDY ANNEX: MOZAMBIQUE

Supplement to the Situational Analysis Report |
Assessment of Digitalization in the Agricultural Systems
of the SADC Region

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



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SYSTEMS OF THE SADC REGION: SITUATIONAL ANALYSIS REPORT**

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ACRONYMS AND ABBREVIATIONS

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
DE4A	Digital Economy for Africa Initiative
DIAL	Digital Impact Alliance
EGDI	E-Government Development Index
FANR	Food, Agriculture and Natural Resources Directorate
FAO	Food and Agriculture Organization of the United Nations
GCI	Global Competitiveness Index
GDP	Gross Domestic Product
GII	Global Innovation Index
GIS	Geographic Information System
GNI	Gross National Income
GPS	Global Positioning System
GSMA	Global System for Mobile Communications
HDI	Human Development Index
ICDL	International Computer Driving License
ICKM	Information, Communication and Knowledge Management
ICT	Information Communication Technology
ICT4AG	ICT for Agriculture
IDIA	International Development Innovation Alliance

IOT	Internet of Things
IS	Information Society
IT	Information Technology
ITU	International Telecommunications Unit
KII	Key Informant Interview
MSMES	Micro, Small and Medium Enterprises
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
SAAS	Software as a Service
SADC	Southern African Development Community
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
USSD	Unstructured Supplementary Service Data

1 INTRODUCTION

1.1 INTRODUCTION TO THE STUDY AND THE STRUCTURE OF THE DACS

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 African 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. CCARDESA has appointed IMC Worldwide to carry out a situation analysis of the status of digitalization in the agricultural systems of SADC member states.

Aligned with the Terms of Reference, a separate report has been produced by the study team, the *Situational Analysis Report: Assessment of Digitalization in the SADC Region* which addresses the assignment objectives (Section 2.2 in the Situational Analysis Report).

This Digital Agricultural Country Study (DACS) for Mozambique is an annex to the *Situational Analysis Report* and provides a snapshot of the general digital ecosystem, the policy environment of digital and agricultural policies, relevant digital agricultural innovations, and an overview of digital agricultural skills and digital entrepreneurial skills development in universities, incubators, and accelerators within an ecosystem. This document is not intended to provide a full analysis of the ecosystem in this country but provides an early baseline in gathering data and information collected from voluntary respondents on these topics for possible further study. The baseline data collected provides insights into the extent to which Mozambique has enabled and encouraged digital technology solutions, such as the use of digital data in agricultural research, education, extension, and market access. In specific terms and to the extent possible:

- The DACS identified available public national policies and legislation which provide a conducive environment for agricultural digital innovations to thrive. The study team also reviewed the context in which digitalization is linked to agriculture to enhance the agricultural innovation ecosystem.
- The DACS provides a catalogue of relevant agricultural digital innovations and where available, their availability, affordability, usability, and potential for scalability (adoption by smallholder farmers). These innovations were characterized in use cases according to a suitable framework and mapped to the roles they play in providing solutions within fragmented agriculture value chains.
- The DACS also maps syllabi at Agricultural Universities, Colleges, Incubators, and Accelerators which have embraced digital and entrepreneurial skills training to encourage and empower young people to become digital entrepreneurs in the future.

The study has assembled a wide array of evidence and research using qualitative and quantitative methods and approaches. Data collection on digital tools reflects the extent to which they have been embraced, but it is important to note that this study is not exhaustive in identifying every digital tool available. The report has the following structure:

Chapter 1:	Introduction to Mozambique, including the general digital ecosystem, agriculture sector, digital infrastructure, and benchmark assessment results.
Chapter 2:	The Broader Policy Environment
Chapter 3:	Digital Agricultural Innovations
Chapter 4:	Digital Agricultural Skills and Entrepreneurship Training
Chapter 5:	Insights and Reflections

All the information compiled for Mozambique will be combined with data from the other 15 SADC member states and presented on a platform hosted by CCARDESA.

1.2 METHODOLOGY

IMC Worldwide, CCARDESA and the World Bank agreed to the framework, approach, and methodology for the assignment. CCARDESA facilitated the introduction to the Information, Communication and Knowledge Management (ICKM) Focal Point in Mozambique, Mr. Américo António Humulane, Socioeconomist and Executive Secretary of the Scientific-Technical Council at the Agricultural Research Institute of Mozambique (IIAM), and Mr Philimone Carlos Francisco Xavier, Researcher and Head of Technology Transfer at IIAM. The study team also worked with a National Consultant in Mozambique, Mr. Joao Mudema.

Further information on the methodology for this assignment is provided in the *Situational Analysis Report* (Section 3) along with the data collection tools used, including the key informant guides and surveys (Annex 6-13 in the *Situational Analysis Report*).

GENERAL ECOSYSTEM

The study team collected key digital ecosystem figures for each country through a desk review of country reports and industry websites (World Bank, ITU, GSMA, etc.). These figures are presented in section 1.3 and 1.4 below.

BENCHMARK ASSESSMENT

The team completed a benchmark assessment across the 16 SADC member states. The assessment sought to provide a context to the findings of this study, and not to determine each SADC country's development of a digital economy. 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 member states. Other frameworks and toolkits were reviewed in preparation for the benchmark with more information in the *Situational Analysis Report*. The assessment areas in the SMART Africa/ DIAL report are based on the five foundational pillars of the Kenyan [Digital Economy Blueprint](#), illustrated in figure 1, and are similar in nature to the African Union's [Digital Transformation Strategy](#) foundation pillars, illustrated in figure 5, (Enabling Environment; Policy and Regulation; Digital Infrastructure; Digital Skills and Human Capacity; Digital Innovation and Entrepreneurship).

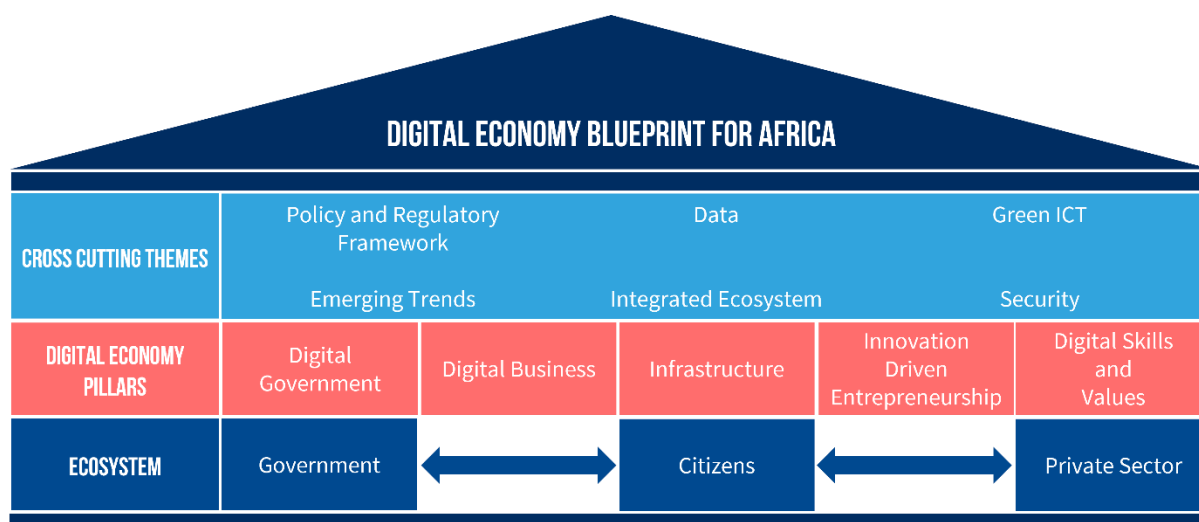


FIGURE 1 OVERVIEW OF KENYAN DIGITAL ECONOMY BLUEPRINT

A sixth pillar was added to the benchmark to include Policy and Regulatory Frameworks to align it with this study and as this was a regular cross-cutting area mentioned in other frameworks. These six pillars are presented in table 1.

TABLE 1 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.

Assessing all pillars has provided a picture across all 16 countries and forms the basis of the specific indicators that were selected for the benchmark assessment. The indicators used were based on the SMART Africa/DIAL report. Changes were made to some of the indicators for this study to focus more specifically 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 Digital 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 2.

TABLE 2 INDICES AND DATA STREAM USED FOR THE BENCHMARK ASSESSMENT AND MAXIMUM SCORE AVAILABLE

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). The benchmark is based on a mix of indicators from 2019-2021, outlined in Table 2.

POLICIES

For the broader policy section, the study team identified available policies, strategies and legislation around Information Communication Technologies (ICT), 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 key informant interviews (KIIs) with available CCARDESA ICKM focal points to identify additional policies, including draft versions that may be unavailable online and to understand practical challenges around the policy environment within ministries.

The team reviewed available public policies to understand their complexity, basic goals and strategies and the relationship with agriculture within the public sector. The team took stock of relevant digital laws, although the list included in this report is not exhaustive but focused on electronic transactions and 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 Government.

The approach sought to provide an audit of the policies in the public domain illustrating to what extent digitalization is embraced by government, and the relationship and implication for the agriculture sector. The report did not seek to analyze the content of policies or strategies or assess whether they are effective, enforceable or have achieved their objectives.

INNOVATIONS

Digital agricultural innovations were identified through a desk review of international reports, internet searches, local networks supplied by the CCARDESA ICKM focal point in the country and the national consultants. In some countries, innovations were identified that were also implemented in other countries (regional innovations), this is reflected in Chapter 3: Digital Agricultural Innovations. The national consultants validated all identified innovations available (national and regional innovations in that country) and identified contact information of the innovators which was then uploaded into a Google Form. Some regional innovations which claimed they were implemented in Mozambique could not be fully validated, but this was insufficient to suggest they did not exist and so are included in the lists within.

Each identified innovator was sent a survey by email, requesting more detail on their innovations related to the maturity, numbers of users and scale as well as more detailed characterizations of their unique innovation. Survey participants provided the survey responses voluntarily through Google Sheets which were converted

into excel files. All innovators were pursued rigorously for some weeks, by email and by phone, to encourage them to fill out the survey.

Survey answers were self-reported and where there were outlier responses, follow-ups were made to ensure conformity of information. The survey results were cleaned by combining duplicate answers (when submitted from more countries), clustered (in cases of open answers, for example with “other”) and names between identified and survey results were aligned. In some cases, the answers were coded for better analysis of the data. An analysis spreadsheet was developed to analyze the data in more depth and to create the graphs. All innovations received a unique number and were uploaded to the database. The database forms the basis for the interactive web portal of CCARDESA, further information on the portal can be found in the *Situational Analysis Report*. Alongside the survey, several KIIs with innovators took place both with regional innovations and with national innovations that have reached a certain level of scale.

This DACS has characterized use cases based on a model and framework created by GSMA based on different use cases and sub use cases and is represented below in figure 2. These broadly fall into access to services, access to markets and access to assets.

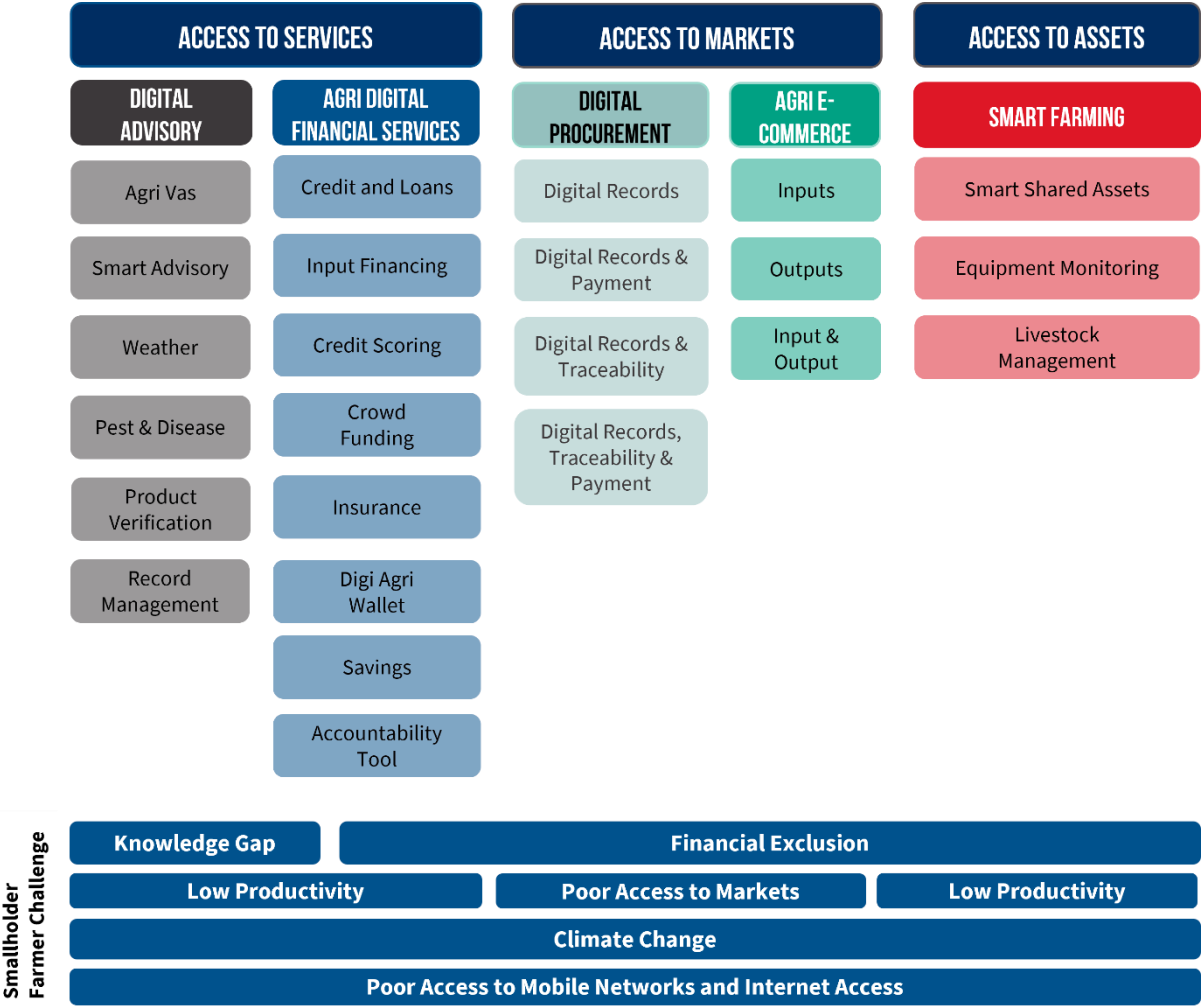


FIGURE 2 USE CASE MODEL BASED ON GSMA FRAMEWORK

In graphs and tables included in this DACS, the following color coding was used to illustrate the different use-cases:



DIGITAL SYLLABI

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 Regional Universities Forum (RUFORUM) network, but some institutions were contacted that were not strictly agricultural to try and provide a complete picture in the region (a total of 58 difference faculties were contacted). The names and addresses of these University contact points was facilitated via collaboration with the RUFORUM University membership in the SADC member states. The study team also carried out KIIs with representatives of faculties of agriculture at selected Universities and Incubators. The full list of universities and incubators approached, tools used, and stakeholders interviewed can be found in annex 3-4 and 8-10 in the *Situational Analysis Report*.

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.

The data collection for this study was entirely voluntary and self-reported. Every effort was made by the study team to engage a representative sample of stakeholders under each theme and encourage completion of surveys and interviews, there are cases within some of the DACS where the data may be more limited than in others due to the maturity of the digital agricultural ecosystem. Therefore, while the data collected for each country provides a reasonable baseline of the current landscape, this overview is not exhaustive and must not be seen as such. The intention of the data collection was to address the assignment objectives which sought to understand regional trends, themes, and opportunities around digitalization in agricultural systems. The DACS are supplemental documents which present the country data collected, some of which was used in the *Situational Analysis Report*, but they should not be interpreted as providing a detailed analysis of the country ecosystem.

POLICIES

There were several challenges in obtaining policy documents and determining if they were accurate, final, or valid and implemented. The impact of the Covid-19 pandemic has affected the priorities of governments and implementation of their related policies. Furthermore, the pandemic has 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. If documents were unavailable online then the ICKM focal points were asked for access where possible, national consultants also tried to source documents locally. Unverified versions of documents available online were also used for review.

INNOVATIONS

The current DACS is a snapshot in time as new digital innovations are in development in Mozambique and some may be declining because of the Covid-19 pandemic. Due to various Covid-19 restrictions, physical meetings could not always take place. People had to work from home which significantly affected their ability and willingness to participate in online interviews and survey instruments. The efforts of the national consultants to convince innovators to participate in the survey required significant energy and effort and, in some cases, took longer than expected. Many innovators are 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 consultants and share proprietary data.

DIGITAL SYLLABI

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. This is believed to be due to the enormous additional workload on staff at Universities 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 in the study is believed to be much lower than the reality for the region. In part, this can also be explained by the intentional targeting of Agricultural Faculties and Universities in the region rather than conducting a wider survey across Universities and Colleges more widely. During the KIs it was also established that some Universities and Faculties struggled to see their role as part of an ecosystem actor in providing for agricultural digital skills building specifically.

1.3 COUNTRY CONTEXT

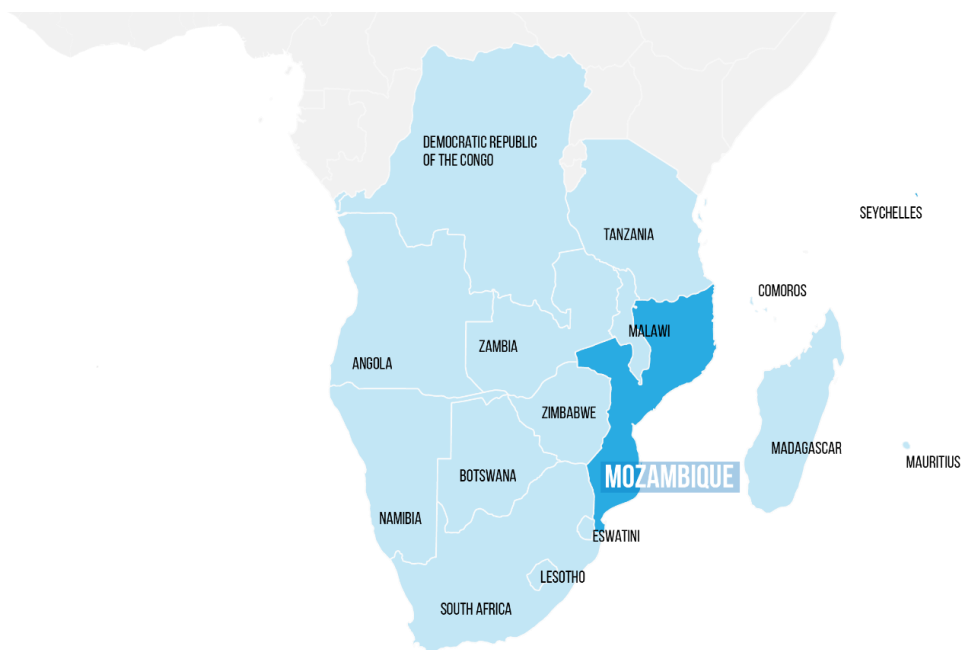


FIGURE 3 MAP OF MOZAMBIQUE IN SADC

Mozambique is classified as a low-income country with a population of 31.2 million.¹ The UNDP’s Human Development Indicators² rank Mozambique as 181st out of 190 countries and 16th out of the 16 SADC countries. Mozambique scores below average in the region for gender equality with a Gender Development Index of 0.912.¹ It is one of the poorest countries in the SADC region with a Gross National Income per capita of only \$1,310 (compared to an average of \$8,050 in the region).³ Although 72.5% of the population falls under the UN Multidimensional Poverty Index,⁴ only 46.10% live below the poverty line according to the World Population Review.⁵ This is above the average rate of the SADC region of 40.8%. The median age of Mozambique’s population is also significantly lower than the average in SADC with 17.6 years (versus 22.1 years).

AGRICULTURE ENVIRONMENT

In the case of urbanization, Mozambique is below average in the SADC region with 36.8% living in urban areas. Although only 26.03% of the GDP is earned in agriculture, 70.22% of the population works in the agriculture sector (higher than the average of the SADC region of 43.37%). On the Global Food Security Index, Mozambique ranks as the 99thth country with an overall score of 40.6—making it the 6th in the SADC region alone.⁶

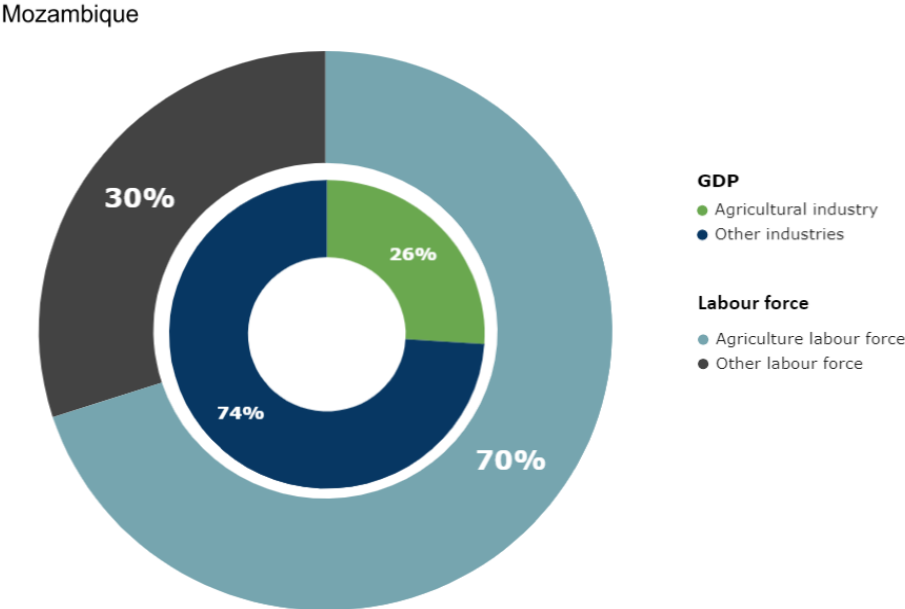


FIGURE 4 MOZAMBIQUE’S AGRICULTURAL INDUSTRY SHARE OF GDP AND THE SHARE OF THE AGRICULTURAL LABOR FORCE

1.4 THE GENERAL DIGITAL ECOSYSTEM

In 2020, the African Union (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

¹ The Gender Development Index (GDI) measures gender inequalities in achievement in the three basic dimensions of human development.

sustainable growth⁷. 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.

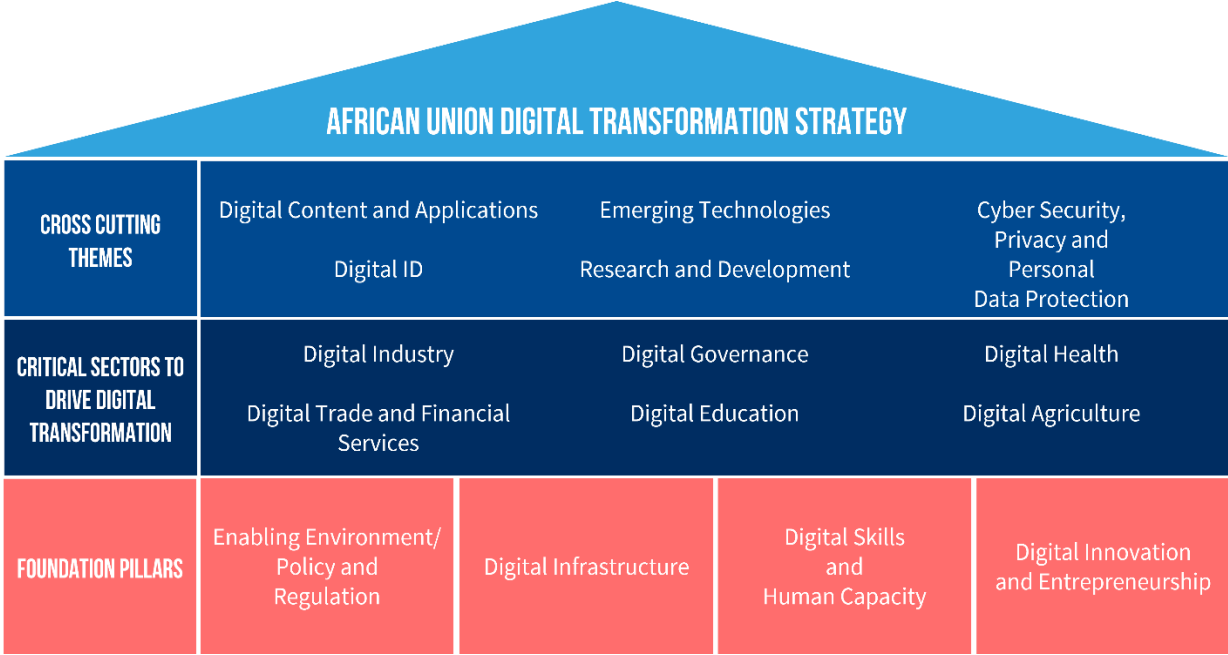


FIGURE 5 OVERVIEW OF THE AFRICAN UNION DIGITAL TRANSFORMATION STRATEGY

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 IT industry and encourages a whole-of-government approach to have more emphasis on the overall ecosystem and economy⁸.

BENCHMARK ASSESSMENT FINDINGS

The purpose of the benchmark is to provide a context to the findings and identify where SADC countries are progressing, or where they may be behind or not developing in terms of a digital ecosystem. 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. Further information on these groupings, the assessment results and regional trends can be found in the *Situational Analysis Report*.

The results for Mozambique are illustrated in table 3.

TABLE 3 BENCHMARK PILLAR SCORES: MOZAMBIQUE

Mozambique	Score	Maximum Score
Digital Government (OSI, 2020)	0.488	1
Digital Business (GCI, 2019)	36.720	100
ICT Infrastructure (AIDI, 2020)	9.934	100
Innovation Driven Entrepreneurship (GII, 2021)	15.000	100
Digital Skills (GCI, 2019)	24.094	100
Policy and Regulatory Frameworks (ITU, 2021)	44.500	100

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, Mozambique, Zambia, Malawi, and Madagascar.

Group 4: Angola, Mozambique, the Democratic Republic of Congo (DR Congo), and Comoros.

TABLE 4 OVERALL BENCHMARK ASSESSMENT RESULTS AND RANK FOR ALL 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
Mozambique	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
DR Congo	0.2782	15
Comoros	0.2497	16

BENCHMARK ASSESSMENT: MOZAMBIQUE

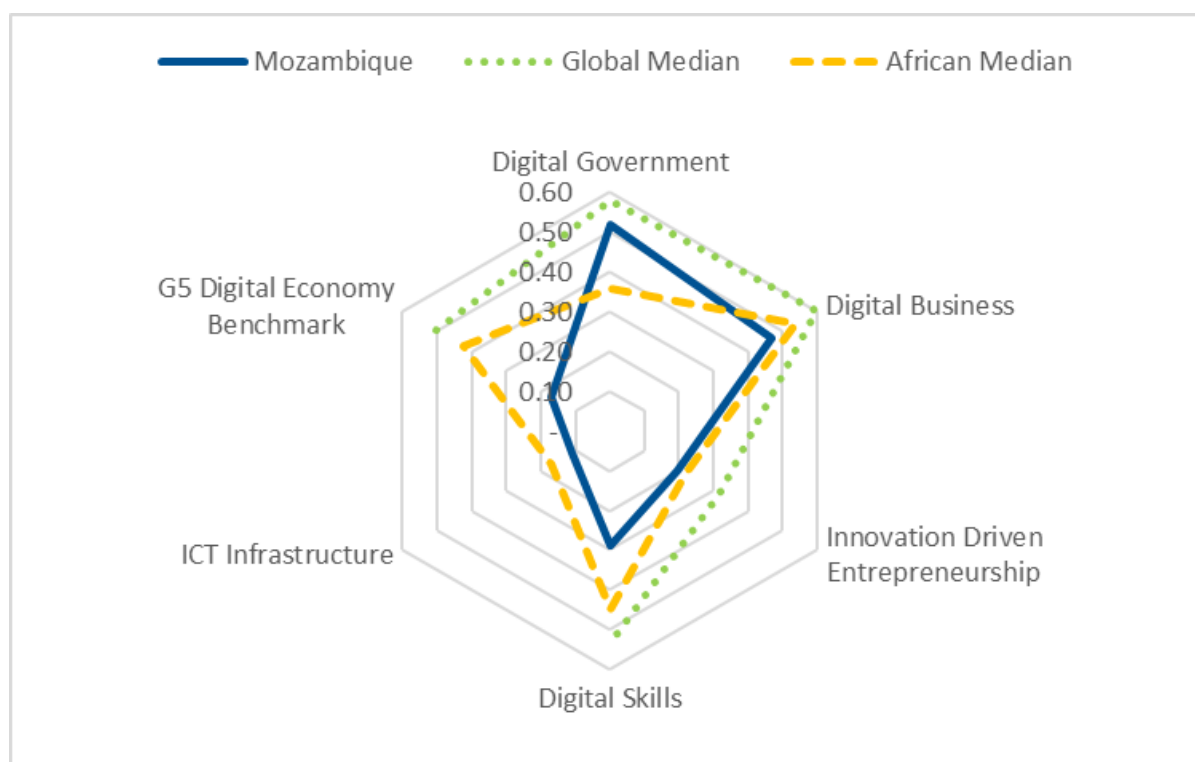


FIGURE 6 RESULTS FROM BENCHMARK ASSESSMENT FOR MOZAMBIQUE

In the benchmark assessment Mozambique ranked 14 out of the 16 SADC member states. Figure 6 below, illustrates the results of the benchmark in comparison to the global and African medians. Mozambique is only ahead of the African median in Digital Government. In the other five assessment areas it lags most of the SADC member states. The benchmark suggests that Mozambique may be lacking in some key foundational areas necessary for a robust digital economy enabling environment for digital development.

Mozambique scored poorly in all but the Digital Government pillar, where it ranked seventh. Table 5 below illustrates the ranking for each individual pillar where it predominantly ranked in the lower half of countries for all pillars.

TABLE 5 RANKING OF ALL SADC MEMBER STATES PER BENCHMARK ASSESSMENT PILLAR

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	DR Congo
7	Mozambique	Madagascar	Madagascar	Zambia	Eswatini	Tanzania
8	Angola	Namibia	Zimbabwe	Mozambique	Zambia	Zambia
9	Eswatini	Eswatini	Zambia	Eswatini	Mozambique	Mozambique
10	Malawi	Mozambique	Mozambique	South Africa	Tanzania	Zimbabwe
11	Botswana	Malawi	Angola	Madagascar	Mozambique	Angola
12	Mozambique	Mozambique		Malawi	Angola	Madagascar
13	Madagascar	Zimbabwe		Mozambique	Comoros	Namibia
14	Zambia	DR Congo		Angola	Malawi	Comoros
15	DR Congo	Angola			DR Congo	Mozambique
16	Comoros				Madagascar	Seychelles

DIGITAL INFRASTRUCTURE

In Mozambique, the [ITU](#) suggests that 10% of the total population is using the internet. This average is much lower than the regional average of 29.94%. The GSMA Mobile Connectivity Index shows a 55% access to the 3G network,⁹ which complements the HDI report of mobile cellular subscriptions at 47.7 per 100 people.¹⁰ Mozambique also ranks as 109th on the Inclusive Internet Index¹¹ which details the accessibility, affordability, and relevancy of internet in 120 countries. However, according to the Mobile Connectivity Index,¹² Mozambique is ranked 11 in terms of overall mobile connectivity in the SADC countries with an overall index of 35—which just about disqualifies it as an emerging country (above 35). It scores above average for affordability, but below average on consumer readiness, availability of infrastructure, and content and services.² In terms of ICT adoption, Mozambique scores position 122 (out of 140). The Mozambique government is considered less future orientated based on the position 122 (out of 140), and it scores similarly on the innovation capability index as number 120 out of 140.¹³ The country also scores 2.74 out of 7 points on the GCI 4.0 Digital Skills Among the Population Index,¹⁴ which is slightly below the SADC average.

² The enablers of mobile internet connectivity that inform the indicators selected for the Index are: 1. Infrastructure 2. Affordability 3. Consumer readiness 4. Content and Services.

2 THE BROADER POLICY ENVIRONMENT

In the benchmark assessment Mozambique ranked 14 out of 16 in the region, lagging in all indicators except digital government. The low scores and ranking in the assessment pillars indicate that Mozambique is lacking in some foundational requirements for a digital economy and that there is likely a weaker enabling environment for a digital economy. In the *Situational Analysis Report* the clusters of SADC countries identified from the benchmark are discussed in more detail but Mozambique forms part of Group 4 which is made up of countries that scored less strongly in the benchmark, are generally more reliant on agriculture for GDP growth and employment and are non-English speaking member states.

The purpose of this section is as follows:

- Take stock of available public policies, strategies, and legislation to understand their scale and scope, and assess whether digitalization has been generally embraced by Governments.
- Understand the degree to which these policies provide an enabling environment for a digital economy that includes the agriculture sector.

It is important to recognize that 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. The ability of an innovation to demonstrate value and a viable business model underpinning their innovation, progress towards investment readiness, sustainability and the level of scale that is achievable is likely to play a more important role in enabling innovations rather than policy frameworks¹⁵. Concurrently, a lack of policies or legislation does not inhibit the creation of digital innovations and technologies. The OECD highlights the common pacing problem, whereby digital technologies and innovations are advancing much faster than regulations and policies¹⁶. The inherent risks of rushing policies and regulations into effect must be weighed up against the benefits, as getting the pacing wrong could ultimately lead to greater barriers to innovation and risks creating regulations that could be outdated¹⁷.

2.1 GENERAL DIGITAL POLICIES

The benchmark assessment suggested that Mozambique's digital economy is underdeveloped and from the stock take of documents it has been difficult to source relevant plans, strategies, and legislation to suggest otherwise.

POLICIES, STRATEGIES AND PLANS

The **Information Society Policy** is the main guiding document and sets the vision, mission, guiding principles and objectives for Mozambique's digital transformation. The **Strategic Plan for the Information Society** is a 10-year plan that sets out the priority areas, governance models, implementation plan, financing, and monitoring and evaluation of the ICT sector. The **Operational Plan for the Information Society** provides the actions that need to be developed for each 5-year implementation period of the Strategic Plan. Only the first two documents were reviewed for this assessment. These three documents replaced previous iterations: The Information Technology Policy, The Information Technology Policy Implementation Strategy, and the e-Government Strategy.

The **Information Society Policy 2018** is made up of fourteen specific objectives (Table 6) and is focused around seven priority areas of action:

1. Education and Human Development
2. Health
3. E-Governance
4. Agriculture, Fisheries, Environment and Rural Development
5. Industry, Commerce and Services
6. Access and Connectivity
7. Policy and Regulation

The use and importance of data is mentioned under the e-Governance section with an objective of setting up a National Government Data Centre to encourage open government data and to create a central location for storing data. Naturally, there is the suggestion for a legal framework on open data and data protection to be developed and implemented alongside.

TABLE 6 KEY OBJECTIVES OF THE INFORMATION SOCIETY POLICY

Objectives of the Information Society Policy:	
1.	Ensure development of human capital with skills needed to meet the challenges of modernizing society;
2.	Improve health care delivery by promoting universality, quality, equity, and adoption of a preventive approach;
3.	Ensure existence of attractive conditions for private sector development in ICTs, fostering job creation and generation of ideas;
4.	Stimulate competitiveness of the Mozambican economy by promoting the growth of e-commerce;
5.	Promote development of the primary sector of the economy, fostering its competitiveness and ensuring sustainable environmental management;
6.	Ensure modernization of public administration services provided to citizens, private sector, and other orgs, stimulating efficiency and effectiveness, and ensuring compliance with principles of good governance;
7.	Ensure the existence of infrastructures that are inclusive and promote universal access to ICTs;
8.	Contribute to creation of a favorable regulatory environment for development of the Information Society, namely aspects related to data protection and information security;
9.	Contribute to the establishment of protection measures for the national industry of ICTs;
10.	Make Mozambique a producer and not only consumers of ICTs;
11.	Raise awareness of various actors in society to importance of ICTs as path to economic and social development;
12.	Stimulate innovation in economic and social terms;
13.	Contribute towards improving Mozambique's HDI and the standard of living, reducing existing asymmetries;
14.	To enhance the integration of Mozambique in a Globalized Information and Knowledge Society.

Three key areas identified as fundamental to promote growth under the Industry, Commerce and Services priority area are: ICT sector development, employment and entrepreneurship, and competitiveness of the economy. To stimulate growth in these areas and attract foreign direct investment suggestions are made to create tax, regulatory, and legal incentives to promote a conducive environment for start-ups, encourage incubation in Science and Technology Parks, set up an ‘Innovate in Mozambique’ program to stimulate development in innovative products and services, and develop an e-commerce strategy. These suggestions would have positive impacts on the agricultural sector if innovations were supported within SMEs and incubators.

The aims of the Policy and Strategy are ambitious and set up a strong guiding document to incorporate ICTs into the wider economy. There is a strong focus around universal access to devices, networks, and mobile data, as well as the improvement of infrastructure, and rightfully so as this was one of the lowest scoring indicators in the benchmark assessment in Chapter 1. However, there is also a real drive to improve digital skills at all levels, and a real drive to incorporate digital platforms into every sector and drive innovation and entrepreneurship. The policy frameworks in place are fairly underdeveloped which is again backed up by the

benchmark, but the importance of this element is recognized in the document with the specific objectives of implementing the Electronic Transaction Act and designing and implementing a Data Protection Act and a Cyber Security Policy within the time period.

2.2 LEGISLATION

Sourcing relevant legislation was challenging for Mozambique and the only document that could be obtained from an official Government of Mozambique website was the **Electronic Transaction Law 2017**. The objective of the law is to establish a legal framework for electronic transactions and impose penalties for cyber offenses, to promote public and private investment and efficient use of technologies. It also establishes the National Institute of Information and Communication Technologies, whose mandate is to ensure compliance with the Electronic Transactions Law, implement e-Government, license service intermediaries for network and communications systems, ensure the implementation of the electronic certification service, and promote the application of electronic transactions and protect the consumer in the context of transactions, e-Commerce, and e-Government.

There are some additional laws in place around the telecommunications sector to ensure fair competition, universal service, and the liberalization of the market, these were not available for review¹⁸.

As referenced in the Information Society Policy, there is currently no data protection laws or cyber security laws. Some provisions have been included in the Electronic Transaction Law, but it is unlikely that these are robust enough to cover the detail required. As more emerging technologies such as Big Data and Artificial Intelligence become prevalent in innovations it is likely that the regulatory frameworks will have to be updated and further developed.

2.3 DIGITALIZATION IN AGRICULTURE

DIGITAL IN AGRICULTURE POLICIES

A review of several Ministry of Agriculture sector strategies and plans revealed that only the **National Agriculture Investment Plan 2014-2018 (NAIP)** referred to digital technologies. However, unlike other SADC countries that incorporate digital or ICTs into their extension services, Mozambique has referred to digital payment systems. Under the *Market Access* priority, reference is made to a Financial Services Program with the focus on digital payment systems and an e-voucher system. The Financial Services Program aims to broaden the reach of digital payment systems in poor and rural areas and expand the range of services available on these platforms. The challenge of poor infrastructure and small customer base are acknowledged but suggest that this can be done via phones and shops where subscribers can convert cash into digital money.

From the stock take of agriculture policies available, it was not apparent that digitalization had been embraced in the sector within any policy frameworks. However, the **National ICT Policy 2006** highlighted agriculture as a key sector and proposed objectives to use online agriculture extension services, offer basic computer training to farmers and rural populations, and encouraged farmers to market their products online. This policy predates the Investment Plan above and the other documents reviewed, but no reference was made to any of these initiatives.

The **National Information Society Policy 2018** also presents agriculture as a priority area but provides greater detail than the first ICT Policy. It was published more recently and provides a better insight into the

agriculture sector currently. The Information Society Policy outlines the opportunities that are possible from the better integration of ICTs within the sector:

- Development of information systems to monitor market performance in terms of prices charged and inventory, among others, as well as stimulating communication between the various stakeholders.
- Promotion of knowledge dissemination to ensure equitable access to new techniques to increase agricultural production and productivity and mitigate the effects of climate change.
- Establishment of geographical information systems allowing better environmental management and anticipation of emergency situations, promoting increasingly proactive action by the agents involved.
- Promotion of the implementation of communication systems that allow, in a fast and efficient way, access to information on emergency situations.

These opportunities are not dissimilar to what was mentioned in the ICT Policy which is concerning and could suggest that the integration of the first policy was unsuccessful.

The Strategic Plan for the Information Society 2019-2028 outlines the following aims for the sector: access to technologies to increase technical knowledge, access to markets and adoption of technologies that enable modern practices, increasing digital skills, encouraging the low cost of access to networks and mobile data and access to information sharing equipment. The overall KPI is to have 50% of farmers and buyers to use electronic systems for agricultural markets. As most of these aims are reliant on other factors that are not directly related to the agriculture sector, the initiatives put forward in the Strategy Plan focus on digital platforms that can provide services to alleviate the knowledge gap, encourage access to greater markets, and provide greater advisory information for farmers. Some of the initiatives were already in progress at the time of the Strategy but no investigation has been made to determine what is still in effect, the table below is provided as a reference to present some of the solutions that have incorporated digitalization into the agricultural system.

TABLE 7 AGRICULTURAL ICT STRATEGIES AND PROGRAMS INCLUDED IN THE INFORMATION SOCIETY STRATEGY

Initiatives for Agricultural System
Agricultural Markets Information System (SIMA): Creation of an online portal, supported by multi-channel platforms, which allows access to information on agricultural brands and interaction between producers and traders of agricultural products, promoting fairs.
Agricultural Producer Portal: Creation of an online platform, supported by multi-channel platforms, in which useful information is made available for the practice of agriculture and livestock in Mozambique, namely on production methods, product prices, natural disaster management, among other aspects, also serving as a repository of statistical data on this sector. The sharing of information with users should be made available, in addition to the website, through messaging services (SMS), email and video or audio in the main national languages.
Platform for Registration of Cashew Producers and Plantations: The Platform for Registration of Producers and Cashew Plantations is an electronic interface developed with the aim of improving the system of data collection and communication in extension in an effective and sustainable way. In addition to the registration of producers, the platform allows the registration of their plantations, georeferencing, auditing (mapping) of planting areas, technical assistance, and monitoring and evaluation at the sector level, in real time and in an integrated manner
System and Issue of Sanitary and Phytosanitary Licenses and Certificates: It is a system that allows import licenses and export certificates to be issued in a simplified and swift manner, avoiding their falsification, and guaranteeing compliance with sanitary and phytosanitary norms, with a view to giving national products access to the various international markets.
Prior Notice System: Platform that allows the production and dissemination of agro-climatic information through alert and early warning for food security and monitoring of crop development and crop prognosis.
Pest and Disease Mapping System: Electronic platform that aims to provide information on the incidence of pests and diseases of animal and plant origin.
Registration System for Veterinary Medicinal Products (MedVed): Enables the registration of veterinary medicines and vaccines in computerized form; Enables the electronic submission of data inherent to medicines: Facilitates the reading and evaluation of the submitted dossiers

Livestock Identification Mark Registration System: System that aims to register and issue certificates with cattle identification marks to ensure disease control, avoid theft and prevent conflicts between owners and breeders.
Extension Data Collection and Analysis System (SIRADE): The data collection and analysis system are characterized by the diversity of sources, extension agents and collection instruments, but these data are stored, retrieved, and manipulated in a single form, the digital one (versa for disseminated technologies). SIRADE will make available data on agricultural extension in Mozambique, presenting references for understanding these activities and subsidizing the decision-making processes of MASA, non-governmental organizations (NGOs) and private companies.
National Information System on Irrigation (SINIR): The National Irrigation Information System is an electronic platform for collecting, storing, and displaying geo-referenced and non-irrigated information on irrigated agriculture in the country. Developed to facilitate data storage, availability and/or display of relevant information in real time on irrigated agriculture practiced in Mozambique, the platform will be open to the public and will provide information on irrigable potential, existing irrigated areas and their characteristics, production, and productivity, among other aspects.
Registration of Plant Varieties and Seed Certification: Platform that automates the process of Registering Plant Varieties and issuing Seed Certificates

CHALLENGES

Sourcing documents for Mozambique has been a challenge as the majority of these are not available online through the Government portals. Common feedback when interviewing public sector stakeholders across the SADC region within Agricultural Ministries has been the lack of knowledge and accessibility to understand what policies and strategies are currently in place and how they relate to the sector.

It is unlikely that the overview above provides a complete picture of the policy and regulatory environment around digital technologies and the agriculture sector. However, the lack of availability of documentation from Ministry and Government websites speaks to the limited development and advancement of the digital economy and digitalization more generally.

The Information Society Policy is the key guiding document in enabling a digital economy and provides a clear vision. There are some gaps in the policy environment, namely the lack of robust legislation or policies around access to data, data protection, privacy, and cyber security. When asked about any unintended consequences from the use of digital technology, a stakeholder replied that there are cases of fraud. They added that companies, particularly digital financial services, collect data and can share this data without user's consent. If strategies or legislation to tackle this are not implemented, it will hinder the growth of the sector, lower trust, and the possibility that digitalization can positively impact the agriculture. This is particularly relevant to the suggestion made in the NAIP which explicitly referenced digital financial systems for farmers.

A key barrier to embracing digitalization in agricultural systems is a lack of a guiding policy or strategy that adequately integrates the use of technologies and services specific to the sector. A clear policy or strategy for agriculture that includes smallholder farmers, and the private sector could be used as an advocacy tool to push for greater funding and prioritization.

It is unlikely that most of the pain points for enabling digitalization within agriculture is because of a lack of sector specific strategies or policies but most of the challenges that are faced and mentioned within these policies such as low literacy levels, poor uptake of technologies and access to infrastructure are factors that need to be addressed on a higher level and through other Ministries and Departments³.

Greater efforts need to be made in the public sector to address some of the foundational elements required for greater digitization. Until these barriers are addressed the integration of digital in agricultural systems will be challenging and limited.

³ KII with public sector stakeholder.

3 DIGITAL AGRICULTURAL INNOVATIONS

This chapter provides a stocktaking analysis to assess the numbers, scope, trends, and characteristics of digital agricultural innovations in Mozambique.

3.1 MAPPING THE DIGITAL AGRICULTURAL INNOVATIONS

The DACS for Mozambique present use cases according to a typology and framework developed by GSMA (See figure 1). The broad areas include access to services, access to markets and access to asset classes.

A total of 23 innovations were identified in Mozambique that had a mix of use cases as illustrated in Figure 7 below. There were 10 identified innovations specific to Mozambique and 13 additional innovations were identified for multiple countries which included Mozambique.

From the identified innovations most (13) were developed for multiple use cases (three for 5 use cases, one for 4 use cases, six for 3 use cases and three for 2 use cases) and only 10 for a single use case.

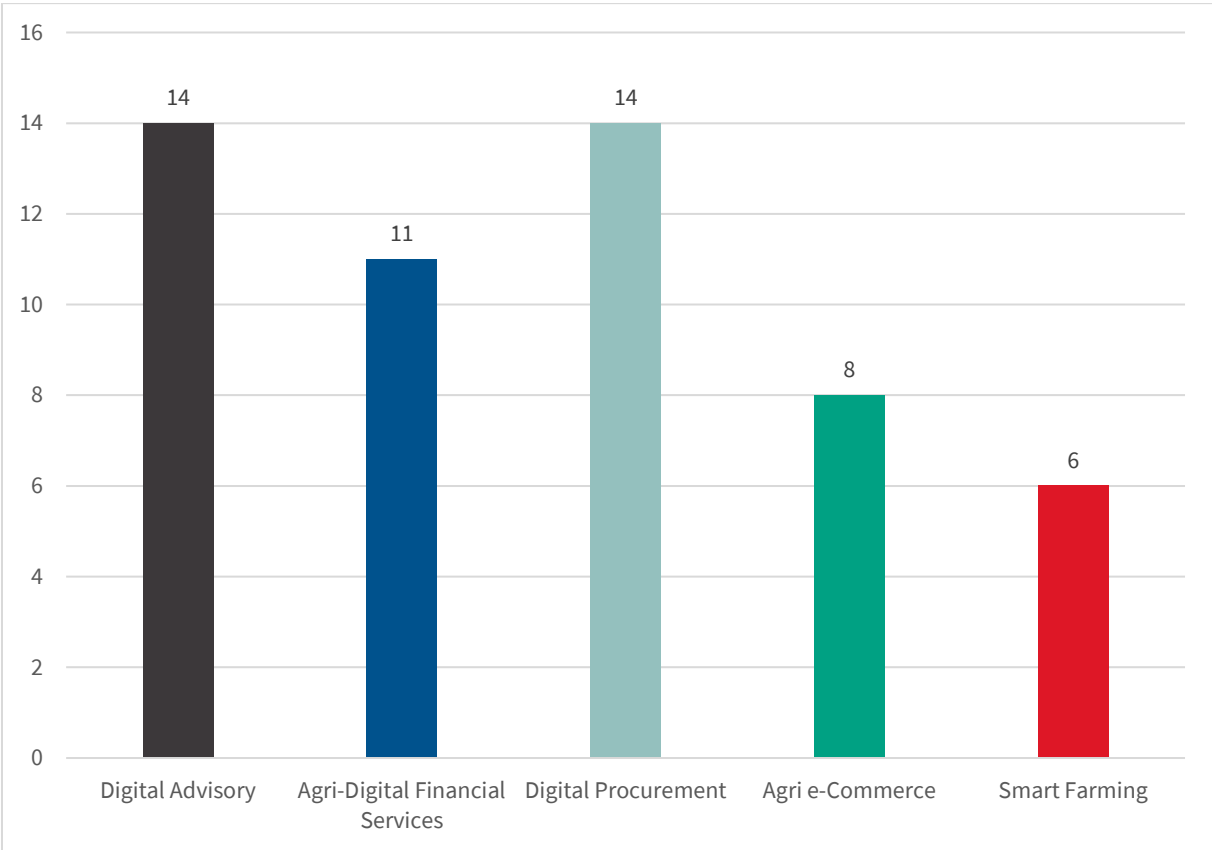


FIGURE 7 IDENTIFIED USE CASES FROM INNOVATIONS IN MOZAMBIQUE

The table below presents an overview of all identified innovations with their use cases, if they filled in the survey or not, a brief description of the innovation and company, and where the innovation is operational in the SADC member states.

3.2 IDENTIFIED AGRICULTURAL INNOVATIONS OPERATIONAL IN MOZAMBIQUE

In the first four columns the following color coding is used for the different use-cases:



TABLE 8 OVERVIEW OF IDENTIFIED AGRICULTURAL INNOVATIONS OPERATIONAL IN MOZAMBIQUE

				Name of innovation	Name of the company	Survey ✓/X	Description of innovation	Operational Countries in SADC
	■			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 enroll 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, Mozambique, 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 developed using donor grants from government or foundations. Currently still dependent on program 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 program focused on areas prone to drought. Their technology is inclusive of disadvantaged groups.	Botswana, Mozambique, Namibia, South Africa

■	■	■	■	■	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
		■	■		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 dialing 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
		■			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	Mozambique

							<p>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.</p>	
■				Digital Grow	Fondation Ondjyla	✓	<p>Digital Grow. This innovation from Fondation Ondjyla 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 center - digital library, free access with technical documentation to support family farming, including books, technical articles, videos, or practical exercises, being found in four 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 centers 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</p>	Angola, Mozambique

							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.		
■	■	■			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. 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/behavior change, and regulatory and policy environment factors affecting the operational environment. Scaling stage to other geographies.	Mozambique, South Africa, Zambia
		■			E- License application for Exporters of Agri-products and Agricultural ERP	Twenty Third Century System	✓	E-License application for Exporters of Agri-products and Agricultural ERP (2020) from Twenty Third Century System. Farmers apply for export licenses online using a clean and friendly user interface. Operational in Malawi, Mozambique, Namibia, Tanzania, Zambia, and Zimbabwe with 135 registered users.	Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe

		■	■	E-Mola Mobile Money Service	M-Mola SA.	✓	<p>Movitel is an MNO with the most extensive fiber 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 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.</p>	Mozambique
	■		■	E-Voucher System	FAO	✓	<p>This is a UN FAO - 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 intervention addresses 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,</p>	Mozambique

							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 programs 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		
■	■	■			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 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	Mozambique

							<p>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.</p> <p>Common challenges are language, literacy and digital literacy level, and the uptake by farmers and behavior change amongst farmers. The lack of connectivity, network coverage are 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.</p>		
■		■		■	GeoFarmer	GEOTERRAIMAGE (Pty) LTD	✓	<p>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 GeoTerralmage 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. Through the use of computers, satellites and Earth Observation the innovative solution provides visual maps and illustrations, statistics and trends for each field or farm being analyzed (crop type, crop growth stages, land suitability, crop irrigation) and guiding decision making around farm</p>	<p>Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Mozambique, Madagascar, Malawi,</p>

								management and practices for more efficient and sustainable production. GeoTerraImage have reached wide scale sustained adoption and operate in Angola, Botswana, Comoros, DRC, Eswatini, Mozambique, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, 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.	Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia, Zimbabwe
■	■	■	■	■	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-	Angola, Mozambique

							record keeping through Plan & Activity Tracker (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.		
■					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, center and north, respectively.	Mozambique
	■				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 60,000 active 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
■	■	■	■	■	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	Mozambique

							<p>income, unbanked, non-internet users, women) without depending on the internet or bank accounts. MoveCare 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 centers, 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 behavior change. Operational constraints including policy enabling environment and lack of electricity, mobile coverage, electricity, and trust.</p> <p>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</p>
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							extensive approach requiring an ecosystem of knowledgeable actors. The technology is designed with deliberate actions to make it inclusive of underrepresented groups.		
	■	■	■		Mukuru App	Mukuru Africa	✓	<p>Mukuru Money Transfer Limited is a private sector company operating regionally (Botswana, DRC, Eswatini, Mozambique, 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).</p> <p>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.</p>	Botswana, Democratic Republic of Congo, Eswatini, Mozambique, Malawi, Mauritius, Mozambique, South Africa, Tanzania, Zimbabwe
■	■	■			SEGIA - (Serviço de Gestão de Informação Agrária/ Agricultural Information	Iniciativa para Democracia e Cidadania (IDC)	✓	<p>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</p>	Mozambique

				Management Service)			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 track input use, procurement, revenue and sales. They also provide input financing for seeds, fertilizer, agrochemicals, through subsidies from government and organize 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 behavior 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 considered explicitly the needs of disadvantaged groups. They have 53 current users and 213 registered users.	
■				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	Angola, Mozambique

							good practices to increase efficiency and productivity using computers, a dashboard and portal but currently face operational constraints.		
■					Skudu Exact	Skudu.co.za	✓	<p>This innovation is 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, maximize 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, fertilizer, 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.</p>	Malawi, Mozambique, Namibia, South Africa, Zimbabwe
■	■	■	■	■	SmartFarmer	Riskflow DBS	✓	<p>Smart Farmer of Riskflow DBS, a private sector company, 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</p>	Botswana, Mozambique, Malawi, Mozambique, South Africa, Tanzania, Zambia, Zimbabwe

								<p>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, maximize 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 Optimizer to deal with open integrated and adaptive web based platform with details of dealers, counterparties, making use of Intelligent Financial Performance Monitoring components.</p> <p>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 in accessing loans as well as keeping their Bio Data digitally and open for appraisal to Financial Institutions.</p> <p>b) Improved Yields through use of 3rd Party software that we have partnered with on our Platform such as Skudu to provide fertilizer and Insuring Yields through an Area Yield Index based Insurance model from PULA, our insurance partner.</p> <p>The regional initiative is active in Botswana, Mozambique, 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.</p>
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■	■	■	■	ThirdEye	ThirdEye Mozambique	✓	<p>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 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 meters 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 abundance 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, maximize 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.</p> <p>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 mechanized farming equipment. They offer smallholder farmers the opportunity to use machinery in processes such as crop spraying, crop monitoring and land</p>	Mozambique
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							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 behavior 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		
■					Viamo platform	Viamo	✓	<p>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) organization 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 specializes in mobile engagement and Information and Communication Technology for Development. Viamo works in partnership with organizations to connect them and individuals through digital technology, 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 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.</p>	Democratic Republic of Congo, Madagascar, Malawi, Mozambique, Tanzania, Zambia

3.3 RESULTS FROM INNOVATION SURVEY RESPONDENTS

All identified innovators received a survey and 19 innovations implemented in Mozambique responded. The answers on the survey are self-reported. Of the innovations identified, seven were operational in Mozambique only and the remaining twelve operated in multiple countries. All identified innovators were reminded several times by email and by phone to complete the survey. The response rate of the survey for Mozambique was 83% (19 out of 23 identified innovations responded).

USE CASES AND SUB USE CASES

The division of GSMA use cases shows that in Mozambique multiple use cases are most common. Twelve (12) out of 19 respondents provided multiple services and only seven respondents provided a single use case. Two respondents address all five use cases in their innovation, one includes four use cases, six includes 3 use cases and three include 2 use cases.

Figure 8 below illustrates the division of use cases provided. Digital advisory and digital procurement were the most common use cases cited by 12 survey respondents, respectively. Agri-Digital Financial Services was provided by nine respondents. Agri e-Commerce was cited by seven innovations and Smart Farming was the least common with only five respondents. Figure 8 also illustrates a comparison of use cases to the rest of the identified innovations in the SADC region.

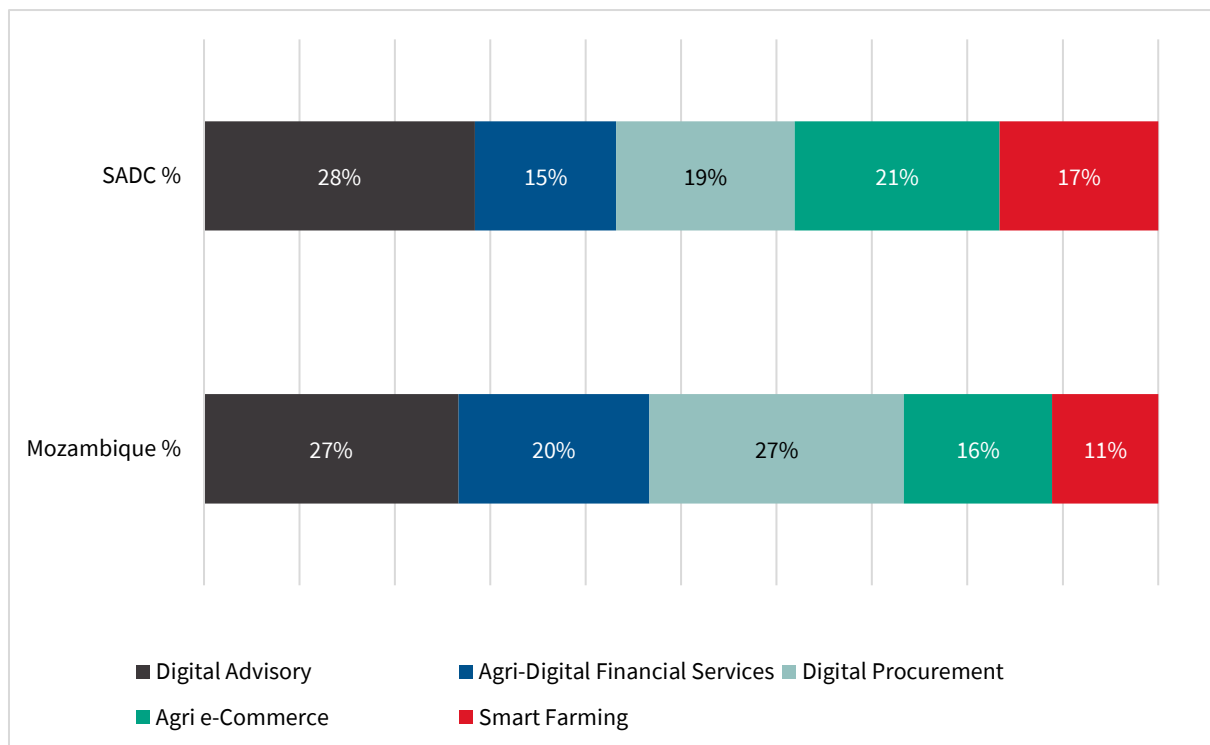


FIGURE 8 DIVISION OF USE CASES FOR SURVEY RESPONDENTS IN MOZAMBIQUE VS. IDENTIFIED INNOVATIONS IN SADC

Eleven (11) innovations were launched between 2019 and 2021, whereas the next largest group (7) were launched from 2015-2017. The earliest innovation was launched in 2013. Most innovations were developed by private sector companies (12), but innovations were also developed by NGOs (3), MNOs (1), farmer associations (1), and multilateral organizations (1).

The innovations present in Mozambique cover almost all sub-use cases as presented in figure 9 below.

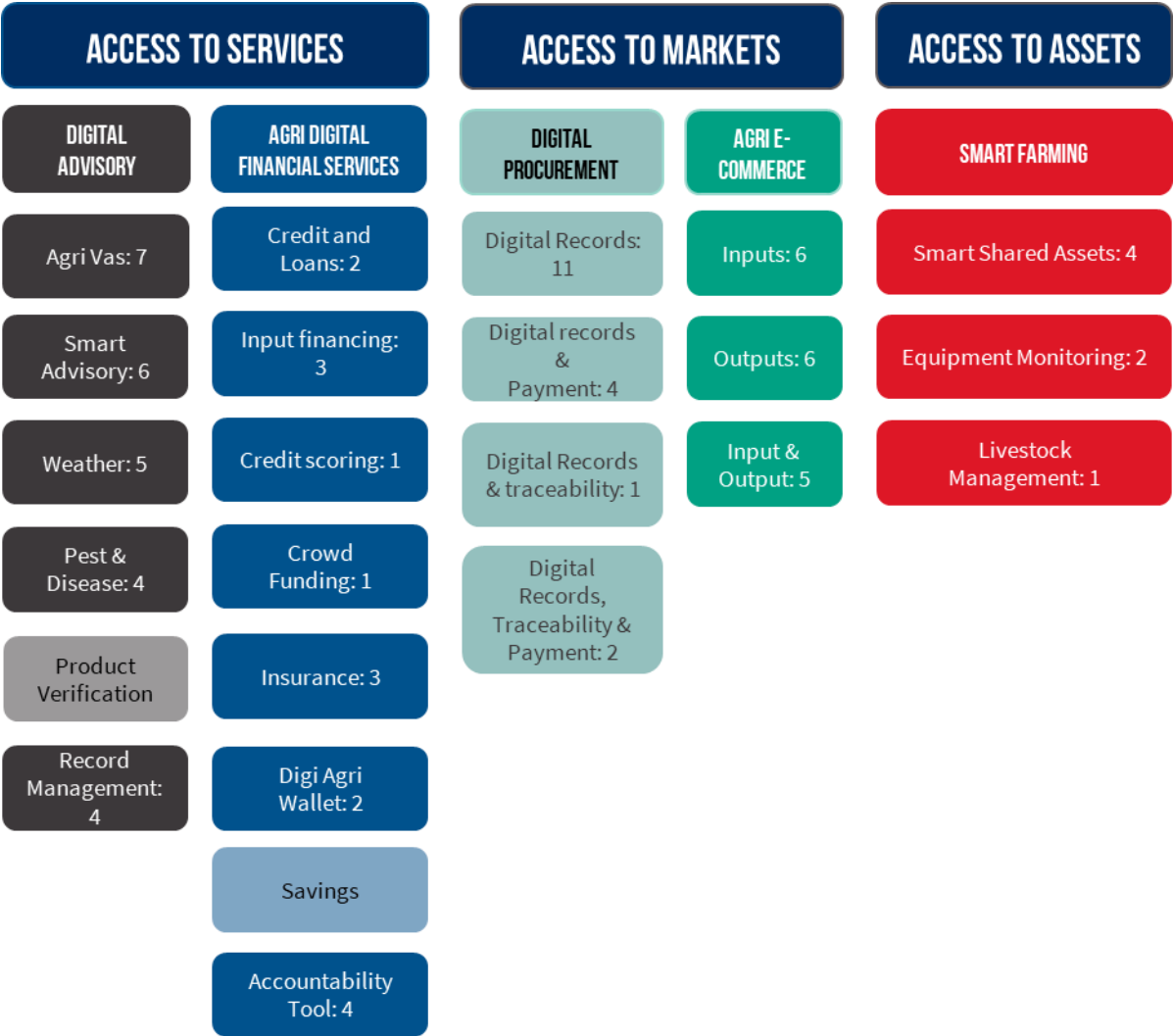


FIGURE 9 OVERVIEW OF SUB USE CASES PRESENT IN SURVEYED INNOVATIONS IN MOZAMBIQUE

CHALLENGES

The innovations targeted a wide range of anticipated outcomes. The knowledge gap was most often mentioned (12x) followed by low productivity (11) and poor access to markets (11). Financial exclusion and climate change were also frequently cited outcomes being addressed (8, respectively). By far the biggest challenge in the application of technology is digital literacy in Mozambique (12) and farmer uptake / behavior change (12). Followed by lack of mobile coverage (9), language or literacy generally (7), a lack of electricity (6) and data collection challenges (6). Also often mentioned were user affordability (5), access to devices (5), understanding the market and user needs (5), and trust (5).

TECHNOLOGY USE AND CHANNELS

Smartphones were the number one device required for innovations (11) followed by computers (9) and basic phones (7). A Website / Dashboard / Portal is the most common channel used by innovations (13) followed by Smartphone Apps (11). Cloud-based databases and spreadsheets (10, respectively) were the most popular tool for analysis.

VALUE CHAIN PHASES COVERED

Innovations in Mozambique are represented at all stages of the value chain but are more tailored to the earlier stages (planning, on-farm production, and inputs).

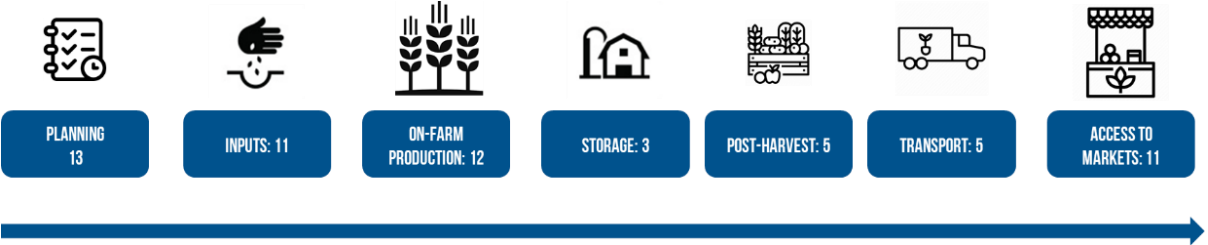


FIGURE 10 SURVEYED INNOVATIONS PRESENCE IN THE VALUE CHAIN IN MOZAMBIQUE

SCALING

Most digital innovations in Mozambique are in later stages of scaling based on the [Insights on Scaling Innovation](#)¹⁹. Of the respondents 82% are transitioning or have reached a level of scale which is adaptive and can be replicated or is sustained. Most of these innovations operate regionally, whereas the picture is much less oriented towards mature scale when looking at Mozambique-only innovations. Of the Mozambique-only innovations, one has reached sustainable scale, two have reached the “scaling” phase, one is at a transition to scale, one is at the proof-of-concept phase, and one is at the concept development phase.

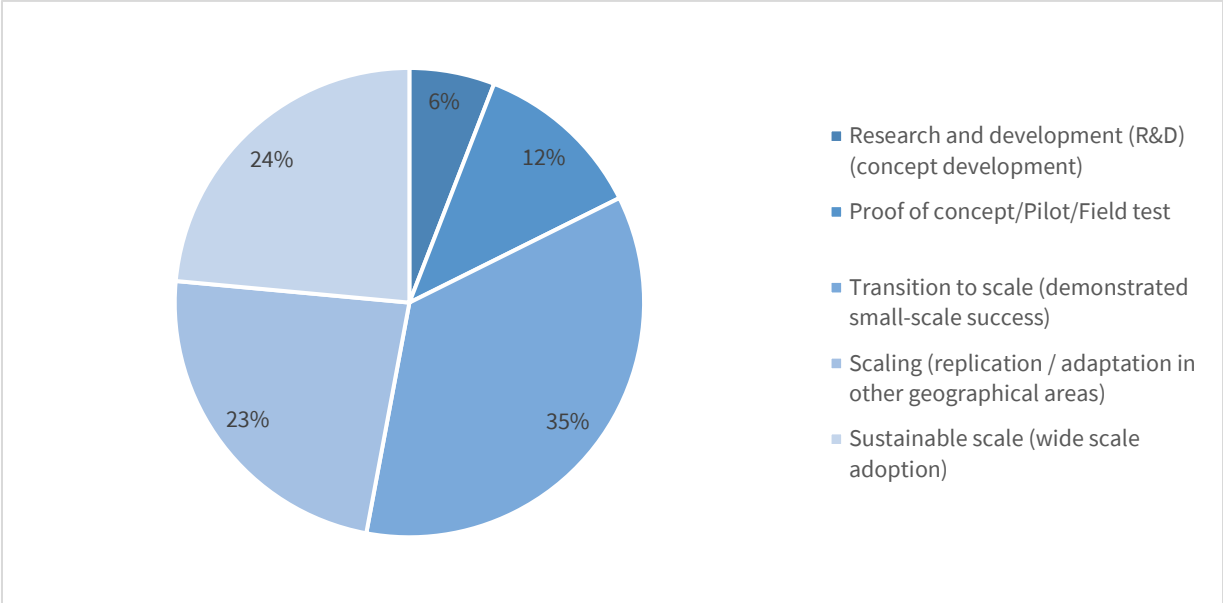


FIGURE 11 SCALING STAGES FROM SURVEYED INNOVATIONS IN MOZAMBIQUE

FUNDING, REVENUE AND DEVELOPMENT

Although most of the innovations in Mozambique have been developed by the private sector, seven cited that they used donor grants to support the innovation financially. Five respondents cited business development support, four used funding from friends and family, and three cited incubators and training opportunities. Only

regional innovations cited impact investors as providing funding and only the local innovations (operating only in Mozambique) cited self-funding, crowdfunding, or challenge funds to support their innovations.

For revenue streams, eight charge transactions fees and five are dependent on donor subsidies or program support. Charging business or individual subscription fees was also common. When asked whether additional subsidies or donor support would be required to sustain the innovation, the majority (11) said yes, three said no and four were unsure.

INCLUSIVITY

Not all innovations were inclusive although the greatest subset suggested that the technology, they used is already inclusive of women, people with disabilities, the elderly, smallholder farmers and those with limited literacy. Five innovations had taken explicit actions to make their technology more inclusive for smallholder farmers and those with limited or low literacy levels, respectively. Actions were also made to be more inclusive of the elderly (5) and women (3). However, only one innovation made deliberate attempts to include people with disabilities.

4 DIGITAL AGRICULTURAL SYLLABI AND ENTREPRENEURSHIP TRAINING

Mozambique's Strategic Plan for the Information Society (2019-2028) highlights the importance of ICTs and digital literacy in education and indicates that ICTs can serve as learning and teaching tools. Equipping schools with the necessary tools and basic investment in infrastructure, especially to reduce constraints in the energy network, is therefore necessary. Apart from infrastructure, the Strategic Plan for the Information Society highlights the need for the inclusion of ICT subjects at all levels of education. In the tertiary education sector, higher education courses and technical-vocational courses on ICT development are supposed to be stimulated. The objectives set are a ratio of 10 students per computer; access to computer rooms and Internet for all technical-vocational schools, all secondary schools, and all Zone of Pedagogical Influence (ZIP); access to computer rooms and Internet for 50% of the primary schools; and ICT training for all teachers. Through these measures, ICT skills and digital literacy is supposed to increase. Furthermore, guiding instruments for the use and proliferation of ICTs in education, namely the ICT Policy and Master Plan, should be developed. Another initiative is the development of Science and Technology Parks to stimulate innovation and technological development through training in different ICT-related areas (objective: 10 ICT courses taught per year). In the agricultural sector, ICTs are considered an important measure to stimulate economic growth and to enhance efficiency and productivity. The planned measures to reach this goal, are the promotion of ICT learning and the facilitation of access to ICTs, especially in the rural areas.

[Mozambique Research and Education Network \(MoRENet\)](#) is the Mozambique national research and education network (NREN) mandated to be the internet service provider for research and educational institutions and stakeholders. NRENs provides affordable internet connectivity and other value-added services that could promote sustainable digital agricultural economies.

In 2020 the Network Readiness Index²⁰ rated Mozambique 126 out of 134 economies in the technology pillar. The technology pillar considers access to technological infrastructure, content, usage, and the vision for future technologies. These ratings provide an indication that Mozambique requires immediate support to prepare for a digital agricultural future.

4.1 AGRICULTURAL SYLLABI UNIVERSITIES

A total of three Agricultural Universities were targeted in the country:

- The Eduardo Mondlane University
- Universidade Zambeze
- Universidade Católica de Moçambique (UCM)

The Universidade Zambeze was the only respondent to our survey. The Eduardo Mondlane University agreed to participate in a qualitative KII instead of completing the survey.

UNIVERSIDADE ZAMBEZE

THE FACULTY OF AGRONOMY AND FORESTRY ENGINEERING

The Faculty of Agronomy and Forestry Engineering at the [Universidade Zambeze](#) offers various onsite and online digital training courses since 2009. Regarding the levels of these digital trainings, 11 of them are

delivered at the certificate level, 11 at B.Sc. level, none at M.Sc. level, seven at the college incubator and nine at university incubator. As for digital agriculture, the faculty teaches Big Data for analytics in agriculture and Digital entrepreneurship in agriculture, onsite, at the certificate level. The digital trainings are not aligned to a specific institutional ICT or digital strategy. The faculty responded that they do not implement entrepreneurship training for digital businesses. According to the Faculty, equipping young people in data collection, digital advisory, agri digital financial services, digital procurement, agri-e-commerce, e-Extension, and smart farming will facilitate their absorption into Mozambique’s agricultural labor market.

UNIVERSITY EDUARDO MONDLANE

FACULDADE DE AGRONOMIA E ENGENHARIA FLORESTAL (FAEF)

At FAEF entrepreneurship training is directed towards graduate students who are assisted to develop business plans as part of the faculty curriculum. These students are trained in entrepreneurship and business management to improve their knowledge on how to start a business in the agriculture sector. Apart from a class in “Comercialização e Marketing”, which teaches students digital marketing of products through using social media such as Facebook and WhatsApp, **they do not offer further trainings on digital agriculture and ICT skills**. FAEF targets students who aspire to become agricultural entrepreneurs but there is also an extension department which develops and implements training programs for NGO’s or government programs targeting youth. FAEF provides know-how to the students in the above areas but does not support them in the acquisition of resources for their projects.

At the country level FAEF collaborates with the Escola Superior de Negócios e Empreendedorismo de Chibuto (ESNEC) in the training of Mozambican students in business management, mainly in the agriculture sector. FAEF’s activities are mostly funded by government but complemented by the private sector and NGO funds.

TABLE 9 OVERVIEW OF RESPONSES FROM SURVEYED UNIVERSITIES IN MOZAMBIQUE

MOZAMBIQUE UNIVERSITIES	
Universidade Zambeze - The Faculty of Agronomy and Forestry Engineering	
Digital Agri Skills	Big Data for analytics in agriculture Digital entrepreneurship in agriculture
Digital training courses updated	Yes
Digital entrepreneurship trainings	None
Type of Skills building	None
Most important digital Agri skills	Data collection Digital advisory Agri digital financial services Digital procurement Agri-e-commerce E-Extension Smart farming
Most important facility for digital trainings	University or College Incubator/Innovation Space Experimental Farms ICT Laboratories Research Laboratories Student’s associations space/ Clubs
Aligned with institutional strategy	No

4.2 INCUBATORS AND INNOVATION HUBS

A total of 12 business support organizations have been mapped in Mozambique, out of which 6 are operating in the agricultural sector.

The general business support organizations without focus or activity in the agricultural sector that have been identified are [ideiaLab](#), [IDEÁRIO Innovation](#), [Orange Corners Maputo](#), [Espaço de Inovação da UEM](#), [The Maputo Living Lab \(MLL\)](#), [MUVA](#) and [Instituto de Tecnologias Inovação e Serviços](#). For these organizations we did not find evidence of trainings and incubation activities dedicated to agriculture entrepreneurs and therefore they were not targeted for the KIIs.

The agriculture-related business support organizations that were identified and contacted are:

- [DEV Mozambique](#)
- [Aga Khan Foundation Mozambique/Agricultural Institute of Bilibiza \(IABil\)](#)
- Agricultural Value Chain and Youth Empowerment Project (AVACYEP)
- [Technoserve Mozambique \(TnsMz\)](#)
- [IDEÁRIO Innovation](#)
- [Green Innovation Centers for the Agriculture and Food Sector \(GIC\)](#)

These organizations support entrepreneurs and youth in Mozambique to build their digital and entrepreneurial capacities and skills in the agricultural sector. A total of **two** business support organizations responded to our request and took part in KIIs.

GREEN INNOVATION CENTER FOR THE AGRICULTURE AND FOOD SECTOR (GIC)

Established in 2017, the [GIC](#) is a capacity development project commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) and operated by GIZ. It consists of two projects: the *Green Innovation Centre* and the *ProEcon – Sustainable economic development project*. The first includes a value chain study for baobab and pigeon pea - analysis, evaluation, scouting for potential private partners in the area and reviewing the access of farmers to the markets. The latter targets small and medium size companies and aims to organize and train the producers, improve the capacities of companies, train the trainers, and support with equipment using a company-focus approach. Both projects will end in 2024.

Aside from their mandated objective the two projects focus on evaluating which digital tools are most suitable for their farmers, and have achieved several digital agricultural outputs:

1. A need assessment for farmers,
2. A database system to supply the value chain for farmers, information management systems development through different means like radio, sensitization of the government to disseminate food's price information, tracing applications and
3. A plant disease identification system.

Currently they have 24 agricultural enterprises in their portfolio. The projects do not target startups, but enterprises with at least three years of track record.

The GIC supported four companies so far and are expanding. Regarding the ProEcon project, they have 20 enterprises in their portfolio and are planning to train 1,000 service providers for these companies. In the next

couple of years, the projects plan to have 30 agricultural start-ups in their portfolio and want to reach 3,000 micro entrepreneurs.

Two exemplary enterprises in their portfolio are: 1) Luteari, that sell agriculture inputs and buy products from farmers to sell them to the market. They have financial products for the farmers as well, agricultural shops of organic products and others and 2) Baobab Products Mozambique (BPM) which is owned by a foundation and works with women collecting baobab fruit. GIZ supports the cooperative with a pre-processing center. Furthermore, the GIC trained 56,000 smallholder farmers and plans to reach the number of 70,000 trained farmers by the end of the project. With their trainings in digital agriculture, ICTs/digitalization and entrepreneurship, they target young agriculture entrepreneurs and micro-entrepreneurs, young entrepreneurs and students. They focus their trainings on the digital transformation for the companies and young entrepreneurs. They do not have much access to internet and technologies, so they try to transform what is on paper in small and simple applications to digitize the information:

- Registering farmers info
- Capturing geolocation in the field
- Registering trainings into digital platforms
- Surveys to capture information

In their training program, they include several tools of digital agriculture, such as digital advisory (market information system, SMS services to spread information on market price development) and digital procurement (recording information from paper to digital). They do not provide agri digital financial services and do not yet work with smart farming. Agri-e-commerce businesses are all around Maputo while they work in the rural areas. Therefore, the advanced e-services cannot be useful for the project target participants.

They use the training of trainers approach for transmitting the knowledge to the companies. They also collaborate with a school (Young Africa Agri-Tech (YAAT)) which teaches agricultural skills and a private consultancy organization (Ralph Elsässer/Geo-Solutions Freiburg) which implements part of the project. Furthermore, they collaborate with the German Humboldt-Universität in Berlin.

They do not receive funds from the government of Mozambique.

IDEÁRIO INNOVATION

Established in 2014, [IDEÁRIO Innovation](#) is a training center for business skills. They provide support on entrepreneurial and managerial matters, as well as on business digitalization, mainly for digital marketing. To date they have supported six agricultural start-ups (Xeirobom, Indika, MaaM, Wamina, Bioásis, Kharin) but they do not have updated information concerning whether the start-ups still exist.

The Covid-19 pandemic had a deep impact on the organization and as a result did not support any agricultural start-ups at the time of interviewing.

The organization targets young aspiring or young entrepreneurs to support them in the implementation of their business ideas in various sectors, including agriculture. They teach digital marketing as a digital skill but do not teach any agriculture concepts or tools, neither do they have employed digital agriculture experts.

IDEÁRIO does not collaborate with Universities and do not receive any government funds - they support their activities using their own funds.

TABLE 10 OVERVIEW OF RESPONSES FROM INTERVIEWED INCUBATORS IN MOZAMBIQUE

MOZAMBIQUE INCUBATORS	
Green Innovation Center for the Agriculture and Food Sector (GIC)	
Year of Establishment	2017
Agri start-ups incubated	24
Target of Digital Agri trainings	Young agriculture entrepreneur
Digital Skills trainings	Digital transformation: - Registering farmers info - Capturing geolocation in the field - Registering trainings into digital platforms - Surveys to capture information
Digital Agri Tools taught	Digital Advisory Digital Procurement
Collaboration with Universities and Colleges	Young Africa Agri-Tech (YAAT) German Humboldt-Universität in Berlin
Supported by the Government?	No
IDÉARIO Innovation	
Year of Establishment	2014
Agri start-ups incubated	6
Target of Digital Agri trainings	Young agriculture entrepreneur Aspiring entrepreneur
Digital Skills trainings	Digital marketing
Digital Agri Tools taught	None
Collaboration with Universities and Colleges	None
Supported by the Government?	No

5 INSIGHTS AND REFLECTIONS

The following section outlines the key insights from the data collection of the DACS and towards the end of the report signposts some broader reflections relevant to this country from the *Situational Analysis Report*.

It is important to note that digitalization is a gradual process, which requires a broad and well understood internal rationale, adjustment of organizational culture and adequate investments over time and of resources to align actors, processes, and capacity. This section acknowledges that the data collected is not exhaustive but has enabled some insights and reflections to be shared that are more country specific. To capitalize on these results multi-stakeholder processes to define clear approaches based on agreed priorities will be necessary.

5.1 INSIGHTS

BENCHMARK RESULTS

Mozambique ranked 14 out of 16 in the benchmark assessment which suggests that it is lagging the other SADC member states. 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. Mozambique scored poorly in all but the digital government pillar where it ranked seventh out of 16. This pillar identifies the presence and use of digital services and platforms to enable public service delivery. Mozambique ranked lowest and behind the African median, in digital business (which identifies the development of a robust marketplace for digital trade, digital financial services and digital content), digital skills (which identifies the development of a digitally skilled workforce that is grounded on sound ethical practices and socio-cultural values) and ICT infrastructure (which identifies the availability of affordable, accessible, resilient, and reliable infrastructure).

Four clusters of countries at different points in their progress were identified in applying the benchmark. The clusters formed through the benchmark help to identify the progress countries have made and where greater efforts may need to be directed. Mozambique makes up part of Group 4, 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 digital transition and could leapfrog the more conventional stages of policy development with the right level of prioritization within government and the public sector.

POLICY ENVIRONMENT

The benchmark assessment suggested that Mozambique's digital economy is lagging, but the stock take of national policies, strategies and legislation suggests that some prioritization is occurring. ICT has been consistently integrated into national development plans, with benchmarks and targets to achieve a contribution to development goals and was reinforced by the National Strategy for Broadband in 2018 and Information Society Policy of Mozambique. The stock take identified three documents that prioritized digitalization but also addressed changes from previous iterations of the policies⁴.

⁴ The previous iterations were not reviewed as they were not available, but reference was made to them in the available strategies and policies reviewed.

No specific sectoral strategy or policy on digitalization within agriculture was identified. Agriculture was identified as a priority within national plans and some strategies were suggested. However, this integration has been less apparent in agriculture sector strategies and plans. Only one policy was available, the National Agriculture Investment Plan, which had minimal references to digital transformation. Currently the policies are more directed towards guiding and encouraging innovation and entrepreneurship, but policies need to be implemented within the agriculture sector that build on the national strategies to support an environment that would be conducive to innovations directly aimed at agriculture stakeholders, including farmers. Many of the challenges faced in the rural agriculture sector cannot be addressed only by policies and strategies led by the Ministry of Agriculture but rely on collaboration between all stakeholders to support the overall digital ecosystem and its integration with agriculture.

DIGITAL AGRICULTURE INNOVATIONS

A total of 23 innovations were identified in Mozambique, and 19 responded to the survey. All use cases were present in Mozambique, with digital advisory and procurement the most common. The surveyed innovations addressed all stages of the value chain. Innovations targeted a wide range of outcomes predominantly addressing knowledge gaps related to low productivity, and poor access to markets. The major challenges they experienced was the lack of digital literacy in their target customers and encouraging farmer uptake and behavior change. There were also factors such as a lack of mobile coverage, low levels of language literacy, electricity, data collection challenges and user affordability.

Given the low levels of household computers and the low access to mobile broadband and the internet, it was interesting to see the high dependence on websites as the most common channel, followed by apps for smartphones. The latter are also expensive, and accessibility is restricted due to the cost. Many of the innovations used spreadsheets and cloud-based software, which may also have encountered challenges due to the availability and reliability of broadband.

Most innovations identified in Mozambique are from the private sector and have reached a level of scale. However, when local innovations (operational in Mozambique only) are extrapolated, there is more variety across levels of scale. There also seems to be reliance on donor funding in sustaining innovations.

DIGITAL AGRICULTURAL SYLLABI AND ENTREPRENEURSHIP TRAINING

Digital transformation is a catalyst for socio-economic development in Mozambique and could improve household livelihoods and tackle food insecurity. If achieved, the country's Strategic Plan for the Information Society (2019-2028) will improve the access and teaching of ICTs in the education sector. There is a wide digital literacy gap that excludes the poorest from the benefits of the digital world. Digital skills across all sectors and at all levels of the skills spectrum must be addressed.

Training in the digital agriculture sector should be improved. Training institutions and the tertiary education sector need capacity building and better equipment for digital agriculture education. Closer cooperation and exchange of competences between incubators and universities, and between universities and incubators and private business service providers is also suggested to improve the development of digital agriculture curricula and a more entrepreneurship-oriented education for the youth.

Mozambique must encourage a larger mass of digital entrepreneurs to build its digital ecosystem and begin transformation of home-grown solutions. Policies and strategies to promote entrepreneurship, access to capital, information and support services will encourage investment in new ventures. For the incubators

interviewed, CCARDESA and other international partners could better support the development of digital skills for agricultural youth entrepreneurship in the SADC region by standardizing the implementation of digital approaches in the SADC Region through a participatory approach in sharing ideas for the standardization; assessing the ICT skills that exist in the SADC region and seeing how it can be shared among countries; and focusing on enterprises as key implementing actors of ICT. Short-time trainings for youth in agricultural entrepreneurship should be provided or supported, as well as scholarships for longer term trainings in this field. Helping Universities and Faculties of Agriculture to see themselves taking a leading role especially in Mozambique where the networks of these institutions appear to be good would be a significant step forward.

5.2 REFLECTIONS FROM THE SITUATIONAL ANALYSIS REPORT

This document has presented the available data collected for Mozambique and provides detailed insights on the three main elements: policies, innovations, and digital skills. The country data collected is intended to be useful for a local context, however the *Situational Analysis Report* presents a much broader perspective which examines regional trends, provides analysis on the regional findings, and highlights potential areas for shared learnings across the SADC region.

This section briefly presents key regional reflections that are relevant for this country that are derived from the *Situational Analysis Report*. The intention is to direct the reader to the report where these points have been elaborated on and presented alongside other countries in the region to learn from.

The key reflections from the Situational Analysis Report relevant to Mozambique include:

- **Government has a role in improving access to the digital communication channels for the population and farmers.** 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. 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.
- **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.** A clear agriculture sector specific strategy or roadmap can address some of the key challenges raised by stakeholders consulted during this study.
- **Digital content should be hyper-localized, relevant to local constraints and deployed through channels that facilitate and enable action by farmers.** 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. 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.

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**DIGITAL AGRICULTURE
COUNTRY STUDY ANNEX TO
THE SITUATIONAL ANALYSIS
REPORT OF THE SADC REGION**

Centre for Coordination of Agricultural Research
and Development for Southern Africa

World Bank Group