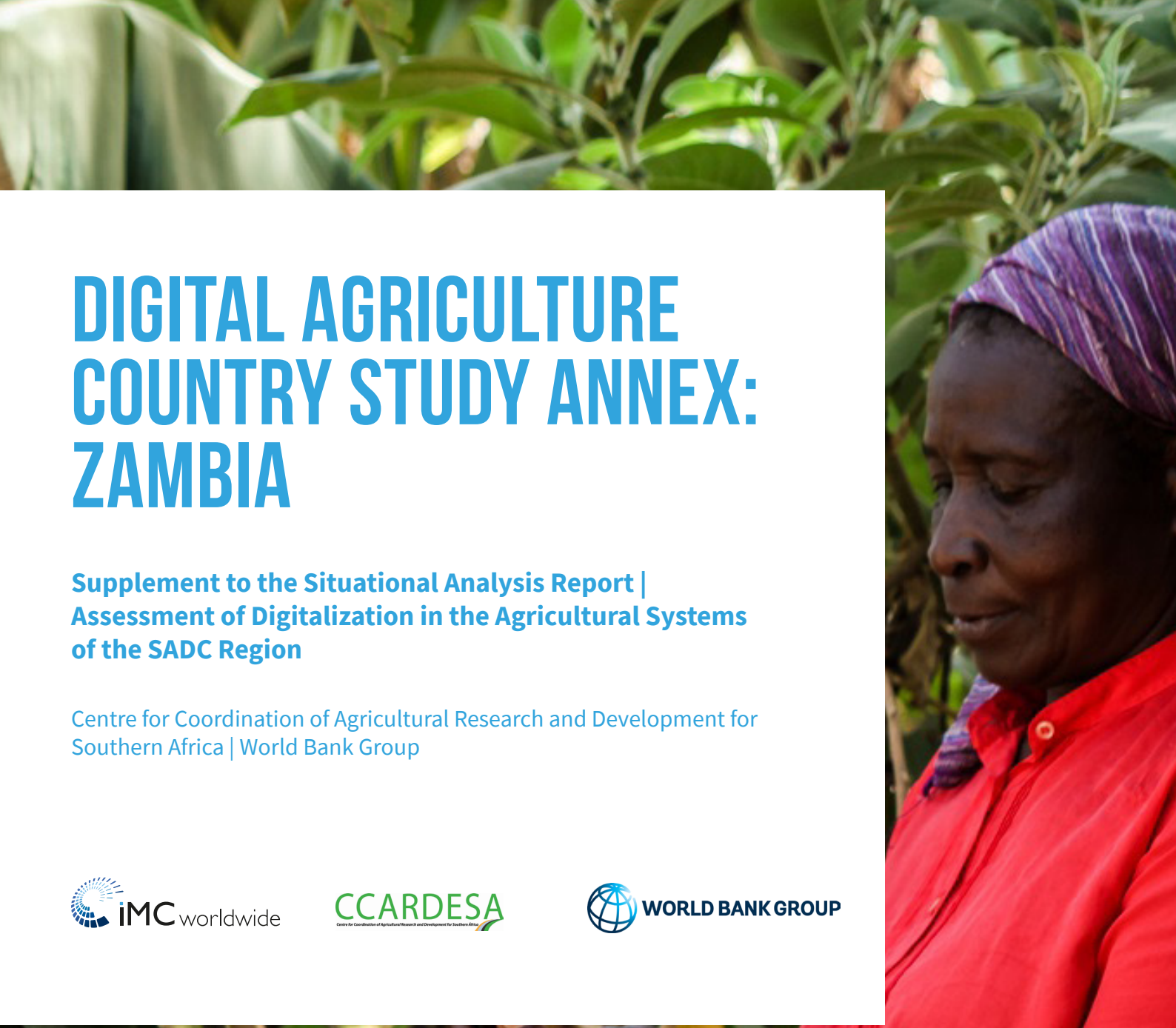

DIGITAL AGRICULTURE COUNTRY STUDY ANNEX: ZAMBIA

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

DIGITAL AGRICULTURE COUNTRY STUDY ANNEX: ZAMBIA

SUPPLEMENT TO THE ASSESSMENT OF DIGITALIZATION IN THE AGRICULTURAL SYSTEMS OF THE SADC REGION: SITUATIONAL ANALYSIS REPORT

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

2021/2022

TABLE OF CONTENTS

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 Zambia 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 Zambia 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 Zambia, 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 Zambia 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 Zambia, Jones Malama, Agricultural & Research Institute, and Dorcus Kabuya, National Agricultural Research Services. The study team also worked with a National Consultant in Zambia, Lukonga Lindunda from Bongo Hives.

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).

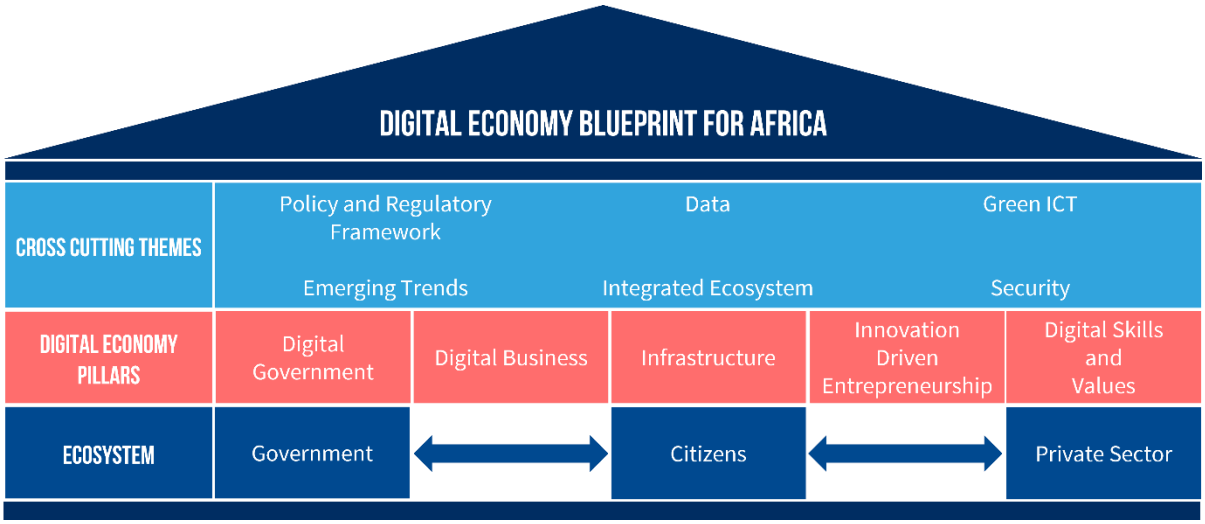

FIGURE 1 OVERVIEW OF KENYAN DIGITAL ECONOMY BLUEPRINT

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 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 Zambia could not be fully validated, but this was insufficient to suggest they did not exist and so are included in the lists.

A virtual workshop was jointly planned with the study team and hosted by Bongo Hive to test the survey and discuss challenges innovators had encountered in Zambia whilst testing it. Ten innovators took part in the workshop who had also filled in the survey and provided feedback to the research team.

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.

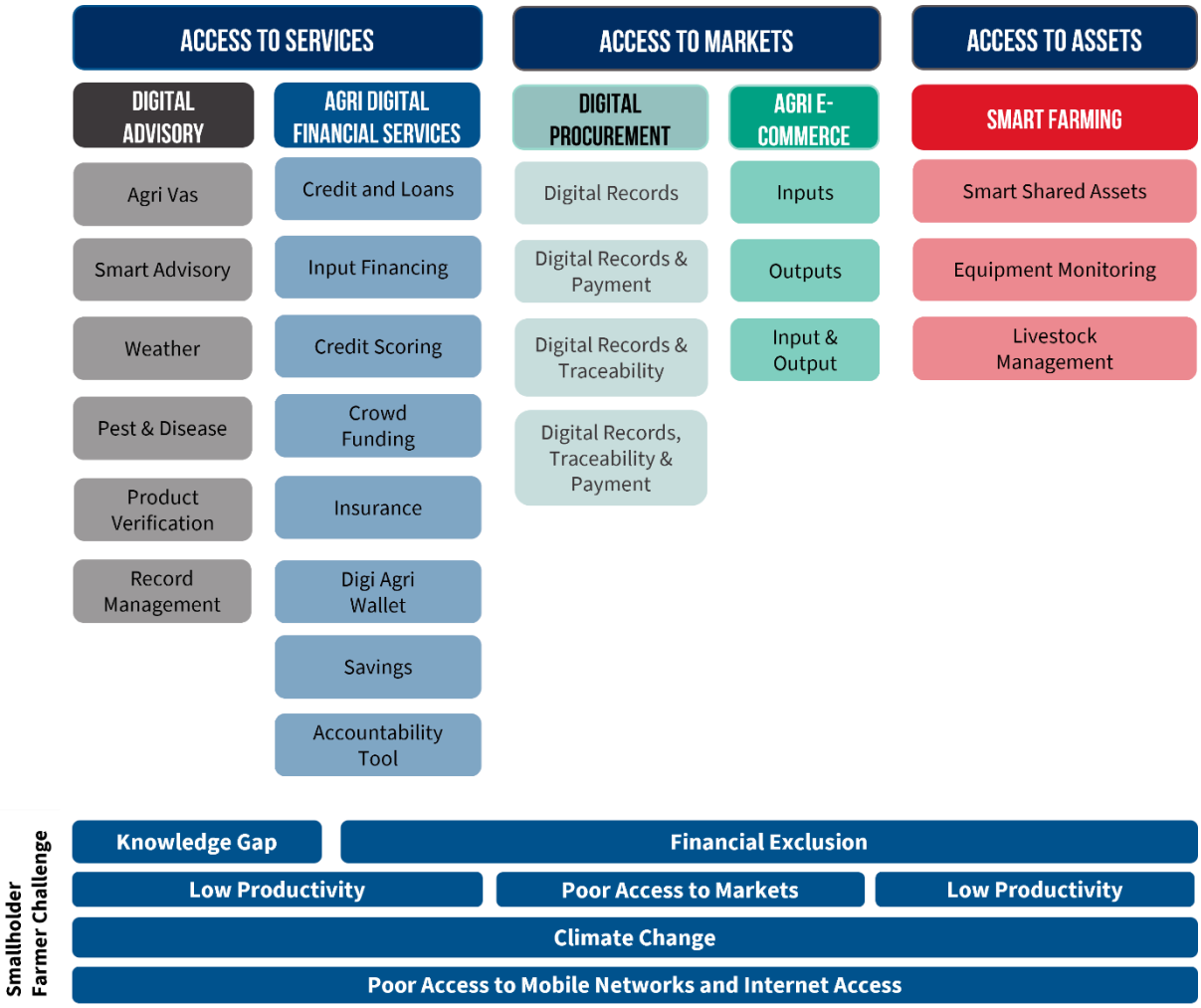

FIGURE 2 USE CASE MODEL BASED ON GSMA FRAMEWORK

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 annexes 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 Zambia 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 KIIs 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

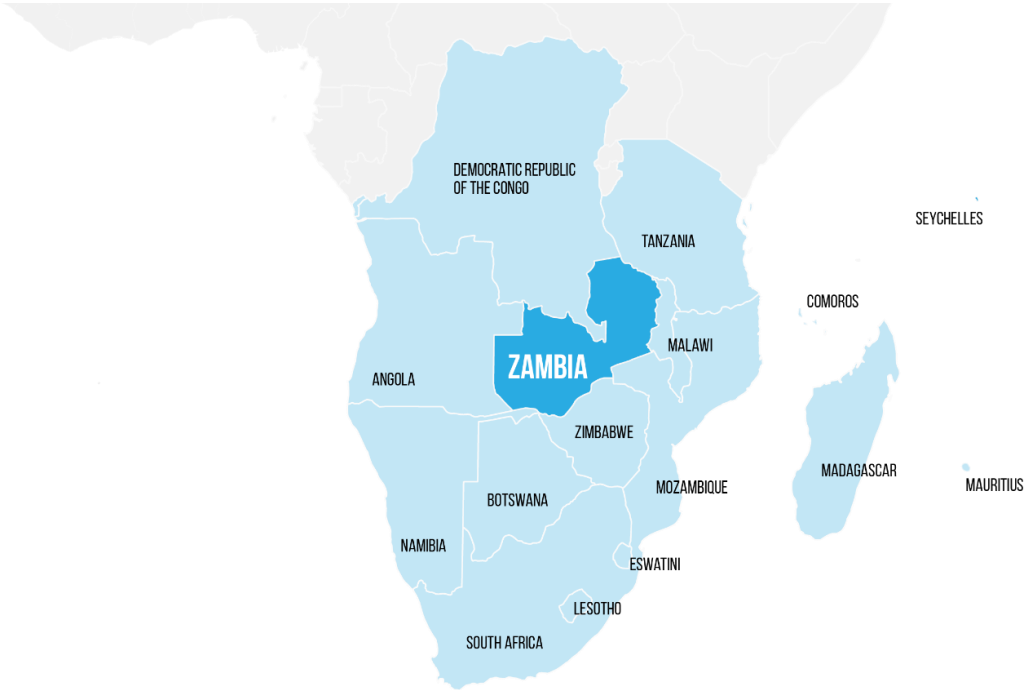

FIGURE 3 MAP OF ZAMBIA IN SADC

Zambia is a landlocked lower-middle income country with a population of 18.3 million.[1] The UNDP's Human Development Indicators rank Zambia as 146th out of 190 countries and 7th out of the 16 SADC countries[2]. Zambia scores on the higher scale in the region for gender equality with a Gender Development Index of 0.958.[i] It is one of the poorest countries in the SADC region with a Gross National Income per capita of only $3,560 (compared to an average of $8,050 in the region).[3] Although 47.9% of the population falls under the UN Multidimensional Poverty Index,[4] 54.4% lives 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 Zambia's population is also significantly younger than the average in SADC with 17.6 years (versus 22.1 year).

AGRICULTURE ENVIRONMENT

In the case of urbanization, Zambia is above average in the SADC region with 44.1% living in urban areas. Although only 2.73% of the GDP is earned in agriculture, 46.64% of the population works in the agriculture sector (slightly higher than the average of the SADC region of 43.37%). On the Global Food Security Index, Zambia ranks as the 111th country with an overall score of 36.6—making it the 9th in the SADC region alone.[6]

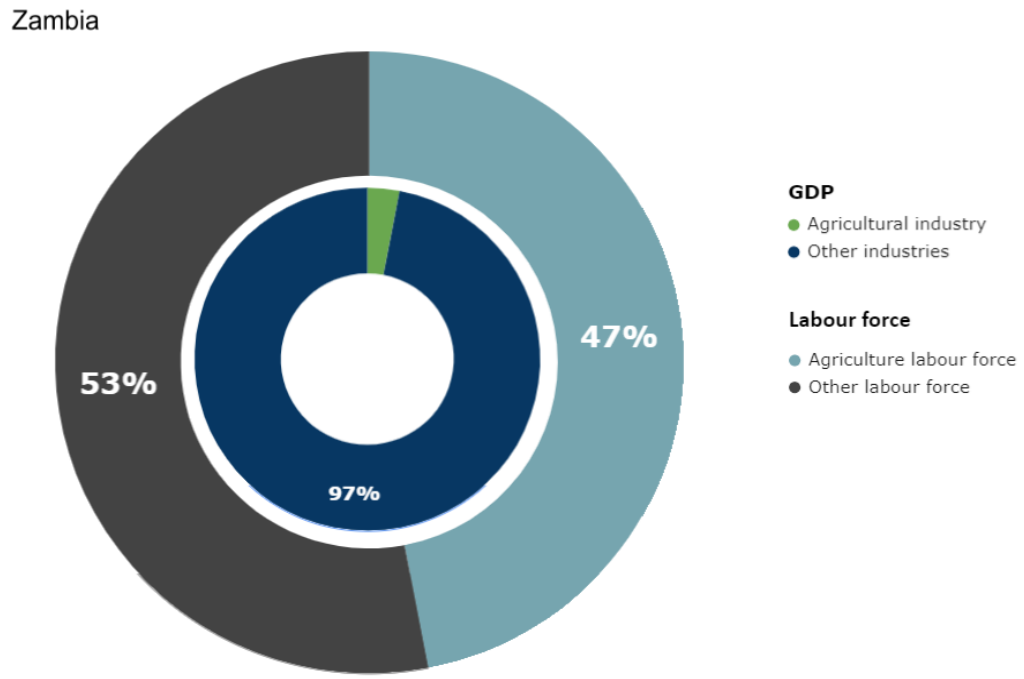

FIGURE 4 ZAMBIA'S AGRICULTURAL INDUSTRY SHARE OF GDP AND THE SHARE OF THE AGRICULTURAL LABOR FORCE

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

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

sustainable growth[7]. 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.

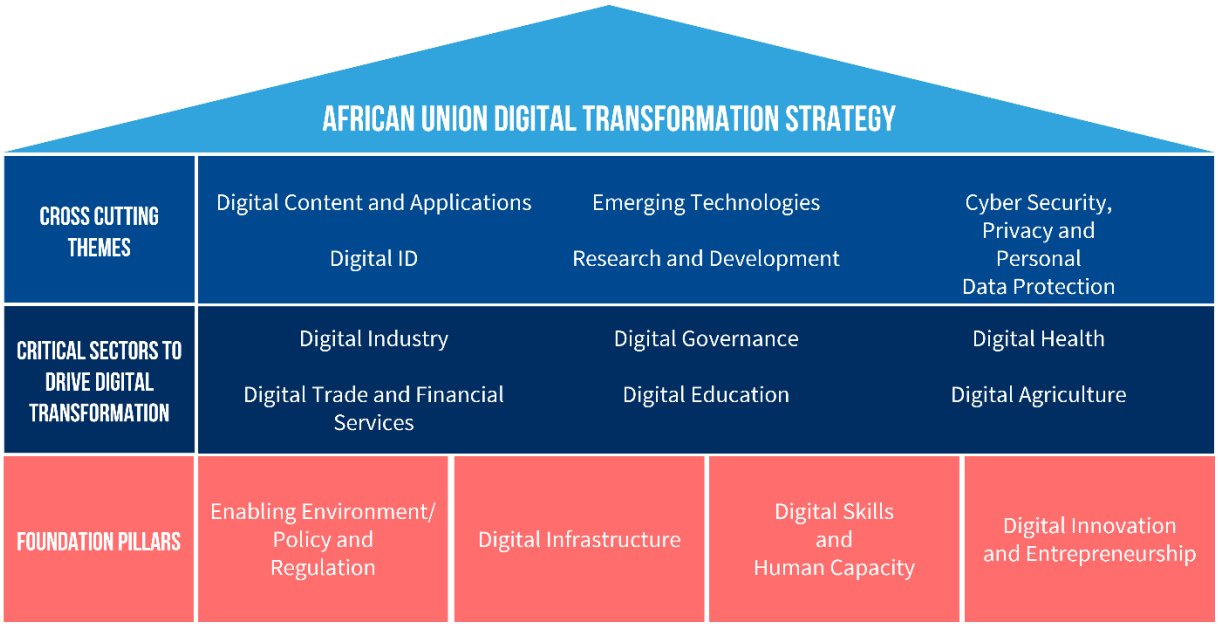

FIGURE 5 OVERVIEW OF THE AFRICAN UNION DIGITAL TRANSFORMATION STRATEGY

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 ICT industry and encourages a whole-of-government approach to have more emphasis on the overall ecosystem and economy[8].

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 Zambia are illustrated in table 3.

TABLE 3 BENCHMARK PILLAR SCORES: ZAMBIA

Zambia	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, Lesotho, 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
Lesotho	0.3802	9
African Median	0.3595	
Zambia	0.3506	10
Malawi	0.3483	11
Madagascar	0.3005	12
Angola	0.2985	13
Mozambique	0.2919	14
DR Congo	0.2782	15
Comoros	0.2497	16

BENCHMARK ASSESSMENT: ZAMBIA

In the benchmark assessment Zambia ranked tenth out of the 16 SADC member states. Figure 6 below illustrates the results of the benchmark in comparison to the Global and African medians. Zambia scores well in all areas in comparison to most African countries. The benchmark suggests that Zambia has some key foundational elements necessary for a robust digital economy.

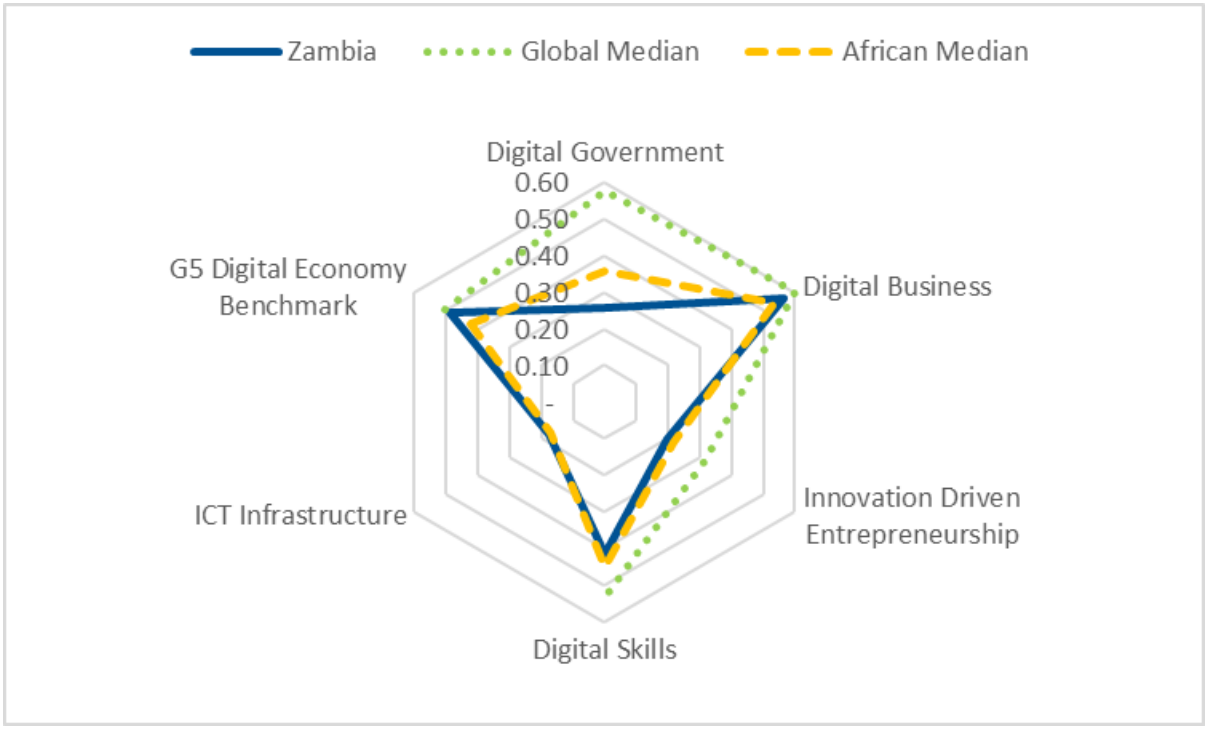

FIGURE 6 RESULTS FROM BENCHMARK ASSESSMENT FOR ZAMBIA

Zambia scored well in most assessment areas but falls in the bottom half of countries for the digital government and innovation driven entrepreneurship pillar. Table 5 below, illustrates the ranking for each individual pillar where it predominantly ranked in the top 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	Lesotho	Zambia	Zambia
9	Eswatini	Eswatini	Zambia	Eswatini	Lesotho	Lesotho
10	Malawi	Lesotho	Mozambique	South Africa	Tanzania	Zimbabwe
11	Botswana	Malawi	Angola	Madagascar	Mozambique	Angola
12	Lesotho	Mozambique		Malawi	Angola	Madagascar
13	Madagascar	Zimbabwe		Mozambique	Comoros	Namibia
14	Zambia	DR Congo		Angola	Malawi	Comoros
15	DR Congo	Angola			DR Congo	Mozambique
16	Comoros				Madagascar	Seychelles

DIGITAL INFRASTRUCTURE

Zambia ranks eight out of 16 SADC member states in the ICT infrastructure pillar but only 14.3% of the total population is using the internet.[9] This is much lower than the regional average of 29.94%. The GSMA Mobile Connectivity Index shows a 72% access to the 3G network,[10] which complements the HDI report of mobile cellular subscriptions at 89.2 per 100 people.[11] Zambia also ranks as 101st on the Inclusive Internet Index which details the accessibility, affordability, and relevancy of internet in 120 countries[12]. However, according to the Mobile Connectivity Index,[13] Zambia is ranked number 10 in terms of overall mobile connectivity in the SADC countries with an overall index of 35.3—which just about qualifies it as an emerging country (above 35). It scores above average for consumer readiness, but below average on affordability, availability of infrastructure, and content and services.[ii] In terms of ICT adoption, Zambia scores position 106 (out of 140). The Zambian government is at an average when considering its future orientation based on the position 82 (out of 140), but it scores lower on the innovation capability index as number 115 out of 140.[14] However, it scores higher with 3.5 out of 7 points on the GCI 4.0 Digital Skills Among the Population Index, which is exactly the SADC average. [15]

[ii] The enablers of mobile internet connectivity that inform the indicators: 1. Infrastructure, 2. Affordability, 3. Consumer readiness and 4. Content and Services.

2 THE BROADER POLICY ENVIRONMENT

In the benchmark assessment Zambia ranked tenth out of 16 in the region, scoring in the middle in most indicators. The average scores and ranking in the assessment pillars indicate that Zambia is unlocking the digital economy to an extent, but it is unclear from these results whether there is a robust enabling environment. In the *Situational Analysis Report* the clusters of SADC countries identified from the benchmark are discussed in more detail but Zambia forms part of Group 3 which is made up of countries that are in digital transition and could benefit from learning from its regional neighbors.

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 frameworks[16]. 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 policies[17]. 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 outdated[18].

2.1 GENERAL DIGITAL POLICIES

Zambia has several general policies and examples of legislation related to technology and digitalization, some of which have only been published recently (2021).

POLICIES, STRATEGIES AND PLANS

The **National Information and Communication Technology Policy 2006** was the first comprehensive guiding document in developing ICT policies and plans and follows the **Fifth National Development Plan 2006-2010** recognition of ICT as a priority sector for Zambia. The Policy focuses on capacity building, a competitive and efficient ICT sector, and an effective legal and regulatory framework. It is based around thirteen pillars outlined in table 6 below.

TABLE 6 THIRTEEN PILLARS OF ZAMBIA'S FIFTH NATIONAL DEVELOPMENT PLAN 2006-2010

Pillar	Objective
Human Resource Development	To attain sufficient and world-class human resource capacity in critical and relevant ICT skills required for developing and driving Zambia's information and knowledge-based society and economy.

Education	To integrate ICTs in the education system and develop the nation's Research and Development (R&D) capacity to support, facilitate and contribute to the development of key sectors of the economy including the development of appropriate local ICT products and services.
Access, Media, Content and Culture	To promote widespread public access to information through appropriate traditional and new technology solutions based on relevant local content while promoting cultural heritage.
ICT Sector	To develop a competitive local ICT industry supported by a clear policy roadmap; fair and transparent regulatory framework and pro-investor market conditions resulting in the effective participation of the private sector in value-adding, export-oriented services; serving as the main engine for accelerating the development of the local economy.
Telecommunications Infrastructure	To increase access and promote widespread deployment of ICT services through the expansion of the nation's telecommunications backbone infrastructure covering the whole country.
E-Government	To improve public sector management as well as efficient and effective delivery of public goods and services through the implementation of E-Government systems.
E-Commerce	To promote Zambia's full and effective participation in national, regional and global trade through E-Commerce services and facilities.
Agriculture	To improve productivity as well as competitiveness of the agricultural sector using ICTs in the planning, implementation, monitoring, and the information delivery process.
Health	To improve access to quality healthcare as close to the family as possible through the deployment and exploitation of ICTs and other modern technologies.
Tourism, Environment and Natural Resources	To integrate ICTs in the development of the tourism industry and facilitate the conservation of Zambia's natural resources & heritage as well as to protect the environment.
Youth & Women	To use ICTs as an instrument to mainstream youth and women issues in all activities of the economy and society as well as empower youths and women through opportunities created by the implementation of ICT projects and programs in the country.
Legal and Regulatory Framework	To develop appropriate institutional, legal, and regulatory system to support the development of a competitive local ICT sector based on convergence principles; supported by fair, predictable, and transparent legal and regulatory framework.
Security in the Information Society	To safeguard national, institutional, and individual security concerns to support the development, deployment and effective use of ICTs within the Zambian economy and society at large.

The **National ICT Strategic Plan 2015-2020** is aimed at operationalizing the ICT Policy and encouraging integration of ICTs in all sectors of the economy. The Strategy provides responsibilities, timelines, and a roadmap of stages to achieve the vision and targets.[iii]

The **National Information and Communication Technology Policy 2021,** which was recently published, aims to update the 2006 Policy with the mission to "transform Zambia into a Digital Economy and knowledge-based Information Society with ICTs integrated into all aspects of development". The main reason for this policy is to address the gaps identified in implementing the 2006 Policy and to adapt and address the emerging issues that arise from greater uptake of digital solutions. The specific objectives of the 2021 policy are:

- Make ICT products and services more inclusive and accessible to bridge the digital divide
- Enhance the use of digital platforms in all sectors of the economy
- Build confidence, trust, and security in the use of ICTs
- Promote efficient deployment of ICT infrastructure to support the provision of quality broadband
- Improve digital literacy and support linkages with innovation and entrepreneurship in the ICT sector
- Enhance the legal and regulatory environment to make it responsive to emerging issues and trends in the ICT sector

[iii] This summary is taken from the SMART Zambia e-Government Master Plan as the original document could not be sourced online.

In comparison to the original ICT Policy in 2006, the updated version of 2021 is much more concise and less detailed in its plans and strategies. It sets out a broad agenda to be applied sector-wide, but some of the aims are not dissimilar to what was presented in 2006. However, there is more of a focus on creating a conducive environment for increased use of emerging technologies. It is likely that this policy is a starting point for a raft of new strategies and legislation to be published relevant for each sector.

Of note from the benchmark assessment is the low score around the Digital Government pillar. The Government established the SMART Zambia Institute in 2016 with a mandate to provide e-Government services for improved service delivery. Since its establishment it has produced a number of Standards and Plans including the **SMART Zambia e-Government Master Plan 2018-2030** which has three desired outcomes: improve country competitiveness, improve infrastructure, and strengthen the legal and regulatory framework; the **Public Service ICT Human Capital Development Standard** which aims to build ICT skills and develop proficiency in management practices for all Public Service employees; and the **Information Security Standard for Public Service** to enhance user confidence and trust, and provide controls to ensure ICT security is met within Government services. These standards are quite progressive and present a drive and desire to strengthen public services in line with the overall digital economy agenda. These documents and the establishment of SMART Zambia suggest that there is a concerted effort to work on progressing "Digital Government" in Zambia, but this is not reflected in the benchmark assessment and could be explained by the use of the OSI data stream which looks at the provision of online services, rather than e-Government as a whole[iv].

An aspect not measured in the benchmark, but which is increasingly important is that of trust, cybersecurity, and privacy. Zambia recently published their **National Cybersecurity Policy 2021** which sets out four objectives: to secure Zambia's information infrastructure to enhance cyber resilience; to develop a coordinated governance framework and set the agenda for cybersecurity; to promote international cooperation to help deal with cybersecurity incidents; to promote cybersecurity education and attain a culture of cybersecurity; and to promote R&D to reduce the reliance on foreign cybersecurity solutions. A corresponding **National Cybersecurity Policy Implementation Plan** was published which provides some KPIs, budgetary allocations and timeframes, but does not provide additional detail. There is no mention of data specifically in the Cybersecurity Policy which seems at odds with the emphasis on emerging technologies in the ICT Policy as these technologies tend to be more data-intensive and will create issues down the line if no clear rules are in place. However, a **Cybersecurity and Cybercrimes Act** is being prepared and this may be able to practically address some potential risk areas. Zambia is embracing digitalization within the policy environment and while the specific strategies identified are limited, two of the policies identified were published this year. There needs to be greater clarity in the implementation of the newer policies to fully understand how much digitalization is being embraced in other sectors.

2.2 LEGISLATION

Zambia has several pieces of legislation relating to ICTs and digital, with the key items documented below. The main pieces of legislation to come out of the National ICT Policy of 2006 were:

- **The Information and Communication Telecommunications Act 2009** provides for the economic and technical regulations of ICTs, facilitates access to ICTs, protects the rights and interests of service

[iv] The OSI, part of the EGDI is not designed to capture e-government development but give it a performance rating relative to other governments.

providers and consumers, regulates and manages radio spectrum, and renamed the regulator to the Zambia Information and Communications Technology Authority (ZICTA).

- **The Electronic Communications and Transactions Act 2009 (The ECT Act)** provides for the development of a safe, secure, and efficient environment for the consumer, business sector and the Government to conduct and use electronic communications; promotes legal certainty and confidence and encourages investment and innovation in the electronic communications industry. It also defines the rules and procedures related to cybersecurity. This Act has now been repealed and replaced with the Cyber Security and Cyber Crimes Act, the Data Protection Act, and the Electronic Communications and Transactions Act.

The three Acts introduced to replace the ECT Act:

- **The Cyber Security and Cyber Crimes Act 2021** provides for cybersecurity, constitutes the Zambia Computer Incidence Response Team and the National Cyber Security Advisory and Coordinating Council, and the continuation of the Central Monitoring and Coordination Centre. It is also to protect persons against cybercrime, promote child online protection, and to facilitate identification, declaration and protection of critical information infrastructure, the collection and preservation of evidence of computer and network related crime, admission in criminal matters of electronic evidence, and registration of cybersecurity service providers[v].
- **The Electronic Communications and Transaction Act 2021** provides for the development of a safe, secure and effective environment for the use, security, facilitation and regulation of electronic communications and transactions, including secure electronic signatures; facilitates electronic filing of documents by public authorities; promotes legal certainty and confidence, and encourages investment and innovation in relation to electronic transactions; it also regulates the National Public Key Infrastructure[vi].
- **The Data Protection Act of 2021** provides an effective system for the use and protection of personal data and regulates the collection, use, transmission, storage and otherwise processing of personal data. It also establishes the Office of the Data Protection Commissioner and provides for the rights of data subjects. The principles and rules regarding processing personal data is closely aligned to the EU's General Data Protection Regulation.

Similar to the updated National ICT Policy, the Cybersecurity Framework provides minimal detail and planning on how these goals will be achieved and that is likely due to the fact that a multi-sectoral approach will be necessary that will have to be led by those separate institutions.

From the two National ICT Policies it is apparent that digitalization is being embraced as a priority area and it is encouraging that efforts have been made to publish an updated version which incorporates more focus on emerging technologies and the risks associated with greater digitalization, cybersecurity, and privacy. The strategies, policies and legislation listed above provide a useful insight into how Zambia has made efforts to update policies and legislation to keep pace with the changing nature of technologies and risks associated with digital transformation. Zambia has an impressive and agile process to repeal Acts when they are outdated, in contradiction or in need of updating in line with an overall national vision and will likely stimulate increased investment in the sector. As previously mentioned though, the presence of policies and legislation does not necessarily reflect the enforcement or the successful implementation of these strategies.

[v] While outside of the scope of this study, further information on the response to analysis of this Act can be found here.
[vi] A system—including policies, institutions, and technologies—that manages the distribution, authentication, and revocation of digital certificates is often referred to as public-key infrastructure (PKI).

2.3 DIGITALIZATION IN AGRICULTURE

DIGITAL IN AGRICULTURE POLICIES

The Ministry of Agriculture website was inaccessible at the time of review, so documents had to be sourced through the CCARDESA ICKM focal points or through online searches, which may have limited the findings.

Digitalization that is integrated into development plans seems to be in the early stages in Zambia. This is reflected in searching and reviewing agriculture documents as there is no singular strategy on digitalization in agriculture. Three items that were found are directly related to digitalization in agriculture: The National ICT Policy 2006 (mentioned above), the **Second National Agricultural Policy 2016**, and the **National Agricultural Extension and Advisory Services Strategy 2017-2020**.

Agriculture, as the economic backbone of rural Zambia, plays an important role in the development of the country. As such, the **National ICT Policy 2006** identified it as one of the thirteen pillars of the policy. Commitments are made to improve infrastructure in rural areas, institute policy measures to integrate and encourage the use of technologies into the sector, increase the competitiveness of farmers and their products with technology, and to promote the development of ICT entrepreneurs at SME level to strengthen the development and application of ICTs in agriculture. The policy sets out the following strategies to achieve those goals:

- Create an integrated agricultural information system on agro-technologies and techniques, pricing, and market information for all agro-products to provide strategic information for farmers, government authorities, and other stakeholder at national, provincial and district levels.
- Undertake intensive ICT awareness campaigns for all types of farmers in the use of traditional and new ICT tools at all levels.
- Intensify the use of radio and TV programs and integrate new technologies to reach extension workers and farmers alike.
- Develop weather and agrometeorology early warning systems to support agricultural production and predict as well as prevent disasters.
- Develop incentives for deployment of affordable ICT solutions to support rural connectivity of farmers especially those within the catchments of existing ICT infrastructure.
- Develop and promote ICT skills development among agricultural extension workers and farmers.
- Develop database systems and applications including GIS to support agricultural input resource management as well as to support land and water resource management, environmental monitoring and impact assessment, crop yield assessment and livestock management, among others.
- Develop a monitoring and evaluation system for the conservation and sustainable utilization of natural resources in the agricultural production process.
- Promote two-way information dissemination to support the physical and socio-economic planning process in the agricultural systems.

These strategies go beyond the simplistic goal of increasing access to farmers. However, the technology mentioned within the Policy is basic (radio and TV) rather than modern devices such as mobile phones and

smartphones, or the internet. Despite this, the key aims of increasing information and reducing the knowledge gap, improving skills, and encouraging uptake of ICTs by farmers is all captured within the strategies.

It seems that in the ICT Policy there were ambitious goals and strategies that were specifically adapted to the sector, but this has not been reflected well or carried over into more recent agriculture strategies and plans. This could be a result of departments and ministries working in silos, hindering information sharing and resulting in duplication of policies or even a lack of knowledge or enforcement of these agendas. Despite the prioritization that agriculture received in the first ICT Policy, this same prioritization is not reflected in the **Second National Agricultural Policy 2016.** There is little mention of the specific benefits that ICTs and digital technologies can bring into the agricultural sector. The only references made are in the general measures to increase agricultural productivity and production (Objective 1) to "promote the use of ICTs in extension service delivery" which encourages operationalizing mobile phone SMS based extension service platforms. The limited reference to ICTs suggests that it has not been fully absorbed into the agricultural systems of Zambia. Several challenges are presented in the Policy (low production and productivity, high post-harvest losses, and limited access and availability to agriculture finance) to which digital solutions could be applied. However, reference is made in the **National Agricultural Extension and Advisory Services Strategy 2017-2020** to the use of ICT tools in advisory services and the pledge that Government will continue encouraging the inclusion of ICTs to scale up advisory services but not much more detail is provided.

It is encouraging to see a whole policy priority for agriculture in the National ICT Policy and the omission of any specific sector mentions in the updated National ICT Policy in 2021 suggests that a digital strategy for agriculture may be produced in time. This would be most useful to understand what additional potential exists in the sector beyond information systems and extension services to increase productivity.

CHALLENGES

Sourcing agriculture documents was challenging and as a result may provide an inaccurate representation of the extent to which digital technologies have been integrated into public sector priorities. As mentioned in section 2.1, the lack of policies or regulations within the sector does not necessarily inhibit the development or implementation of innovations and digital solutions.

The agriculture policies and strategies reviewed imply that there is little prioritization of this agenda, but in practice this may be different. One key platform that is led through the SMART Zambia Institute is the Zambia Integrated Agriculture Management Information System (ZIAMIS), which is a platform that provides extension messages through SMS[19] and acts as an e-subsidy platform with an e-voucher scheme through the Farmer Input Support Program[20,21]. This suggests that innovation is taking place or at least being trialed. However, a public sector stakeholder interviewed acknowledged that the use of ICT in the Agricultural sector generally is still in its infancy but has potential. When pressed on who leads this agenda, where the potential would come from and whether any future agricultural strategies or policies would include digital elements, the stakeholder shared that it is the responsibility of different ministries' to produce a document that supports the National Policy. This suggests that advancement is happening in silos with limited cross-collaboration between ministries and departments.

3 DIGITAL AGRICULTURAL INNOVATIONS

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

3.1 MAPPING THE DIGITAL AGRICULTURAL INNOVATIONS

The DACS for Zambia presents use cases according to a typology and framework developed by GSMA (see figure 2). The broad areas include access to services, access to markets and access to asset classes.

A total of 26 innovations were identified in Zambia that had a mix of use cases as illustrated in figure 7 below. 12 of the innovations identified were for Zambia and 14 were regional innovations that are implemented in Zambia and were identified in other countries. Digital advisory was the most common use case provided by innovations, followed by agri e-commerce and digital procurement.

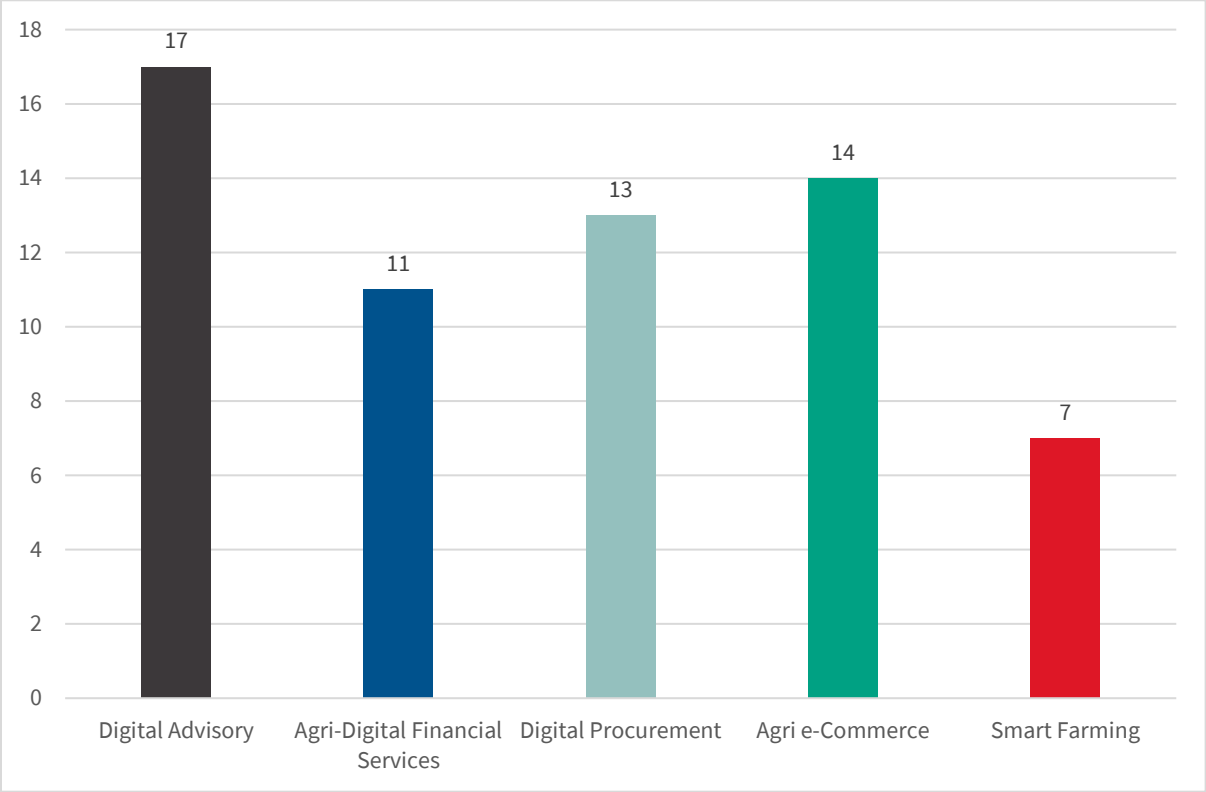

FIGURE 7 IDENTIFIED USE CASES FROM INNOVATIONS IN ZAMBIA

From the identified innovations, eight were developed for a single use case and 18 for multiple use cases.

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 ZAMBIA

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

DIGITAL ADVISORY | AGRI-DIGITAL FINANCIAL SERVICES | DIGITAL PROCUREMENT | AGRI E-COMMERCE | SMART FARMING

TABLE 7 OVERVIEW OF IDENTIFIED AGRICULTURAL INNOVATIONS OPERATIONAL IN ZAMBIA

					Name of innovation	Name of the company	Survey ✓/X	Description of innovation	Operational Countries in SADC
	■				AgriPay	Zanaco Plc	✓	AgriPay (2019) from Zanaco Plc. AgriPay is a mobile-based (USSD) platform for smallholder farmers. The bundled services include account opening, access to markets, access to information, and a suite of digital financial products and services. The solution is value-chain agnostic and designed to meet the needs of value chain players in the agri-space. They have around 7500 users.	Zambia
■	■	■	■		AgriPredict Platform	AgriPredict Solutions	✓	AgriPredict Platform (2019) from AgriPredict Solutions. Using mobile phones to provide vital, timely and on-demand agricultural information to small scale farmers to help them manage risk. They have around 51,000 registered users of which around 10,000 are active.	Zambia
■	■	■	■	■	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	Eswatini, Mozambique, Namibia, South Africa, Zambia, Zimbabwe

								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.	
					Alternative Exchange (trading platform) in Eastern and Southern Africa,	Escrow Group	X	Alternative Exchange (trading platform) in Eastern and Southern Africa from the Escrow Group for Tanzania, Zambia and Zimbabwe. This is a registered alternative exchange (trading platform) in eastern and southern Africa. The platform enables members of the public to access financial markets using mobile phones / USSD platforms and apps to shop and choose what they want to invest in, including mobile retail bonds (Government and Corporate), securities, and commodities (piloting).	Tanzania, Zambia, Zimbabwe
					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
					eMsika	eMsika Services Ltd	✓	eMsika (2016) from eMiksa Services Ltd. eMsika is an online agriculture marketplace for farmers and agro-retailers to Find, Buy and Receive farm inputs across the country. They have around 1500 registered users.	Zambia
					E-Soweto	E-Soweto farmers market	✓	E-Soweto (2020) from E-Soweto farmer's market. E-Soweto Farmers Market is a social enterprise providing live online market price information to all stakeholders in the agriculture sector. They focus on fruits and vegetables. In the vegetable market they closely monitor market prices for Tomatoes, Onions, Carrots, Cabbages, Cucumbers and Potatoes. In the fruits Market updates on Apples, Bananas, Pineapples and Watermelons. User numbers are not available.	Zambia
					eVetCare Livestock e-Extension	eVetCare Limited	✓	eVetCare Livestock e-Extension (2020) from eVetCare Limited. eVetCare is an online platform that links veterinarians and veterinary input suppliers to farmers that do not have ready access. The underlying principle is to make veterinary services and input accessible to all farmers available all the time (24/7). They have around 160 registered users.	Zambia
					Food Processing Software	Matrix Software	✓	Matrix Software is a meat and food matrix software solution for stock control, yield management, traceability, productivity, and cost margin management. Matrix Software is a service-led private company that provides software services predominantly to the livestock and meat industry and established in 2019. These are digital, mobile, and tablet-based systems for yield and stock control and statistics leading to costings and profitability. Matrix software utilizes android mobile scanners and their associated applications, RFID integrated solutions, automated weighers, and third-party integration. This reduces the initial capital outlays and good implementation support for feedlots, abattoirs, deboning plants, and meat processing plants including others such	Botswana, Eswatini, Lesotho, Mauritius, Namibia, Seychelles, South Africa, Tanzania,

								as fish, poultry, butcheries, and retail outlets. Matrix Software has been located/incubated in the AgVentures Hub in South Africa. This regional solution is deployed in 10 SADC countries (Botswana, Eswatini, Lesotho, Mauritius, Namibia, Seychelles, South Africa, Tanzania, Zambia and Zimbabwe), but also in counties as Australia and New Zealand. Matrix Software solutions have reached a stage of replication and adaptation in other geographies and are in the Scaling state of development.	Zambia, Zimbabwe
■			■	■	FruitLook	eLeaf BV	✓	FruitLook in South Africa is a web-based portal with near real-time data based on satellite and remote sensing data modelling for the Western Cape agricultural sector. The FruitLook portal delivers weekly remote sensing data year-round for subscribing farmers. FruitLook incorporates a suite of data products covering crop growth, evapotranspiration deficits, and crop nitrogen status provided on a near real-time basis updated weekly. These data products are relevant for orchards, vineyards, pastures, range lands and field crops. The quantitative and spatial information on water, vegetation, and climate is designed to enable farmers to better understand the effects of their water use and their farm management decisions. The FruitLook data and team inform farm operations on management decisions relating to irrigation scheduling and crop production. The service is free of charge and funded by the Western Cape Department of Agriculture and provides metrics such as biomass production, evo-transpiration, water use efficiency which are provided weekly for the largest part of the Western Cape throughout the year. They launched the FruitLook service in 2010 and have 500 active users and 2000 registered users and provide smart data driven advisory based on tailored, farm-level agro-climatic and crop specific information to support decision making, maximize productivity and reduce costs. Technologies such as sensors, satellites, and drones, as well as big data analytics and AI, underpin many of these services., Weather information: Specialist services that provide regional and localized weather forecasts. This sub-category may include weather-adaptive and climate-smart advice. They enable resource use optimization and asset management (e.g., irrigation equipment). They use computers, satellite information and earth observation and technologies such as sensors, satellites, and drones, as well as big data analytics and AI, to address a knowledge gap by farmers. Record keeping: Digital tools that enable farmers to keep detailed records of livestock, including health and feeding data, to help mitigate diseases and avoid missed conceptions. Record keeping tools are also used to	Malawi, South Africa, Zambia

								keep details of input usage, procurement, cost and revenue and sales records., Information for farms to develop, manage, measure, and report a sustainability strategy for their business. The channels are principally computers, cloud-based databases, website, and dashboard. As a private company they have supported themselves, with support also from the Western Cape government. Their challenges include levels of digital literacy, farmer uptake and behavior change and address pain points around planning, inputs, and on-farm production. They are at the level of sustainable scale Implementing on over 300,000 Ha and resulting in water savings on farms and in catchments on average of 10% with as high as 30% in some cases. An integral part of the Western Cape Department of Agriculture's climate change response strategy. Their technology has been developed in conjunction with others and, has taken active approaches to ensure its inclusivity particularly for disadvantaged groups.	
■		■		■	GeoFarmer	GEOTERRAIMAGE (Pty) LTD	✓	GeoFarmer at GEOTERRAIMAGE Ltd is established in 2017 and has combined innovations in smart farming and digital advisory and e-commerce and are regional in their deployment across the entire SADC region. Whilst GeoTerraImage is a private sector company which provides actionable intelligence through monthly crop monitoring through GeoFarmer-©-Crop monitoring platform to support precision farming, and accurate information to map crop trends and statistics by using a dashboard in a cloud-based environment. The innovative solution provides - through the use of - computers, satellites and Earth Observation visual maps and illustrations, statistics and trends for each field or farm being analyzed (crop type, crop growth stages, land suitability, crop irrigation) and guiding decision making around farm management and practices for more efficient and sustainable production. GeoTerraImage have reached wide scale sustained adoption and operate in Angola, Botswana, Comoros, DRC, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, 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.	Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia, Zimbabwe

■	■		■	■	Global Farmers Connect	Global Farmers Connect	X	Global Farmers Connect operates in South Africa, Zambia, Zimbabwe. Global Farmers Connect is an artificial intelligence tool used to provide farmers with a platform to reach and sell their agricultural products directly to end consumers. Farmers also have access to information about their daily requirements such as farm equipment, greenhouse needs, animal farming, fertilizers, feeds, and qualified agronomists' advice.	South Africa, Zambia, Zimbabwe
■	■			■	GreenFingers Mobile	GreenFingers Mobile	X	GreenFingers Mobile from GreenFingers Mobile in Tanzania, South Africa, Zambia, and Zimbabwe. GreenFingers Mobile is a mobile-first Software-as-a-Service (SaaS) technology platform, to manage and finance large groups of smallholder farmers. Developed by a team of agricultural value chain experts, the platform easily adapts to different crop types and use cases.	South Africa, Zambia, Zimbabwe, Tanzania
■		■		■	iDrone4ag	iDrone Services	✓	Idrone4Ag (2017) from iDrone Services. iDrone Services is a start-up company providing Agriculture mapping services using Drones. They are working with commercial farmers and private companies in the use of drone for precision agriculture applications. iDrone Services provides drone-enabled crop imagery database and analysis services to the Zambian farmers. The main application platform is to build a Digital Farmers Profile Database (Aerial Image Capture and Data Portal for Agriculture and Food Security to Strengthen District Governance). They have 12 users.	Zambia
	■	■			Jumo	Jumo	X	Jumo is a market leading banking as a service platform, launched in 2015, which enables real-time access to funds at the lowest possible operating costs. They offer high quality providers of financial services products to connect entrepreneurs to world's growing markets. They also offer loans, savings, and a range of financial choices. They have a core next-to-end generation banking infrastructure. And unify which is a machine learning capability to analyze the data to reduce the cost and risk of lending by building accurate credit scores and target people who do not have a formal financial identity, collateral, or credit record. They also use automated algorithms to ensure they don't overextend themselves and have built protective safeguards into the heart of our technology. They have served 18M+ individuals and small businesses, with 120M loans and $3.5b+ dollars disbursed. They are active in Ghana, Tanzania, Kenya, Uganda, Zambia, Cote	South Africa, Tanzania, Zambia

								d'Ivoire and Pakistan with an operational tech hub in Cape Town, Nairobi, Porto and London.	
	■	■	■		Just Fresh Group Online Market	Just Fresh Group Limited	✓	Just Fresh Group Online Market (2019) from Just Fresh Group Limited. A Food and Agro-inputs supply chain company. They have around 908 users.	Zambia
■		■			Kulima	Agricomm-media	✓	Kulima-academy (2020) from Agricomm-media. Online agricultural learning for anyone anywhere. They have around 200 registered users. They want to address Improved farm productivity via increased access to research based agriculture information.	Zambia
■		■			Lima Links Farmer Platform	Lima Links Limited	✓	Lima Links Farmer Platform (2016) from Lima Links Limited. Lima Links is a social enterprise set up in August 2016 to connect smallholder farmers to the agricultural marketplace via its technology Platform. They have around 158,000 users.	Zambia
			■		Maano Virtual Farmers Market	World Food Program	X	Maano Virtual Farmers Market of World Food Program. Virtual Farmers' Market (VFM) is an app-based e-commerce platform where farmers' surplus and buyers' demand for crops are advertised and traded. VFM provides a transparent, open, and trustworthy space for smallholder farmers and buyers to negotiate fair prices and deals.	Zambia
■	■		■		Mulimi Apunzile	E-msika Services Ltd	✓	Mulimi Apunzile (2020) from E-msika Services Ltd. From the same company as eMsika. This is an online advisory information to farmers using live and on demand videos from experts, it is like a Udemy for agriculture. They have around 900 users.	Zambia
			■		Rovert Foods	Rovert Foods	X	Rovert Foods of Rovert Foods Convenient and safe fresh and dry foods delivery service within Lusaka, Zambia.	South Africa, Zambia
■	■	■			Small-Scale farmer seed production	Good Nature Agro	✓	Small-Scale farmer seed production from Good Nature Agro (2014). This is an integrated agriculture digital tool that can monitor production, logistics and supply of the legume value chain products and services. It has 15,000 users in Zambia and Malawi.	Malawi, Zambia
■	■	■	■	■	Smart Farmer	Riskflow DBS	✓	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	Botswana, Lesotho, Malawi, Mozambique,

								user friendly, efficient, and flexible ICT-based services which cut across many functions and access channels. The value of Smart Farmer is in assisting farming communities and other stakeholders in doing things smarter, with transparency, accountability, and efficiency, while driving profitability. As a response to the problems faced by agricultural communities, Smart Farmer provides the following services: Peer-to-Peer communication for Farmer-to-Farmer Interaction, Funder-to-Farmer Communication, Government-to-Farmer Communication, Price tracking and reporting, Agricultural alert systems (sending and receiving), Commodities offer and bid facilitation, Location services for service providers, Production information systems e.g., best practices, planning, e-Extension services. The Agri-VAS service assist farmers throughout the production cycle and livestock information and market prices – from planning to sale stages, whether locally, regionally, or globally. Smart Farmer offers a new way through which information systems in agriculture are vastly improved. Agri VAS are delivered via voice channels (IVR, helplines), text channels (SMS and USSD) and via apps., Smart advisory: Data-driven advisory based on tailored, farm-level agro-climatic and crop specific information to support decision making, 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. 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. b) Improved Yields through use of 3rd Party software that we have partnered with on our	South Africa, Tanzania, Zambia, Zimbabwe

								Platform such as Skudu to provide fertilizer and Insuring Yields through an Area Yield Index based Insurance model from PULA, our insurance partner. The regional initiative is active in Botswana, Lesotho, Malawi, Mozambique, South Africa, Tanzania, Zambia, Zimbabwe with 15,000 active users and 300,000 registered users and is in the transition to scale stage.	
			■		Soweto Uber	Soweto Uber	X	Soweto Uber of Soweto Uber. This is a web shop for all groceries and food stuff in Lusaka, Zambia. Soweto Uber is linking farmers and consumers.	Zambia
■					Viamo platform	Viamo	✓	Viamo 321 Platform from Viamo. The Viamo platform is implemented in Democratic Republic of Congo, Madagascar, Malawi, Mozambique, Tanzania, Zambia. Viamo is a global Mobile for Development (M4D) 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.	Democratic Republic of Congo, Madagascar, Malawi, Mozambique, Tanzania, Zambia

3.3 RESULTS FROM INNOVATION SURVEY RESPONDENTS

All identified innovators received a survey and 18 innovations implemented in Zambia responded. The answers on the survey are self-reported. Of the innovations that responded, nine were operational in Zambia only and the remaining eight operated in several countries. All identified innovators were reminded several times by email and by phone to complete the survey. The response rate of the survey for Zambia was 69% (18 out 26 identified innovations responded).

USE CASES AND SUB USE CASES

The division of GSMA use cases shows that in Zambia multiple use cases are most common. 14 out of 18 respondents provided multiple services and only four respondents provided a single use case. One respondent provides all five use cases in their innovation, one provides four use cases, seven provide three use cases and five provides two use cases.

Figure 8 provides the division of use cases. Digital advisory was the most common use case cited by all survey respondents, followed by digital procurement (11). Figure 8 also illustrates a comparison of use cases to the rest of the identified innovations in the SADC region.

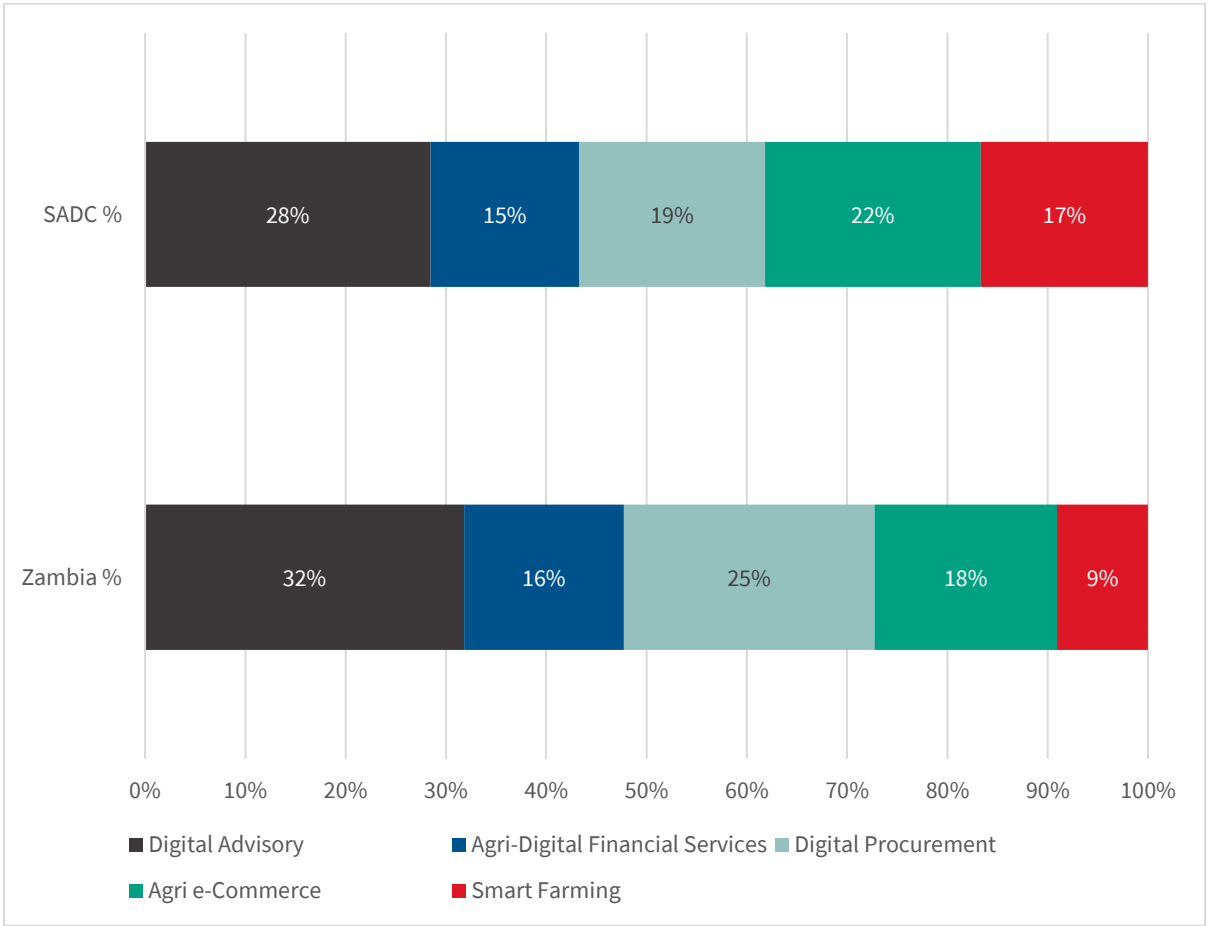

FIGURE 8 DIVISION OF USE CASES FOR SURVEY RESPONDENTS IN ZAMBIA VS. IDENTIFIED INNOVATIONS IN SADC

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

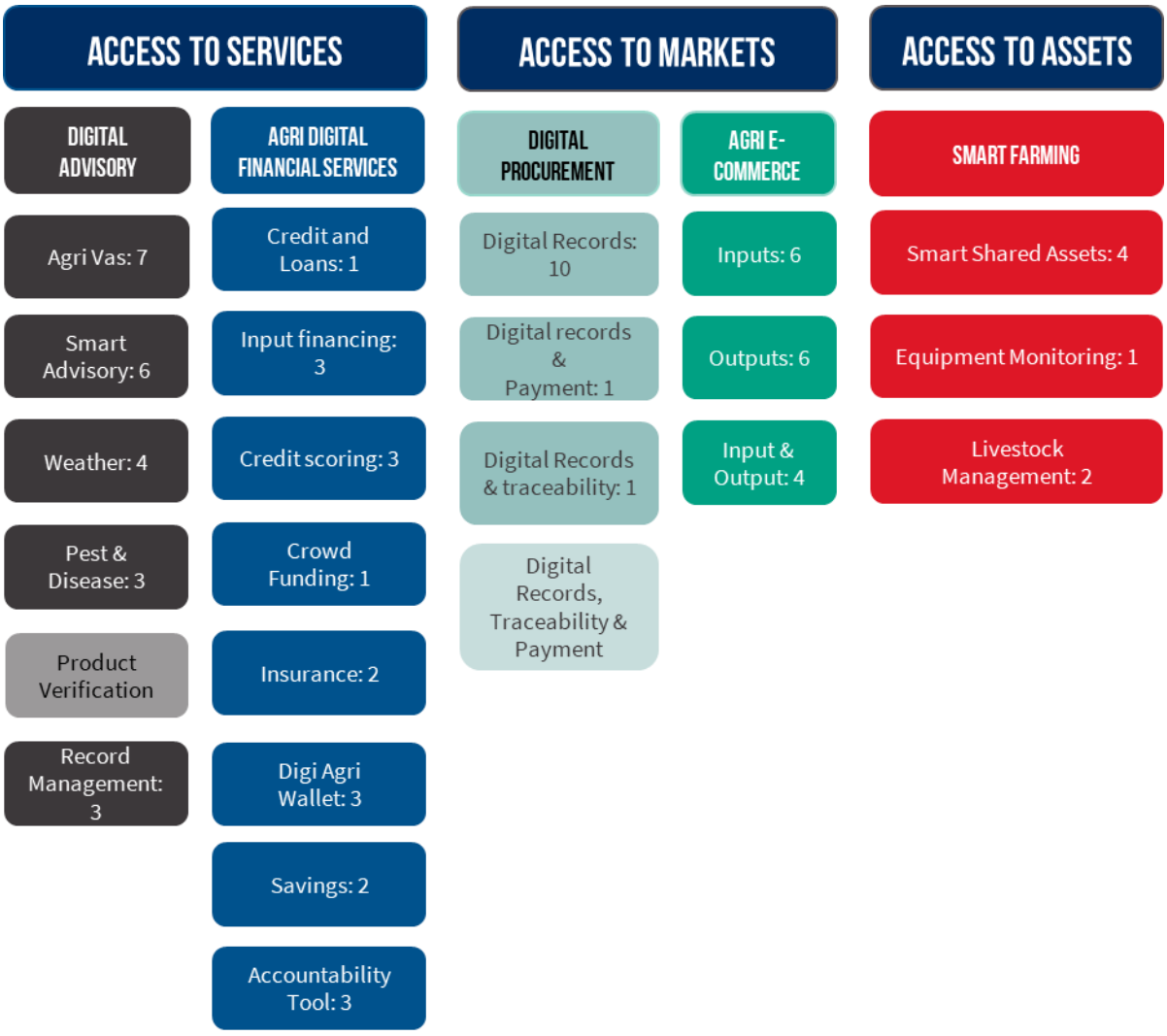

FIGURE 9 OVERVIEW OF SUB USE CASES PRESENT IN SURVEYED INNOVATIONS IN ZAMBIA

CHALLENGES

The survey respondents targeted a wide range of anticipated outcomes, the most common included addressing the knowledge gap (13), poor access to markets (12), low productivity (11) and financial exclusion (10).

By far the biggest challenge in the application of technology is digital literacy which was cited by all respondents (14) and farmer uptake or behavior change (10). A lack of mobile coverage (9), operational constraints (9), user affordability (7) and access to devices (7) were also provided as common challenges. One survey respondent mentioned explicitly the cost of onboarding farmers and the difficulty for business clients to pay for it. Another challenge mentioned was the slow user adoption because it takes time to build trust in the market. Another survey respondent mentioned "*Our biggest challenge has been sourcing funding (be it angel investors, impact investors or Grants) to accelerate the launch and development of the website and other innovation features such as USSD. We have received positive feedback from farmers, farmer groups and the government on the usefulness of our innovations and its potential impact on improving market efficiency and linking farmers to regional markets. However, a lack of local investors to come on board and support the development has been a major setback as we currently rely on founding members contributions, and*

unfortunately the team is mostly youths with limited personal resources" which is in line with another survey response.

TECHNOLOGY USE AND CHANNELS

A Website / Dashboard / Portal is the most common channel (16) followed by the Smartphone App (10). Spreadsheets are the most popular tool for analysis (13) followed by cloud-based databases (10).

VALUE CHAIN PHASES COVERED

Innovations in Zambia are more tailored for the earlier stages of the value chain and the last stage.

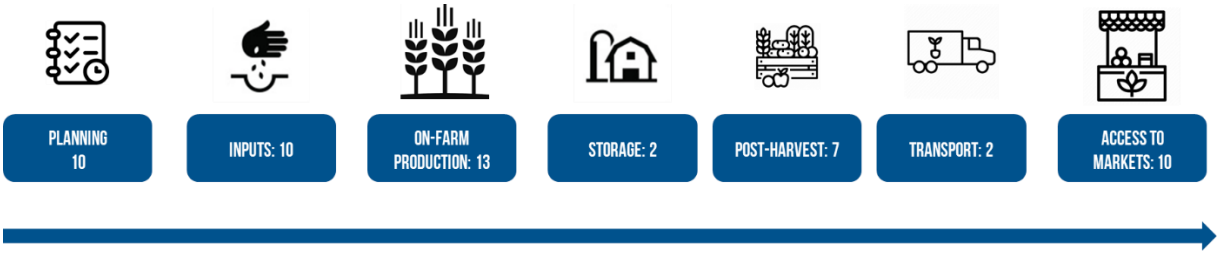

FIGURE 10 SURVEYED INNOVATIONS PRESENCE IN THE VALUE CHAIN IN ZAMBIA

DEVELOPMENT AND SCALING

All innovations surveyed were developed by private sector companies and were predominantly launched between 2020-2014. The oldest innovation is a food processing application from Matrix Software from 2002 and Fruitlook of eLeaf from 2010. Five innovations surveyed launched in 2020, four in 2019, and three in 2016 and 2015.

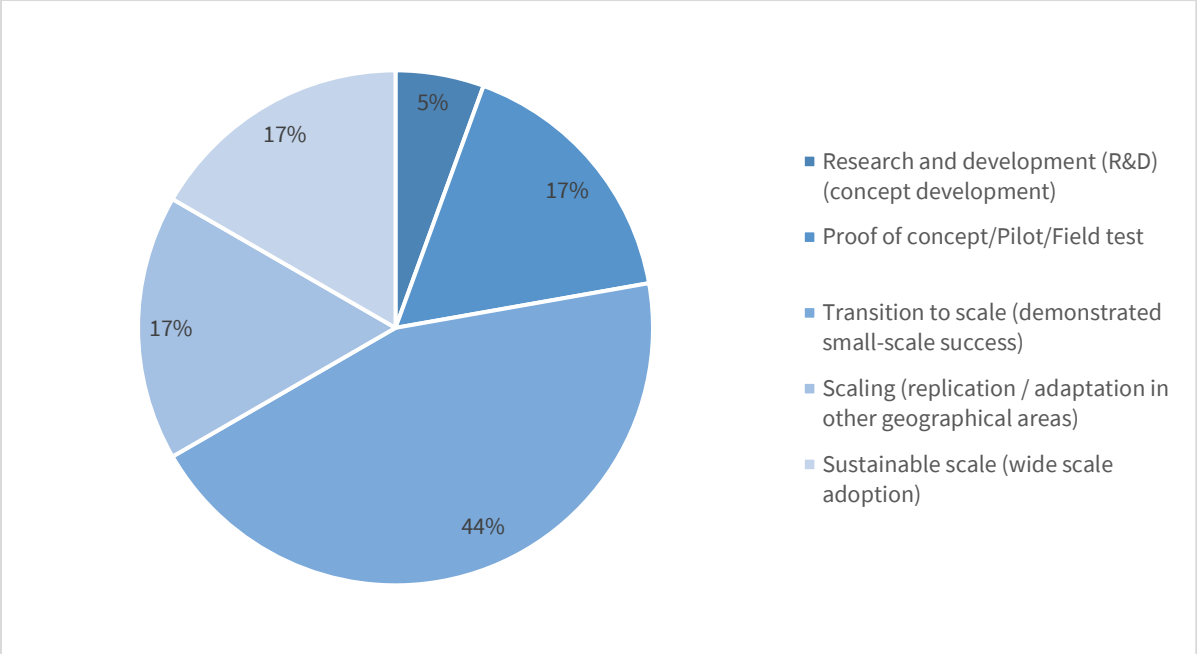

FIGURE 11 SCALING STAGES FROM SURVEYED INNOVATIONS IN ZAMBIA

Most digital innovations in Zambia are in a transitional stage of scaling based on the Insights on Scaling Innovation report[22]. Only 34% have reached a form of scale. Eight respondents are transitioning to scale, six of these are for Zambian-only innovations. All three respondents that were in the proof-of-concept phase were Zambian-only innovations. Interestingly, one innovation which is in the concept development phase is a regionally operated innovation. None of the innovations that were large scale adoptions were Zambian-only operations.

Zambian innovators typify many innovators by not having a common definition of 'scale.' A large innovator like Viamo, which has 8.5 million total registered users and 600,000 in Zambia, is still dependent on donor grants because their model relies on premium services to development partners, such as content creation, and dissemination of the information that the development partners would like to disseminate to subscribers (bulk IVR messages). Geo Farmer mentioned that they reached sustainable scale and do not need donor funding, but they did not provide information about the number of registered users they serve. Smart Farmer, with 311,000 registered users is a much smaller innovator than Viamo but sees themselves at Transition to Scale stage. Smart Farmer is still self-funded. Lima Links has 158,000 registered users and sees themselves in the Scaling phase (replication in other geographical areas). They have a business subscription model but also rely on CSR funding. Zambian companies often use a business subscription model for farmer cooperatives (10) followed by transaction fees (6) and individual subscriptions to farmers.

FINANCE AND REVENUE

The survey respondents were also asked how they financed the development and growth of their companies. Many private sector companies have bootstrapped using friends and family for support (7), but donor or grant money (7) is also very popular. Networking (6), incubators (6), business development (5), challenge prizes (5) and training opportunities (5) are also forms of support often utilized. Angel investors and crowd funding are not mentioned, and impact investment is limited (3). Four innovations did not need any subsidy or additional grant money anymore, while four others were unsure about it. Ten mentioned that they still need additional funding.

INCLUSIVITY

Not all innovations focus on inclusiveness. Seven innovations took explicit action to reach individuals with limited or low literacy levels (use of IVR, for example) and five for smallholder farmers (with videos for example). For people with disabilities, 11 companies mentioned that no specific action was taken to be more inclusive. Only Viamo mentioned that they took specific action to reach vulnerable groups.

4 DIGITAL AGRICULTURAL SKILLS AND ENTREPRENEURSHIP TRAINING

The main development outcomes of Zambia's Seventh National Development Plan for 2017-2021 are enhanced ICT, more job opportunities in the economy, and opportunities for improved education and skills development. Zambia's Vision 2030 prioritizes a diversified, balanced, and strong industrial sector, a modern agricultural sector, and an efficient and productive services sector. It also emphasizes a nation that is technologically proficient, fully able to adapt, innovate and invest using its human and natural resources. The Zambia Academic Research and Education Network (ZAMREN), a specialized provider of internet and advanced ICT services to research and educational institutions, is supported by the Government of Zambia to address the challenge of "universal internet access to all." ZAMREN has provided fiber optic last mile connectivity to several higher education institutions, and they are benefiting from significant reductions in the cost of dedicated bandwidth.

4.1 AGRICULTURAL SYLLABI UNIVERSITIES

Three Agriculture Universities were approached to respond to the survey:

- University of Zambia, The School of Agricultural Science
- Copperbelt University
- Mulungushi University

Only University of Zambia responded to the survey and participated in the KII.

UNIVERSITY OF ZAMBIA

Department of Agricultural Economics and Extension

The Department of Agricultural Extension is one of the five departments of the University of Zambia housed in the School of Agricultural Sciences. The Department of Agricultural Extension offers various onsite and online digital training courses. Regarding the levels of implementation of these digital trainings: nine of them are delivered at B.Sc. level, one at M.Sc., and one at Ph.D. level. The digital entrepreneurship in agriculture course is delivered at the B.Sc. level. The digital entrepreneurship training courses focus on Agri digital financial services, smart farming, and ICT-enabled advisory services. Students in the School of Agricultural Sciences are trained to improve their ICT skills. The University does not have the necessary infrastructure or equipment, but staff engage students in field visits to create opportunities for practice and experiential learning. According to the Department of Agricultural Extension, equipping young people in data collection will facilitate their absorption into Zambia's agricultural labor market sector. The experimental farm is considered the most important facility for digital training.

The University of Zambia has good ICT infrastructure, Wi-Fi is accessible to students and staff members. The Covid-19 pandemic has accelerated the use of e-learning platforms that were developed eight years ago but were previously under-used. Digital and entrepreneurship skills taught include data collection skills for research such as GIS (geographic information system), precision agriculture and agricultural management. The University is working with the RUFORUM network on an agri-skills project. Digital skills are one of the key

components of the agri-skills project. Numerous collaborations on agribusiness entrepreneurship exist between the University, the Agribusiness Incubation Trust and MUSIKA. MUSIKA is a company working with startups to accelerate agribusiness entrepreneurship in Zambia.

TABLE 8 OVERVIEW OF RESPONSES FROM SURVEYED UNIVERSITIES IN ZAMBIA

ZAMBIAN UNIVERSITIES	
University of Zambia (School of Agri Sciences, and Department of Agri Economics and Extension)	
Digital Agri Skills	Digital entrepreneurship in agriculture Precision agriculture for agricultural engineering GIS
Digital training courses updated	Yes
Digital entrepreneurship trainings	Agri Digital Financial services, Smart Farming, ICT-enabled advisory services
Type of Skills building	Launching an enterprise Finding a job as an employee Working for the public sector Working in advancing research (PhD, research institutions, others, etc.)
Most important digital Agri skills	Data Collection
Most important facility for digital trainings	Experimental farms
Aligned with institutional strategy	Unsure

4.2 INCUBATORS AND INNOVATION HUBS

Zambia has nine incubators but only one supports agricultural entrepreneurs specifically. The general business support organizations that indicated any focus or activity in the agricultural sector were the Asikana Network, Forloop, Agora Code Community, LudoHub, Facebook Developer Circle: Lusaka, WEAC Zambia and Renovative Codes. However, we did not find evidence of trainings and incubation activities dedicated to agricultural entrepreneurs and therefore they were not targeted for the KIIs.

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

- BongoHive
- Agribusiness Incubation Trust (AgBIT)

From further investigation, the study team became aware that AgBIT is not currently functioning and the remaining business support organization that responded to our request and took part in a KII is BongoHive.

BONGOHIVE

BongoHive is Zambia's first private technology and innovation hub. BongoHive has supported almost 100 businesses at different stages since its establishment in 2011. The digital training and tools for graduates and young agriculture entrepreneurs cover financial management for SMEs (how to use financial management software) and digital marketing. In the agriculture theme they support startups/SMEs by providing a CTO (chief technology officer) and they create partnerships with existing digital service providers. The main target beneficiaries of these trainings are graduates and young agriculture entrepreneurs. Those involved in traditional farming or value chains are not that young anymore but those involved in the e-commerce and

markets businesses are younger. BongoHive stipulate that agriculture entrepreneurs have an established business idea.

BongoHive have an internal digital team of seven technology experts. These technology experts are not specialized in digital agriculture and depending on opportunities BongoHive sometimes chooses to work with external experts. For the agricultural sector program, they have one non-technical person who works on running agri-incubation programs assisted by three others. BongoHive collaborates with Copperbelt University, University of Zambia, Mulungushi University and ZCAS University.

TABLE 9 OVERVIEW OF RESPONSES FROM INTERVIEWED INCUBATORS IN ZAMBIA

ZAMBIAN INCUBATORS	
	BongoHive
Year of Establishment	2011
Agri start-ups incubated	100+
Target of Digital Agri trainings	Graduate Young agriculture entrepreneurs
Digital Skills trainings	Financial management for SMEs Financial management software
Digital Agri Tools taught	Agri Digital Financial services Digital Procurement Agri-e-commerce Smart Farming
Collaboration with Universities and Colleges	Copperbelt University University of Zambia Mulungushi University ZCAS University
Supported by the Government?	No

5 INSIGHTS AND REFELECTIONS

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

Zambia ranked tenth out of 16 in the benchmark assessment which suggests that it has some key foundational elements necessary for a robust digital economy. 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. Zambia ranked in the middle of the SADC member states for most pillars except digital government (which identifies the presence and use of digital services and platforms to enable public service delivery) where it ranked fourteenth. Zambia ranked highest, fourth, in the digital business pillar (which identifies the development of a robust marketplace for digital trade, digital financial services, and digital content).

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. Zambia makes up part of Group 3, these countries ranked in the middle of the benchmark and tend to be more reliant on agriculture for employment and economic growth.

POLICY ENVIRONMENT

The benchmark assessment suggested that Zambia's digital economy is underdeveloped, however the stock take of national policies and strategies identified that digitalization is being prioritized in Zambia, with a few national documents published more recently (2021). Three key documents were available for review that focused on a general approach to integrating ICTs or transforming to a digital economy. There were also two specific documents available that guided on a specific agenda such as cybersecurity or e-Government. Of particular interest is the efforts that Zambia has made to publish updated versions of documents, such as the ICT Policy, to incorporate more focus on emerging technologies and the risks associated with greater digitalization, security, and privacy. This kind of agile approach is needed when attempting to transform to a digital economy to keep pace with the changing nature of technologies and risks associated with digital transformation. The responsive process to repeal legislation when they are outdated, or contradictory is also encouraging and provides validation of the importance of this agenda across government.

It is unclear to what extent digitalization has been embraced in the agricultural systems when reviewing sectoral policies and strategies as little reference is made to these topics, but it was deprioritized in the most recent ICT Policy. There are two assumptions that could be made for this omission: a sector specific digital plan is in development and so detailed plans were not included in the national strategy, or there was limited collaboration across government when developing the most recent policy. The latter assumption is based on a discrepancy between the earlier ICT policy which did feature a section on digitalization in agriculture, but which was subsequently missing in policies and strategies developed specifically for the agriculture sector.

Policies require implementation to promote entrepreneurship and increase access to capital so that solutions can be developed across the economy. However, the agriculture sector should support an environment that will allow for the integration of these innovations such as increasing digital skills, improved connectivity, and farmer uptake so that strategies and policies complement each other and support the overall digital ecosystem.

DIGITAL AGRICULTURE INNOVATIONS

Generally, the digital agricultural sector is still in its infancy. This has not stopped the integration of some digitalization but the reach of this seems to only be in digital advisory, although digital procurement is rising. A sign of more emerging digital agriculture solutions is the bundling of services that is found in more and more innovators. The biggest challenge for innovators is to access finance to move from a proof-of-concept phase to scaling up. Many innovations are financed by bootstrapping or friends and family, but angel investors and venture capitalist are less accessible in Zambia. Innovators therefore still rely heavily on donor grants for investments.

DIGITAL AGRICULTURAL SYLLABI AND ENTREPRENEURSHIP TRAINING

While digital agricultural trainings are acknowledged as crucial skills to prepare young people for the labor market, the institutions interviewed still lacked equipment that was tailored or adapted and have poor infrastructure and resources to train students and youth. Enhancing agri-entrepreneurship with necessary technology and equipment will enable universities to provide a more consistent and updated curricula on digital agricultural skills and prepare the trainers and teachers with new methodologies and contents.

Universities in Zambia would benefit from sharing curricula with their peers in the region so that they collaborate to strengthen their curricula for digital agriculture. Shared infrastructure through the local national research and education network (ZAMREN) or selected centers could cut down costs of each university purchasing its own equipment.

For the incubator interviewed, CCARDESA could support the local ecosystem by bringing together stakeholders to address the opportunities and the challenges of the digital agriculture sector to achieve better coordination of targeted activities. A regional guiding policy for digital agricultural skills and digital agricultural entrepreneurship training would be useful in creating a standard for universities and innovation hubs.

5.2 REFLECTIONS FROM THE SITUATIONAL ANALYSIS

This document has presented the available data collected for Zambia 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 Zambia include:

- **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.** Government has a role in improving access to the digital communication channels for the population and farmers. This will go some distance in preparing the market demand for new solutions and enable farmers to exploit the opportunities.

- **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.** The FAO states that "committing piecemeal resources to ICT4Ag on an *ad hoc* basis results in higher costs and lower impacts" and that any effective roadmap will require "a holistic, multi-stakeholder approach as ICTs is also driving other sectors critical for agriculture, namely banking, weather monitoring, insurance, logistics and e-governance"[23]. A clear agriculture sector specific strategy or roadmap can address some of the key challenges raised by stakeholders consulted during this study.

- **There is a missing middle in terms of funding for innovators that move from start-up to scale-up.** Survey respondents use different financial mechanisms to underpin their innovations. Most innovations are still dependent on donor grants for further investments in new functionalities and services. Respondents report the challenges moving beyond the start-up phase, especially in being able to access appropriate finance and develop their capacities to expand their users or customer base. In Zambia many of the innovations reported relying heavily on further donor grants and subsidies.

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

REFERENCES

[1] World Bank (2020) Population, total | Data
[2] UNDP (2020) Human Development Indicators | Zambia
[3] World Bank (2020) GNI per capita, PPP (current international $) | Data
[4] UNDP (2020) Human Development Indicators | Zambia
[5] World Population Review (2021) Poverty Rate by Country
[6] Global Food Security Index (2020) Rankings and trends
[7] African Union (2020) Digital Transformation Strategy for Africa
[8] OECD (2019) Going Digital: Shaping Policies, Improving Lives
[9] UNDP (2020) Human Development Indicators | Zambia
[10] GSMA (2019) Mobile Connectivity Index | Zambia
[11] UNDP (2020) Human Development Indicators | Zambia
[12] The Inclusive Internet Index (2021) Overall rankings
[13] GSMA (2019) Mobile Connectivity Index | Zambia
[14] World Economic Forum (2018) GCI Profile | Zambia
[15] World Bank (2019) GCI 4.0: Digital Skills Among the Population Index
[16] ReSAKSS Annual Trends and Outlook Report (2020) The Enabling Environments for the Digitalisation of African Agriculture
[17] OECD (2019) Regulatory effectiveness in the era of digitalization
[18] Forbes (2018) Law is Lagging Digital Transformation – Why It Matters
[19] CABI (2021) Digital extension campaign boosts farmers' knowledge and capacity to manage fall armyworm in Zambia
[20] The Policy and Monitoring and Research Centre PMRC (2018) The E-voucher restructuring 2018-2019
[21] FAO (2020) Use of ICT in agriculture and enhancing extension services to promote conservation agriculture
[22] International Development Innovation Alliance (2017) Insights of Scaling
[23] OECD (2019) Digital Opportunities for Better Agricultural Policies

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