DIGITAL AGRICULTURE COUNTRY STUDY ANNEX: ANGOLA

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

iMC worldwide

CCARDESA
Centre for Coordination of Agricultural Research and Development for Southern Africa

WORLD BANK GROUP

DIGITAL AGRICULTURE COUNTRY STUDY ANNEX: ANGOLA

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 Angola is an annex to the *Situational Analysis Report* and provides a snapshot of 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 Angola 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 Angola, 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 Angola 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 Angola, Mr. Alberto Sili Mateus (Agronomy Research Institute) and a new focal point person Mr. Tarcísio Baptista (Agronomy Development Institute). The study team also worked with a National Consultant in Angola, Ms. Erica Taveres. In addition, the APPSA contact person Dr. Ribeiro João António (MINAGRIF) was interviewed.

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).
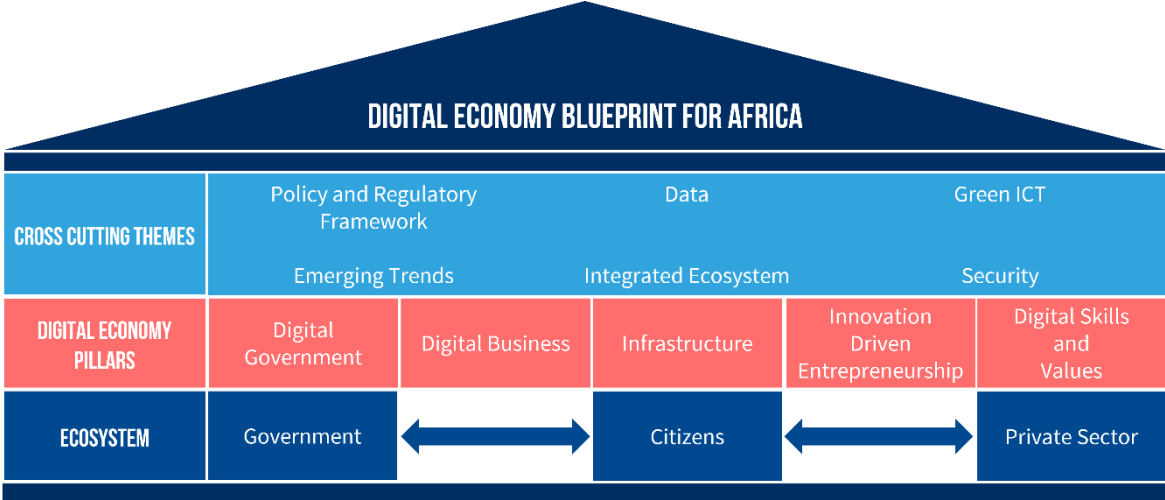

FIGURE 1 OVERVIEW OF KENYAN DIGITAL ECONOMY BLUEPRINT

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

Each identified innovator was sent a survey, 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.
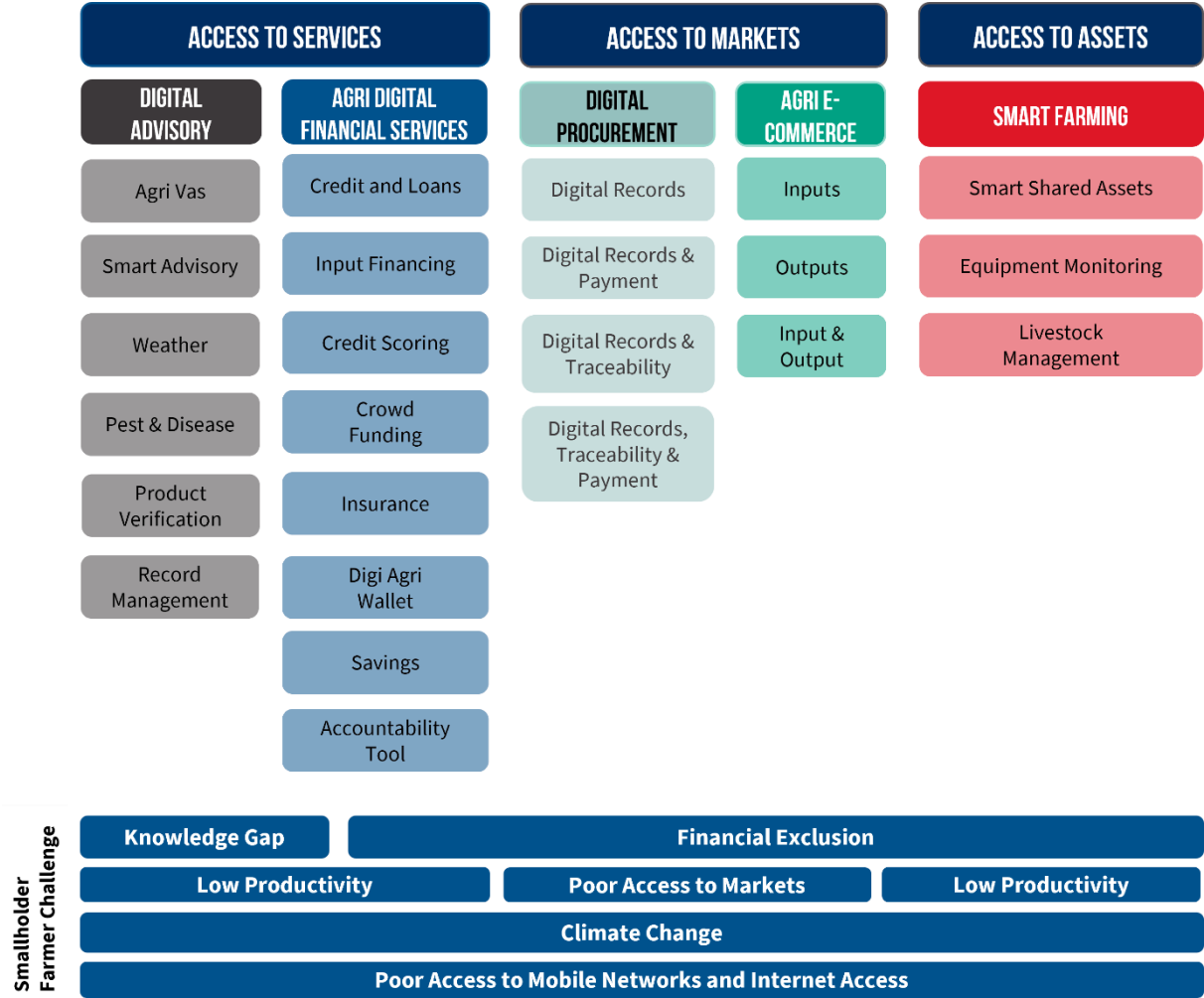

FIGURE 2 USE CASE MODEL BASED ON THE GSMA FRAMEWORK

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

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

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 different faculties were contacted). The names and addresses of these University contact points was facilitated via collaboration with the RUFORUM University membership in the SADC member states. The study team also carried out KIIs with representatives of faculties of agriculture at selected Universities and Incubators. The full list of universities and incubators approached, tools used, and stakeholders interviewed can be found in annex 3-4 and 8-10 in the *Situational Analysis Report.*

LIMITATIONS TO THE METHDOLOGY

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.

The current DACS is a snapshot in time as new digital innovations are in development in Angola 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 this 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 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.
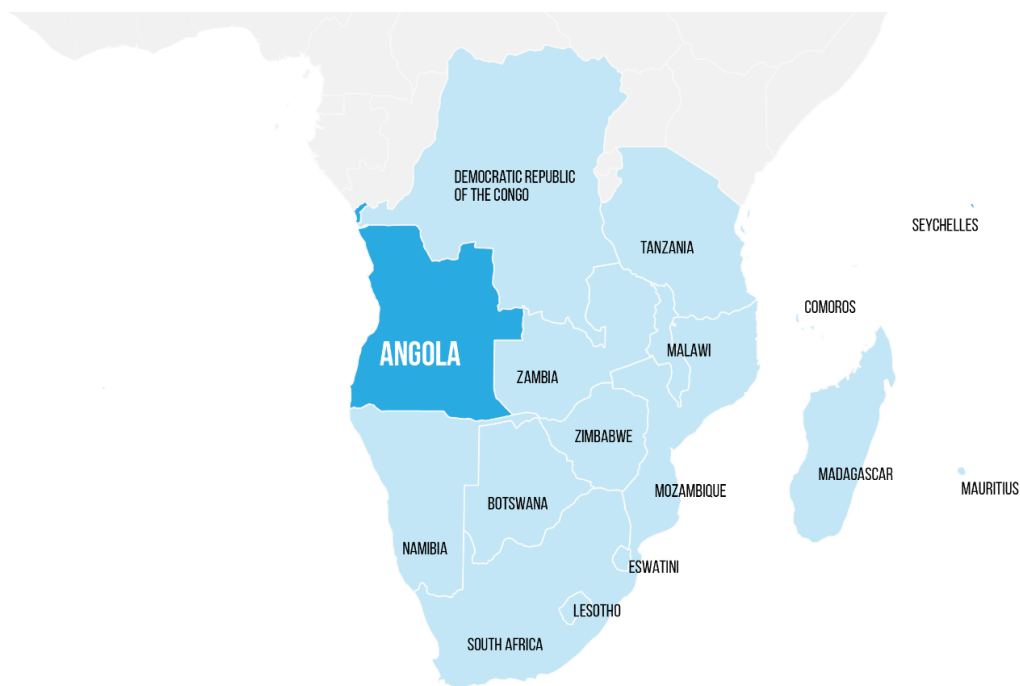
1.3 COUNTRY CONTEXT

FIGURE 3 MAP OF ANGOLA IN SADC

Angola is a lower-middle income country with a population of 32.8 million.[1] The UNDP's Human Development Indicators[2] rank Angola as low as 148th out of 190 countries and eighth out of the 16 SADC countries. Angola scores on the lower scale in the region for gender equality with a Gender Development Index of 0.903[3]. It is one of the poorest countries in the SADC region with a Gross National Income per capita of only $6,320 (compared to an average of $8,277 in the region)[4]. Although 51.1% of the population falls under the UN Multidimensional Poverty Index[5], only 32.3% live below the poverty line according to the World Population Review[6]. This is still below the average rate of the SADC region of 40.8%. The median age of Angola's population is also significantly younger than the average in SADC with 16.7 years (versus 22.1 years).

AGRICULTURE ENVIRONMENT

In the case of urbanization, Angola is above average in the SADC region with 66.2% living in urban areas. Although only 9.43% of the GDP is earned in agriculture, 50.73% of the population works in the agriculture sector (higher than the average of the SADC region of 43.37%). On the Global Food Security Index, Angola ranks as the 97th country with an overall score of 42.1 making it the fourth in the SADC region alone[7].
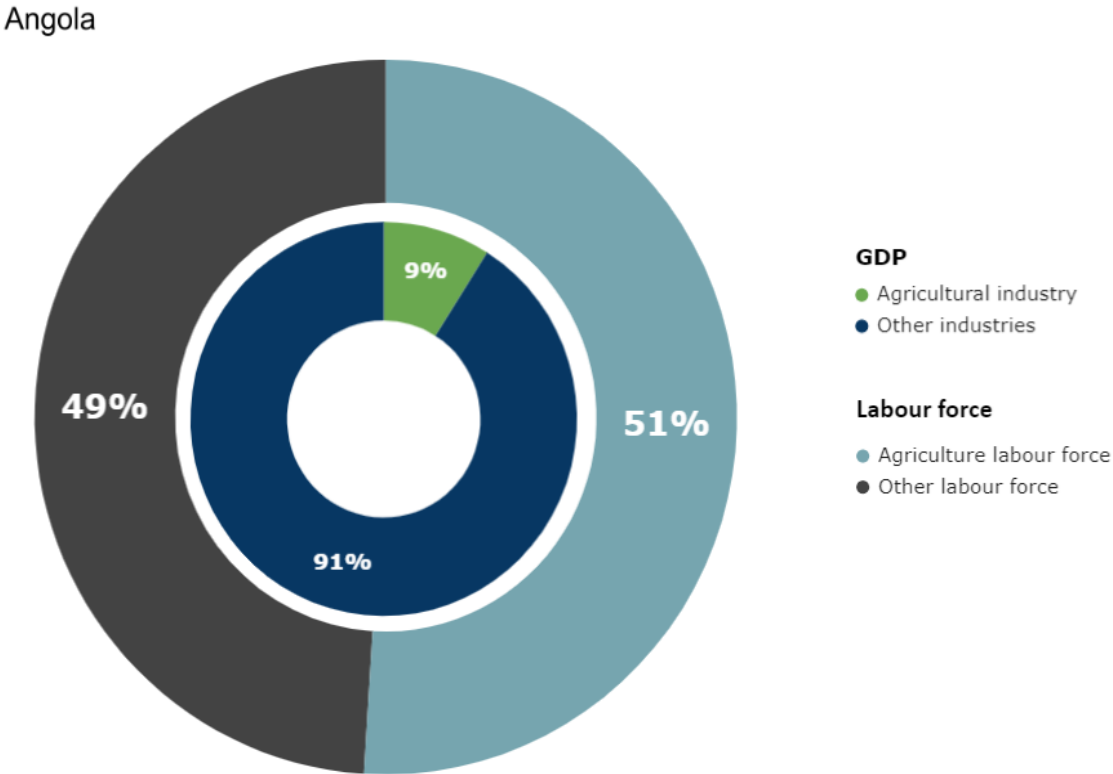
FIGURE 4 ANGOLA'S AGRICULTURAL INDUSTRY SHARE OF GDP AND THE SHARE OF THE AGRICULTURAL LABOR FORCE

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

sustainable growth[8]. 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.
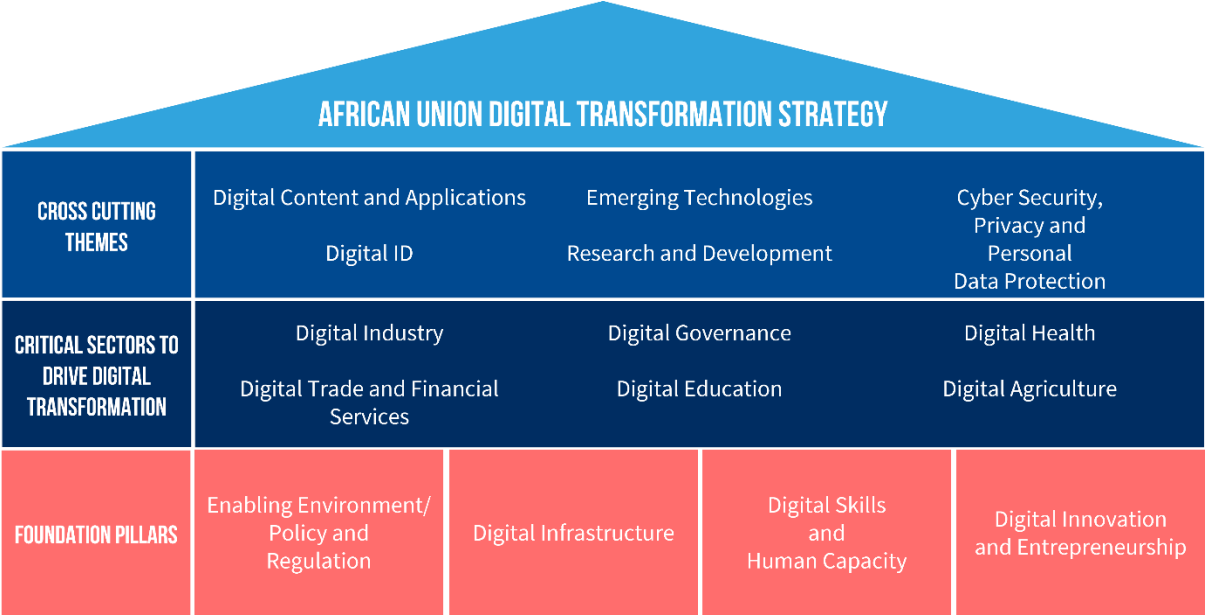

AFRICAN UNION DIGITAL TRANSFORMATION STRATEGY

CROSS CUTTING THEMES	Digital Content and Applications Digital ID	Emerging Technologies Research and Development	Cyber Security, Privacy and Personal Data Protection
CRITICAL SECTORS TO DRIVE DIGITAL TRANSFORMATION	Digital Industry Digital Trade and Financial Services	Digital Governance Digital Education	Digital Health Digital Agriculture
FOUNDATION PILLARS	Enabling Environment/ Policy and Regulation	Digital Infrastructure	Digital Skills and Human Capacity	Digital Innovation and Entrepreneurship

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[9].

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 economy. 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 Angola are illustrated in table 3.

TABLE 3 BENCHMARK PILLAR SCORES: ANGOLA

Angola	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

Digital Agriculture Country Study Annex | **Angola**

The benchmark assessment identified four clusters of countries:

Group 1: South Africa, Mauritius, 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: ANGOLA
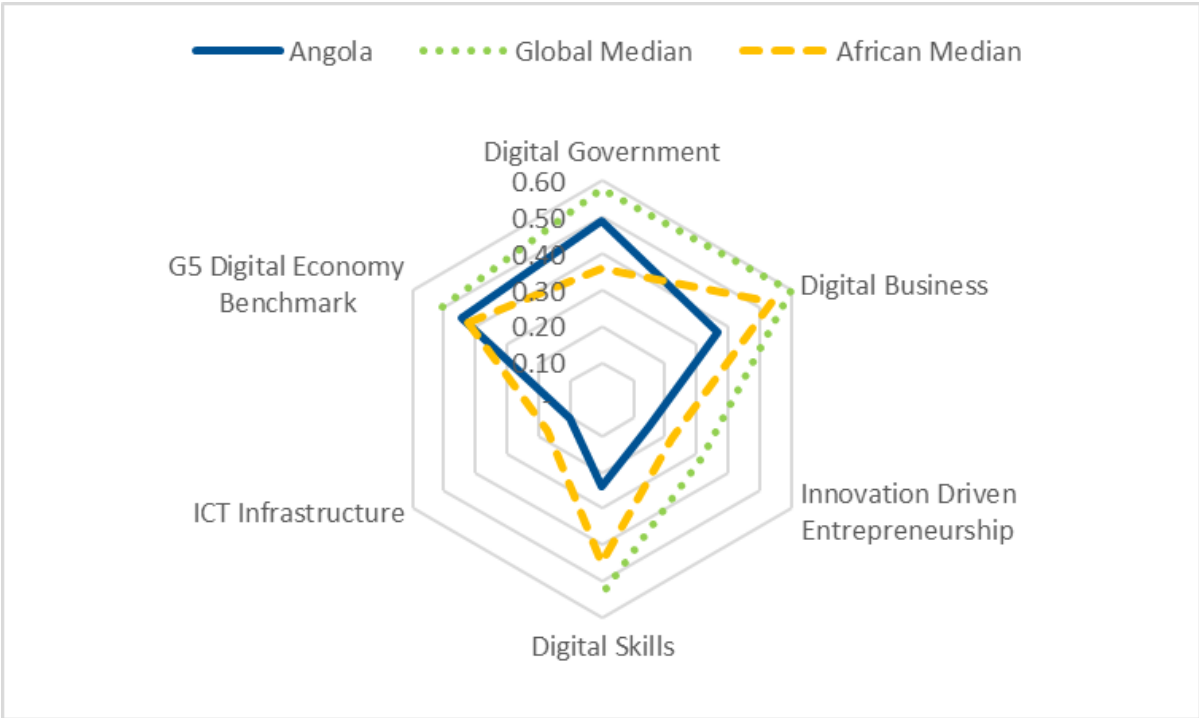
FIGURE 6 RESULTS FROM BENCHMARK ASSESSMENT FOR ANGOLA

In the benchmark assessment Angola ranked 13 out of the 16 SADC member states. Figure 6 below, illustrates the results of the benchmark in comparison to the Global and African medians. Angola is only ahead of the African median in two indicator areas, Digital Government, and the G5 Digital Economy Benchmark. In the other four assessment areas it lags most of the SADC member states. The benchmark suggests that Angola may be lacking in some key foundational areas necessary for a robust enabling digital economy.

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

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

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

DIGITAL INFRASTRUCTURE

Angola ranked 12 out of the 16 SADC member states in the ICT Infrastructure pillar, a key foundational element required for a digital economy. According to the UN, 14.3% of the total population is using the internet[10]. This is much lower than the regional average of 29.94%. The GSMA Mobile Connectivity Index shows a 71% access to the 3G network[11], which complements the HDI report of mobile cellular subscriptions at 43.1 per 100 people[12]. Angola also ranks as 110th on the Inclusive Internet Index[13] which details the accessibility, affordability, and relevancy of internet in 120 countries. In contrast to the findings of the benchmark, according to the Mobile Connectivity Index[14] , Angola is ranked number 4 in terms of overall mobile connectivity in the SADC countries with an overall index of 43.5—which qualifies it as an emerging country (above 35). It scores above average for consumer readiness, affordability, availability of infrastructure and content and services[i]. In terms of ICT adoption, Angola scores position 119 (out of 140). The Angolan government is not considered future oriented based on the position 130 (out of 140) and it scores last on the innovation capability index as number 140 out of 140[15]. However, it scores higher with 2.45 out of 7 points on the GCI 4.0 Digital Skills Among the Population Index[16], which is below the SADC average.

---

i 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 Angola ranked 13 out of 16 in the region, lagging in all indicators except digital government and the G5 benchmark. The low scores and ranking in the assessment pillars indicate that Angola is lacking in some foundational requirements for a digital economy and that there is likely a poor enabling environment for a digital economy. In the *Situational Analysis Report* the clusters of SADC countries identified from the benchmark are discussed in more detail but Angola forms part of Group 4 which is made up of countries that scored poorly in the benchmark, are generally more reliant on agriculture for GDP growth and employment and are non-English speaking member states.

The purpose of this section is as follows:

- Take stock of available public policies, strategies, and legislation to understand their scale and scope and assess whether digitalization has been 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[17]. 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[18]. The inherent risks of rushing policies and regulations into effect must be weighed up against the benefits, as getting the pacing wrong could lead to greater barriers to innovation and risks creating regulations that could be outdated[19].

2.1 GENERAL DIGITAL POLICIES

Souring relevant policies, strategies, and legislation for this study was challenging as the information on government websites was limited. However, a number of documents were obtained, and these present an optimistic overview that digitalization is being integrated into development plans.

POLICIES, STRATEGIES AND PLANS

The **National Information Society Plan (NISP) 2013-2017** follows on from a previous Information Society Policy which was not available for review. The NISP provides a clear guide in how to integrate ICTs within the wider economy to stimulate growth and development. The Plan is focused on the following pillars: infrastructure and connectivity, digital citizenship, e-Governance, Agriculture, Rural Development, Environment and Fisheries, Health, Education, industry, trade, and services, and focuses on five overarching aims: ensuring social inclusion, universal education, improving health care, stimulating the private sector and providing better services to citizens and businesses. There is a balanced focus on improving the more structural challenges such as infrastructure, connectivity, and access points, with the sectoral focuses on increasing competitiveness and productivity in areas such as agriculture and e-commerce. The plan sets out

the responsibilities of all stakeholders and calls for a cross-ministerial approach so that all sectors can benefit from learning and opportunities. However, beyond stating the suggested programs there is no additional detail on funding or implementation provided.

The **White Paper on Information and Communications Technologies 2019-2022** sets out the policy and strategy measures to take Angola to the next level of 'digitalization' with a deliberate focus on the digital economy. The White Paper shares similar objectives to previous ICT Policies (White Paper on Telecommunication Policy in Angola in 2001; Information Society Plan; Electronic Governance Action Plan 2005)[ii] and builds on them to provide updated policies and strategies that incorporate the learnings previously achieved and also integrates new challenges that are arising in this space along with emerging technologies. It also follows closely to the national development plans such as the **National Development Plan 2019-2022** and **Angola 2025.**

The White Paper is a keystone document that provides clear guidance on the direction Angola wants to take in unlocking the digital economy. It updates the previous plan focusing on the more advanced or next generation technologies and services including 5G, fiber, and Internet of Things. Focus is placed on e-Government and digital platforms to increase integration into daily life and increase uptake. Public and private Data Centers are suggested to stimulate support for the digital environment, as well as a focus on security and privacy. There is also a strong emphasis on updating and developing a new regulatory framework that prioritizes organizing the electronic communications market to provide the best options in price, quality and security, and prioritizing the protection of the consumer and their rights. The White Paper is a strong indication that Angola intends to prioritize digitalization into the wider economy.

2.2 LEGISLATION

There are four key legal documents in Angola relevant to the sector and one regulatory item is included below as well:

- The **Basic Telecommunications Law 8/01** provides a legal framework that allows and guarantees the expansion and modernization of the national telecommunications system and the provision of quality telecommunications services at affordable prices. The following are also objectives of this law: promote public and private investment; guarantee competition among service providers; eliminate exclusive or special rights to service providers; promote competition on the basis of transparent rules for licensing of services; determine universal service obligations and extend basic services to rural and remote communities; promote the development of new services and networks; avail technologies that facilitate cost efficient service provision; ensure efficient use of the frequency spectrum and numbering resources; and protect consumer rights.

- **Data Protection Law 22/11** provides legal rules to the processing of personal data and to respect public freedoms and fundamental rights. The law draws on provisions from the EU and Portuguese legal regimes for the protection of personal data[20].

[ii] These documents were not available for review but were referenced in the White Paper.

- **Electronic Communications and Information Society Services Law 23/11** revokes the Basic Telecommunications Law 8/01 and contains specific data protection rules for personal data generated from electronic communications.

- **Protection of Information Systems and Networks Law 7/17** establishes the legal regime for cybercrimes and includes definitions on illegal access, data interference, fraud, forgery, and copyright infringement.

- **Regulation on Information Technologies and Services 202/11** provides regulation on electronic transactions, electronic documents and records and electronic signatures.

2.3 DIGITALIZATION IN AGRICULTURE

DIGITAL IN AGRICULTURE POLICIES

Collecting agricultural policies, strategies and plans was challenging as many were not accessible or available online. There does not seem to be a specific sectoral strategy or policy on digitalization within agriculture, however agriculture has been included within the key national policies.

In the **Information Society Plan,** agriculture is featured as a key pillar with emphasis on boosting the non-extractive primary sector which involved strategies and programs to increase information and knowledge sharing between stakeholders. Suggestions included a multi-channel platform for agriculture, a commodities exchange platform and increasing capacity within the sector for better uptake and integration of ICTs. In the recent **White Paper** agriculture is again identified as a key industry that could benefit from the use of geographical information systems and knowledge-based systems that are incorporated into technologies employed in the field. The White Paper also acknowledges the need for data, information, and knowledge management at all stages of the production chain which could include intelligent irrigation systems, precision agriculture involving the application of embedded intelligence, automation and local sensor networks for soil mapping, and monitoring of disease and meteorological variables to obtain more data on production and environmental aspects. It seems that digitalization within the agriculture sector in Angola is at the embryonic stage when reviewing available documentation and there seems to be a lack of a guiding strategy in place. This is not to suggest that digitalization is not occurring in Angola but that no evidence was available.

CHALLENGES

To be able to unlock the digital economy and utilize the digital plan included in the White Paper, some challenges need to be addressed. A key barrier to embracing digitalization in agricultural systems is a lack of a guiding policy framework and regulatory support that integrates the use of technologies and services. Efforts have been made to implement ICTs within the agriculture faculties but without any guiding policies to sustain them.

There are also some practical challenges in implementing digital, including the level of digital literacy among farmers and agro-technicians and the current infrastructure in place to enable them. This was also highlighted in the benchmark assessment with Angola scoring below the regional and the continental medians on ICT infrastructure and digital skills. Alleviating these barriers is usually outside the remit of the Ministry of Agriculture and requires impetus of other stakeholders and collaboration with the private sector to increase

competitiveness and ensure quality and affordable services. Connectivity is one of the biggest barriers to realizing the benefits of digital. The White Paper calls for concrete actions to be defined for the digitalization of the agricultural sector, providing an impetus to prepare a strategy or policy which clearly defines the challenges that exist and opportunities to create an enabling environment through greater partnerships and stakeholder involvement. A clear policy or strategy for agriculture that includes smallholder farmers, and the private sector could be used as an advocacy tool to push for greater funding and prioritization.

There is plenty of opportunity for Angola to embrace digitalization within the agriculture value chain for improved efficiency and productivity gains but many of the barriers that currently exist require efforts outside of the Ministry. However, producing a strategy or policy that includes all the departments of the Ministry to share information and knowledge and builds on the benefits already acknowledged in the White Paper could prove to be a useful advocacy tool for greater funding and prioritization.

3 DIGITAL AGRICULTURE INNOVATIONS

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

3.1 MAPPING THE DIGITAL AGRICULTURE INNOVATIONS

The DACS for Angola 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 13 innovations were identified in Angola that had a mix of use cases as illustrated in Figure 7 below. Only three identified innovations had more than one identified use case (GeoFarmer with three and Alfa Sementeira Limitada & AgriTPG with two).
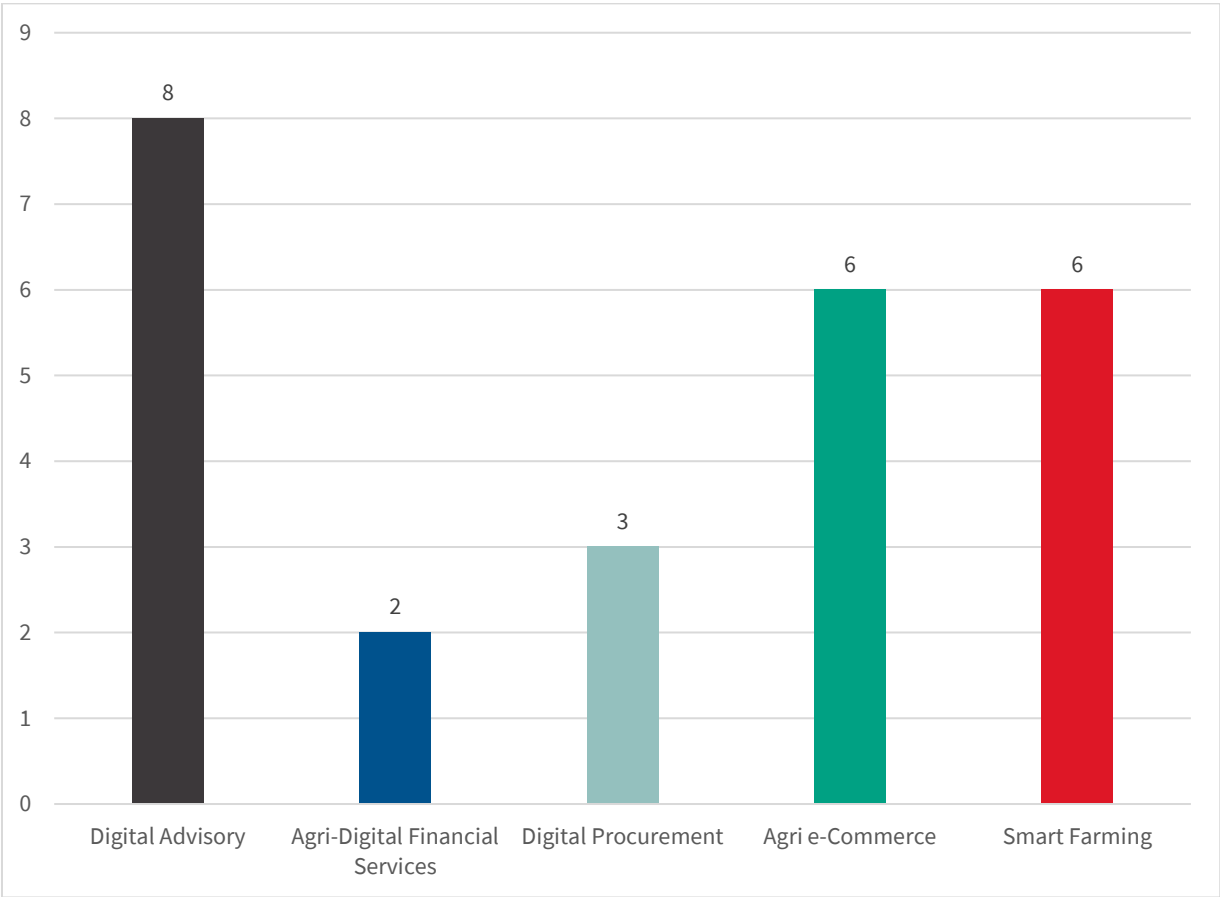

FIGURE 7 IDENTIFIED USE CASES FROM INNOVATIONS IN ANGOLA

The table below presents an overview of all identified innovations with their use cases, 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 ANGOLA

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 6 OVERVIEW OF IDENTIFIED AGRICULTURAL INNOVATIONS OPERATIONAL IN ANGOLA

				Name of innovation	Name of the company	Survey ✓/X	Description of innovation	Operational Countries in SADC
■			■	AgriTPG	TOPOGIS	✓	AgriTPG of Topogis. Providing plantation statistics using satellite and drone imagery. They are launched in 2019 with a group of young Angolans. Their solution tries to close the knowledge gap. Challenges that they are facing during implementation were: Understanding the market and user needs, Procurement of technology vendors, Data collection issues.	Angola
		■		Agroportal AO	Agro Portal	X	Agroportal AO of Agroportal. This is a digital platform made up of complementary components (website, social networks, and newsletters) and which serves as a vehicle for boosting Agribusiness in Angola, providing its users with several totally free services of great use and added value, as well as being a way to develop and promote business or a brand in this segment quickly and efficiently.	Angola
■		■	■	Alfa Sementeira Limitada	Alfa Sementeira Limitada	✓	Alfa Sementeira Limitada of Alfa Sementeira Limitada. The use of drones and other information technology and GIS in the monitoring and development of agriculture.	Angola
■				Digital Grow	Fundación Ondjyla	✓	Digital Grow. This innovation from Fundación Ondivia was established in 2017 is a tool with 2 components active in Angola and Mozambique. It has 1,500 active users and 2,300 registered users and deals with digital advisory through Agri VAS: One to many advisory covering agricultural livestock information and addressing knowledge gaps leading to low productivity. A resource center - digital library, free access with technical documentation to support family farming, including books, technical articles, videos, or practical exercises, being found in 4 languages: Portuguese, Spanish, French and English. The contents of the Digital Library are tailor-made, for the most disadvantaged regions and a virtual Platform that, in partnership with universities and research centers in	Angola, Mozambique

				Name	Company		Description	Countries
							Africa and Latin America, promotes training at different levels, promoting transfer of know-how and South-South relations. Digital Grow develops technical training tailored and adjusted to the local reality, especially suitable for geographies with weak internet and less sophisticated devices, operating offline. The contents of this training allow the farmer a deeper knowledge of the entire production process and value chain, a better use of resources, a reduction in production costs and an increase in production and income. They use smartphones, a website, dashboard, and portal, both local and cloud-based software. Their challenges are understanding the market and user needs, accessibility, digital literacy and use by marginalized groups. Their funding has come from impact investors and donors and is dependent on them.	
■		■	■	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 uses 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
			■	Humbitec	Humbitec	✗	Humbitec of Humbitec. This is an EO company focusing on digital image and GIS processing. The company make use of satellite data to address challenges in various sectors including the health sector, management, agriculture, urban management, and governance.	Angola

					Jardins da Yoba	Jardins da Yoba	✗	Jardins da Yoba from Jardins da Yoba. Jardins da Yoba is an agribusiness company located in the province of Huila in Angola. Jardins da Yoba uses sustainable production systems with integration of the agricultural and livestock component is strongly committed to environmental sustainability and adequate use of resources. The production and multiplication of seeds is the core activity of our company, as well as the production of vegetables and fruit trees. The production of honey and bee products, as well as, the organic production of sweets and jams, constitute the present and future potential for export and commitment to excellence.	Angola
■	■	■	■		Kepya Marketplace	Agro Marketplace	✓	Agro Marketplace from Kepya. Platform for the commercialization of products from the field, market information and logistics.	Angola
■	■	■	■	■	KRES	KRES Network (KRES with partners in Network in Netherlands, Angola, Mozambique including World Vision)	✓	KRES Network. KRES Network (KRES with partners in Network in Netherlands, Angola, Mozambique including World Vision). It is a network with a social enterprise as the operating entity to provide decentralized services. It operates in Angola and Mozambique. It was launched in 2021 and it has 250 smart phone users and 2,800 basic phone users. It empowers farmers to adopt regenerative agriculture to improve productive resources (soil) and productivity through digital advisory and market linkage services using conversational engagement (voice Bot, chatbot) and geodata/AI. Realize Rural Agri Entrepreneurs (Farmer Business Advisors) through an industry/sector platform involving private and non-private sector partners acting as liaison between farmers and markets. Innovative digital/e-learning (drills on chatbots) are available and further development to develop capacity of remote Rural Agri Entrepreneurs. Smart advisory: Data-driven advisory based on tailored, farm-level agro-climatic and crop-specific information to support decision making, maximize productivity and reduce costs. Technologies such as sensors, satellites, and drones, as well as big data analytics and AI, underpin many of these services., Weather information: Specialist services that provide regional and localized weather forecasts. This sub-category may include weather-adaptive and climate-smart advice, pest, and disease management: Digital tools that help farmers diagnose plant disease and develop strategies to treat diseased plants as well as mitigate future outbreaks. Most of the services are accessible via mobile applications and require a farmer to upload a picture of the infected plant for diagnosis. Some services are also accessible via USSD. Also includes national and regional-level pest and disease early warning systems., Agri-record keeping through Plan & Activity Tracker (voice and chat bot based). Accountability tool: Digital tools designed to help farmers view farming as	Angola, Mozambique

							a business by allowing them to track farming expenses and revenues and prove their creditworthiness., Liquidity Financing under design/development for different 'segments' involving FADA, BNI, BDA (Angola) and HUB, Casa do Agricultor (Mozambique). Inputs and outputs: Platforms that enable the sale of agricultural inputs to farmers from input suppliers, as well as the sale of agricultural produce from farmers to consumers and businesses., KRES is not a marketplace. Smart Digital Agent approach to link farmers to markets. Also uses remote sensing, geodata using satellites. The Kres Network was started under the Mavo Diami project in Angola.	
■					Mavo Diami	World Vision	✗	Mavo Diami from consortium led by World vision Netherlands. The Mavo Diami project funded under the Geo Data 4Agriculture and Water of the Dutch Ministry of Foreign Affairs / Netherlands Space Agency. The aim of this project is to improve the food and income security of more than 100,000 smallholder farmers by accelerating their agri-business performance through informed decisions supported by the Mavo Diami services built on weather, water, soil and crop signals and other relevant data and indicators. The project is called Mavo Diami, which means 'my land' in Angolan local language (Kimbundo). During the project, the Kres network was formed as a social enterprise to carry on beyond the project.	Angola
			■		Portal da Divulgação Nacional de Produção	Government Angola	✗	Portal da Divulgação Nacional de Produção of Government Angola. This is a government e-commerce portal.	Angola
			■		Roque online	Roque online	✗	Roque online from Roque online. This is an Online platform that connects informal markets of the world with empowering technologies. They did not want to participate to the survey, because they receive too many surveys already, without any feedback on the result.	Angola
■					SKAN - Sharing Knowledge Agrifood Networks	INOVISA	✓	SKAN This is a Sharing Knowledge AgriFood Network - INOVISA - Associação para a Inovação e Desenvolvimento Empresarial. This emergent innovation is created by INOVISA (established in 2013) which is an NGO and includes a platform sharing knowledge between the Portuguese speaking countries on agrifood, forestry and the environment. They have 260 active and registered users and share information on good practices to increase efficiency and productivity using computers, a dashboard and portal but currently face operational constraints.	Angola, Mozambique

3.3 RESULTS FROM INNOVATION SURVEY RESPONDENTS

All identified innovators received a survey and seven innovations implemented in Angola responded. The answers of the survey are self-reported. Of the innovations identified, four were operational in Angola only and the remaining nine operated regionally. Three innovations operated in Angola and Mozambique (Lusophone countries) and one regionally (GeoFarmer). All innovators were reminded several times by email and by phone to complete the survey. The response rate of the survey for Angola was 54% (7 of 13 identified innovations responded).

USE CASES AND SUB USE CASES

The division of GSMA use cases shows that in Angola multiple use cases are most common. Five out of seven respondents provided multiple services and only two respondents provided a single use case. One respondent addresses all five use cases in their innovation, one address four use cases, two address three use cases and one addressed two use cases.

Figure 8 below illustrates the division of use cases provided. Digital advisory was the most common use case cited by all survey respondents. Smart Farming (4), Digital Procurement and Agri E-Commerce (3x, respectively) were the next most common in Angola. Agri-Digital Financial Services was the least common and was only provided by two respondents. Figure 8 also illustrates a comparison of use cases to the rest of the surveyed respondents in the SADC region, Angola broadly follows the same trend, although Digital advisory is overrepresented. Most innovations were developed by private sector companies (4), but innovations were also developed by an NGO, a farmer association, and a Network.
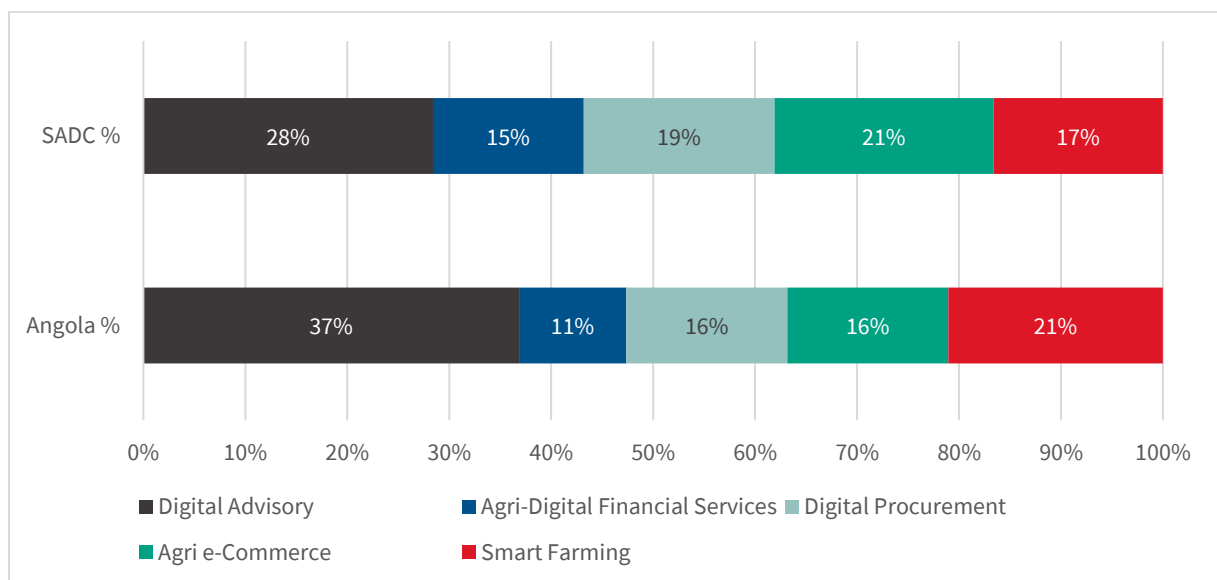

FIGURE 8 DIVISION OF USE CASES FOR SURVEY RESPONDENTS IN ANGOLA VS. IDENTIFIED INNOVATIONS IN SADC

The innovations in Angola represent a variety of sub-use cases as presented in Figure 9 below. For Digital Advisory, agricultural value-added services and smart advisory were the most common. In addition to the sub use cases below, some additional options were included under "Other" by respondents: Farm Setup was mentioned twice and Knowledge Sharing once under the Digital Advisory use case; liquidity financing was

mentioned once as a sub-use case of Agri-Digital Financial Services; Smart contracts were provided as a sub-use case for Digital Procurement; and crop monitoring and geo data were also provided as sub-use cases for Smart Farming. KRES, a surveyed innovation, clarified that it was not a digital marketplace but a network to provide market linkages via Smart Digital Agents which fell under the Agri E-Commerce use case.

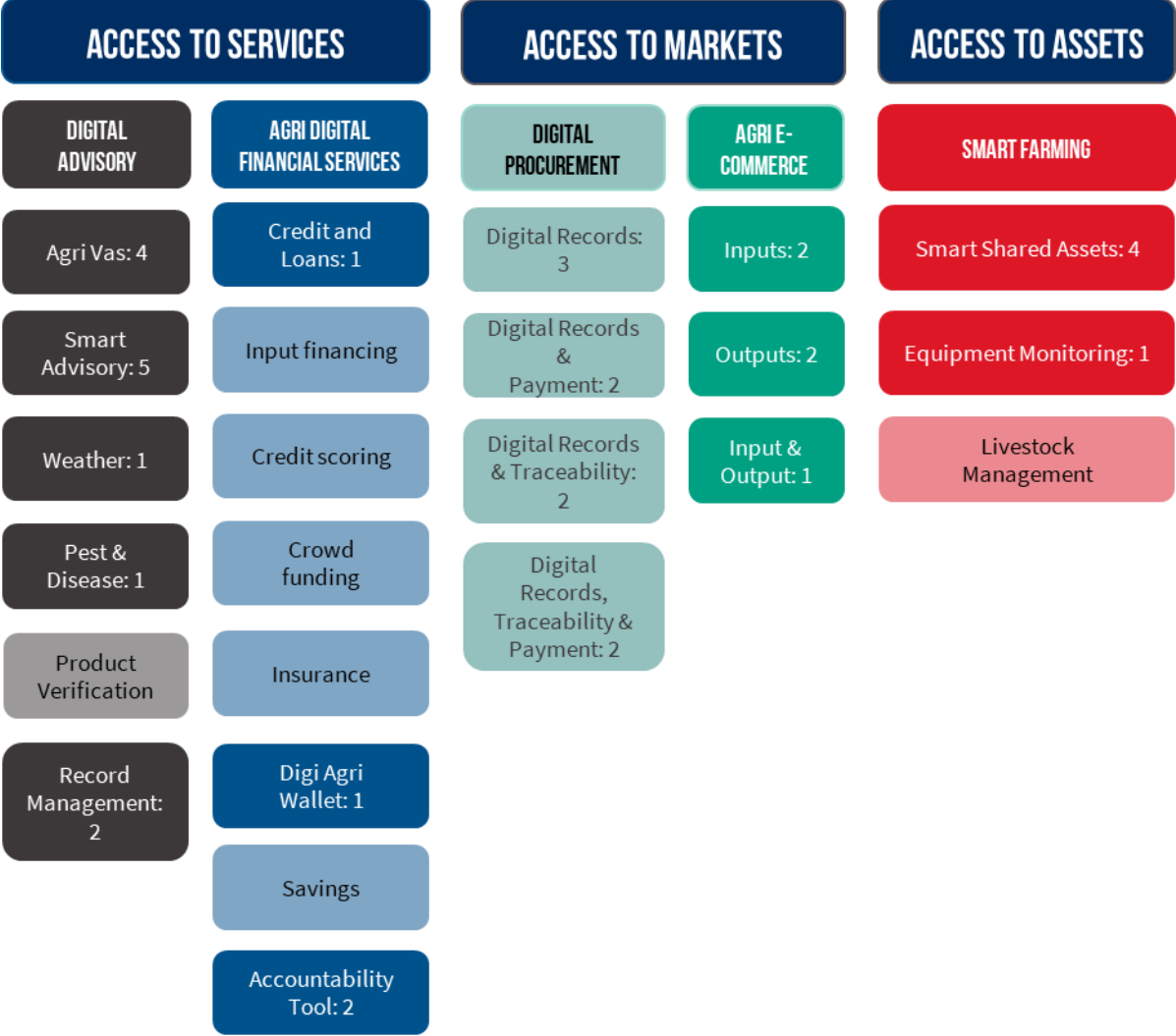| ACCESS TO SERVICES		ACCESS TO MARKETS		ACCESS TO ASSETS
DIGITAL ADVISORY	AGRI DIGITAL FINANCIAL SERVICES	DIGITAL PROCUREMENT	AGRI E-COMMERCE	SMART FARMING
Agri Vas: 4	Credit and Loans: 1	Digital Records: 3	Inputs: 2	Smart Shared Assets: 4
Smart Advisory: 5	Input financing	Digital Records & Payment: 2	Outputs: 2	Equipment Monitoring: 1
Weather: 1	Credit scoring	Digital Records & Traceability: 2	Input & Output: 1	Livestock Management
Pest & Disease: 1	Crowd funding	Digital Records, Traceability & Payment: 2		
Product Verification	Insurance			
Record Management: 2	Digi Agri Wallet: 1			
	Savings			
	Accountability Tool: 2			

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

The innovations targeted a wide range of anticipated outcomes: market linkages, crop monitoring, improved livestock production, increased efficiency and record keeping, reduced cost and wastage, access to financial services, traceability, and improved yields.

TECHNOLOGY AND CHANNELS

Computers were the most common device used by solution (4x) together with feature phones (3x) and smartphones (3x). In terms of types of digital channels, portal websites were mentioned most (6x) followed by geodata (4x) and SMS (2x). For analysis tools and technologies, respondents provided a mix of examples. Cloud-based databases (3x) and machine learning (3x) to analyze data were most common, followed closely by spreadsheets (2x) and Artificial intelligence platforms (e.g., IBM Watson) (2x).

CHALLENGES

In Angola, most innovations are trying to address four key challenges or pain points: the knowledge gap (7x), low productivity (4x), poor access to markets (3x) and climate change (3x). These same challenges were also mentioned when asked what challenges had been faced in applying and implementing the innovation.

VALUE CHAIN PHASES

Surveyed innovations in Angola addressed all stages of the value chain but are more tailored for the earlier stages of the value chain in terms of on-farm processing and planning. Figure 10 illustrates the different phases of the agricultural value chain that the innovations in Angola address.

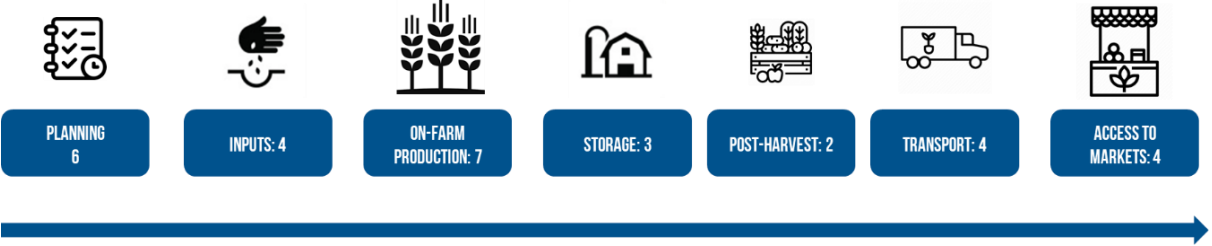| PLANNING 6 | INPUTS: 4 | ON-FARM PRODUCTION: 7 | STORAGE: 3 | POST-HARVEST: 2 | TRANSPORT: 4 | ACCESS TO MARKETS: 4 |

FIGURE 10 SURVEYED INNOVATIONS PRESENCE IN THE VALUE CHAIN IN ANGOLA

SCALING

In terms of scaling, most digital innovations in Angola are in the early stages based on the Insights on Scaling Innovation report [21]. Only two innovations have reached the scaling or sustainable scaling phase: GeoFarmer, a regional innovation, and Digital Grow (also implemented in Mozambique).
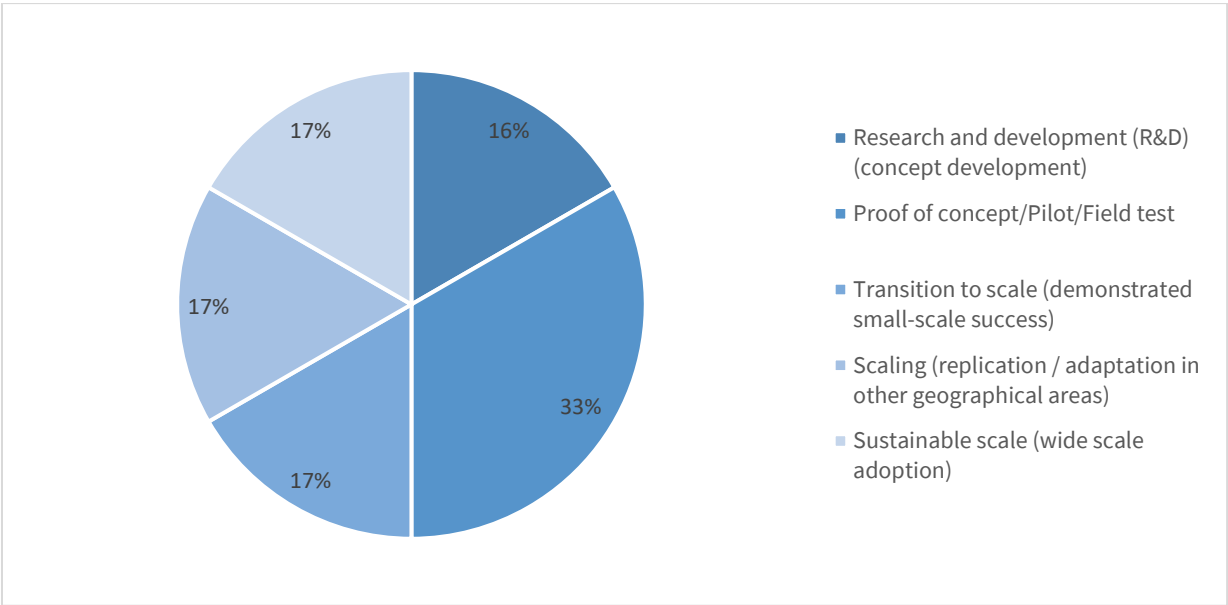

- Research and development (R&D) (concept development)
- Proof of concept/Pilot/Field test
- Transition to scale (demonstrated small-scale success)
- Scaling (replication / adaptation in other geographical areas)
- Sustainable scale (wide scale adoption)

FIGURE 11 SCALING STAGES FROM SURVEYED INNOVATIONS IN ANGOLA

DEVELOPMENT, FUNDING AND REVENUE SCHEMES

There were no clear organizations financing the innovations. Donor grants were mentioned three times and friends / family or own funds twice, but still for six an additional subsidy was necessary to become sustainable. The same mixture of answers is seen in revenue models: donor grants (2x) and transaction fees (2x) were mentioned more than once. Local government was mentioned most as an involved actor in developing the innovation (3x) followed by donors. The same pattern is seen in the implementation.

The respondents did not share much of the results already achieved, this may be due to the early stage of most of the innovations. Results that were mentioned by some included the training of cooperatives in the field and the winning of innovation awards.

INCLUSIVITY AND TARGET AUDIENCES

Most innovations target individual farmers (5x) and farmers cooperatives (5x) followed by other value chain actors (4x), NGOs (4) and government agencies (4x). Extension workers (4x) are seen as intermediary users. Most innovations targeted businesses (6x), followed by communities (5x), Government (4x) and then household/ personal use (3x).

Not all innovations focused on inclusivity. According to the survey respondents three innovations were already inclusive for women and smallholder farmers and two for people with low literacy levels. Only two innovations have taken explicit steps for people with disability, elderly, small holder farmers or individuals with low literacy levels. While three innovations did not take special actions for people with disability and two for elderly.

4 DIGITAL AGRICULTURAL SYLLABI AND ENTREPRENEURSHIP TRAINING

Since the implementation of the Action Plan for the Angolan Information Society (PASI) from 2005, the country has invested in providing computer facilities for schools and universities and aims to strengthen the presence of ICTs in the education sector. Angola's National Information Society Plan (PNSI) 2013-2017 is a follow up to the 2005 PASI and the objective is to further develop the information society in the country. One of its seven strategic pillars is digital education. The goals are to strengthen the ICT skills of the population, enhance the use of ICTs in the education system, increase access to education and content and promote research and development. An outdated Presidential Decree (2011) focused on the promotion of ICT in education and training, and on online education, but this has not translated into recent national strategies, actions, and results. Angola's population is supposed to gain ICT literacy through trainings to participate in the information society and to boost entrepreneurship and employability. A new strategy is needed to implement this in a systematic way.

4.1 AGRICULTURAL SYLLABI UNIVERSITIES

One Agriculture University was contacted in Angola:

- José Eduardo dos Santos University

Two faculties of this university responded to the survey: the Faculty of Veterinary Medicine of Huambo (Faculdade de Medicina Veterinaria do Huambo) and the Faculty of Agricultural Sciences.

JOSÉ EDUARDO DOS SANTOS UNIVERSITY – FACULTY OF AGRICULTURAL SCIENCES

The Faculty of Agricultural Sciences offers onsite digital training courses since 2017 and has updated its curriculum since its first implementation. Regarding the levels of the digital trainings implemented, seven of them are delivered at certificate level, three at B.Sc. level, two at M.Sc. level and four through the college incubators. In the area of digital agriculture, all seven courses are delivered at certificate level and are taught on-site. The Faculty of Agricultural Sciences also provides entrepreneurship training for digital businesses in the following fields: E-extension, smart farming, and digital content creation. These trainings equip students to work for the public sector or in advanced research.

JOSÉ EDUARDO DOS SANTOS UNIVERSITY – FACULTY OF VETERINARY MEDICINE OF HUAMBO

The Faculty of Veterinary Medicine of Huambo has offered online and offline digital trainings for its students since 2021. Regarding the levels of these digital trainings implemented, twelve of them are delivered at Certificate Level, four at B.Sc. level, thirteen at M.Sc. level, one at Ph.D. and eight by the university incubator. In the area of digital agriculture, all seven courses are delivered at the M.Sc. level and are taught online. In the survey, the faculty did not provide information regarding digital entrepreneurship trainings.

TABLE 7 OVERVIEW OF RESPONDENTS FROM SURVEYED UNIVERSITIES IN ANGOLA

ANGOLAN UNIVERSITIES	
José Eduardo dos Santos University – Faculty of Agricultural Sciences	
Digital Agri Skills	Big Data for analytics in agriculture Internet of Things for agriculture Programming / Coding for agricultural systems Digital entrepreneurship in agriculture Virtual Reality for agriculture
Digital training courses updated	Yes, the courses were updated after the first introduction in 2017
Digital entrepreneurship trainings	E-extension Smart Farming Digital Content Creation
Type of Skills building	Working for the public sector Working in advancing research (PhD, research institutions, others, etc.)
Most important digital Agri skills	Data collection Digital Procurement E-extension
Most important facility for digital trainings	Research Laboratories (3 out of 5) Experimental farms (3 out of 5) University or college incubator (2 out of 5)
Aligned with institutional strategy	Yes
José Eduardo dos Santos University – Faculty of Veterinary Medicine of Huambo	
Digital Agri Skills	Big Data for analytics in agriculture Artificial Intelligence for agriculture Internet of Things for agriculture Programming / Coding for agricultural systems Digital entrepreneurship in agriculture- Cyber security in the agricultural context Virtual Reality for agriculture
Digital training courses updated	No not after introduction 2021
Digital entrepreneurship trainings	Not answered
Type of Skills building	Not answered
Most important digital Agri skills	Not answered
Most important facility for digital trainings	Not answered
Aligned with institutional strategy	Yes, https://vetagrotice.vetagro-sup.fr/course/view.php?id=2142&section=8

4.2 INCUBATORS AND INNOVATION HUBS

A total of ten business support organizations have been mapped in the country: Orange Corners Angola, KiandaHub, Acelera Angola, Bantu Makers, Fábrica de Sabão, Founder Institute Luanda, Disruption lab, BETA START Luanda, NINAPEM ICT Incubator and INEFOP-PEA Business Incubator. None of them is operating in the agricultural sector. For these organizations no evidence of trainings and incubation activities dedicated to agriculture entrepreneurs was found and therefore they were not targeted for the KIIs.

5 INSIGHTS AND REFLECTIONS

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

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

5.1 INSIGHTS

BENCHMARK RESULTS

Angola was ranked 13 out of 16 in the benchmark assessment which suggests that it is some way behind the other SADC member states. The benchmark assessment enabled the identification of countries within SADC that are unlocking positive pathways towards a digital economy and a vibrant ecosystem of different actors. Angola scored poorly in all but the digital government pillar where it ranked eighth out of 16. This pillar identifies the presence and use of digital services and platforms to enable public service delivery. Angola ranked lowest and behind the African median, in digital business (which identifies the development of a robust marketplace for digital trade, digital financial services and digital content) and digital skills (which identifies the development of a digitally skilled workforce that is grounded on sound ethical practices and socio-cultural values).

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. Angola makes up part of Group 4, these countries ranked lower down the benchmark and based on the data collected, appear to be least advanced in the region. However, these countries are in transition and could leapfrog the more conventional stages of policy development with the right level of political will and prioritization within government and the public sector.

POLICY ENVIRONMENT

The benchmark assessment suggested that Angola's digital economy is lagging, however the stock take of national policies, strategies and legislation identified that digitalization is being prioritized. Four key documents were available for review that focused on a general approach to integrating ICTs or transforming to a digital economy. Two national plans were reviewed that also prioritized the importance of digitalization across the economy. These documents provide an optimistic picture that Angola is focusing on digital transformation, especially the White Paper as it references more advanced and emerging technologies and priorities such as data management and dissemination. However, it seems that Angola is still in the preliminary stages of development of a digital economy and the White Paper should serve as a guiding document rather than a fully developed plan or roadmap.

No specific sectoral strategy or policy on digitalization within agriculture was identified. Collecting and obtaining agricultural policies, strategies and plans was challenging as many were not accessible or available online. However, agriculture was featured as a key pillar in the Information Society Plan and the White Paper. It seems that digitalization within the agriculture sector in Angola is at an embryonic stage and this is a key barrier for development. The key challenges identified from research, stock take review, and KIIs is the lack of a guiding policy or strategy specific to agriculture, the level of digital literacy among farmers and the current ICT infrastructure in place. Many of these challenges require greater stakeholder collaboration including the private sector and civil society as they fall outside the remit of the Ministry of Agriculture.

DIGITAL AGRICULTURE INNOVATIONS

A total of 13 innovations were identified in Angola, but of these, seven responded to the survey. All use cases were represented in results from Angola including digital advisory, agri-digital financial services, digital procurement, agri e-commerce and smart farming. Digital advisory was most common and prevalent in all respondents, but there was a clear gap around agri-digital financial services with only two respondents. The surveyed innovations addressed all stages of the value chain, but most are tailored to the earlier stages with on-farm production and planning the most cited by all innovations respectively. These results are reflective of the main pain points those innovations are attempting to address: the knowledge gap and low productivity.

The results from Angola suggest there is a clear challenge for innovations to reach scale and financial sustainability. Only two innovations surveyed have reached scale and both are regional innovations that operate in several countries. Around half of the innovations surveyed are either in the concept development phase or are being piloted. In terms of sustainability, six innovations cited that they would need additional subsidies or donor funding to continue. This is also reflective of the start-up funding and revenue models used which relied on donor grants, friends or family support, and transaction fees.

DIGITAL AGRICULTURAL SYLLABI AND ENTREPRENEURSHIP TRAINING

Digitalization in the agricultural sector is an important driver for economic growth, especially in rural areas. However, digital agricultural trainings are not yet targeted by business service organizations, even though they are taught at the José Eduardo dos Santos University. Digital agriculture needs to be supported by local policies and capacity building must be promoted among incubators and innovation hubs to prepare the local youth to invest in the sector and develop new services for the local farmers and agricultural stakeholders. The University targeted in the survey seems to acknowledge the importance of digital agricultural skills for the local labor market and has the potential to play a key role as a vector to disseminate this knowledge within the Angolan ecosystem.

Angola is one of the SADC countries that has not established its National Research and Education Network (NRENs). NRENs are critical for supporting access to cheaper internet bandwidth and providing platforms for shared e-services for the benefit of education, training, and research. It is recommended that CCARDESA encourages the establishment of the Angolan NREN.

5.2 REFLECTIONS FROM THE SITUATIONAL ANALYSIS REPORT

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

▪ An agriculture sector specific digital strategy and roadmap is necessary with clear objectives, milestones, timelines, and funding requirements to tie in the sector performance with a digital economy advancement. A key barrier to embracing digitalization in agricultural systems is a lack of a guiding policy framework and regulatory support that integrates the use of technologies and services. A clear agriculture sector specific strategy or roadmap can address some of the key challenges raised by stakeholders consulted during this study.

▪ **Digital content should be hyper-localized, relevant to local constraints and deployed through channels that facilitate and enable action by farmers.** Most agricultural research content is created in English and approved content is usually only available in a national language, but not all farmers understand either of these. Countries, like Angola, whose first language is not English are at a real disadvantage in terms of content generation and/ or adaptation. To use digital agriculture innovations, digital skills are critical. In Angola, the digital literacy of farmers is low, this hinders the access to and use of digital agricultural innovations.

▪ **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 and being able to access appropriate finance and develop their capacities to expand their users or customer base. A few regional innovations are available in Angola that have reached a level of scale, but these originated in other countries. Most innovations that originated from Angola were not at a mature state of scaling.

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

▪ **It is important to boost the digital agriculture entrepreneurship sector through the acquisition of advanced skills in the space and an alternative model of sustainability for the incubators (especially those who are not supported by the government).** In Angola, no incubators relevant to

agriculture were available. In contrast, Universities appear to be more advanced in terms of digital training curricula such as AI for agriculture, programming/coding for agricultural systems and design of digital tools to help farmers with crop calendars and weather forecasting. Involving the private sector will help a more entrepreneurship-oriented approach adapted to the current labor market where youth can innovate in a context where agriculture is still regarded as old fashioned (which may discourage youth to get into digital agriculture initiatives).

REFERENCES

[1] The World Bank Group - Population, total | Data (2020)
[2] United Nations Development Programme, (2020), Human Development Indicators | Angola
[3] The Gender Development Index (GDI) measures gender inequalities in achievement in the three dimensions of human development.
[4] The World Bank Group GNI per capita, PPP (current international $) | Data (2020)
[5] United Nations Development Programme, (2020), Human Development Indicators | Angola
[6] World Population Review Poverty Rate by Country (2021)
7 Global Food Security Index - Rankings and trends (2020)
[8] African Union - Digital Transformation Strategy for Africa (2020)
[9] OECD - Going Digital: Shaping Policies, Improving Lives (2019)
10 United Nations Development Programme, (2020), Human Development Indicators | Angola
11 GSMA - Mobile Connectivity Index | Angola (2019)
12 United Nations Development Programme, (2020), Human Development Indicators | Angola
13 The Inclusive Internet Index, (2021), Overall rankings
14 GSMA - Mobile Connectivity Index | Angola (2019)
15 World Economic Forum, GCI Profile | Angola (2018)
16 The World Bank, GCI 4.0: Digital Skills Among the Population Index (2019)
[17] ReSAKSS Annual Trends and Outlook Report- The Enabling Environments for the Digitalisation of African Agriculture (2020)
[18] OECD Regulatory effectiveness in the era of digitalization (2019)
[19] Forbes Law is Lagging Digital Transformation – Why It Matters (2018)
[20] Data Protection Africa - Factsheet Angola (2020)
[21] International Development Innovation Alliance (IDIA) – Insights of Scaling (2017)

imcworldwide.com

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