DIGITAL AGRICULTURE COUNTRY STUDY ANNEX: SEYCHELLES

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

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

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CCARDESA
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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

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ACRONYMS AND ABBREVIATIONS

AI	Artificial Intelligence
AIDI	Africa Infrastructure Development Index
APPSA	Agricultural Productivity Program for Southern Africa
AR4D	Agricultural Research for Development
AU	African Union
B2B	Business-to-Business
B2C	Business-to-Consumer
CCARDESA	The Centre for Coordination of Agricultural Research and Development for Southern Africa
COVID-19	Coronavirus pandemic
DACS	Digital Agricultural Country Study
DE4A	Digital Economy for Africa Initiative
DIAL	Digital Impact Alliance
EGDI	E-Government Development Index
FANR	Food, Agriculture and Natural Resources Directorate
FAO	Food and Agriculture Organization of the United Nations
GCI	Global Competitiveness Index
GDP	Gross Domestic Product
GII	Global Innovation Index
GIS	Geographic Information System
GNI	Gross National Income
GPS	Global Positioning System
GSMA	Global System for Mobile Communications
HDI	Human Development Index
ICDL	International Computer Driving License
ICKM	Information, Communication and Knowledge Management
ICT	Information Communication Technology
ICT4AG	ICT for Agriculture
IDIA	International Development Innovation Alliance

IOT	Internet of Things
IS	Information Society
IT	Information Technology
ITU	International Telecommunications Unit
KII	Key Informant Interview
MSMES	Micro, Small and Medium Enterprises
NGO	Non-Governmental Organization
NREN	National Research and Education Networks
OECD	Organization for Economic Co-operation and Development
OSI	Online Service Index
R&D	Research and Development
RCOL	Regional Centers of Leadership
RUFORUM	Regional Universities Forum
SAAS	Software as a Service
SADC	Southern African Development Community
SME	Small and Medium Enterprise
SMS	Short Message Service
SSA	Sub Saharan Africa
TOR	Terms of Reference
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
USSD	Unstructured Supplementary Service Data

1 INTRODUCTION

1.1 INTRODUCTION TO THE STUDY AND THE STRUCTURE OF THE DACS

The Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA) is a sub-regional organization that was approved by the Council of Ministers of the Southern African Development Community (SADC) in 2010 and launched in 2011. CCARDESA promotes innovative research, technology generation and adoption of sustainable agricultural development through partnership and capacity development. CCARDESA also coordinates the Agricultural Productivity Program for Southern Africa (APPSA), a regional program supported by the World Bank to promote collaboration and to encourage technology generation and dissemination across national borders of participating countries of SADC. CCARDESA has appointed IMC Worldwide to carry out a situation analysis of the status of digitalization in the agricultural systems of SADC member states.

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

This Digital Agricultural Country Study (DACS) for Seychelles 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 Seychelles 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 Seychelles, 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 Seychelles 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 Seychelles, Sandra Sinon from the Seychelles Agricultural Agency. The study team also worked with a National Consultant in Seychelles, Dr. Barry Nourice.

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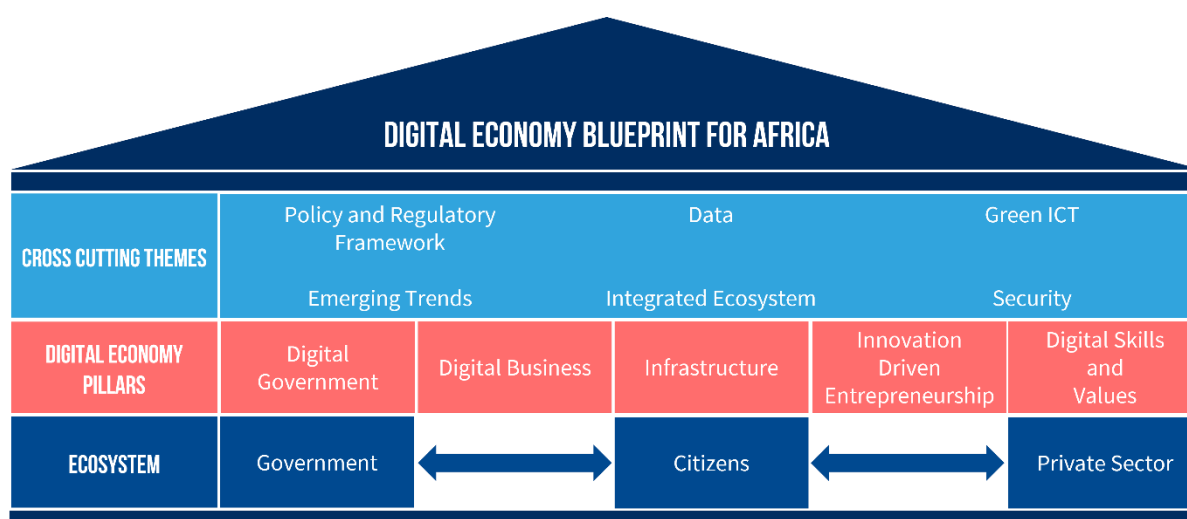
A sixth pillar was added to the benchmark to include Policy and Regulatory Frameworks to align it with this study and as this was a regular cross-cutting area mentioned in other frameworks. These six pillars are presented in table 1.

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 Skills score in the Global Competitiveness Index (GCI) which includes factors not related to digital. The indicators and data stream used and the maximum score available is illustrated in table 2.

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

Benchmark Pillar	Index	Data Stream	Maximum Score
Digital Government	E-Government Development Index (EGDI) 2020	Online Service Index (OSI)	1
Digital Business	GCI 2019	Business Dynamism Component	100

ICT Infrastructure	AIDI 2020	ICT Composite Index	100
Innovation Driven Entrepreneurship	Global Innovation Index (GII) 2021	N/A	100
Digital Skills	GCI 2019	Digital skills among active population	100
Policy and Regulatory Frameworks	ITU G5 Benchmark 2021	N/A	100

Each SADC country received a total score based on the specific scores of each pillar, outlined above. These figures were then compiled into an index (this was done by dividing the scores by the maximum possible score). The benchmark is based on a mix of indicators from 2019-2021, outlined in table 2. Some data was not available for all the assessment areas for the Seychelles. This was accounted for and adjusted when ranking the countries.

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

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

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

Survey answers were self-reported and where there were outlier responses, follow-ups were made to ensure conformity of information. The survey results were cleaned by combining duplicate answers (when submitted from more countries), clustered (in cases of open answers, for example with "other") and names between identified and survey results were aligned. In some cases, the answers were coded for better analysis of the data. An analysis spreadsheet was developed to analyze the data in more depth and to create the graphs. All innovations received a unique number and were uploaded to the database. The database forms the basis for the interactive web portal of CCARDESA, further information on the portal can be found in the main report, *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.
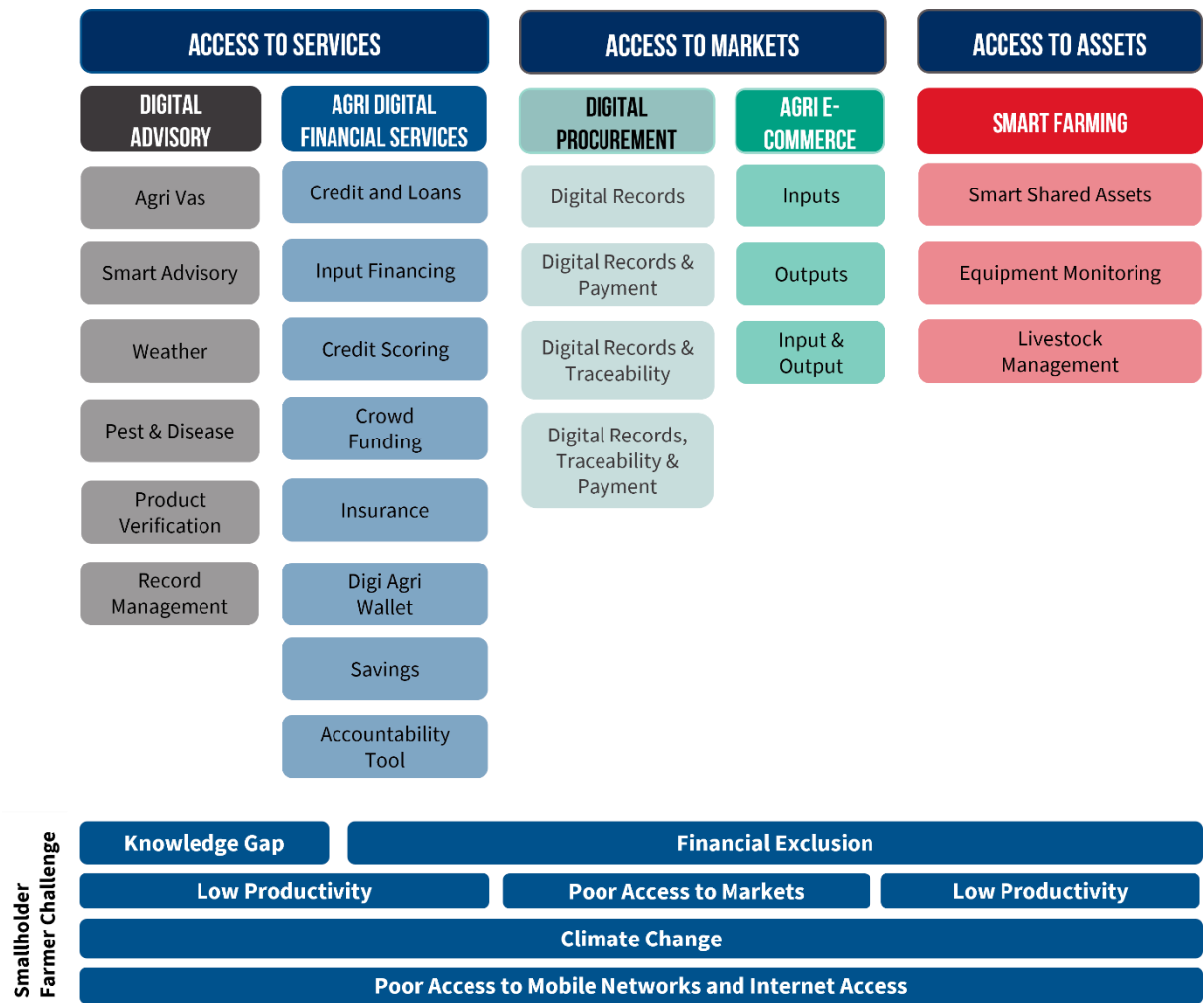

FIGURE 2 USE CASE MODEL BASED ON GSMA FRAMEWORK

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

DIGITAL 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 focused to try and provide a complete picture of 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 annexes3-4 and 8-10 in the *Situational Analysis Report.*

LIMITAITONS 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 available online were also used for review.

In the Seychelles there were some delays in setting up a meeting with the CCARDESA ICKM focal point as there had recently been a handover of the role and the Seychelles Agricultural Agency was undergoing structural and institutional changes at the time of the study.

INNOVATIONS

The current DACS is a snapshot in time as new digital innovations are in development in Seychelles 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.

In the Seychelles the study team were advised not to approach the Agricultural College as they were undergoing some changes the national consultant informed the team that no digital skills were being taught there. To have greater representation the study team approached the University of Seychelles but the request to participate in the survey or a KII was declined on the grounds that the University was not oriented to agricultural trainings.

1.3   COUNTRY CONTEXT

The Seychelles is an archipelago off the coast of East Africa in the Indian Ocean and has the smallest population in the SADC region of only 98,462.[1] The UNDP's Human Development Indicators rank Seychelles as 67th out of 190 countries and second out of the 16 SADC countries. [2] However, it is the richest country in the SADC region with a Gross National Income per capita of $29,840 (compared to an average of $8,050 in the region) and is classified as a high-income country.[3] Although only 0.9% of the population falls under the UN Multidimensional Poverty Index,[4] 39.3% live below the poverty line according to the World Population Review.[5]

This is only slightly below the average rate of the SADC region of 40.8%. The median age of Seychelles' population is one of the oldest in the region and higher than the average in SADC with 34.2 years (versus 22.1 years).

FIGURE 3 MAP OF SEYCHELLES IN SADC

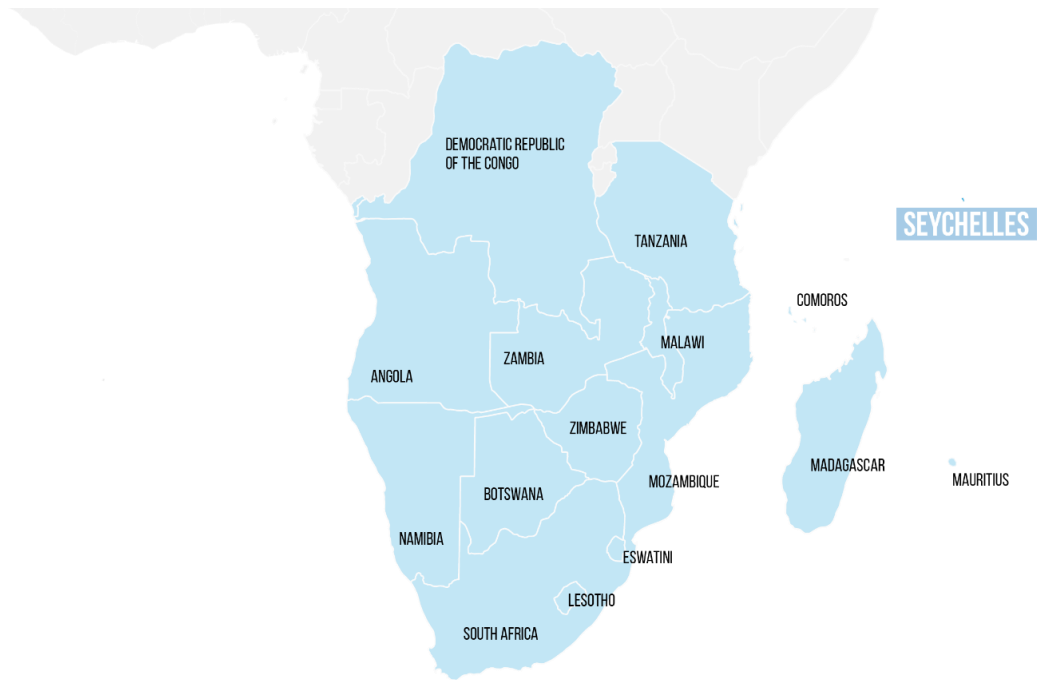## AGRICULTURE ENVIRONMENT

In the case of urbanization, Seychelles is above average in the SADC region with 57.1% living in urban areas. Only 2.48% of the GDP is earned in agriculture, but there is no information on what proportion of the population works in the agriculture sector (with the average of the SADC region being 43.37%).[6]
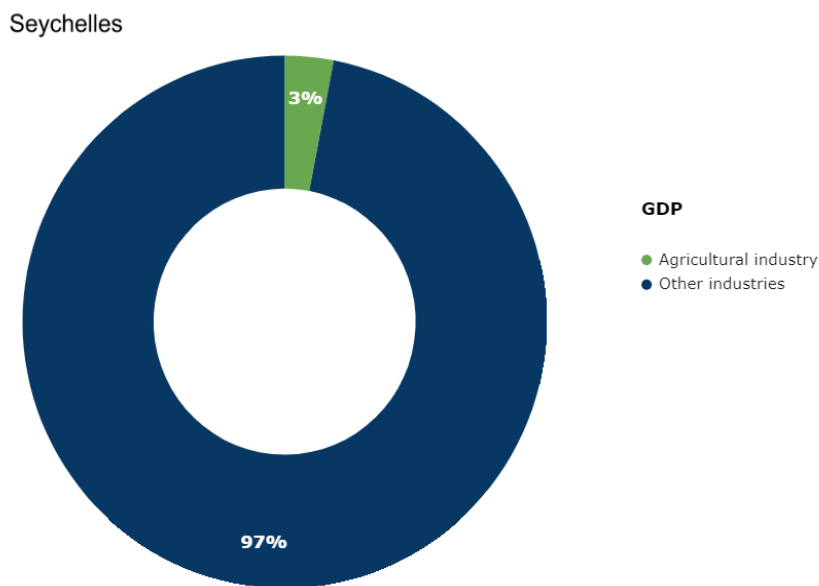

FIGURE 4 SEYCHELLES' AGRICULTURAL INDUSTRY SHARE OF GDP

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[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.

AFRICAN UNION DIGITAL TRANSFORMATION STRATEGY

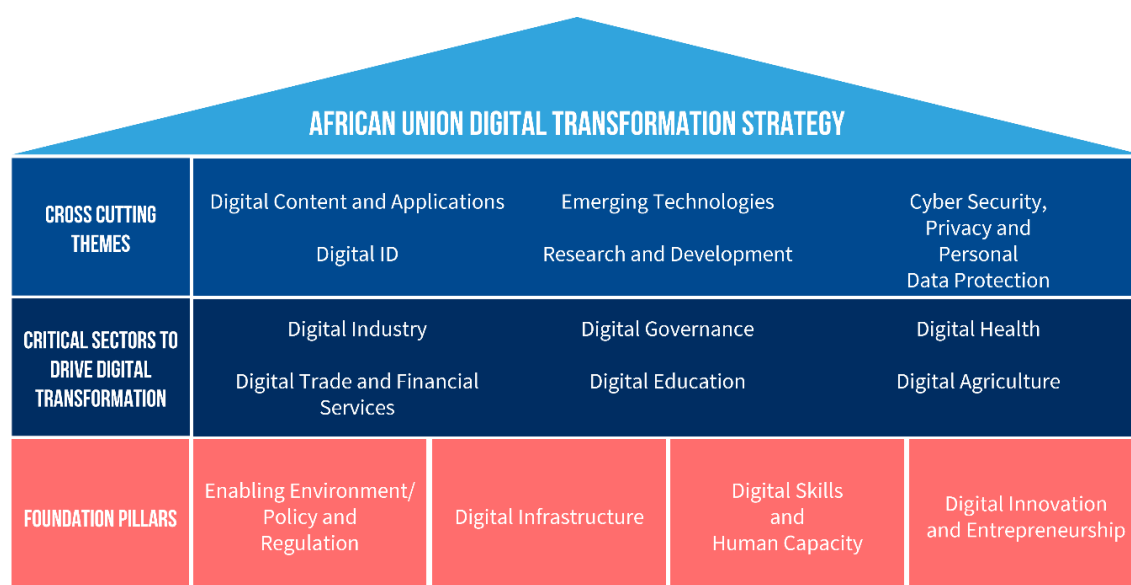| CROSS CUTTING THEMES | Digital Content and Applications / Digital ID | Emerging Technologies / Research and Development | Cyber Security, Privacy and Personal Data Protection |
| CRITICAL SECTORS TO DRIVE DIGITAL TRANSFORMATION | Digital Industry / Digital Trade and Financial Services | Digital Governance / 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 AFRICAN UNION DIGITAL TRANSFORMATION STRATEGY

The transition to, and importance of, a digital economy is illustrated in the prevalence of this agenda within regional institutions, donors, and multilateral organizations. Where agendas previously focused on ICTs, providing hardware and universal access, the focus is now on enabling a digital economy with a more holistic view of digital and ICTs. The digital economy considers sectors beyond the IT industry and encourages a whole-of-government approach to have more emphasis on the overall ecosystem and 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 Seychelles are illustrated in table 3.

TABLE 3 BENCHMARK PILLAR SCORES: SEYCHELLES

Seychelles	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
Democratic Republic of the Congo	0.2782	15
Comoros	0.2497	16

BENCHMARK ASSESSMENT: SEYCHELLES
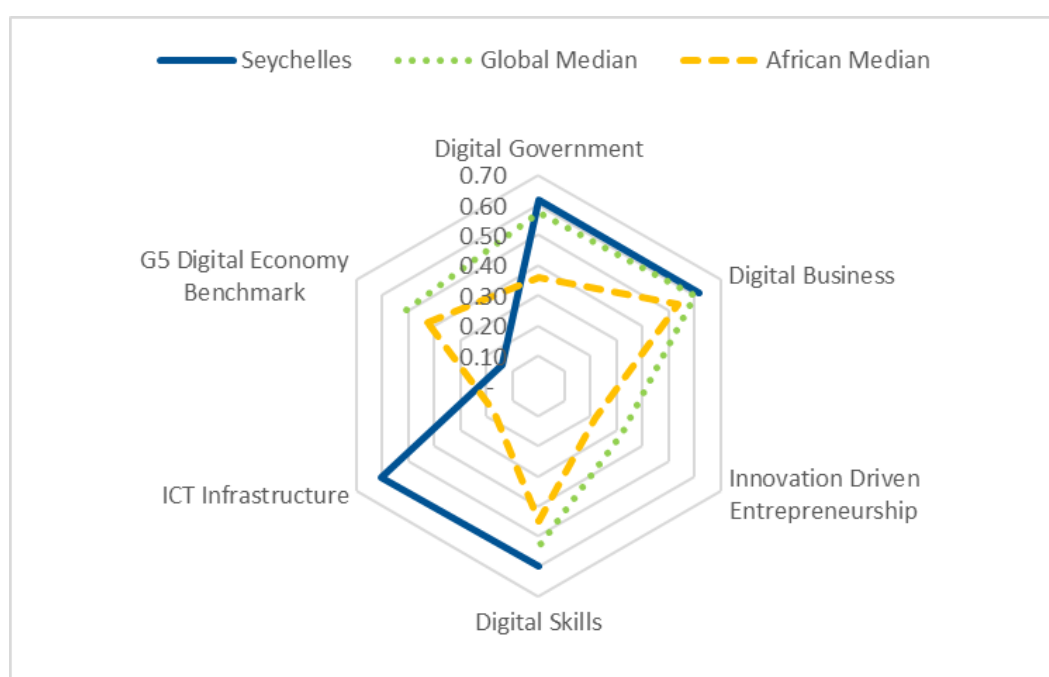
FIGURE 6 RESULTS FROM BENCHMARK ASSESSMENT FOR SEYCHELLES

Digital Agriculture Country Study Annex | **Seychelles**

In the benchmark assessment Seychelles ranked third out of the 16 SADC member states. Figure 6 below illustrates the results of the benchmark in comparison to the Global and African medians. Seychelles exceeds the global and continental medians in all indicators except the G5 Digital Economy Benchmark. The benchmark suggests that Seychelles has some key foundational areas necessary for a robust digital economy.

Seychelles scored highly in all but the G5 benchmark pillar, where it ranked last out of the SADC member states. Table 5 below illustrates the ranking for each individual pillar where it predominantly ranked in the top three 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

Seychelles ranks third out of the 16 SADC member states in the ICT Infrastructure pillar which is reflected in the population using the internet which according to the UN is 58.8%.[9] This is much higher than the regional average of 29.94%. While there is no information about Seychelles on the GSMA Mobile Connectivity Index or the Inclusive Internet Index, the HDI reports its mobile cellular subscriptions at 184.3 per 100 people, the highest in the region.[10] In terms of ICT adoption, Seychelles scores position 63 (out of 140). The Seychelles government is ranked highest in the region on its future orientation based on the position 33 (out of 140).[11]

2 THE BROADER POLICY ENVIRONMENT

In the benchmark assessment Seychelles ranked third out of 16 in the region, scoring highly in most indicators. The high scores and ranking in the assessment pillars indicate that Seychelles has foundational requirements for a digital economy and that there is likely a strong enabling environment in place for a digital economy. In the *Situational Analysis Report* the clusters of SADC countries identified from the benchmark are discussed in more detail. Seychelles forms part of Group 1 which is made up of countries that scored highly in the benchmark, are generally less reliant on agriculture for GDP growth and employment and are the richest of the SADC member states.

The purpose of this section is as follows:

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

It is important to recognize that the presence of policy, regulatory or legal frameworks may not always translate into awareness, effectiveness, or enforcement of these frameworks. Policies provide one part of the wider ecosystem needed for enabling innovations. The ability of an innovation to demonstrate value and a viable business model underpinning their innovation, progress towards investment readiness, sustainability and the level of scale that is achievable is likely to play a more important role in enabling innovations rather than policy frameworks[12]. 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[13]. 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[14].

2.1 GENERAL DIGITAL POLICIES

The benchmark assessment suggested that Seychelles' digital economy is well developed but was lagging in the G5 benchmark. From the stock take it seems that strategies and legislation related to digitalization are few and could provide a reason to the low score in the benchmark, but the most recent National Strategy sets out a clear path to unlock a digital economy.

POLICIES, STRATEGIES AND PLANS

The **National ICT Policy 2010** (NICTP) is a short brief with the aim for Seychelles to become "*globally competitive, with a modern ICT-enabled economy and a knowledge-based Information Society where strong, efficient, and sustainable improvement…. can be achieved through the deployment and effective application of ICT*". The NICTP recognizes the importance of ICT for stimulating development and that ICTs are cross-sectoral, as well as a sector itself. The NICTP is based around five focus areas:

- **ICT Infrastructure**: to promote accessible, universal, affordable, reliable, modern, and high-quality levels of ICT facilities and services.
- **Legal and regulatory framework**: to provide for the creation of an enabling legal and regulatory environment that ensures the growth and development of the sector.
- **Human resources development**: to promote the use of ICT to enhance education and skills development.
- **Industry:** to use ICT to create an enabling and conducive environment for the promotion of investment and development of a vibrant economy.
- **Government**: should support the use of ICT for innovative, effective, and efficient delivery of information and services to the population and within the public sector.

The NICT is a good first document but provides little detail around how it will achieve the objectives it has included under the focus areas. There is mention of a National ICT Strategic Plan but there is no evidence of this on the Department of Information Communication and Technology website.

The appreciation for the importance of greater digitalization in the NICT is fully realized in the **Seychelles National Development Strategy 2019-2023 (NDS)** which reflects **Vision 2033**. The NDS is based around six pillars for development: good governance; people at the center of development; social cohesion; innovative economy; economic transformation; and environmental sustainability and resilience. Digitalization and innovation are fully recognized and prioritized by the statement that *A successful Seychelles must, by its very nature, be a connected, digitalized Seychelles, embracing the fourth industrial revolution*. It sets the tone for all future plans and policies to be fully mindful of this agenda. Digital elements are included under all the pillars but specifically under the innovation economy. The main aims are to create an enabling environment for research and development through the creation of incubators, a climate attractive for entrepreneurs, and a knowledge-based innovation-oriented economy with integration of science, technology, and innovation across all sectors. A strong legal and regulatory framework is recognized for greater digitalization to enhance e-commerce activities and for greater protections from cybercrime and data access. These will also be paramount if Seychelles intends to achieve its aim of becoming a FinTech hub.

Both these documents suggests that there is an appetite and appreciation for the importance of, and benefits, of digitalization and the need to incorporate it into national plans and sectoral strategies.

2.2 LEGISLATION

The legal and regulatory frameworks are lagging in the Seychelles with regards to digitalization but according to the National Development Strategy this will be addressed to achieve the goals set out for growth and development. Below is the key legislation relevant to the study:

- The **Electronic Transactions Act 2001** provides regulation on electronic records, signatures, and contracts to foster e-commerce and provide secure and reliable electronic records recognized legally.

- The **Data Protection Act 2003** aims to ensure that personal data is obtained and processed in a fair and lawful manner. However, the Act has still not come into operation[15].

- The **Draft Communications Bill 2020** intends to consolidate and revise the law relating to broadcasting and electronic communications on par with international best standards and to provide for establishment of an authority for regulation. This is set to replace the **Broadcasting and**

> **Telecommunications Act 2000** which provides regulation of the broadcasting and telecommunications sectors and the distribution of licenses.

The legal and regulatory space in the Seychelles has several gaps that need to be filled to achieve the goals of the NDS which cover areas of privacy, data protection, information laws, as well as updated regulations around e-commerce to ensure consumer protection.

2.3 DIGITALIZATION IN AGRICULTURE

DIGITAL IN AGRICULTURE POLICIES

Digital is being embraced within the general policies and strategies for Seychelles to help it achieve growth and development but there is no evidence that this prioritization has integrated within agricultural policies and plans.

In the **NDS,** agriculture and food security are included under the "Innovation Economy" pillar but with little additional detail. There is no policy or strategy on digitalization in agriculture in the Seychelles. In the policies and strategies that exist, there is little mention of innovative digital technologies and solutions. The **Seychelles National Agriculture Investment Plan 2015-2020 (SNAIP)** calls for greater investment in research for the sector to strengthen and support knowledge management in agriculture. Under this objective there is a short reference made to "develop ICT for the agriculture sector" but no further detail is provided on what this entails. The **Seychelles Agricultural Agency Strategy 2020** also refers to a need for greater information in the sector and better management of data but does not provide further detail. Brief mention is also made in the **Science, Technology and Innovation Policy and Strategy 2016-2025** under "STI in Agriculture and Food Security" which encourages the production of local produce through the injection of new technologies and innovative marketing practices to combat the heavy dependence on importing food in the Seychelles. Despite small references being made to digitalization in agricultural systems the stock take of these documents does not present an impression that digitalization is being prioritized within the sector in the same way as the other priority sectors.

CHALLENGES

The agriculture sector is not a priority in many of the national strategies and plans as the Seychelles is attempting to move away to become an industrialized and digitalized economy. There is an underappreciation of the agriculture sector due to an over dependence on tourism and the fisheries sector for the economic growth it provides[16].

A key barrier to embracing digitalization in agricultural systems is a lack of a guiding policy or strategy that adequately integrates the use of technologies and services. A clear policy or strategy for agriculture, which includes smallholder farmers and the private sector, could be used as an advocacy tool to push for greater funding and prioritization on this specific agenda. With the impetus within the NDS on an Innovative Economy and a "digitalized Seychelles" there could be greater appetite for a plan such as this.

Beyond the challenges from a lack of a guiding policy or strategy and limited funding, there are more practical challenges in implementing digital. The high cost of data is a major barrier felt by innovators, entrepreneurs, and beneficiaries. Alleviating such 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.

As with most of the region, the farming workforce is made up of an aging or older population which limits uptake of solutions as they struggle with using the tools. A survey that the Agriculture Agency completed in 2019 asked farmers how they wanted to access information and the majority responded their preference was through radio[i]. The Seychelles previously had a program that sent out SMS messages to farmers with agricultural information and advice, but this was through a specific mobile network operator so farmers that were with another provider were at a disadvantage. As a result of the Covid-19 pandemic, some farmers have been pushed to use some digital social platforms to advertise, sell, and deliver of their crops.

The agriculture sector in the Seychelles is unattractive to young people with one public sector stakeholder stating that "*going to agriculture school is the last choice as there is no interest in agriculture*". This lack of demand for innovating the sector could be unlocked if greater involvement of young people, SMEs and entrepreneurs was encouraged but it is likely that the Blue Economy and Fisheries sector is attracting more youth and resulting in further lagging and de-prioritization of agriculture.

There is plenty of opportunity for the Seychelles to embrace digitalization within the agriculture value chain for improved productivity and more climate smart technology, but many of the barriers that currently exist require efforts outside of the Ministry and greater funding.

Producing a strategy or policy that encourages a cross-sectoral approach and involvement of the private sector to share information and knowledge and builds on the benefits of digitalization already realized outside the sector could prove to be a useful advocacy tool for greater funding and prioritization.

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[i] KII with public sector stakeholder

3 DIGITAL AGRICULTURAL INNOVATIONS

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

3.1 MAPPING DIGITAL AGRICULTURAL INNOVATIONS

The DACS for the Seychelles 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 eight innovations were identified in the Seychelles that had a mix of use cases as illustrated in Figure 7 below. There is a clear predominance of Digital Procurement as a use case which was present in all but one innovation. From the identified innovations, most (6) were identified as being developed for multiple use cases and two for a single use case (four had 3 use cases, and two had 2 use cases). Of the innovations identified, two operated exclusively in the Seychelles and six were operating regionally.
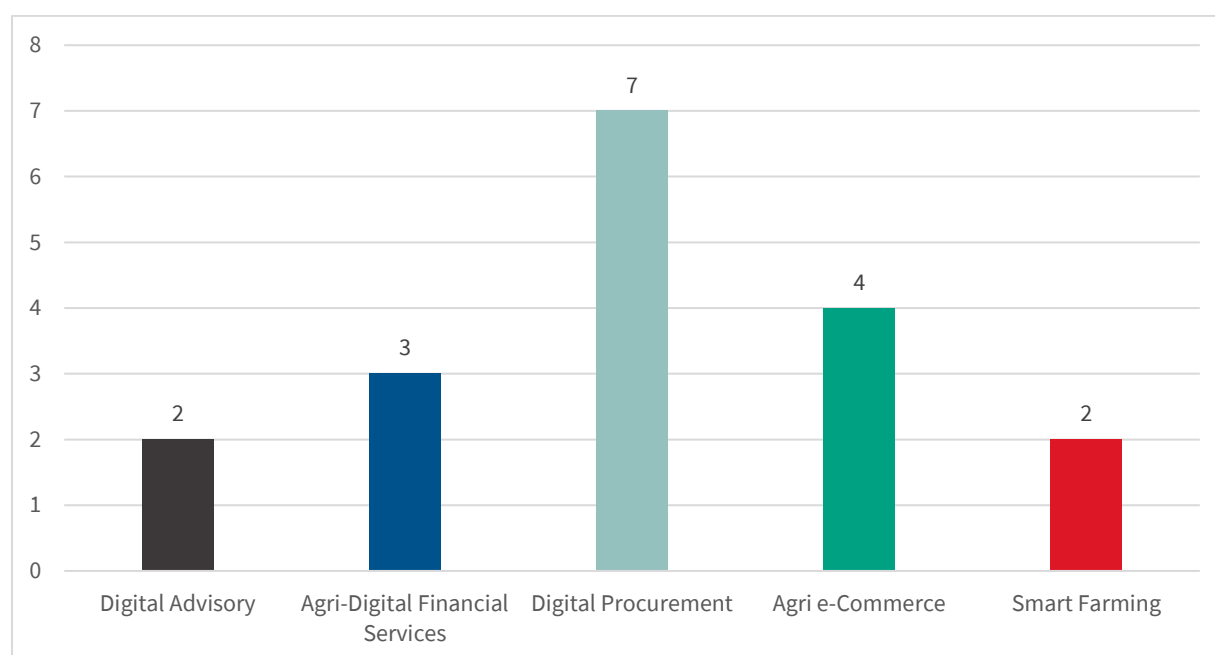

FIGURE 7 IDENTIFIED USE CASES FROM INNOVATIONS IN THE SEYCHELLES

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 THE SEYCHELLES

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 IINNOVATIONS OPERATIONAL IN THE SEYCHELLES

				Name of innovation	Name of the company	Survey ✓/X	Description of innovation	Operational Countries in SADC
	■		■	Airtel Money	Airtel Seychelles	X	Airtel Money of Airtel Seychelles. Is a mobile money service that allows you to send and receive money, buy airtime for yourself or others, and make payments using airtel money (e.g., utility bills, good and services). Implemented in Seychelles only but Airtel Seychelles is a subsidiary of Airtel Africa which operates in other countries.	Seychelles
	■	■	■	eShops	Multiple Internet Payment System (MIPS)	✓	This is a free commerce website with integrated payment solutions launched in 2020 which has a relationship with several online shops and thousands of users (visitors and customers) to increase the efficiency of selling products and receiving payments. Several of the operators on the local Food sector are hosted on the platform. This private company has 300 on-line shops (B2B) with thousands of users. They use cloud-based software as a service through third parties and address all parts of the value chain where payments are necessary. They charge transaction fees and deal with financial exclusion and cashless payment systems that are linked to banks. They have found understanding the market and user needs challenging as well as digital literacy, shared devices, and farmer uptake/use/behavior change. They believe their technology is inclusive.	Madagascar, Mauritius, Seychelles

					Name	Provider	✓	Description	Countries
■		■	■		Farmers Online Marketplace	National Institute for Science, Technology and Innovation Seychelles	✓	Farmers Online Marketplace of the National Institute for Science, Technology, and Innovation (NISTI) for the Seychelles. An innovative digital marketplace giving Seychelles local producers a new home to connect and build personalized relationships with consumers. This is currently under development.	Seychelles
		■			Food Processing Software	Matrix Software	✓	Matrix Software is a meat and food matrix software solution for stock control, yield management, traceability, productivity, and cost margin management. Matrix Software is a service-led private company that provides software services predominantly to the livestock and meat industry and established in 2019. These are digital, mobile, and tablet-based systems for yield and stock control and statistics leading to costings and profitability. Matrix software utilizes android mobile scanners and their associated applications, RFID integrated solutions, automated weighers, and third-party integration. This reduces the initial capital outlays and good implementation support for feedlots, abattoirs, deboning plants, and meat processing plants including others such as fish, poultry, butcheries, and retail outlets. Matrix Software has been located/incubated in the AgVentures Hub in South Africa. This regional solution is deployed in 10 SADC countries (Botswana, Eswatini, Lesotho, Mauritius, Namibia, Seychelles, South Africa, Tanzania, Zambia, and Zimbabwe), but also in counties as Australia and New Zealand. Matrix Software solutions have reached a stage of replication and adaptation in other geographies and are in the Scaling state of development.	Botswana, Eswatini, Lesotho, Mauritius, Namibia, Seychelles, South Africa, Tanzania, Zambia, Zimbabwe
■		■		■	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	Angola, Botswana, Comoros, Democratic Republic of Congo, Eswatini, Lesotho, Madagascar,

							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.	Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Tanzania, Zambia, Zimbabwe
		■			JuicePro	The Mauritius Commercial Bank Limited	✓	MCB-Juice is an innovation of the Mauritius Commercial Bank established as far back as 1838 with a single bank and now a Group with assets worth 16B $US and 60 branches or kiosks nationwide and active in Madagascar, Mozambique, Reunion Island Mayotte, Paris, Seychelles and the Maldives with a wide network of correspondent banks across the world. Launched in 2020 in Mauritius (and 2019 in the Seychelles), Juice is a mobile based banking system for businesses providing ready access to bank accounts and transactions. The Pro version enables multiple signatories to access and sign/approve as part of the workflow. Smartphone App is available on the App Store, Google Play and the AppGallery. Juice has 4,400 active users and 9,200 registered users and utilizes a subscription model. It is a private company at a sustainable scale in its development. It addresses financial exclusion, cashless payments, and has been challenged both by digital and financial literacy and sustainable business models but its technology is inclusive.	Madagascar, Mauritius, Seychelles
		■	■		PRESAN (Program Régional de Sécurité Alimentaire et	Indian Ocean Commission	X	PRESAN -The Indian Ocean Regional Program on Food Security and Nutrition (PRESAN) provides a framework for strategic collaboration and implementation of joint activities which include outreach and communications, information sharing, resource mobilization and technical support to improve food and nutrition security amongst IOC Member States Comoros, Madagascar, Mauritius, Reunion, and Seychelles. It is	Comoros, Madagascar, Mauritius, Seychelles

| | | | | | Nutritionnelle) platform | | | supported by FAO and IFAD and enables FAO to provide technical support necessary to respond to urgent needs in the region, such as the reduction of the deficit of the agricultural trade balance. There is opportunity for join resource mobilization activities and technical support for Small Island Developing States (SIDS) | |
| ■ | ■ | ■ | | | QuickPay | Multiple Internet Payment System (MIPS) | ✓ | Quick Pay System of Multiple Internet Payment System (MIPS) is a private sector fintech payment ecosystem established in 2019 which is compatible with third parties, shops and enables a quick pay system by allowing businesses to create a payment ticket and send a link, when the link is clicked, then a payment can be made by a card. This aspect includes digital and agri wallets and an accountability tool and enables acquisition of inputs and outputs as a sub use case. This is a free hosted e-commerce website with integrated payment solution towards increased efficiency for selling and receiving payments. | Madagascar, Mauritius, Seychelles |

3.3 RESULTS FROM INNOVATION SURVEY RESPONDENTS

All identified innovators received a survey. Only six out of the identified eight innovators filled in the survey. Of those that responded, only one was a Seychelles-only innovation, and five were operational in multiple countries (as reported by the innovations themselves). The answers in the survey are self-reported. All innovators were reminded several times by email and phone. The response rate of the survey was high for the identified innovators in Seychelles with 75% responding.

USE CASES AND SUB USE CASES

The division of GSMA use cases shows that in Seychelles multiple use cases are most common. Four out of six respondents provided multiple answers and two only provided a single use case. Figure 8 below provides the division of use cases. Digital procurement was the most common use case cited by all innovations that completed the survey. Agri e-commerce was the next most common in the Seychelles, this included the Seychelles-only innovation (Farmers Online Marketplace). Smart farming was the least common and was only provided by a regional innovation that operates in all sixteen of the SADC countries (GeoFarmer).

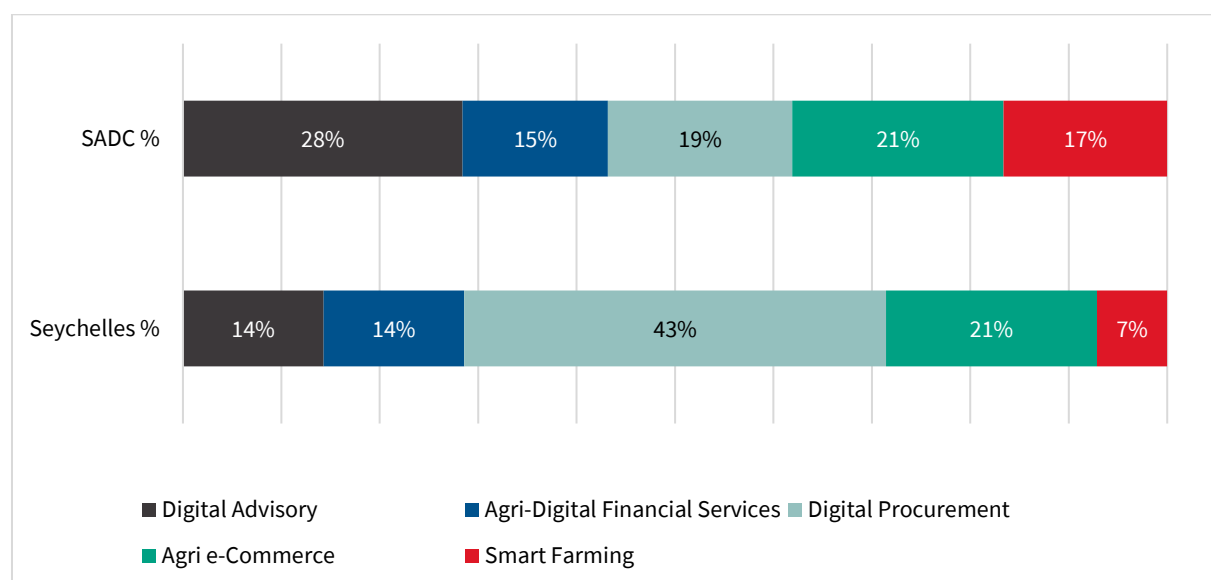|	Digital Advisory	Agri-Digital Financial Services	Digital Procurement	Agri e-Commerce	Smart Farming
SADC %	28%	15%	19%	21%	17%
Seychelles %	14%	14%	43%	21%	7%

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

The innovations present in the Seychelles do not provide a large variety of sub-use cases as illustrated by figure 9 below. In terms of e-commerce there is a slight increase in the number of innovations that focus on outputs[ii]. Digital procurement was the most common use case and all innovations also selected digital records as the sub-use case which deals with replacing paper-based systems and digitizing transactions between farmers and agribusinesses. Of the innovations surveyed, there seems to be a gap in the agri-digital finance services with the focus only on digital wallets or accountability tools (designed to help farmers track farming expenses, revenues and prove creditworthiness). Seychelles has a growing FinTech environment with a focus on

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[ii] Platforms that enable farmers to sell to consumers (B2C model) and to enterprise customers (B2B model) such as companies in the catering industry (e.g., hotels, restaurants) and market retailers, or a hybrid of the two.

becoming a hub for FinTech and so it is likely that some innovations present in country were missed in the survey as they are not agriculture specific.
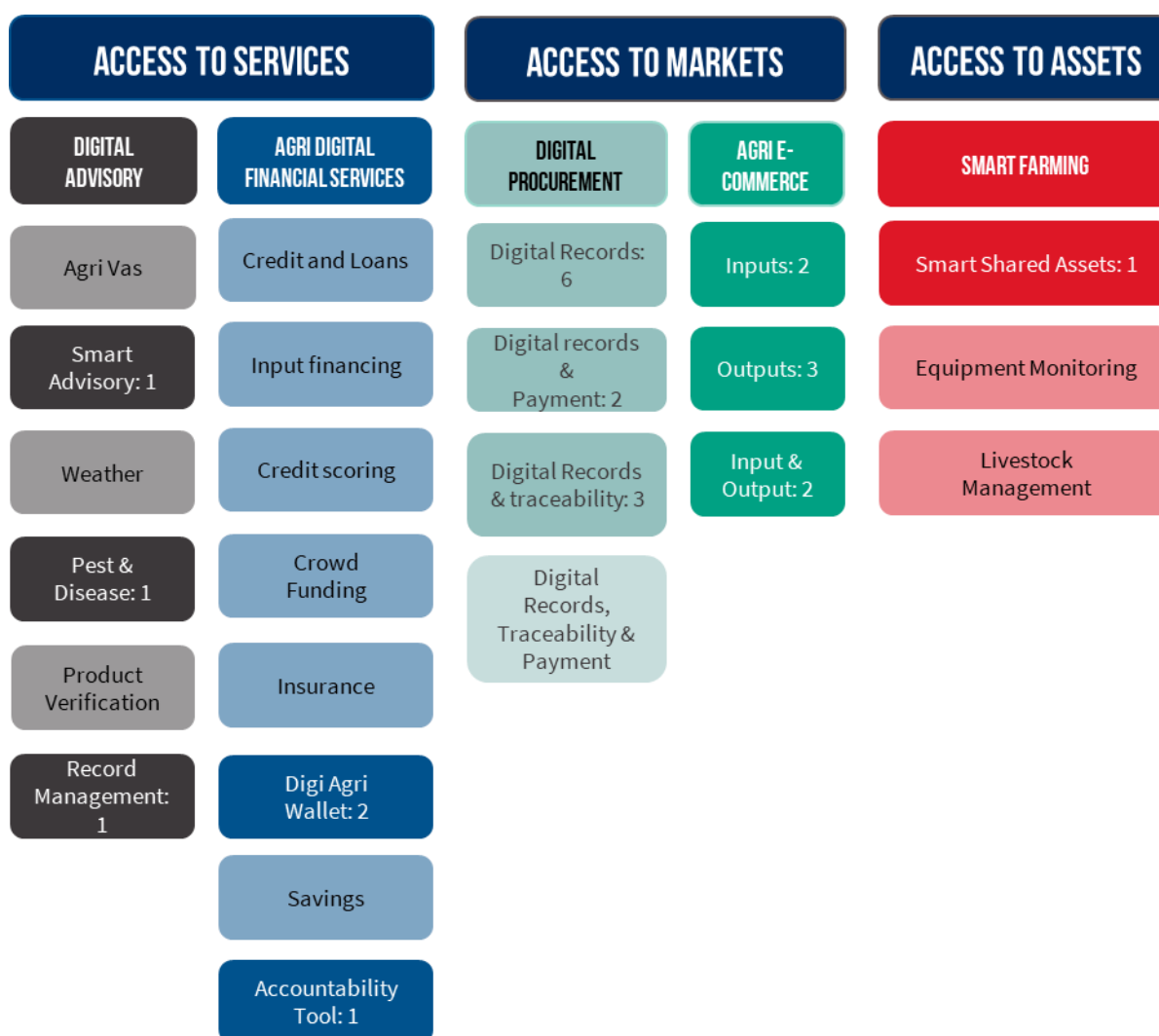

ACCESS TO SERVICES		ACCESS TO MARKETS		ACCESS TO ASSETS
DIGITAL ADVISORY	AGRI DIGITAL FINANCIAL SERVICES	DIGITAL PROCUREMENT	AGRI E-COMMERCE	SMART FARMING
Agri Vas	Credit and Loans	Digital Records: 6	Inputs: 2	Smart Shared Assets: 1
Smart Advisory: 1	Input financing	Digital records & Payment: 2	Outputs: 3	Equipment Monitoring
Weather	Credit scoring	Digital Records & traceability: 3	Input & Output: 2	Livestock Management
Pest & Disease: 1	Crowd Funding	Digital Records, Traceability & Payment		
Product Verification	Insurance			
Record Management: 1	Digi Agri Wallet: 2			
	Savings			
	Accountability Tool: 1			

FIGURE 9 OVERVIEW OF SUB USE CASES PRESENT IN SURVEYED INNOVATIONS IN THE SEYCHELLES

CHALLENGES

Innovations that operate within the Seychelles are looking to address all the key challenges and pain points listed in the survey, except for poor access to internet which was not mentioned. The most common pain points being addressed are financial exclusion and poor access to markets (both 3), the knowledge gap, and low productivity (both 2), climate change and good processing (both 1). More specifically the innovations seek to address inefficiencies in the selling and receiving of payments, access to accounts, improved food safety and traceability, increased efficiencies in the value chain to lower food price and to attempt to make Seychelles less dependent on food imports.

Low digital literacy is overwhelmingly the key challenge that innovators face when implementing technologies, with farmer uptake the next most common barrier. This is corroborated with the findings in the policy section where most farmers prefer to use less advanced technology such as radios as a means for information sharing. Understanding market and user needs, user affordability, access to devices, lack of technical capacity operationally, data collection issues, lack of mobile network coverage, lack of electricity

and low trust were also cited as challenges faced. The Food Processing Software by Matrix Software, a solution for livestock and meat management, specifically noted that user adoption was slow, and time had to be spent building trust within the market to encourage uptake. To what extent this challenge is specific in the Seychelles is unknown. Some of these more infrastructure-based challenges such as poor network coverage and electricity are at odds with the technologies of choice for the innovations (computers and smartphones).

TECHNOLOGY USE AND CHANNELS

The digital devices that the innovations rely on and the channels used to implement them were not that varied. Computers (4) and smartphones (3) were the most common device required which matches the most common channels utilized in the Seychelles: websites (4) and smartphone apps (3). The regional innovation present in all SADC countries (GeoFarmer) did not include smartphone apps as a device but cited satellites as the second device required. Other technologies and channels were cited (basic/feature phones, wearable devices, GPS, landlines, mobile voice/IVR, SMS, social media, geo data, and messaging platforms) but these were all responses from the Seychelles-only innovation that has not launched (Farmers Online Marketplace).

For analysis of the data and information, five innovations used cloud-based software for this[iii], supplemented with a mix of cloud-based databases and spreadsheets (3, respectively). The most innovative tools, Artificial Intelligence and Machine Learning, were used by GeoFarmer[iv].

Most of the technology and channels required for the innovations in the Seychelles rely on more modern technology rather than the advanced emerging technology available which should make it more accessible. It is not expected that all farmers have personal computers or smartphones but through internet centers and cafes these are more accessible than technology such as drones or sensors.

VALUE CHAIN PHASES COVERED

Innovations in the Seychelles are more tailored for the earlier stages of the value chain in terms of planning, input access and use, and on farm production. There were also innovations to address post-harvest and access to markets. There is a clear gap around solutions for storage and transport.
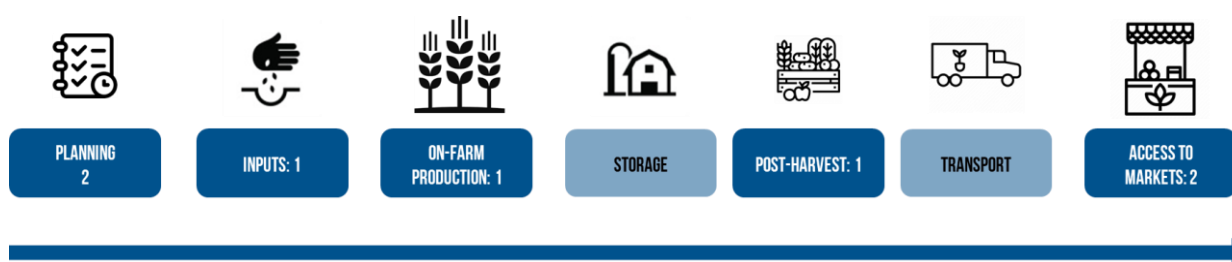

| PLANNING 2 | INPUTS: 1 | ON-FARM PRODUCTION: 1 | STORAGE | POST-HARVEST: 1 | TRANSPORT | ACCESS TO MARKETS: 2 |

FIGURE 10 SURVEYED INNOVATIONS PRESENCE IN THE VALUE CHAIN IN THE SEYCHELLES

SCALING

Most digital innovations in the Seychelles are in the late scaling stage based on the Insights on Scaling Innovations report[17]. Two innovations had reached wide scale adoption (GeoFarmer and JuicePro), two innovations had reached scaling stage with replication or adaptation in other geographical areas (Food

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[iii] QuickPay Systems by MIPS did not complete the responses for this section.
[iv] Farmers Online Marketplace also noted machine learning as a tool, but this platform has not launched yet.

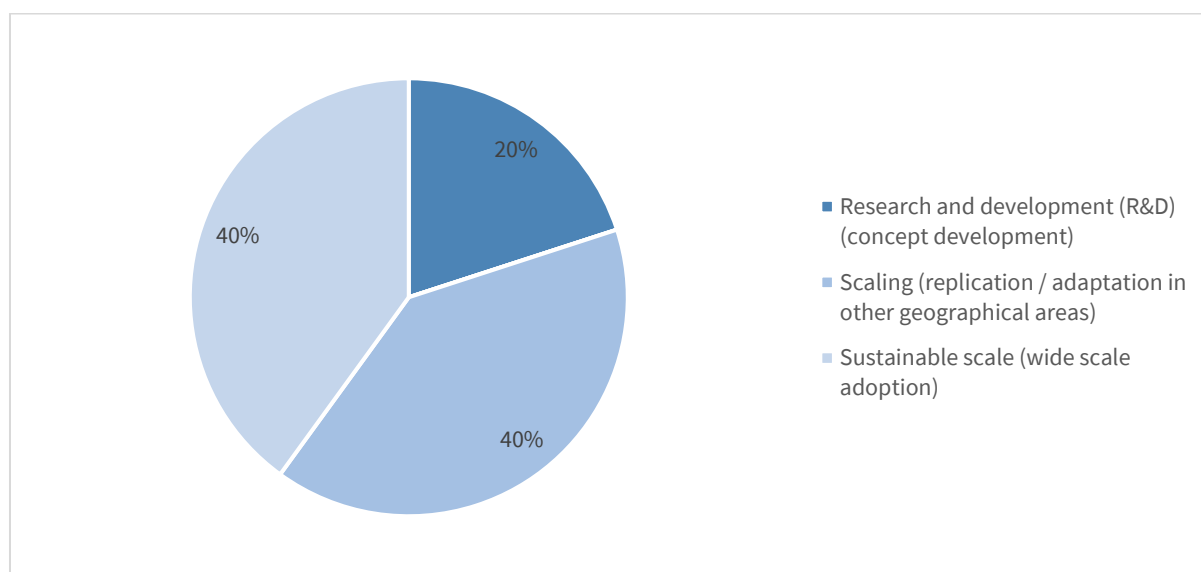Processing Software and eShops) and one innovation was at the concept development phase (Farmer Online Marketplace)[v].

FIGURE 11 SCALING STAGES FROM SURVEYED INNOVATIONS IN SEYCHELLES

Scale was determined and self-reported by the innovations. JuicePro which has reached sustainable scale reported 9,200 registered users, while GeoFarmer did not provide a figure for comparison. QuickPay, which did not provide a level of scale, reported 350 registered users, while Food Processing Software which was at the scaling stage reported 150 registered users. It is unclear if these figures consider businesses and individuals separately.

DEVELOPMENT, FUNDING AND REVENUE SCHEMES

All but one innovation (Farmers Online Marketplace) surveyed in the Seychelles were private sector companies. Two innovations in the Seychelles were developed in 2020, one is under development since 2021, and the rest were all launched between 2002-2019. The oldest innovation is the Food Processing Software by Matrix Software which was developed with entrepreneurs, social enterprises, and commercial agricultural companies. In both the development and implementation of the innovations, entrepreneurs and social enterprises were the most common support in development[vi]. Community organizations, such as local CSOs, were noted as a support in the development and implementation of the Seychelles-only innovations Farmers Online Marketplace.

Funding of the innovations was split between business development support and bootstrapping through friends and family (both mentioned twice). Two regional innovation that operate in the most countries (GeoFarmer and the Food Processing Software) were also supported by impact investors, training, and network opportunities.

In terms of revenue schemes, as most of the innovations are targeted to businesses the most common funding comes from business subscription fees (3) and individual subscription fees, transaction fees, premium service costs, and cost efficiency all cited once. When asked if additional subsidies or donor support would be required

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[v] QuickPay Systems did not provide a response to this question.
[vi] Only three innovations responded to this section of the survey fully.

only Farmers Online Marketplace (the Seychelles-only innovations) confirmed. This innovation is developed through NISTI Seychelles. All other innovations (4) did not require additional subsidies or donor support to sustain the innovation[vii].

INCLUSIVITY AND TARGET AUDIENCES

The target audience for all the innovations in the Seychelles are businesses (5) with individuals, households, and communities the second most common (3)[viii]. This is reflected in the users of the innovations with most users considered other value chain actors[ix] (4). Government was only targeted by one innovation (GeoFarmer). However, cooperatives, farmers, government agencies, extension workers and NGO staff were all included as primary users by the innovations as well. There was no single innovation that was only used by one stakeholder group.

Inclusivity did not seem to be a priority for the Seychelles innovations, with the majority noting that either no specific action was taken or that the innovation was already inclusive. These are self-reported results and so the validity of these statements cannot be confirmed. Only one innovation noted any explicit action to be more inclusive to smallholder farmers (Farmers Online Marketplace, the Seychelles-only innovation that has not yet launched).

[vii] Not all the innovations responded to this section of the survey.
[viii] QuickPay Systems by MIPS did not complete the responses for this section.
[ix] Other value chain actors include input suppliers, buyers, mills, among others.

4 DIGITAL AGRICULTURAL SYLLABI AND ENTREPRENEURSHIP TRAINING

4.1 AGRICULTURAL SYLLABI UNIVERSITIES

In Seychelles, no universities are part of the RUFORUM network. There is an Agricultural University, but they do not provide any kind of relevant trainings or courses[x] so were not contacted for the survey. The ICT Faculty of the University of Seychelles was contacted but did not want to participate as they did not see the relevance in the questions asked as they are not involved with the agricultural sector.

4.2 INCUBATORS AND INNOVATION HUBS

A total of two business support organizations have been mapped in the country, both are not operating in the agricultural sector. The business support organizations that have been identified and contacted are Blue Economy Incubator and The Guy Morel Institute. Both organizations support entrepreneurs and youth in Seychelles to build their digital and entrepreneurial capacities and skills, funded through a SeyCCAT Grant. The organization didn't participate in the KIIs because they felt the survey was not relevant to them as it was outside the scope of the grant policy and were largely not active (the reasons for their inactivity/dormancy was not provided).

Further detailed study around general digital skills training, digital agriculture trainings and digital entrepreneurship trainings would be valuable to better understand the digital ecosystem in the Seychelles and what support is available to the agriculture sector specifically.

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[x] National consultant and CCARDESA ICKM focal point confirmed this.

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*. Due to the number of challenges in data collection the insights the team were able to obtain from the data is limited.

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

Seychelles ranked third out of 16 SADC member states in the benchmark assessment which suggests that it has some key foundational areas necessary for a robust digital economy and could provide guidance on some best practices. 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. Seychelles consistently ranked in the top three for all pillars exceeding the African and Global medians except the G5 digital economy benchmark (which identifies the presence of policies and regulations that are dynamic and flexible and promote the digital economy) where it ranked last, and the innovation driven entrepreneurship pillar where data was not available.

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. Seychelles makes up part of Group 1, as it is a front-runner in the region for unlocking a digital economy. Countries that make up part of Group 1 have been the most successful to date at advancing their policy and enabling environments and all have agriculture sectors contributing less than 10% of GDP and employ less than 5% of their population in productive agriculture. There may be many more people engaged in the food system itself including retail, processing, trade, storage, logistics, marketing, and food preparation. These front-runners provide good areas of potential learning in certain foundational pillars necessary for a vibrant digital economy. Specific focus and investigation should be made to understand what is working within these countries in the implementation of their policies and legislation, how it is working, and the levels of enforcement with regards to the policy, regulatory and legal frameworks.

POLICY ENVIRONMENT

Agriculture only makes up 2.48% of GDP in the Seychelles[18]. This has resulted in a significant de-prioritization of the agriculture sector in Government policy and plans. The shift has been to focus on greater digitalization of services, tourism, and the Blue Economy to stimulate growth in the economy.

The stock take of national policies and strategies identified that digitalization has been considered but there is no clear digital plan or strategy that sets this out as a key priority. The number of available documents that related to topics was low, with only one ICT policy and no sectoral specific plans available, such as e-Governance or cyber security. These scant findings support the low pillar score that Seychelles received under the ITU G5 digital economy benchmark, but further investigation is needed to provide more context to the score. The National Development Strategy does recognize the importance for a "digitalized Seychelles" and attempts to embed this priority throughout the strategy and in all sectors, but it is unclear how far reaching this is. There is no evidence that this prioritization has integrated within agricultural policies and plans.

There is plenty of opportunity for the Seychelles to embrace digitalization within the agriculture value chain for improved productivity and more climate smart technology. It is possible, and likely, that such digitalization will occur first in the fisheries sector and can then extend to key areas of agricultural production in the Seychelles. This innovation and investment in the Fisheries sector is likely led by the private sector so government ministries should find ways to collaborate across departments to allow for shared learnings and solutions. Producing a strategy or policy that encourages a cross-sectoral approach and involvement of the private sector to share information and knowledge that builds on the benefits of digitalization already realized outside the sector could prove to be a useful advocacy tool for greater funding and prioritization. Policies need to be implemented within the sector that build on national strategies to support an environment that would be conducive to greater digital innovations, such as improved connectivity and farmer uptake of technologies so that strategies complement each other and support the overall digital ecosystem and all stakeholders. These priorities work in parallel with improving digital agricultural training and skills, basic foundational elements of the digital economy and fostering innovation for all sectors.

DIGITAL AGRICULTURE INNOVATIONS

The unclear level of digitalization in agriculture is evident in the innovation mapping in Chapter 3. Only eight innovations were identified, six innovators responded to the survey, and only one of the respondents was an innovation developed in Seychelles. This innovation has not launched but is in the development phase. This suggests that the innovation ecosystem in the Seychelles is either undeveloped generally, or more particularly in relation to the agriculture sector. What is encouraging is that the one innovation that was operational in the Seychelles is government led and was directly targeted to farmers, whereas the other regional innovations were either targeting businesses or focused on e-commerce and financial services. However, agriculture is not seen as a priority or an innovative space that attracts digital transformation. This needs to be reprioritized and greater efforts need to be made to attract younger people to the sector either to become part of the work force or to develop solutions that can improve Seychelles' food security and dependence on food importation.

DIGITAL AGRICULTURAL SYLLABI AND ENTREPRENEURSHIP TRAINING

In Seychelles, digital infrastructure and trainings have been made accessible to the population but are small in comparison to the region. In the field of digital agriculture, courses seem to be absent in the formal education system although it is difficult to confirm as there was limited engagement with these stakeholders. It is recommended to include digital agriculture in the curriculum of higher education in the country. For that, higher education institutions will need capacity building and equipment for digital agricultural education and behavioral change of the agriculture sector.

To encourage greater youth engagement with the agriculture sector and the entrepreneurship climate, Seychelles needs to improve and increase the availability of training for digital skills and entrepreneurship but also the integration of digital technologies in agriculture such as e-extension.

5.2 REFLECTIONS FROM THE SITUATIONAL ANALYSIS REPORT

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

- **Digital agriculture must be guided by local priorities, policies and capacity development in an on-going manner and must be promoted among incubators and innovation hubs to prepare the local youth to invest in the sector and develop new services for local farmers and agricultural stakeholders.** 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.

- **A whole-of-government approach is necessary for a thriving digital economy that enables engagement of stakeholders in the policy process and can alleviate cross-sectoral challenges, such as connectivity and digital literacy skills.** A digital economy strategy enables the private sector to engage in policy formulation and play a role in whether policies are delivering an enabling environment. The observation from our analysis suggests the predominance of a siloed approach by different ministries and departments suggesting gaps, overlaps and inherent inefficiencies. This nature of siloed policymaking hinders the entrance of partnerships with the private sector.

- **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"[19]. A clear agriculture sector specific strategy or roadmap can address some of the key challenges raised by stakeholders consulted during this study.

- **Countries whose first language is not English are likely to be at a real disadvantage in terms of content generation and/ or adaptation.** 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. To use digital agriculture innovations, digital skills are critical. Where digital literacy is low, access to and use of digital agricultural innovations is likely to be lower.

- **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.

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

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