

# DIGITAL AGRICULTURE COUNTRY STUDY ANNEX: MADAGASCAR

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

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



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SYSTEMS OF THE SADC REGION: SITUATIONAL ANALYSIS REPORT**

Centre for Coordination of Agricultural Research and Development for  
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# TABLE OF CONTENTS

- ACRONYMS AND ABBREVIATIONS .....V**
- 1 INTRODUCTION ..... 1**
  - 1.1 INTRODUCTION TO THE STUDY AND THE STRUCTURE OF THE DACS ..... 1
  - 1.2 METHODOLOGY ..... 2
  - 1.3 COUNTRY CONTEXT ..... 7
  - 1.4 THE GENERAL DIGITAL ECOSYSTEM..... 8
- 2 THE BROADER POLICY ENVIRONMENT .....12**
  - 2.1 GENERAL DIGITAL POLICIES ..... 12
  - 2.2 LEGISLATION ..... 13
  - 2.3 DIGITALISATION IN AGRICULTURE ..... 13
- 3 DIGITAL AGRICULTURAL INNOVATIONS .....15**
  - 3.1 MAPPING DIGITAL AGRICULTURAL INNOVATIONSS ..... 15
  - 3.2 IDENTIFIED AGRICULTURAL INNOVATIONS OPERATIONAL IN MADAGASCAR ..... 16
  - 3.3 RESULTS FROM INNOVATION SURVEY RESPONDENTS..... 23
- 4 DIGITAL AGRICULTURAL SYLLABI AND ENTREPRENEURSHIP TRAINING .....27**
  - 4.1 AGRICULTURAL SYLLABI UNIVERSITIES ..... 27
  - 4.2 INCUBATORS AND INNOVATION HUBS ..... 28
- 5 INSIGHTS AND REFLECTIONS .....30**
  - 5.1 INSIGHTS..... 30
  - 5.2 REFLECTIONS FROM THE SITUATIONAL ANALYSIS REPORT ..... 31
- REFERENCES.....33**

Figure 1 Overview of Kenyan Digital Economy Blueprint ..... 3

Figure 2 Use Case Model Based on GSMA Framework ..... 5

Figure 3 Map of Madagascar in SADC..... 7

Figure 4 Madagascar’s Agricultural Industry Share of GDP and the Share of the Agricultural Labor For ..... 8

Figure 5 Overview of the African Union Digital Transformation Strategy ..... 9

Figure 6 Results from Benchmark Assessment for Madagascar ..... 10

Figure 7 Identified Use Cases from Innovations in Madagascar ..... 15

Figure 8 Division of Use Cases for Survey Respondents in Madagascar vs. Identified Innovations in SADC..... 23

Figure 9 Overview of Sub Use Cases Present in Surveyed Innovations in Madagascar ..... 24

Figure 10 Surveyed Innovations Presence in the Value Chain in Madagascar ..... 25

Figure 11 Scaling Stages from Surveyed Innovations in Madagascar ..... 26

Table 1 Pillars for the Benchmark Assessment ..... 3

Table 2 Indices and Data Stream Used for the Benchmark Assessment and Maximum Score Available ..... 3

Table 3 Benchmark Pillar Scores: Madagascar ..... 9

Table 4 Overall Benchmark Assessment Results and Rank for all SADC Member States..... 10

Table 5 Benchmark Assessment Pillar Rankings..... 11

Table 6 Overview of Identified Agricultural Innovations Operational in Madagascar ..... 16

Table 7 Overview of Responses from Surveyed Universities in Madagascar ..... 27

Table 8 Overview of Responses from Interviewed Incubators in Madagascar ..... 29

# ACRONYMS AND ABBREVIATIONS

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

<b>IOT</b>	Internet of Things
<b>IS</b>	Information Society
<b>IT</b>	Information Technology
<b>ITU</b>	International Telecommunications Unit
<b>KII</b>	Key Informant Interview
<b>MSMES</b>	Micro, Small and Medium Enterprises
<b>NGO</b>	Non-Governmental Organization
<b>NREN</b>	National Research and Education Networks
<b>OECD</b>	Organization for Economic Co-operation and Development
<b>OSI</b>	Online Service Index
<b>R&amp;D</b>	Research and Development
<b>RCOL</b>	Regional Centers of Leadership
<b>RUFORUM</b>	Regional Universities Forum
<b>SAAS</b>	Software as a Service
<b>SADC</b>	Southern African Development Community
<b>SME</b>	Small and Medium Enterprise
<b>SMS</b>	Short Message Service
<b>SSA</b>	Sub Saharan Africa
<b>TOR</b>	Terms of Reference
<b>UN</b>	United Nations
<b>UNCTAD</b>	United Nations Conference on Trade and Development
<b>UNDP</b>	United Nations Development Program
<b>USSD</b>	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 Madagascar 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 an 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 Madagascar 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 Madagascar, 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 Madagascar 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. Madagascar did not have a CCARDESA Information, Communication and Knowledge Management (ICKM) Focal Point to assist with this study. The study team worked with a National Consultant in Madagascar, Mr. Samuel Andrianjafy.

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

### GENERAL ECOSYSTEM

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

### BENCHMARK ASSESSMENT

The team completed a benchmark assessment across the 16 SADC member states. The assessment sought to provide a context to the findings of this study, and not to determine each SADC country's development of a digital economy. The approach was adapted from [Unlocking the Digital Economy in Africa: Benchmarking the Digital Transformation Journey](#) by SMART Africa and the Digital Impact Alliance (DIAL). SMART Africa's mandate is to encourage Africa's transformation into a knowledge economy through the usage of ICTs, and therefore this assessment would be most compatible to the SADC member states. Other frameworks and toolkits were reviewed in preparation for the benchmark with more information in the *Situational Analysis Report*.

The assessment areas in the SMART Africa/ DIAL report are based on the five foundational pillars of the Kenyan [Digital Economy Blueprint](#), illustrated in figure 1, and are similar in nature to the African Union's [Digital Transformation Strategy](#) foundation pillars, illustrated in figure 5, (Enabling Environment; Policy and Regulation; Digital Infrastructure; Digital Skills and Human Capacity; Digital Innovation and Entrepreneurship).

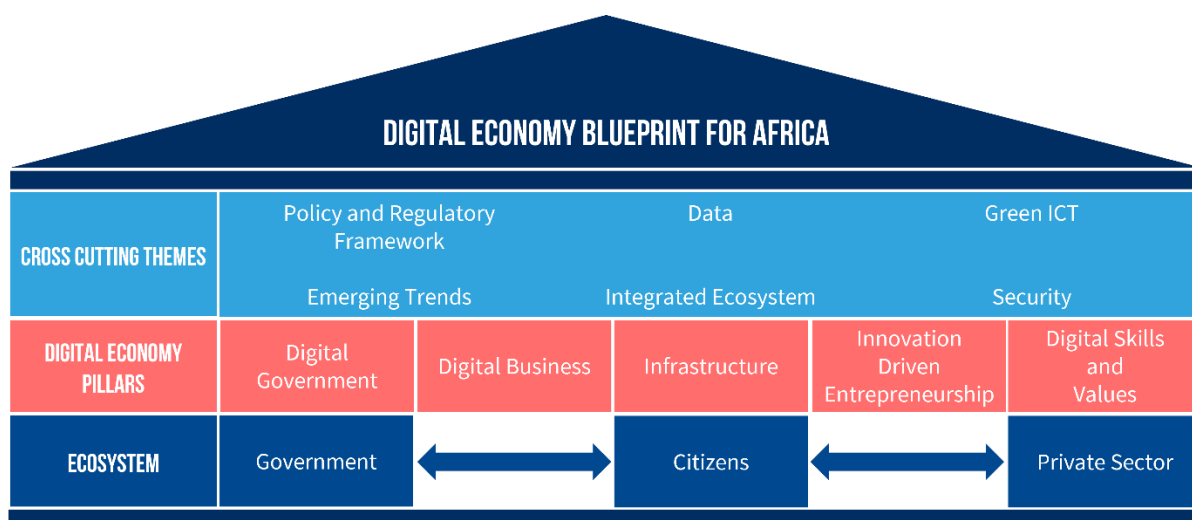


FIGURE 1 OVERVIEW OF KENYAN DIGITAL ECONOMY BLUEPRINT

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

TABLE 1 PILLARS FOR THE BENCHMARK ASSESSMENT

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

Assessing all pillars has provided a picture across all 16 countries and forms the basis of the specific indicators that were selected for the benchmark assessment. The indicators used were based on the SMART Africa/DIAL report. Changes were made to some of the indicators for this study to focus more specifically on the digital elements. For example, the ICT Infrastructure pillar uses the ICT Composite Index score, rather than the general Infrastructure indicator from the Africa Infrastructure Development Index (AIDI) that included elements such as roads. For the Digital Skills pillar, only the digital skills among active population score were used for this benchmark rather than the general Digital Skills score in the Global Competitiveness Index (GCI) which includes factors not related to digital. The indicators and data stream used and the maximum score available is illustrated in Table 2.

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

Benchmark Pillar	Index	Data Stream	Maximum Score
Digital Government	E-Government Development Index (EGDI) 2020	Online Service Index (OSI)	1

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

Each SADC country received a total score based on the specific scores of each pillar, outlined above. These figures were then compiled into an index (this was done by dividing the scores by the maximum possible score). The benchmark is based on a mix of indicators from 2019-2021, outlined in Table 2.

## POLICIES

For the broader policy section, the study team identified available policies, strategies and legislation around Information Communication Technologies (ICT), digitalization, data, cybersecurity and privacy, e-commerce and transactions and agricultural sector policies through desk-based research and discussions with in-country consultants. The team undertook key informant interviews (KIIs) with available CCARDESA ICKM focal points to identify additional policies, including draft versions that may be unavailable online and to understand practical challenges around the policy environment within ministries.

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

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

## INNOVATIONS

Digital agricultural innovations were identified through a desk review of international reports, internet searches, and local networks supplied by 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 Madagascar 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.

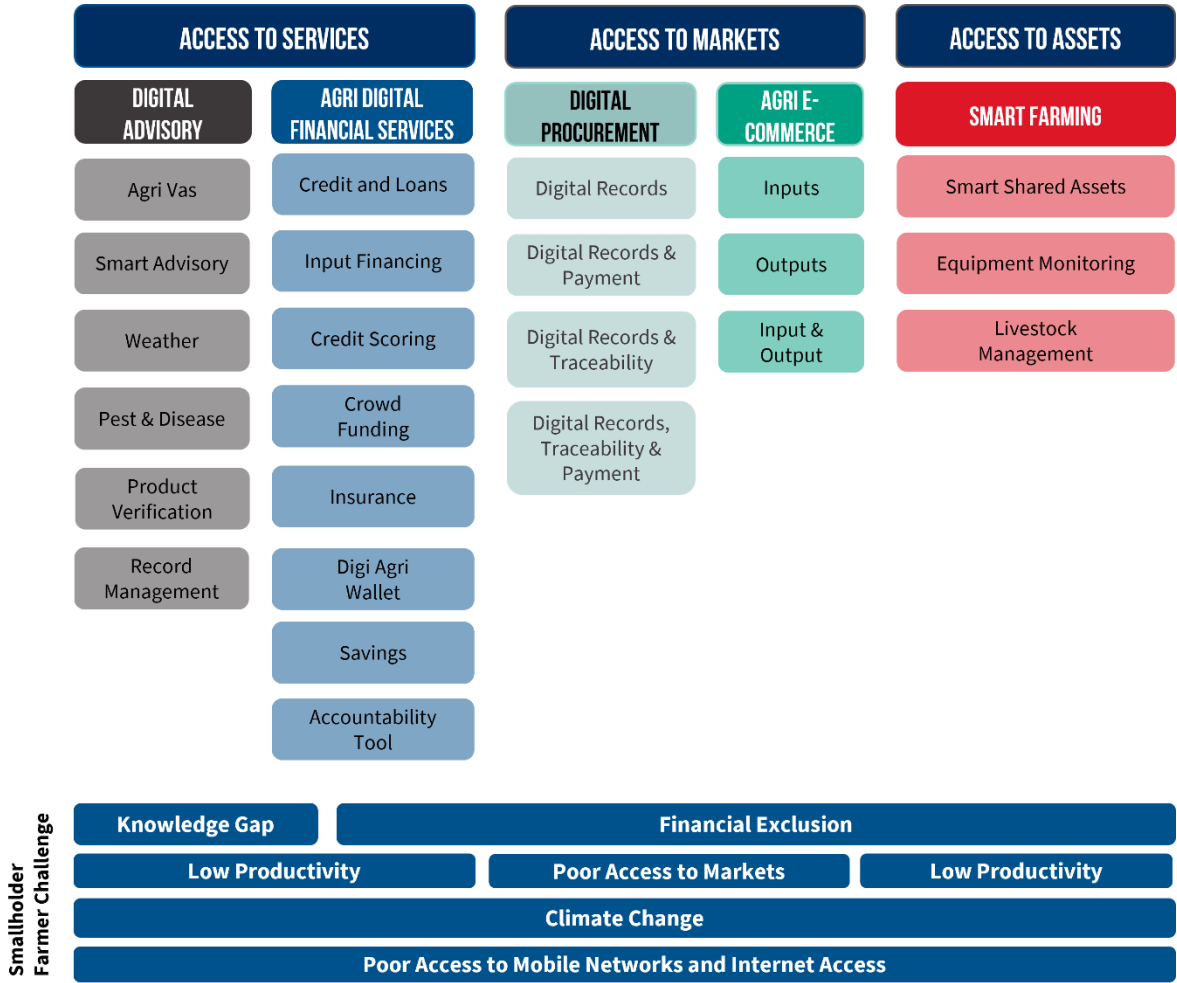


FIGURE 2 USE CASE MODEL BASED ON GSMA FRAMEWORK

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



## DIGITAL 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 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 annexes 3-4 and 8-10 in the *Situational Analysis Report*.

## LIMITATIONS TO THE METHODOLOGY

The planning, data collection, analysis and reporting of this study was completed between April to December 2021. Due to the Covid-19 pandemic much of the data collection and delivery of this assignment was completed remotely across the 16 SADC member states. The inability of some national consultants to conduct in-person meetings or interviews, and restrictions around national travel due to Covid-19 protocols limited the data collection and led to delays in some areas.

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

## POLICIES

There were several challenges in obtaining policy documents and determining if they were accurate, final, or valid and implemented. The impact of the Covid-19 pandemic has affected the priorities of governments and implementation of their related policies. Furthermore, the pandemic has constrained open and full consultation of policies that have been drafted and may have delayed their finalization. Additionally, much of the documentation the team found is split between ministry websites and illustrates the siloed nature of policy formulation in this space. If documents were unavailable online then the ICKM focal points were asked for access where possible, national consultants also tried to source documents locally. Unverified versions of documents available online were also used for review.

## INNOVATIONS

The current DACS is a snapshot in time as new digital innovations are in development in Madagascar and some may be declining because of the Covid-19 pandemic. Due to various Covid-19 restrictions, physical meetings could not always take place. People had to work from home which significantly affected their ability and willingness to participate in online interviews and survey instruments. The efforts of the national consultants to convince innovators to participate in the survey required significant energy and effort and, in some cases, took longer than expected. Many innovators are very busy and mentioned that participating in another survey or interview did not equate to new opportunities for their innovation. There was also suspicion and caution by innovators and public sector stakeholders to engage with consultants and share proprietary data.

## DIGITAL SYLLABI

Across the region, the response rate of universities to the survey tool and interviews was 47% which was a reasonable response rate. However, the response rate is variable between countries and the number of participating universities in some countries was much lower than expected given their diversity and maturity and contrasted highly with much smaller nations in the region. This is believed to be due to the enormous additional workload on staff at Universities as a direct result of the pandemic forcing many to move all activities online and the time and pressures this entailed. As a result, University staff struggled to find available time for the survey.

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

# 1.3 COUNTRY CONTEXT

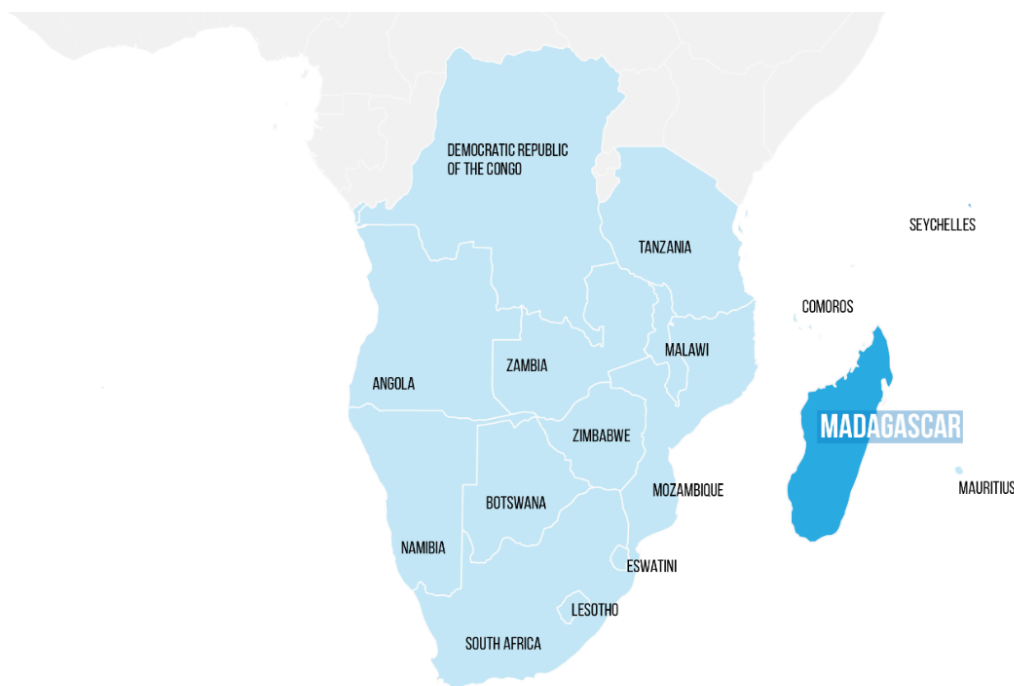


FIGURE 3 MAP OF MADAGASCAR IN SADC



Madagascar is an island off the coast of Africa and is classified as a low income country with a population of 27.7 million.<sup>1</sup> It is one of the poorest countries in the SADC region with a Gross National Income per capita of only \$1,620 (compared to an average of \$8,277 in the region).<sup>2</sup> The UNDP Human Development Indicators<sup>3</sup> rank Madagascar as 164th out of 190 countries and 12th out of the 16 SADC countries. For gender equality, the country scores around average in the region for gender equality with a Gender Development Index of 0.952.<sup>i</sup> While 69.1% of the population falls under the UN Multidimensional Poverty Index,<sup>4</sup> 70.7% live below the poverty line according to the World Population Review.<sup>5</sup> This is significantly above the average rate of the SADC region of 40.8%. The median age of Madagascar's population is also younger than the average in SADC with 19.6 years (versus 22.1 years).

**AGRICULTURE ENVIRONMENT**

In the case of urbanization, Madagascar is slightly above average in the SADC region with 37.9% living in urban areas. Although only 24.12% of the GDP is earned in agriculture, 64.12% 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, Madagascar ranks as the 106th country with an overall score of 37.5—making it the 7th in the SADC region alone.<sup>6</sup>

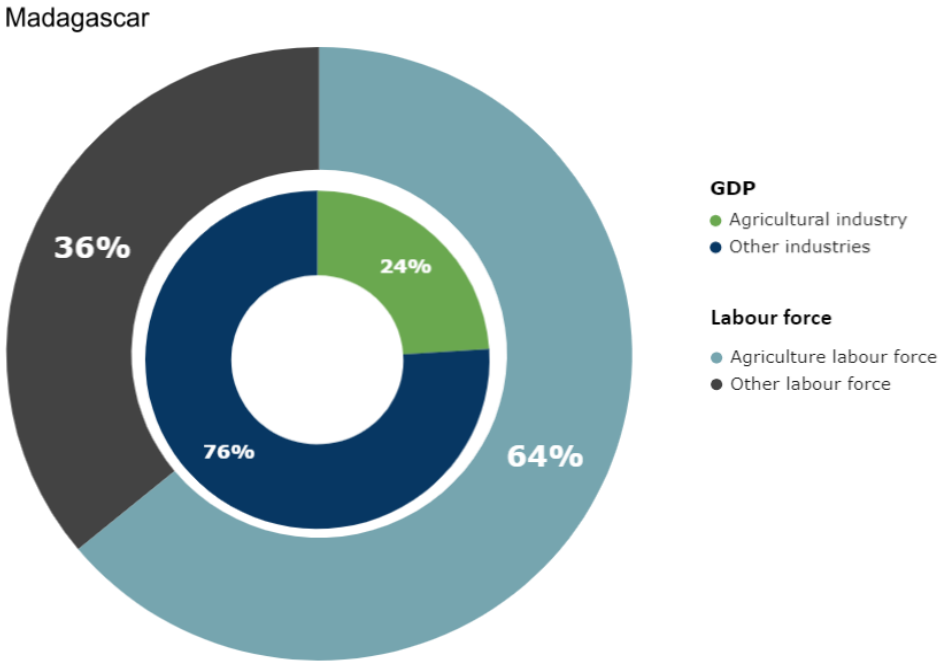


FIGURE 4 MADAGASCAR'S AGRICULTURAL INDUSTRY SHARE OF GDP AND THE SHARE OF THE AGRICULTURAL LABOR FOR

**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

<sup>i</sup> Gender Development Index (GDI) measures gender inequalities in achievement in the three basic dimensions of human development.

sustainable growth<sup>7</sup>. The Strategy, illustrated in Figure 5, is based on foundational pillars, critical sectors to drive the digital transformation, and cross cutting themes to support the digital ecosystem.

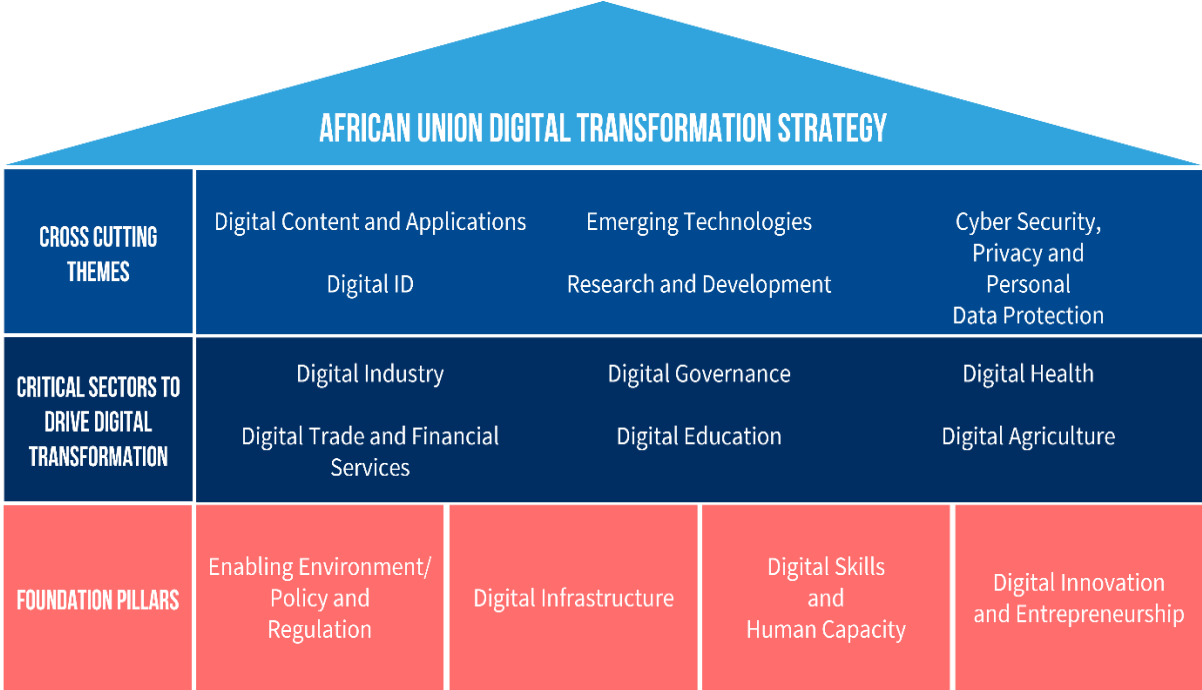


FIGURE 5 OVERVIEW OF THE AFRICAN UNION DIGITAL TRANSFORMATION STRATEGY

The transition to, and importance of, a digital economy is illustrated in the prevalence of this agenda within regional institutions, donors, and multilateral organizations. Where agendas previously focused on ICTs, providing hardware and universal access, the focus is now on enabling a digital economy with a more holistic view of digital and ICTs. The digital economy considers sectors beyond the IT industry and encourages a whole-of-government approach to have more emphasis on the overall ecosystem and economy<sup>8</sup>.

**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. 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 Madagascar are illustrated in table 3.

TABLE 3 BENCHMARK PILLAR SCORES: MADAGASCAR

Madagascar	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, 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: MADAGASCAR**

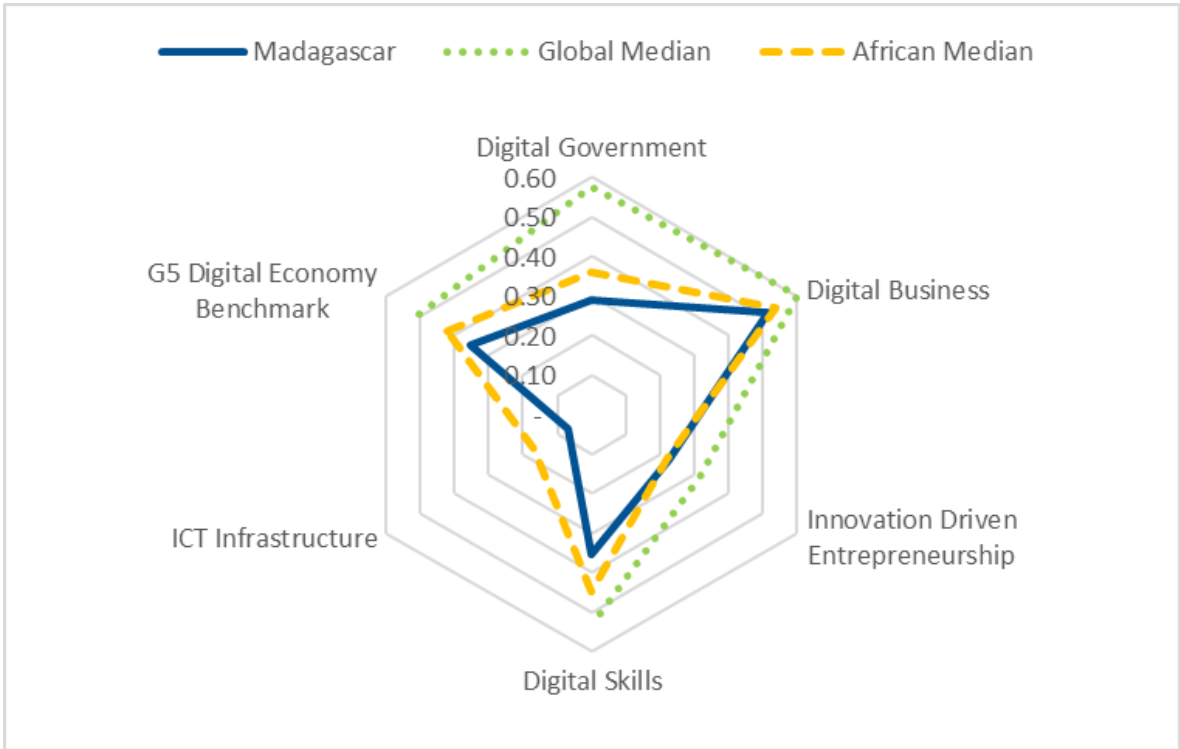


FIGURE 6 RESULTS FROM BENCHMARK ASSESSMENT FOR MADAGASCAR

In the benchmark assessment Madagascar ranked 12 out of the 16 SADC member states. Figure 6 below, illustrates the results of the benchmark in comparison to the global and African medians. Madagascar is on par with the African median in two indicator areas, Digital Business, and Innovation Driven Entrepreneurship. In the other four assessment areas it lags most of the SADC member states. The benchmark suggests that Madagascar may be lacking in some key foundational areas necessary for a robust digital economy, such as digital skills and infrastructure.

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

**TABLE 5 BENCHMARK ASSESSMENT PILLAR RANKINGS**

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

**DIGITAL INFRASTRUCTURE**

Madagascar ranked last in the ICT Infrastructure pillar which is reflected in the figures for the total population using the internet which according to the UN is 9.8%.<sup>9</sup> This is much lower than the regional average of 29.94%. The GSMA Mobile Connectivity Index shows a 65% access to the 3G network,<sup>10</sup> which complements the HDI report of mobile cellular subscriptions at 40.6 per 100 people.<sup>11</sup> Madagascar also ranks as 112nd on the Inclusive Internet Index<sup>12</sup> which details the accessibility, affordability, and relevancy of the internet in 120 countries. However, according to the Mobile Connectivity Index,<sup>13</sup> Madagascar is ranked number 12 in terms of overall mobile connectivity in the SADC countries with an overall index of 38.2—which qualifies it as a Discoverer country (below 35), the lowest level of 5. It scores below average for consumer readiness, affordability, availability of infrastructure, and content and services.<sup>ii</sup> Unfortunately, there is no information on Madagascar in terms of ICT adoption, future orientation of the government, or even on innovation capability index.<sup>14</sup> However, it scores 3.13 out of 7 points on the GCI 4.0 Digital Skills Among the Population Index, which is slightly below the SADC average.<sup>15</sup>

<sup>ii</sup> 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 Madagascar ranked 12 out of 16 in the region, lagging in all indicators except digital business and innovation driven entrepreneurship. The low scores and ranking in the assessment pillars indicate that Madagascar is lacking in some foundational requirements for a digital economy and that there is 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 Madagascar forms part of Group 4 which is made up of countries that scored poorly in the benchmark, are more reliant on agriculture for GDP growth and employment and are non-English speaking member states.

The purpose of this section is as follows:

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

It is important to recognize that the presence of policy, regulatory or legal frameworks may not always translate into awareness, effectiveness, or enforcement of these frameworks. Policies provide one part of the wider ecosystem needed for enabling innovations. The ability of an innovation to demonstrate value and a viable business model underpinning their innovation, progress towards investment readiness, sustainability and the level of scale that is achievable is likely to play a more important role in enabling innovations rather than policy frameworks<sup>16</sup>. 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<sup>17</sup>. 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<sup>18</sup>.

### 2.1 GENERAL DIGITAL POLICIES

The benchmark assessment suggested that Madagascar's digital economy is developing but lagging most of the region. Sourcing documents for the stock take was challenging due to a lack of CCARDESA ICKM focal point, and limited availability of strategies and policies on Government websites. The policies reviewed have not had their sources validated and it is not clear whether they have been implemented.

#### **POLICIES, STRATEGIES AND PLANS**

No general digital policies, strategies or plans were identified for this study; however, some reference is made within the documents reviewed.

The **National Plan for Development 2015-2019** is a national guide that sets out several aims and objectives to stimulate growth and development in Madagascar and is focused around five strategic and broad axes:

- Governance, Rule of Law, Security, Decentralization, Democracy, National Solidarity
- Preservation of macroeconomic stability and support for development

- Inclusive growth and territorial anchoring of development
- Adequate human capital for the development process
- Enhancing natural capital and building resilience to disaster risks

The Plan acknowledges the importance of technological progress for improving efficiency, productivity, and competitiveness of economies. It states that technology will have to play a central role in the modernization of agriculture, the preservation of the environment and to generate employment. Technologies should be directed to critical sectors of the economy (particularly agriculture and natural resources) through partnerships with research centers and the private sector. Despite this reference, it is unclear whether digitalization receives prioritization within the Plan. In the strategies and objectives, the only references to it are reduced to penetration rates and internet users rather than a holistic uptake of digital solutions.

The **National Innovation Policy and Strategy on Intellectual Property of Madagascar 2016** is an interesting document that is not strictly related to digitalization but has implications for this sector, along with stimulating innovation which can include digital technologies. The Strategy is applied to the whole economy and sets out objectives to strengthen the legislative and regulatory framework for creativity and innovation, and intellectual property; capacity building in the field of intellectual property and how it can be best utilized for the Madagascar economy; strengthening public private partnerships in research and development and innovation; and the use of intellectual property for technology development and infrastructure. The Strategy identifies the need to adopt a technological development policy to stimulate growth in international trade.

## 2.2 LEGISLATION

There are five key legislation items relevant to the sector and this study in Madagascar:

- **Law 2005-023 on Institutional Reform of the Telecommunications Sector** provides a legal framework liberalizing the sector, promotes e-governance, establishes three licensing regimes, technological neutrality, and establishes a regulatory authority responsible for implementing the law: 'Autorité de Régulation des Technologies et de la Communication (ARTC)'.
- **Law 2014-024 on electronic transactions**
- **Law 2014-025 on electronic signatures**
- **Law 2014-038 on Personal Data Protection Law** which declares that the processing of personal data is based on four main pillars, namely the principles of legitimate purpose and fairness of collection and processing, the existence of data subjects' rights, the presence of an independent supervisory authority, and the establishment of an enforcement regime.
- **Law 2014-006 on Cybercrime** establishes and recognizes crimes related to information systems, crimes related to injuries through information systems, and responsibilities for operators and service providers against the exploitation of networks, telecommunications, or electronic communication services

## 2.3 DIGITALISATION IN AGRICULTURE

No digital agricultural policies, strategies or plans were identified for this study; however, some reference is made within the available documents below.

**The National Agriculture Investment Plan 2016-2020** provides little insight into whether digitalization is being prioritized in the agricultural system. References are made to technologies although it is likely these are not digital technologies and are omitted from the findings. The only information included in the plan, which was of relevance, was the intervention to develop a harmonized and reliable information and communication system for all actors through the computerization of resource management. Included was the acknowledgement that computer equipment and internet access would be needed for this. Beyond this small inclusion there is very little in the document that relates to digitalization specifically, although there are scenarios of challenges and strategies suggested that could benefit from digital solutions.

**The Malagasy Agricultural Transformation Program (PIAM) 2020** is also brief on references regarding digitalization however under the “strengthening the supply of financial and non-financial services” strategy, reference is made to the establishment of a digital platform for agricultural sector actors (access to inputs and services). This item is referenced again in a Terms of Reference issued by the Ministry of Agriculture, Livestock and Fisheries under the *Producer Resilience Initiative for Covid-19* where the mission is to design a digital platform for collecting, managing, and sharing information. No further information is available. Beyond these small additions in the above policies, it is unclear whether digitalization has been embraced within agricultural systems and policies of Madagascar.

## CHALLENGES

Sourcing documents for Madagascar has been a challenge as the majority of these are not available online through the Government portals. Common feedback when interviewing public sector stakeholders across the SADC region within Agricultural Ministries has been the lack of knowledge and accessibility to understand what policies and strategies are currently in place and how they relate to the sector. The documents available do not present an image of prioritization of digitalization in agriculture or more generally across government. There was no public sector focal point available for Madagascar and so the information for what is available is limited. However, the reflection that digitalization is not prioritized may be incorrect and further study is encouraged.

Although no strategies were available for review, there is a Digital Governance Unit website which was set up in 2019 and focuses on the transformation of public services<sup>19</sup>. Contrary to the findings of this stock take, it suggests that digitalization is being embraced but no further public documents were available.

In terms of digitalization within agriculture, this also seems nascent. Small references in sectoral and national strategies on improving information systems and flows did appear. Blockchain technology is also beginning to be applied in organic farming to provide traceability information and assurances although it is unclear if this initiative is being supported by Government institutions<sup>20</sup>.

A key barrier to embracing digitalization in agricultural systems is a lack of a guiding policy or strategy that 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.

# 3 DIGITAL AGRICULTURAL INNOVATIONS

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

## 3.1 MAPPING DIGITAL AGRICULTURAL INNOVATIONS

The DACS for Madagascar 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. The diagram below represents the type of GSMA use cases found in the identified innovations in Madagascar. A total of 23 innovations were identified in Madagascar that had a mix of use cases as illustrated in Figure 7.

From the identified innovations, 12 were developed for a single use case and 11 for multiple use cases (one for 4 use cases, four for 3 use cases, and four for 2 use cases). Thirteen (13) identified innovations were specific for Madagascar only and eight were identified as innovations operating regionally. Figure 7 illustrates the division per use case for the identified innovations.

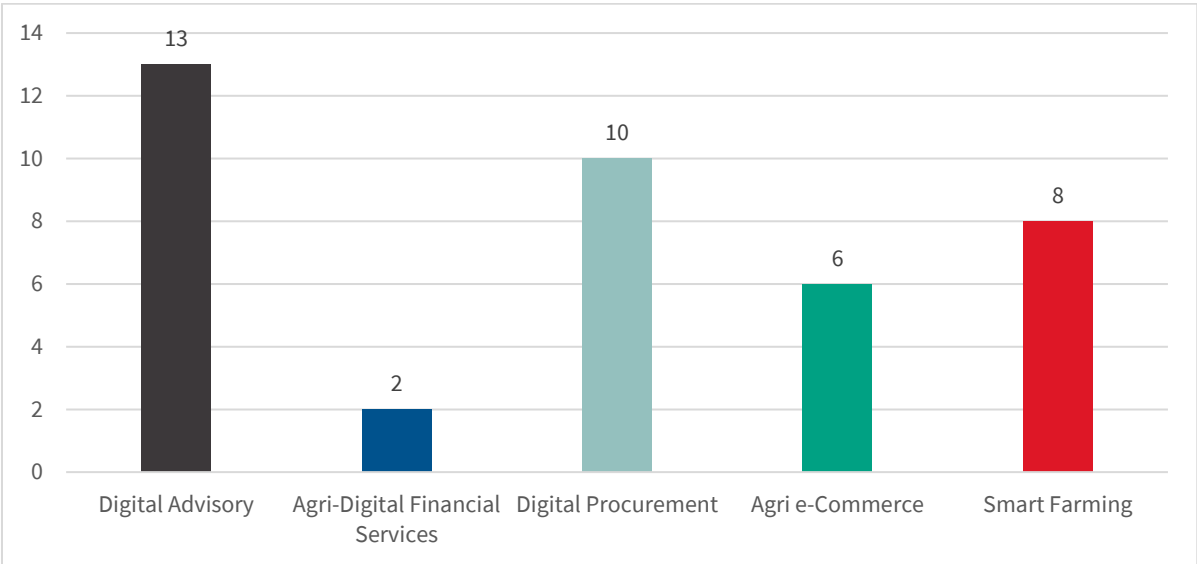


FIGURE 7 IDENTIFIED USE CASES FROM INNOVATIONS IN MADAGASCAR

The innovations present in Madagascar have been developed by different organizations compared to other countries in the SADC region, but the majority of identified innovations were developed by private sector companies (9). Farmer associations developed five innovations, and government, international organizations and NGOs all developed two innovations, respectively. One innovation was developed by a research institute.

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 MADAGASCAR

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



TABLE 6 OVERVIEW OF IDENTIFIED AGRICULTURAL INNOVATIONS OPERATIONAL IN MADAGASCAR

					Name of innovation	Name of the company	Survey ✓/X	Description of innovation	Operational Countries in SADC
■				■	3C-BIOVIS	National Center for Applied Research in Rural Development (FOFIFA-DRZVP)	✓	3C-BIOVIS of National Center for Applied Research in Rural Development (FOFIFA-DRZVP). 3C-BIOVIS (carrying capacity and plant biomass calculator using satellite imagery) is a calculation tool that allows the quantity of forage resources to be determined from data obtained by processing satellite images. The principle of the tool consists of measuring and transforming the reflectance of plants (NDVI) detected by satellites into yield in tons of dry matter per hectare. 3C-BIOVIS predicts real-time information on the availability of forage resources: (amount of green matter and dry matter measured on a plot) from data extracted by processing satellite images. The results are then used by the tool to calculate the number of animals (cattle, sheep, goats) that can be fed on the plot.	Madagascar
■					3D cartoon: agroecology for future generations	GSDM	X	3D cartoon: agroecology for future generations of GSDM. GSDM has produced a series of 3D cartoons on agroecology for children available in Malagasy, French and English. They are then broadcasted in GSDM's partner schools.	Madagascar
■				■	Aerial photographs /	CIRAD	✓	The use of drones to get spatial information. Once georeferenced and orthorectified, photo-interpretation techniques were used to classify the different types of land use and occupation at the level of the land.	Madagascar

					mapping by drone				
				■	CGARD	Center On Geoinformatics Applications in Rural Development	✓	Centre on geoinformatics applications in rural development (CGARDS) of Ministry of Agriculture, Livestock and Fisheries. It is a decision support system based on satellite images. For the Ministry of Agriculture, the tele detection applications of this project will allow to evaluate the agricultural areas; to establish the land use map; to monitor the crops and to predict the agricultural production / yields by using the vegetation indices with other types of data (agro-meteorology, cultivation practices, soil properties,...); to evaluate the damages in case of natural disasters; to improve the planning of the cultivation seasons according to the information obtained thanks to the monitoring system.	Madagascar
■					Digitization of agriculture	HOREB (Hygiène, Organisation et Restauration de l'Environnement et de la Biodiversité)	X	Digitization of agriculture of HOREB (Hygiène, Organisation et Restauration de l'Environnement et de la Biodiversité). The HOREB initiative, together with CRS and Orange Madagascar, launched a pilot project in the rural communes of Milenake and Ankililoaka, district of Toliara II in the Atsimo-Andrefana region. The beneficiary communities are equipped with smart TVs and an internet connection to interact and exchange directly with agricultural technicians	Madagascar
■				■	Drone for Development	Farming and Technology for Africa	✓	Drone for Development Madagascar of Farming and Technology for Africa (FTA). Drone for Madagascar (D4D) wants to combine technology and rural development. Through the use and processing of data provided by a drone, D4D wants to provide quick and effective solutions in several areas: agriculture, environment, sanitation, land use, forestry, tourism, etc.	Madagascar
	■	■	■		eShops	Multiple Internet Payment System (MIPS)	✓	This is a free commerce website with integrated payment solutions launched in 2020 which has a relationship with a number of online shops and thousands of users (visitors and customers) to increase the efficiency of selling products and receiving payments. Several of the operators on the local Food sector are hosted on the platform. This private company has 300 on-line shops (B2B) with thousands of users. They use cloud-based software as a service through third parties and address all parts of the value chain where payments are necessary. They charge transaction fees and deal with financial	Madagascar, Mauritius, Seychelles

							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.		
			■		E-vokatra	Tranoben'ny Tantsaha Mpamokatra (TTM)	✓	e-vokatra of Tranoben'ny Tantsaha Mpamokatra. This is a producer's association. E-Vokatra is an e-commerce platform for producers. It is in a concept phase.	Madagascar
■					Films pédagogiques	FIFAMANOR	✓	Films pédagogiques of FIFAMANOR. The technical sheets of the several themes have been digitized in video and shared with the internal and external network of FIFAMANOR	Madagascar
■		■		■	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 GeoTerralmage is a private sector company which provides actionable intelligence through monthly crop monitoring through GeoFarmer-©-Crop monitoring platform to support precision farming, and accurate information to map crop trends and statistics by using a dashboard in a cloud-based environment. The innovative solution provides by 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. GeoTerralmage 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 applications GeoTerralmage 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

		■		GSMA	Lecofruit	X	GSMA AgriTech program of Lecofruit. A digital solution for farmer registration, procurement and mobile money payments in the green beans value chain.	Madagascar
		■		JuicePro	The Mauritius Commercial Bank Limited	✓	<p>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.</p> <p>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.</p> <p>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.</p>	Madagascar, Mauritius, Seychelles
		■		Metajua	Metajua	X	Metajua of Metajua. This innovation provides a modular solution with the aim of covering all data flow needs for organizations buying agriculture products from and interacting with smallholder farmers.	Democratic Republic of Congo, Madagascar, Tanzania
■				PIF-TIC (Point d'Information et de Formation utilisant les TIC)	PIF-TIC	X	PIF-TIC (Point d'Information et de Formation utilisant les TIC) of PIC-TIC. In partnership with the Malagasy government, the PIF-TIC centers aim to train farmers and youth in the use of digital tools (computers, smartphones, tablets, etc.) to improve their ability to access information and the market.	Madagascar

		■	■		PRESAN (Program Régional de Sécurité Alimentaire et Nutritionnelle) platform	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 supported by FAO and IFAD and enables FAO to provide technical support necessary to respond to urgent needs in the region, such as the reduction of the deficit of the agricultural trade balance. There is opportunity for join resource mobilization activities and technical support for Small Island Developing States (SIDS)	Comoros, Madagascar, Mauritius, Seychelles
	■	■	■		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 and shops. It enables a quick pay system by allowing businesses to create a payment ticket and send a link, when the link is clicked, a payment can be made by card. This 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
■		■	■	■	SIEL ((Système d'Information Economique sur les Légumes) /	Ceffel	✓	SIEL (Système d'Information Economique sur les Légumes) of Ceffel. SIEL is a platform for farmers, collectors, and buyers to meet. It allows to identify the price trends on fruits and vegetables, to allow the producers to choose their market, to know the needs in fruits and vegetables and thus to program the cultural calendar.	Madagascar
■		■	■		SIEL+	Ceffel (Conseil Expérimentation Formation en fruit et légume)	✓	SIEL + of Ceffel. It is a tool for bringing together supply and demand.	Madagascar
■				■	Simulation de dynamique spatiale avec Ocelet	CIRAD	X	Simulation de dynamique spatiale avec Ocelet of CIRAD. Used for several years to simulate the spatio-temporal dynamics of landscapes. This method is based on interaction graphs to simulate the interdependence between landscape elements and allows to integrate this interdependence in the manipulation of spatial information such as mapping. It has contributed to improve the robustness of the mapping of	Madagascar

							agricultural plots, and to simulate their spatio-temporal evolution according to different scenarios based on farming strategies.		
				■	Smart Solutions for Agriculture by HMT	Harel Mallac Technologies (HMT)	✓	<p>Smart Solutions for Agriculture by Harel Mallac Technologies (HMT). Rapidly emerging technologies that capture, manage, communicate, and use information in digital form are dramatically transforming the way that farming and agribusiness are done across the globe, especially for large commercial farms. Through the Mauritius Research and Innovation Council (MRIC), Harel Mallac Technologies (HMT) has developed an AgriTech platform to unleash the power of IOT and AI for farmers thus accelerating the development of its innovative business solutions in the agriculture sector. The platform supports IoT enabled systems to monitor critical parameters like water content and NPK in the soil medium, automate irrigation and fertilization whilst considering weather forecasts, and monitoring intrusion in real time. The AgriTech platform is powered by an intelligent engine able to forecast yield of the cultivations by consolidating live and statistical data. The platform was launched in 2020. The platform uses computers, sensors (weather stations, IoT of things devices, website, dashboard, Portal RaWAN network. Smartphones and websites are being used and cloud-based software as a service. The initiative deals with planning and on-farm production. It is currently at the proof-of-concept phase but aiming to start commercializing and has received a government grant and committed internal resources. They charge individual subscriptions and business subscription fees and have currently piloted with 5 users.</p> <p>The equipment monitoring involves irrigation to enable farmers to remotely control and track and maintain equipment for farming operations and leads to a reduction in water consumption and waste. They have awaited approval by the ICTA regulatory body of the frequency allowed since their sensors are LoRa (long range, low power wireless based). They have also been challenged in understanding the market and user needs. Procurement of vendors has been challenging as is user affordability, internal technical capacity, and data collection. Farmer uptake and behavior change remain challenges. The technology is believed to be inclusive of women.</p>	Madagascar, Mauritius
		■			Survey 123	ESRI (Environmental	✓	Survey 123 is a mobile application from ESRI (Environmental System Research Institute), a privately held company that invented the GIS (Geographic Information	Madagascar

					System Research Institute)		System) software concept. For a quick overview of the product, Survey123 for ArcGIS is a simple and intuitive forms-based data collection solution. It allows you to create, share and analyze data taken in the field.		
■					Viamo platform	Viamo	✓	Viamo 321 Platform from Viamo. The Viamo platform is implemented in Democratic Republic of Congo, Madagascar, Malawi, Mozambique, Tanzania, Zambia. Viamo is a global Mobile for Development (M4D) organization that aims to improve lives via the power of mobile technology. With a presence in more than 20 major markets in Africa and Asia, Viamo is a global social enterprise that specializes in mobile engagement and Information and Communication Technology for Development. Viamo works in partnership with organizations to connect them and individuals through digital technology, for everyone to make better decisions. Viamo uses IVR technology for Agri-VAS for information dissemination and data collection. It also helps provide market linkages between farmers and consumers. It assists farmers with climate smart information hosted on a hotline that farmers can access on-demand and provides market price information. Agri VAS are delivered via voice channels (IVR, helplines), text channels (SMS and USSD) and via apps. Launched in 2017 it has 300,000 smartphone users and 8.5M registered users in the SADC region. The challenges they face, relate to understanding the market and user needs, device sharing, uptake by farmers especially women and girls, lack of mobile coverage, electricity. They have reached sustainable scale and charge commercial rates as a social enterprise. Development partners can use the platform for a fee to develop content and disseminate this to subscribers.	Democratic Republic of Congo, Madagascar, Malawi, Mozambique, Tanzania, Zambia
■					Video to increase the efficiency and effectiveness of agricultural advisory services and extension	Farming and Technology for Africa (FTA)	X	e-Extension video from Farming and Technology for Africa (FTA). The video is to increase the efficiency and effectiveness of agricultural advisory services and extension. Videos of Access Agriculture were translated in local languages.	Madagascar

# 3.3 RESULTS FROM INNOVATION SURVEY RESPONDENTS

All identified innovators received a survey in French and 15 innovations implemented in Madagascar responded. The answers on the survey are self-reported. Of the innovations identified, nine were operational in Madagascar only and the remaining six operated in several countries. All identified innovators were reminded several times by email and by phone to complete the survey. The response rate of the survey for Madagascar was 65% (15 out of 23 identified innovations responded).

## USE CASES AND SUB USE CASES

The division of GSMA use cases shows that in Madagascar multiple use cases are most common, but only just. Eight out of 15 respondents provided multiple services and only seven respondents provided a single use case. Notably, both regional and Madagascar-only respondents reflected multiple use cases. One respondent addresses all four use cases in their innovation, four address 3 use cases, and three address 2 use.

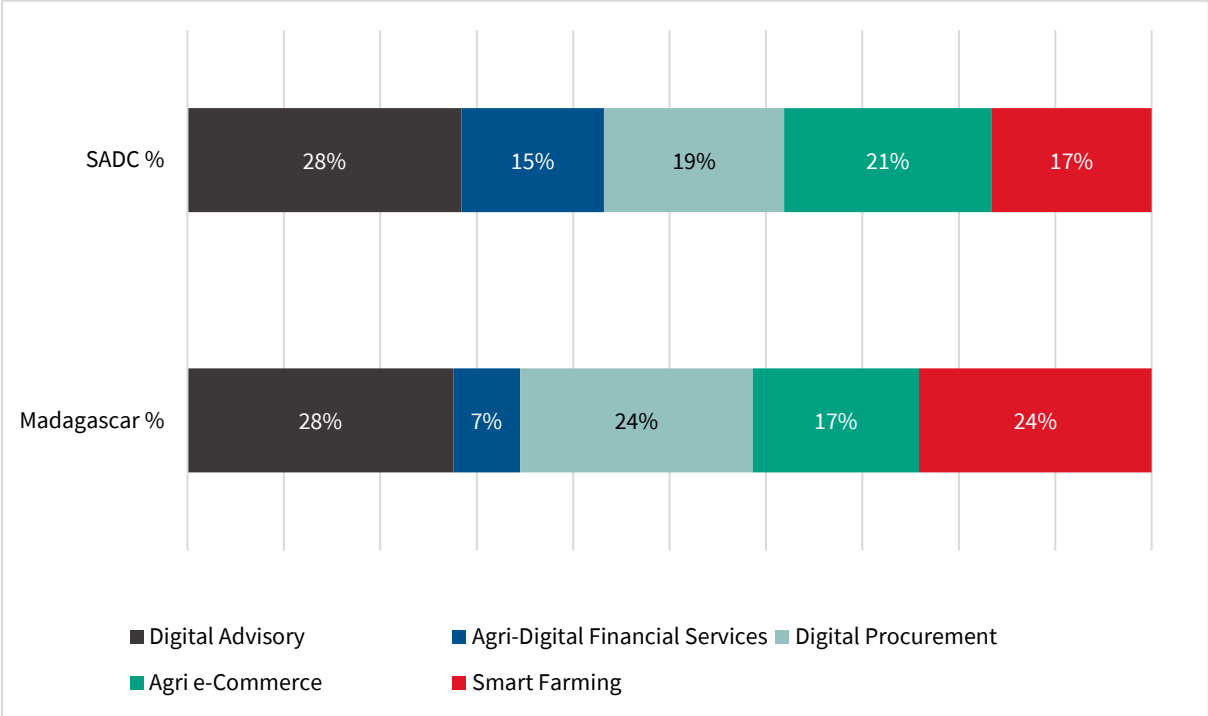


FIGURE 8 DIVISION OF USE CASES FOR SURVEY RESPONDENTS IN MADAGASCAR VS. IDENTIFIED INNOVATIONS IN SADC

Figure 8 provides the division of use cases provided in the survey. Digital advisory was the most common use case cited by eight survey respondents, followed by Digital Procurement and Smart Farming which were both mentioned seven times. Agri e-Commerce was mentioned five times, and Agri-Digital Financial Services were mentioned the least, only twice. All use cases were present in the country innovations, except financial services. Figure 8 also illustrates a comparison of use cases to the rest of the identified innovations in SADC. Madagascar has a few Smart Farming innovations which were not commonly found in the SADC region.

The innovations present in Madagascar provide a variety of sub use cases as presented in figure 9. The gap in agri digital financial services is apparent when looking at sub use cases as there is much less variety illustrated.



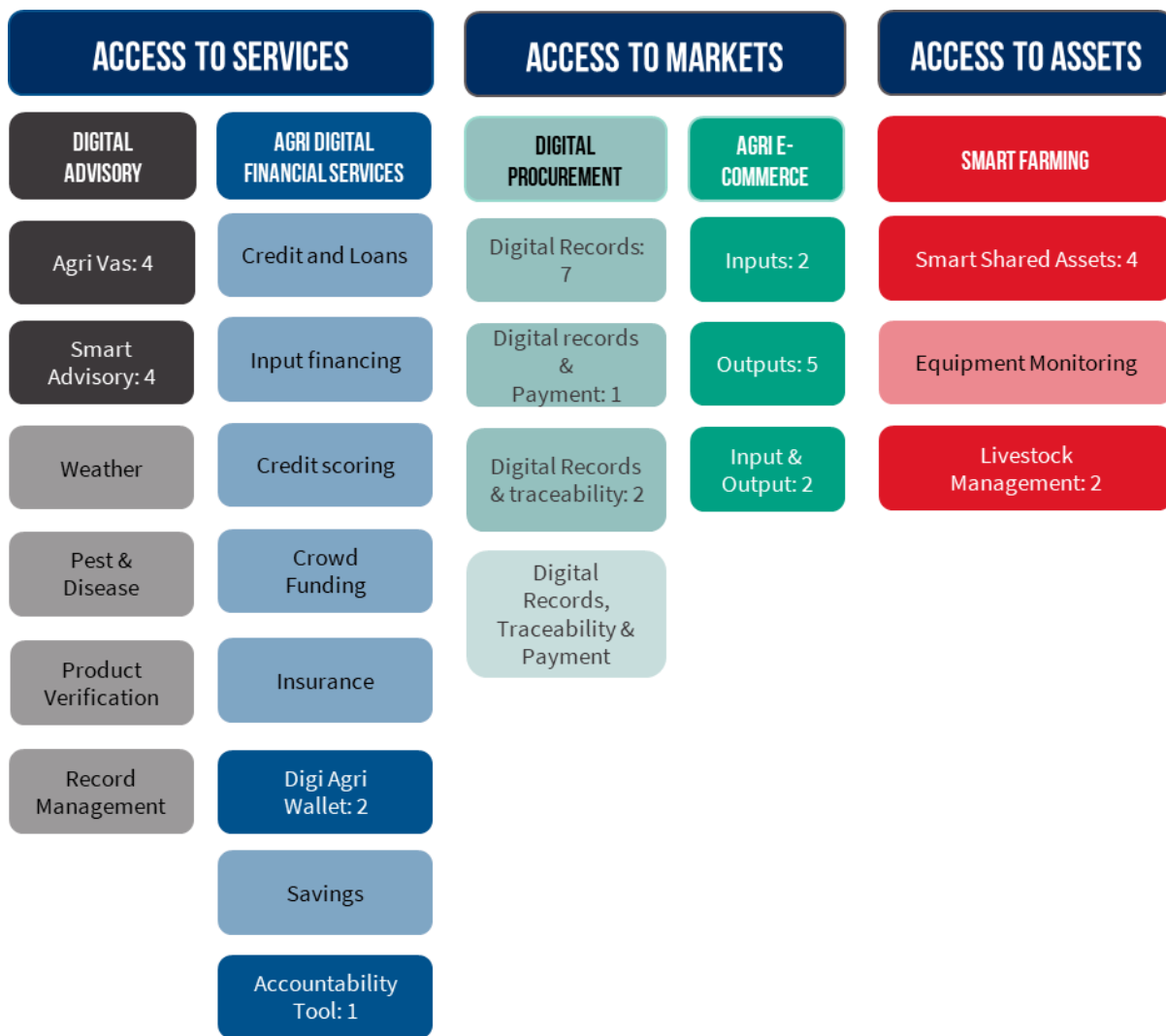


FIGURE 9 OVERVIEW OF SUB USE CASES PRESENT IN SURVEYED INNOVATIONS IN MADAGASCAR

## CHALLENGES AND OUTCOMES

The innovations targeted a wide range of anticipated outcomes: improved agricultural production and access to markets (both mentioned three times); improved producer income, mapping farms and improved decision making (mentioned twice); and market transparency, strengthening the agriculture data system, increasing producers' responsiveness and increased farmer welfare, all mentioned once.

In Madagascar, all respondents were trying to address a variety of pain points within the agricultural systems. The four most common challenges are: the knowledge gap (9), low productivity (7), climate change (7), and poor access to markets (5). Regional respondents were also trying to address financial exclusion and poor access to internet.

Challenges that the respondents faced when implementing or applying their solutions were widespread but the two most common were understanding the market and user needs, and lack of electricity (both mentioned five times). Farmer uptake and use, and data collection issues were mentioned four times, digital literacy and operational constraints were mentioned three times, and user affordability, access to devices, lack of technical capacity, and financial sustainability were all mentioned twice. Two unique challenges faced by innovations

that operated only within Madagascar were language or literacy levels, and product development or translation into a local language for greater understanding by end users.

**TECHNOLOGY USE AND CHANNELS**

According to regional reports, Madagascar is one of the countries lagging in internet penetration and mobile connectivity. However, this is not reflected in the innovations for Madagascar. The most used devices for the innovations are computers (9x), followed by smartphones (7x) and basic phones (2x). Notably, UAVs/drones and GPS devices are also used by innovations only operational in Madagascar. In terms of types of digital channels, portal websites were mentioned most (7x) followed by smart phone apps (5x) and geodata (3x). Cloud-based software (9x) and spreadsheets (4x) to analyze data were used most.

**VALUE CHAIN PHASES COVERED**

Surveyed innovations in Madagascar addressed all stages of the value chain but are more tailored for earlier stages of the value chain in terms of planning, on-farm production, storage, and access to markets. Figure 10 illustrates the different phases of the agricultural value chain addressed by innovations in Madagascar.



FIGURE 10 SURVEYED INNOVATIONS PRESENCE IN THE VALUE CHAIN IN MADAGASCAR

**SCALING, FINANCE AND REVENUE**

The innovations in Madagascar are at their infancy. Three innovations were launched this year (2021), two in 2020, three in 2019, one in 2018, three in 2017, two in 2016, and one in 2014.

These early-stage innovations are also reflected in the number of users, although this is distorted since four innovations did not fill in the number of users while some of them did mention they are in sustainable scale or in the scaling phase (replication to other geographical areas). Four (4) innovations cited no users, these were not yet launched or in pilot stage. Viamo has more than 2.2 million users in Madagascar, based on a model with premium services (development organizations buy access to the platform of farmers and pay for content development and dissemination). Juice Pro has 9,200 registered users but is focuses more on business-to-business. They also see themselves in the sustainable scaling phase. They mention that they did not need subsidies or donor funding to become sustainable, just like GeoFarmer and eShops from MiPS. The other innovations in Madagascar mention that they are not yet sustainable and need subsidies / donor grants.

Most digital innovations operational in Madagascar only are in an early stage based on the [Insights on Scaling Innovation](#) report<sup>21</sup>. Overall, three of the surveyed innovations are at sustainable scale, two are scaling, three are in transition and have demonstrated small scale success, three are in the pilot phase, and three are in the concept development. The three in the earliest stage are all Madagascar-only innovations, and none of them are in the final sustainable scale.

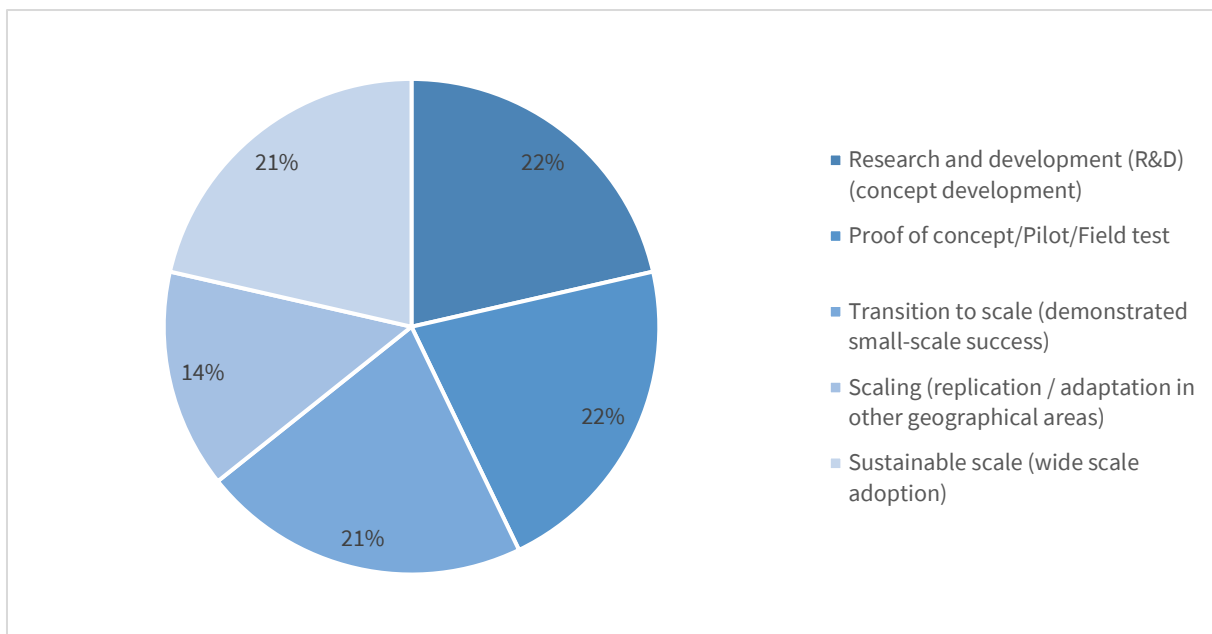


FIGURE 11 SCALING STAGES FROM SURVEYED INNOVATIONS IN MADAGASCAR

## INCLUSIVITY AND TARGET AUDIENCES

Not all innovations focused on inclusivity. Some respondents had made explicit efforts to be more inclusive of smallholder farmers (3), and those with limited or low levels of literacy (3). This were Viamo with their 321-platform, Fifamanor and Siel. Seven innovations reported that they were already inclusive of women, six for smallholder farmers, five for those with low levels of literacy, and four for people with disabilities, and the elderly. Three innovations acknowledge that they may not be fully inclusive for people with disabilities. Eight (8) innovations were already inclusive for women, six for smallholder farmers, four for people with disability and four for elderly people. Only three innovations had explicit steps for small holder farmers (3x) and illiterate people (3x).

# 4 DIGITAL AGRICULTURAL SYLLABI AND ENTREPRENEURSHIP TRAINING

## 4.1 AGRICULTURAL SYLLABI UNIVERSITIES

A total of four Universities were targeted in the country:

- University of Antsiranana
- University of Fianarantsoa
- University Nord Madagascar
- University of Antananarivo

The University of Antsiranana was the only respondent to our survey and participated in a KII.

### UNIVERSITÉ DE ANTSIRANANA - ECOLE SUPÉRIEURE EN AGRONOMIE ET ENVIRONNEMENT DE DIEGO (ESAED)

The University of Antsiranana (UNA) offers onsite digital training courses and all of them are taught at the B.Sc. level. Regarding digital agriculture, Artificial Intelligence for agriculture and Programming / Coding for agricultural systems are also implemented onsite at the B.Sc. level. They also declared that they teach students the design of digital tools to help farmers with cropping calendars and how to develop solutions for weather forecasting for farmers. For digital entrepreneurship they mentioned that they teach Smart Farming, ICT-enabled advisory services, and Intelligent agriculture/geomatics, especially how to handle satellite data. They also teach about drones, even though they don't have a drone. They stated that digital agriculture was not yet developed in the country and they that they lacked the necessary materials. However, there is the ambition to develop the sector in Madagascar. For the University of Antsiranana, Data collection, Digital Advisory, Agri-e-commerce, E-extension, and Smart Farming are the most important digital agricultural skills to equip students to enter the current labor market.

#### COMPLEMENTARY INFORMATION FROM THE KII - UNIVERSITY OF ANTSIRANANA

The ICT infrastructure of the University has very weak Wi-Fi connections (the old one has been down since 2019, they currently use a box) which does not allow students to connect properly to the internet. They don't have computer labs, the only labs are for biology or soil testing, and they share the lab of the Faculty of Science of UNA, and access is very limited. They are working on building their own lab (they have a promise of funding from GIZ for 2021), to include features such as the installation of gardens and greenhouse cultivation. Digital skills provided by the UNA include basic IT, programming, and geomatics. Digital agriculture is not yet fully developed due to the lack of necessary equipment. Several initiatives are underway to set up an e-learning system. To date the university does not offer training in entrepreneurship and the establishment of a business incubator within the university has been delayed because of the Covid-19 pandemic. The UNA collaborates with the universities of Antananarivo and Mahajanga.

TABLE 7 OVERVIEW OF RESPONSES FROM SURVEYED UNIVERSITIES IN MADAGASCAR

MADAGASCAR UNIVERSITIES	
Université de Antsiranana - Ecole Supérieure en Agronomie et Environnement de Diego (ESAED)	
Digital Agri Skills	Artificial Intelligence for agriculture Programming / Coding for agricultural systems

	Design of digital tools to help farmers (crop calendars and weather forecasting)
<b>Digital training courses updated</b>	Unsure
<b>Digital entrepreneurship trainings</b>	Smart Farming, ICT-enabled advisory services Intelligent agriculture/geomatics
<b>Type of Skills building</b>	Not mentioned
<b>Most important digital Agri skills</b>	Data collection Digital Advisory Agri-e-commerce E-extension Smart Farming
<b>Most important facility for digital trainings</b>	University or College Incubator/Innovation Space Experimental Farms ICT Laboratories Research Laboratories Students' association space/ Clubs
<b>Aligned with institutional strategy</b>	Unsure

## 4.2 INCUBATORS AND INNOVATION HUBS

A total of seven business support organizations have been mapped in the country, out of which three are operating in the agricultural sector. The general business support organizations without a focus or activity in the agricultural sector that have been identified are [HABAKA Madagascar Innovation Hub](#), [Zafy Tody](#), the [Entrepreneurship program of the SCAC of the French Embassy](#) and the [platform for Professionals and Support in Entrepreneurship and Innovation](#). For these organization there was no evidence of trainings and incubation activities dedicated to agriculture entrepreneurs and therefore they were not targeted for the KIIs.

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

- [NextA](#)
- [Orange Fab Madagascar](#)
- [Youth Entrepreneurship Promotion Program in Agriculture and Agribusiness \(PEJAA\)](#)

Two business support organizations responded to our request and took part in a KIIs:

### YOUTH ENTREPRENEURSHIP PROMOTION PROGRAM IN AGRICULTURE AND AGRIBUSINESS (PEJAA)

PEJAA is part of a program called *Enable youth* led by the IITA and funded by the African Development Bank (the program is active in Madagascar and Sudan). Between 2018-2021 the program targeted 410 youth in Madagascar with the aim of giving them business and technical capacities and to provide a loan of 10,000 USD to create their project. PEJAA operates in three regions of Madagascar, and they have three agribusiness incubators (physical spaces hosted by the Minister of Agriculture):

- 1) EFTA, targeting the value chain of vegetable and spices,
- 2) FIFAMAMOR, targeting the value chain of milk and maize,
- 3) SEFAFI, targeting the value chain of aquaculture, peacocks, chicken, eggs, fish.

Every incubator has a dedicated staff and facilities (training rooms, IT facilities, land, processing centers, dormitories, day-care for babies). They are planning to put together the lessons learnt from the first phase of the program and design new activities. Digital trainings mainly cover the use of the internet, social media, and

data collection to sell the products, but they don't yet support digital businesses. So far, they have supported 278 agricultural business projects, such as Max Café (coffee processing) and many more. The target of their digital trainings are graduates, young entrepreneurs, and aspiring entrepreneurs. PEJAA collaborates with the Athénée Saint Joseph Antsirabe and STV Business School (private).

**NEXTA**

NextA was established by the Axian group in 2019 as an incubator for innovative projects to develop and support entrepreneurship in Madagascar. So far, they have supported two agricultural start-ups: Aiko (urban horticulture production) and Bondy (a reforestation initiative). They declared no specific targets for their service, the potential incubates must define an innovative and feasible project and request support. Digital trainings are usually tailored according to the needs of the incubates and they are quite general, such as digital communication and marketing, accounting, multimedia, and others. They don't teach digital agriculture tools and they don't collaborate with colleges and universities. NextA does not receive financial support from the government, however the organization works closely with the public sector such as EBDM to facilitate business creation and formalization.

TABLE 8 OVERVIEW OF RESPONSES FROM INTERVIEWED INCUBATORS IN MADAGASCAR

MADAGASCAR INCUBATORS	
Youth Entrepreneurship Promotion Program in Agriculture and Agribusiness (PEJAA)	
Year of Establishment	2018
Agri start-ups incubated	278
Target of Digital Agri trainings	Graduates Young entrepreneurs Aspiring entrepreneurs
Digital Skills trainings	Use of internet Social media and data collection to sell products
Digital Agri Tools taught	None
Collaboration with Universities and Colleges	Athénée Saint Joseph Antsirabe; STV Business School
Supported by the Government?	Yes
NextA	
Year of Establishment	2019
Agri start-ups incubated	2
Target of Digital Agri trainings	N/A
Digital Skills trainings	Digital communication and marketing Multimedia
Digital Agri Tools taught	None
Collaboration with Universities and Colleges	None
Supported by the Government?	No

## 5 INSIGHTS AND REFLECTIONS

The following section outlines the key insights from the data collection of the DACS and 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**

Madagascar ranked 12 out of 16 in the benchmark assessment which suggests that it may be lacking in some key foundational areas necessary for a robust digital economy, such as digital skills and infrastructure, and is lagging the other SADC member states. The benchmark assessment enabled the identification of countries within SADC that are unlocking positive pathways towards a digital economy and a vibrant ecosystem of different actors. Madagascar scored poorly in all but the digital business pillar where it ranked seventh out of 16. This pillar identifies the development of a robust marketplace for digital trade, digital financial services, and digital content. Madagascar ranked lowest, and behind the African median, in ICT infrastructure (which identifies the availability of affordable, accessible, resilient, and reliable infrastructure).

Four clusters of countries at different points in their progress were identified in applying the benchmark. The clusters formed through the benchmark help to identify the progress countries have made and where greater effort may be necessary. Madagascar makes up part of Group 3, these countries ranked in the middle of the benchmark and tend to be more reliant on agriculture for employment and economic growth but are still lacking in foundational areas required for wide scale uptake of technologies.

#### **POLICY ENVIRONMENT**

The benchmark assessment suggested that Madagascar's digital economy is lacking key foundational elements and may be lagging the region. The stock take of national policies, strategies and legislation indicates that this area is also undeveloped with very little presence of digitalization. There is no clear national digital plan or strategy and there is no sector specific strategy either. Obtaining relevant documents to review was challenging, especially without a focal point on the ground. Two national plans were reviewed but it is difficult to categorically suggest that digitalization is being prioritized across the economy as a result.

No specific sectoral strategy or policy on digitalization within agriculture was identified. Digitalization within the agriculture sector in Madagascar is at the embryonic stage and this is a key barrier for development. The key challenge identified from research and stock take review is the lack of a guiding policy or strategy specific to agriculture. Many of the 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 23 innovations were identified in Madagascar, but only 15 responded to the survey. This high number of innovations was unexpected for a country that the benchmark had indicated was lagging in digital transformation. There was also a wider variety of organizations involved in the development of innovations in Madagascar. All use cases were present in Madagascar: digital advisory, agri-digital financial services, digital procurement, agri e-commerce and smart farming. However, there was a clear gap around agri-digital financial services with only two respondents.

The results from Madagascar suggest there is a clear challenge for innovations to reach scale and financial sustainability. 44% of respondents were in the early stages of development and were largely made up of innovations operational in Madagascar only. The innovations in Madagascar are young, with three being launched this year (2021). Many survey respondents mentioned that their innovation did not have users yet and that they were only in the concept phase. The Madagascar-only respondents were most reliant on donor grants for funding and required further subsidies to remain sustainable.

## **DIGITAL AGRICULTURAL SYLLABI AND ENTREPRENEURSHIP TRAINING**

Digital agricultural courses do not seem to be integrated into the curricula of incubators. The University declared that they teach the topic with very few tools and access to digital agriculture technologies is not developed in the country. Raising awareness about the importance of digital agriculture for the future development of the agricultural sector and the entrepreneurship space for youth and for the population of users is a priority. This would allow the deployment of new tools and the integration of modern digital techniques in the agricultural space. A closer cooperation and exchange of competences between Universities and Incubators is also suggested to improve the development of digital agricultural curricula for the incubators and to integrate the entrepreneurship skills within University courses.

For the incubator interviewed, CCARDESA and other international partners could better support the development of digital skills for agricultural youth entrepreneurship in the SADC region by encouraging the training of policy makers, so that they become aware about digital agriculture opportunities and promote them; lobbying the government to improve the internet connection and make it available for the youth and entrepreneurs (internet is still very expensive for entrepreneurs); improve access to the digital communication channels for the population and farmers in order to exploit the opportunities that digital agriculture might offer; involve private sector initiatives to be more efficient and concrete in promoting the digitization of agriculture; support the inclusion of digitization and digital agriculture items in the training curricula; and promote the establishment of national research and education network in the SADC region to develop affordable internet connectivity for research and education stakeholders.

## **5.2 REFLECTIONS FROM THE SITUATIONAL ANALYSIS REPORT**

This document has presented the available data collected for Madagascar 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 Madagascar 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 clear agriculture sector specific strategy or roadmap can address some of the key challenges raised by stakeholders consulted during this study.
- **While low digital skills are an issue that needs to be addressed in a digital economy strategy, specific and explicit focus will be required for those at greatest risk of exclusion, including the aging rural farming population, women, the elderly and the illiterate.** One way to achieve this is through hyper-localized relevant content that is translated into working languages or images through gamification approaches tailored to a specific country. Some respondents overcome the challenge of digital literacy by creating networks along different value chains with local field agents, trusted agro dealers or lead farmers with higher digital literacy and smart phones ownership. These valuable intermediates (or agents) can share the information with other farmers.
- **There is a missing middle in terms of funding for innovators that move from start-up to scale-up.** 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.
- **The training programs that are most needed are the foundational programs that enable people to use digital tools in their day-to-day activities.** Appropriate training programs that take into consideration the local languages and the local contexts will be a priority particularly for agriculture which demands relevant and local content.
- **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).** 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).
- **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.** Digital agriculture must be guided by local priorities, policies and capacity development in an on-going manner and must be promoted among incubators and innovation hubs to prepare the local youth to invest in the sector and develop new services for the local farmers and agricultural stakeholders.

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

Centre for Coordination of Agricultural Research  
and Development for Southern Africa

World Bank Group