

DIGITAL AGRICULTURE COUNTRY STUDY ANNEX: ESWATINI

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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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 Eswatini 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 Eswatini 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 Eswatini, 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 Eswatini 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 Eswatini, Mr. Bongani Mvubu, Research Officer based at the Malkerns Research Station at the Ministry of Agriculture. Mr. Mvubu was the first point of contact in identifying possible relevant policies and digital agricultural innovations in Eswatini. Mr. Mvubu arranged a teleconference with several colleagues who were able to represent a host of public sector Departments which was very valuable. The study team also worked with a National Consultant in Eswatini, Mr. Theophilus Dlamini.

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

GENERAL ECOSYSTEM

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

BENCHMARK ASSESSMENT

The team completed a benchmark assessment across the 16 SADC member states. The assessment sought to provide a context to the findings of this study, and not to determine each SADC country's development of a digital economy. The approach was adapted from [Unlocking the Digital Economy in Africa: Benchmarking the Digital Transformation Journey](#) by SMART Africa and the Digital Impact Alliance (DIAL). SMART Africa's mandate is to encourage Africa's transformation into a knowledge economy through the usage of ICTs, and therefore this assessment would be most compatible to the SADC member states. Other frameworks and toolkits were reviewed in preparation for the benchmark with more information in the *Situational Analysis Report*. The assessment areas in the SMART Africa/ DIAL report are based on the five foundational pillars of the Kenyan [Digital Economy Blueprint](#), illustrated in figure 1, and are similar in nature to the African Union's [Digital Transformation Strategy](#) foundation pillars, illustrated in figure 5, (Enabling Environment; Policy and Regulation; Digital Infrastructure; Digital Skills and Human Capacity; Digital Innovation and Entrepreneurship).

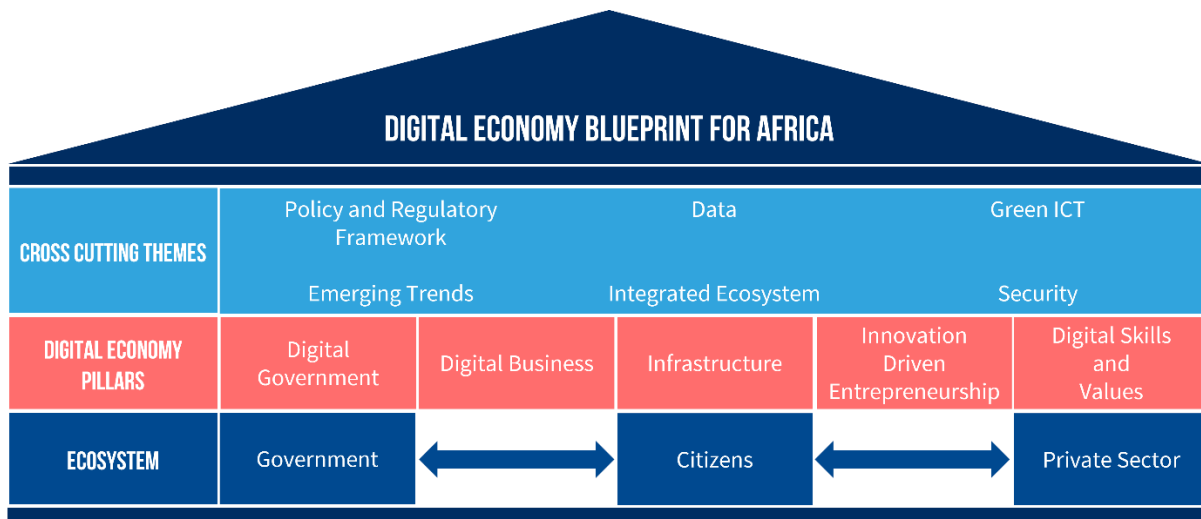


FIGURE 1 OVERVIEW OF KENYAN DIGITAL ECONOMY BLUEPRINT

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

TABLE 1 PILLARS FOR THE BENCHMARK ASSESSMENT

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

Assessing all pillars has provided a picture across all 16 countries and forms the basis of the specific indicators that were selected for the benchmark assessment. The indicators used were based on the SMART Africa/DIAL report. Changes were made to some of the indicators for this study to focus more specifically on the digital elements. For example, the ICT Infrastructure pillar uses the ICT Composite Index score, rather than the general Infrastructure indicator from the Africa Infrastructure Development Index (AIDI) that included elements such as roads. For the Digital Skills pillar, only the digital skills among active population score 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

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 Eswatini. 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 Eswatini 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.

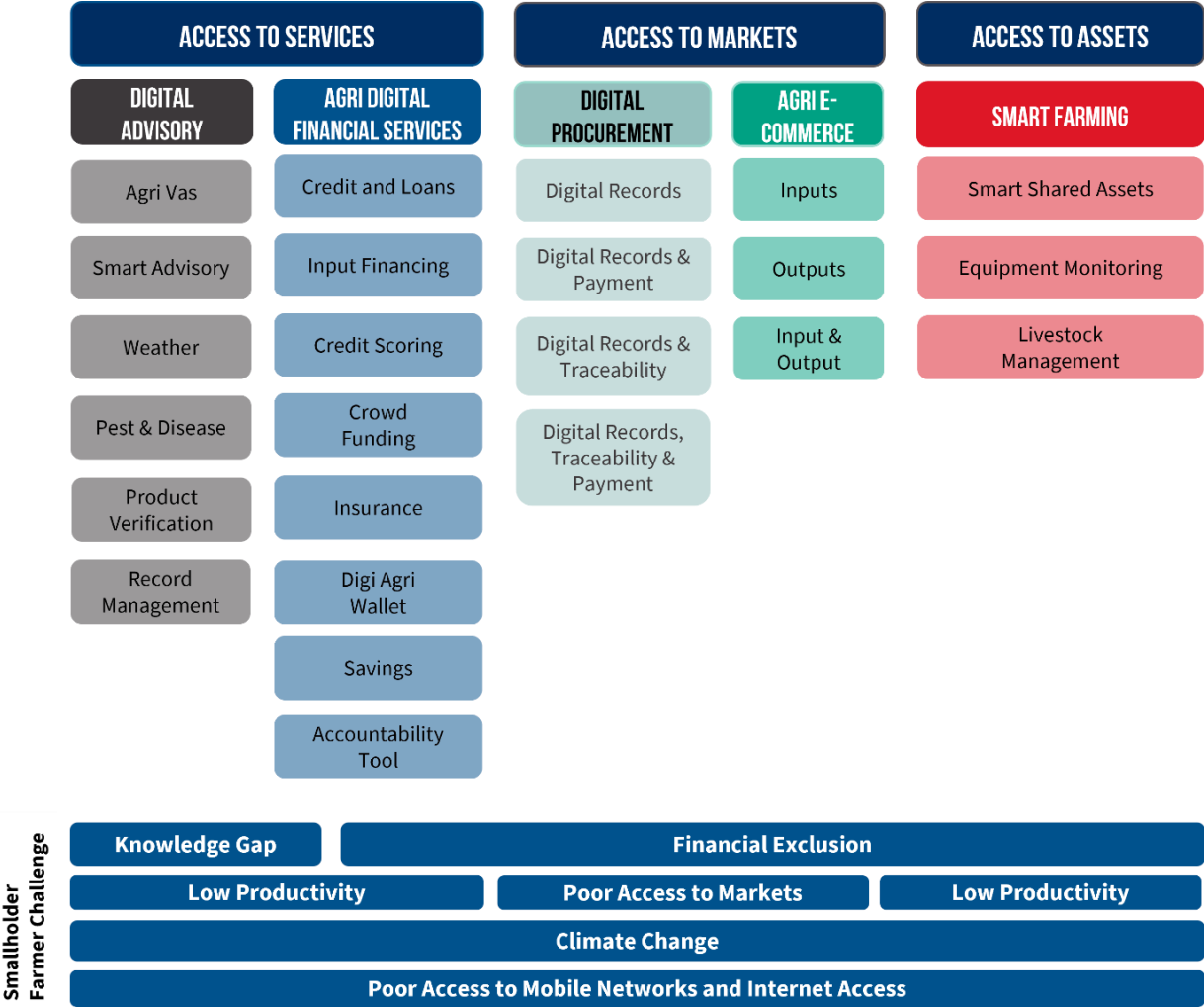


FIGURE 2 USE CASE MODEL BASED ON GSMA FRAMEWORK

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

LIMITATIONS TO THE METHODOLOGY

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

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

POLICIES

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

access where possible, national consultants also tried to source documents locally. Unverified versions of documents available online were also used for review.

INNOVATIONS

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

There were some unique challenges in Eswatini during the study period due to political unrest and several security situations. The internet was also halted at various times preventing opportunities for virtual interviews and meetings. There was also a level of fear attached to providing information via survey instruments which individuals made the team aware of during this period of uncertainty.

DIGITAL SYLLABI

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

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

1.3 COUNTRY CONTEXT

Eswatini is has one of the smallest populations in the SADC of 1.2 million.¹ The UNDP's Human Development Indicators² rank Eswatini as 138th out of 190 countries and 6th out of the 16 SADC countries. Eswatini scores on the higher scale in the region for gender equality with a Gender Development Index of 0.996.ⁱ It has a Gross National Income per capita of \$8,380 (compared to an average of \$ 8,080 in the SADC region) and is classified as a lower middle income country.³ Although only 19.2% of the population falls under the UN Multidimensional Poverty Index,⁴ 58.9% live below the poverty line according to the World Population Review.⁵ This is above the average rate of the SADC region of 40.8%. The median age of Eswatini's population is also younger than the average in SADC with 20.7 years (versus 22.1 years).

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



FIGURE 3 MAP OF ESWATINI IN SADC

AGRICULTURE ENVIRONMENT

In the case of urbanization, Eswatini is below average in the SADC region with 24% living in urban areas. Although only 9.1% of the GDP is earned in agriculture, 12.15% of the population works in the agriculture sector (lower than the average of the SADC region of 43.37%). There is no information on Eswatini on the Global Food Security Index.⁶ However a larger proportion (66%) of the country’s population is food insecure. This is likely to have been exacerbated by the ongoing pandemic⁷. Stunting levels range between 23% -28% and this is attributable to a wide range of factors including targeted interventions, lack of awareness and changes in livelihoods.

Eswatini

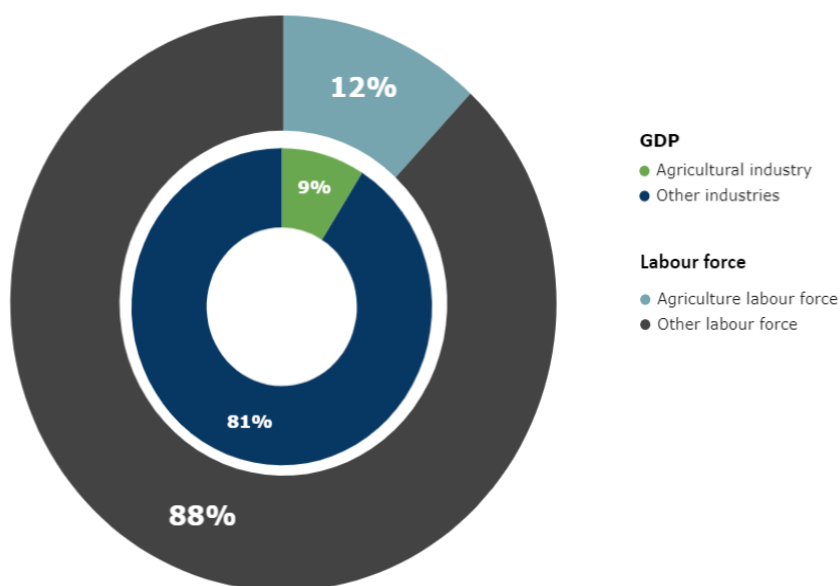


FIGURE 4 ESWATINI'S AGRICULTURAL INDUSTRY SHARE OF GDP AND THE SHARE OF THE AGRICULTURAL LABOR FORCE

1.4 THE GENERAL DIGITAL ECOSYSTEM

In 2020, the African Union (AU) adopted the [Digital Transformation Strategy for Africa \(2020-2030\)](#) which presents a vision of an integrated and inclusive digital society and economy in Africa. It recognizes the digital economy as a key factor in stimulating economic growth and jobs, reducing inequality, and promoting sustainable growth⁸. 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.

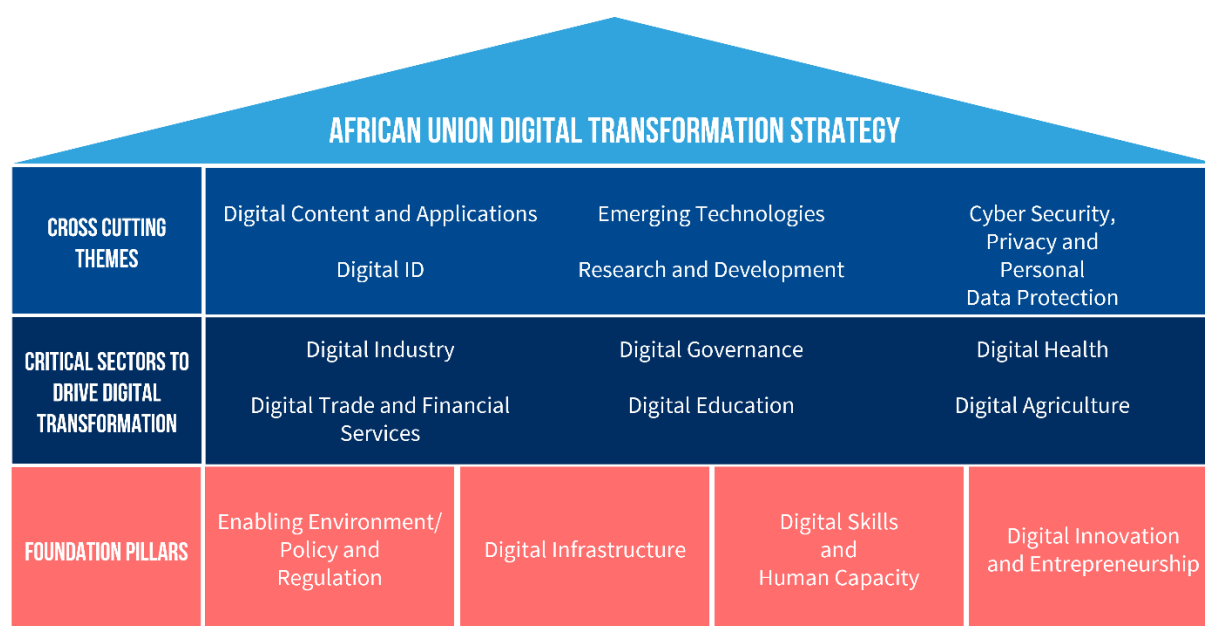


FIGURE 5 OVERVIEW OF THE AFRICAN UNION DIGITAL TRANSFORMATION STRATEGY

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 economy⁹.

BENCHMARK ASSESSMENT FINDINGS

The purpose of the benchmark is to provide a context to the findings and identify benchmark identified 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 Eswatini are illustrated in table 3.

TABLE 3 BENCHMARK PILLAR SCORES: ESWATINI

Eswatini	Score	Maximum Score
Digital Government (OSI, 2020)	0.353	1
Digital Business (GCI, 2019)	50.097	100
ICT Infrastructure (AIDI, 2020)	18.672	100

Innovation Driven Entrepreneurship (GII, 2021)	N/A	100
Digital Skills (GCI, 2019)	N/A	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: ESWATINI

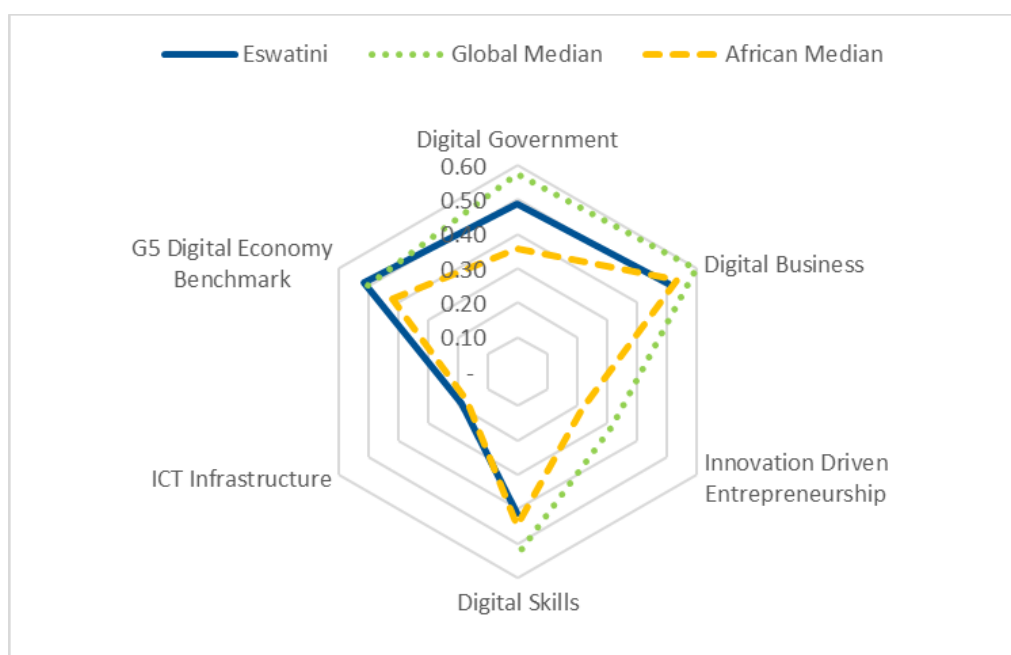


FIGURE 6 RESULTS FROM BENCHMARK ASSESSMENT FOR ESWATINI

In the benchmark assessment Eswatini ranked fourth out of the 16 SADC member states. Figure 6 below, illustrates the results of the benchmark in comparison to the global and African medians. Eswatini is ahead of the African median in Digital Government and on par with the global median on the G5 digital economy benchmark. It scores well in the other assessment areas. The benchmark suggests that Eswatini has a developing digital economy with some key foundational areas being developed.

Eswatini ranked fifth in the region in the G5 Digital Economy Benchmark. Table 5 below, illustrates the ranking for each individual pillar where Eswatini predominantly ranked in the top ten rank for all pillars.

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

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

DIGITAL INFRASTRUCTURE

In Eswatini, 47% of the total population are using the internet.¹⁰ This is higher than the regional average of 29.94%. The GSMA Mobile Connectivity Index shows a 91% access to the 3G network,¹¹ which complements the HDI report of mobile cellular subscriptions at 93 per 100 people.¹² There is no information on Eswatini for the Inclusive Internet Index¹³ which details the accessibility, affordability, and relevancy of internet in 120 countries. However, according to the Mobile Connectivity Index,¹⁴ Eswatini is ranked number 8 in terms of overall mobile connectivity in the SADC countries with an overall index of 48.1, which qualifies it as an emerging country (above 35). It scores above average for consumer readiness, affordability, and availability of infrastructure, but below average on content and services.ⁱⁱ In terms of ICT adoption, Eswatini scores position 125 (out of 140). The Eswatini government does not seem future oriented based on the position 106 (out of 140), and it scores even lower on the innovation capability index as number 134 out of 140.¹⁵

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

2 THE BROADER POLICY ENVIRONMENT

In the benchmark assessment Eswatini ranked fourth out of 16 in the region, ranking particularly well in the ICT Infrastructure and G5 Digital Economy benchmark. The high scores and ranking in the assessment pillars indicate that Eswatini is unlocking the digital economy and that there is a supportive 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 Eswatini forms part of Group 2 which is made up of countries that scored well in the benchmark.

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 frameworks¹⁶. 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 policies¹⁷. 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 outdated¹⁸.

2.1 GENERAL DIGITAL POLICIES

The benchmark assessment suggested that Eswatini has a developing digital economy that is on par with the SADC region. When doing a stock take of available policies, strategies, and legislation, it is apparent that some efforts have been made to prioritize and embrace digitalization generally, but more could be done within the legal frameworks to support emerging technologies and risks.

POLICIES, STRATEGIES AND PLANS

There are some key guiding strategies and policies in place in Eswatini which identify the importance of a transition to a knowledge-based society reliant on ICTs. The **National Information and Communication Infrastructure (NICI) Policy 2006** was the first policy prepared. It focuses around the key strategic areas for implementing ICTs such as human resource capacity, education, infrastructure development and equal access, strategic ICT leadership (e-Government), environmental management, financial services sector, media, and the legal and regulatory frameworks. It is a comprehensive policy outlining the challenges for each of these areas with clear objectives and targets for measurement, such as setting up certain laws (Data Protection Act, Cyber Law, Electronic Payments and Transactions Bill, etc.) and preparing an ICT Master Plan.

Five years after the NICI Policy was released, the **National Information and Communication Infrastructure Implementation Plan 2012-2016** was published to guide the objectives outlined in the Policy. The strategies broadly cover developing the necessary legal, institutional and regulatory enabling environment and structures for supporting the development, deployment and exploitation of ICT within the economy and society; developing the physical ICT infrastructure using innovative methods; building broadband capacity and introducing new services to improve universal access and service quality; promoting the development of a competitive local ICT industry and the facilitation of private sector involvement and investment; improving human resource development through capacity building initiatives; and promoting the integration of ICTs within the economy and society to allow for universal access.

The **National Development Plan 2019-2022** identifies accessible, robust, reliable, and affordable ICT as a priority area under the *Efficient Economy Infrastructure Network* outcome, but beyond that, the NDP does not include digitalization as a key pillar. References are made to the information society and the transition to a knowledge economy but the way that it is presented does not assume an overriding priority in the economic recovery and growth. The **Kingdom of Eswatini Strategic Roadmap 2019-2022** does present *Education and ICT* as a key priority area for the roadmap, but this overwhelmingly focuses on increased infrastructure, e-Government services, and access to ICTs.

In terms of sector specific strategies, Eswatini has two e-Government strategies produced in quick succession, and a recent cybersecurity strategy. The **e-Government Strategy for Swaziland 2013-2017** and the **e-Government Strategy Operational Framework 2015-2019** have a holistic view of e-Governance that aims to improve efficiencies and initiatives in public services that will lead to spillover effects in the wider economy. The Focus areas include education, liberalization of the telecommunications sector (which would lead to increased investment and competition that would improve affordability), and a cyber legislative framework (with a focus on designing a data protection and privacy framework, among other laws that would help stimulate e-commerce activities and investment). The e-Government Strategy is a comprehensive and extensive document with specific targets and details on how improving public service efficiency would result in achieving the goals of the previous strategies and policies outlined above.

The **Eswatini National Cybersecurity Strategy 2020-2025** aims to attract investment from the private sector and enhance trust within citizens through this strategy. It focuses on enhancing the security and resilience of national critical information and other related ICT systems; strengthening cybersecurity governance, policy, regulatory and legislative frameworks; building Eswatini's capacity and expertise in cybersecurity; fostering a safe and secure information society; and strengthening cooperation, collaboration, and partnerships in cybersecurity. It also encourages the passing of several Bills that still need approval (Data Protection and Cybercrime Bill) as well as development of other necessary frameworks on privacy and intellectual property.

2.2 LEGISLATION

The legal framework of relevance to this study in Eswatini consists of one Law and three Bills which are yet to be enacted:

- **Electronic Communications Act 2013** provides a framework for the further development of electronic communications networks and services in Eswatini and provides the mandate for the Eswatini Posts and Telecommunications Corporation (EPTC) to maintain and operate the national backbone infrastructure.

- **Electronic Communications and Transactions Bill 2020** aims to provide for the regulation of electronic transactions and electronic communications; the facilitation of the use of e-government services; the protection of consumers; and the limitation of the liability of service providers.
- **The Data Protection Bill 2020** aims to provide for the collection, processing, disclosure and protection of personal data, and rights of access to and correction of personal data.
- **Computer Crime and Cybercrime Bill 2017** aims to criminalize offences involving computers and network related crimes.

From the policies, strategies and plans available, digitalization has received some prioritization in Eswatini. However, there are some key elements that would help to stimulate private sector investment that are missing such as, an adequate e-commerce bill and various data and privacy protections. Digitalization should feature more prominently in the national plans to help embed it across all policy areas of the economy. The focus has remained on infrastructure and access, which is the foundation of a strong digital economy, and a detailed e-Governance plan. A shift is required to focus on providing attractive legal and regulatory frameworks that match international standards and will attract investment into the sector. A national digital plan would help to set this agenda and could then be used as a guiding document by departments.

2.3 DIGITALIZATION IN AGRICULTURE

DIGITAL IN AGRICULTURE POLICIES

There is no available agricultural policy directly related or dedicated to digitalization in Eswatini. It was also a challenge to source relevant policies and strategies as many of these are unavailable from the Government website, with only a select few from the Livestock Department. The following references were found in the general strategies and plans:

- The **NICI Implementation Plan 2012-2016** sets out a clear objective to “develop the initiative for eAgriculture” which focuses on infrastructure, reducing costs, and improving connectivity for greater efficiency and access to markets. It also presents some strategies to establish a national ICT master plan for agriculture; create an information database for agricultural produce, commercial markets and other information streams for farmers utilizing mobile phones, computers, and other digital technologies; establishing early warning systems for farmers on food security, water resources, animal and crop disease, and natural disasters using ICT handhelds and information boards.
- The **e-Government Strategy** also provides insight on the need to provide information services that are across the agricultural value chain including: knowledge and best practice on farming, livestock management, preventive measures about pest management, applications relating to micro-financing loans and loan payments, on-line market trading of agricultural commodities and foodstuff, environment and weather warnings, importation, and exportation of foodstuff.
- The **NDP** prioritizes enhancing agribusiness and agro-processing to unlock productivity and growth. It acknowledges that to achieve this it will require skills, technology, infrastructure, and a climate that supports growth of industries, entrepreneurship and attracts foreign investment.

The suggestions within these national plans are good and should be replicated in a sector specific plan that goes into more detail on what would be required to achieve these efforts, in terms of stakeholders and financing. The **Swaziland National Agricultural Investment Plan (SNAIP) 2015** includes some of the

suggestions from the national strategies but focuses on increasing access and dissemination of information for smallholder farmers through:

- Improved communication infrastructure
- Increased number of institutions linked to the national database
- Formation of communication networks to disseminate knowledge by electronic means
- Creation of a ‘virtual library’ of information on the sector
- Real-time market information and market analysis
- Weather and climate information
- An improved early warning system.

It is unclear to what extent digitalization has been embraced in the agricultural systems when observing sectoral policies and national strategies. Agriculture is frequently noted as a key priority sector but there is little evidence of an integration of ICTs in the available documents. However, there is likely more digitalization than presented in these strategies as certain agriculture parastatals have digitalized some of their services and processes, such as the Agricultural Marketing Information Services launched by the National Agriculture Marketing Board which is a digital marketing system for farmers launched in September 2020 and constitutes a website and a mobile platformⁱⁱⁱ. The platform provides market information for farmers, information on food security and production levels for the Government, and a platform to sell and buy produce (similar to an online forum rather than transaction based)^{iv}. There is also a National Plant Protection Service which produces digitalized Phytosanitary certification, also launched in 2020, that removes the burden of handwritten certificates that can be easily rejected when exporting items^v.

An updated sector specific strategy is recommended to incorporate and update some of the suggestions included in national strategies and to manage any trade-offs and challenges that might require multi-stakeholder collaboration (cross-Ministry and public private partnerships).

CHALLENGES

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. This must be Government-led but the agriculture sector does not receive prioritization for funding especially during the Covid-19 pandemic^{vi}. 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, especially as some of the benefits are starting to be realized through the application of some digitalized services mentioned above. However, it is unusual for a sector specific digitalization strategy to be published before a general national plan. There is also the issue of operating in silos within Ministries and departments so that policies are formulated but there is little involvement of other stakeholders which leads to a misalignment of priorities and initiatives.

Beyond the challenges of a lack of a guiding policy or strategy, poor intra-communication within Ministries and limited funding, there are more practical challenges in implementing digital. The high cost of data is a major barrier felt by innovators, entrepreneurs, beneficiaries, and government officials^{vii}. Accessibility and connectivity issues can set back progress and lead to frustration. Alleviating these barriers is usually outside

ⁱⁱⁱ KII with public sector stakeholder

^{iv} KII with stakeholder from National Agricultural Marketing Board

^v KII with public sector stakeholder (National Plant Protection Service)

^{vi} KII with public sector stakeholder.

^{vii} KII stakeholder group

the remit of the Ministry of Agriculture and requires the impetus of other stakeholders, such as 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. More effort needs to be made in extension services and training to improve the digital literacy of farmers. Furthermore, the inclusion of digital tools is motivating more young people to join the sector. This could lead to broader benefits, such as increased innovation and development of technologies and solutions by local entrepreneurs and SMEs, greater investment by the private sector, and potentially greater knowledge sharing of digital literacy.

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

3.1 MAPPING DIGITAL AGRICULTURE INNOVATIONS

The DACS for Eswatini has characterized 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 Eswatini. A total of 10 innovations were identified in Eswatini that had a mix of use cases as illustrated in Figure 7.

From the 10 identified innovations, six were identified as digital procurement, five provided digital advisory, digital financial services (not exclusively for the agricultural sector but including the rural population), and agri e-commerce. Only three innovations provide smart farming services.

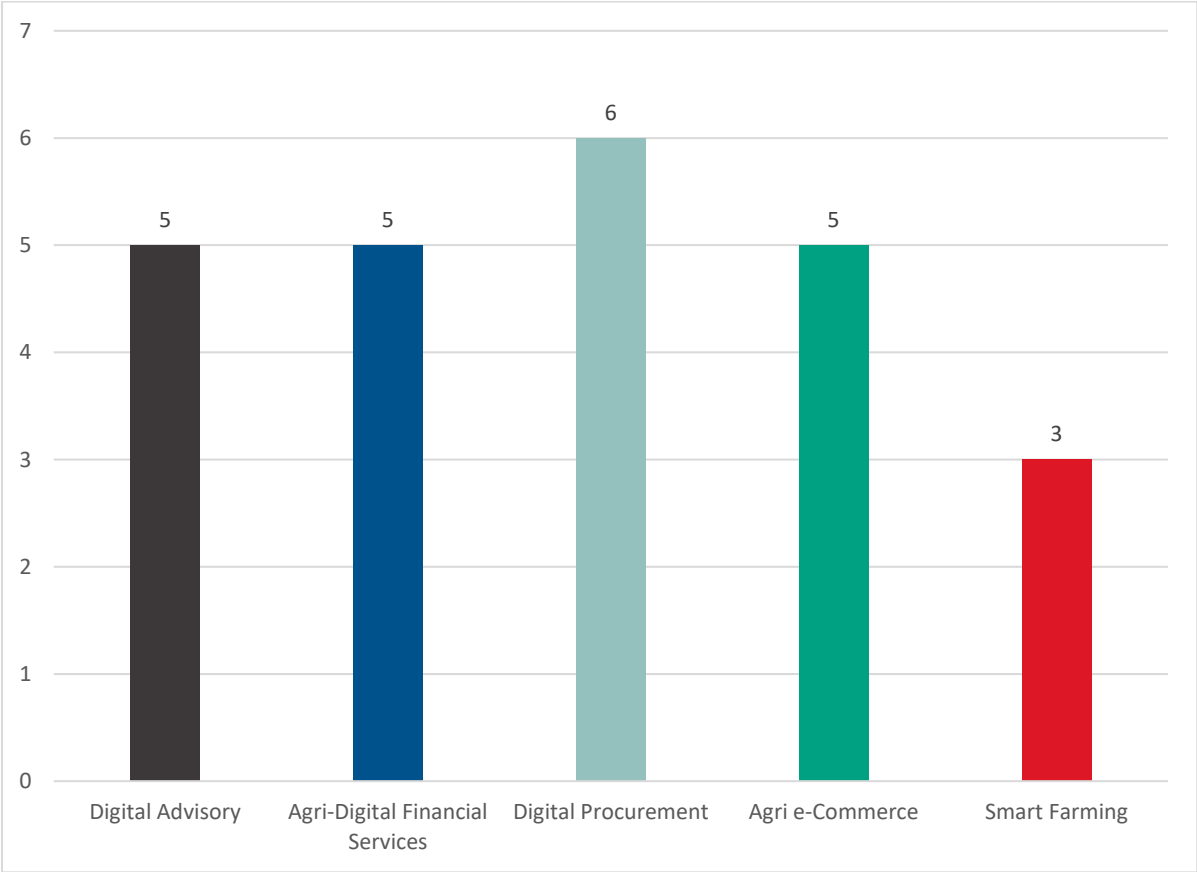


FIGURE 7 IDENTIFIED USE CASES FROM INNOVATIONS IN ESWATINI

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 ESWATINI

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 ESWATINI

				Name of innovation	Name of the company	Survey ✓/X	Description of innovation	Operational Countries in SADC
■		■	■	Agricultural Marketing Information System (AMIS)	Ministry of Agriculture Eswatini	✓	The Agricultural Market Information System of Eswatini (AMIS) is part of the establishment of the NOLWATI AGRIBUSINESS hub by the National Agriculture Marketing Board (NAMBOARD) on behalf of the Ministry of Agriculture and in conjunction with other stakeholders such as ESWADE, SNAU, NGOs and private organizations which help with data capturing, system dissemination and content drafting. AMIS holds relevant information on national business trends on international markets, and the web portal provides information to all agricultural stakeholders. The free subscription page enables emails and participation in Blogs and Fora. Farmers who register provide information on plantings and forecast harvest dates and yields and can receive information via SMS on their cell phones. Currently market price statistics for Eswatini and neighboring export markets are on fruit, vegetables, and Maize but in the future grains, small and large livestock are planned. They have an Android App which is designed for farmers, businesses, and individuals to upload products, place orders online as well as to get weather updates, and a Facebook page. It was launched in 2020 with an average of 350 active users of their web-based services, their App (AMIS) and USSD Platform (AMIS) respectively, and they have 1,024 registered users. AMIS specifically encourages both B2C and B2B models arising from providing a platform to encourage buying and selling based on the most accurate and up to date market information for agricultural commodities relevant to local and export markets therefore encouraging e-procurement and e-commerce transactions and opportunities for leveraging logistics, transport, and the use of farm machinery. AMIS is more related to digital procurement and e-commerce as well as digital advisory on pricing and spans digital advisory, digital procurement and Agri commerce use cases and sub-use cases.	Eswatini

								Addressing a knowledge gap, AMIS enables farmers to access markets more directly and reduce the role of middlemen and have the nearest state of the art data on pricing for agricultural commodities, therefore empowering them to demand fair prices for their harvests. AMIS seeks to ensure marketing for post-harvest produce and clearly buying for those purchasers looking for specific commodities. The service was developed through donor funding and central government funding and will remain reliant on this for the short to medium term. The service was developed through the public sector with extensive consultation with government, commercial companies and social enterprises and entrepreneurs. The model underpinning the platform is a public-private model managed by the NAMBORD parastatal. The application uses Computers, Smartphones, basic and feature phones. It has a website, dashboard, and social media platforms (WhatsApp and Twitter). The most significant challenges experienced in the two Eswatini innovations include for AMIS, the affordability of using the App, Platform and USSD services, the uptake of these services by farmers and particularly women and girls and any resulting behavior changes. AMIS had enabled the government to shut down borders to imports of certain produce, which is in surplus in Eswatini, as determined by farmer production forecasts. AMIS has moved from successful small-scale testing to wider scale adoption.	
■	■	■	■	■	AgroMate/ AgriFusion	Chartered Systems Integration	X	AgroMate from AgroMate (Agri Fusion) is a unique platform that links farmers with off takers and financial institutions which provides the risk management of farmers to guarantee delivery of the product to the off takers. This is the first platform of its kind that addresses financing of farmers, aggregating orders from off takers and allocating them to farmers to plant the crop and applying Agri VAS with Artificial Intelligence for the ongoing monitoring and evaluation of the farming activities. This allows the financier to use this data to calculate expected credit losses for each offtake agreement in real-time. Banks are now able to offer purchase order factoring to finance farmers with a high degree of predictability of the risk and outcomes. This data can also be used for crop insurance to reduce the risk of non-performance of the crop. This innovation has not been validated on the ground and did not fill out the survey.	Eswatini, Mozambique, Namibia, South Africa, Zambia, Zimbabwe
	■				eSusFarm	eSusFarm Eswatini	X	eSusFarm is an Agri-fintech the specializes in tracking and providing advanced agricultural statistical data to smallholder farmers and the entire Agri-value chain for the purpose of increasing agricultural productivity, smallholder market and credit access and increase the efficiency of the Agri-value chain. It has a Facebook page in Eswatini, which highlights a USSD	Eswatini, South Africa

								String *700# which utilizes the Eswatini Mobile Network. eSusFarm collects agricultural data through a mobile feature phone and enables linking farmers to market, credit provider and an existing track record and enabling them to link to other stakeholders such as tractor services and Transport, Input suppliers (e.g., fertilizers), buyers of produce, banks and insurance companies, development partners, governments, IoT providers and drones and satellite services. The farmer gets connected without the need for Wi-Fi, mobile data, or a smart phone. eSusFarm declined to fill in the survey tool.	
■	■		■	■	Financial Inclusion and Cluster Development Project (FINCLUDE)	Centre for Financial Inclusion	X	The Financial Inclusion and Cluster Development Project (FINCLUDE) is a pilot project that is being tested in selected areas of Eswatini. It is through an agreement with IFAD and the Government of Eswatini which commenced in 2019 for a period of 6 years to increase the profitability and sustainability of rural economic activities through a comprehensive and multi-layered set of interventions. The Centre for Financial Inclusion is a semi-autonomous body under the auspices of the Ministry of Finance to facilitate access to financial services for micro-entrepreneurs and the un-banked population through creating an enabling environment for the sector. FINCLUDE will provide support to stakeholders to develop profitable value chains and support entrepreneurship in commodity-based clusters in different locations that have a competitive advantage. The project seeks to increase returns from sustainable farm and non-farm enterprises. The former includes key commodities red meat (beef/goats), piggery, indigenous chicken, vegetables, and legumes. Non-farm enterprises include those which enhance or promote operations of the agricultural value chain such as transport, cold chain storage and the hire of tractors. The locations of the project are Manzini and including selected areas in Tiers 1+2, Hhohho including selected areas in Tiers 1+2, Lubombo and selected areas in Tiers 1+2 and Shiselweni and selected areas of Tiers 1 and 2. They did not fill out the survey.	Eswatini
		■			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 to the livestock and meat industry and was 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	Botswana, Eswatini, Lesotho, Mauritius, Namibia, Seychelles, South Africa, Tanzania,

								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 such as Australia and New Zealand. Matrix Software solutions has reached a stage of replication and adaptation in other geographies and is in the Scaling stage of development.	Zambia, Zimbabwe
■		■		■	GeoFarmer	GeoTerralma ge (Pty) Ltd	✓	GeoFarmer at GeoTerralma Ltd was established in 2017 and has combined innovations in smart farming and digital advisory and e-commerce and is regional in its deployment across the entire SADC region. GeoTerralma is a private sector company which provides actionable intelligence through monthly crop monitoring through the GeoFarmer-©-Crop monitoring platform to support precision farming and accurate information to map crop trends and statistics by using a dashboard in a cloud-based environment. The innovative solution provides - through the use of computers, satellites and Earth Observation - visual maps and illustrations, statistics and trends for each field or farm being analyzed (crop type, crop growth stages, land suitability, crop irrigation) and guiding decision making around farm management and practices for more efficient and sustainable production. GeoTerralma has reached wide scale sustained adoption and operates 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, GeoTerralma uses remote sensed data to create spatial information. It combines advanced information and reporting to enable analysis, quantification, and monitoring to support key decision making. It charges business subscription fees for its fully commercial product and believe its 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
	■		■		Mobile Money (MoMo)	MTN Eswatini	X	MoMo Money by the MTN mobile network operator in Eswatini. The MoMo is a general branchless banking tool, it is not customized for agriculture, nonetheless it is very popular amongst farmers and people in remote rural areas in Eswatini. MTN Eswatini was the first MNO in Eswatini to introduce the product in the country. MoMo currently has more than 500 000 users nationwide, more than 80% of Swaziland's adult population. They did not fill out the survey.	Eswatini

		■	■	■		Mukuru App	Mukuru Africa	✓	<p>Mukuru Money Transfer Limited is a private sector company operating regionally (Botswana, DRC, Eswatini, Lesotho, Malawi, Mauritius, Mozambique, South Africa, Tanzania, and Zimbabwe). The application addresses a knowledge and access gap and provides access to markets and financial services. The Mukuru App was launched in 2019 and allows customers to create orders for remittances individually and initiate a payment for the transfer to happen. The app can also be used to self-register a customer on the platform and verification takes 24 hours. This enables efficient access to financial services through smartphones. The innovation uses SMS, USSD, a Smartphone App, Website, Dashboard and Social Media Platforms (Facebook, Twitter, WhatsApp, and Messenger).</p> <p>The platform uses local and cloud-based databases (Excel, MS Access, SQL) and AI platforms (IBM Watson) for Machine learning. Regionally it has 500,000 users and 1M registered users. It also enables farmers to sell to consumers (B2C) and to enterprise customers (B2B) such as hotels, restaurants, and market retailers. Challenges include digital literacy, device sharing, lack of mobile coverage and financial sustainability of the business model in different locations. The application has reached sustainable scale and is focused on individual users. The business was supported by friends and family and development support and training grants. The revenue model is based on transaction fees and the in-house development of the App and platform which is believed to be inclusive of disadvantaged groups.</p>	Botswana, Democratic Republic of Congo, Eswatini, Lesotho, Malawi, Mauritius, Mozambique, South Africa, Tanzania, Zimbabwe
			■			National Plant Health Inspectorate Services Portal (NaPHIS Portal)	National Plant Health Inspectorate Services (NaPHIS), Ministry of Agriculture	✓	<p>National Plant Health Inspectorate Services (NaPHIS) system is set up by the Government of Eswatini National Plant Health Inspectorate Services that has the responsibility to protect plant resources from pests. It provides science-based regulatory services assuring plant health, food security and the safe trade of plant products. It aims to prevent the introduction and spread of plant pests and promote appropriate measures for their control and to facilitate the safe trade of plants and plant products in accordance with the provisions of the International Plant Protection Convention (IPPC). The work is funded by the European Union. It provides four main services through web access of their site where one can register and apply for the permits or services. Its main role and service offerings include Information System and Policy Analysis, Pest Risk Analysis (PRA) and Permits (Import, Re-Export, Transit and Phytosanitary Certificates), Pest Surveillance, Quarantine and Diagnostics (SQ&D) and Regional Coordination and Inspectorate. NaPHIS was launched in 2020 as an Agri-VAS service with 300 active users of its website and 600 registered users. It is a web-based system for the issuance of phytosanitary</p>	Eswatini

							<p>certificates, regulated plants, plants products, soil and biological articles with traceability for payment. People and businesses requiring phytosanitary services, documents such as phytosanitary certificates, plant import and transit permits apply online and get the different documents online at the comfort of their home or office. The platform is accessible through smart phones, tablets, desktops computers and laptops as long they are connected to the internet. The platform has two modules, one for the user (applicant) and one for the regulator (government officers). Through the platform, turn-around time has been reduced to a few minutes from several day or weeks and both applicants and government officers has saved more in terms of travelling costs. NaPHIS has also enabled a very successful transition from paper based to digitized records both at government level but also for primary users.</p> <p>NaPHIS enables access to markets by providing the necessary certification and phytosanitary clearance for produce. This has the benefit of reducing the cost of doing business for farmers, improved ease of selling produce in Eswatini and in neighboring countries and improved records of export and import information for the government as well as occurrences of pests and disease outbreaks threatening Eswatini's production systems. The service was developed through the provision of donor funding and central government funding and will remain reliant in the short to medium term on these subsidies. It was developed through extensive consultation in government, with commercial companies, entrepreneurs and social enterprises following digital design principles as far as possible. As suggested the service will continue to operate on a public goods business model where some degree of public subsidy will be required. For NaPHIS challenges have included digital literacy amongst users, the lack of mobile coverage and Wi-Fi/internet across the country due to electricity or power supply failures and the expensive cost of data for cell phones. NaPHIS is a service that provides pest and disease management and weather information as well as providing certification for produce for trade. NaPHIS was designed to fill knowledge gaps, combatting low productivity, and improving quality of produce for trade. NaPHIS has demonstrated its model with small-scale success.</p>	
■				Swaziland Livestock Information and	Eswatini Government,	X	The implementation of the identification of livestock included a first stage that involved branding cattle with the country identification mark (shield) and a herd mark (dip tank of origin number). The second stage refers to SLITS which is the computerized identification system funded by the Government and supported by FAO. This system is currently under development	Eswatini

					Traceability System (SLITS)	Ministry of Agriculture	<p>by the Ministry of Agriculture, as part of the government’s endeavor to transition from manual paper-based records to a system of digital records and to create a computerized livestock identification and traceability system that will control and monitor animal diseases, inhibit cross-border thefts of livestock as well as track livestock movements. The combination of first and second stage will combine brand marks with ear tags and will be monitored through a network of veterinary offices, registration, movement and animal health and brands database. Accompanying this will be a computerized system to track all movement and health information of cattle from birth to death. The system is expected to improve access to markets of livestock and livestock products, assist with the recovery of stolen animals or in disputes of ownership, contain animal diseases where there are outbreaks, production management and improve the efficiency of Government controlled movement permits. They did not fill out the survey.</p>	
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3.3 RESULTS FROM INNOVATION SURVEY RESPONDENTS

All identified innovators received a survey and five innovations implemented in Eswatini responded. The answers on the survey are self-reported. Of the innovations identified, five were operational in Eswatini only and other five operated in several countries. All identified innovators were reminded several times by email and by phone to complete the survey. The ability to follow up with in-person and phone-based meetings had been hampered because of further outbreaks of violence and insecurity, and for periods of time where the internet services were halted. The response rate of the survey for Eswatini was 50% (five out of 10 identified innovations responded).

Within Eswatini alone, AMIS innovation and the NaPHIS innovations completed the survey. It should be noted that eSusFarm declined to fill out the survey and that SLITS and the FINCLUDE innovations are still in pilot testing and at a stage that was more about testing their ideas in controlled groups and therefore did not have answers to include in the survey and declined the invitation to fill it out.

USE CASES AND SUB USE CASES

The division of GSMA use cases shows that in Eswatini multiple use cases are most common. Three out of five respondents provided multiple services and only two respondents provided a single use case.

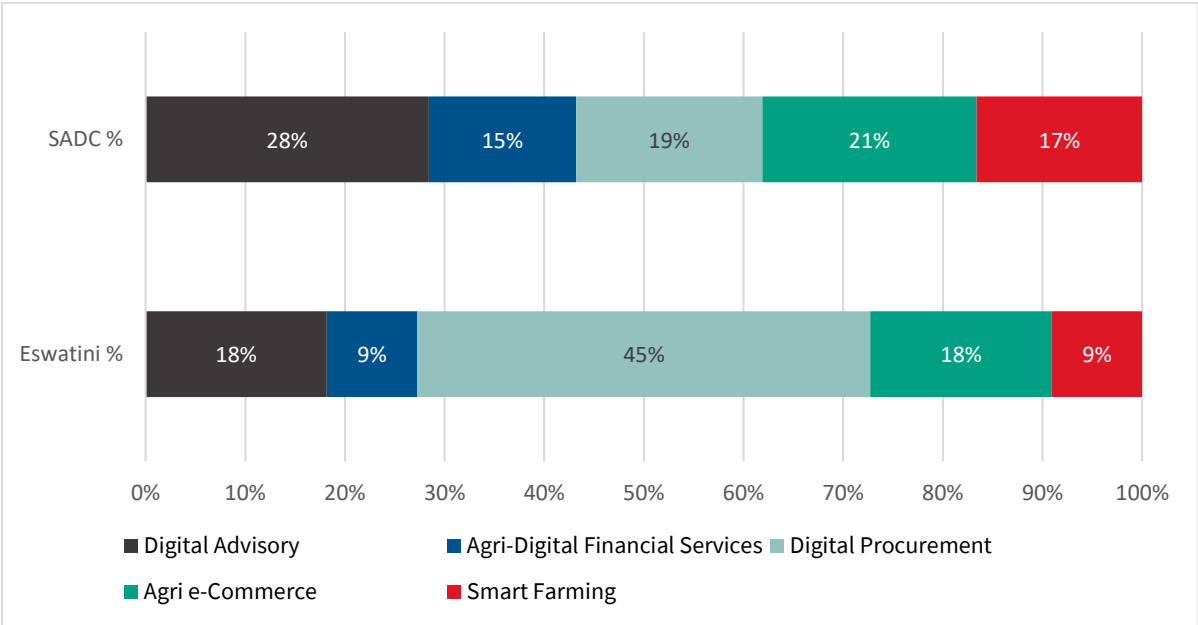


FIGURE 8 DIVISION OF USE CASES FOR SURVEY RESPONDENTS IN ESWATINI VS. IDENTIFIED INNOVATIONS IN SADC

Figure 8 provides the division of use cases provided in the survey. Digital procurement was the most common use case cited by five respondents. Some are focused on certification and provide services to generate permits and financial inclusion in the form of digital financial services. There are also software solutions for managing livestock stock, yield, and traceability utilizing mobile and tablet scanners. Digital Advisory and Agri E-Commerce were the next most common; twice mentioned. Agri-Digital Financial Services and Smart Farming were only mentioned once. Figure 8 also illustrates a comparison of use cases to the rest of the identified innovations in the SADC region.

The innovations present in Eswatini cover a few sub use cases as presented in Figure 9. For Digital Advisory, agricultural value-added services and smart advisory were present. Digital records, under digital procurement, was the most common sub use case present five times.

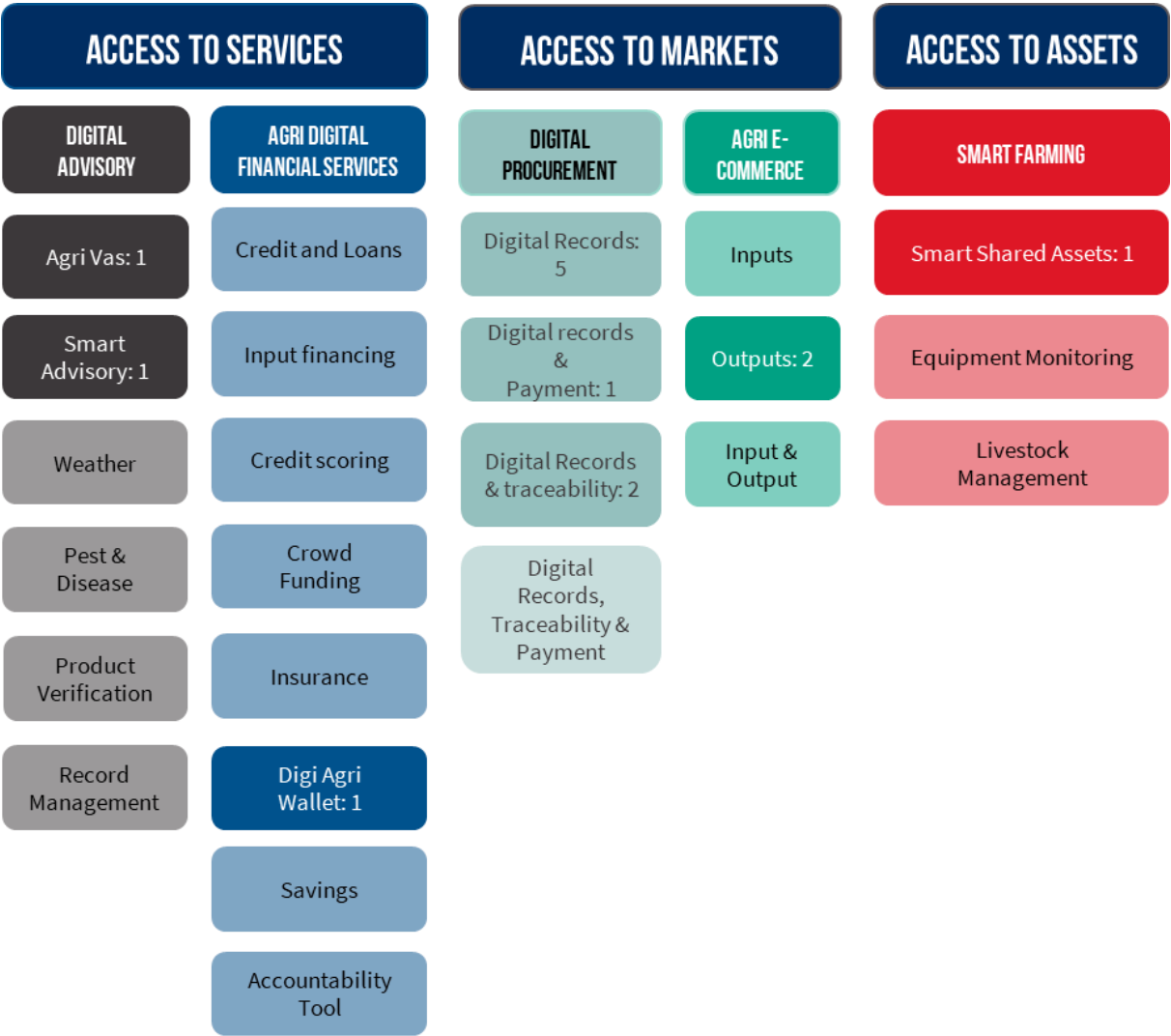


FIGURE 9 OVERVIEW OF SUB USE CASES PRESENT IN SURVEYED INNOVATIONS IN ESWATINI

CHALLENGES

The innovations targeted a wide range of anticipated outcomes including filling knowledge gaps and increasing access to markets for farmers and agribusinesses, as well as addressing low productivity, poor access to the internet, climate change and financial exclusion. The knowledge gap and poor access to markets was most mentioned (4). By far the biggest challenge in the application of technology is digital literacy in Eswatini (3) followed by a lack of mobile coverage (2). User affordability, farmer uptake and use, uptake by women and girls, and a lack of electricity were also mentioned by the innovations operating in Eswatini only. For regional innovations, they also cited access to devices and financial sustainability as challenges in implementing.

TECHNOLOGY USE AND CHANNELS

Most innovations require computers (4), followed by Smartphones (3) or basic feature phones (2) and one regional respondent utilizes satellite imagery. A Website / Dashboard / Portal was the most common channel cited by all respondents, followed by social media channels (2). All respondents also use spreadsheets or cloud-based databases for analysis.

VALUE CHAIN PHASES COVERED

Innovations in Eswatini are more tailored for the earlier stages of the value chain in terms of planning, input, access, use, and on-farm production. There were also innovations to address post-harvest and access to markets. No innovations surveyed provided solutions for storage or transport.

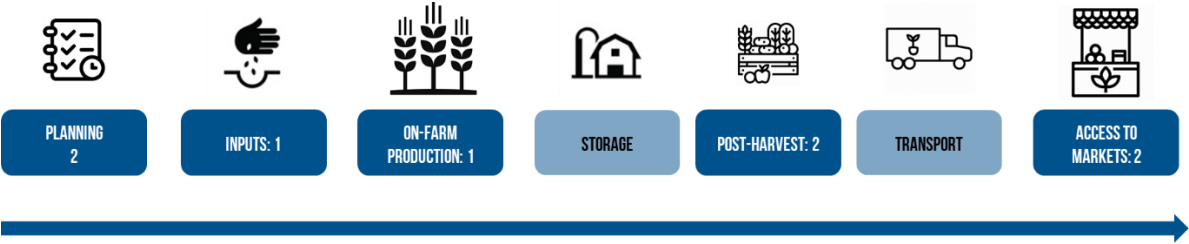


FIGURE 10 SURVEYED INNOVATIONS PRESENCE IN THE VALUE CHAIN IN ESWATINI

SCALING

Most digital innovations in Eswatini appear to be on the more advanced scale on the [Insights on Scaling Innovation](#) report¹⁹. Of the respondents, 60% are transitioning or have reached a level of sustained scale and the remainder are either at the adaptation stage of replicating the model elsewhere or transitioning towards scale.

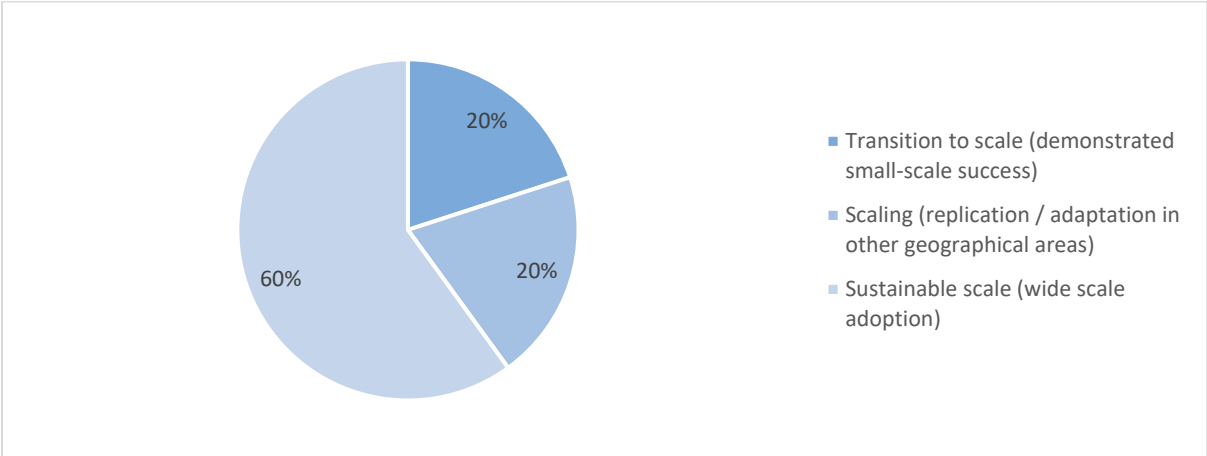


FIGURE 11 SCALING STAGES FROM SURVEYED INNOVATIONS IN ESWATINI

DEVELOPMENT, FUNDING AND REVENUE SCHEMES

One service was launched in 2002, one in 2017, one in 2019 and the remaining two in 2020. These are predominantly private sector (3) followed by Government or Parastatal (2). The two innovations operational only in Eswatini are Government-led.

Most innovations in Eswatini are derived from private sector companies many of whom are operating at a regional scale and include businesses that started with funds from friends and family, incubators, or

government or parastatal innovations that were developed through support from donors such as government or foundations. A number received training and networking opportunities. The majority charge business subscription fees, transactional fees, or fees for premium services or through public sector support.

INCLUSIVITY

In self-reported data, the greatest subset suggested that the technology they used was inclusive of women, people with disabilities, and the elderly. Only one innovation, AMIS, had taken explicit action to be more inclusive of the elderly, smallholder farmers, and those with limited or low levels of literacy.

4 DIGITAL AGRICULTURAL SYLLABI AND ENTREPRENEURSHIP TRAINING

The Kingdom of Eswatini's [National Information and Communication Infrastructure Policy Implementation Plan](#) (2012-2016) states that access by primary, secondary and high schools to computer laboratories and the internet is rather weak and a standard curriculum of teaching ICT skills does not exist in the country. In the tertiary sectors, digital education is more developed and diploma degree courses are offered in computer science and electronic engineering.

In 2020 the International Telecommunication Union (ITU) World Telecommunication/ICT Indicators Database²⁰ reported that only 26% of the Eswatini population was using the internet. In 2020 the Network Readiness Index²¹ rated Eswatini 116 out of 134 in the technology pillar. The technology pillar considers access to technological infrastructure, content, usage and the vision for future technologies. These ratings provide an indication that Eswatini requires support to prepare for a digital agricultural future.

The Kingdom of Eswatini's 2019-2022 Strategic Road Map²² acknowledged that ICT development in the country was lagging other nations – and that high ICT costs were impacting 'operations in both public and private sectors as well as the population at large'. Section 6 Priority III of the strategic roadmap focusses on Infrastructure, Investment and Innovation. Agriculture, ICT and Education were included in the five key growth sectors to be supported.

4.1 AGRICULTURAL SYLLABI UNIVERSITIES

One Agricultural University was targeted in the country: [The University of Eswatini](#). The university responded to our survey incompletely and did not participate in a KII.

THE UNIVERSITY OF ESWATINI

FACULTY OF AGRICULTURE

The Faculty of Agriculture at the [University of Eswatini](#) declared that they **do not provide digital agriculture training courses or digital entrepreneurship trainings**.

4.2 INCUBATORS AND INNOVATION HUBS

A total of one business support organization was mapped in the country and is operating in the agricultural sector: the [Business Incubator RSTP](#) of the [Royal Science and Technology Park](#). This organization supports entrepreneurs and youth in Eswatini to build their digital and entrepreneurial capacities and skills in the agricultural sector and they participated in a KII.

ROYAL SCIENCE AND TECHNOLOGY PARK BUSINESS INCUBATOR

Established in 2012, the [Royal and Technology Park Business Incubator](#) is a department of the Royal Science and Technology Park which is a parastatal under Eswatini's Ministry of Information and Communication technology.

The Royal and Technology Park (RSTP) business incubator has supported eight agricultural startups in the past and currently has six agricultural startups in their portfolio (Smiling through, BIB Investment, Farm to Table, Chakara Muelo, Maestro investment and ROSILE investment).

The RSTP business incubator provides support in the areas of acceleration and incubation, managerial support, physical spaces (including shared services), entrepreneurial and managerial training, ICTs/Digital agriculture training, administrative and legal services, intellectual property, support for the development of networking relationships and support in fundraising and investment readiness.

The main target beneficiaries of the incubator programs and trainings in digital agriculture, ICTs and entrepreneurship are students, graduates, researchers, young agricultural entrepreneurs and aspiring agricultural entrepreneurs. Yet, it stated that it did not have any digital skills trainings in its program portfolio that are specially designed for entrepreneurs. It does not include any digital agricultural concepts and tools in the training program. The RSTP business incubator did not provide any information on which institution – the incubator or external partners – delivers the trainings.

The organization collaborates with universities but did not specify with which universities. The RSTP business incubator currently receives a UNDP grant. RSTP described the public environment as not enabling in the support of business service provider organizations. The organization is run through the support of government funds

TABLE 7 OVERVIEW OF RESPONSES FROM INTERVIEWED INCUBATORS IN ESWATINI

ESWATINI INCUBATORS	
Royal and Technology Park (RSTP) Business Incubator	
Year of Establishment	2012
Agri start-ups incubated	8
Target of Digital Agri trainings	Students Graduates Researchers Entrepreneurs Young agricultural entrepreneurs Aspiring agricultural entrepreneurs
Digital Skills trainings	None
Digital Agri Tools taught	None
Collaboration with Universities and Colleges	Not specified
Supported by the Government?	Yes

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

Eswatini ranked fourth out of 16 in the benchmark assessment which suggests a developing digital economy with some key foundational areas being developed. The benchmark assessment enabled the identification of countries within the SADC region that are unlocking positive pathways towards a digital economy and a vibrant ecosystem of different actors. Eswatini ranked averagely in most pillars, ranking highest in the G5 benchmark (fifth) and the ICT infrastructure pillar (seventh).

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. Eswatini makes up part of Group 2, these countries ranked in the top half of the benchmark but are not the front-runners in the region, based on the data collected.

POLICY ENVIRONMENT

The stock take of national policies and strategies identified that digitalization has been prioritized in Eswatini. Key documents were developed that focus on ICT dissemination, the information society, e-Government and cyber security. Two national plans have also stressed the importance for greater connectivity and access to internet and devices. These are all useful as guiding documents but lack a clear mandate that embeds digitalization as a national priority for all sectors and strategies moving forward. It is unclear to what extent digitalization has been embraced in agricultural systems when observing sectoral policies and national strategies. Agriculture is frequently noted as a key priority sector but there is little evidence of an integration of ICTs in the available documents.

Gaps also exist in legislation with an e-commerce bill yet to be enacted and various data protection laws missing. These frameworks need to be strengthened and harmonized with international standards to attract greater investment in the sector. A national digital plan would help to set this agenda and could then be used as a guiding document by other departments. Policy needs to be implemented to promote entrepreneurship and increased access to capital so that solutions can be developed. However, the sector also needs to prepare and support an environment that will allow for the integration of these innovations such as increasing digital

skills, improved connectivity, and increased farmer uptake so that these strategies complement each other and support the overall digital ecosystem.

The commitment and the focus on building a collaborative digital ecosystem to bring together ideas, and scale efforts that are working well, together with advancements in the digital economy are necessary with a clear road map to guide implementation. Ensuring that the digitization of public services and the private sector are encouraged will also drive skills development and create demand for better products and services. Ideally all of this will be pursued with a proactive and inclusive agenda.

DIGITAL AGRICULTURE INNOVATIONS

The study undertaken on Eswatini identified 10 innovations; half focused on Eswatini alone and half were operating on a regional basis. The majority addressed digital procurement, and an equal proportion distributed across digital advisory, digital financial services, and e-commerce. The survey response rate was modest at 50% and the respondents were deployed by the private sector (3) and by the government (2). These were recently launched in 2019 and 2020, with one in 2017. There are clearly some significant gaps in innovations addressing particular use cases. Innovations had combined use cases with three, two or one service and addressed knowledge gaps, low productivity, and access to markets. The major challenges faced were digital literacy, lack of mobile coverage, prohibitive cost of data, and a central control of the internet. Innovations developed for Eswatini alone are at earlier stages in development, whilst regional innovations are more advanced and are at a sustained level of scale. This last point reflects on the capability in country. Furthermore, given the low levels of household computers and the low access to mobile broadband and the internet, it was interesting to see the high dependence on websites as the most common channel, followed by apps for smartphones. The latter are also expensive, and accessibility is restricted due to the cost. Many of the innovations used spreadsheets and cloud-based databases, which may also have encountered challenges due to the availability and reliability of broadband. The notion of home-grown solutions and enhancing the climate for AgriTech innovations in Eswatini links clearly to the available capacity of digitally savvy entrepreneurs in the country.

DIGITAL AGRICULTURAL SYLLABI AND ENTREPRENEURSHIP TRAINING

Although the University of Eswatini filled out two surveys^{viii}, they reported that they do not teach digital skills. This would be a welcome addition but is insufficient in providing digital literacy services to assist, empower and grow the ability and capability of individuals at all levels in society. The current digital divide is likely to widen in the short term in two ways. Firstly, young skilled digitally savvy people are required to drive the digital economy, they require these skills to innovate and create a vision for the future. Secondly, for those engaged in agriculture, the population has a higher proportion of youth, women, the elderly or poorer farmers who lack language and digital literacy skills. The advancement by government of the e-economy alongside adequate skills-development would enhance the impact of AgriTech for Eswatini's farming population and for its young AgriTech entrepreneurs.

For the incubators interviewed, CCARDESA and other international partners could better support the development of digital skills for agricultural youth entrepreneurship by advancing capacity building, support in relevant program development and raising resources for support to start-ups. The regional research and education network of southern and east Africa, [Ubuntu Net Alliance](#), reports that a National Research and Education Network (NREN) has not been established by the Kingdom of Eswatini. It is recommended that the

^{viii} Two different individuals filled out the survey for the University of Eswatini to corroborate the information that they do not teach digital agriculture skills.

NREN development is supported so that it supports the development of affordable connectivity infrastructure and other value-added services for the benefit of research, education, and innovation-related institutions.

In terms of digital skills, embracing digital skills training in tertiary education to build capacities not only of young people but of all strata including businesses and politicians will be important. Building a more integrated ecosystem of cooperation and collaboration between the University and incubators park to advance digital agricultural curriculum and orient it towards entrepreneurship would be valuable. The encouragement by government of incentives for digital AgriTech entrepreneurs to transform relevant content for home grown solutions and support services will encourage new innovations with tailored content.

Eswatini still has major challenges to quality ICT infrastructure, reliable access to electricity, affordable basic internet and this year has suffered significant and severe political unrest and violence. With one internet provider dominating the market there are concerns on how quick change will be. Low market penetration and high pricing perpetuate the digital gap especially for the unemployed, youth, and the vulnerable. The inequality divide borne by a lack of access to internet, electricity, digital skills, or affordable devices is likely to impede significantly social and economic development as a high proportion of the population is left behind.

To encourage an advancement of Eswatini towards an integrated and inclusive digital economy for AgriTech, there are investments in infrastructure such as an expansion of high-quality high-speed ICT and stable internet such as optic fiber and 4G/5G coverage and internet speeds. The provision of low-cost ICT access and low-cost devices and internet data would revolutionize the pace of development. There is a need to rapidly expand the development and range of content for ordinary citizens and community including the rural population, through local content formulation and provision, and finally to boost digital literacy services.

5.2 REFLECTIONS FROM THE SITUATIONAL ANALYSIS REPORT

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

- **If farmers have limited access to digital solutions or are unable to use them, because they lack digital skills further uptake is likely to be significantly impeded.** Innovators should be encouraged to take deliberate actions to ensure innovations are inclusive of those with lower digital literacy and lower literacy levels to enable both a raised awareness of the benefits of digital agricultural innovations but also to enable their use.
- **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.
- **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 access to these services and promote entrepreneurship.** Government has a role in improving access to the digital communication channels for the population and farmers. This will go some distance in preparing the market demand for new solutions and enable farmers to exploit the opportunities.
- **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.** 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).

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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