Western Cape Government

Agriculture

FOR YOU

Proposed Africa Strategy for the Western Cape Agricultural Sector

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LIST OF ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank
AGRA	Alliance for a Green Revolution in Africa
AI	Artificial Intelligence
ATDC	Agricultural Technology Demonstration Centre
BDRI	Big Data Readiness Index
BMGF	Bill and Melinda Gates Foundation
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CSA	Climate-smart agriculture
Dti	Department of Trade & Industry
FAO	Food and Agriculture Organization of the United Nations
4IR	Fourth Industrial Revolution
GDP	Gross Domestic Product
GPS	Gender Parity Score
GSMA	Global System for Mobile Communication
HS	Harmonised System
ICT	Information Communication Technology
IFPRI	International Food Policy Research Institute
IoT	Information of Things
ITU	International Telecommunication Union
LPI	Logistics Performance Indicators
MNO	Mobile Network Operators
NAMC	National Agricultural Marketing Council
NDP	National Development Plan
NPC	National Planning Commission
OBG	Oxford Business Group
PPP/P	Public-Private Partnership/Public-Private-Producer Partnership
SASVEPM	Society for Veterinary Epidemiology and Preventative Medicine
SDG	Sustainable Development Goals
SDGC/A	Sustainable Development Goals Centre of Africa

SDSN	Sustainable Development Solution Network
UN	United Nations
USD$	United States of America Dollar
US	University of Stellenbosch
VC	Value chain
VCD	Value Chain Development
WEF	World Economic Forum
WB	World Bank
WCDoA	Western Cape Department of Agriculture
WCAAS	Western Cape Agricultural Sector Africa Strategy
WTO	World Trade Organization
ZAR	South African Rand

POLICY SUMMARY

There is a myriad of complex factors that affect and shapes the performance of agriculture on the African continent and relates to (i) access and use of agricultural inputs, (ii) infrastructure and logistics challenges, (iii) lack and asymmetric access to information, (iv), ability to access and the adoption of new technology, (v) forging technology partnerships, (vi) investment and expansion of services (financing and insurance) and (vii) skills development and training. At the same time Africa must stay abreast of emerging trends globally and the African continent, that includes (i) scaling climate-smart agriculture, (ii) emerging technologies (e.g. precision agriculture, digital & mobile technology, big data), (iii) the drive towards circular economies, (iv) empowerment of women, (v) increased use of protective foods (vi) shorter and more efficient value chains), (vii) the promotion of productive and regenerative agriculture, and (viii) consolidation of industries.

In the above context, the drive to take advantage of the opportunities that exist in Africa, and also addressing the various challenges the continent faces are supported by several initiatives, policy documents and directives (some are continental and some specific from a South Africa perspective). These include, amongst others, the following (i) Comprehensive Africa Agriculture Development Programme (CAADP), (ii) African Continental Free Trade Agreement (AfCFTA), (iii) Integrated National Export Strategy (INES), (iv) International Agricultural Trade Diplomacy Strategy, (v) Agriculture and Agro-Processing Master Plan (AAMP) and (vi) 2019 – 2024 Strategic Plan (SP) of the Western Cape Province.

The continental and local policy directives to address the challenges and opportunities in Africa provides an ideal opportunity for the Western Cape's Government to cement its leadership role on the African continent. This leadership role can manifest itself throughout different value and service chains in Africa through the following key interventions, namely (i) Policy & Regulatory support, (ii) an Africa Agribusiness Initiative Centre (AABIC), (iii) an Agro-Technology and Innovation Hub and (iv) Inter-Governmental collaboration and problem solving. Unlocking resources to provide traction for these interventions will ultimately be crucial to achieve the following outcomes, namely (i) an increase in economic growth of the agricultural sector in Africa and the Western Cape, (ii) an increase in the employment in the agricultural sector in Africa and the Western Cape, (iii) an increase in provincial and household food security in Africa and the Western Cape rural communities and (iv) resilient trade and business relationships in Africa and the Western Cape.

The important role that the Western Cape Government should play can't be overstated and should primarily focus on creating an enabling environment for the private sector to unlock and to take advantage of the opportunities that exist in Africa. In fact, the very nature of an African Strategy requires that the Western Cape Government plays a leading role since government-to-government relations at various inter-connected levels will not only determine the openness of trade in products and services, but will be vitally important within the context of willingness to do business. A key consideration should be building trust amongst all stakeholders.

EXECUTIVE SUMMARY

The African Union (AU) Heads of State embraced the Comprehensive Africa Agriculture Development Programme (CAADP) as an instrument to respond to the **opportunities and challenges** brought by several demographic growth projections. The South African government is a signatory to this agreement whose central agenda is to **guide Africa's agricultural transformation for sustained food security and socio-economic growth.** The ultimate objective is to provide effective leadership for the attainment of specific goals by the year 2025, including ending hunger and services, tripling intra- African trade, enhancing resilience of livelihoods and production systems, and ensuring that agriculture contributes significantly to poverty reduction. The 2019 – 2024 Strategic Plan (SP) of the Western Cape Province has identified five Vision Inspired Priorities (VIP) of which VIP 2 targets economic growth and job creation. Subsequent to the Covid-19 Pandemic, the SP in the Western Cape has been re-focussed on the priority areas of jobs, safety and well-being which will lead to dignity

Thus, an opportunity exists for the agricultural sector in the Western Cape to contribute to the ultimate objectives of the CAADP and at the same time contribute to further sustainable growth of the agricultural economy of the Western Cape by supporting the Vision Inspired Priorities (VIP). Amongst others, opportunities in Africa include:

- Agricultural products trade (primary and processed)
- Inputs
- Services
- Technology partnerships
- Information
- Skills development / training
- Logistics
- Others

However, to unlock these opportunities, it is of paramount importance to Development an Africa strategy for the Western Cape Agricultural Sector. The purpose of this diagnostic and design evaluation is to develop a Provincial Agricultural Africa Strategy which will lead to the achievement of provincial outcomes such as:

- Economic growth
- Employment creation
- Provincial and household food security

The key questions to be answered by this diagnostic and design evaluation include:

a) What are the most important trends and trend breaks in Africa?
b) What are the opportunities pertaining to Africa for the Western Cape AgriculturalSector?
c) What are the levers which can be employed by the Western Cape Province?
d) What are the main objectives to be achieved by an Africa Strategy?
e) How can those objectives be achieved (i.e. causality)?

f) What are the five most important interventions to be introduced by the WCDoA?

The comprehensive literature review on the factors Influencing the performance of African agriculture and emerging trends and trend brakes indicate that there are many opportunities to support the growth of African agriculture. There is a growing realization that African economies stand to gain significantly by promoting intra-continental trade of agricultural products and these gains are expected to result in a higher exchange of manufactured and processed goods, greater knowledge transfer, and high value creation. It is also of paramount importance to **link small-holders into commercial value chains** to achieve these gains.

The multi-criteria analysis (using several indices and the survey results) and selection of target African countries indicate that the top countries that should be prioritised are: **Namibia, Botswana, Kenya, Mauritius, Tanzania, Rwanda, Zambia, Côte d'Ivoire and Ghana, Nigeria and Angola**.

The literature review and stakeholders' consultation indicated several levers and stressors that constrain using these levers to optimise outcomes. These were all considered in the structuring of the Western Cape Agricultural Sector African Strategy.

The key sources of information for the development of an Africa strategy for the Western Cape agricultural sector are the literature / documentation overview and information that was obtained from key selected informants in the sector with a structured questionnaire. Due to time constraints and several public holidays during the study, the survey sample is not statistical based. The intention was to obtain the input from well informed individuals with experience in conducting business in Africa. Plausible focus areas and specific interventions per focus area are identified by the team and the rationale for each intervention is unpacked. Through a consultative process with stakeholders in the Western Cape an overall strategic objective was defined:

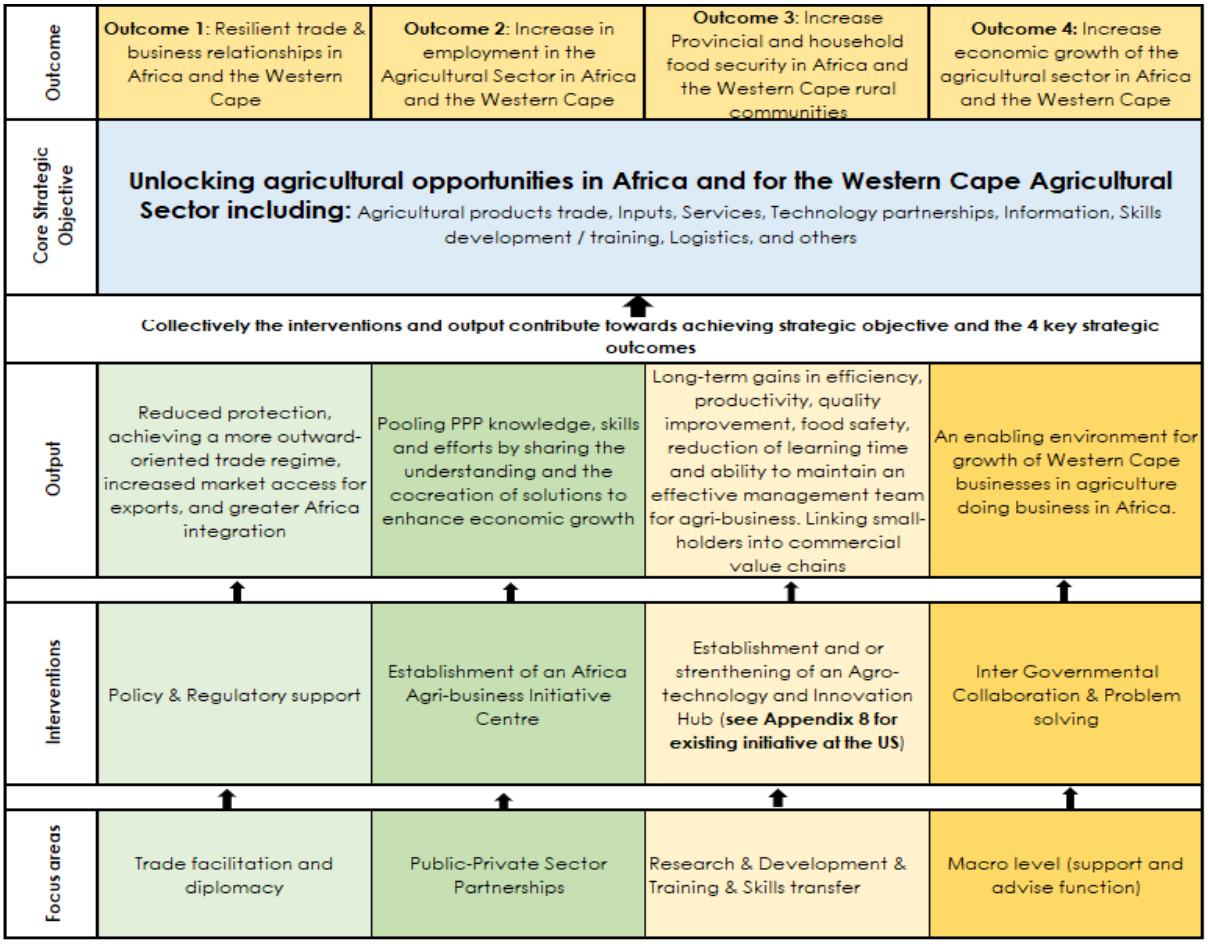
Unlocking agricultural opportunities in Africa and for the Western Cape Agricultural Sector including: Agricultural products trade, Inputs, Services, Technology partnerships, Information, Skills development / training, Logistics, and others

A multicriteria framework, based on implementation criteria, was developed to score the proposed operational interventions and focus areas. **Four Focus Areas** each with **one Strategic Intervention** and **several Operational Interventions** are proposed. This will allow for an integrated approach with only 4 key interventions to direct and drive the Western Cape Agricultural Sector Africa Strategy initiative. They are:

1) Policy & Regulatory support (Intervention 1);
2) The Africa Agribusiness Initiative Centre (AABIC) (Intervention 2);
3) An Agro-Technology and Innovation Hub (Intervention 3); and
4) Inter-Governmental collaboration and problem solving (Intervention 4).

Note: There is no specific focus area for inclusiveness since this is an overarching objective with all the focus areas and interventions

It is clear from the multicriteria analysis that all the focus area's and proposed key interventions scores almost equally (75-76%) with the exception of the Macro Level focus area – Inter Governmental Collaboration & Problem-solving strategic intervention that scores slightly higher (82%). The operational interventions are all important and integrated since it will not be possible to implement the strategic interventions (4) efficiently without executing the 11 operational interventions. Government should play a significant role to create an enabling environment for the private sector to unlock and to take advantage of the opportunities that exist in Africa. Government should consult with the private sector as a key partner. The results of the Log frame analysis in this study should determine the decisions to achieve the 4 expected outcomes. The causality argument for selecting the 4 proposed strategic interventions is presented in the simplified log frame below.



Each Focus Area, Strategic Intervention and Operational Intervention recommended should thus be considered in context of its underlying and linked activities, confirming the integrated nature of the proposals.

1 INTRODUCTION

1.1 Background

The past few years have been characterised by a "rediscovery" of agriculture as a sector for strategic activity, particularly in Africa (OECD, 2010; HLPE, 2011). Although South Africans have been engaging in various sectors in Africa for many years, particularly since 1994, the date of the first democratic elections and the subsequent liberalisation of its economy, the country's agrarian and corporate capital has also been looking for opportunities in agriculture in other African countries. South African farmers and investors, through the export of farmers, expertise, and agribusiness, have developed different production and investment models to implement in agriculture across the continent. A single South African model does not exist (Ward & Buche, 2015).

The African continent is an important market to South Africa and the rest of the world. The African market imports share of 41% for agricultural exports comes from South Africa (Morokong et al. 2021; ITC, 2021). Globally it accounts for 2.9% of global imports and contributes 2.8% to the world economy. Furthermore, during the period 2012-2017 the average annual GDP growth increased by 4.3% which was the second fastest growing economy after Asia at 4.5% (UNCTAD, 2019).

The African Union (AU) Heads of State embraced the Comprehensive Africa Agriculture Development Programme (CAADP) as an instrument to respond to the **opportunities and challenges** brought by these demographic growth projections. The South African government is a signatory to this agreement whose central agenda is to **guide Africa's agricultural transformation for sustained food security and socio-economic growth.** The ultimate objective is to provide effective leadership for the attainment of specific goals by the year 2025, including ending hunger and services, tripling intra- African trade, enhancing resilience of livelihoods and production systems, and ensuring that agriculture contributes significantly to poverty reduction.

The 2019 – 2024 Strategic Plan (SP) of the Western Cape Province has identified five Vision Inspired Priorities (VIP) of which VIP 2 targets economic growth and job creation. Subsequent to the Covid-19 Pandemic, the SP in the Western Cape has been re-focussed on the priority areas of jobs, safety and well-being which will lead to dignity.

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- Services
- Technology partnerships
- Information
- Skills development / training

- Logistics
- Others

However, to unlock these opportunities, it is of paramount importance to Development an Africa strategy for the Western Cape Agricultural Sector.

1.2 Objective

The purpose of this diagnostic and design evaluation is to develop a Provincial Agricultural Africa Strategy which will lead to the achievement of provincial outcomes such as:

- Economic growth
- Employment creation
- Provincial and household food security

This strategy may include, but is not limited to, levers such as:

- Market development
- Growth in bi-lateral trade
- Research and knowledge exchange
- Strategic engagement

1.3 METHODOLOGY

- Phase 1: Organising the effort and project inception
- Phase 2: Literature and documentation overview
- Phase 3: Diagnostic and design evaluation
- Phase 4: Draft and Final report

2 LITERATURE REVIEW

Please note that this section is a condensed summary of a comprehensive literature review, available in **Annexure A**.

2.1 Factors Influencing the Performance of African Agriculture

2.1.1 Introduction

There is a growing realization that African economies stand to gain significantly by promoting intra-continental trade of agricultural products and these gains are expected to result in a higher exchange of manufactured and processed goods, greater knowledge transfer, and high value creation (Songwe, 2019).

McKinsey & Company (2019) highlight that substantial investments in inputs (e.g., fertilizer and hybrid seeds), infrastructure (e.g., irrigation, electricity, ports, and storage), and trade (i.e., trade flows and policies) are prerequisites to realizing Africa's untapped agricultural potential. Agricultural innovation and technology, along with connections to institutions (both public and private) are also identified as key drivers toward African agriculture's sustained prosperity (World Bank, 2021; World Bank 2019a; World Bank 2019b; World Bank, 2017). Also equally important are investments in information systems, farmer training, and services (Adenle et al., 2019). To obtain the big picture on South Africa's agriculture sector as it relates to other continental

agriculture sectors, the following sections provide a condensed review of literature on the aforementioned factors that are cited as being principal to unlocking the potential of African agriculture, with particular focus placed on South Africa's Western Cape Province. Also, emerging trends that are shaping African agriculture such as digital technology, mobile technology, Big Data, BlockChain technology, women empowerment, and the concept of circular economy are reviewed.

2.1.2 Agricultural Inputs

Agricultural productivity growth in Africa has been noted to be stagnating in recent years and this is attributed, in part, to the limited use of recent and improved agricultural inputs such as seeds, fertilizers, and innovative mechanization services (Suri & Udry, 2022; Langyintuo, 2020; World Bank, 2019a). From a demand perspective, small-scale African producers do not utilize quality inputs with advanced technologies due to risk aversion (low risk-bearing ability), insufficient knowledge (e.g., on availability of ecologically adapted seed varieties), high input prices coupled with lack of cash, and limited access to credit markets (Langyintuo, 2020). African small-scale farmers also face high transaction costs that arise from the inaccessibility of input markets and this is noted to hinder the adoption of new input technologies (Suri & Udry, 2022). In addition, there is also a lack of markets for quality, intimating a lack of varying prices for varying levels of input quality (Suri & Udry, 2022). Despite all these challenges, there has been considerable progress in input usage among African farmers (Janyne et al., 2019).

2.1.3 Logistics

The potential for long-term growth and development in Africa highly depends on the improvement of individual countries' logistics performance (Chakamera & Pisa, 2020). Elements of logistics performance such as the quality of institutions, border, and transport efficiency, as well as physical and communication infrastructure are highlighted as major determining factors of both Africa's intra and inter-continental trade engagements (Yushi & Borojo, 2018). Yushi & Borojo (2018) explain that a simultaneous improvement in all of these factors is necessary to reduce the cost of trade in Africa and facilitate higher regional trade engagement.

A combination of structural issues and inefficiencies in the administration and regulation of cross-border transport was identified as contributive to high road freight rates. It was also noted that limited return trips caused by differences in trade flows between countries contribute to high road freight rates. From these findings, Vilakazi (2018) recommended focusing not just on infrastructural investments, but also on addressing administrative and regulatory hold-ups that make regional trade via road costly and cumbersome.

2.1.4 Information

The Fourth Industrial Revolution (4IR), which coincides with the postmodern information age, has made agriculture increasingly knowledge-intensive (Mapiye et al., 2020; FAO & ITU, 2016; Drafor, 2016; World Bank, 2017). There is growing awareness that access

to timely and accurate information, that is customized according to different locations and conditions, is critical for farmers to make well-informed timeous decisions under dynamic circumstances (Mapiye et al., 2021; FAO & ITU, 2016; Abay et al., 2021; AGRA, 2016). Sub-optimal choices by farmers due to information asymmetry lead to market failure. Digital technologies remedy market failures arising from information asymmetry on product price and quality along agri-food value chains (Abay et al., 2021). Digital technologies, which are typified by mobile internet-enabled devices, can be harnessed for improved continental connection (Statista, 2022).

2.1.5 Technology

African agriculture can benefit from a constellation of new tools and technologies that improve production, productivity, distribution processes, and access to markets (Mavilia & Pisani, 2021). Examples of these technologies include Blockchain, Internet of Things (IoT), Information Communication Technologies (ICTs), Big Data, Artificial intelligence, and drones (UN, 2021; Abay et al., 2021; Smidt, 2018; Mavilia & Pisani, 2021; Sarker et al., 2020; Masupha et al., 2021). South Africa's Western Cape Department of Agriculture (WCDoA), in line with its provincial goals and the National Development Plan (NDP), has been implementing novel methods and technologies to address challenges in agriculture faced by the province (Naidoo et al., 2016). These innovations, which have a broad spectrum, include the latest biotechnology (e.g., ovine genomic selection for breeding), remote sensing satellite and spatial information (e.g., Spatial Intelligence Project and FruitLook), Agricultural Integrated Management System, information management and dissemination technologies (e.g., smart (digital) pen and paper technology, and Agri-touch) and new conservation agriculture methods. Despite the probable benefits of these innovative technology applications to agricultural producers, Mavilia and Pisani (2021) stress the importance of considering their relative costs as well as associated risks of implementation.

2.1.6 Technology Partnerships

In today's dynamic environment, the public sector alone is unable to adequately address the myriad of challenges faced by African agricultural producers (Sihlobo, 2021; Raidimi & Kabiti, 2017; Fourie & Poggenpoel, 2017; Hanusch & Karimjee, 2018; Rankin et al., 2016). The public sector is constrained by, among several factors, limited resources and bureaucracy which lead to poor response to changing circumstances (Raidimi & Kabiti, 2017; Adenle et al., 2019). Phenomena such as globalization are reinforcing the need for small-scale agricultural enterprises to network both horizontally and vertically to gain access to global markets (Rambe & Agbotame, 2018; Mavilia & Pisani, 2021). Innovation theory posits that through collaboration, interdependencies among institutions are established, cultivating innovation (Rankin et al., 2016). Senyolo et al. (2021) explain that collaborative partnerships in agricultural research and development have grown to be considered an effective way to conduct advanced research, commercialize new technologies, and disseminate

information on new products to small-scale farmers for improved performance.

Rankin et al. (2016) explain that PPPs offer a framework to organize researchers, service providers, and farmers into innovation-driven collaborative networks that are capable of formulating research-driven solutions to facilitate the effective and efficient transfer of technology innovations to farmers. This multi-agency system benefits farmers as each participating partner can contribute according to its strengths (Raidimi & Kabiti, 2017). Furthermore, Kunert et al. (2020) highlight that such partnerships cohere domestic policies and lead to the coherence of policies across borders.

A very good example of a Technology partnership in the Western Cape is the "US Technology Innovation hub". Such a virtual/physical space should: (**see Appendix 8**)

- Be a hub for start-ups and young businesses where they receive support on ventures in the space spanning the agri-food-energy-environment nexus.
- Provide access to a network of mentors, investors as well as existing agribusiness entrepreneurs and farmers, as well as industry bodies in Agriculture, Food and forestry.
- Host events to promote investment and exposure for these entrepreneurs, but also students and academics interested in agri-entrepreneurship.
- Provide the potential to network with academics and students for expertise but also to develop young minds towards entrepreneurial ambitions.
- Give access to cost-effective workspaces and offices at the new Agri precinct and/or at partners.

2.1.7 Services

The pursuit of development and commercialization of the African agriculture sector requires significant support, for example, from financial and insurance services (World Bank, 2020a). Efficient financial services are of importance to the sector as they support agriculture stakeholders by providing them access to credit markets on favorable terms. This can be used to fund the purchase or lease of costly agricultural infrastructure and machinery. Insurance services are also critical as they cover participants of the agriculture value chain against risk, and this is noted to encourage investments into productivity-inducing methods and technologies (Suri & Udry, 2022).

2.1.8 Agricultural Skills Development and Training

For Africa to achieve productivity-led growth in the agricultural sector, Jayne et al. (2020) point out that higher education institutions need to play a transformative role. The authors support this view by highlighting that investments in African higher education are known to yield the highest returns in the world, estimated at 21%. Furthermore, they estimate that a one-year increase in average tertiary education levels results in Africa's GDP growing by 0.39%, eventually yielding a 12% increase in the long term. Through higher education, Jayne et al. (2020) also note that there is a significant creation of knowledge-based goods and services that exert a transformational effect on the agriculture sector. However, Kirui (2020) notes that there

is currently a mismatch between the training available and the skills being demanded by the private sector in Africa. To catalyze and facilitate development in African agriculture, upskilling and training of the agricultural labor force (particularly the youth) should go beyond just knowledge transfer (Kirui, 2020). There must be a passing of relevant in-demand expertise, experience, best practice, and learning. This transfer of capabilities can be achieved through forging partnerships with countries that have more sophisticated technologies, methods, and technical know-how.

2.2 Emerging Trends and Trend Brakes in African Agriculture

2.2.1 Scaling Climate-Smart Agriculture (CSA)

Climatic risks associated with climate change include the increased risk associated with more frequent instances of heat stress, drought stress, flooding, wildfires and more (Njeru, Grey and Kilawe, 2016; World Bank, 2018; World Bank, 2021). Africa is particularly vulnerable to climate shocks that threaten food production (Scherer and Verburg, 2017). The dilemma is that, on one hand, climate change issues contribute to the dilemma of food security, and on the other hand, farming contributes massively to climate change issues (Scherer and Verburg, 2017). This leads on to the need for Climate-Smart Agriculture (CSA). CSA 'addresses the challenges of building synergies among climate change mitigation, adaptation and food security that are closely related within agriculture and minimizing their potential negative trade-offs.

2.2.2 Optimizing Resources through Precision Agriculture

The Fourth Industrial Revolution (4IR), and subsequently the fourth agricultural revolution (agriculture 4.0), is currently underway and is significantly different to previous industrial revolutions in the sense that the scope of the 4IR is far broader than 'mere smart and connected machines' (Western Cape Department of Agriculture (WCDoA) and the University of Stellenbosch Business School (USB), 2018; Jellason, Robinson and Ogbaga, 2021). The 4IR involves a pivot towards a conjoined physical and virtual world (WCDoA and USB, 2018). The 4IR is resulting in the realization of many opportunities. To 'stay ahead of the game' agricultural actors will need to 'embrace technology through the adoption of farm-management software, precision agriculture, predictive data analysis and genetics' (WCDoA and USB, 2018). Precision agriculture is growing in popularity around the world as it cuts on costs, time, reduces wasted inputs and is also environmentally friendly (AFGRI, 2022; Kynoch, 2022). To date, precision agriculture is yet to make its mark on the African continent as there is little evidence of its use (Sahel, 2021).

2.2.3 Digital Technology in African Agriculture

Digital technologies are improving African food producers and processors' ability to increase food production, improve food safety, minimize food waste, safeguard the environment, improve operational efficiency, and overall create economic gains in agriculture (Benyam et al., 2020; Kudama et al., 2021; UN, 2021; World Bank, 2021; World Bank, 2019a). Interest in digital platforms by investors and consumers in Africa is growing, and this is apparent, amongst many indicators, in the rise of tech hubs

(Mabaya & Porciello, 2022). Tech hubs, which are credited with providing Africa's agri-food systems with innovative digital solutions (Afrilabs And Briter Bridges, 2019), are described by GSMA (2021) as "physical spaces that are designed to foster and support tech startups". Using GSMA statistics, the Afrilabs and Briter Bridges (2019) report show a rise in the number of tech hubs across Africa with 314 in 2016, 442 in 2018, 618 in early 2019, and 643 towards the end of 2019. These tech hubs are concentrated in South Africa, Nigeria, Egypt, Kenya, Morocco, and Ghana. In sub-Saharan Africa, there is perceptible growth in digital financial services which is a result of the rapid adoption of mobile money in most states (Phatty-Jobe et al., 2020). Through digitization, there can be greater financial inclusion for farmers (World Bank, 2020b). This not only improves their consumption but also allows them to make productivity-enhancing investments (World Bank, 2020b).

2.2.4 Harnessing Mobile Technology for Agricultural Service Delivery

The digitization of agri-food systems and value chains in Africa has largely been spurred by the rapid penetration of mobile phones (Mabaya & Porciello, 2022). Between 2005 and 2020, mobile phone subscriptions in sub-Saharan Africa have risen from just under 10 per 100 people to over 90 per 100 people (World Bank, 2022). 615 million people in sub-Saharan Africa (equivalent to about 50% of the region's population) are forecast to subscribe to mobile technology by 2025 (GSMA, 2021). Considering mobile connections via smartphones are expected to reach 68% by 2025 in Africa (GSMA, 2021), it is tenable to expect greater opportunities for mobile-based solutions in many sectors, agriculture included (Mabaya & Porciello, 2022).

2.2.5 Leveraging Big Data in Agriculture

The insurgence of disruptive technologies (e.g., mobile technology, BlockChain, Internet of Things [IoT], Artificial Intelligence [AI]) in Africa is providing the agriculture sector with high streams of data that can be harvested into innovative tools and business models to transform the sector (Ordu et al., 2021; Srivastava, 2019). This trajectory of innovations in technology is pointing toward a future in African agriculture where there is an emphasis on new, high-frequency data that is available in real-time to solve challenges in value chains (Mabaya & Porciello, 2022). New-age technologies such as Big Data are being mainstreamed and noted to be impactful in agriculture (Srivastava, 2019). Big Data generates data-driven farming intelligence which can be transformed into actionable insights and added value across the agricultural sectors of African countries (Joubert et al., 2021). Hence, producer-to-market delivery cycles can be shortened which minimizes wastages, particularly of perishable agri-products.

2.2.6 Driving a Circular Economy

In recent years, the concept of a circular economy has emerged as a topical issue that is highlighted as a potential solution to the economic, social, and environmental challenges that are currently being faced by countries (Mehmood et al., 2021; Govindan et al., 2018; Sassanelli et al., 2019). The gradual shift away from the

traditional linear economic business model approach is being driven, largely in part, by instability in resource prices, shifting socio-economic regulatory landscapes, mounting regulatory pressure on waste, greenhouse gas emissions, and climate change (Mehmood et al., 2021). Unlike the traditional economy which was focused just on production, consumption, and disposal, the circular economy centers around sustainability. In Africa, like many other regions, circular economy opportunities are noted to exist in resource-intensive sectors such as agriculture, transport, and manufacturing (Godfrey et al., 2021).

2.2.7 Women Empowerment

The United Nations SDG 5 outlines the globally shared 2030 agenda for achieving gender equality and empowerment (SDGC/A & SDSN, 2020). Africa has shown significant commitment and progress in advancing this agenda (UN Women, 2022). This commitment is apparent in the ratification of international legal instruments such as the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) by the majority of African countries (UN Women, 2022). More than half of African countries have also ratified the African Union's Protocol on the Rights of Women in Africa (UN Women, 2022). Notwithstanding this progress, women's potential is still hampered by discrimination (Moodley et al., 2019). In the context of agriculture, Njuki et al. (2021) spotlight evidence of discrimination against African women in accessing resources such as land, water, seeds, chemical inputs, technology and information, and finance. This, despite women being a source of vitality across all sectors of the economy in Africa (UN Women, 2022). Women are noted to be key actors in agri-food systems as producers, wage workers, processors, traders, and consumers (Njuki et al., 2021).

2.2.8 Embracing Protective Foods (rich in minerals and vitamins)

One of the 'Ten Critical Transitions' identified by the Food and Land Use Coalition (FOLU) (2019), involves a global transition towards healthy diets. This involves increased consumption of plant-based diet that includes more protective foods- foods like fruits, vegetables and whole grains (FOLU, 2019). If the transition towards protective foods is to be achieved, more protein will need to be sourced from a variety of food types that do not include an increase in the consumption of animal products (FOLU, 2019). In Africa, there is a shift being experienced towards healthier and more nutrient rich, protective diets. The shift is not as rapid as it is in more developed countries, and along with increased rates of urbanization the threat of an increasing shift towards calorie dense and convenient diets threatens a shift towards more nutrient rich diets (Malabo Montpellier Panel, 2021; Sahel, 2021).

2.2.9 Creating shorter and more efficient value chains

Agriculture value chains in Africa are gradually evolving and this process is being driven by a variety of factors, including income and population growth, changing relative prices, urbanization, and technology change (de Brauw & Bulte, 2020). Consequent to this evolution, there has been an emergence of new entrants along

the agricultural value chains and new institutional arrangements (e.g., contract farming and value chain financing) (de Brauw & Bulte, 2020). Advancement in digital or manufacturing technologies combined with improving customer sophistication is creating opportunities for new entrants to shorten the value chain (Hagel et al., 2016). By eliminating or shifting unrequired stages of the traditional value chain to other participants (e.g., through vertical integration), value chains are becoming shorter and more consolidated.

2.2.10 Promoting Productive and Regenerative Agriculture

The majority of global food and agricultural production takes place on large scale commercial farms that utilize synthetic chemical inputs and large quantities of water (Food and Land Use Coalition, 2019). This larger scale agricultural practice comes with various benefits, such as the ability to produce large quantities of food at a relatively cheap cost, high productivity per hectare and dependable output (FOLU, 2019). However, this form of agriculture comes with its own drawbacks. The continuous use of potent and synthetic pesticides, herbicides and fungicides raises concerns over the risks imposed on the ecosystems due to the removal of a wide range of different species resulting in reduced biodiversity (Chagnon, Kreutzweiser, Mitchell, Morrissey, Noome and Van der Sluijs, 2015; World Bank, 2021). Broadly defined, regenerative agriculture is concerned with agricultural practices that, 'amongst other benefits, reverse climate change by rebuilding soil organic matter and restoring degraded soil biodiversity- resulting in both carbon drawdown and improving the water cycle' (Regeneration International, 2017; Sahel, 2021). The scaling of productive and regenerative agriculture comes with many benefits. These include environmental, health, inclusivity, and food security benefits (FOLU, 2019).

2.2.11 Consolidation in the Industries

In the developing world Africa has experienced the fastest growth in urbanization in recent decades. The growth rate has been occurring at a rate 3.5% annually and the trend is expected to continue this vector through to 2050 (African Development Bank (AfDB), 2012; Pereira, 2014). The number of medium-size farms is also rising and increased smallholder productivity is expected to be the biggest growth driver (McKinsey and Company, 2019). Urbanization, however, leads to the consolidation of land sizes as more people move into urban areas, allowing for an increase in large-scale, mechanized farming (McKinsey and Company, 2019). Consolidation of farms and urbanization leads on to the need for consolidation along the value chain in turn to supply food to the growing urban population. Consolidation along the length of value chains that make up the food system is a global phenomenon (Metelerkamp, 2014).

3 MULTI-CRITERIA ANALYSIS AND SELECTION OF TARGET AFRICAN COUNTRIES

This section is based on recent work by Annandale (2022). The sections that follow is only a condensed summary of the analysis. (See **Appendix 1-4 and Annex A)**.

3.1 Variables used in constructing the Country Priority Index

The Country Priority Index is a composite index made up of three different dimensions, each with its own variables/indices. The dimensions, shown in Table 3-1, include the 'Market Conditions', 'Business Environment' and 'Logistical Conditions'. The 'Global Competitiveness Index' (GCI) compiled by the World Economic Forum and the 'Country Attractiveness Index' (CAI) compiled by Morokong and Pienaar (2019) were used as the basis to select the different variables per dimension but were excluded from the analysis to compile a Country Priority Index to avoid "double counting" of different variables/indices.

Table 3-1: Three dimensions of the Country Priority Index

Market Conditions	Business Environment	Logistical Conditions
Gross Domestic Product (GDP) per capita	Political Stability	Road Infrastructure
GDP Growth Expecatations (2019-2024 (%))	Ease of Doing Business Index	Port Infrastructure
Human Development Index (HDI)	Corruption Perceptions Index	Logistical Performance Index (LPI)
FDI Net Inflows (2017-2019 Average) (USD)	Regulatory Quality	Distance to Market (km)

Market conditions describe those factors that influence the size of a market (Gross Domestic Product (GDP) per capita) and its growth projections (GDP growth expectations), the human development status of a country (HDI) and the interest (confidence) in the market from an international investment perspective (FDI Net inflows). The GDP per capita and the HDI are important factors to consider in the development of the Country Priority Index as these can aid in products/services selection for the export market. For example, a country with a relatively high GDP per capita will most likely import food products/services that are higher in value.

The business environment is an important dimension as it allows for potential players in the market to determine how feasible (practical) it is to operate in the respective international market. A market with low political stability carries with it higher levels of risk, and a country with poor regulatory quality means that the government is unable to "formulate and implement sound policies and regulations that permit and promote private sector development" (World Bank, 2021). This makes operating a business in the foreign market more risky and more difficult.

Logistical conditions in the foreign market determine the ease/difficulty with which an exporter may experience in getting the produce to the final consumer, which in turn influences the costs involved of getting the produce to the final consumer. This will impact the competitiveness of the exporter. The inclusion of the logistical conditions pillar allows for the consideration of the practicality behind getting the actual produce/product to the final consumer and allows for the identification of a suitable export market. The Logistical Performance Index (LPI) is an important inclusion as it measures the performance along the logistics supply chain of a country from both an international and a domestic perspective (World Bank, 2018).

Not all the input variables used to construct the country priority index was complete. To account for missing data, multiple linear regressions were performed, each regression used for the imputation of the missing variables. The linear regressions were performed using variables that had a full set of data. The model used is the Classical

Linear Regression Model (CLRM) and it makes use of the methodology of Ordinary Least Squares (OLS).

3.2 Methodology used to construct the Country Priority Index

The variables used in the formation on the Country Priority Index were all normalized using a popular normalization technique known as 'Min-max normalization'. After normalization of the variables, weights were assigned to each variable. The weights represent the importance (contribution) each variable holds when determining the importance of a market. The weights of the variables were determined via a survey that was distributed to stakeholders in the Western Cape agricultural sector. Special consideration was given to each variable when performing the weighting to control for 'double counting', and to avoid the exclusion of appropriate variables. After normalization and weighting, the variables were aggregated using a widespread measure of linear aggregation which involves the summation of weighted and normalised individual indicators (OECD, 2010). The resultant values corresponding to the respective countries were then ranked from largest to smallest. Largest values represent the countries that the Western Cape agricultural sector should focus on according to the Country Priority Index, whilst the smallest values are countries that are viewed as the least appropriate. The detailed results can be found in **Appendix 5**. A condensed summary of the top 25 countries is presented in Table 3-2.

Table 3-2: Country Priority Index Ranking – Top 25

COUNTRY	Country Priority Index Score	Rank According to Country Priority Index
Mauritius	0,81	1
Seychelles	0,71	2
Namibia	0,68	3
Botswana	0,67	4
Rwanda	0,65	5
Morocco	0,62	6
Egypt	0,60	7
Kenya	0,57	8
Tunisia	0,52	9
Cote d'Ivoire (Ivory Coast)	0,51	10
Cabo Verde (Cape Verde)	0,51	11
Ghana	0,49	12
Eswatini	0,48	13
Senegal	0,48	14
Sao Tome & Principe	0,48	15
Zambia	0,47	16
Tanzania	0,47	17
Djibouti	0,47	18
Benin	0,45	19
Togo	0,44	20
Algeria	0,43	21
Uganda	0,43	22
Gabon	0,42	23
Lesotho	0,42	24
Malawi	0,41	25

Actual agricultural trade with African countries were used as a proxy for doing business in Africa to determine under and over exposure in certain countries. The

rankings according to the Country Priority Index were compared to actual trade data. A grouping of the top 25 agricultural exports by the Western Cape to Africa was extracted from the Quantec trade database for the period 2016 to 2021. The countries were then ranked from 1 through to 53 according to the average value of the imports from largest to smallest for the period 2016 to 2021. The country ranking according to the Country Priority Index was then subtracted from the country ranking according to actual trade figures. The results give an indication of whether (i) trade follows the Country Priority Index, (ii) trade is more than what the Country Priority Index suggests it should be and (iii) trade is less than what the Country Priority Index suggests it should be. See **Appendix 5** for the results. The results are discussed in more detail in the next section.

3.3 Results – markets to focus on

When comparing actual trade statistics (as proxy for doing business in Africa) to the Country Priority Index, several conclusions as to which markets to focus on, as well as, which markets are potentially over focused on can be made.

The countries in red, are countries that are currently exported to significantly more than is suggested by the Country Priority Index. Countries in yellow, are countries that are currently exported to more than the Country Priority Index suggests. Countries in green resemble countries that are exported to in quantities that agree with the results of the Country Priority Index. Countries in grey are countries that should be awarded more export attention as the Country Priority Index suggests that trade is less than it should be. Countries in blue are exported to far less than the Country Priority Index suggests.

Zimbabwe, Mozambique, and other red countries are countries that are considered extremely poor export destinations according to the Country Priority Index. However, due to the volume of trade it can be postulated that these countries do present trade opportunities. At the same time there are several other countries that present trade opportunities that have not been explored yet as suggested by the Country Priority Index. The same can be said for countries like Lesotho, Cameroon, and others that are in the yellow section, but to a lesser extent.

Countries in green are countries that are traded with proportionately to the Country Priority Index. These countries include countries such as Uganda, Kenya, and so forth. It can therefore be suggested that industry stakeholders should maintain current export levels, but they may also consider the potential exports that can be realized in other African countries.

Countries such as Djibouti, Algeria, and so on, are markets identified as having more export potential than is currently being realized by South African industry stakeholders. These are countries that industry stakeholders should look at to potentially increase current exports to. The same can be said for countries in blue, but to a greater extent.

4 DESKTOP IDENTIFICATION OF POSSIBLE OPPORTUNITIES PERTAINING TO AFRICA FOR THE WESTERN CAPE AGRICULTURAL SECTOR

4.1 General opportunities in Africa

Identifying opportunities for the Western Cape in Africa can to a large extent be based on Transforming Africa's Agriculture to Improve Competitiveness. The World Economic Forum (2015) identified 8 generic opportunities for the African continent which are briefly discussed below.

Develop high-yield crops

Increased research into plant breeding, which considers the unique soil types of Africa, is a major requirement. A dollar invested in such research by the CGIAR consortium of agricultural research centres is estimated to yield six dollars in benefits.

Boost irrigation

With the growing effects of climate change on weather patterns, more irrigation will be needed. Average yields in irrigated farms are 90% higher than those of nearby rain-fed farms.

Increase the use of fertilizers

As soil fertility deteriorates, fertilizer use must increase. Governments need to ensure the right type of fertilizers are available at the right price, and at the right times. Fertilizer education lessens the environmental impact and an analysis of such training programs in East Africa found they boosted average incomes by 61%.

Improve market access, regulations, and governance

Providing market access and better incentives to farmers, including reductions in food subsidies, could raise agricultural output by nearly 5%.

Make better use of information technology

Information technology can support better crop, fertilizer and pesticide selection. It also improves land and water management, provides access to weather information, and connects farmers to sources of credit. Esoko, a provider of mobile crop information services, estimates they can boost incomes by 10-30%.

Adopt genetically modified (GM) crops

The adoption of GM crops in Africa remains limited. Resistance from overseas customers, particularly in Europe, has been a hindrance. But with Africa's rapid population growth, high-yield GM crops that are resistant to weather shocks provide an opportunity for Africa to address food insecurity. An analysis of more than one hundred studies found that GM crops reduced pesticide use by 37%, increased yields by 22%, and farmer profits by 68%.

Reform land ownership with productivity and inclusiveness in mind

Africa has the highest area of arable uncultivated land in the world (202 million hectares) yet most farms occupy less than 2 hectares. This results from poor land governance and ownership. Land reform has had mixed results on the African continent but changes that clearly define property rights, ensure the security of land tenure, and enable land to be used as collateral will be necessary if many African nations are to realise potential productivity gains.

Step up integration into Agricultural Value Chains (AVCs)

Driven partly by the growth of international supermarket chains, African economies have progressively diversified from traditional cash crops into fruits, vegetables, fish, and flowers. However, lack of access to finance and poor infrastructure have slowed progress. Government support, crucial to coordinate the integration of smallholder farmers into larger cooperatives and groups, may be needed in other areas that aid integration with wider markets.

4.2 Trade

Wesgrow (2021) reported that the Western Cape's top five agricultural exports in 2020 were citrus fruit, wine, apples, pears and quinces, and other fruit. For the purposes of this study, only the agricultural export opportunities in the African continent will receive more attention (**see Annexure A** for detail). The top 10 priority short-, medium- and long-term export opportunities have no African markets listed but have various agricultural commodities/products listed. These include, but are not limited to, 'Crop and Animal Production, hunting and related service activities', 'Manufacture of tobacco products' and 'Manufacture of food products' (Wesgro, 2022). The study did not consider only agricultural export opportunities and so the top 10 identified opportunities in each time frame had to compete with higher valued export opportunities and wealthier overseas markets, which explains the lack of a list African export markets and agricultural products/commodities.

African countries (specifically Namibia, Botswana and Lesotho) are major markets for Western Cape exports (Wesgro, 2022). The largest African export destination is Botswana with 3% of all of the Western Cape's agricultural exports as of 2019, an increase of 1% when compared to 2018 (Partridge *et al.*, 2020). This figure may seem small, but as a region, Africa accounted for 19% of the Western Cape agricultural sector's exports in 2019 (Partridge *et al.*, 2020). When considering agricultural imports from African countries, the Western Cape sources the majority of its agricultural imports from Namibia (10%), Zimbabwe (4%) and Mozambique (4%) (Partridge *et al.*, 2020). As a region, Africa exports 30% of the Western Cape's total agricultural imports (Partridge *et al.*, 2020).

4.3 African Immigrant Food Market

Kaizer (2015) conducted a comprehensive study on the African immigrant food market in the Western Cape. The study explored demand for traditional foods by the African immigrant market in the Western Cape. Following below is a condensed summary of the findings with emphasis on the opportunities for Western Cape Agriculture. At the time of writing (2015), they estimated that there were between 200 000 and 450 000 African immigrants in the Western Cape (in 2022 the higher number is probably applicable). They estimated demand for 15 identified products/product groupings that the research indicated might have greater potential for local supply from a market demand perspective, including: Beans, Cassava, Cocoyam, Egusi, Groundnuts, Leafy greens (various), Millet, Okra, Palm oil, Chillies, Plantain, Sweet Potato, Guinea Yam ("Yam"), Crustaceans, and Freshwater fish.

The authors are of the opinion that this could be of sufficient scale to be of interest to small-scale producers and agriculture development initiatives.

4.4 Inputs

Input use across Sub-Saharan Africa is more complex than prevailing beliefs and macroscale statistics suggest. In summary, modern input use is not as low as is commonly believed, but there is room for considerable improvement, in both the level and method of input use. Although the conventional wisdom remains largely true, some movement is occurring on Africa's agricultural input front.

Thus, in general, there are significant opportunities for agricultural input providers based in the Western Cape in Africa. However, the three main constraints facing agricultural input business sector in Africa **include knowledge constraints, financial constraints and risks.** These are faced by both purchasers and suppliers. Successful prospective and potential business alliances to address these constraints should focus on a combination of the three at the same time.

4.5 Agri-business development services

According to Bain & Company (2020), in order to feed and employ the fastest-growing population in the world (Africa), we need a new approach to agricultural development in Africa, one with farmer-allied intermediaries at its centre. Farmer-allied intermediaries have changed the lives of many commercially oriented smallholder farmers. Working hand in hand with **smallholder farmers, farmer-allied intermediaries, including producer organizations, aggregators, processors and vertically integrated food brands,** can simultaneously achieve a number of critically important outcomes for a broad set of stakeholders.

The authors are of the opinion that there are already successful businesses in the Western Cape that specialise in farmer development, incubation and intermediary services. **Linking farmers to competitive value chains- short, regional, global**. Some of them already have presence in Africa. It is clear from the condensed background that there is a demand for these services in Africa and scope of the expansion of

current and new services to African countries.

4.6 Technology partnerships

Africa may in recent years have seen a growth in the number of agritech services that offer things such as farmer advisory services or access to finance via smart phone but more than 90% of the market for digital services that support African smallholders remains untapped and could be worth over $2.2-billion according to a new report by CTA (2019). The Technical Centre for Agricultural and Rural Co-operation (CTA) found nearly 400 different digital agriculture solutions with 33 million registered farmers across sub-Saharan Africa. These include farmer advisory services, which provided weather or planting information via SMS or apps, and financial services including loans and insurance for farmers.

Ranjan & Kaushik (2022) is of the opinion that Public Private Partnerships can unlock the power of agricultural technologies. Public private partnerships involve collaborations between a government agency and private sector body to finance, build and deliver a public asset or service. They combine the strength of the government's mandate and ability to deliver public services, with the private sector responsible for investments, technology, products and distribution systems.

Partnering with academic and research institutions is of paramount importance (Ranjan & Kaushik, 2022). While start-ups have good expertise of emerging technologies like artificial intelligence (AI), the internet of things (IOT), blockchain and drones, they often lack the application-level domain expertise. Such digital innovations also need **testing and validation for credibility among farmers** and scaled field deployment. The existing body of agricultural research from universities and institutions can be better leveraged to scale work done by private agricultural technology players through PPPs. The US Technology Innovation hub is a good example – **see Appendix 8**.

In November 2020, Dr Mogale Sebopetsa, HOD of the WCDoA announced that 14 new agri-tech innovations were developed in the Western Cape. They were demonstrated at an information day at Elsenburg (Foodformzansi, 2020). Thus, it can be concluded that there are certainly many opportunities for agri-tech businesses in the Western Cape to explore this opportunity. However, as pointed out, partnerships with African Governments and Research Institutions will be the key to successfully unlock these opportunities.

4.7 Agricultural Information & Intelligence

Smallholder farmers account for between 60–80% of the food produced in the sub-Saharan Africa region but face many challenges that impede their productivity. Such challenges include a lack of timely access to appropriate agricultural information and services, which results in poor decision-making, particularly in addressing challenges and responding effectively to opportunities. In that context, the effective use of Information and Communication Technologies (ICTs) in improving accessibility to appropriate agricultural information and services presents substantial prospects for

transforming the productivity and livelihoods of the farmers. Currently, the region experiences massive penetration and propagation of mobile and web-based applications.

In the Western Cape several new innovative agricultural information systems have been developed over the years and many recently. Some of these systems are very successful and there may be a potential for Western Cape based businesses / organisation to expand them to other African countries.

4.8 Skills & Training

According to Allen et al., (2018), 22% of total food economy employment in West Africa is in off-farm food activities. Many of these jobs are vendors in small shops, street markets, hawkers or food stalls and street food. The transformation of food systems creates new off-farm employment opportunities in rural areas. Many of the new jobs are linked to agriculture. Specialisation of agricultural production systems towards higher-value food products (fruit, vegetables, dairy, meat) and processed foods, leads to increased demand for rural labour in the off-farm segments of the food economy. Increasing agricultural productivity will be central in developing the job potential in off-farm employment opportunities, as well as in agriculture itself.

Developing these new employment opportunities - on- and off- farm and in rural and urban areas – depends on an understanding of food systems, capturing the links between agricultural productivity, off-farm employment and rural and urban areas.

Thomas (2017) pointed out that there is growing consensus that the productive agriculture of the future will be knowledge and technology intensive, and will require a greater range of technical, business and soft behavioural skills (such as problem solving, organizing and planning, working in teams) than African education and training systems are currently producing.

Given the condensed background on the transformation of the food systems in Africa, the authors is of the opinion that there is a huge potential for skills development and training to support the transformation of the food systems. Thus, there may be educational supply chain opportunities for the Western Cape for existing and new skills development & training organisations focussed on the agricultural sector and food systems.

4.9 Agricultural logistics

The African Continental Free Trade Agreement (AfCFTA) promises to usher in a new era of economic prosperity in Africa. The agreement came into force on 30 May 2019, the historic agreement will create the world's largest free trade area since the WTO. However, the transformative potential of the AfCFTA will depend on the free flow of goods across borders - which only the logistics sector can help unlock. According to a recent Briter Bridges survey of logistics tech companies across the continent, 3 trends will shape the future of logistics in African markets: closing the urban-rural divide, the digitization of logistics, and the continued rise of B2B logistics companies (Hashi, 2019).

Africa presents great commercial logistical opportunities for those with a bold vision and persistent drive to find the right way. As an example, Unitrans Africa (2022) (Western Cape based) have demonstrated this ability and ongoing desire to leave a positive mark on the economic development of Sub-Sahara Africa serving more than 300 million people. If South Africans make the decision to expand in Africa, they will need a solid long-term strategy. The continent needs better transport infrastructure, more connectivity across borders, and an improved business environment to reach its potential (PWC, 2013.). The condensed background indicates that, albeit challenges, there are several opportunities for Western Cape logistical companies in Africa.

5 DESKTOP IDENTIFICATION OF THE LEVERS WHICH CAN BE EMPLOYED BY THE WESTERN CAPE PROVINCE

The literature review and stakeholders' consultation, indicated the following key levers:

- Explore and expand upon international networks for funding and collaboration. Increase in consortia forming and levering of external international funding. Leveraging resources through partnerships, co-financing, and initiatives.
- Scaling and leveraging what is already working: the initiatives that form the underlying execution of the strategy are either universally proven to deliver results or involve scaling up and replicating promising pilots.
- Establishment of an Africa Agribusiness Investment Unit for the Western Cape Province. Leveraging shared capabilities and footprints to enhance programs and expand reach. Leveraging key partnerships (e.g. agro-dealer's networks).
- Establishment of agri-processing R&D forum focussed on opportunities in Africa to export processed products and or to imports raw materials from Africa and to process for the African immigrant's market in the Western Cape.
- Reviewed trade policies to favour intra-Africa trade and bilaterals
- 4th IR technology often makes an effective lever.
- Levering Big Data in agriculture in Africa
- Leverage mobile technology
- Being sufficiently targeted: Direct resources to a series of commodities and agro-ecological zones, and thereby avoid investments becoming too diffuse, losing synergies in driving multi-country value chain synergies, and require a breadth of commodity and agro-industry expertise that could not be viably created.
- The Partnership for Agricultural Transformation in Africa (PATA) will leverage existing CAADP mechanisms. A key aim of the PATA (CAADP) is to bring together actors from across governments, development institutions, private sectors, and civil society with a focus on coordinating and financing strategies for a specific AVC in a specific region. The Western Cape Government to take specific actions to ensure that the agricultural sector benefit from these initiatives.

6 DESKTOP IDENTIFICATION OF STRESSORS THAT CONSTRAINS USING LEVERS TO OPTIMISE OUTCOMES

Within the context of this study stressors are environments that might be demanding, challenging, and/or threatening the achievement of strategic outcomes.

6.1 The digital revolution stressors

The digital revolution is transforming industries and changing the nature of work across all regions of the world, including in Sub-Saharan Africa. Amidst this ongoing change, there are fears that automation and other digital innovations will lead to large-scale job displacement in manufacturing, retail services, and other industries. In developing countries where a large share of the labour force is in informal employment, there are **fears that automation could close the traditional industrial pathway to economic transformation through low-wage employment** (Choi & Dutz, and Usman, 2020).

Of course, the risk of large sections of the poor, the low-skilled, and the uneducated being left behind in a so-called digital divide looms large as more than 60 percent of the labour force is made up of ill-equipped adults and almost 90 percent of total employment is in the informal sector (Choi & Dutz, and Usman, 2020).

Choi & Dutz, and Usman (2020) identified three important areas in Africa to addresses the humanitarian, economic, and social implications of the COVID-19 global pandemic and sets the foundations for the needed recovery afterward:

1. **Improve the availability of digital technologies (also highlighted by McKinsey & Company, 2017)** across the region to help increase the productivity of workers and businesses. It will be important to close the current gap in digital infrastructure by enhancing afford- able broadband access with improved regulatory frameworks.
2. **Boosting human capital in African countries** is crucial to enable broader participation of all segments of the population in the digital economy.
3. **Create a business environment that helps increase the productivity and upgrade the skills of informal businesses and workers**— including by leveraging worker-enhancing digital solutions for low-skilled workers.

Why focus on digital technology adoption in Africa? Because digital technologies have the potential to help build skills not just for a privileged few but for all workers—including those with low education and limited opportunities—and to boost productivity and create better jobs in all enterprises, including informal ones.

6.2 Agricultural development stressors in Africa

Yumkella et al., (2011) identified seven development pillars to optimise agricultural development in Africa:

Pillar 1 Enhancing agricultural productivity

The Comprehensive African Agricultural Development Programme (CAADP) has established very ambitious targets for Africa's annual agricultural growth. Both supply-

side and demand-side issues related to the agricultural sector in terms of structural transformation, agro-industrial commodity linkages, and important policy interactions should be addressed. The role of the agricultural inputs that are required by agro-industry for achieving higher productivity, competitiveness, growth, and consumer quality are critical. The efficiency gains of focusing more on regional markets in Africa, of considering the impact of the choice of techniques, of innovative business models, and of new agro-industrial policies are also paramount for success.

Pillar 2 Upgrading value chains

Market development for commodities and processed goods via value chains, and potential ways of strengthening the competitiveness of firms and farms within those value chains (linking African producers to local, regional and global value chains, options for product, process and functional upgrading with the aim of improving the competitiveness of firms and farms in value chains. Finally, the role of standards and of quality management with regard to the products supplied by the value chain to markets, and the issue of coordination and governance in the value chain, so as to reach a higher level of efficiency in the system should be addressed.

Pillar 3 Exploiting local, regional and international demand (Also highlighted by the UN, 2021)

Local, regional and global market demand dynamics affecting African agribusiness. Increasing supply to these markets, especially intra-African markets, will require agribusinesses to improve quality, to innovate, and to be able to adapt quickly to changing demand patterns and market opportunities for processed and higher-value agro-industrial products. New marketing instruments and market research activities via value chains and clusters should be considered. At the national and continental levels, policies to reduce supply- side rigidities are reviewed. At the international level, trade reforms towards removing trade distortions that unfavourably affect agro-industrial exports should be analysed, and the potential for these policies to increase competitiveness. Main emphasis should be on the importance of intra-African markets. Also highlighted by the UN (2021).

Pillar 4 Strengthening technological efforts and innovation capabilities

The critical role of science, technology and innovation (STI) in promoting agro-industrial development and creating comparative advantages in Africa's agro-industry subsectors.

Pillar 5 Promoting effective and innovative sources of financing

Public and private financing mechanisms for agribusiness development in Africa, including traditional domestic and foreign sources of investment, and innovative new financing mechanisms for promoting investments in agro-industry and agribusiness.

Pillar 6 Stimulating private sector participation

Strengthening private enterprise development in the agro-industry, focusing on the creation of an enabling policy environment for agribusiness investors. The provision of

appropriate factor conditions in input and output markets and of institutional support services for agribusinesses is highlighted. The role of domestic and foreign investment in agribusiness is important, as are related reforms of macro-policies and of institutions. The importance of private-sector producer organizations, associations, alliances, cooperatives, and of chambers of commerce and industry is emphasized, as these are indispensable for organizing government support in the form of public goods, for developing and improving technical and business support systems, and for enhancing investment promotion policies and institutions. New investment strategies and policies for agribusiness development are required across a range of areas including trade, taxation and public expenditure, public investment, provision of public goods in general, and regional and structural policies.

Pillar 7 Improving infrastructure and energy access

The infrastructure bottlenecks affecting agro-industry, including transport capacity, access to energy and ICT systems, rural roads, irrigation facilities, warehouse facilities, and storage facilities should be addressed as a critical stress factor. Technical support systems (for quality control and metrology) and the business support systems (for consulting and marketing services) are also important. Infrastructural bottlenecks create high costs and impede innovation and expansion of firms, value chains and clusters. High transport and communication costs, and other costs related to distance and unreliability of services, create disadvantages to producers and impede the realization of comparative advantages. New methods and instruments to overcome these bottlenecks in agro-industrial production should be explored. Innovative methods for increasing energy production are also critical to address since in many rural regions of Africa this is a huge stress factor that constrains using levers to optimise outcomes.

6.3 South African Government Trade Strategy Stressors

Effective implementation of the International Agricultural Trade Diplomacy Strategy (DIRCO, 2021) by the Chief Directorate International Relations and Trade and the Directorate International Trade Promotions. Its focus is on trade diplomacy, trade negotiations, market access and trade opportunity intelligence. It finds its practical implementation in trade negotiations, market access negotiations and implementation thereof, and the private public partnerships between industry and government through joint forums, such as the Agricultural Trade Forum, NEDLAC, and industry specific Value Chain Round Tables and various Trade Working Groups.

The Agriculture and Agro-Processing Master Plan (AAMP)

The AAMP was launched by Minister Thoko Didiza in May 2022 and is the Social Compact co-created by the government, business, labour and civil organisations in the agriculture and agro-processing sectors. The vision of the AAMP is to build a growing, equitable, inclusive, competitive, job-creating, low-carbon and sustainable agriculture and agro-processing sectors.

The AAMP has the following specific objectives, namely:

- Increase food security in South Africa;
- Promote and accelerate sustainable transformation in the agriculture and agro-processing sectors;
- Improve access to local and export markets, which will require constant upgrades in the quality of supply to bolster South Africa's competitiveness;
- Enhance competitiveness and entrepreneurship opportunities through technological innovation, innovative financing models for black farmers, infrastructure construction and digitalization;
- Create an effective farmer support system and agro-processing incentives;
- Create decent, growing and inclusive employment, in addition to improving working conditions and fair wages in the sector;
- Improve the safety of the farming community and reduce stock and crop thefts and farm attacks;
- Create a capable state and enabling policy environment; and
- Enhance resilience to the effects of climate change and promote sustainable management of natural resources.

It is thus vitally important that the Africa Strategy for the Western Cape Department of Agriculture aligns with the AAMP to support its objectives and intended outcomes. In fact, the AAMP can be leveraged to ensure buy-in from all social partners in the Western Cape.

Integrated National Export Strategy (INES) or "export 2030" (DTI, Nd). The Department of Trade and Industry (the dti), through Trade and Investment South Africa (TISA) is mandated to grow the export base and increase exports of South African value added products and services. TISA identified the need to review existing strategies and develop a streamlined approach to export development supported by strategic export promotion in line with global best practice. The development of this Integrated National Export Strategy (INES) or "Export 2030" therefore looked into the progress of South Africa's export sector and identified priorities for enhanced export performance. The INES covers a basket of interventions at the macro and micro levels of export development and promotion. The strategies and principles of the INES extend to the activities of the relevant economic agents from the public sector (all departments, at all three spheres of government, State-owned enterprises and other government agencies) as well as the private sector. Many of the strategic actions, which are outlined in this document, will be implemented in the short term, while others require medium and long-term time horizons.

African Continental Free Trade Agreement (AfCFTA) - About 54 Member States have signed the AfCFTA and 40 countries have ratified it. About 18 countries have submitted their Tariff Offers (AU, 2018). AU Heads of State and Government decided that preferential trade should start on 1 January 2021 but practical trade will probably only take place later in the year 2022 once some outstanding issues are concluded. Once practical trade start the reduction commitments maybe backdated to 1 January 2021 affecting two years' tariff cuts. SACU (including RSA) has submitted its Tariff Offer. Trade will commence on the basis of the concluded work (Tariffs and Rules of Origin).

The Department continues to engage trade partners bilaterally to explore market access for new commodities and continues maintaining existing markets through supplying required products compliant to partner countries' standards.

Selected strategic countries are: East Africa: Kenya; North Africa: Morocco, Egypt, Libya; West Africa (ECOWAS): Ghana, Cote d'Ivoire, Guinea, Senegal, Burkina Faso, Nigeria. The calculated export growth potential value of the AfCFTA for agricultural exports from SA is about Rand 6.0 Billion in addition to the existing South African agricultural exports of R 15.1 Billion in Africa. Key products with potential high demand are: Vegetable Oils, **Cereals**, Sugars, **Sauces and preparations**, Live Plants, Dog or Cat food, **Non-alcoholic beverages**, Soups and broth and **Dairy products**.

7 DIAGNOSTIC AND DESIGN EVALUATION

7.1 Introduction

The key sources of information for the development of an Africa strategy for the Western Cape agricultural sector are the literature / documentation overview and information that was obtained from key selected informants in the sector with a structured questionnaire. Due to time constraints and several public holidays during the study, the survey sample is not statistical based. The intention was to obtain the input from well informed individuals with experience in conducting business in Africa.

7.2 Condensed survey results

A detailed results tables are presented in **Appendix 7**. This section will only present some of the key results with emphasis on the identification of proposed focus areas and interventions.

7.2.1 Key reasons for doing business in Africa and specific opportunities for agriculture in the Western Cape

Key reasons for doing business in Africa mentioned by participating stakeholders includes:

- Increasing sales
- Market expansion beyond SA
- Market potential offered in Africa
- Increasing profits
- Satisfying the demand for services / products not currently supplied

Table 7-1 indicates the top 15 business types indicated by respondents. Please note that the ranking is based on the number of respondents that indicated this type of business. Thus, some of the business types were mentioned by the same number of respondents and therefore have the same ranking. Trade (both primary and processed products) was indicated by most participants as their type of business followed by market information, market access services and skills development & training and skills transfer mentioned by the same number of participants.

Table 7-1: Top 15 business types conducted in Africa

Type of business	Rank
Trade (primary / processed products)	1
Information: Market intelligence and information	2
Market access services – market compliances and certification	2
Market access services – Sanitary and phytosanitary measures (SPS)	2
Skills development, training and transfer	2
Consultancies (e.g. R&D; Farm / Project Assessments)	3
Market access services – legal / regulatory requirements compliances	3
Trade: Food services (e.g retail, wholesale)	3
Agri-processing potential analysis and feasibility	4
Extension / technical advisory services	4
Policy or advocacy development services	5
Climate smart agriculture	6
Information: Climate information linked to crop suitability	6
Institutional development	6
Value Chain (VC) studies – Development of new VCs and upgrading of VCs with growth potential	6

7.2.2 The top 20 African countries indicated and compared with indices

Table 7-2 display a comparison between the top 20 countries indicated by participants of the survey, the Country Priority Index and the WC Attractiveness Index developed by the WCDoA.

Table 7-2: Top 20 African countries

Survey country selection compared to Country Priority Index	Rating	Country Priority Index Score (Annandale) compared to survey	Rating	WC Attractiveness Index (WCDoA) - compared to survey	Rating	Countries featuring on all 3 lists
Kenya	1.00	Mauritius	1	Namibia	1	Namibia
Ghana	2.00	Seychelles	2	Botswana	2	Botswana
Nigeria	3.00	Namibia	3	Nigeria	3	
Angola	4.00	Botswana	4	Kenya	4	Kenya
Zambia	5.00	Rwanda	5	Mauritius	5	Mauritius
Namibia	6.00	Morocco	6	Egypt	6	
Botswana	7.00	Egypt	7	Tanzania	7	Tanzania
Uganda	8.00	Kenya	8	Rwanda	8	Rwanda
Congo, Dem. Rep.	9.00	Tunisia	9	Zambia	9	Zambia
Mozambique	10.00	Cote d'Ivoire (Ivory Coast)	10	Côte d'Ivoire	10	Côte d'Ivoire
Lesotho	11.00	Cabo Verde (Cape Verde)	11	Mozambique	11	
Senegal	12.00	Ghana	12	Angola	12	
Tanzania	13.00	Eswatini	13	Morocco	13	
Cameroon	14.00	Senegal	14	Togo	14	
Zimbabwe	15.00	Sao Tome & Principe	15	Somalia	15	
Cote d'Ivoire	16.00	Zambia	16	Ghana	16	Ghana
Mauritius	17.00	Tanzania	17	Djibouti	17	
Rwanda	18.00	Djibouti	18	Sao Tome and Princip	18	
Ethiopia	19.00	Benin	19	Uganda	19	
Malawi	20.00	Togo	20	Malawi	20	

The far-right column indicates the African countries that featured in all of the lists. These are Namibia, Botswana, Kenya, Mauritius, Tanzania, Rwanda, Zambia, Côte d'Ivoire and Ghana (9 countries). The authors are of the opinion that Nigeria and Angola should probably also be included as priority countries.

7.2.3 Key challenges indicated by respondents in existing countries where they do business

The respondents indicated several challenges in the existing countries where they do business. The top 12 are:

- Unplanned border closures to protect own producers
- Land administration and access to land; Absence of all sorts of finance
- Electricity availability and reliability
- Road infrastructure
- Port infrastructure
- Customs and Excise processes and documentation
- High freight and other transaction costs for different modes of transport
- Corruption
- Constraining government policies and difficult regulatory landscape
- Cumbersome and time staking bureaucratic processes
- Policy Uncertainty
- Sparsely populated - long distances to travel - time consuming

7.2.4 Key challenges to enter new targeted African countries

The respondents indicated a number of challenges to enter new target markets. The top 15 includes:

- Insufficient focus from our company in identifying the correct partner in target country
- Customs and Excise processes and documentation
- High freight and other transaction costs for modes of transport
- Corruption
- Cumbersome and time staking bureaucratic processes
- Need more market intelligence
- Funding for tuition fees and subsistence, research and traveling
- Identifying key partners in the market
- Road infrastructure
- The absence of harmonised rules/regulations/standards across countries
- The absence/poor support from SA government for outward business to Africa
- Uncoordinated implementation of trade rules
- Absence of adhering to regional trade agreements and rules
- Policy Uncertainty
- Weak enforcement of rules/legal system

7.3 Summary of a workshop analysis of the rationale for interventions and recommendations

A virtual workshop was conducted on the 9th of May 2022 to present the survey results (at the time 22 fully completed survey questionnaires received). Key take aways from this engagement includes:

Key strategic objective and outcomes

The key strategic objective of the strategy and expected outcomes should clearly indicate that the focus is both on Africa and the Western Cape. The first outcome would be to increase economic growth of African agriculture. It is not only about self-interest. We want to grow African agriculture.

Collaboration, networking and partnerships

- There is a lot of opportunities in many African countries. Talk to people that still operate in Africa, they conduct business and somehow, they deal with these issues in a way that that makes business profitable to them. Support in intelligence is extremely important. Information is creating the opportunities; it is creating the networks and getting counterparts on the other side of the border.
- There are two key levels here in terms of strategy. The first one on the policy level is extremely difficult within the context of this strategy. The other one, the operational level where information and networking will become very important is doable. The Western Cape Government can at both levels do a lot especially at the operational level in collaboration with the private sector through Public Private Partnerships creating intelligence information by network facilitation.
- Getting into the continent, it is important to learn through partners, those that are already in. A two-way approach is extremely valuable in that not only looking at what we can offer in product trade, but there is also the technology and the services. Generally African countries, both governments as well as companies are very good, even better than some South African companies dealing with small and medium businesses. In other words, reaching them, be it for credit, or for our technology distribution and technology adoption.
- But somehow many companies on the continent, can do it better than we do in South Africa, and there are lessons there to be learned. There are several examples that one can give. In Kenya, there is the equity bank that is operating across the country in as far as penetrating the agricultural market reaching the unbankable banking market. It possible for them to receive coupons, credit, make payments, their uptake is far higher than what we do with our instant banking and so forth and I think they are massive learnings not only on what we can give but also what we can learn and get from them.
- Network development – existing, new and trusted networks. To create those type of facilitation situations can become a very important activity for the WCDoA in collaboration with the private sector.
- A major focus should be around collaboration in terms of accessing markets and dealing with issues without triggering the Competition Commission. The interventions should consider the Competition Commission. There is a huge difference between collaboration and collusion and if it's not anticompetitive, there's nothing preventing us from working together. The WCDoA can facilitate in creating a platform whereby stimulate collaboration with various stakeholders and partners. So, it is about building some credible exchange or networking or linking opportunities to give it more credibility.

Infrastructure & Logistics

- Improvement in infrastructural and logistical support systems. Trying to resolve the issues in the Cape Town port and the container terminal specifically. Logistics and cost - investment in terms of infrastructure specifically can also be prioritized even though it might be a national imperative. Creating an enabling environment within which the private sector can operate. Government should clearly identify what are the inhibiting or the limiting factors currently in terms of that environment.
- Technology to provide real time or nearly real time logistical information is available. But even if you have that, if the bottleneck is still in the port and it is due to capacity constraints, equipment, lab efficiency, etcetera, that does not help you at all. It is just telling you the trouble is coming.

Trade policies & agreements & regulations

- The issue of trade policies and agreements were highlighted. The African continental free trade agreements on paper seems great, but there is nothing on ground level yet. WCDoA to use its influence in National Government to push for more rapid implementation. The requirements in terms of Sanitary and Phytosanitary standards are vastly different between African countries. How will the Free trade agreement influence these?
- Fertilizer regulations inside South Africa, for example, product registrations, it is not possible to export the product to a neighbouring country like Namibia for example, if it is not registered. It can take up to two years to get a product registered. So if the Western Cape government can on a national level assist with problem identification and problem communication it can contribute to improve processes. Create a platform to determine what are the regulatory issues that the sector is struggling with and create and put that into the national space.

Coordination & Communication between Provincial and National Government

- The Department of Agriculture could work more closely with the Department of Environmental Affairs because, for instance, to get a CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) permit. The Department of Environmental Affairs brought in this bioprospecting permit. They take months to issue these permits. The officials in positions that issue these permits do not necessarily understand the value chains about which we are talking.
- On the relationship with the Department of Environmental affairs and those sort of things it was recognised as very valid issues and that it should definitely be flagged, but not as part of the African Agricultural Strategy because that is very much a domestic issue. It is an issue for all new industries. So it is almost part of the New Industry Development Strategy rather than the African strategy.
- All the national issues that needs to be addressed will require a structure for problem identification and reporting.

Government support to remove blockages due to red tape

- The lack of SA Government support to exporters and other stakeholders were

highlighted.

- The Western Cape Department as one of the interventions, should be involved in intelligence generation, value chain linkages etcetera, implying that they should play an extremely valuable role. The harmonization of standards in the region and the regulatory environment is also very important. The Department of Agriculture can play a very influential role.
- Creating a support unit as a collaborative action between the private and the public sector, where at least some of the things could be attended to. If we do advocacy with government (and also of course other governments), it should not only be with our government, our partners in Africa should also approach their governments.

Research & Training & Skills transfer

One of the ideas that came out strongly, is to facilitate the establishment a Technology and Skills Transfer Africa Centre of Excellence. This will definitely not only be WCDoA initiative, but one will have to see how one can involve the different Universities in the Western Cape as part of this process so. How can we support Africans to develop their own agricultural knowledge and science so that people do not always have to go to Europe for this knowledge? This is how this intervention can be motivated. It will be important to identify potential partners, either as technical partners or funding partners.

Finally, a lot of the things that were mentioned are not necessarily in the sole domain of the WCDoA, it is a Western Cape Provincial issue. So on a number of possible interventions that were suggested, the WCDoA would at later stage decide, where in the Western Cape Government structures they should be implemented?

7.1 Implementation multicriteria to select the most promising interventions

A multicriteria framework, based on implementation criteria, was developed to score the proposed operational interventions and focus areas. The results of the analysis are presented in Table 7-3. **Four Focus Areas** each with **one Strategic Intervention** and **several Operational Interventions** are proposed. This will allow for an integrated approach with only 4 key interventions to direct and drive the Western Cape Agricultural Sector Africa Strategy initiative. All these interventions and focus areas are very much different sides. They are:

1) Policy & Regulatory support (Intervention 1);
2) The Africa Agribusiness Initiative Centre(AABIC) (Intervention 2);
3) An Agro-Technology and Innovation Hub(Intervention 3); and
4) Inter-Governmental collaboration and problem solving (Intervention 4).

Note: There is no specific focus area for inclusiveness since this is an overarching objective with all the focus areas and interventions

Table 7-3: Multicriteria analysis to select interventions

Overall objective: Unlocking agricultural opportunities in Africa including: Agricultural products trade, Inputs, Services, Technology partnerships, Information, Skills development / training, Logistics, and others

1= Low score, 5 = high score

Focus Area Number	Key focus areas (4)	Strategic Intervention Number	Strategic intervention (4)	Operational intervention (number)	Operational interventions	Level of impact / contribution to reach overall objective	Timeframe to realize impact (in 5-years)	Ease of implementation	Implementation risk	Clear runway to implementation	Overall score	Relative Score % (average of team)	Average rating per Key Focus Area
1	Trade facilitation and diplomacy	1	Policy & Regulatory support	1,1	Establish measures against illegal trade – In collaboration and partnership with regulatory authorities and industry structures enforce existing, and where necessary establish new, measures to combat illegal trade in products and services.	4	3,5	3,5	4	3	18	72%	76%
				1,2	Promote reciprocity with trade agreements – Provide evidenced based support to promote reciprocity with regards to regional and Africa-wide trade agreements.	4	4	3	4	4	19	76%	
				1,3	Promote the harmonisation of standards and import regulations – Provide evidence based technical support in collaboration with relevant stakeholders to harmonise primary and secondary agricultural product/services. standards and import regulations	4,5	3	2,5	4	3,5	17,5	70%	
				1,4	Strengthening links between the WCDoA and diplomatic missions in top ranking African countries – information desk – including trade policies. Leverage existing diplomatic channels to strengthen relations between diplomatic missions, Western Cape industries (businesses) and institutions (parastatals) to grow intra-regional trade in agricultural products and services.	4	4	4	4	4	20	80%	
				1,5	Develop specialists to assist exporters with customs and excise processes and documentation – Establish capacity dedicated to streamline and support exporters/importers of products/services with customs and excise procedures/documentation/sanitary and phyto-sanitary regulations/international approved standards (etc) through appropriate sanctioned/mandates mechanisms in collaboration with affected stakeholders.	4	3,5	3,5	5	4	20	80%	
2	Public-Private Sector Partnerships	2	Establishment of an Africa Agri-business Initiative Centre	2,1	Establish an Agri and Agribusiness Trade, Services & Investment desk (Unit) to internally and/or in collaboration with relevant public-private institutions: - Advocate and improve market access for South African agri- and agro-processing value propositions, in particular for fruit, vegetables, alcoholic and non-alcoholic (such as Rooibos & Honeybush) beverages; - Joint promotion of key products/services (e.g. Products of Origin, Brand South Africa); - Incentives to export and import innovations; - Support bankable collaboration and joint initiatives/ventures (government-to-government, business-to-business, government-to business); - Financial solutions/innovations to mitigate risks associated with financial transactions to support PPP initiatives; - Advice on market opportunities and challenges; - Exchange expertise regarding value chain development; - Incentive packages (similar to DTI support) for doing business in viable African countries; - Generate information with regular deep dives into specific high potential markets (market and value chain analysis and Agribusiness Directory – networking directory; - Develop joint market development programs with institutions in partner countries to access global markets where there is strong complementary product value chains; - Invest in, and support digitization of logistics and B2B logistics companies (e.g. mobile/virtual applications); and - Target specific regions in specific countries with specific synergies with Western Cape products/service providers.	5	3,5	3,5	3	3,5	18,5	74%	76%
				2,2	WCDOA to actively participate and contribute to initiatives to upgrading of export facilities (airport & harbour) – Through a consultative process with relevant stakeholders privatise (or PPP) harbour facilities and operations (including upgrading of infrastructure).	5	3,5	3,5	3,5	4	19,5	78%	
3	Research & Development & Training & Skills transfer	3	Establishment of an Agro-technology and Innovation Hub (see Appendix 8 for existing initiative at University of Stellenbosch)	3,1	Establish dedicated research capacity for continues and timely research on future agri, agroprocessing, agri technology opportunities based on evidence based solutions beneficial to South Africa and partner countries in collaboration with local and international business, research and donor organisations.	5	4	4	4	5	22	88%	75%
				3,2	Facilitate and support R&D collaboration between sub-Sahara Africa (also neighbouring countries) institutions pertaining to agricultural value chains (inclusive of Universities, research agencies, International development agencies, etc).	4	3	3	4	3	17	68%	
				3,3	Develop programmes jointly with donor organisations to mobilise funds for training interventions – Develop collaborative programmes with, the private sector, NGO's and donor organisations to mobilise funds for training and skills development interventions, such as incubation centres to advance African development and productivity in primary agriculture and agri-business.	4	3	3,5	4	3	17,5	70%	
4	Macro level (support and advise function)	4	Inter Governmental Collaboration & Problem solving	4,1	Provide support to SA's National departments (DALRRD, Dti, Customs, Transnet) to operate efficiently. Collaborate with National Departments – e.g. agriculture, trade, etc. and assist and work on specific issues – e.g. quality of vegetables, fruit, etc. SPS and other quality issues; etc.	5	3,5	4	4	4	20,5	82%	82%

It is clear from the multicriteria analysis that all the focus area's and proposed key interventions scores almost equally (75-76%) with the exception of the Macro Level focus area – Inter Governmental Collaboration & Problem-solving strategic intervention that scores slightly higher (82%). The operational interventions are all important and integrated since it will not be possible to implement the strategic interventions (4) efficiently without executing the 11 operational interventions.

7.2 Proposed interventions and a causality argument regarding why certain interventions are proposed

The causality argument for selecting the 4 proposed strategic interventions is presented in the simplified log frame (see Figure 7-1). Successful implementation will collectively contribute to achieve the core strategic objective and all 4 of the expected outcomes.

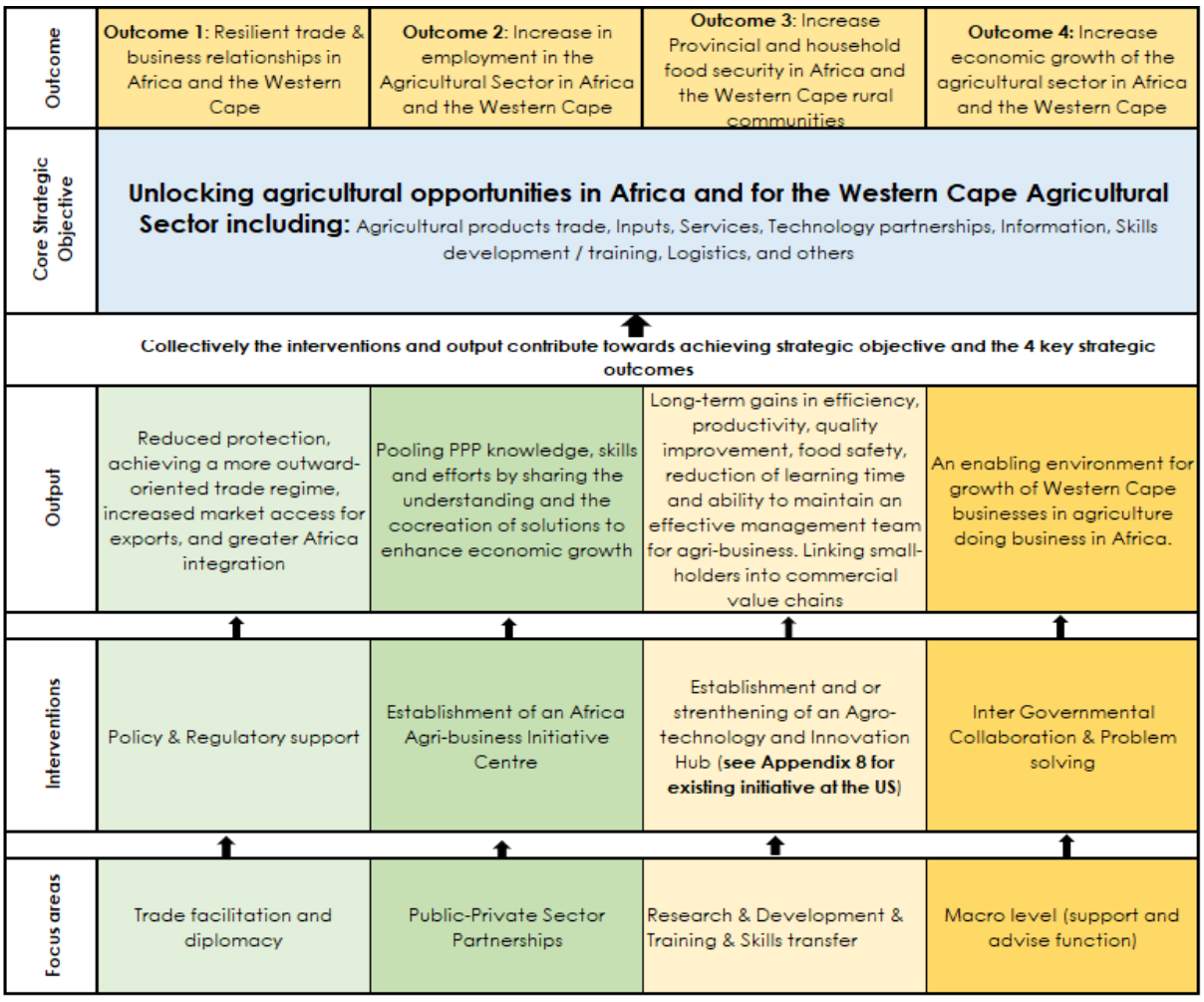


Figure 7-1: Simplified log frame - Western Cape Agricultural Sector Africa Strategy (WCAAS)

For the convenience of the reader, the WCAAS is packaged and presented in a conceptual framework (see Figure 7-2). The key strategic objective of the strategy and expected outcomes clearly indicate that the focus is both on Africa and the Western Cape. It is not only about self-interest. It is to grow African agriculture.

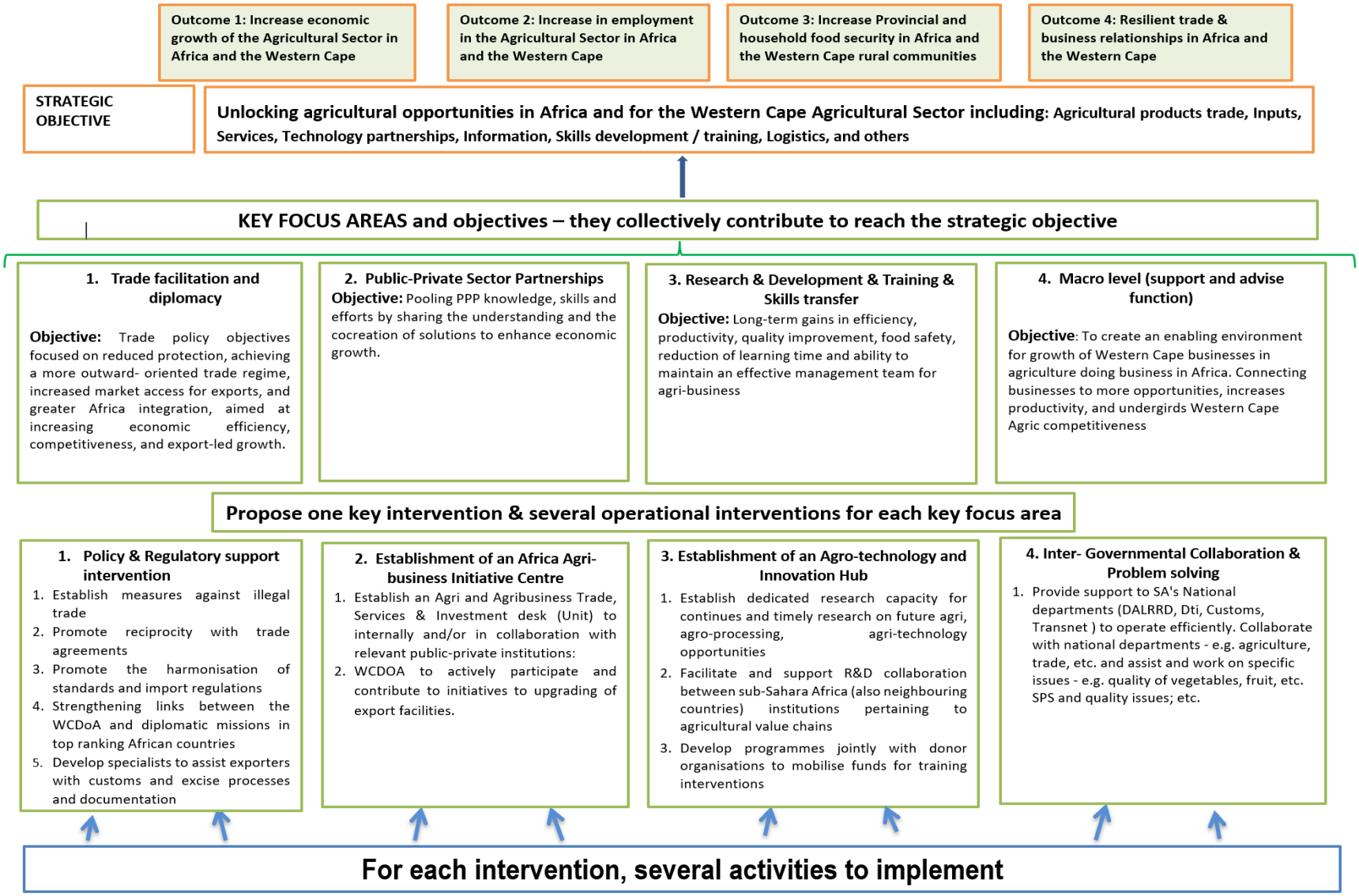


Figure 7-2: Conceptual Western Cape Agricultural Sector Africa Strategy (WCAAS)

8 CONCLUSION AND RECOMMENDATIONS

8.1 Conclusions

The African Union (AU) Heads of State embraced the Comprehensive Africa Agriculture Development Programme (CAADP) as an instrument to respond to the opportunities and challenges brought by several demographic growth projections. The South African government is a signatory to this agreement whose central agenda is to guide Africa's agricultural transformation for sustained food security and socio-economic growth. The ultimate objective is to provide effective leadership for the attainment of specific goals by the year 2025, including ending hunger and services, tripling intra- African trade, enhancing resilience of livelihoods and production systems, and ensuring that agriculture contributes significantly to poverty reduction.

The 2019 – 2024 Strategic Plan (SP) of the Western Cape Province has identified five Vision Inspired Priorities (VIP) of which VIP 2 targets economic growth and job creation. Subsequent to the Covid-19 Pandemic, the SP in the Western Cape has been re-focussed on the priority areas of jobs, safety and well-being which will lead to dignity.

Thus, an opportunity exist for the agricultural sector in the Western Cape to contribute to the ultimate objectives of the CAADP and at the same time contribute to further sustainable growth of the agricultural economy of the Western Cape by supporting the Vision Inspired Priorities (VIP).

However, to unlock these opportunities, it is of paramount importance to Development an Africa strategy for the Western Cape Agricultural Sector.

The comprehensive literature review on the factors Influencing the performance of African agriculture and emerging trends and trend brakes indicate that there are many opportunities to support the growth of African agriculture. There is a growing realization that African economies stand to gain significantly by promoting intra-continental trade of agricultural products and these gains are expected to result in a higher exchange of manufactured and processed goods, greater knowledge transfer, and high value creation.

Amongst others, opportunities in Africa include:

- Agricultural products trade (primary and processed)
- Inputs
- Services
- Technology partnerships
- Information
- Skills development / training
- Logistics

- Others

The multi-criteria analysis (using several indices and the survey results) and selection of target African countries indicate that the top countries that should be prioritised are: Namibia, Botswana, Kenya, Mauritius, Tanzania, Rwanda, Zambia, Côte d'Ivoire and Ghana, Nigeria and Angola.

The literature review and stakeholders' consultation indicated a number of key levers and stressors that constrains using levers to optimise outcomes. These were all considered in the structuring of the Western Cape Agricultural Sector African Strategy.

The key sources of information for the development of an Africa strategy for the Western Cape agricultural sector are the literature / documentation overview and information that was obtained from key selected informants in the sector with a structured questionnaire. Due to time constraints and several public holidays during the study, the survey sample is not statistical based. The intention was to obtain the input from well informed individuals with experience in conducting business in Africa.

A conceptual strategic framework for the WCAAS identified the Core Strategic Objective as:

Unlocking agricultural opportunities in Africa and for the Western Cape Agricultural Sector including: Agricultural products trade, Inputs, Services, Technology partnerships, Information, Skills development / training, Logistics, and others

A multicriteria framework, based on implementation criteria, was developed to score the proposed operational interventions and focus areas. **Four Focus Areas** each with **one Strategic Intervention** and **several Operational Interventions** are proposed. This will allow for an integrated approach with only 4 key interventions to direct and drive the Western Cape Agricultural Sector Africa Strategy initiative. All these interventions and focus areas are very much different sides. They are:

5) Policy & Regulatory support (Intervention 1);
6) The Africa Agribusiness Initiative Centre(AABIC) (Intervention 2);
7) An Agro-Technology and Innovation Hub(Intervention 3); and
8) Inter-Governmental collaboration and problem solving (Intervention 4).

Note: There is no specific focus area for inclusiveness since this is an overarching objective with all the focus areas and interventions

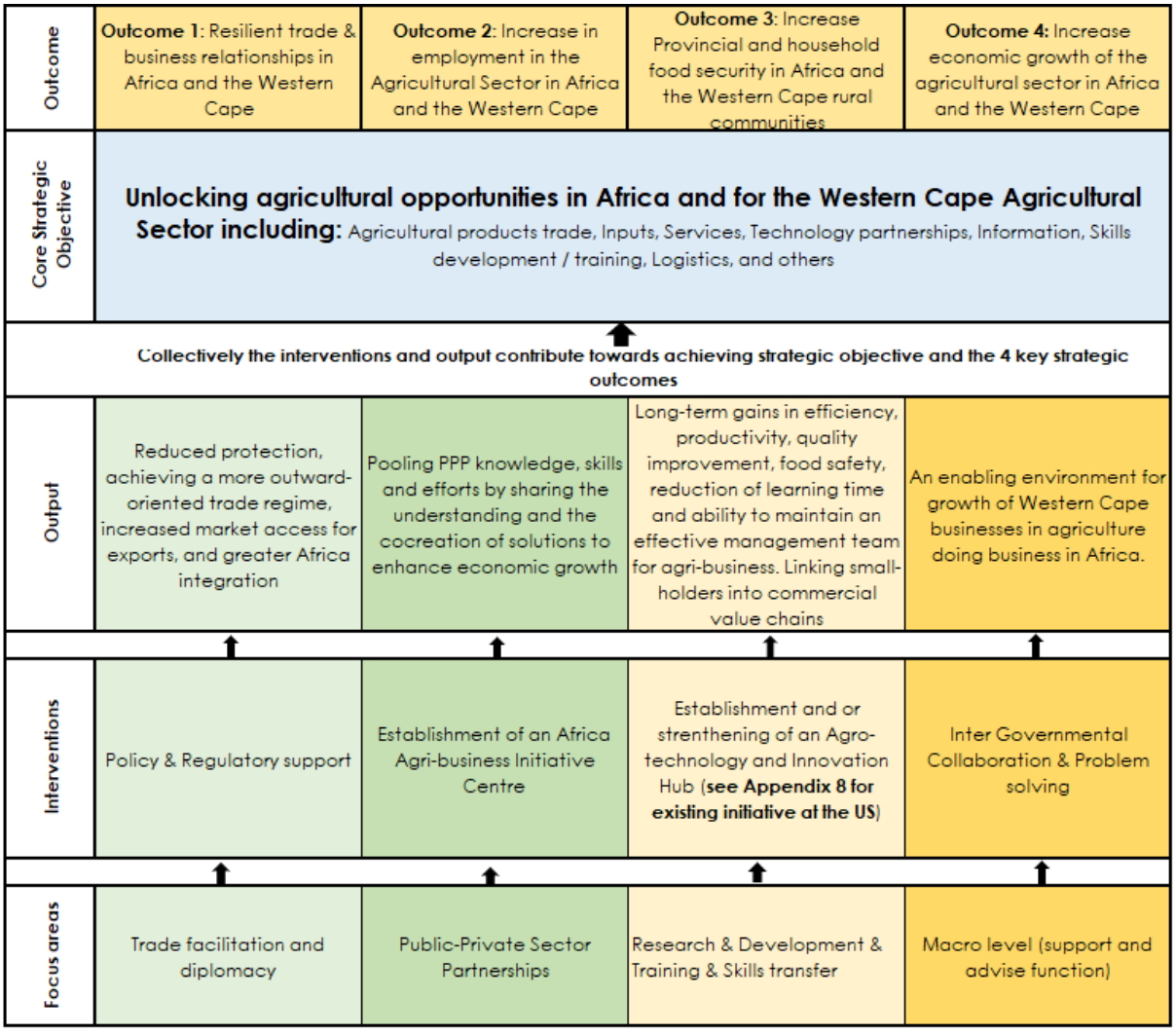
It is clear from the multicriteria analysis that all the focus area's and proposed key interventions scores almost equally (75-76%) with the exception of the Macro Level focus area – Inter Governmental Collaboration & Problem solving strategic intervention that scores slightly higher (82%). The operational interventions are all

important and integrated since it will not be possible to implement the strategic interventions (4) efficiently without executing the 11 operational interventions.

8.2 Recommendations

Government should play a significant role to create an enabling environment for the private sector to unlock and to take advantage of the opportunities that exist in Africa. Government should consult with the private sector as a key partner. The results of the Log frame analysis in this study should determine the decisions to achieve the 4 expected outcomes.

The causality argument for selecting the 4 proposed strategic interventions is presented in the simplified log frame below. Successful implementation will collectively contribute to achieve the core strategic objective and all 4 of the expected outcomes.



Each Focus Area, Strategic Intervention and Operational Intervention recommended should thus be considered in context of its underlying and linked activities, confirming the integrated nature of the proposals.

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Appendix 1: The Global Competitiveness Index (GCI)

Basic Requirements (20-60%)			
Institutions (Pillar 1)	**Infrastructure (Pillar 2)**	**Macroeconomic Environment (Pillar 3)**	**Health and Primary Education (Pillar 4)**
Property Rights	Quality of Overall infrastructure	Government budget balance	Business impact of malaria
Intellectual Property Protection	Quality of roads	Gross national savings	Malaria incidence
Diversion of Public Funds	Quality of railroad infrastructure	Inflation	Business imppact of tuberculosis
Public Trust in politicainas	Quality of port infrastructure	Government debt	Tuberculosis incidence
Irregualr payments and bribes	Quality of air transport infrastructure	Country credit rating	Business impact of HIV/AIDS
Judicial independence	Availbale airline seat kilometres		HIV Prevalence
Favoritism in decisions of government officials	Quality of electrictiy supply		Infant Mortality
Wastefulness of government spending	Mobile telephone subscriptions		Life Expectancy
Burden of government regulation	Fixed Telephone Lines		Quality of primary education
efficiency of legal framework in settling disputes			Primary education enrollment rate
Efficiency of legal framework in challenging regulations			
Transparency of government policy making			
Business costs of terrorism			
Business costs of crime and violence			
Organized crime			
Reliablility of police services			
Ethical Behaviour of firms			
Strength of Auditing and reporting standards			
Efficacy of corporate boards			
Protection of minority shareholders' interests			
Strength of investor protection			

Innovation and Sophsitication Enhancers (5-30%)	
Business Sophistication (Pillar 11)	**R&D Innovation (Pillar 12)**
Local supplier quantity	Capacity for innovation
Local supplier quality	Quality of scientific research institutions
State of cluster development	Company spending on R&D
Nature of competitive advantage	University-industry collaboration in R&D
Value chain breadth	Government procurment of advanced technology products
Control of international distribution	Availability of scientists and engineers
Production process sophistication	PCT patent applications
Extent of marketing	Intellectual property protection
Willingness to delegate authority	
Reliance on professional management	

Efficiency Enhancers (30-50%)		
Financial Market development (Pillar 8)	**Technological Readiness (Pillar 9)**	**Market Size (Pillar 10)**
Financial services meeting business needs	Availability of latest technology	Domestic market size index
Affordability of financial services	Firm-level technology absorption	Foreign market size index
Finaincing through local equity market	FDI and technology transfer	
Ease of access to loans	Internet users	
Venture Cpatial availability	Broadband and internet subscriptions	
Soundness of banks	Internet bandwidth	
Regulations of securities exchange	Mobile broadband subscriptions	
Legal rights index	Mubile telephone subscirptions	
	Fixed telephone lines	

Efficiency Enhancers (30-50%)		
Higher Education and Training (Pillar 5)	**Goods market efficiency (Pillar 6)**	**Labour Market Efficiency (Pillar 7)**
Secondary Education enrollment rate	Intensity of local competition	Cooperation in labour-employer relations
Tertiary education enrollment rate	Extent of market dominance	Flexibility of wage determination
Quality of the educational system	Effectiveness of anti-monopoly policy	Hiring and firing practices
Quality if math and science education	Effect of taxation on incentives to invest	Redundancy costs
Quality of management schools	Total tax rate	Effect of taxation on incentives to work
Internet access in schools	Number of procedures required to start a busniess	Pay and productivity
Local availability of specialized research and training services	Time required to start a business	Reliance on professional management
Extent of staff training	Agricutlural policy costs	Country capacity to retain talent
	Prevalnce of trade barriers	Country capacity to attract talent
	Trade tariffs	Female participation in labour force
	Prevalnce of foreign ownership	
	Business impact of rules on FDI	
	Burdens of customs procedures	
	Imports as a percentage of GDP	
	Degree of Customer Orientation	
	Buyer Sophistication	

Source: World Economic Forum (2020)

Appendix 2: The Country Attractiveness Index (CAI)

Rank	Country	Country Attractiveness Index	GDP 2017 USD (millions)	GDP Growth Expectations 2019-2024 years (%)	Population Totals ('000)	Population Growth Estimates (2017-2050)	Ease of doing business (Rank)	Human Development Index	Agriculture's share of GDP	WC Total Export Value 2017 (R millions)	WC Total Export Growth (5 year)	WC Agricultural Export Value 2017 (R millions)	WC Agricultural Export Growth (5 year growth)	Urbanisation (%)	Logistics performance index	Distance to Market (KM)
1	Namibia	53.1	13 254	5.1	2 534	1.6	107	0.65	7.0	11 458	1.3	3 293	9.3	49.0	2.8	1 324
2	Botswana	50.8	17 407	6.5	2 292	1.2	86	0.72	2.0	6 877	-4.0	1 802	10.6	68.7	2.8	522
3	Nigeria	49.2	375 745	4.7	190 886	2.3	146	0.53	20.8	1 227	-20.3	706	17.3	49.5	2.6	4 719
4	Kenya	46.2	79 263	8.3	49 700	2.0	61	0.59	34.6	2 993	5.8	423	12.2	26.6	2.6	3 233
5	Mauritius	42.0	13 266	6.2	1 265	-0.1	20	0.79	3.1	1 469	24.9	494	15.5	40.8	2.8	3 223
6	Egypt	41.8	235 369	8.2	97 553	1.4	120	0.70	11.5	91	-11.2	25	6.6	42.7	2.8	6 582
7	Tanzania	41.5	52 090	6.8	57 310	2.7	144	0.54	28.7	858	0.8	134	4.9	33.1	2.8	2 725
8	Rwanda	41.4	9 135	10.1	12 208	1.8	29	0.52	31.0	42	-13.2	10	7.5	17.1	2.8	3 001
9	Zambia	41.3	25 868	4.8	17 094	2.7	87	0.59	6.7	2 784	6.5	677	17.5	43.0	2.3	1 587
10	Côte d'Ivoire	39.3	37 353	9.0	24 295	2.3	122	0.49	21.6	182	-11.4	65	13.7	50.3	2.9	5 162
11	Mozambique	39.2	12 646	8.8	29 669	2.5	135	0.44	21.3	1 910	0.4	638	11.5	35.5	2.2	879
12	Angola	39.2	122 124	5.3	29 784	2.9	173	0.58	10.0	2 498	-2.0	1 050	-1.7	64.8	1.9	2 539
13	Morocco	39.2	109 709	6.4	35 740	0.7	60	0.67	12.4	47	24.9	14	22.1	61.9	2.4	7 814
14	Togo	37.7	4 758	7.6	7 798	2.1	137	0.50	41.8	706	14.6	53	26.4	41.2	2.2	4 886
15	Somalia	37.6	7 052	5.7	14 743	2.7	190	0.35	75.0	27	20.3	23	155.2	44.4	1.8	4 059
16	Ghana	37.5	58 997	6.9	28 834	1.8	114	0.59	19.7	493	4.4	300	6.7	55.4	2.4	4 925
17	Djibouti	37.2	1 845	8.2	957	1.0	99	0.48	2.2	75	18.8	12	20.6	77.6	2.8	4 821
18	Sao Tome and Princip	37.1	393	7.1	204	1.9	170	0.59	11.5	8	53.9	2	49.0	72.0	2.3	3 924
19	Uganda	37.0	25 995	8.5	42 863	2.8	127	0.52	24.6	284	19.7	77	15.9	23.2	2.2	3 332
20	Malawi	36.6	6 303	8.1	18 622	2.5	111	0.48	26.1	427	8.9	160	25.4	16.7	2.2	1 726
21	Congo, Dem. Rep.	36.5	37 642	6.8	81 340	2.7	184	0.46	19.9	1 098	13.6	139	19.6	43.9	2.1	2 718
22	Algeria	36.3	167 555	3.1	41 318	1.0	157	0.75	12.3	276	22.6	34	19.3	72.1	2.4	7 643
23	Ethiopia	36.0	80 561	9.3	104 957	1.8	159	0.46	34.0	60	9.7	45	47.1	20.3	2.1	4 434
24	Senegal	35.4	21 070	10.7	15 851	2.3	141	0.51	16.0	268	6.3	189	31.4	46.7	2.2	6 756
25	Gabon	35.1	15 014	6.4	2 025	1.7	169	0.70	5.2	121	-21.4	77	13.8	89.0	2.1	3 694
26	Eswatini	35.0	4 434	3.6	1 367	1.3	117	0.59	8.4	2 454	2.7	874	14.6	23.6	2.3	428
27	Madagascar	34.8	11 500	7.2	25 571	2.3	161	0.52	20.0	180	33.9	72	23.8	36.5	2.2	2 309
28	Seychelles	34.5	1 498	5.9	96	0.1	96	0.80	1.9	221	17.5	71	23.5	56.3	2.3	4 028
29	Tunisia	34.5	39 932	6.0	11 532	0.6	80	0.73	9.5	21	77.4	2	-6.8	68.6	2.1	7 432
30	Cameroon	33.8	34 923	7.3	24 054	2.2	166	0.56	14.4	141	-21.0	79	-10.5	55.8	2.6	4 224
31	Sudan	33.6	117 488	2.4	40 533	2.1	162	0.50	30.5	106	41.2	21	17.3	34.4	2.2	4 884
32	South Sudan	32.6	2 904	8.2	12 576	2.1	185	0.39	30.5	2	81.6	1	51.0	19.3	2.3	4 884
33	Benin	32.5	9 247	8.7	11 176	2.3	153	0.51	23.0	86	-7.7	35	-24.5	46.8	2.5	4 868
34	Zimbabwe	32.5	22 041	6.1	16 530	1.8	155	0.53	8.3	1 651	1.4	588	7.5	32.2	1.8	1 101
35	Burkina Faso	32.4	12 323	8.2	19 193	2.5	151	0.42	28.7	34	64.8	9	7.4	28.7	2.4	5 551
36	Mauritania	32.2	5 025	9.2	4 420	2.2	148	0.52	23.1	27	12.4	9	-3.0	52.8	2.3	6 899
37	Mali	32.1	15 334	7.0	18 542	2.7	145	0.43	38.3	334	16.1	3	-19.9	41.6	2.3	5 954
38	Lesotho	31.8	2 578	4.1	2 253	1.1	106	0.52	6.1	2 561	4.4	480	9.6	27.7	2.0	369
39	Chad	31.3	9 871	7.1	14 900	2.5	181	0.40	49.1	5	89.4	1	-1.2	22.9	2.4	4 621
40	Congo, Rep.	31.1	8 701	3.5	5 261	2.4	180	0.61	6.4	104	-40.1	74	9.0	66.5	2.1	3 096
41	Comoros	29.8	1 068	5.3	814	1.8	164	0.50	29.9	2	-33.6	2	13.2	28.8	2.3	2 536
42	Niger	29.8	8 120	9.2	21 477	3.6	143	0.35	39.7	2	-5.0	1	-12.5	16.4	2.0	5 353
43	Liberia	29.0	3 285	3.0	4 732	2.2	174	0.44	37.1	143	7.6	25	32.3	50.7	1.9	5 595
44	Gambia, The	28.5	1 489	7.1	2 101	2.4	149	0.46	23.0	32	21.2	4	10.8	60.6	1.8	6 621
45	Cabo Verde	27.4	1 773	7.2	546	0.9	131	0.65	6.0	1	-12.1	-	-100.0	65.3	2.3	7 392
46	Eritrea	27.2	6 050	6.6	3 499	2.0	189	0.44	11.7	10	3.9	3	-13.5	33.2	1.9	5 071
47	Sierra Leone	27.0	3 775	7.4	7 557	1.7	163	0.42	60.3	28	3.7	14	13.5	41.6	1.8	5 942
48	Guinea-Bissau	26.5	1 347	7.2	1 861	2.0	175	0.46	49.0	3	-24.1	0	0.0	42.9	1.8	6 433
49	Guinea	26.4	10 473	7.7	12 717	2.3	152	0.46	16.4	16	24.6	6	43.5	35.8	1.6	6 056
50	Libya	26.0	38 108	3.6	6 375	0.7	186	0.71	1.3	14	-12.4	11	-19.0	79.8	2.2	6 902
51	Equatorial Guinea	24.8	12 294	-1.4	1 268	2.5	177	0.59	2.3	10	-11.9	5	-6.5	71.6	1.9	3 996
52	Central African Repu	24.7	1 949	7.2	4 659	2.0	183	0.37	39.6	1	-12.6	-	0.0	41.0	1.9	3 890
53	Burundi	21.9	3 172	2.6	10 864	2.7	168	0.42	30.6	5	-33.3	0	-43.2	12.7	2.0	2 848

Source: Morokong and Pienaar(2019)

Appendix 3: The variables used to construct the Country Priority Index and their sources

Variable	Source	
Global Competitiveness Index	World Economic Forum	https://www.weforum.org/
Country Attractivness Index	Morokong and Pienaar, 2019	Western Cape Government
GDP per capita	World Bank	https://www.worldbank.org/en/home
GDP Growth Expectations (2019-2024)	Morokong and Pienaar, 2019	Western Cape Government
Human Development Index	United Nations Development Programme	https://www.un.org
FDI Net Inflows (2017-2019 Average)	World Bank	https://www.worldbank.org/en/home
Political Stability	World Bank	https://www.worldbank.org/en/home
Ease of Doing Business Index	World Bank	https://www.worldbank.org/en/home
Corruption Perceptions Indes	Transparency International	https://www.transparency.org
Regulatory Quality	World Bank (World Growth Indicators)	https://www.worldbank.org/en/home
Road Infrastructure	World Economic Forum	https://www.weforum.org/
Port Infrastructure	World Economic Forum	https://www.weforum.org/
Logistical Performance Index	World Bank	https://www.worldbank.org/en/home
Distance to Market	Morokong and Pienaar, 2019	Western Cape Government

Appendix 4: Results of the Classic Linear Regression Model (CLRM) and the Subsequent full set of data

COUNTRY	Global Competitiveness Index (GCI) (2020)	Country Attractiveness Index (CAI) (2019)	Gross Domestic Product per Capita (GDP per cap) (2020)	Gross Domestic Product Growth Expectations (2019-2024 (%))	Human Development Index (HDI) (2020)	Foreign Direct Investment Net Inflows (2017-2019 Average (USD))	Political Stability (2020)	Ease of Doing Business Index (2019)	Corruption Perceptions Index (2021)	Regulatory Quality (2020)	Road Infrastructure	Port Infrastructure	Logistical Performance Index (LPI) (2018)	Distance to Markets (km)		Ease of Doing Business Index (Adjsuted for Normalization)	Distance to Markets (km) (Adjsuted for Normalization)
Algeria	56,25	36,30	3306,86	3,10	0,75	1 359 186 522,84	-0,86	157,00	33,00	9,13	4,00	3,90	2,45	7643,00		-157,00	-7643,00
Angola	38,11	39,20	1776,17	5,30	0,58	-5 983 950 189,98	-0,52	177,00	29,00	15,87	2,20	2,80	2,05	2539,00		-177,00	-2539,00
Benin	45,82	32,50	1291,04	8,70	0,51	204 394 758,09	-0,44	149,00	42,00	38,94	3,20	3,70	2,75	4868,00		-149,00	-4868,00
Botswana	55,49	50,80	6404,90	6,50	0,72	213 379 107,11	1,09	87,00	55,00	65,38	3,80	3,20	2,62	522,00		-87,00	-522,00
Burkina Faso	43,42	32,40	857,93	8,20	0,42	144 652 579,51	-1,55	151,00	42,00	37,50	2,80	2,80	2,62	5551,00		-151,00	-5551,00
Burundi	40,25	21,90	238,99	2,60	0,42	781 726,48	-1,41	166,00	19,00	12,50	3,90	3,20	2,06	2848,00		-166,00	-2848,00
Cabo Verde (Cape Verde)	50,83	27,40	3064,27	7,20	0,65	109 228 746,69	0,88	137,00	58,00	50,48	4,00	3,20	2,28	7392,00		-137,00	-7392,00
Cameroon	46,02	33,80	1537,13	7,30	0,56	868 110 063,87	-1,53	167,00	27,00	19,71	2,40	3,10	2,60	4224,00		-167,00	-4224,00
Central African Republic	43,54	24,70	492,80	7,20	0,37	16 831 148,05	-2,18	184,00	24,00	5,77	3,23	3,53	2,15	3890,00		-184,00	-3890,00
Chad	35,08	31,30	659,27	7,10	0,40	463 637 030,67	-1,26	182,00	20,00	11,06	2,87	3,50	2,42	4621,00		-182,00	-4621,00
Comoros	41,08	29,80	1420,66	5,30	0,50	4 630 875,04	-0,29	160,00	20,00	10,58	3,47	3,83	2,56	2536,00		-160,00	-2536,00
Congo, Democratic Republic	40,21	36,50	543,95	6,80	0,46	1 268 845 765,73	-1,71	183,00	19,00	5,29	2,10	2,40	2,43	2718,00		-183,00	-2718,00
Congo, Republic	36,14	31,10	1846,13	3,50	0,61	4 032 763 221,33	-0,90	180,00	21,00	7,21	2,83	3,23	2,49	3096,00		-180,00	-3096,00
Cote d'Ivoire (Ivory Coast)	48,15	39,30	2325,72	9,00	0,49	814 742 264,20	-0,98	110,00	36,00	41,83	3,60	4,00	3,08	5162,00		-110,00	-5162,00
Djibouti	45,73	37,20	3425,48	8,20	0,48	169 976 292,43	-0,32	112,00	30,00	20,19	3,54	4,17	2,63	4821,00		-112,00	-4821,00
Egypt	54,54	41,80	3569,21	8,20	0,70	8 186 700 000,00	-1,21	114,00	33,00	25,48	5,10	4,80	2,82	6582,00		-114,00	-6582,00
Equatorial Guinea	40,94	24,80	7143,24	-1,40	0,59	384 397 380,53	-0,19	178,00	17,00	4,81	3,57	3,50	2,32	3996,00		-178,00	-3996,00
Eritrea	42,17	27,20	715,36	6,60	0,44	61 199 666,67	-0,98	189,00	22,00	0,48	2,87	3,50	2,09	5071,00		-189,00	-5071,00
Eswatini	46,43	35,00	3424,28	3,60	0,59	33 818 051,74	-0,12	121,00	32,00	32,69	4,00	3,40	2,40	428,00		-121,00	-428,00
Ethiopia	44,37	36,00	936,34	9,30	0,46	3 308 774 120,22	-1,74	159,00	39,00	14,42	3,00	2,80	2,32	4434,00		-159,00	-4434,00
Gabon	47,46	35,10	6881,72	6,40	0,70	1 415 412 340,33	-0,08	169,00	31,00	17,79	2,51	3,30	2,16	3694,00		-169,00	-3694,00
Gambia	45,92	28,50	773,00	7,10	0,46	72 408 942,83	0,25	155,00	37,00	25,96	3,70	3,90	2,40	6621,00		-155,00	-6621,00
Ghana	51,20	37,50	2205,53	6,90	0,59	3 374 618 823,23	0,13	118,00	43,00	52,40	3,00	3,10	2,57	4925,00		-118,00	-4925,00
Guinea	46,13	26,40	1194,04	7,70	0,46	324 916 666,67	-0,64	156,00	25,00	19,23	3,70	5,00	2,20	6056,00		-156,00	-6056,00
Guinea-Bissau	41,71	26,50	727,52	7,20	0,46	35 971 232,17	-0,60	174,00	12,00	9,62	3,47	3,83	2,39	6433,00		-174,00	-6433,00
Kenya	54,14	46,20	1878,58	8,30	0,59	1 408 165 105,92	-1,00	56,00	30,00	35,58	4,10	4,20	2,81	3233,00		-56,00	-3233,00
Lesotho	42,90	31,80	875,35	4,10	0,52	39 591 816,48	-0,33	122,00	38,00	32,21	2,70	3,63	2,28	369,00		-122,00	-369,00
Liberia	40,55	29,00	632,94	3,00	0,44	154 551 479,44	-0,37	175,00	29,00	13,46	3,87	3,87	2,23	5595,00		-175,00	-5595,00
Libya	44,21	26,00	3699,29	3,60	0,71	459 917 194,22	-2,48	186,00	17,00	0,96	3,33	3,17	2,11	6902,00		-186,00	-6902,00
Madagascar	42,86	34,80	471,49	7,20	0,52	517 068 128,83	-0,46	161,00	26,00	22,60	3,54	3,40	2,39	2309,00		-161,00	-2309,00
Malawi	43,70	36,60	636,82	8,10	0,48	74 160 051,87	-0,24	109,00	35,00	23,56	2,80	2,20	2,59	1726,00		-109,00	-1726,00
Mali	43,59	32,10	862,45	7,00	0,43	582 356 141,84	-2,15	148,00	29,00	30,29	3,20	2,20	2,59	5954,00		-148,00	-5954,00
Mauritania	40,92	32,20	1701,99	9,20	0,52	159 182 185,38	-0,75	152,00	28,00	20,67	3,10	4,17	2,33	6899,00		-152,00	-6899,00
Mauritius	64,27	42,00	8627,84	6,20	0,79	470 643 120,63	0,89	13,00	54,00	84,13	4,70	4,50	2,73	3223,00		-13,00	-3223,00
Morocco	60,01	39,20	3058,69	6,40	0,67	2 648 440 696,21	-0,33	53,00	39,00	48,56	4,70	5,10	2,54	7814,00		-53,00	-7814,00
Mozambique	38,08	39,20	448,54	8,80	0,44	2 059 300 466,48	-1,16	138,00	26,00	25,00	2,40	3,30	2,37	879,00		-138,00	-879,00
Namibia	54,46	53,10	4179,28	5,10	0,65	112 790 479,32	0,65	104,00	49,00	49,04	5,30	4,90	2,62	1324,00		-104,00	-1324,00
Niger	43,54	29,80	567,67	9,20	0,35	507 300 207,51	-1,74	132,00	31,00	23,08	2,97	3,50	2,07	5353,00		-132,00	-5353,00
Nigeria	48,33	49,20	2097,09	4,70	0,53	1 831 107 375,98	-1,86	131,00	24,00	13,94	2,50	2,50	2,53	4719,00		-131,00	-4719,00
Rwanda	52,82	41,40	797,86	10,10	0,52	301 130 213,80	0,03	38,00	53,00	58,17	4,80	3,20	2,97	3001,00		-38,00	-3001,00
Sao Tome & Principe	45,83	37,10	2157,84	7,10	0,59	27 366 203,34	0,48	170,00	45,00	16,83	3,54	3,63	2,65	3924,00		-170,00	-3924,00
Senegal	49,69	35,40	1471,83	10,70	0,51	833 865 797,58	-0,02	123,00	43,00	42,79	4,10	4,00	2,25	6756,00		-123,00	-6756,00
Seychelles	59,60	34,50	10764,42	5,90	0,80	228 670 249,85	0,72	100,00	70,00	48,08	4,00	4,40	2,52	4028,00		-100,00	-4028,00
Sierra Leone	38,80	27,00	509,38	7,40	0,42	335 539 418,82	-0,24	163,00	34,00	18,27	3,54	4,17	2,08	5942,00		-163,00	-5942,00
Somalia	40,21	37,60	438,26	5,70	0,35	408 000 000,00	-2,52	190,00	13,00	2,40	2,93	2,90	2,21	4059,00		-190,00	-4059,00
South Sudan	43,54	32,60	715,36	8,20	0,39	19 783 333,33	-2,17	185,00	11,00	1,92	2,87	3,50	2,23	4884,00		-185,00	-4884,00
Sudan	40,21	33,60	486,42	2,40	0,50	1 008 813 545,93	-1,76	171,00	20,00	4,33	3,33	2,90	2,43	4884,00		-171,00	-4884,00
Tanzania	48,19	41,50	1076,47	6,80	0,54	1 042 170 706,15	-0,41	141,00	39,00	27,40	4,10	4,10	2,40	2725,00		-141,00	-2725,00
Togo	45,73	37,70	914,95	7,60	0,50	84 427 843,89	-0,92	97,00	30,00	30,77	3,64	4,17	2,45	4886,00		-97,00	-4886,00
Tunisia	56,41	34,50	3521,59	6,00	0,73	870 017 613,85	-0,63	78,00	44,00	39,42	3,60	3,40	2,57	7432,00		-78,00	-7432,00
Uganda	48,94	37,00	822,03	8,50	0,52	1 043 981 026,63	-0,78	116,00	27,00	36,54	3,70	2,70	2,58	3332,00		-116,00	-3332,00
Zambia	46,51	41,30	985,13	4,80	0,59	687 975 402,05	-0,13	85,00	33,00	29,33	3,40	2,70	2,53	1587,00		-85,00	-1587,00
Zimbabwe	44,24	32,50	1214,51	6,10	0,53	424 851 020,35	-1,08	140,00	23,00	7,69	2,80	3,10	2,12	1101,00		-140,00	-1101,00

Source: Annandale (2022)

Appendix 5: Results of the Country Priority Index

COUNTRY	Country Priority Index Score	Rank According to Country Priority Index
Mauritius	0,81	1
Seychelles	0,71	2
Namibia	0,68	3
Botswana	0,67	4
Rwanda	0,65	5
Morocco	0,62	6
Egypt	0,60	7
Kenya	0,57	8
Tunisia	0,52	9
Cape Verde	0,51	10
Cote d'Ivoire (Ivory Coast)	0,51	11
Eswatini	0,49	12
Ghana	0,49	13
Senegal	0,48	14
Sao Tome & Principe	0,48	15
Zambia	0,47	16
Tanzania	0,47	17
Djibouti	0,47	18
Benin	0,45	19
Togo	0,44	20
Algeria	0,43	21
Uganda	0,43	22
Gabon	0,42	23
Lesotho	0,42	24
Malawi	0,41	25
Gambia	0,40	26
Comoros	0,40	27
Madagascar	0,39	28
Guinea	0,39	29
Mauritania	0,38	30
Mozambique	0,36	31
Equatorial Guinea	0,35	32
Congo, Republic	0,35	33
Sierra Leone	0,35	34
Zimbabwe	0,34	35
Cameroon	0,33	36
Burkina Faso	0,33	37
Ethiopia	0,32	38
Liberia	0,32	39
Guinea-Bissau	0,31	40
Nigeria	0,30	41
Niger	0,29	42
Angola	0,28	43
Mali	0,28	44
Chad	0,27	45
Burundi	0,26	46
Libya	0,26	47
Sudan	0,26	48
Eritrea	0,25	49
DRC	0,23	50
Central African Republic	0,23	51
South Sudan	0,21	52
Somalia	0,16	53

Source: Annandale (2022)

Country	Western Cape Average Top 25 Agricultural Exports to Africa for 2016-2017 (ZAR Current Prices)
Namibia	1 487 048 177
Botswana	1 033 364 473
Nigeria	652 544 297
Eswatini	435 283 289
Kenya	402 673 303
Mozambique	334 458 594
Zambia	294 758 324
Mauritius	252 148 710
Senegal	244 197 673
Zimbabwe	238 884 638
Angola	226 802 264
Lesotho	200 799 483
Tanzania	143 480 727
Ghana	102 504 231
DRC	92 531 638
Cote d'Ivoire	86 780 865
Cameroon	83 466 394
Malawi	82 942 553
Uganda	67 787 681
Togo	64 817 818
Gabon	62 471 177
Congo, Republic	41 066 421
Ethiopia	39 634 967
Somalia	35 266 507
Madagascar	34 256 016
Seychelles	24 780 393
Djibouti	23 250 829
Benin	18 819 044
Liberia	16 517 961
Guinea	10 505 914
Gambia	8 617 100
Burkina Faso	8 396 182
Egypt	8 324 895
Mali	7 816 421
Rwanda	7 630 676
Sierra Leone	5 908 433
Algeria	5 236 923
Eritrea	3 699 235
Sudan	3 368 129
Niger	2 964 503
South Sudan	2 319 955
Guniea-Bisau	2 200 976
Mauritania	2 014 909
Equatorial Guinea	1 929 098
Chad	1 253 389
Comoros	1 081 368
Burundi	588 853
Libya	437 978
Morocco	172 781
Tunisia	152 151
Sao Tome and Principe	103 763
Central African Republic	80 246
Cape Verde	37 979

Source: Quantec, (2022)

Comparison of Trade vs Country Priority Index

Country	Trade Rank Minus Index Rank	Color Codes
Nigeria	-38	Current Trade Significantly Exceeds Country Priority Index
Congo, Democratic Republic	-35	
Angola	-32	
Somalia	-29	
Mozambique	-25	
Zimbabwe	-25	
Cameroon	-19	Current Trade Exceeds Country Priority Index
Ethiopia	-15	
Lesotho	-12	
Congo, Republic	-11	
Eritrea	-11	
South Sudan	-11	
Liberia	-10	Current Trade Correlates with Country Priority Index
Mali	-10	
Sudan	-9	
Zambia	-9	
Eswatini	-8	
Malawi	-7	
Burkina Faso	-5	
Senegal	-5	
Tanzania	-4	
Kenya	-3	
Madagascar	-3	
Uganda	-3	
Botswana	-2	
Gabon	-2	
Namibia	-2	
Niger	-2	
Chad	0	
Togo	0	
Burundi	1	
Central African Republic	1	
Ghana	1	
Guinea	1	
Libya	1	
Guinea-Bissau	2	
Sierra Leone	2	
Cote d'Ivoire (Ivory Coast)	5	
Gambia	5	
Mauritius	7	
Benin	9	
Djibouti	9	
Equatorial Guinea	12	Country Priority Index Exceeds Current Trade
Mauritania	13	
Algeria	16	
Comoros	19	
Seychelles	24	Country Priority Index Significantly Exceeds Current Trade
Egypt	26	
Rwanda	30	
Sao Tome & Principe	36	
Tunisia	41	
Cabo Verde (Cape Verde)	43	
Morocco	43	

Key for the Country Priority Index

0 to Negative
Trade is more than what the index suggests (overtrading)

0 to Positive
Trade is less than what the index suggests (Undertrading)

Description
Green: Current trade correlates with country priority index
Orange: Current trade exceeds country priority index
Blue: Country priority index significantly exceeds current trade
Red: Current trade significantly exceeds country priority index
Grey: Country priority index exceeds current trade

Source: Annandale (2022)

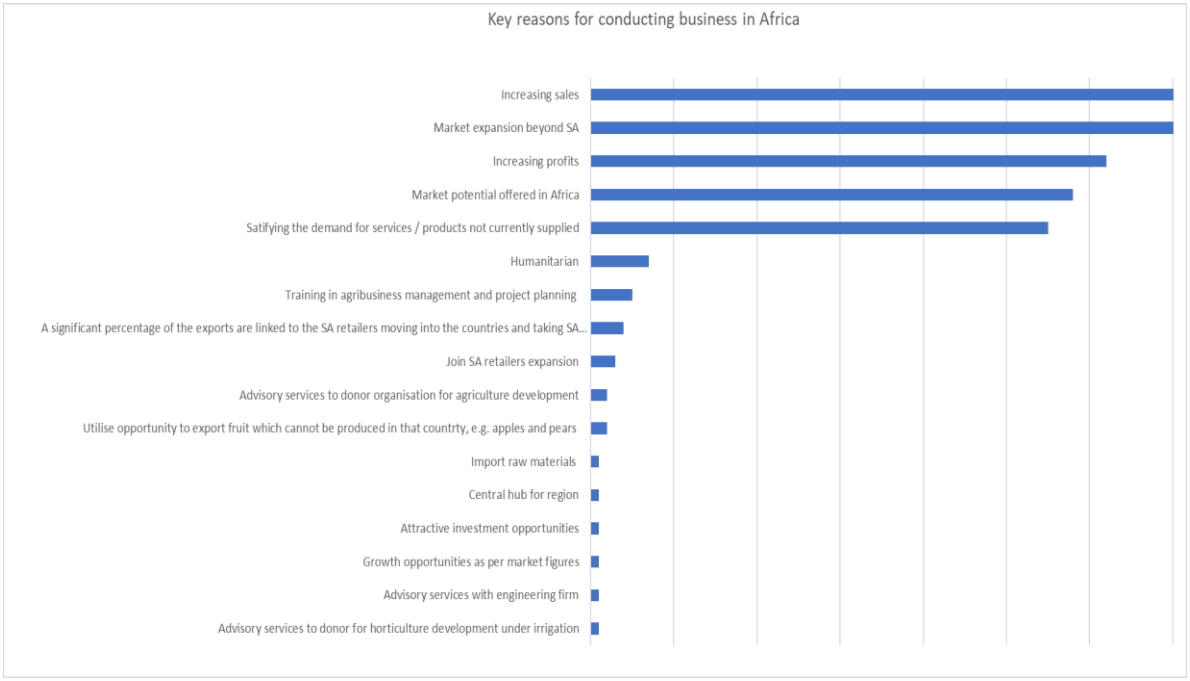
Appendix 6: The Top 25 Agricultural Exports by the Western Cape (Average 2016-2021) (Rand '000 current prices)

Number	Product	Top 25 Exp to Africa (Rand '000)(Average 2016-2021)
1	HST080810: - Apples	1 459 804
2	HST220421: - Wine of fresh grapes	884 484
3	HST220600: - Cider and other fermented beverages	649 540
4	HST200990: - Mixtures of fruit juices, including grape must, and vegetable juices	577 532
5	HST210690: - Food preparations n.e.s.	491 386
6	HST200989: - Juice of fruit or vegetables	210 930
7	HST040120: - Milk and cream of a fat content, by weight, exceeding 1 % but not exceeding 6 %	188 884
8	HST080610: - Fresh grapes	176 467
9	HST040690: - Cheese (excluding fresh cheese)	166 296
10	HST210320: - Tomato ketchup and other tomato sauces	166 139
11	HST220870: - Liqueurs and cordials	158 324
12	HST170490: - Sugar confectionary not containing cocoa	152 407
13	HST230400: - Oilcake and other solid residues, whether or not ground or in the form of pellets, resulting from the extraction of soya-bean oil	144 411
14	HST220820: - Spirits obtained by distilling grape wine or grape marc	142 441
15	HST080510: - Oranges	137 611
16	HST220830: - Whiskies	134 911
17	HST210390: - Preparations for sauces and prepared sauces	130 015
18	HST080830: - Fresh pears	124 260
19	HST220300: - Beer made from malt	123 986
20	HST120991: - Vegetable seeds for sowing	120 663
21	HST220429: - Wine of fresh grapes in containers more than two litres (excluding sparkling wine)	118 053
22	HST190590: - Bread, pastry, cakes, biscuit and other bakers' wares	115 084
23	HST100630: - Semi-milled or wholly milled rice, whether or not polished or glazed	114 404
24	HST200969: - Grape juice, including grpae must, unfermented	112 997
25	HST220210: - Waters, including mineral waters and aerated waters, containing added sugar or other sweetening matter or flavoured	111 467

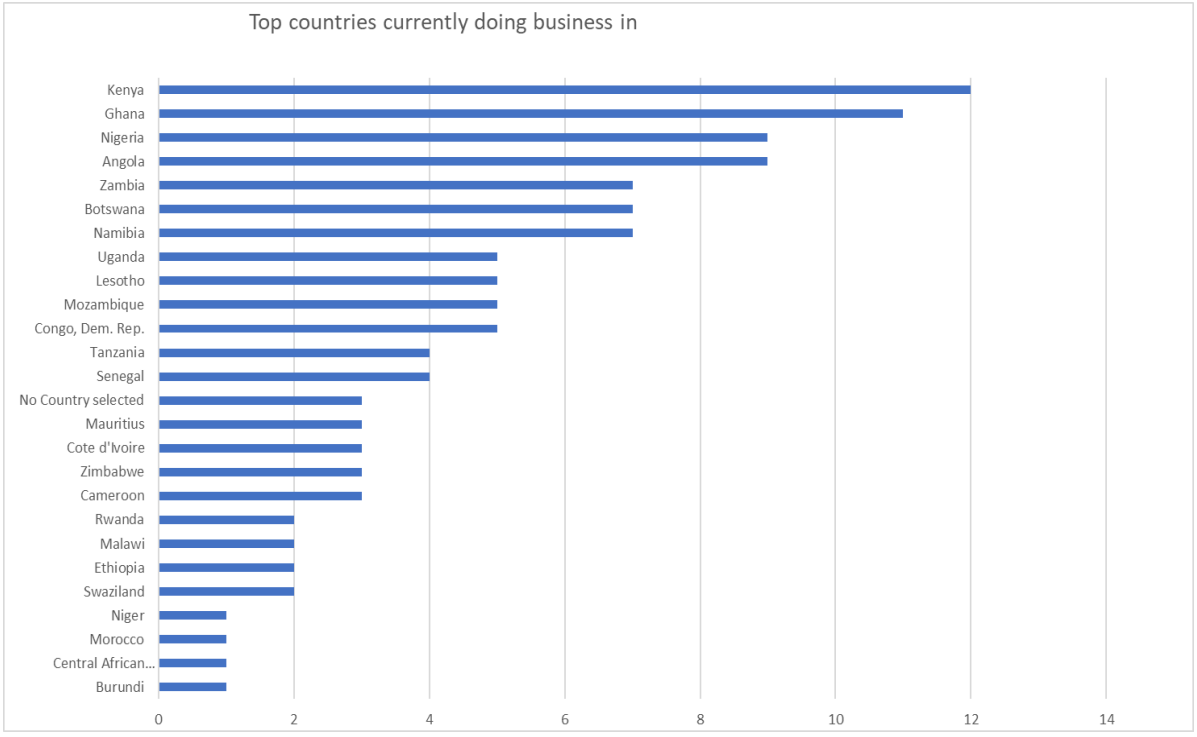
Source: Quantec and own calculations

Appendix 7: Business survey results

1. Number of respondents = 25
2. Key reasons for doing business in Africa

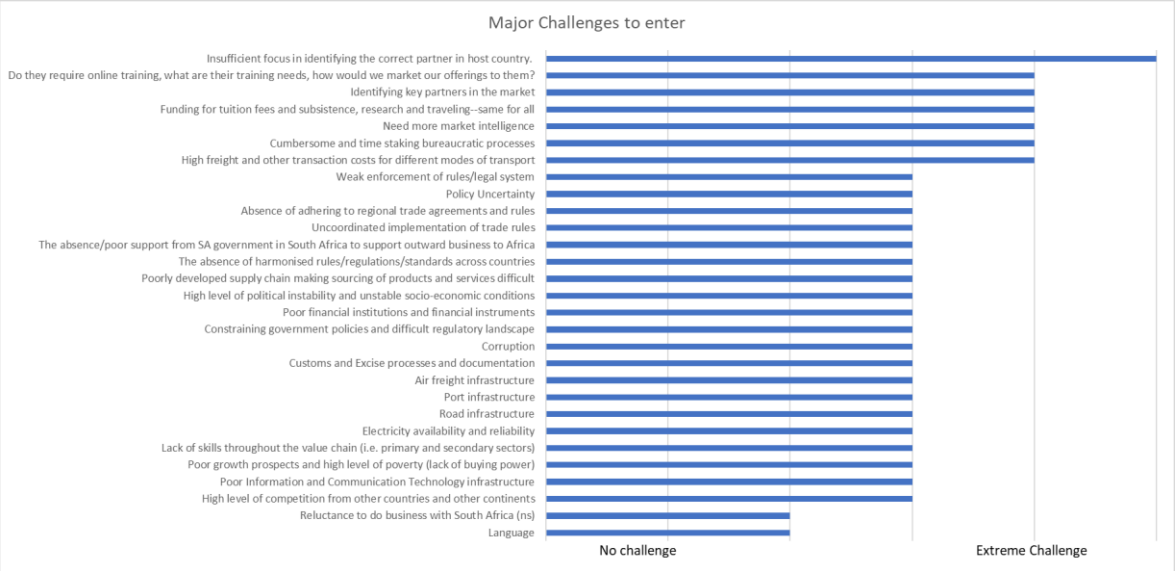


3. Top countries – current business



4. Major challenges for current business in Africa

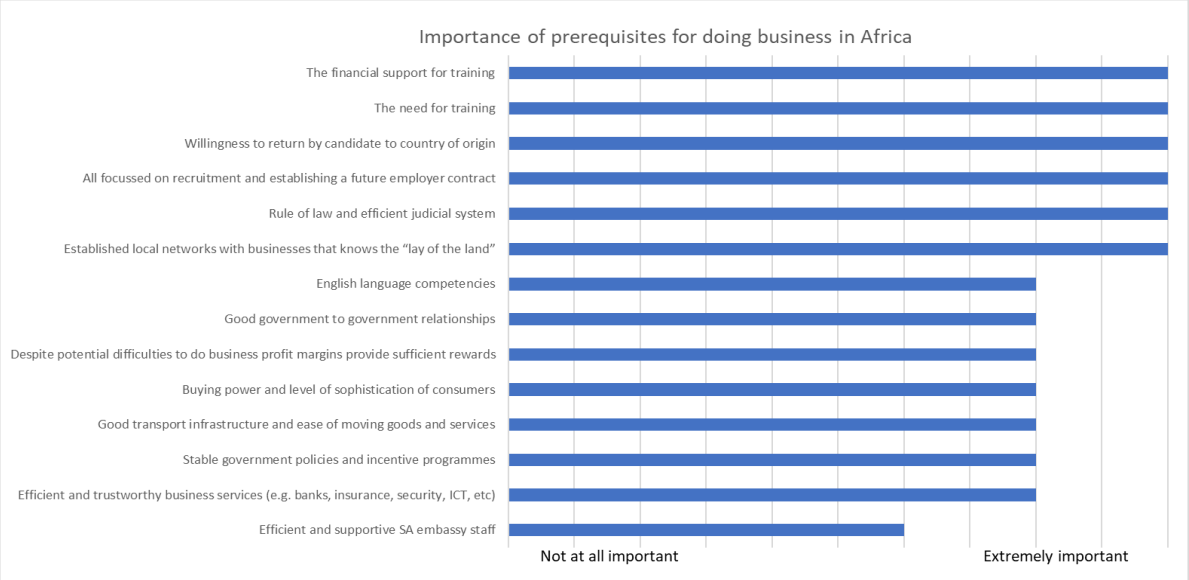
5. Major challenges to enter new African markets



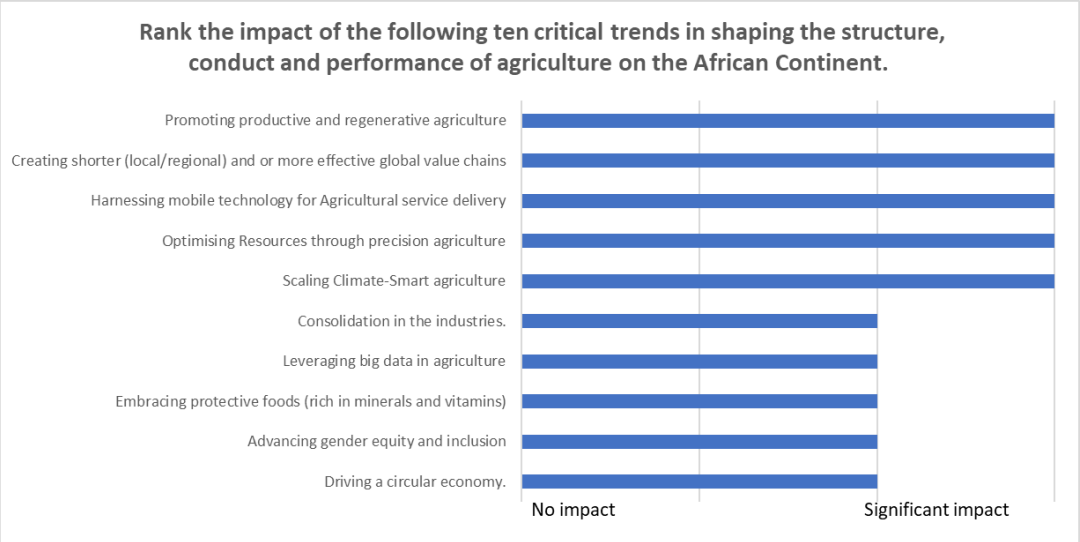
6. Scoring of indices by respondents

Index	Total	Weight
Ease of doing business	260	12.4%
Political Stability	252	12.0%
Human Development / Education	222	10.6%
Port Infrastructure	185	8.8%
Road infrastructure	179	8.5%
Logistical Performance	173	8.2%
Country Attractiveness	157	7.5%
GDP Growth Expectations (2019-2024 years (%))	143	6.8%
Corruption Perceptions Index	138	6.6%
Distance to Market (KM)	118	5.6%
Foreign Direct Investment Index	103	4.9%
GDP / Capita	97	4.6%
Regulatory Quality Index	73	3.5%
Total	2099	100.0%

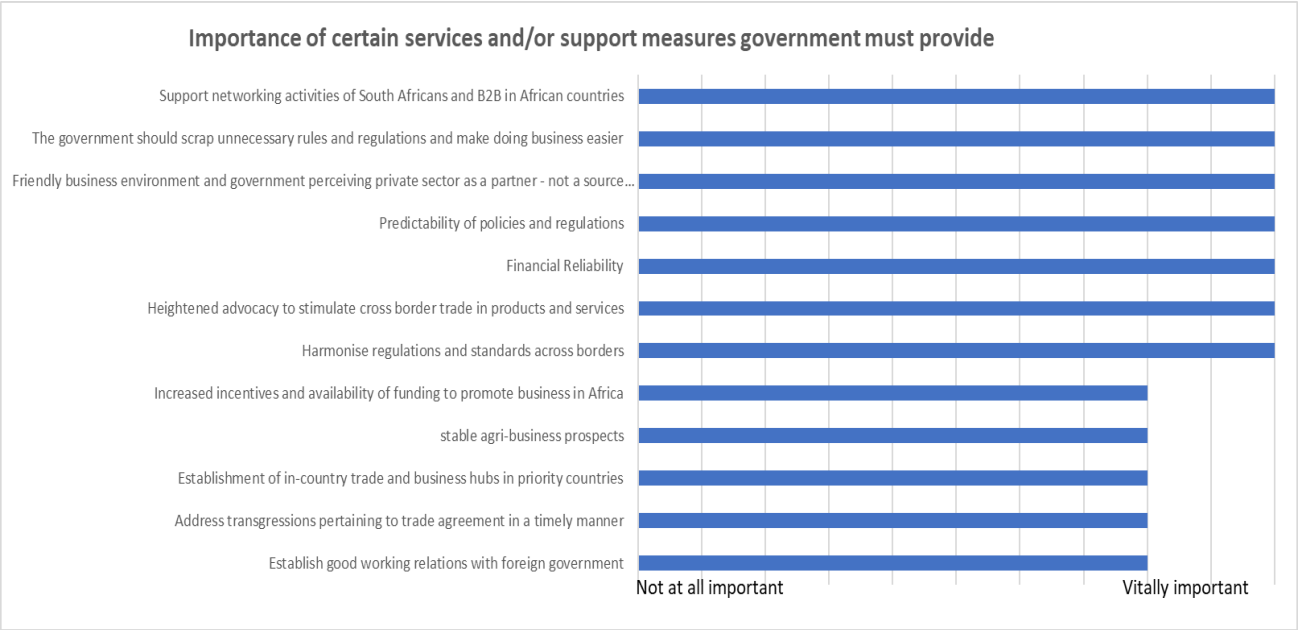
7. Importance of prerequisites for doing business in Africa



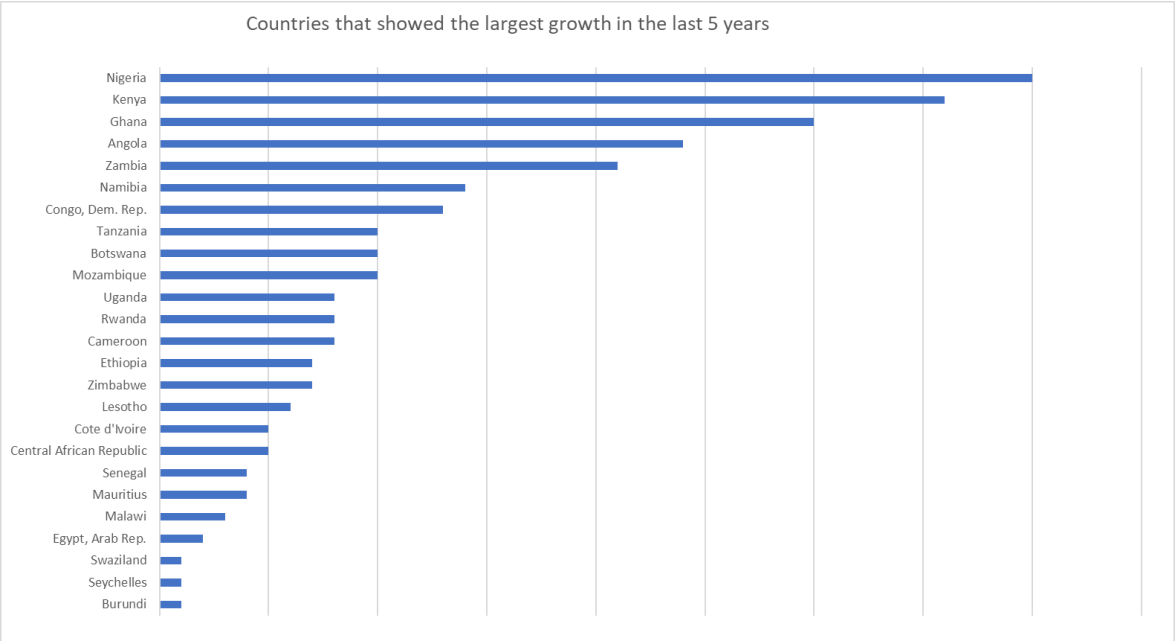
8. Ranking the impact of the following ten critical trends in shaping the structure, conduct and performance of agriculture on the African Continent



9. Importance of certain services and/or support measures government must provide



10. Countries that showed the largest growth in the last 5 years



11. If you were the Western Cape Department of Agriculture and you could do something to try and address some of these challenges, what would you do?

Number	Intervention
1	Ensure that SA's National departments (DALRRD, dti, Customs, Transnet) operate efficiently
2	Bilateral discussions to enforce free trade arrangements - all of Southern Africa - in particular SACU preferential trade agreement
3	Think tanks/formal discussion groups between government and agribusiness to design strategies
4	Bilateral trade visits with inclusion of industry
5	Establish trade offices in all the countries with export potential to facilitate trade
6	Provide a type of help desk to advice on market challenges
7	Infrastructure when exporting to Africa remain a huge concern - Investigate how to overcome this
8	Provide support to trade and investment missions to some of these countries
9	Conduct research to determine where a need is for specific industries in the Western Cape (e.g., fruit) and where are needs in Africa for similar industries - e.g. grapes in Ethiopia or wheat production in Zambia
10	Western Cape could collaborate with national departments - e.g., agriculture, trade, etc. and assist and work on specific issues - e.g., quality of vegetables, fruit, etc. SPS and quality issues; etc.
11	Create collaboration with specific regions in specific countries e.g., Western Cape and certain states in Nigeria or regions in Ghana. Be strategic and specific - look for specific synergies in specific states with perhaps similar climatic conditions.
12	Assess local agro-processing industries and where are the strong points (e.g., fruit packaging, juice production, wine industry, etc.) and identify where there are needs. Lesotho is currently looking at apple production for export markets.
13	We need to help fellow African countries develop - in the whole of sub-Sahara Africa but also our neighbouring countries. South Africa needs to provide leadership and see how we can assist. Univ. Stellenbosch is doing work in Ghana why not link WC Provincial Department with agriculture development in Ghana.
14	Nigeria - Support on import duties on certain products - illegally supplied and imported products are more lucrative
15	Financial institutions should support business in the African countries to share risk
16	Zambia - Support S.A supplied products on Duty reductions and quotas

Number	Intervention
17	TO DEVELOP STRONGER LINKS WITH THE HIGHER EDUCATIONALINSTITUTIONS IN SELECTED AFRICACOUNTRIES WITH STRONG(ER) AGRI BUSINESS PROSPECTS & AND REPUTABLE TRAINING INSTITUTIONS
18	To develop links with world donor organisations to mobilise funds for such training interventions
19	to offer innovative training and skills development modules-- linked to agribusiness internships at selected SA agribusinesses.
20	Get better market access for alcoholic beverage exports to Nigeria and Kenya (ECOWAS, EAC). Currently no market access preferences are offered in the tripartite Africa free trade agreement negotiations
21	Actively drive policy advocacy on key current export barriers for the top western cape industries exporting into Africa - For example Angola is not joining the SADC free trade area after several years of benefiting from SADC duty free access
22	In all markets work with existing structures created to address non-tariff barriers
23	Work in collaboration with South African Attaches posted in markets and the DTIC head office for markets without Attaches
24	Communicate matters of non-tarrifs barriers with Regulators in markets
25	Collaborate with Business units, Importers in markets and Chambers of Commerce
26	Use existing structures created by our government for non-tariff barriers
27	Involve Attaches
28	Involves Regulators in those countries
29	Involves SADC Business Council including Business units of those countries
30	Involves Embassies via our government department (DTIC), DALRRD
31	Promote the concept of gender balance at all levels
32	Engage in a participative, non-paternalistic manner- designing solutions for actual problems
33	Design systems of support re monitoring and evaluation
34	Promote focused Trade - Southern Africa
35	Exchange expertise regarding value chain development - e.g., Ethiopia
36	Assist in joint Market development - complementary products
37	Assist with value chain development training
38	Develop reliable data sets to identify joint market opportunities
39	Trade missions
40	Infrastructure development
41	Joint venture facilitation

Number	Intervention
42	The main thing for African countries is that GDP growth would increase trade between South Africa and Africa. The government should therefore focus on making it as easy as possible to export to markets.
43	STANDARD IMPORT REQUIREMENTS ACROSS ALL AFRICAN COUNTRIES, i.e., CAMEROON VERY STRICT IMPORT REGULATIONS ON FRUIT COMPARED TO NIGERIA/SOUTH AFRICA/GHANA ETC
44	AFRICAN CURRENCIES TO BE ACCEPTED FOR PAYMENT, i.e., Ability to receive Naira, and convert to ZAR/USD.
45	Country protocols
46	Market analysis of the different countries
47	Develop an information hub per country with regular deep dives into specific high potential markets
48	Government to government workshop to enable less bureaucratic processes
49	Make available specialists to assist exporters with customs and excise processes and documentation
50	Establishment of an Africa Agribusiness Investment Unit - emphasis for the top 10 ranking countries
51	Development of incentive packages (similar to DTI support) for doing business in the top 10 ranking countries
52	Establishment of an Agribusiness Directory (networking directory) - emphasis for the top 10 ranking countries
53	Development of Agribusiness opportunity profiles / scoping reports for selected top-ranking countries - annual updates
54	Strengthening links between the WCDoA and diplomatic missions in top ranking African countries - information desk - including trade policies
55	Support digitization of logistics and B2B logistics companies - mobile applications
56	Facilitate the establishment of technology & skills transfer Africa center of excellence - incubation hub for Africans
57	Promote harmonised trade regulations and policies
58	Lobby to improve infrastructure (Port, rail, and roads) to stimulate import and exports through W Cape Harbours (Cape Town, Saldana etc.)
59	Optimise Border Infrastructure
60	We need the buy in of farmers and agents, needing our training. We also need to make sure what we're offering is of value and suitable to the various countries. We need sponsorship from industries to train farmers. I can't be more specific than this for the different countries.
61	Publish annual export statistics report for Agricultural Inputs into the various African countries

Number	Intervention
62	Develop African Market intelligence streams which flow through to industry in the Western Cape
63	Pressurize the Cape Town port to operate efficiently
64	Develop trade missions based on Specific market intelligence into specific countries
65	Assist with Trade show support Mechanisms / pavilions (e.g., AgriTech in Zambia)
66	Play a match making role to develop routes to market in specific growth countries for specific product lines.
67	Government must create a conducive environment for companies to invest in Africa. The biggest problem is to obtain funding for green field projects. The banks in Africa see agriculture as high risk whilst South African banks do not provide funding outside the borders of South Africa.
68	Improve ports

Appendix 8: Response from Dr AE Strever, coordinator of innovation and entrepreneurship in the AgriSciences Faculty, Stellenbosch University

Stellenbosch
UNIVERSITY
IYUNIVESITHI
UNIVERSITEIT

AGRISCIENCES
EYENZULULWAZI NGEZOLIMO
AGRIWETENSKAPPE

RE: Western Cape Agricultural Africa Strategy Questionnaire: Response from Dr AE Strever, coordinator of innovation and entrepreneurship in the AgriSciences Faculty, Stellenbosch University.

Current interactions with Launchlab and INNOVUS.

The AgriSciences Faculty has engaged with INNOVUS (https://www.innovus.co.za/) and Launchlab (https://www.launchlab.africa/) on several projects and events in the past years, and the Faculty also established a platform of innovation representatives from the different departments. These interactions included, amongst others work with the Western Cape Department of Agriculture in 2017/18 on the 4th industrial revolution in Agriculture, a wine industry (WINETECH) pitching event in 2018, an WWF pitching/ideas event in 2019 and an Agri+Data showcase in 2020. The Faculty also proudly hosts many researchers that either engage on product, patent or licensing endeavours, but also in several spin-out companies.

Ambitions to develop a virtual/physical agri incubator in partnership with Launchlab.

Although our innovation and entrepreneurship platform has been operational for a few years, we plan to also in future add a physical space and dedicated team to expand our activities. Such a virtual/physical space should:

- Be a hub for start-ups and young businesses where they receive support on ventures in the space spanning the agri-food-energy-environment nexus.
- Provide access to a network of mentors, investors as well as existing agribusiness entrepreneurs and farmers, as well as industry bodies in Agriculture, Food and forestry.
- Host events to promote investment and exposure for these entrepreneurs, but also students and academics interested in agri-entrepreneurship.
- Provide the potential to network with academics and students for expertise but also to develop young minds towards entrepreneurial ambitions.
- Give access to cost-effective workspaces and offices at the new Agri precinct and/or at partners.

Potential for an increased undergraduate focus on agritech, with an associated pipeline for postgraduate studies in Agritech+Innovation/entrepreneurship.

The Faculty is currently looking at ways in enhancing both the technical content and soft skills offered in the curriculum, including enhancing and nurturing entrepreneurial mindsets both at under- and postgraduate levels. One initiative will be to configure a structured Master's degree, possibly in an online/part-time format in Agri- technologies and entrepreneurship.

Question 10: If you were the Western Cape Department of Agriculture, and you could do something to try and address some of these challenges, what would you do? Be country specific if possible.

In South-Africa the development of entrepreneurial ventures, specifically also linked to the agricultural value chain is deemed crucial in the future of the different industries, but also for the country in general. One example of where this will be required is with the current energy crisis the country is facing, and the potential of agricultural businesses to be part of the energy solution i.e. through the integration of photovoltaics into the sector in many different ways. The triple helix model is crucial in such ventures, and therefore we need many more discussions between industry actors, University academics and practitioners in innovation/entrepreneurship (i.e. in my position or in my network), and government. The proposed incubator/centre/hub could, with support from government achieve many of these objectives.

Kind regards / Ngemibuliso emihle / Vriendelike groete

Dr Albert Strever
Innovation & Entrepreneurship coordinator | Innovasie & Entrepreneurskap koordineerder
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forward together
sonke siya phambili
saam vorentoe

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Annexure A: Literature review, Desktop identification of possible opportunities pertaining to AFRICA and Multi-criteria analysis and selection of target African countries

Western Cape Department of Agriculture

Development of an Africa strategy for the Western Cape Agricultural Sector

Annexure A:

- **Literature review**
- **Desktop identification of possible opportunities pertaining to AFRICA**
- **Multi-criteria analysis and selection of target African countries (sampling)**

18 May 2022

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Date: 18 May 2022

LIST OF ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank
AU	African Union
AGRA	Alliance for a Green Revolution in Africa
AI	Artificial Intelligence
ATDC	Agricultural Technology Demonstration Centre
BDRI	Big Data Readiness Index
BMGF	Bill and Melinda Gates Foundation
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CSA	Climate-smart agriculture
DAFF	Department of Agriculture, Forestry and Fisheries
FAO	Food and Agriculture Organization of the United Nations
4IR	Fourth Industrial Revolution
GDP	Gross Domestic Product
GPS	Gender Parity Score
GSMA	Global System for Mobile Communication
HS	Harmonised System
ICT	Information Communication Technology
IFPRI	International Food Policy Research Institute
IoT	Information of Things
ITU	International Telecommunication Union
LPI	Logistics Performance Indicators
MNO	Mobile Network Operators
NAMC	National Agricultural Marketing Council
NDP	National Development Plan
NPC	National Planning Commission
OBG	Oxford Business Group
PPP/P	Public-Private Partnership/Public-Private-Producer Partnership
SASVEPM	Society for Veterinary Epidemiology and Preventative Medicine
SDG	Sustainable Development Goals

SDGC/A	Sustainable Development Goals Centre of Africa
SDSN	Sustainable Development Solution Network
UN	United Nations
USD$	United States of America Dollar
US	University of Stellenbosch
VC	Value chain
VCD	Value Chain Development
WB	World Bank
WCDoA	Western Cape Department of Agriculture
WTO	World Trade Organization
ZAR	South African Rand

1 LITERATURE REVIEW

1.1 Factors Influencing the Performance of African Agriculture

1.1.1 Introduction

Recently, there has been a surge of interest in how to deliver on Africa's potential in agriculture (Farming First, 2022; Bill & Melinda Gates Foundation (BMGF), 2022; Oxford Business Group (OBG), 2021; McKinsey & Company, 2019). This is apparent in the renewed prominence of agriculture on the development agenda of most African countries, South Africa included (Chitiga et al., 2020; Resnick et al., 2020; Matona, 2019; African Development Bank (AfDB), 2018; Beintema & Stads, 2014; National Planning Commission (NPC), n.d.). Granted that there exist diverse agricultural situations among African countries, agriculture is noted to have a large economic and social footprint in Africa (Jayne et al., 2021; OBG, 2021; National Agricultural Marketing Council (NAMC), 2020; Alliance for a Green Revolution in Africa (AGRA), 2016). There is a growing realization that African economies stand to gain significantly by promoting intra-continental trade of agricultural products and these gains are expected to result in a higher exchange of manufactured and processed goods, greater knowledge transfer, and high value creation (Songwe, 2019).

McKinsey & Company (2019) highlight that substantial investments in inputs (e.g., fertilizer and hybrid seeds), infrastructure (e.g., irrigation, electricity, ports, and storage), and trade (i.e., trade flows and policies) are prerequisites to realizing Africa's untapped agricultural potential. Agricultural innovation and technology, along with connections to institutions (both public and private) are also identified as key drivers toward African agriculture's sustained prosperity (World Bank, 2021a; World Bank 2019a; World Bank 2019b; World Bank, 2017). Also equally important are investments in information systems, farmer training, and services (Adenle et al., 2019). To obtain the big picture on South Africa's agriculture sector as it relates to other continental agriculture sectors, the following sections provide a review of literature on the aforementioned factors that are cited as being principal to unlocking the potential of African agriculture, with particular focus placed on South Africa's Western Cape Province. Also, emerging trends that are shaping African agriculture such as digital technology, mobile technology, Big Data, BlockChain technology, women empowerment, and the concept of circular economy are reviewed. As a starting point, the following sections spotlights Africa's agricultural challenges identify possible opportunities (resulting from challenges) for the Western Cape Agricultural Sector.

1.1.2 Agricultural Inputs

Agricultural productivity growth in Africa has been noted to be stagnating in recent years and this is attributed, in part, to the limited use of recent and improved agricultural inputs such as seeds, fertilizers, and innovative mechanization services (Suri & Udry, 2022; Langyintuo, 2020; World Bank, 2019a). Additionally, a lack of land tenure

security has been impeding investments in land improvement technologies and the adoption of sustainable agricultural practices. From a demand perspective, small-scale African producers do not utilize quality inputs with advanced technologies due to risk aversion (low risk-bearing ability), insufficient knowledge (e.g., on availability of ecologically adapted seed varieties), high input prices coupled with lack of cash, and limited access to credit markets (Langyintuo, 2020). African small-scale farmers also face high transaction costs that arise from the inaccessibility of input markets and this is noted to hinder the adoption of new input technologies (Suri & Udry, 2022). In addition, there is also a lack of markets for quality, intimating a lack of varying prices for varying levels of input quality (Suri & Udry, 2022).

Despite access to reliable water being a necessity for high land productivity, Langyintuo (2020) notes that irrigation facilities are limited which is concerning considering 60% of sub-Saharan Africa is exposed to drought. Functional irrigation schemes are fraught with inefficiencies and are not effective in meeting farmer water requirements. Such inefficiencies arise due to poor farmer consultations during the design phase, a mismatch between irrigation facilities and existing farming systems, institutional weaknesses, and capital-intensive investments that require high input levels. Nyam et al. (2020) spotlight South Africa's water challenges during recurring droughts and reiterate the need for an in-depth understanding of the factors behind its water challenges when crafting methods for sustainable water management and agricultural development. Despite all these challenges, there has been considerable progress in input usage among African farmers (Janyne et al., 2019). For example, countries such as South Africa have reached the 50 kg/ha by 2015 target in fertilizer consumption as per the Abuja Declaration (Langyintuo, 2020). However, Langyintuo (2020) noted there is still room for further improvement in this area as upper-middle-income countries are noted to consume, on average, upward of 180 kg/ha which is comparatively higher than South Africa's consumption of 72.8 kg/ha in 2018 (World Bank, 2019c).

1.1.3 Logistics

The potential for long-term growth and development in Africa highly depends on the improvement of individual countries' logistics performance (Chakamera & Pisa, 2020). Elements of logistics performance such as the quality of institutions, border, and transport efficiency, as well as physical and communication infrastructure are highlighted as major determining factors of both Africa's intra and inter-continental trade engagements (Yushi & Borojo, 2019). Yushi & Borojo (2019) explain that a simultaneous improvement in all of these factors is necessary to reduce the cost of trade in Africa and facilitate higher regional trade engagement. This was proven to be the case in Takele's (2019) study on the trade logistics performance of African countries. Using 2010 - 2018 Logistics Performance Indicators (LPIs), Takele (2019) deduced that improvements in components of the LPI such as infrastructure development, customs clearance, logistics service quality, tracking and tracing, international shipments, and timelines have a positive effect on intra-continental

trade. The author also observed Africa's low LPI scores compared to its trading partners in other regions. To get a big picture of the logistics performance in Africa, table 2 below shows the aggregated LPIs for Africa for the period covering 2012 - 2018 for 48 African states (out of a total of 167 states globally). The LPI, which is a multidimensional tool to assess logistics performance, was used to determine country scores from six components, namely, customs, infrastructure, international shipments, logistics competence, tracking and tracing, and timelines. Scores were ranked from 1 (worst) to 5 (best). From Table 1-1, it can be noted that South Africa was ranked highest in Africa (29th globally) with an LPI score of 3.51. On the opposite end of the spectrum is Somalia, which ranked lowest in Africa (167th globally).

Table 1-1: Aggregated Logistics Performance Indicators for Africa (LPIs)

Country	Africa LPI Rank	Global LPI Rank	LPI Score	Customs	Infrastructure	International Shipments	Logistics Competence	Tracking & Tracing	Timelines
South Africa	1	29	3.51	3.29	3.39	3.53	3.42	3.56	3.85
Botswana	2	58	2.96	2.95	2.85	2.82	2.71	2.81	3.60
Egypt, Arab Rep.	3	60	2.95	2.67	2.91	2.94	2.95	2.91	3.30
Kenya	4	63	2.93	2.66	2.68	2.86	2.88	3.11	3.35
Rwanda	5	65	2.90	2.68	2.60	3.14	2.77	2.83	3.31
Cote d'Ivoire	6	66	2.89	2.66	2.67	2.96	2.95	2.95	3.11
Tanzania	7	67	2.88	2.66	2.72	2.89	2.80	2.85	3.34
Uganda	8	72	2.79	2.78	2.45	2.82	2.70	2.69	3.27
Namibia	9	80	2.73	2.60	2.74	2.68	2.64	2.55	3.14
Malawi	10	84	2.69	2.58	2.56	2.61	2.76	2.65	2.99
Mauritius	11	91	2.65	2.51	2.68	2.35	2.69	2.72	2.98
Benin	12	93	2.65	2.48	2.45	2.66	2.50	2.58	3.17
Burkina Faso	13	96	2.63	2.44	2.48	2.79	2.56	2.42	3.06
Ghana	14	101	2.60	2.41	2.46	2.63	2.51	2.58	2.95
Mozambique	15	102	2.59	2.45	2.22	2.86	2.38	2.62	2.98
Nigeria	16	103	2.59	2.15	2.50	2.52	2.54	2.73	3.10
Tunisia	17	104	2.59	2.27	2.27	2.53	2.45	2.78	3.20
São Tomé and Príncipe	18	105	2.56	2.52	2.30	2.44	2.55	2.66	2.90
Algeria	19	107	2.56	2.28	2.45	2.54	2.53	2.65	2.89
Mali	20	109	2.55	2.22	2.28	2.66	2.40	2.81	2.87
Comoros	21	114	2.51	2.58	2.27	2.47	2.32	2.67	2.74
Zambia	22	118	2.49	2.27	2.29	2.72	2.46	2.18	2.94
Togo	23	119	2.48	2.33	2.23	2.58	2.29	2.50	2.93
Cameroon	24	125	2.43	2.27	2.36	2.51	2.50	2.37	2.56
Djibouti	25	126	2.43	2.29	2.47	2.33	2.14	2.46	2.91

Country	Africa LPI Rank	Global LPI Rank	LPI Score	Customs	Infrastructure	International Shipments	Logistics Competence	Tracking & Tracing	Timelines
Guinea-Bissau	26	128	2.40	2.21	1.94	2.52	2.29	2.60	2.80
Sudan	27	130	2.40	2.13	2.14	2.49	2.41	2.45	2.73
Ethiopia	28	131	2.40	2.54	2.13	2.54	2.39	2.24	2.49
Congo, Rep.	29	133	2.38	2.07	2.12	2.58	2.25	2.38	2.80
Madagascar	30	137	2.35	2.32	2.16	2.22	2.25	2.42	2.70
Gambia, The	31	138	2.34	2.08	1.90	2.68	2.23	2.48	2.60
Chad	32	140	2.34	2.15	2.26	2.35	2.39	2.28	2.58
Senegal	33	141	2.34	2.29	2.24	2.44	2.27	2.19	2.56
Congo, Dem. Rep.	34	143	2.33	2.23	2.04	2.26	2.34	2.41	2.65
Guinea	35	145	2.30	2.39	1.80	2.38	2.27	2.59	2.30
Liberia	36	146	2.29	2.04	2.06	2.22	2.24	2.15	2.99
Niger	37	148	2.29	2.14	2.10	2.28	2.26	2.29	2.62
C.A.R.	38	150	2.26	2.35	2.17	2.25	2.13	2.21	2.46
Lesotho	39	153	2.22	2.20	2.02	2.14	2.12	2.22	2.60
Burundi	40	154	2.22	1.90	2.00	2.28	2.33	2.23	2.55
Libya	41	155	2.21	2.00	2.17	2.18	2.21	1.90	2.78
Equatorial Guinea	42	156	2.21	1.99	1.82	2.46	2.11	2.14	2.66
Mauritania	43	157	2.20	2.16	2.09	2.15	2.06	2.18	2.54
Gabon	44	158	2.19	1.99	2.07	2.23	2.13	2.06	2.61
Angola	45	160	2.18	1.79	2.01	2.33	2.13	2.14	2.65
Zimbabwe	46	161	2.17	2.01	2.01	2.13	2.20	2.19	2.45
Eritrea	47	162	2.11	2.05	1.89	2.12	2.19	2.09	2.31
Somalia	48	167	2.00	1.81	1.69	2.24	2.07	1.94	2.18

Source: World Bank (2018a)

Considering that about 70 - 90% of agricultural goods in Africa are transported via road (World Bank, 2015), Vilakazi (2018) investigated the causes of high intra-regional road freight rates for food in Southern Africa. A combination of structural issues and inefficiencies in the administration and regulation of cross-border transport was identified as contributive to high road freight rates. It was also noted that limited return trips caused by differences in trade flows between countries contribute to high road freight rates. From these findings, Vilakazi (2018) recommended focusing not just on infrastructural investments, but also on addressing administrative and regulatory hold-ups that make regional trade via road costly and cumbersome.

1.1.4 Information

The Fourth Industrial Revolution (4IR), which coincides with the postmodern information age, has made agriculture increasingly knowledge-intensive (Mapiye et al., 2020; Food and Agriculture Organization of the United Nations (FAO) & International Telecommunication Union (ITU), 2016; Drafor, 2016; World Bank, 2017). There is growing awareness that access to timely and accurate information, that is customized according to different locations and conditions, is critical for farmers to make well-informed timeous decisions under dynamic circumstances (Mapiye et al., 2021; FAO & ITU, 2016; Abay et al., 2021; AGRA, 2016). Sub-optimal choices by farmers due to information asymmetry lead to market failure. While public discourse, development policy, and private enterprises have shown considerable enthusiasm for the possible benefits of digital technologies in transforming the information landscape in African agriculture, Abay et al. (2021) note that there has been muted progress and failure to scale up. This, despite digital innovations potentially addressing market and institutional failures commonly present in African agricultural markets (Courtois & Subervie, 2015). For example, digital technologies remedy market failures arising from information asymmetry on product price and quality along agri-food value chains (Abay et al., 2021). Digital technologies, which are typified by mobile internet-enabled devices, can be harnessed for improved continental connection (Statista, 2022).

1.1.5 Technology

African agriculture can benefit from a constellation of new tools and technologies that improve production, productivity, distribution processes, and access to markets (Mavilia & Pisani, 2021). Examples of these technologies include Blockchain, Internet of Things (IoT), Information Communication Technologies (ICTs), Big Data, Artificial intelligence, and drones (UN, 2021; Abay et al., 2021; Smidt, 2018; Mavilia & Pisani, 2021; Sarker et al., 2020; Masupha et al., 2021). South Africa's Western Cape Department of Agriculture (WCDoA), in line with its provincial goals and the National Development Plan (NDP), has been implementing novel methods and technologies to address challenges in agriculture faced by the province (Naidoo et al., 2016). These innovations, which have a broad spectrum, include the latest biotechnology (e.g., ovine genomic selection for breeding), remote sensing satellite and spatial information (e.g., Spatial Intelligence Project and FruitLook), Agricultural Integrated Management System, information management and dissemination technologies (e.g., smart (digital) pen and paper technology, and Agri-touch) and new conservation agriculture methods.

Despite the probable benefits of these innovative technology applications to agricultural producers, Mavilia and Pisani (2021) stress the importance of considering their relative costs as well as associated risks of implementation. Suri and Udry (2022) note that small-scale African farmers tend to have constraining budgets and are unable to insure against risk. Consequently, this biases their decisions towards

technologies that are low-risk and those that yield low returns. Suri and Udry (2022) also note that when farmers are insured against risk, there is a higher adoption rate of technologies such as new fertilizer and seed varieties due to increased risk-bearing ability. However, the authors are also cognizant of the complexities involved in crafting insurance schemes, for example, insurance against weather through rainfall-based crop insurance. Such insurance will only become a viable option for African small-scale farmers when the cost of acquiring information (e.g., from high-resolution satellite images and remote sensing-based crop yield measurement) goes considerably down (Lobell et al., 2020; Benami et al., 2021). Alternatively, there can be the upscaling of more projects such as AfriCultuReS which provide farmers with integrated agricultural monitoring and early warning system for Africa (Alexandridis et al., 2021). There should also be a focus on work such as that of Masupha et al. (2021) who reviewed early drought warning systems in various countries and mapped a prospective system available to South African farmers.

1.1.6 Technology Partnerships

In today's dynamic environment, the public sector alone is unable to adequately address the myriad of challenges faced by African agricultural producers (Sihlobo, 2021; Raidimi & Kabiti, 2017; Fourie & Poggenpoel, 2017; Hanusch & Karimjee, 2018; Rankin et al., 2016). The public sector is constrained by, among several factors, limited resources and bureaucracy which lead to poor response to changing circumstances (Raidimi & Kabiti, 2017; Adenle et al., 2019). Phenomena such as globalization are reinforcing the need for small-scale agricultural enterprises to network both horizontally and vertically to gain access to global markets (Rambe & Agbotame, 2018; Mavilia & Pisani, 2021). Innovation theory posits that through collaboration, interdependencies among institutions are established, cultivating innovation (Rankin et al., 2016). Senyolo et al. (2021) explain that collaborative partnerships in agricultural research and development have grown to be considered an effective way to conduct advanced research, commercialize new technologies, and disseminate information on new products to small-scale farmers for improved performance. For example, Rambe & Agbotame (2018) investigated the influence of foreign partnerships on the performance of small-scale agricultural businesses in South Africa. Based on their findings, they determined a positive and statistically significant relationship between the establishment of foreign partnerships and the performance of small-scale agricultural business enterprises. They also noted that there still exists incomplete information on the capacity of African small-scale agricultural enterprises to forge foreign partnerships while concurrently lessening the adverse effects of globalization.

As per the Malabo Declaration[1], the African Union's Continental Agribusiness Plan spotlights public-private partnerships (PPP)[2] as a priority action for agribusiness transformation on the continent (African Union (AU), 2018). PPPs refer to the provision of public assets and services through the participation of the government, the private sector, and consumers (Senyolo et al., 2021). Through synergy, African agriculture stakeholders (particularly small-scale farmers) can benefit from pluralistic partnerships between the private sector, farmer organizations, academic and research institutions, financial organizations, input suppliers, as well as information and technology providers (FAO, 2022; Senyolo et al., 2021; Ordu et al., 2021; Sihlobo, 2021; Farmer's Weekly, 2018; Grow Africa Smallholder Working Group, 2018). Rankin et al. (2016) explain that PPPs offer a framework to organize researchers, service providers, and farmers into innovation-driven collaborative networks that are capable of formulating research-driven solutions to facilitate the effective and efficient transfer of technology innovations to farmers. This multi-agency system benefits farmers as each participating partner can contribute according to its strengths (Raidimi & Kabiti, 2017). Furthermore, Kunert et al. (2020) highlight that such partnerships cohere domestic policies and lead to the coherence of policies across borders.

1.1.7 Services

The pursuit of development and commercialization of the African agriculture sector requires significant support, for example, from financial and insurance services (World Bank, 2020a). Efficient financial services are of importance to the sector as they support agriculture stakeholders by providing them access to credit markets on favorable terms. This can be used to fund the purchase or lease of costly agricultural infrastructure and machinery. Insurance services are also critical as they cover participants of the agriculture value chain against risk, and this is noted to encourage investments into productivity-inducing methods and technologies (Suri & Udry, 2022). By implication, there exists linkages between a country's insurance industry and its agricultural sector. IFPRI (2022) explains that due to Africa's agricultural productivity stagnating in recent years, extension services are becoming crucial for providing critical support services particularly to rural small-scale producers. Such services are critical to small-scale producers due to the growing emphasis on agricultural products standards, labels, and food safety (IFPRI, 2022). A failure to meet these requirements easily results in producers being excluded from participating in the formal value chain. This was the case for Kenyan potato farmers in 2020 during the COVID-19 pandemic (Njagi et al., 2022). They were unable to supply large firms such as KFC with potatoes

[1] The Malabo Declaration was adopted by the AU Assembly Heads of State and Government in June 2014 and provides the direction for Africa's agricultural transformation for the period 2015-2025, within the Comprehensive Africa Agriculture Development Programme (CAADP).

[2] When public-private partnerships (PPPs) include producers, they are known as public-private-producer-partnerships (PPPPs).

during the country's COVID-era shortages because their produce failed to meet quality standards. This is a case example where a lack of advisory and support services results in farmers being excluded from participating in formal value chains.

1.1.8 Agricultural Skills Development and Training

For Africa to achieve productivity-led growth in the agricultural sector, Jayne et al. (2020) point out that higher education institutions need to play a transformative role. The authors support this view by highlighting that investments in African higher education are known to yield the highest returns in the world, estimated at 21%. Furthermore, they estimate that a one-year increase in average tertiary education levels results in Africa's GDP growing by 0.39%, eventually yielding a 12% increase in the long term. Through higher education, Jayne et al. (2020) also note that there is a significant creation of knowledge-based goods and services that exert a transformational effect on the agriculture sector. However, Kirui (2020) notes that there is currently a mismatch between the training available and the skills being demanded by the private sector in Africa. To catalyze and facilitate development in African agriculture, upskilling and training of the agricultural labor force (particularly the youth) should go beyond just knowledge transfer (Kirui, 2020). There must be a passing of relevant in-demand expertise, experience, best practice, and learning. This transfer of capabilities can be achieved through forging partnerships with countries that have more sophisticated technologies, methods, and technical know-how.

Tugendhat & Alemu (2016) spotlight an ongoing debate around Chinese agricultural training courses that are offered to African countries. Annually, around 10 000 African officials are given training in China on a wide range of topical issues in agriculture and development. Despite suggestions of a 'Beijing Consensus' being pushed via this agricultural training (Halper, 2012; Williamson, 2012; Harding et al., 2021), Tugendhat & Alemu (2016) concluded that these course offerings and training are based on demonstration, experiment, and learning. However, the authors also note that training programs contribute to the Chinese diplomatic engagement in Africa. Harding et al. (2021) bring attention to the Chinese agricultural projects in South Africa such as the China Agricultural Technology Demonstration Center (ATDC) which Jiang et al. (2016) note to have successfully provided training and knowledge transfer of high-productivity agricultural methods to a large number of small-scale farmers.

1.1.9 Efficient and resilliant agri-food value chains

Value chain development, management and servises to enable producers and in particular small holders to link into such chains to enable production increases is extremely important (World Bank, 2011; 2013; International Food and Agribusiness Management (IFAMA), 2014; FAO, 2016).

1.2 Emerging Trends and Trend brakes in African Agriculture

1.2.1 Scaling Climate-Smart Agriculture (CSA)

Climate change is a global issue that has large ramifications for agricultural production and consumption. The agricultural sector is already plagued by high risks, and the increased risks of climate change add to the challenges faced by the industry even more so. Climatic risks include the increased risk associated with more frequent instances of heat stress, drought stress, flooding, wildfires and more (Njeru et al., 2016; World Bank, 2018b; World Bank, 2021b). Africa is particularly vulnerable to climate shocks that threaten food production (Scherer and Verburg, 2017). The agricultural sector itself is a major source of global climate change as it is a major source of greenhouse gas emissions with agriculture accounting for 52% of methane emissions and 84% of nitrous oxide emissions, this is before taking into consideration agriculture's role in global deforestation (World Bank, 2021b). These climate change issues are exacerbated by a growing global population, high rates of poverty and increased environmental degradation (Musvoto et al., 2015). Figure 1-1 displays the different sources of greenhouse gas emissions within the agricultural sector.

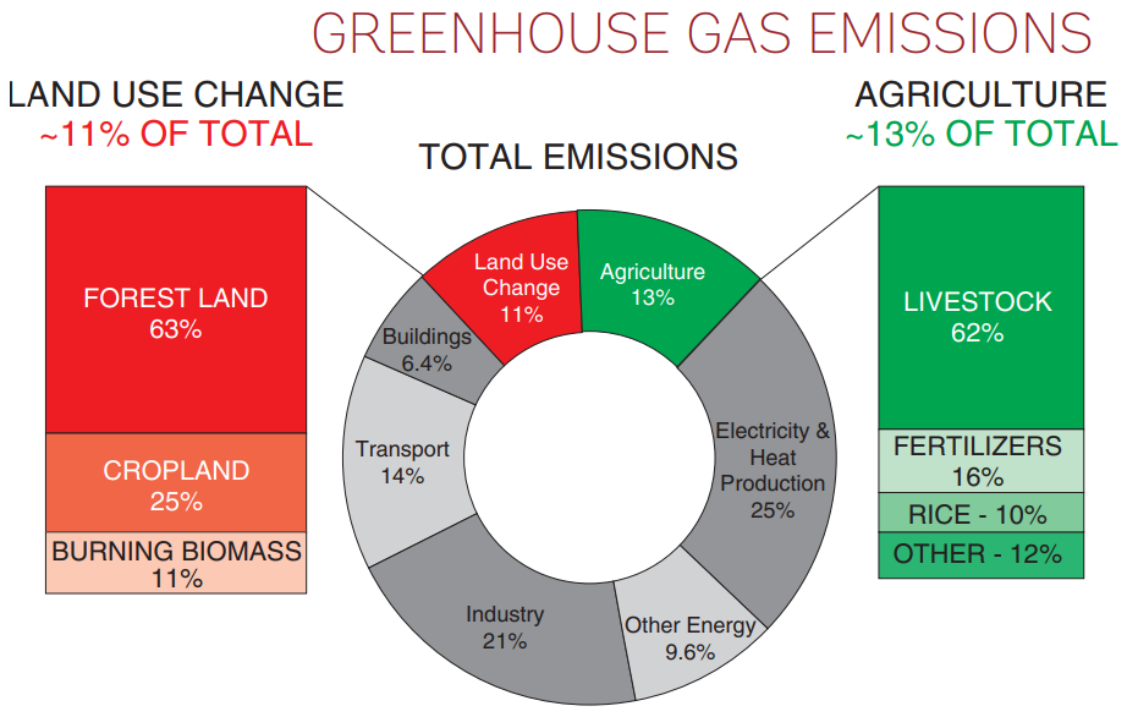


Figure 1-1: Share of greenhouse gas emissions in the agricultural sector

Source: World Bank, 2021b

Two of humanity's largest issues are climate change and global food security, the two are interlinked (Scherer and Verburg, 2017). On one side of the problem, climate change issues contribute to the dilemma of food security, and on the other, farming contributes massively to climate change issues (Scherer and Verburg, 2017). This leads

on to the need for Climate-Smart Agriculture (CSA). CSA 'addresses the challenges of building synergies among climate change mitigation, adaptation and food security that are closely related within agriculture and minimizing their potential negative trade-offs. It seeks to enhance the capacity of the agricultural sector to sustainably support food security, incorporating the need for adaptation and the potential for mitigation into development strategies. The specific conditions, circumstances, and capacities within countries will define opportunities and barriers to implementation, and hence policy choices' (FAO, 2011). Table 1 displays the three pillars of CSA. According to the research programme on Climate Change, Agriculture and Food Security (CCAFS), led by the Consultative Group on International Agricultural Research (CGIAR), 'scaling' refers to 'the set of processes required- in the context of climate variability, climate change and uncertainty about future climate conditions- to go beyond pilot projects through sustainable change that can bring higher quality solutions to millions of farmers and food system actors in a fast, equitable, inclusive, and lasting manner, towards achieving the Sustainable Development Goals (SDG)' (CCAFS, 2022). CSA is essentially an approach used to identify the most suitable strategies according to national and local priorities and conditions to meet the three objectives in Table 1-2 (Williams et al., 2015).

Table 1-2: The three pillars of Climate-Smart Agriculture

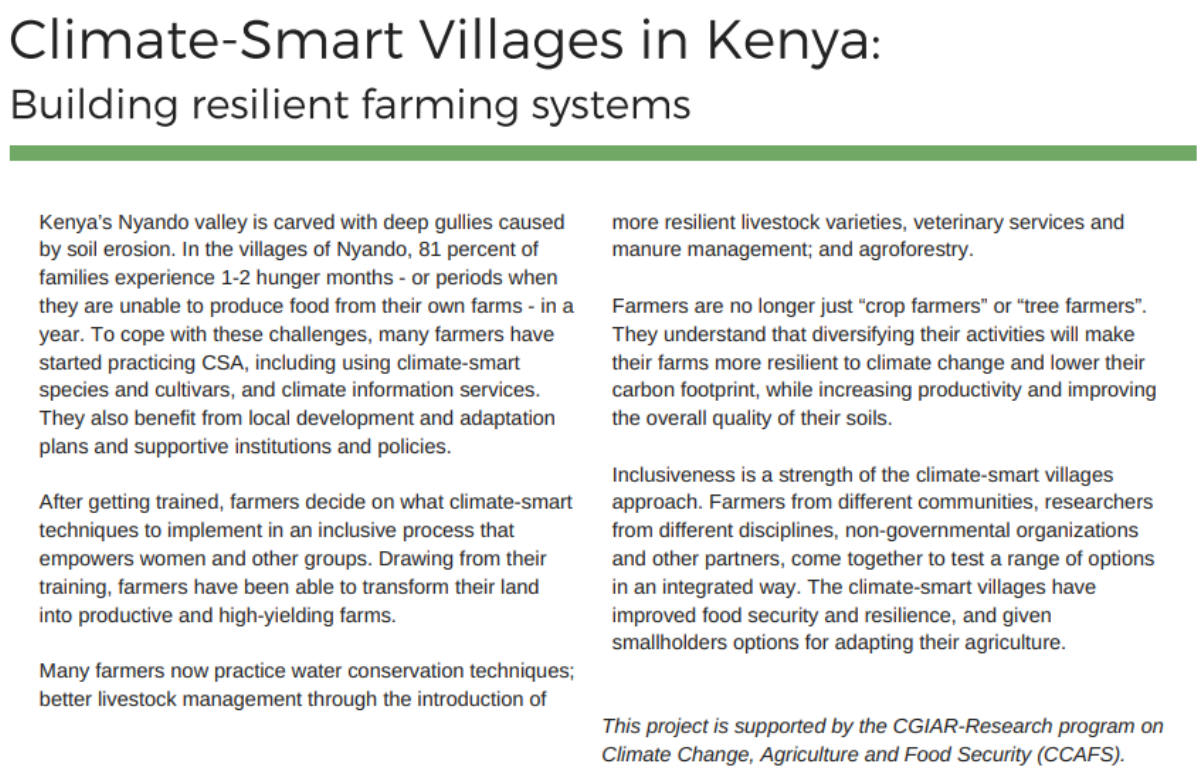
Pillar 1	Sustainably increasing agricultural productivity to support equitable increases in incomes, food security and development.
Pillar 2	Adapting and building resilience to climate change from the farm to national levels.
Pillar 3	Developing opportunities to reduce Greenhouse Gases (GHG) emissions from agriculture compared with past trends.

Source: Williams *et al.*, 2015; World Bank, 2018b; Asafu-Adjaye and Tessema, 2019

In Africa there are many opportunities for CSA interventions. Opportunities arise due to low levels of technological development which results in food losses due to poor production, harvesting and handling practices as well as storage problems (Scherer and Verburg, 2017). These poor practices unfortunately also lead to the degradation of the surrounding environment and soil fertility losses (Williams *et al.*, 2015). Africa has also been identified as the region most at risk to climate change due to the continent's high dependence on rainfed agriculture and its dependence on natural resources (Asafu-Adjaye and Tessema, 2019; Jellason et al., 2021). Factors such as resource constraints, institutional instruments, climate and ecological settings, and farmer's characteristics (experience, access to extension services) are significant determinants of CSA uptake by farmers in Africa (Abegunde and Obi, 2022). To date, the expansion in agricultural production has predominantly arisen due to expansion in land area used, little expansion in production has arisen due to changes in production techniques and yield increases (Williams *et al.*, 2015).

However, Africa has had success stories with CSA, ten of which are documented in a booklet produced by the World Bank (Hou, Morales, Obuya, Bobo and Braimoh, 2018), despite low uptake by farmers (Abegunde and Obi, 2022). For example,

Climate-Smart Villages in Kenya. Figure 1-2 is an extract from Hou *et al.* (2018) discussing the success farmers in Nyando valley in Kenya have had with CSA and how the method was implemented for the specific area[3]. Other success stories discussed arise from Uganda, Tanzania, Ethiopia, Zambia and Morocco (Hou *et al.*, 2018; World Bank, 2018b). Efforts to promote CSA have been advancing at the policy level in Africa which has resulted in the formation of the African Climate Smart Agriculture Alliance (ACSAA), which is aimed at enabling the New Partnership for Africa's Development (NEPAD) to collaborate with Regional Economic Communities (RECs) and Non-Governmental Organizations (NGOs) in targeting 25 million farm households by the year 2025 (Williams *et al.*, 2015). The Economic Community of West African States (ECOWAS) has, for example, put in place the West Africa CSA Alliance to support the mainstreaming of CSA into the Economic Community of West Africa Agriculture Policy/Comprehensive Africa Agriculture Development Plan (ECOWAP/CAADP) programmes (Williams *et al.*, 2015).



Climate-Smart Villages in Kenya:

Building resilient farming systems

Kenya's Nyando valley is carved with deep gullies caused by soil erosion. In the villages of Nyando, 81 percent of families experience 1-2 hunger months - or periods when they are unable to produce food from their own farms - in a year. To cope with these challenges, many farmers have started practicing CSA, including using climate-smart species and cultivars, and climate information services. They also benefit from local development and adaptation plans and supportive institutions and policies.

After getting trained, farmers decide on what climate-smart techniques to implement in an inclusive process that empowers women and other groups. Drawing from their training, farmers have been able to transform their land into productive and high-yielding farms.

Many farmers now practice water conservation techniques; better livestock management through the introduction of more resilient livestock varieties, veterinary services and manure management; and agroforestry.

Farmers are no longer just "crop farmers" or "tree farmers". They understand that diversifying their activities will make their farms more resilient to climate change and lower their carbon footprint, while increasing productivity and improving the overall quality of their soils.

Inclusiveness is a strength of the climate-smart villages approach. Farmers from different communities, researchers from different disciplines, non-governmental organizations and other partners, come together to test a range of options in an integrated way. The climate-smart villages have improved food security and resilience, and given smallholders options for adapting their agriculture.

This project is supported by the CGIAR-Research program on Climate Change, Agriculture and Food Security (CCAFS).

Figure 1-2: Climate-smart villages in Kenya

Source: Hou *et al.*, 2018

There are challenges, however, in the implementation of CSA in Africa. These include;

- Lack of practical understanding of the approach,

[3] For the full technical report see: (Oostendorp, van Asseldonk, Gathiaka, Mulwa, Radeny, Recha, Wattel and van Wesenbeeck, 2021)

- Lack of data and information and appropriate analytical tools at local and national levels
- Lack of adequate investment at the national/regional level and high up-front cost investment in CSA at the farm level,
- Inadequate coordinated, supportive and enabling policy frameworks,
- Socioeconomic constraints at the farm level,
- Inadequate empowerment of woman and youth,
- Lack of adequate and innovative financing mechanisms and effective risk-sharing,
- Difficulty in managing trade-offs from the farmers' and policymakers' perspectives (Williams *et al.*, 2015; Asafu-Adjaye and Tessema, 2019).

The opportunities that are available for CSA development in Africa include;

- Africa's natural and human resources (Africa has 65% of the world's arable land and also has 10% of the world's internal renewable water sources),
- Evolving and increasing set of analytical tools and decision support models (Williams *et al.*, 2015).

At the sub-regional level, opportunities for CSA include;

- Integrated solutions for sustainable agricultural intensification in Sub-Saharan Africa (SSA),
- Recovery of forest-based farming in Central Africa,
- Horticulture led growth in Northern Africa,
- Crop-livestock integration in Southern Africa,
- Rice and aquaculture systems supplement cereal and tuber staple crops in West Africa,
- Water-smart agriculture in East Africa (Williams *et al.*, 2015; Asafu-Adjaye and Tessema, 2019).

The Western Cape has not been immune to the effects of climate change as most parts of the province have been heavily affected by water shortages (Wesgro, 2022). These water shortages are not expected to end any time soon and so the province is at continuous risk of being negatively affected by extended drought periods and negative production impacts (Wesgro, 2022). This calls for the need for the scaling of CSA.

1.2.2 Optimizing Resources through Precision Agriculture

The Fourth Industrial Revolution (4IR), and subsequently the fourth agricultural revolution (agriculture 4.0), is currently underway and is significantly different to

previous industrial revolutions in the sense that the scope of the 4IR is far broader than 'mere smart and connected machines' (Western Cape Department of Agriculture (WCDoA) and the University of Stellenbosch Business School (USB), 2018; Jellason et al., 2021). The 4IR involves a pivot towards a conjoined physical and virtual world (WCDoA and USB, 2018). The 4IR is resulting in the realization of many opportunities. To 'stay ahead of the game' agricultural actors will need to 'embrace technology through the adoption of farm-management software, precision agriculture, predictive data analysis and genetics' (WCDoA and USB, 2018). This document, however, is concerned predominantly with precision agriculture which is quickly gaining popularity and traction across the globe (Sahel, 2021). Figure 1-3 is an infographic that displays the industrial revolutions to date and highlights how they have impacted agricultural production through the years.

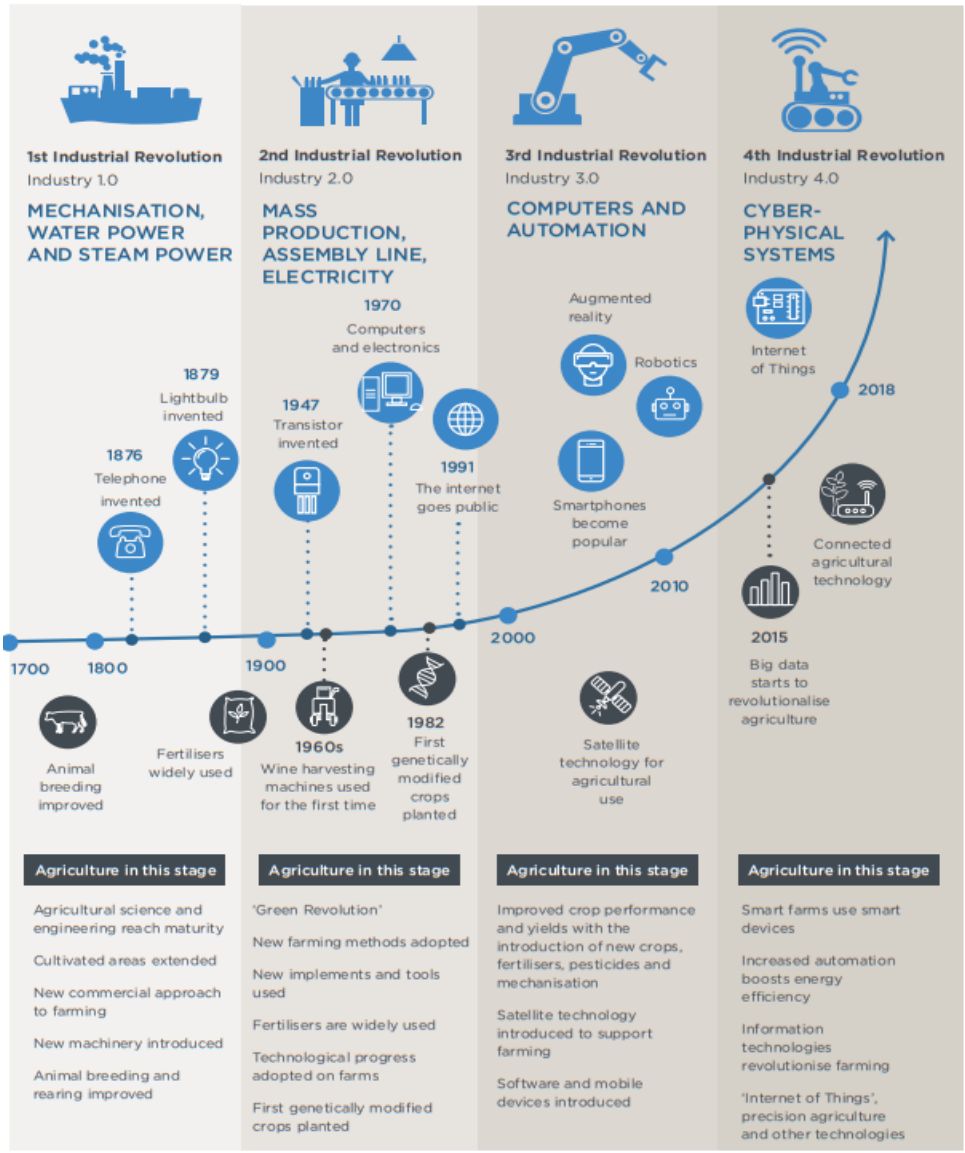


Figure 1-3: The four industrial revolutions

Source: WCDoA and USB, 2018

Precision agriculture and the increased adoption of Agricultural Technology (AgTech) offers new, efficient and sustainable ways of farming and is leading to increased competition amongst producers (WCDoA and USB, 2018; Du Preez, 2020). The need for efficient and increased production in order to feed an expected population of over 9 billion people by 2050, in the light of climate change and energy concerns, has never been more important for the human race than it is now (WCDoA and USB, 2018).The use of sensors, satellites, drones and artificial intelligence in precision agriculture are promising advancements towards increased and more efficient agricultural production (WCDoA and USB, 2018; Du Preez, 2020; AFGRI, 2022).

Precision agriculture is a term used for 'site specific' crop management (Kynoch, 2022). This form of crop management involves the analysis and consideration of a multitude of variables in order to determine the correct volume of inputs required to maximize the achievable yield (Kynoch, 2022). This form of agriculture is growing in popularity around the world as it cuts on costs, time, reduces wasted inputs and is also environmentally friendly (AFGRI, 2022; Kynoch, 2022). Figure 1-4 displays the roles of different technologies in precision agriculture and how they link up to achieve more efficient and increased production.

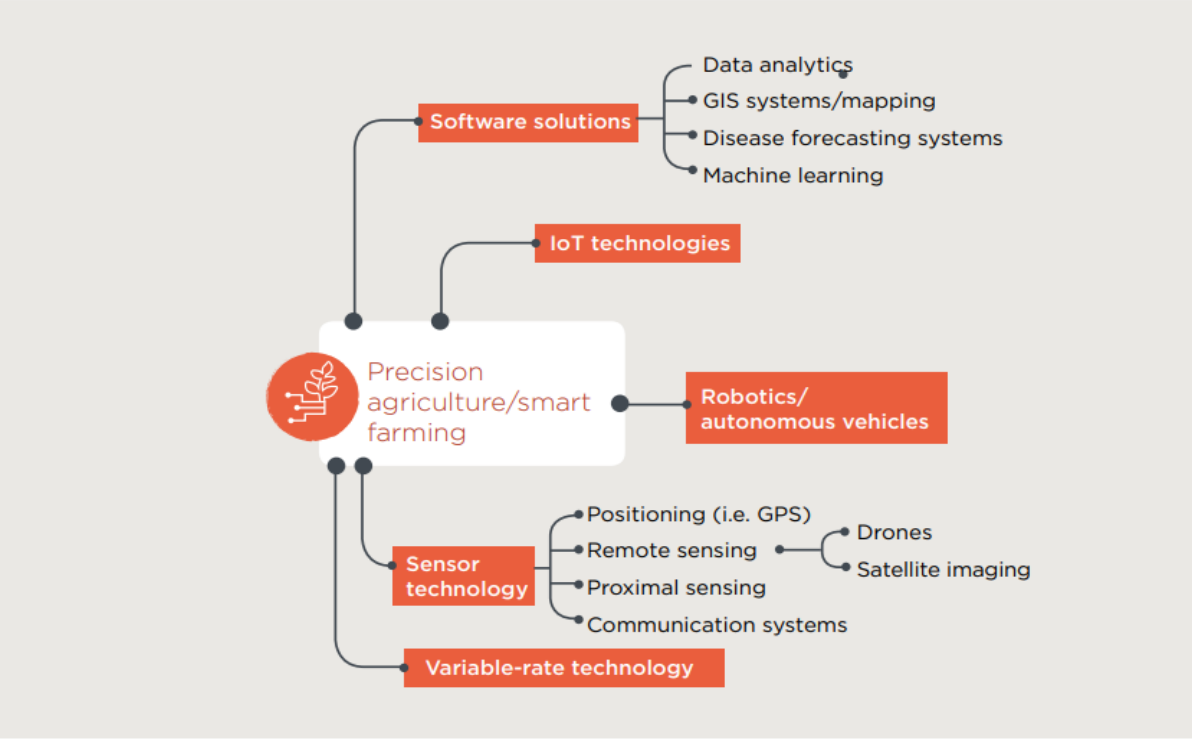


Figure 1-4: The different roles of technologies involved in achieving precision agriculture

Source: WCDoA and USB, 2018

In Sub-Saharan Africa (SSA), cereal and livestock are the predominant agricultural industries, with maize being the staple food across most of the region (Du Preez, 2020). However, SSA is subject to water stress issues and interestingly, large quantities of the crops grown in the region are not perfectly suited to the environment (Du Preez, 2020). This calls for the need of increased investments into precision agriculture. To date, precision agriculture is yet to make its mark on the African continent as there is little evidence of its use (Sahel, 2021). However, there is evidence of a sector-wide precision agriculture initiative across the continent which has the potential to create a solid foundation for further progress (Sahel, 2021). Precision agriculture will allow for agriculturalists to produce more efficiently and to therefore use less water and other inputs (WCDoA and USB, 2018; Du Preez, 2020; Sahel, 2021; Kynoch, 2022). Therefore, precision agriculture technology is seen as a necessity and a means to improve agricultural productivity and to increase yields, all at the same time as reducing wasted inputs and cutting on costs and providing employment (FOLU, 2019; Magwentshu et al., 2019). This is vital going forward with a growing population and limited resources that are already being stressed.

African agriculture is predominantly characterized by small-scale farmers that only operate on a few hectares of land (Jellason *et al.*, 2021). 60% of Africa's population depends on these smallholder farmers directly or indirectly, and the sector contributed 23% to the continent's Gross Domestic Product (GDP) (African Union Development Agency (AUDA), 2021). These farmers are characterized by low capital intensity and low productivity levels (Jellason *et al.*, 2021). Some authors believe that if Africa is to become active and grow in the precision agriculture front, these smallholder farmers need to be focused on (Jellason *et al.*, 2021). Some challenges that have impacted the adoption of precision agriculture in the low capital, smallholder agricultural sector are the high costs and knowledge requirements and the unavailability of services afforded to them, these are therefore some areas in which to focus on (Ncube and Mupangwa, 2018). It is a good sign then, that precision agriculture is gaining traction in Africa (AUDA, 2021). Despite the gaining traction in precision agricultural production techniques, there are few studies that delve into smallholder farmers and livestock production (Nyaga et al., 2021). Figure 1-5 illustrates 40 innovators in Africa's precision agriculture market and in which countries they operate, and the investments made in 2020, and Figure 1-6 shows the increased trend of investments into precision agriculture between 2015 and 2020. Figure 1-7 shows the number of precision agriculture studies by country on the African continent, highlighting countries that have few or no studies looking into precision agriculture, and countries that are more involved.

Figure 1-5: 40 innovators in Africa's precision agriculture market in 2020

Source: The Baobab Network, 2021

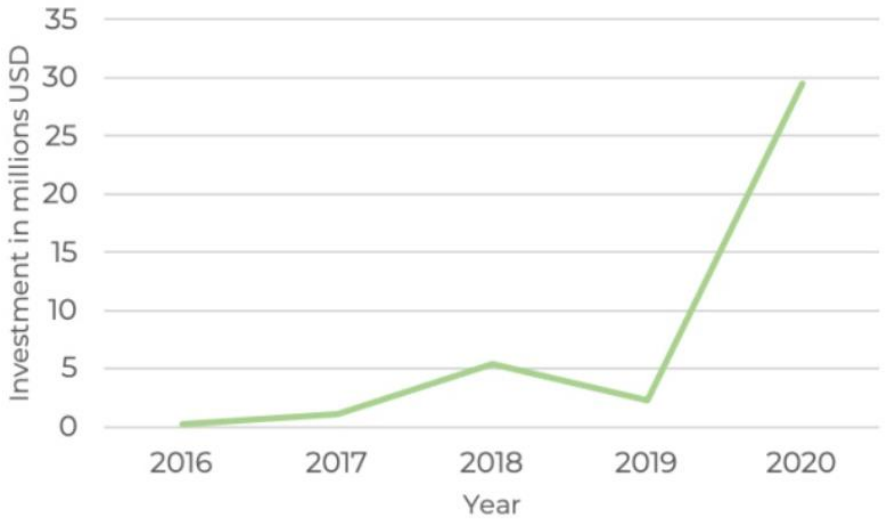


Figure 1-6: Investments into precision agriculture in Africa between 2015 and 2020

Source: The Baobab Network, 2021

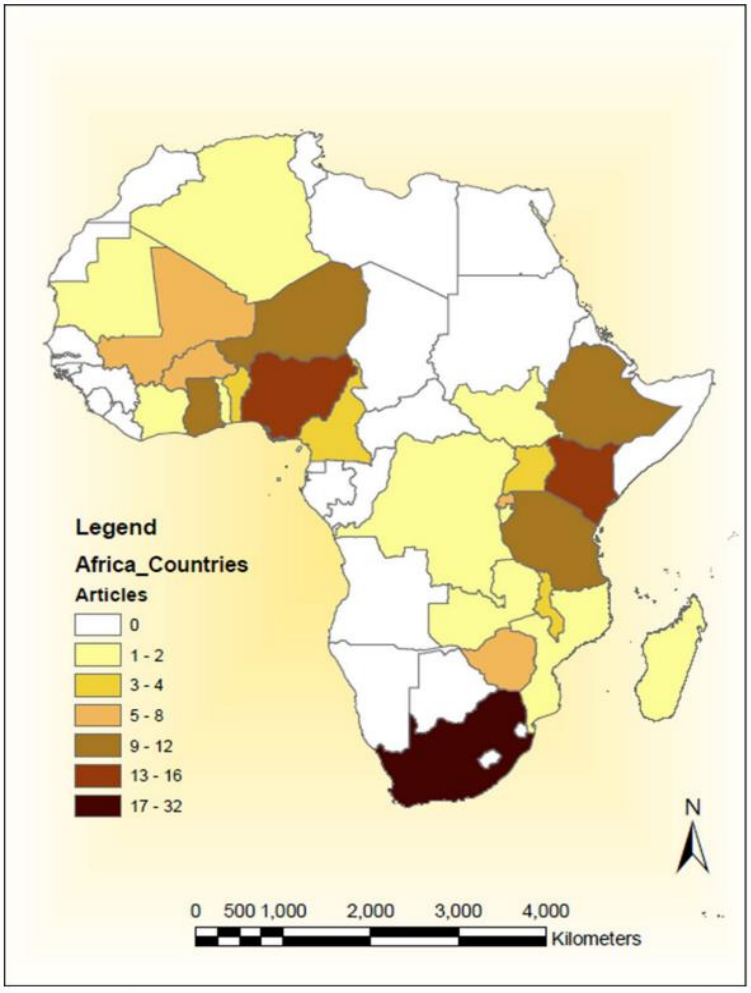


Figure 1-7: Precision agriculture studies by country on the African continent

Source: Nyaga *et al.*, 2021

In South Africa, fruit farmers have benefited from adopting precision agriculture in their farming process (AUDA, 2021). The Western Cape Department of Agriculture (WCDoA), for instance, has developed the 'Fruit Look' technology which enables fruit farmers to improve water usage whilst also maintaining large levels of production (AUDA, 2021). Along with aiding the farmers in conserving water in a drought prone area, Fruit Look provides the farmers with other data that concerns 'crop growth, evapotranspiration deficits, and crop nitrogen status', this information enables farmers to implement cost-effective crop management practices (AUDA, 2021). South Africa is also a continental leader when it comes to research into precision agriculture which is a strong advantage that can be capitalized on (Nyaga *et al.*, 2021). Other countries, such as Mozambique, Tanzania and Zimbabwe have also adopted precision agriculture practices and are reaping the rewards (Ncube and Mupangwa, 2018; AUDA, 2021).

The Western Cape has not been immune to the effects of climate change as most parts of the province have been heavily affected by water shortages (Wesgro, 2022). These water shortages are not expected to end any time soon and so the province is

at continuous risk of being negatively affected by extended drought periods and negative production impacts (Wesgro, 2022). This highlights the importance and the need for precision agriculture in the Western Cape.

1.2.3 Digital Technology in African Agriculture

Digital technologies are improving African food producers and processors' ability to increase food production, improve food safety, minimize food waste, safeguard the environment, improve operational efficiency, and overall create economic gains in agriculture (Benyam et al., 2021; Kudama et al., 2021; UN, 2021; World Bank, 2021a; World Bank, 2019a). Interest in digital platforms by investors and consumers in Africa is growing, and this is apparent, amongst many indicators, in the rise of tech hubs (Mabaya & Porciello, 2022). Tech hubs, which are credited with providing Africa's agri-food systems with innovative digital solutions (Afrilabs and Briter Bridges, 2019), are described by the Global System for Mobile Communication (GSMA) (2021) as "physical spaces that are designed to foster and support tech startups". Using GSMA statistics, the Afrilabs and Briter Bridges (2019) report show a rise in the number of tech hubs across Africa with 314 in 2016, 442 in 2018, 618 in early 2019, and 643 towards the end of 2019. These tech hubs are concentrated in South Africa, Nigeria, Egypt, Kenya, Morocco, and Ghana. According to Tsan et al. (2019), there were at least 390 information communication technology (ICT) and digital solutions actively operating within African agriculture in 2018. By January 2020, Phatty-Jobe et al. (2020) note this number had increased to 437 for sub-Saharan Africa alone.

Phatty-Jobe et al. (2020) identified six key themes in digital agriculture services in Africa, namely advisory and information services, market linkage, financial access, supply chain management, data intermediary, and macro agri-intelligence (see Figure 1-8). They noted that advisory and information services dominate digital agriculture in Africa, accounting for 35% of all available digital solutions offered and 68% of users that are subscribed to these solutions. Market linkages account for 27% of total digital agriculture solutions with only 7% of subscribers. In spite of all this progress, concerns have been raised that digital agriculture might shrink in Africa as most of this growth is donor-funded and there is a low willingness to pay for digital services by small-scale farmers (Mabaya & Porciello, 2022). There is also a lack of clear revenue models in most digital agriculture solutions which is cause for concern for ensuring sustainability in growth (Tsan et al., 2019).

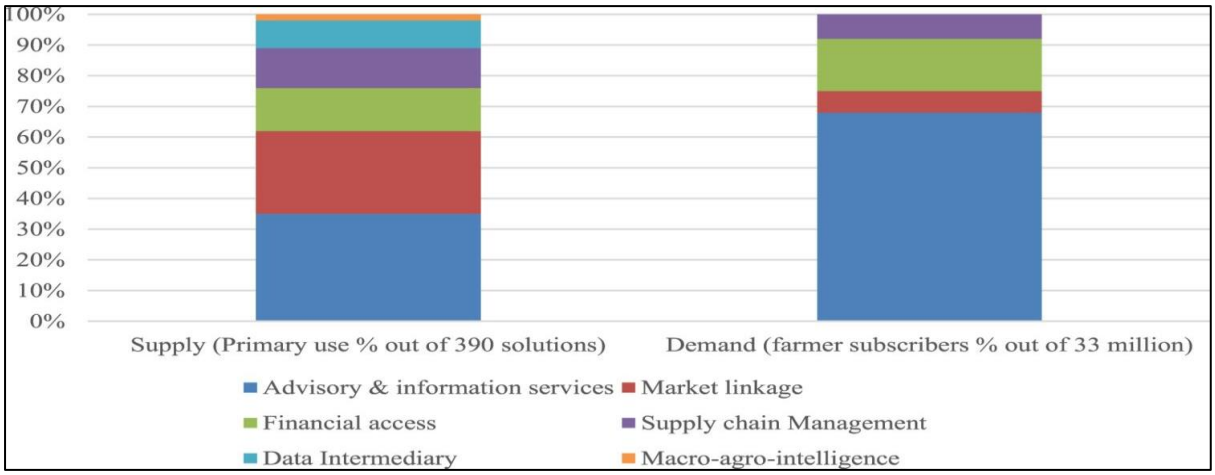


Figure 1-8: Supply and demand of digital agriculture solutions in Africa

Source: Mabaya & Porciello (2022)

1.2.3.1 Digital Payment Systems

In sub-Saharan Africa, there is perceptible growth in digital financial services which is a result of the rapid adoption of mobile money in most states (Phatty-Jobe et al., 2020). There has been a rise in the usage of mobile-based money applications and this is evident in mobile money transactions which amounted to USD$490 billion in 2020 alone (GSMA, 2021). The World Bank (2020b) notes that there exists USD$6 billion digitization potential in mobile money in sub-Saharan Africa. Through digitization, there can be greater financial inclusion for farmers (World Bank, 2020b). This not only improves their consumption but also allows them to make productivity-enhancing investments. Furthermore, it places them in a better position to access credit, savings, and insurance products (World Bank, 2020b). Digital money also creates transparency on when and how farmers are paid. While digitization is lower in sub-Sahara Africa than in other regions globally (World Bank, 2020b), the observation is that there exists significant variability between countries. Using Global Findex 2017 data, the World Bank (2020b) spotlights Kenya and Ghana as the top two countries with the highest uptake of mobile money. In both countries, 37% of all agricultural payment recipients reported using a mobile money account. Uganda and Zambia are also noted to have a high uptake of mobile money with 28% and 27%, respectively, of agricultural payment recipients using a mobile money account (World Bank, 2020b). This serves as an indication of mobile money accounts being a key driver of digitization in these African states.

1.2.3.2 South Africa and Digital Money in Agriculture

Digital agriculture in South Africa indicates significant growth and dynamism (Born et al., 2021). However, digital agriculture innovations and solutions are skewed towards commercial farmers and this is explained by South African agriculture's dualistic nature (Mabaya & Porciello, 2022). Smidt (2021) notes that due to budget constraints, small-scale South African farmers are mostly limited to mobile phone applications. The prohibitive cost of data, which the Alliance for Affordable Internet (2018) reported to

be around USD$10.37 per gigabyte, is a major deterrent to small-scale farmers and agri-SMEs fully leveraging mobile technology as a productivity tool. These prohibitive costs are largely attributable to the South African government's delays in releasing new radio frequencies (Mabaya & Porciello, 2022). Due to the prominence of mobile technology amongst small-scale farmers and agri-SMEs, there exists potential to improve their financial inclusion through mobile money accounts.

1.2.4 Harnessing Mobile Technology for Agricultural Service Delivery

The digitization of agri-food systems and value chains in Africa has largely been spurred by the rapid penetration of mobile phones (Mabaya & Porciello, 2022). Between 2005 and 2020, mobile phone subscriptions in sub-Saharan Africa have risen from just under 10 per 100 people to over 90 per 100 people (World Bank, 2022). 615 million people in sub-Saharan Africa (equivalent to about 50% of the region's population) are forecast to subscribe to mobile technology by 2025 (GSMA, 2021). Declining prices of mobile phones (particularly second-hand mobile sets) coupled with a rise in international mobile service providers are expected to accelerate this adoption of mobile technology (Mabaya & Porciello, 2022). The GSMA report indicates a 46% penetration rate of unique mobile subscriptions in 2020 alone, with 48% of these being smartphones (GSMA, 2021). Such a rise in smartphones might explain the visible growth in the percentage of the sub-Saharan population that is making use of the internet, from just 2% in 2005 to almost 29% in 2019, with no signs of slowing down (World Bank, 2022). Considering mobile connections via smartphones are expected to reach 68% by 2025 in Africa (GSMA, 2021), it is tenable to expect greater opportunities for mobile-based solutions in many sectors, agriculture included (Mabaya & Porciello, 2022).

With this apparent shift towards a digital-centric future in Africa, mobile technology can be harnessed for the creation and consumption of innovative solutions in agriculture. Ordu et al. (2021) note that mobile technology can progress the formation of platforms (e.g., e-commerce platforms) that link farmers directly to markets, service providers, and aggregators (Ordu et al., 2021). Such platforms create network effects that drive scale in agriculture and shorten the value chain (Mabaya & Porciello, 2022; Ordu et al., 2021). Mobile phones can be transformed into productivity tools that farmers, particularly small-scale farmers, can utilize to access critical information to enhance their knowledge and skills (Phatty-Jobe et al., 2020). Thence, improving on-farm services, reducing inefficiencies, and boosting yields. Mobile technology is also a useful tool for digital advisory and extension services (Mabaya & Porciello, 2022). The potential for extension services is inarguable considering most African countries are estimated to have a ratio of 4000 farmers to 1 extension worker, compared to FAO's recommendation of 1 extension officer to 400 farmers (Tambo et al., 2019). Mobile phones make it more feasible to provide farmers with real-time advice in multimedia formats and local languages (Mabaya & Porciello, 2022). Based on substantial evidence, digital advisory and extension services are noted to have positive impacts on income, productivity, yields, resilience, nutrition, social inclusion,

social learning, and gender outcomes (Mabaya & Porciello, 2022). Despite these numerous benefits, Mabaya & Pociello highlight that digital technologies (e.g. mobile phones) are enablers of progress not solutions to the productivity challenges faced by small-scale agricultural producers.

There are potentially significant gains for agriculture in Africa as mobile technologies and services are forecast to generate USD$155 billion in economic value added by 2025 (GSMA, 2021). By harnessing mobile technology to encourage the adoption of digital solutions African governments can better position African agriculture (Mabaya & Porciello (2022). The potential role of governments in African agriculture's digitization is underlined by Tsan et al. (2019) who note that Mobile Network Operators (MNO) and governments have the largest user base, accounting for 40% of total users of digital agriculture solutions. Despite a large user base, MNOs and African governments only deploy 4% and 2% respectively of digital solutions (Tsan et al., 2019). The provision of most digital solutions (74%) is by the private sector (Tsan et al., 2019). East Africa is noted to have the most sophisticated digital agriculture in terms of geographic spread, with the highest number of active users estimated at around 20.9 million (Mabaya & Porciello, 2022). In Comparison, Southern Africa and Central Africa have 5.1 million and 1 million users respectively. Krishnan (2018) notes that East Africa has been attracting significant investment in digital agriculture, with USD$425 million invested during the period 2015 to 2017. 64% of this investment was attracted by Kenya, 26 % by Uganda, 6% by Tanzania, and 3% by Rwanda. Tsan et al (2019) spotlight Kenya as having the highest concentration of digital agriculture in Africa.

1.2.5 South Africa and ICT in Agriculture

Smidt (2018) noted that there is a dearth of literature on Information Communication Technologies (ICTs), their usage, as well overall impact (both current and potential) on emerging commercial agriculture in South Africa. This is particularly important considering ICT is improving the effectiveness and efficiency of processes of collecting, saving, analyzing, and using data in the agricultural sector (AGRA, 2016). According to the World Bank (2017), ICT refers to "…any device, tool, or appliance that permits the exchange or collection of data through interaction or transmission". Smidt (2018) focused on the state of e-agriculture in South Africa and explored the various factors of ICTs that influence the development of emerging commercial agriculture in South Africa and the Western Cape specifically. This author explains that e-agriculture includes the design, development, and application of innovative ways to use ICTs in the rural domain, focusing primarily on agriculture. Despite a consensus among surveyed farmers that ICTs were essential in their farming activities, Smidt (2018) noted a lack of ICT literacy which was also noted to be one of the top influencers on adoption.

While it can be expected that emerging commercial farmers mostly do not afford new ICTs, ICTs via mobile technology can assist emerging farmers to access export markets through online advertising, traceability, and e-commerce (Chirinda, 2021;

Smidt, 2018; Smidt, 2021). Barends-Jones (2020) concurs by highlighting that South African farmers, particularly small-scale farmers, still face challenges in accessing markets. The 'where to sell' problem may be solved by incorporating mobile technology to create e-commerce models which allow small businesses market penetration into third-party markets that are already established and at minimal costs. However, Barends-Jones (2020) notes that there is still low digital maturity in provinces such as the Western Cape and there remain inadequate investigations into agricultural producers' preferences and willingness to pay for digital platforms for e-commerce. Also, a limited number of studies have investigated the adoption of e-commerce in African countries (Barends-jones, 2020). In the medium-term (5-10 years) poor technology adoption (as indicated by low digital maturity) may cause disruptions to the Western Cape's agricultural sector, prompting Barends-Jones (2020) to highlight the importance of establishing the digital quotient of smallholder farmers. This can be established through collaborations, for example, the collaboratory partnership between Stellenbosch University's Faculty of AgriSciences and AgriColleges to provide digital services (Born et al., 2021).

1.2.6 Leveraging Big Data in Agriculture

The insurgence of disruptive technologies (e.g., mobile technology, BlockChain, IoT, AI) in Africa is providing the agriculture sector with high streams of data that can be harvested into innovative tools and business models to transform the sector (Ordu et al., 2021; Srivastava, 2019). This trajectory of innovations in technology is pointing toward a future in African agriculture where there is an emphasis on new, high-frequency data that is available in real-time to solve challenges in value chains (Mabaya & Porciello, 2022). New-age technologies such as Big Data are being mainstreamed and noted to be impactful in agriculture (Srivastava, 2019). Big Data generates data-driven farming intelligence which can be transformed into actionable insights and added value across the agricultural sectors of African countries (Joubert et al., 2021). Ordu et al. (2021) underline how real-time Big Data and computational power are progressively making it possible for participants in agriculture value chains, including small-scale farmers, to make effective decisions regarding production, product-to-market strategies, access to credit, and access to micro-insurance. For example, Big Data is increasingly being used in supply chain management to improve operational efficiency (Analytics Insights, 2021). It can be used to track and optimize delivery truck routes (Analytics Insights, 2021). Hence, producer-to-market delivery cycles can be shortened which minimizes wastages, particularly of perishable agri-products.

1.2.7 Big Data in Agricultural Production

At the primary level, Big Data can be leveraged to obtain useful information on factors that influence yields such as weather, rainfall, and soil moisture (Analytics Insights, 2021). Using data from multiple sources and different algorithms, Big Data allows

farmers to make data-driven decisions on planting (i.e, when and where to plant), plant spacing (i.e., to minimize weeds and maximize yields), irrigation (i.e, when to water and optimal quantity), chemicals application (i.e, when to apply and optimal quantities), harvesting (i.e, when and how best), and also for yield prediction (Analytics Insights, 2021). This can improve operational efficiencies as farmers make decisions that are based on accurate and reliable information. Through the use of data applications that are capable of processing and analyzing high streams of data, for example, from satellites to farm equipment sensors, farmers can also remotely track and manage farm equipment (Analytical Insights, 2019).

1.2.7.1 Big Data Beyond the Farm Gate

Toesland (2020) points out that if the goal of a shared continental economy is to be realized through growing intra-regional engagement, participants in African agriculture value chains will require an in-depth understanding of the region to engage effectively. By leveraging Big Data, African countries gain access to real-time data-driven intelligence on several key indicators, for example, the ease of doing business, infrastructure, policy environment, population demographics, and investment.

1.2.7.2 Africa Big Data Readiness

Considering many African countries are noted to suffer from 'data poverty' (Wiener et al., 2020), an investigation by Joubert et al. (2021) determined the 'Big Data readiness' of all African countries using a Big Data Readiness Index (BDRI). The BDRI was developed by aggregating three indicators that are commonly used to describe Big Data, namely, volume, velocity, and variety. According to Joubert et al. (2021), 'volume' refers to the size of the data, 'velocity' refers to the speed of data generation and the frequency of its delivery, and 'variety' considers the different data types of data. The results of the study are visualized in Figure 1-9 below. In descending order of BDRI, the following top 10 countries were determined to have the highest scores: Mauritius, South Africa, Seychelles, Rwanda, Kenya, Namibia, Morocco, Tunisia, Cabo Verde, and Ghana.

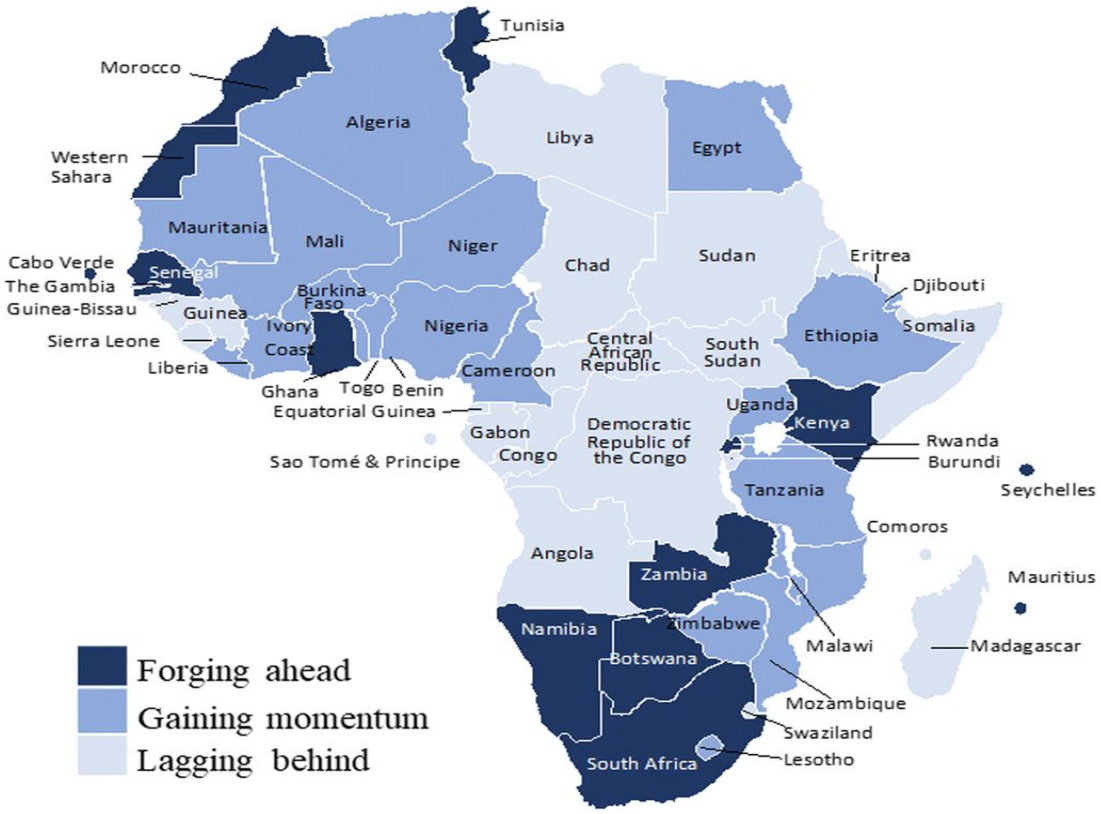


Figure 1-9: The State of Big Data Readiness in Africa

Source: Joubert et al. (2021)

1.2.8 Driving a Circular Economy

In recent years, the concept of a circular economy has emerged as a topical issue that is highlighted as a potential solution to the economic, social, and environmental challenges that are currently being faced by countries (Mehmood et al., 2021; Govindan & Hasanagic, 2018; Sassanelli et al., 2019). The gradual shift away from the traditional linear economic business model approach is being driven, largely in part, by instability in resource prices, shifting socio-economic regulatory landscapes, mounting regulatory pressure on waste, greenhouse gas emissions, and climate change (Mehmood et al., 2021). Unlike the traditional economy which was focused just on production, consumption, and disposal, the circular economy centers around sustainability. This is apparent in its focus on reduction, maintenance, repair, reuse, remanufacturing, and recycling (Esposito, 2020; Gustavsson et al., 2013; Parfitt et al., 2010). An economy is deemed to be circular when these aforesaid principles of sustainability operate at all levels of the economy, that is, at the micro, meso, and macro-level (UN, 2018; Mehmood et al, 2021). In Africa, like many other regions, circular economy opportunities are noted to exist in resource-intensive sectors such as agriculture, transport, and manufacturing (Godfrey et al., 2021). The promise to

countries of driving a circular economy is sustainable development that manifests through economic prosperity, social quality, and environmental resilience (Mehmood et al., 2021).

The drive for a circular economy is also synced to the United Nations 2030 Agenda (UN, 2018). Circular economy as a tool contributes toward achieving multiple Sustainable Development Goals (SDGs), which include, SDG 6 on energy, SDG 8 on economic growth, SDG 11 on sustainable cities, SDG 12 on sustainable consumption and production, SDG 13 on climate change, SDG 14 on oceans, and SDG 15 on life on land (UN, 2018). Against this knowledge, the 2020 Africa SDG index rankings (shown in Table 1-3 below) can be used to assess the extent of Africa's drive toward a circular economy (SDGC/A & SDSN, 2020). The Africa SDG index uses 97 indicators across all 17 SDGs to rank 52 African countries. A score of 0 signifies the worst outcome and a score of 100 the best outcome. From Table 1-3, it is visible that Tunisia ranks highest in Africa (67.10) indicating that it is 67% towards achieving the SDGs. Mauritius (66.79), Morocco (66.30), Algeria (65.90), and Carbo Verde (65.59) are also part of the top five ranked countries. Low-performing countries in the Africa SDG index are noted to be countries with high levels of poverty and conflict within their territories (SDGC/A & SDSN, 2020). By implication, these low-ranking countries have less drive towards a circular economy.

Table 1-3: 2020 Africa SDG Index Ranking

Rank	Country	Score	Rank	Country	Score
1.	Tunisia	67.10	27.	Zambia	53.25
2.	Mauritius	66.79	28.	Mali	53.22
3.	Morocco	66.30	29.	Eswatini	52.94
4.	Algeria	65.90	30.	Libya	52.70
5.	Cabo Verde	65.59	31.	Malawi	52.64
6.	Egypt	65.44	32.	Lesotho	52.43
7.	Botswana	63.93	33.	Mozambique	52.17
8.	Ghana	62.69	34.	Sierra Leone	51.59
9.	South Africa	62.20	35.	Djibouti	51.30
10.	São Tomé and Príncipe	61.61	36.	Angola	51.18
11.	Senegal	58.69	37.	Republic of Congo	50.81
12.	Kenya	58.54	38.	Niger	50.47
13.	Namibia	58.31	39.	Burundi	50.37
14.	Gabon	58.07	40.	Guinea	50.20
15.	Côte d'Ivoire	57.67	41.	Liberia	49.33
16.	Rwanda	57.65	42.	Nigeria	48.84
17.	Tanzania	57.00	43.	Madagascar	47.94
18.	Burkina Faso	55.90	44.	Sudan	47.85
19.	Uganda	55.71	45.	Comoros	46.98

Rank	Country	Score	Rank	Country	Score
20.	The Gambia	55.53	46.	Guinea-Bissau	46.37
21.	Togo	54.41	47.	Democratic Republic of Congo	44.83
22.	Ethiopia	54.15	48.	Eritrea	44.17
23.	Zimbabwe	53.79	49.	Somalia	42.73
24.	Mauritania	53.78	50.	Chad	40.34
25.	Benin	53.53	51.	Central African Republic	38.05
26.	Cameroon	53.37	52.	South Sudan	32.36

Source: SDGC/A & SDSN, 2020

1.2.9 Women Empowerment

The United Nations SDG 5 outlines the globally shared 2030 agenda for achieving gender equality and empowerment (SDGC/A & SDSN, 2020). Africa has shown significant commitment and progress in advancing this agenda (UN Women, 2022). This commitment is apparent in the ratification of international legal instruments such as the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) by the majority of African countries (UN Women, 2022). More than half of African countries have also ratified the African Union's Protocol on the Rights of Women in Africa (UN Women, 2022). Notwithstanding this progress, women's potential is still hampered by discrimination (Moodley et al., 2019). In the context of agriculture, Njuki et al. (2021) spotlight evidence of discrimination against African women in accessing resources such as land, water, seeds, chemical inputs, technology and information, and finance. This, despite women being a source of vitality across all sectors of the economy in Africa (UN Women, 2022). Women are noted to be key actors in agri-food systems as producers, wage workers, processors, traders, and consumers (Njuki et al., 2021).

Moodley et al. (2019) note that like many other regions in the world, Africa's progress toward gender parity has stalled. For example, the Gender Parity Score (GPS)[4] for Africa was 0.58 in 2015 and 2019, indicating stalled progress in achieving a state of gender equality (Moodley et al., 2019). Since women empowerment is a critical aspect of achieving gender equality (Njuki et al., 2021), the GPS (taken as a proxy for gender equality) can provide insights into the state of women's empowerment across Africa. Figure 1-10 below visualizes the GPS across African states. It is noted that South Africa scored the highest GPS of 0.76 (medium inequality) and Niger the lowest, scoring 0.45 (extremely high inequality). To accelerate Africa's progress toward gender parity, Moodley et al. (2019) highlight 5 priority areas that require intervention by both the public and private sectors:

[4] Developed by the McKinsey Global Insitute.

1. Invest in human capital - e.g. equip women to enhance their financial, digital, and legal literacy.
2. Create economic opportunities - e.g. unlock opportunities for women-owned businesses. Also, focus on higher female participation in quality jobs in the formal sector.
3. Leverage technology - e.g. spread the use of digital technology (mobile phones) to raise financial inclusion and empower female entrepreneurship.
4. Shape attitudes - e.g. run campaigns
5. Enforce laws, policies, and regulations - e.g. institute and enforce legal rights, create enabling policies and regulations for gender equality.

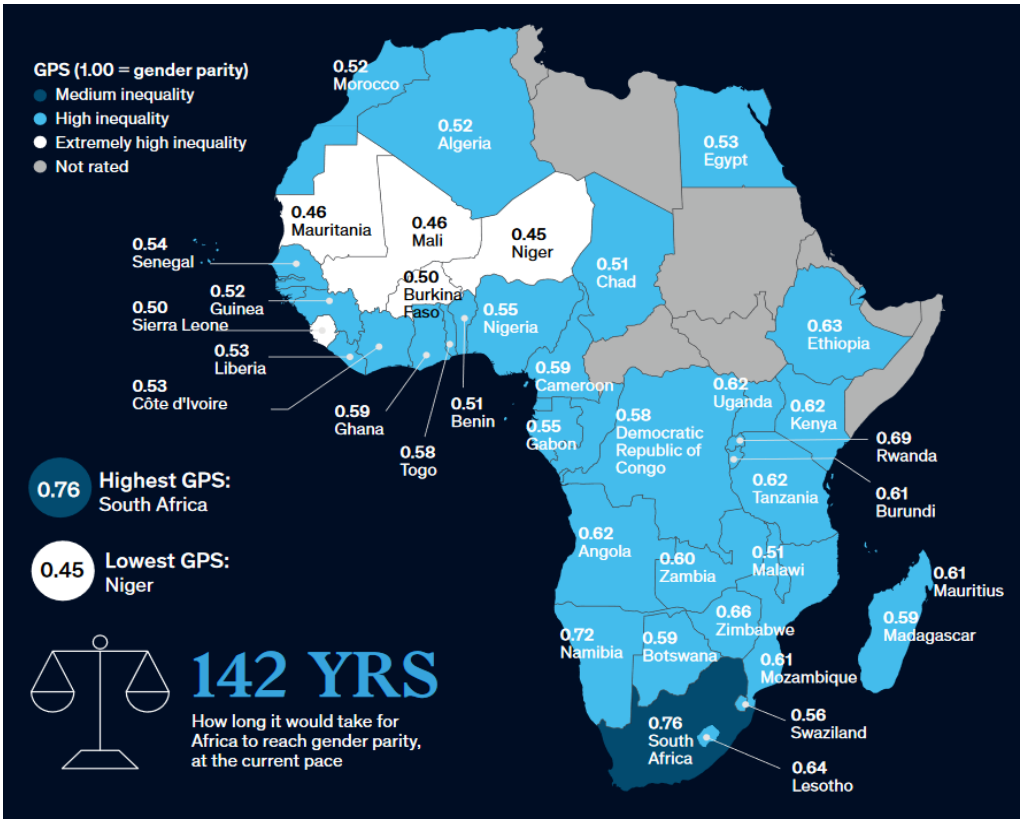


Figure 1-10: The economic case for gender parity in Africa

Source: Moodley et al. (2019)

1.2.10 Embracing Protective Foods (rich in minerals and vitamins)

One of the 'Ten Critical Transitions' identified by the Food and Land Use Coalition (FOLU) (2019), involves a global transition towards healthy diets. This involves increased consumption of plant-based diet that includes more protective foods- foods like fruits, vegetables and whole grains (FOLU, 2019). Current, unhealthy diets are responsible for serious effects on not only human health but also detrimental environmental effects due to the need for more agricultural land and therefore increased

deforestation levels (FOLU, 2019). Unfortunately, current trends follow that as incomes rise, countries consume more unhealthy foods (FOLU, 2019). With a rapidly rising Gross Domestic Product (GDP) in Africa, only being bested by Asia, this raises concerns for the dietary changes that may arise in coming decades on the continent, thereby implying the need to encourage the move towards healthy diets (FOLU, 2019; Morokong and Pienaar, 2019). If the transition towards protective foods is to be achieved, more protein will need to be sourced from a variety of food types that do not include an increase in the consumption of animal products (FOLU, 2019).

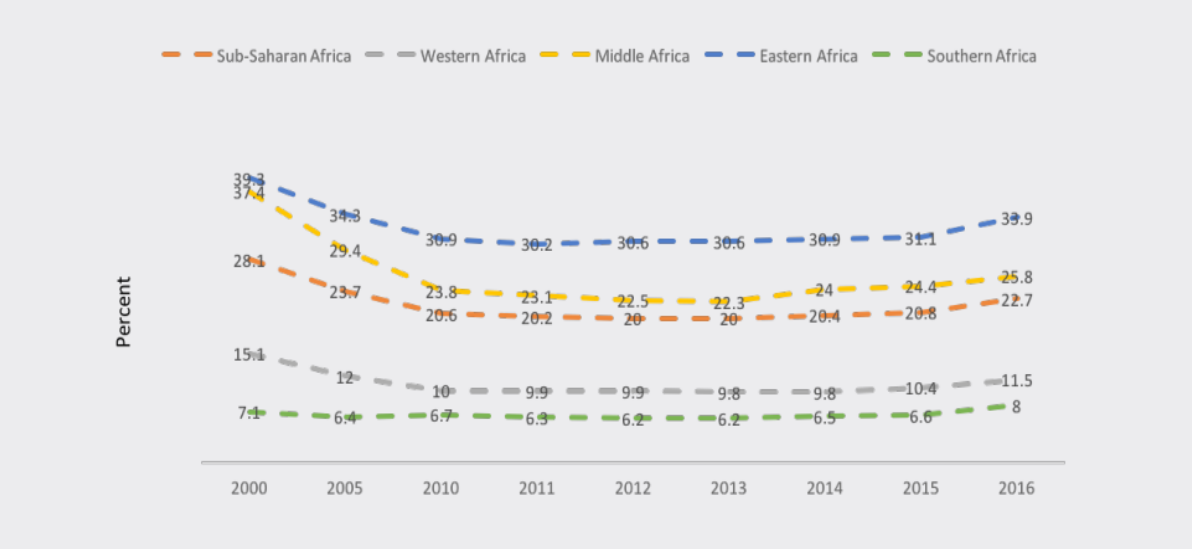
Despite the trend for increased consumption of unhealthy foods with rising GDPs, there is in fact a global transition towards more protective foods (Sahel, 2021). The trend of increased healthy diets has gained a large public interest due to the outbreak of the COVID-19 virus that resulted in a global pandemic (Sahel, 2021). This is due to the recognition that protective foods (foods such a fruit, nuts, vegetables, whole grains and legumes) have beneficial anti-viral properties, immune system-boosting and disease-preventing properties (Sahel, 2021).

In Africa, there is a shift being experienced towards healthier and more nutrient rich, protective diets. The shift is not as rapid as it is in more developed countries, and along with increased rates of urbanization the threat of an increasing shift towards calorie dense and convenient diets threatens a shift towards more nutrient rich diets (Malabo Montpellier Panel, 2021; Sahel, 2021). However, there are many efforts being made towards achieving not only a food self-sufficient continent, but also a well-nourished continent (Sahel, 2021). This shift, however, needs active participation from stakeholders at different levels of the agricultural supply chain. If the African continent is to maintain the trend of increased consumption of protective foods, this will bode well for the Western Cape agricultural export industry. This is because in the top 10 export products of the Western Cape: citrus fruit (Harmonized System (HS)[5] code '0805), apples, pears and quinces (HS code '0808), grapes (HS code '0806), other fruit (HS code '0810) and fruit juices and vegetable juices (HS code '2009) place first, third, fifth, sixth and eight respectively (Wesgro, 2022). This can be seen in Figure 3. These different groupings all belong to protective foods and the fact that the Western Cape is a major exporter of these foods, means that the province is already operating at an advantage and has the opportunity to increase exports of these product grouping into the African continent.

Despite the slow shift towards more nutrient rich diets, African consumers have been consuming more and more processed foods for the past 50 years (Reardon et al., 2021). This has resulted in an increased number of overweight and obese people into the food issue, these individuals have joined the long-standing high levels of stunting

[5] The Harmonized System (HS) was developed by the World Customs Organization (WCO) and was used by Wesgro (2022) in their development of a 'Western Cape Export Growth Strategy' in order to identify different commodities and/or products. Therefore explaining the use of the HS coding system in this document.

and wasting among children and extreme thinness among women of childbearing age' (Reardon *et al.*, 2021). This has resulted in a Double Burden of Malnutrition (DBM) in Sub-Saharan Africa (SSA) (Reardon *et al.*, 2021). Figure 1-11 portrays the levels of undernourishment in different regions in Africa and Figure 1-12**Error! Reference source not found.** displays African countries with the DBM issue. It is important to note that Southern Africa has the lowest levels of undernourishment, but since 2015, on a continental level, undernourishment has increased slowly. It is vital that governments recognise this and make concerted efforts towards reversing the trend and increasing consumption of protective foods on the continent. Suboptimal diets are a major risk factor for avoidable death and disease in middle- and low-income countries (Headey et al., 2021).



Source: FAO

Figure 1-11: Levels of undernourishment in Sub-Saharan Africa (SSA) and other regions

Source: FAO, 2017

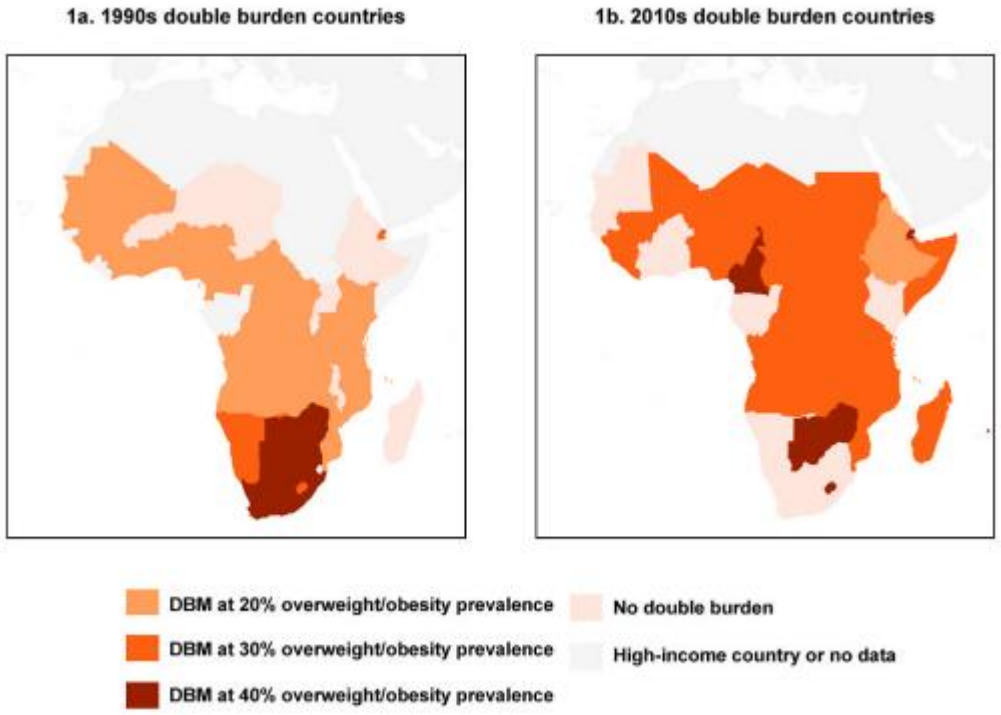


Figure 1-12: African countries with the Double Burden of Malnutrition (DBM) issue

Source: Reardon *et al.*, 2021

The trends driving the increased consumption of processed foods are;

- Rising opportunity costs of time for processing and cooking at home for woman and men working away from home,
- Falling costs of processed foods due to huge increase in domestic supply,
- Increasing purchasing power, and
- Changing food environment due to advertising (Reardon *et al.*, 2021).

1.2.11 Creating Shorter Value Chains

Agriculture value chains in Africa are gradually evolving and this process is being driven by a variety of factors, including income and population growth, changing relative prices, urbanization, and technology change (de Brauw & Bulte, 2021). Consequent to this evolution, there has been an emergence of new entrants along the agricultural value chains and new institutional arrangements (e.g., contract farming and value chain financing) (de Brauw & Bulte, 2021). Advancement in digital or manufacturing technologies combined with improving customer sophistication is creating opportunities for new entrants to shorten the value chain (Hagel et al., 2016). By eliminating or shifting unrequired stages of the traditional value chain to other participants (e.g., through vertical integration), value chains are becoming shorter and more consolidated. Hagel et al. (2016) explain that rearranging participants and stages to create a shorter value chain potentially creates additional value for both

producers and consumers. Furthermore, they highlight that this value-added is potentially above and beyond the incremental cost savings that arise from fewer steps and/or a shift of work to other participants along the value chain. Shorter value chains are noted to alter value delivery to consumers (Hagel et al., 2016). By removing low-value stages of the value chain, participants can seize economic benefits for themselves and their consumers (Hagel et al., 2016).

Multiple reasons support the shortening of value chains. Considering 30 - 50% of agricultural production is lost at various points of the value chain in sub-Saharan Africa alone, shorter value chains provide an attractive opportunity to improve operational efficiency and minimize post-harvest losses (Deloitte, 2015). Long and complex value chains are characterized by high transaction costs, which are cited as being one of the main factors that cumber improvements in the performance of agricultural value chains in Africa (de Brauw & Bulte, 2021). Transaction costs arise from access to liquidity, storage, transportation, trust when buying inputs and selling outputs, as well as costs from risk arising from prices, weather, floods, drought, and theft. Transaction costs are also noted to be significantly high in Africa as most contracting between agricultural buyers and sellers is relational (de Brauw & Bulte, 2021). Long value chains are known to have high capital and infrastructure cost requirements which result in the exclusion of budget-constrained small-scale farmers and agri-SMEs (Hagel et al., 2016). The ability to understand and promptly respond to dynamic customer tastes and preferences is also limited in long value chains (Hagel et al., 2016).

1.2.12 Using BlockChain Technology to Shorten Value Chains

Hagel et al., (2016) spotlight blockchain technology as a powerful tool that provides an attractive opportunity in removing redundant stages of the value chain that focus on validation, tracking, clearing, and risk mitigation. Blockchain technology is an open access decentralized network where transactions, exchange of values, and exchange of goods are carried out with no central mediators (Mavilia & Pisani, 2021). Blockchain systems have been utilized in such a manner in agricultural supply chain management since around 2016 (Rijanto, 2020). Yadav & Singh (2019) cite traceability as one of the main factors prompting the growing implementation of Blockchain systems in agriculture. Motta et al. (2020) point out that owing to its technical and governance characteristics, Blockchain technology provides a suitable system through which information can be effectively communicated to agriculture stakeholders along the agri-food supply chain. The impact of COVID-19 on agri-food supply chains spotlighted the growing importance of Blockchain technology as agriculture stakeholders sought more efficient coordination between parties globally, real-time accurate information, and overall a much more efficient process without bureaucratic processes (Lin et al., 2020; World Bank, 2019a).

Pilot projects such as 'Blockchain for Agrifood', which was launched in 2017, applied Blockchain technology to enhance the compliance process of South African table grapes imported to the Netherlands (Mavilia & Pisani, 2021). This pilot project was

conducted by Wageningen Economic Research and TNO[6] with funding from the Dutch Ministry of Agriculture, Nature and Food Quality. This Blockchain for Agri pilot project creates proof of concept and demonstrates how other African agriculture sub-sectors can eliminate counterparty risk in agricultural transactions, make secure payments, create transparency and improve traceability along agricultural value chains by implementing similar Blockchain technology applications (Mavilia & Pisani, 2021). Within the context of South Africa, Accenture (2018) notes that there is a need for South Africa to understand the potential benefits of applications such applications in facilitating a digital transformation of the agriculture sector. Blockchain technology may potentially be a core technology that will integrate other digital technologies such as artificial intelligence, IoT, Big Data, and ICTs in agriculture.

1.2.13 Promoting Productive and Regenerative Agriculture

The majority of global food and agricultural production takes place on large scale commercial farms that utilize synthetic chemical inputs and large quantities of water (Food and Land Use Coalition, 2019). This larger scale agricultural practice comes with various benefits, such as the ability to produce large quantities of food at a relatively cheap cost, high productivity per hectare and dependable output (Food and Land Use Coalition, 2019). However, this form of agriculture comes with its own drawbacks. The continuous use of potent and synthetic pesticides, herbicides and fungicides raises concerns over the risks imposed on the ecosystems due to the removal of a wide range of different species resulting in reduced biodiversity (Chagnon et al, 2015; World Bank, 2021b). This highly intensive form of agriculture also poses threats to freshwater ecosystems, soil quality, ocean health, natural resources, and the general environment (Chagnon *et al.*, 2015; World Bank, 2021b). Added to these issues, agriculture is both vulnerable to global climate changes and is also seen as a major cause of global environmental change (World Bank, 2021b). This is where productive and regenerative agriculture comes into play.

Regenerative agriculture has been defined differently by various authors and researchers throughout the more recent decades and it is therefore important that each definition should be applied carefully to each use and context concerned (Giller et al., 2021; Newton et al., 2020). Broadly defined, regenerative agriculture is concerned with agricultural practices that, 'amongst other benefits, reverse climate change by rebuilding soil organic matter and restoring degraded soil biodiversity-resulting in both carbon drawdown and improving the water cycle' (Regeneration International, 2017; Sahel, 2021). The scaling of productive and regenerative agriculture comes with many benefits. These include environmental, health, inclusivity, and food security benefits (Food and Land Use Coalition, 2019).

[6] Wageningen Economic Research and TNO worked in collaboration with RVO, AgroConnect, VAA ICT Consultancy, NVWA, AgriPlace, OTC Holland, Floricode, BC3, GS1, Control Union, SKAL, and PPM Oost.

Environmental benefits are concerned with rebuilding of soil health and quality, soil carbon content, lowering greenhouse gas emissions from synthetic inputs, protecting biodiversity, and reducing detrimental impacts to the natural environment (Food and Land Use Coalition, 2019; Sahel, 2021). Health benefits are concerned with improvements in air quality as well as reduced exposure to harmful chemical toxins (Food and Land Use Coalition, 2019). Inclusivity gains are realized through more diverse profitable markets for agricultural produce which creates more skilled roles in the agricultural industry as well as lowering production risk through the creation of healthier soils and drought resilience (Development Initiatives Poverty Research (DIPR), 2018; Food and Land use Coalition, 2019). Food security is raised as healthier soils are able to store more water and deliver more nutrient rich crops, and increased agrobiodiversity increases resilience to pests and climatic changes (Food and Land Use Coalition, 2019).

Globally, productive and regenerative agriculture is gaining popularity and is being promoted firmly by civil society and Non-Governmental Organizations (NGOs) as well as by many major multi-national food companies (Giller *et al.*, 2021). Companies such as General Mills, PesiCo, Danone, Unilever, Hormel, Target and Lan O' Lakes are responding to increased demands for environmentally sustainable foods from the millennial generation and other consumers (Uldrich, 2021). Africa, in particular, is also experiencing an increased interest in productive and regenerative agricultural practices. Companies such as Olam, Nespresso, Twiga, Touton, LEAF Africa and ABInBev are showing an increased promotion of regenerative agriculture (ARASG, 2021). Figure 1-13 shows the efforts and achievements being made in different countries across Africa by the entities discussed.

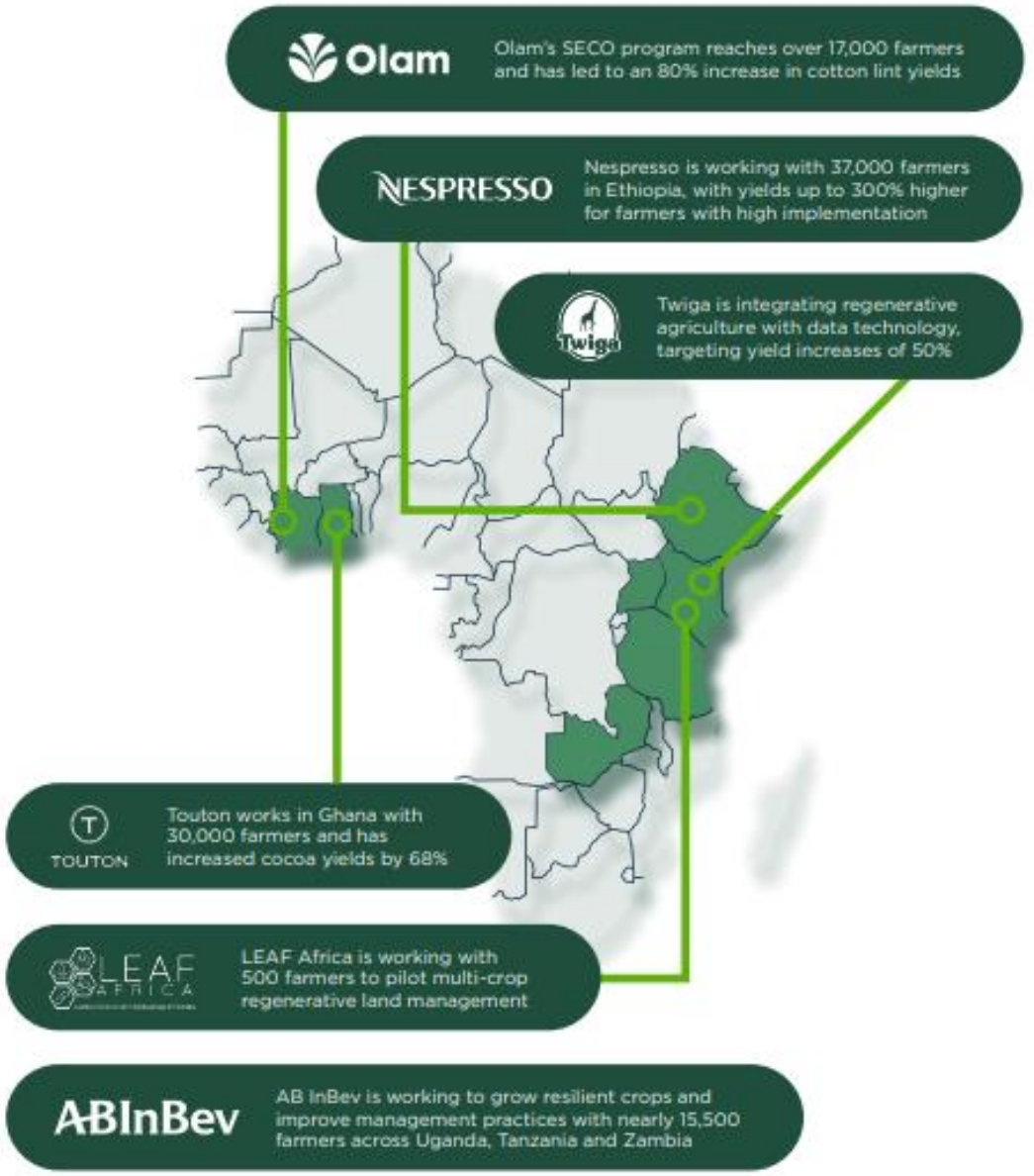
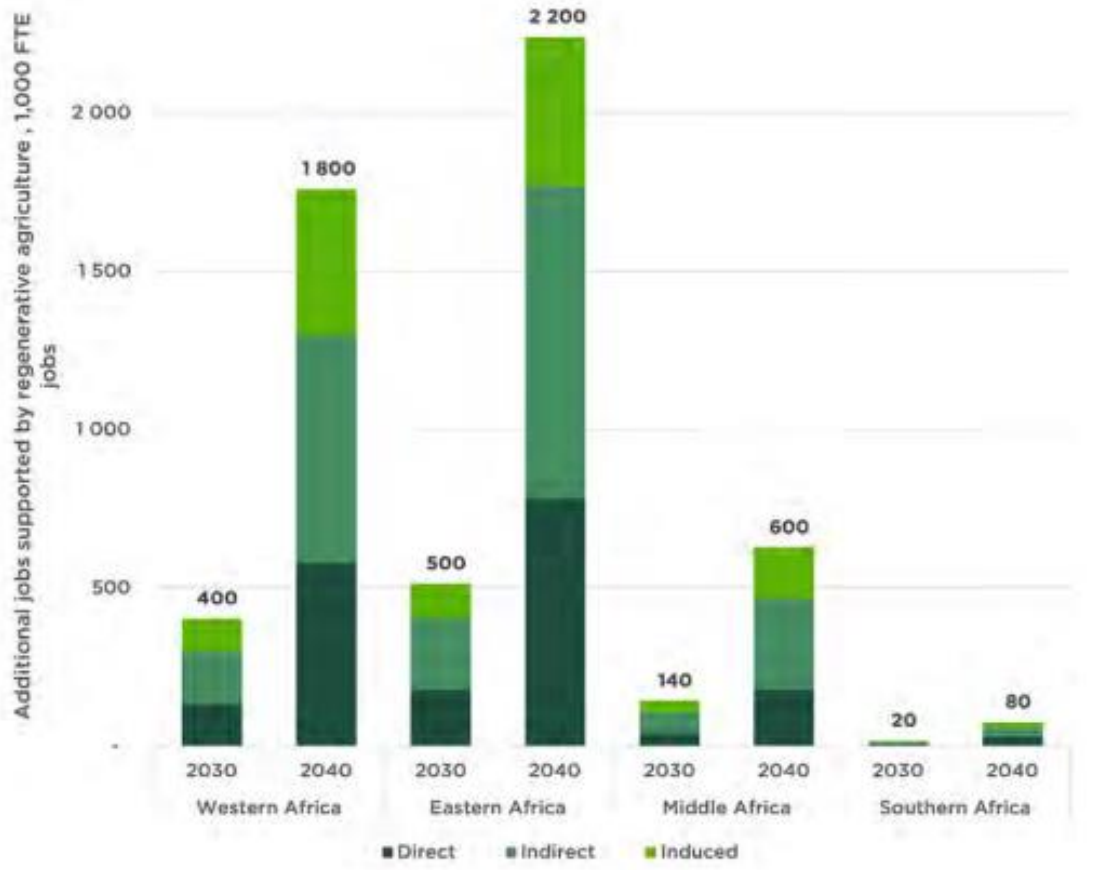


Figure 1-13: Entities involvement in regenerative agriculture in Africa.

Source: ASARG, 2021

Under different scenarios developed by the African Regenerative Agriculture Study Group (ARASG), their regenerative agriculture scenario, when compared to their baseline scenario (which includes increased investment in agricultural technology and crop breeding to increase crop yields), resulted in a 13% higher dry matter yield increase by 2040, to achieve a 65% total dry matter yield increase (ASARG, 2021). This equates to an increase of 62 million tons of dry matter in Sub-Saharan Africa (SSA). These higher yields translate into a higher Gross Value Added (GVA) per year and

stimulate job creation, measured in Full Time Equivalent (FTE) employment creation of up to 1 million jobs by 2030 (ASARG, 2021). These improvements are felt throughout the entire supply chain and economy. Figure 1-14 displays the additional jobs that would be supported by regenerative agriculture in 2030 and 2040 in SSA compared to non-regenerative practices. Other research has stated that USD$15bn in GVA could be added per year on the African continent and that Olam, Toutin, and Twiga are already reaping the rewards of regenerative agriculture (Ventures, 2022)



Note: Direct and indirect jobs are only modelled in the processing sector. Induced jobs cover all sectors. Supported jobs include those created, displaced and safeguarded.

Source: Vivid Economics

Figure 1-14: Employment creation under different scenarios

Source: ASARG, 2021

In South Africa, regenerative agriculture has become essential to the agricultural model as the country has suffered due the irregularity of rainy seasons as well as a lack of crops that can survive in the region (The Borgen Project, 2020; Hayward, 2021; Sahel, 2021). The model is focussed on the propagation of mostly native crops that have fewer intensive water requirements when compared to non-native crops that,

in general, require larger volumes of water (The Borgen Project, 2020). The efficiency of agricultural production has been affected by climate change and highlights the importance and the need for a shift to regenerative agricultural production practices (Hayward, 2021). Added to the problem of climate change is the increased cost of inputs into the agricultural production processes in South Africa, again highlighting the need for regenerative agricultural practices (Hayward, 2021). Figure 1-15 displays the increased costs being experienced by South African farmers.

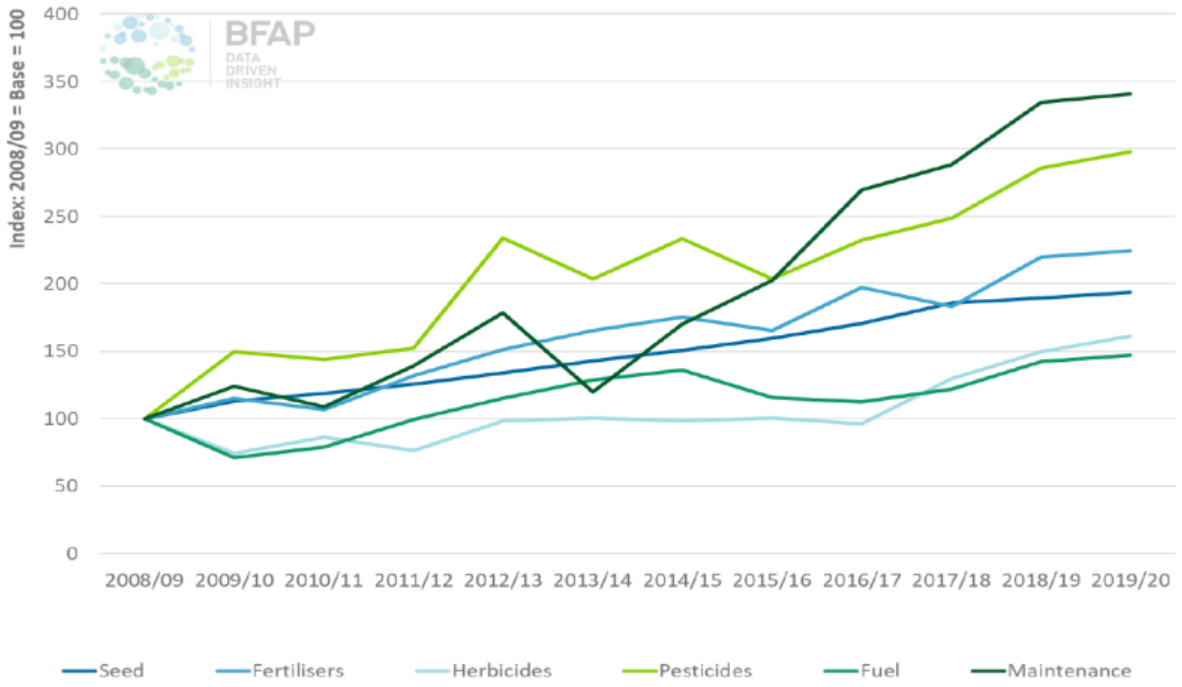


Figure 1-15: Trends in increased agricultural input costs

Source: Hayward, 2021

1.2.14 Consolidation in the Industries

In the developing world Africa has experienced the fastest growth in urbanization in recent decades. The growth rate has been occurring at a rate 3.5% annually and the trend is expected to continue on this vector through to 2050 (African Development Bank (AfDB), 2012; Pereira, 2014). The number medium-size farms is also rising and increased smallholder productivity is expected to be the biggest growth driver (McKinsey and Company, 2019). Urbanization, however, leads to the consolidation of land sizes as more people move into urban areas, allowing for an increase in large-scale, mechanized farming (McKinsey and Company, 2019). In some African countries this is leading to the creation of a class of 5-to-100-hectare sized farms, however, this trend varies largely across the continent as different countries are at different levels of development (McKinsey and Company, 2019). This implies the creation of two primary categories of agriculture in Sub-Saharan Africa (SSA). The two categories include farmers that acquired the land at a later stage in life and that have access to more inputs and are more educated than their counterparts that farm on

land sizes generally less than 5 hectares (McKinsey and Company, 2019). Consolidation of farms and urbanization leads on to the need for consolidation along the value chain in turn in order to supply food to the growing urban population.

Consolidation along the length of value chains that make up the food system is a global phenomenon (Metelerkamp, 2014). Consolidated value chains and industries result in fewer available jobs when compared to fragmented industries, for example, between 2001 and 2013, the agricultural sector shed 331,000 jobs despite the real gross income of the sector growing by more than 60% (Metelerkamp, 2014). Consolidation also results in competition issues and concentration along the value chain, which in turn leaves consumers with fewer choices (Pereira, 2014). South Africa is already highly socially and economically unequal and this consolidation across the value chain suggests higher levels of unemployment and the exacerbation of inequality in the country. Consolidation also leads onto larger farms and commodity-based agriculture that results in affordable agricultural produce such as high-energy, low-nutrition foodstuffs that in turn lead to health issues in a nation (this has implications on 'embracing protective foods') (Metelerkamp, 2014).

Despite these concerning trends and issues, a growing number of business- and community-led initiatives and partnerships seek to find alternative growth routes and/or mitigate the impacts of rapidly consolidating food systems (Metelerkamp, 2014). Table 1-4 demonstrates the ways in which private stakeholders and industry players are proactively working with the community and small-scale local producers to achieve sustainable and less harmful value chain consolidation in South Africa.

Table 1-4: Intervention options for consolidation in South Africa

What	Who	How
Avoid structural investments and strategies that make consolidation a pre-requisite for their competitive advantage	Spar	Spar has largely opted for decentralised procurement strategies which allow individual shop owners to enter into more flexible contracts with local suppliers in smaller volumes than required by nationally centralised distribution centres
Formulate business cases and models around the shift away from up and down stream reliance on consolidated supply chains	Spier Hotel & Farm	Spier has supported and explored local value chains for selling certain farm products and sourcing hotel food where possible. It has also diversified into biologically complementary crop portfolios and supported emerging farmers
Support preferential procurement contracts from unconsolidated suppliers	Anglo-Platinum	Small producers are awarded procurement contracts to supply mining catering needs, such as a poultry farmer who has been awarded a contract to supply 5000 eggs per day
Supporting research, development and promotion of financially unattractive but socio-ecologically positive technologies such as low-external input pest control and open source genetic material	ZZ2 Farming	Developing knowledge and expertise around natural alternatives to chemical agricultural inputs and being willing to share this knowledge and experience with others

Source: Metelerkamp, 2014

Interventions like those in Table 1-4 are leading to a rise of alternative service modules, social entrepreneurship and different business models. While Africa's agricultural potential is significant, capitalizing on the opportunity calls for the need for pro-active on-the-ground efforts aimed at innovating the value chains and accommodating differently sized players in the entire value chain (McKinsey and Company, 2019). Figure 1-16 exhibits seven lessons that can help unlock Africa's agricultural potential and lead to an inclusive and successful value chain.

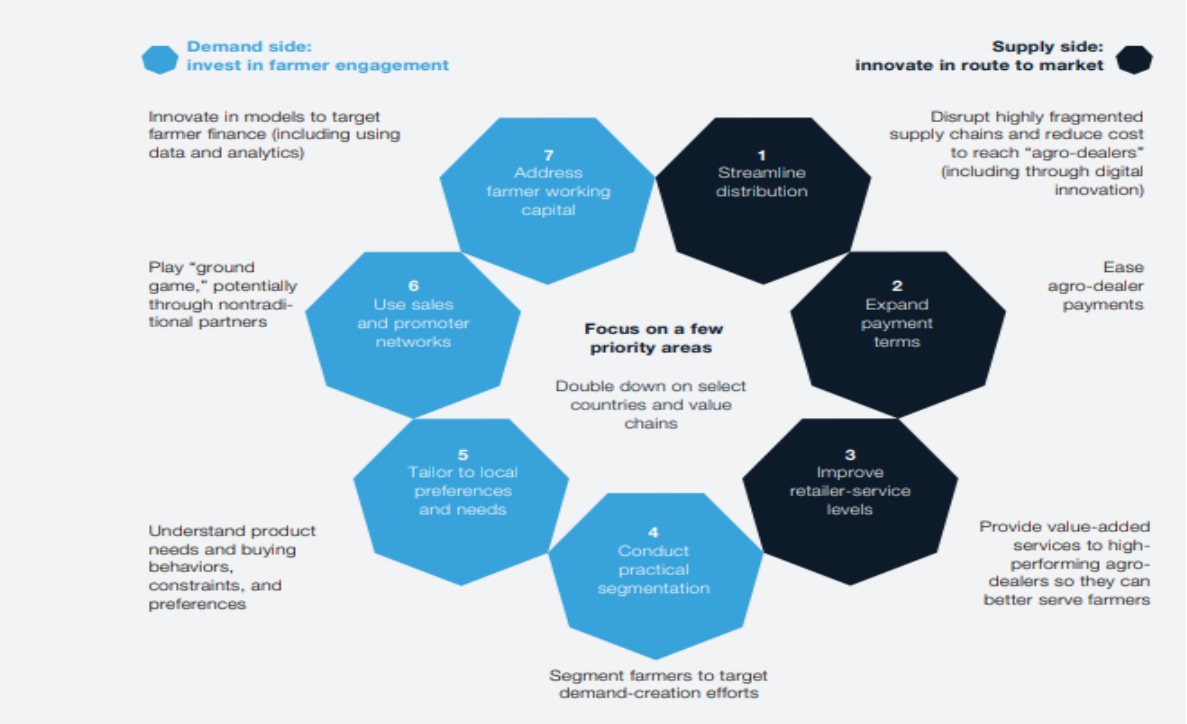


Figure 1-16: Seven lessons that can help unlock Africa's agricultural potential

Source: McKinsey and Company, 2019

1.3 Literature review conclusions

In summation, the previous sections focused, in part, on reviewing the literature on the factors that are considered to influence agriculture in Africa. These factors include agricultural inputs, logistics, information, technology, technology partnerships, services, and agricultural skills development and planning.

From the literature, it was established that agricultural inputs play a significant role in Africa's stagnating agricultural productivity. In logistics, South Africa was noted to be the top performer in Africa, ranking 29th globally. In comparison, Somalia was the lowest scoring country and this was noted to be due to conflict and war within its territory. There was a consensus in the literature on the critical importance of timely accurate information to improve operational efficiency within the agriculture sector. The literature also revealed that East Africa ranks highest in terms of digital technologies (i.e. mobile technology, digital money, digital solutions) with Kenya leading that region.

With regard to technology, the WCDoA has been forging partnerships and facilitating the adoption of innovative agricultural technologies and methods (e.g., GreenAgri, FruitLooks). It was also explained, through literature, that the higher education sector has a potentially transformative role to play in African agriculture's transformation. To do this, there was an emphasis on the need for the African higher education sector to foster the creation of knowledge-based goods and services that will gradually have a transformational effect on agriculture.

Literature also discussed the critical importance of finance, insurance, and advisory services in influencing the production decisions of farmers. Emerging trends in agriculture such as Big Data, the concept of circular economy, women empowerment, and short value chains were also discussed with a focus being placed on how these trends translate to African agriculture's potential. From the Western Cape's point of view, it was noted that the sector's top 5 agricultural exports were citrus fruit (HS0805), wine (HS2204), apples, pears and quinces (HS0808), grapes (HS0806), and other fruit (HS 0810). Botswana, Namibia, and Kenya are noted to be important destination markets for these products.

2 MULTI-CRITERIA ANALYSIS AND SELECTION OF TARGET AFRICAN COUNTRIES (SAMPLING)

This section draws from recent research by Annandale (2022).

2.1 Variables used in constructing the Country Priority Index

The Country Priority Index is a composite index made up of three different dimensions, each with its own variables/indices. The dimensions, shown in Table 2-1, include the 'Market Conditions', 'Business Environment' and 'Logistical Conditions'. The 'Global Competitiveness Index' (GCI) compiled by the World Economic Forum and the 'Country Attractiveness Index' (CAI) compiled by Morokong and Pineaar (2019) were used as the basis to select the different variables per dimension but were excluded from the analysis to compile a Country Priority Index to avoid "double counting" of different variables/indices. The variables used to construct the GCI and CAI can be found in **Appendix 1 and 2** respectively. For all the variables, the most recent data was available was used.

Table 2-1: Three dimensions of the Country Priority Index

Market Conditions	Business Environment	Logistical Conditions
Gross Domestic Product (GDP) per capita	Political Stability	Road Infrastructure
GDP Growth Expecatations (2019-2024 (%))	Ease of Doing Business Index	Port Infrastructure
Human Development Index (HDI)	Corruption Perceptions Index	Logistical Performance Index (LPI)
FDI Net Inflows (2017-2019 Average) (USD)	Regulatory Quality	Distance to Market (km)

Market conditions describe those factors that influence the size of a market (Gross Domestic Product (GDP) per capita) and its growth projections (GDP growth expectations), the human development status of a country (HDI) and the interest

(confidence) in the market from an international investment perspective (FDI Net inflows). The GDP per capita and the HDI are important factors to consider in the development of the Country Priority Index as these can aid in products/services selection for the export market. For example, a country with a relatively high GDP per capita will most likely import food products/services that are higher in value.

The business environment is an important dimension as it allows for potential players in the market to determine how feasible (practical) it is to operate in the respective international market. A market with low political stability carries with it higher levels of risk, and a country with poor regulatory quality means that the government is unable to "formulate and implement sound policies and regulations that permit and promote private sector development" (World Bank, 2021c). This makes operating a business in the foreign market more risky and more difficult.

Logistical conditions in the foreign market determine the ease/difficulty with which an exporter may experience in getting the produce to the final consumer, which in turn influences the costs involved of getting the produce to the final consumer. This will impact the competitiveness of the exporter. The inclusion of the logistical conditions pillar allows for the consideration of the practicality behind getting the actual produce/product to the final consumer and allows for the identification of a suitable export market. The Logistical Performance Index (LPI) is an important inclusion as it measures the performance along the logistics supply chain of a country from both an international and a domestic perspective (World Bank, 2018c).

For further discussion of the variables used to compile the GCI and the CAI, refer to the World Economic Forum (2020) and Morokong and Pienaar (2019) respectively. For information regarding the sources used for each of the variables, refer to **Appendix 3**.

To account for missing data, multiple linear regressions were run, each regression used for the imputation of the missing variables. The linear regressions were run using variables that had a full set of data. The model used is the Classical Linear Regression Model (CLRM) and it makes use of the methodology of Ordinary Least Squares (OLS). The regressions were run using a software called STATISTICA and then exported to WORD format.

The model has six assumptions which are as follows,

- the regression model is linear in parameters,
- the explanatory variable X is uncorrelated with the disturbance term u,
- given the value of X_i the expected value of the disturbance term u is zero,
- the variance of each u_i is constant (homoscedastic),
- there is no autocorrelation between error terms, and lastly,
- the regression model is correctly specified (Guajarati and Porter, 2010).

The resultant model is of the type as seen in Equation 1. The equation was then used to estimate values accordingly for the missing data for the variables. The results of the CLRM can be seen in **Appendix 4.**

Equation 1: The Classic Linear Regression Model (CLRM)

$$Y_i = B_1 + B_2 X_i + u_i$$

(Gujarati and Porter, 2010)

Where:

Y_i	the dependant variable
X_i	the explanatory variable
u_i	the error term
B_1 & B_2	coefficients

Principal component factor analyses were done on all of the variables after imputation to investigate their internal relationships, a biplot of the variables was also done. This was done in terms of the first two principal components.

2.2 Methodology used to construct the Country Priority Index

The variables used in the formation on the Country Priority Index were all normalized using a popular normalization technique known as 'Min-max normalization'. Equation 2 shows the equation used to perform the normalization. In this normalization, each variable (indicator) x^t_{qc} for a country c, and time *t* is transformed to produce normalized indicators I_{qc} that have values lying between 0 and 1[7] (OECD, 2008). 0 represents the lowest (laggard) value for the respective indicator, and 1 represents the highest (leader) value for each indicator (OECD, 2008; World Bank, 2021c).

Equation 2: Min-max normalization equation

$$I^t_{qc} = \frac{x^t_{qc} - min_c(x^t_q)}{max_c(x^t_q) - min_c(x^t_q)}$$

(OECD, 2008; World Bank 2021b)

Where:

$min_c(x^t_q)$	Minimum value of x^t_{qc}
$max_c(x^t_q)$	Maximum value of x^t_{qc}

After normalization of the variables, weights were assigned to each variable. The weights represent the importance (contribution) each variable holds when determining a suitable export market. The weights of the variables were determined via a survey that was distributed to stakeholders in the Western Cape agricultural sector. Special consideration was given to each variable when performing the weighting in order to control for 'double counting', and to avoid the exclusion of

[7] For variables that are not indexed (such as 'Distance to Market'), a lower value (such as a close market) would result in a score closer to zero. To correct for this error, the appropriate variables were made negative. This adjustment allows for the calculation in Equation 2 to yield the correct results. For example, a closer market would have a smaller negative value in terms of distance than a further market, and so I^t_{qc} would be closer to 1.

appropriate variables.

After normalization and weighting, the variables were aggregated using a widespread measure of linear aggregation which involves the summation of weighted and normalised individual indicators (OECD, 2010). The resultant values corresponding to the respective countries were then ranked from largest to smallest. Largest values represent the countries that the Western Cape agricultural export sector should focus on according to the Country Priority Index, whilst the smallest values are countries that are viewed as the least appropriate. The detailed results can be found in **Appendix 5**. A condensed summary of the top 25 countries is presented in Table 2-2.

Table 2-2: Country Priority Index Ranking – Top 25

COUNTRY	Country Priority Index Score	Rank According to Country Priority Index
Mauritius	0,81	1
Seychelles	0,71	2
Namibia	0,68	3
Botswana	0,67	4
Rwanda	0,65	5
Morocco	0,62	6
Egypt	0,60	7
Kenya	0,57	8
Tunisia	0,52	9
Cote d'Ivoire (Ivory Coast)	0,51	10
Cabo Verde (Cape Verde)	0,51	11
Ghana	0,49	12
Eswatini	0,48	13
Senegal	0,48	14
Sao Tome & Principe	0,48	15
Zambia	0,47	16
Tanzania	0,47	17
Djibouti	0,47	18
Benin	0,45	19
Togo	0,44	20
Algeria	0,43	21
Uganda	0,43	22
Gabon	0,42	23
Lesotho	0,42	24
Malawi	0,41	25

Actual agricultural trade with African countries were used as a proxy for doing business in Africa to determine under and over exposure in certain countries. The rankings according to the Country Priority Index were compared to actual trade data. A grouping of the top 25 agricultural exports by the Western Cape to Africa was extracted from the Quantec trade database for the period 2016 to 2021. The countries were then ranked from 1 through to 53 according to the average value of the imports from largest to smallest for the period 2016 to 2021. The country ranking according to the Country Priority Index was then subtracted from the country ranking according to actual trade figures in order to draw some more meaningful conclusions and to provide more concrete suggestions for the Western Cape Department of Agriculture. The results give an indication of whether (i) trade follows the Country Priority Index, (ii) trade is more than what the Country Priority Index suggests it should be and (iii) trade is less than what the Country Priority Index suggests it should be. The detailed results of this exercise can be found in **Appendix 5**.

2.3 Results

When comparing actual trade statistics (as proxy for doing business in Africa) to the Country Priority Index, several conclusions as to which markets to focus on, as well as, which markets are potentially over focused on can be made.

The countries in red, are countries that are currently exported to significantly more than is suggested by the Country Priority Index. Countries in yellow, are countries that are currently exported to more than the Country Priority Index suggests. Countries in green resemble countries that are exported to in quantities that agree with the results of the Country Priority Index. Countries in grey are countries that should be awarded more export attention as the Country Priority Index suggests that trade is less than it should be. Countries in blue are exported to far less than the Country Priority Index suggests.

Zimbabwe, Mozambique, and other red countries are countries that are considered extremely poor export destinations according to the Country Priority Index. However, due to the volume of trade it can be postulated that these countries do present trade opportunities. At the same time there are several other countries that present trade opportunities that have not been explored yet as suggested by the Country Priority Index. The same can be said for countries like Lesotho, Cameroon, and others that are in the yellow section, but to a lesser extent.

Countries in green are countries that are traded with proportionately to the Country Priority Index. These countries include countries such as Uganda, Kenya, and so forth. It can therefore be suggested that industry stakeholders should maintain current export levels, but they may also consider the potential exports that can be realized in other African countries.

Countries such as Djibouti, Algeria, and so on, are markets identified as having more export potential than is currently being realized by South African industry stakeholders. These are countries that industry stakeholders should look at to potentially increase current exports to. The same can be said for countries in blue, but to a greater extent.

3 DESKTOP IDENTIFICATION OF POSSIBLE OPPORTUNITIES PERTAINING TO AFRICA FOR THE WESTERN CAPE AGRICULTURAL SECTOR

3.1 General opportunities in Africa[8]

Identifying opportunities for the Western Cape in Africa can to a large extent be based on Transforming Africa's Agriculture to Improve Competitiveness. The World Economic Forum identified 8 generic opportunities for the African continent which are briefly discussed below.

Develop high-yield crops

Increased research into plant breeding, which considers the unique soil types of Africa, is a major requirement. A dollar invested in such research by the CGIAR consortium of agricultural research centres is estimated to yield six dollars in benefits.

[8] https://www.weforum.org/agenda/2015/06/8-ways-africa-can-raise-farm-productivity-and-boost-growth/

Boost irrigation

With the growing effects of climate change on weather patterns, more irrigation will be needed. Average yields in irrigated farms are 90% higher than those of nearby rain-fed farms.

Increase the use of fertilizers

As soil fertility deteriorates, fertilizer use must increase. Governments need to ensure the right type of fertilizers are available at the right price, and at the right times. Fertilizer education lessens the environmental impact and an analysis of such training programs in East Africa found they boosted average incomes by 61%.

Improve market access, regulations, and governance

Improving rural infrastructure such as roads is crucial to raising productivity through reductions in shipping costs and the loss of perishable produce. Meanwhile, providing better incentives to farmers, including reductions in food subsidies, could raise agricultural output by nearly 5%.

Make better use of information technology

Information technology can support better crop, fertilizer and pesticide selection. It also improves land and water management, provides access to weather information, and connects farmers to sources of credit. Simply giving farmers information about crop prices in different markets has increased their bargaining power. Esoko, a provider of a mobile crop information services, estimates they can boost incomes by 10-30%.

Adopt genetically modified (GM) crops

The adoption of GM crops in Africa remains limited. Resistance from overseas customers, particularly in Europe, has been a hindrance. But with Africa's rapid population growth, high-yield GM crops that are resistant to weather shocks provide an opportunity for Africa to address food insecurity. An analysis of more than one hundred studies found that GM crops reduced pesticide use by 37%, increased yields by 22%, and farmer profits by 68%.

Reform land ownership with productivity and inclusiveness in mind

Africa has the highest area of arable uncultivated land in the world (202 million hectares) yet most farms occupy less than 2 hectares. This results from poor land governance and ownership. Land reform has had mixed results on the African continent but changes that clearly define property rights, ensure the security of land tenure, and enable land to be used as collateral will be necessary if many African nations are to realise potential productivity gains.

Step up integration into Agricultural Value Chains (AVCs)

Driven partly by the growth of international supermarket chains, African economies have progressively diversified from traditional cash crops into fruits, vegetables, fish, and flowers. However, lack of access to finance and poor infrastructure have slowed

progress. Government support, crucial to coordinate the integration of smallholder farmers into larger cooperatives and groups, may be needed in other areas that aid integration with wider markets.

3.2 Trade

The agriculture sector of the Western Cape, which is export-oriented, contributed 44% to national agricultural exports in 2020 (South African Government, 2021). In the same year, the province was noted to have made agricultural exports to the value of ZAR78.68 billion (South African Government, 2021). This was reported to be a 24% increase compared to the previous year (i.e., from ZAR 63.23 billion to ZAR78.68 billion). Wesgrow (2021) reported that the Western Cape's top five agricultural exports in 2020 were citrus fruit, wine, apples, pears and quinces, and other fruit. Using ITC (2022) Trade Map data, South Africa's exports of these agricultural products are shown in Table 3-1.

Table 3-1: South Africa exports of the Western Cape's top 5 agricultural export products

HS code	Agricultural product	Global ranking	Share of global exports (%)	Value exported in 2020 (USD$)	Growth in value between 2019-2020 (%, p.a.)	Top 5 destination markets (Global)	Top 5 destination markets (Africa)
0805	Citrus fruit, fresh or dried	2	10.5	1,707,181,000	25	Netherlands, United Kingdom, United Arab Emirates, Russian Federation & China	Botswana, Namibia, Kenya, Nigeria & Zambia
2204	Wine	12	1.8	621,293,000	-6	United Kingdom, Germany, Netherlands, USA & Namibia	Namibia, Botswana, Tanzania, Kenya & Zambia
0808	Apples, pears and quinces, fresh	6	5.7	599,496,000	8	United Kingdom, Russian Federation, Netherlands, United Aran Emirates & Malaysia	Nigeria, Senegal, Kenya, Botswana & Ghana
0806	Grapes, fresh or dried	8	5.8	644,969,000	1	Netherlands, United Kingdom, Germany, Canada & Hong Kong, China	Algeria, Nigeria, Botswana, Mauritius & Kenya
0810	Other fruit, fresh	17	1	190,695,000	14	United Kingdom, Netherlands, United Arab Emirates, Singapore & Germany	Mozambique, Kenya, Botswana, Mauritius & Namibia

Source: ITC, 2022

Wesgro, a Western Cape based entity, has a 'vision' to help Cape Town, and the Western Cape in entirety, become one of the world's leading regional economies (Wesgro, 2021). Wesgro undertook a study to develop a 'Western Cape Export Growth Strategy' on behalf of the Western Cape Government which was completed at the

beginning of 2022 (Wesgro, 2022). In the report, Wesgro identified several export opportunities in different sectors/industries of the economy using the TRADE-DSM methodology (Wesgro, 2022). These results are displayed in Table 3-2.

Table 3-2: TRADE-DSM results for different export opportunities for the Western Cape Province of South Africa

Priority short-term export opportunities			Untapped value	Leading market opportunities		
Rank	HS Code	Sub-sector	R mn	1	2	3
1	10	Manufacture of food products	81 050	China	USA	Germany
2	32	Other manufacturing	78 005	Switzerland	UAE	Hong Kong
3	01	Crop and animal production, hunting and related service activities	68 034	USA	China	Germany
4	24	Manufacture of basic metals	59 631	Vietnam	Italy	Germany
5	11	Manufacture of beverages	52 188	USA	UK	Germany
6	20	Manufacture of chemicals and chemical products	31 629	China	Hong Kong	USA
7	12	Manufacture of tobacco products	29 030	Japan	Italy	Spain
8	29	Manufacture of motor vehicles, trailers and semi-trailers	23 610	USA	Germany	France
9	38	Waste collection, treatment and disposal activities; materials recovery	22 884	China	Turkey	Germany
10	30	Manufacture of other transport equipment	21 907	USA	Germany	Malta
Subtotal			467 969			
Total			**534 767**			

Priority medium-term export opportunities			Untapped value	Leading market opportunities		
Rank	HS Code	Sub-sector	R mn	1	2	3
1	26	Manufacture of computer, electronic and optical products	63 243	China	Vietnam	Mexico
2	14	Manufacture of wearing apparel	55 643	USA	Germany	Spain
3	21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	52 137	USA	Germany	China
4	10	Manufacture of food products	51 741	China	USA	UK
5	20	Manufacture of chemicals and chemical products	31 139	USA	Japan	Germany
6	25	Manufacture of fabricated metal products	27 919	Hong Kong	China	USA
7	28	Manufacture of machinery and equipment n.e.c.	24 786	USA	France	Germany
8	27	Manufacture of electrical equipment	20 765	Mexico	USA	Germany
9	31	Manufacture of furniture	18 927	France	Germany	UK
10	01	Crop and animal production, hunting and related service activities	15 545	USA	China	Germany
Subtotal			361 844			
Total			**427 239**			

Priority long-term export opportunities			Untapped value	Leading market opportunities		
Rank	HS Code	Sub-sector	R mn	1	2	3
1	20	Manufacture of chemicals and chemical products	3 690	Netherlands	China	Germany
2	24	Manufacture of basic metals	2 965	Turkey	Germany	USA
3	07	Mining of metal ores	2 130	South Korea	Netherlands	Italy
4	13	Manufacture of textiles	1 466	China	Vietnam	Guatemala
5	21	Manufacture of basic pharmaceutical products and preparations	1 088	Benelux	India	Spain
6	10	Manufacture of food products	666	Spain	Poland	China
7	03	Fishing and aquaculture	636	Spain	Bangladesh	France
8	01	Crop and animal production, hunting and related service activities	459	Netherlands	Spain	Slovakia
9	28	Manufacture of machinery and equipment n.e.c.	440	Vietnam	Uzbekistan	USA
10	29	Manufacture of motor vehicles, trailers and semi-trailers	419	Morocco	Poland	Indonesia
Subtotal			13 959			
Total			**14 690**			

Source: TRADE-DSM

Source: Wesgro, (2022)

As can be seen in Table 3-2, there is a large variety of export opportunities in different countries around the world and for various industries. For the purposes of this study, only the agricultural export opportunities in the African continent will receive more attention. The top 10 priority short-, medium- and long-term export opportunities have

no African markets listed but have various agricultural commodities/products listed. These include, but are not limited to, 'Crop and Animal Production, hunting and related service activities', 'Manufacture of tobacco products' and 'Manufacture of food products' (Wesgro, 2022). The study did not consider only agricultural export opportunities and so the top 10 identified opportunities in each time frame had to compete with higher valued export opportunities and wealthier overseas markets, which explains the lack of a list African export markets and agricultural products/commodities.

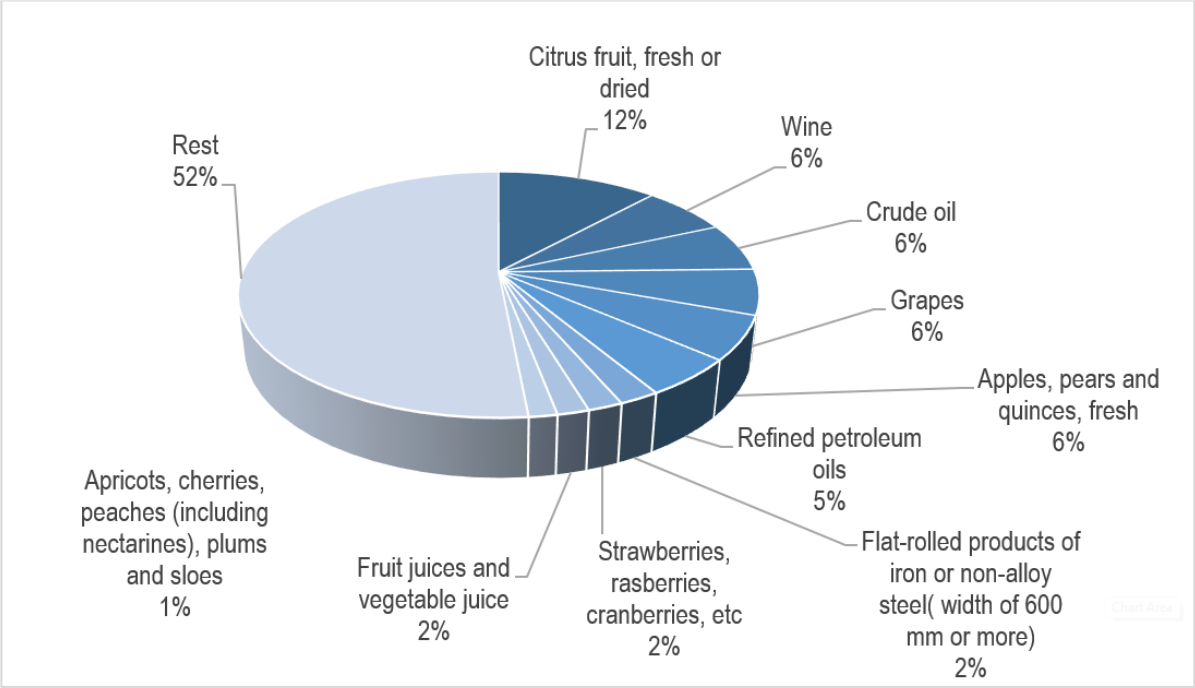
However, the study did identify the Top 10 Western Cape export products and sectors currently, and their markets, these are identified in Table 3-3, Figure 3-1, and Table 3-4 and will be used for further discussion in the subsequent sections to this. It becomes evident that the agricultural sector plays a large role in the Western Cape's export industry. It can also be seen that African countries (specifically Namibia, Botswana and Lesotho) are major markets for Western Cape exports (Wesgro, 2022).

Table 3-3: Western Cape's top 10 export products (2015 and 2020)

			Rand million			
Rank	**HS4 Code**	**Product**	**Exports 2015**	**Exports 2020**	**% of total exports 2020**	**Average annual growth 2015-2020**
1	0805	Citrus fruit, fresh or dried	9 410	18 808	13,8%	16,5%
2	2204	Wine	8 578	9 634	7,0%	2,8%
3	0808	Apples, pears and quinces, fresh	5 994	9 143	6,7%	9,5%
4	2710	Petroleum oils	17 806	8 077	5,9%	-9,6%
5	0806	Grapes, fresh or dried	5 919	8 004	5,9%	6,4%
6	0810	Other fruit, fresh	772	2 714	2,0%	29,0%
7	9706	Antiques	554	2 347	1,7%	125,0%
8	2009	Fruit juices and vegetable juices	2 150	2 289	1,7%	2,3%
9	0303	Fish, frozen	1 267	2 119	1,5%	11,4%
10	3304	Beauty or make-up preparations	1 352	2 071	1,5%	9,7%

Source: Quantec, 2021

Source: Wesgro, 2022



Source: Quantec, 2021

Figure 3-1: Western Cape's top 10 export sectors

Source: Wesgro, 2022

Table 3-4: Top 10 export destinations for the Western Cape (2015 and 2020)

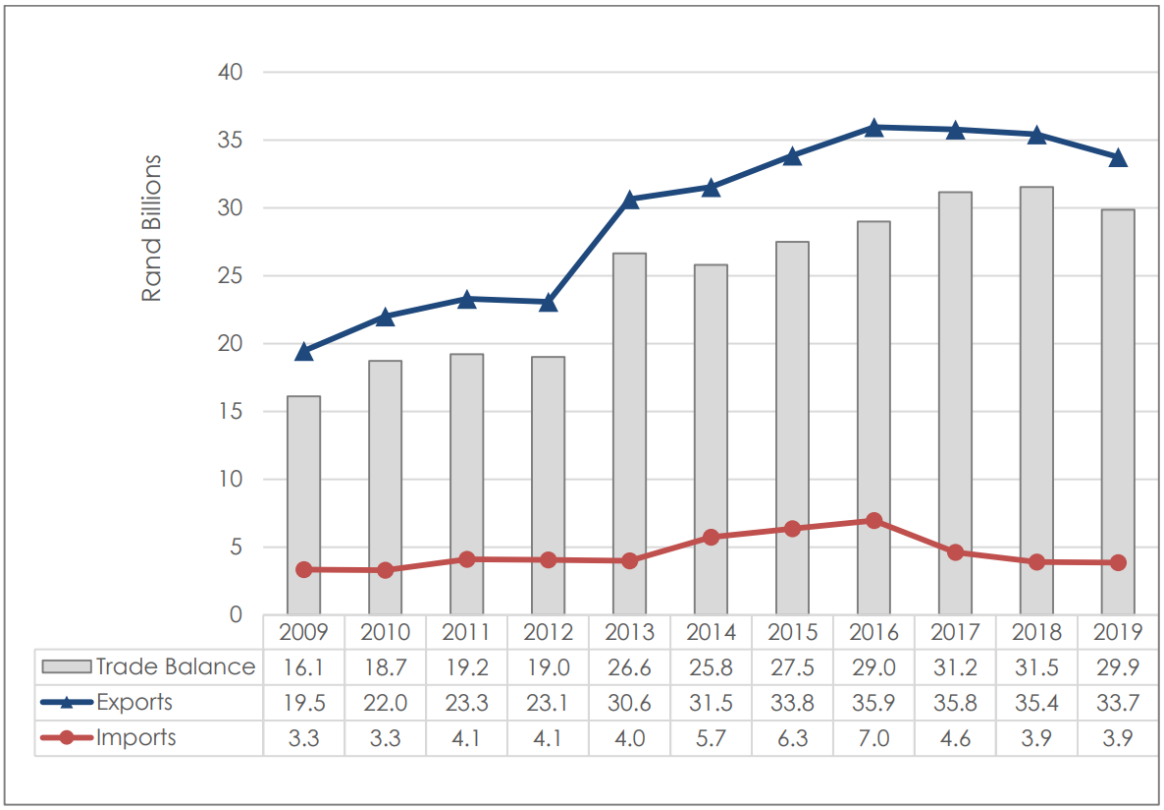
		Rand million			
Rank	**Product**	**Exports 2015**	**Exports 2020**	**% of total exports 2020**	**Average annual growth 2015-2020**
1	Netherlands	7 365	12 454	9,1%	43,4%
2	United Kingdom	9 019	12 318	9,0%	34,7%
3	United States	6 891	10 794	7,9%	19,8%
4	Namibia	12 423	9 863	7,2%	-21,5%
5	China	2 694	6 677	4,9%	25,0%
6	Botswana	6 849	6 643	4,9%	-16,0%
7	Germany	5 009	5 203	3,8%	7,2%
8	United Arab Emirates	2 619	3 825	2,8%	85,6%
9	Russian Federation	1 922	3 410	2,5%	59,3%
10	Lesotho	2 256	2 838	2,1%	-1,8%

Source: Quantec, 2021

Source: Wesgro, 2022 from Quantec data, 2021

The Western Cape agricultural sector has performed at a positive trade balance (value of exports exceeding the value of imports) for more than a decade and has experienced increasing exports with relatively stable imports (Partridge et al., 2020). This trend is displayed in Figure 3-2. The province accounted for 49% of national exports in 2019, slightly lower than the 10-year average at the time and only imported 18% of

national agricultural imports (Partridge *et al.*, 2020). To add to the information provided in Figure 3-3, Figure 3-3 displays the top agricultural export destinations for the Western Cape. The largest African export destination is Botswana with 3% of all of the Western Cape's agricultural exports as of 2019, an increase of 1% when compared to 2018 (Partridge *et al.*, 2020). This figure may seem small, but as a region, Africa accounted for 19% of the Western Cape agricultural sector's exports in 2019 (Partridge *et al.*, 2020). When considering agricultural imports from African countries, the Western Cape sources the majority of its agricultural imports from Namibia (10%), Zimbabwe (4%) and Mozambique (4%) (Partridge *et al.*, 2020). As a region, Africa exports 30% of the Western Cape's total agricultural imports (Partridge *et al.*, 2020).



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Trade Balance	16.1	18.7	19.2	19.0	26.6	25.8	27.5	29.0	31.2	31.5	29.9
Exports	19.5	22.0	23.3	23.1	30.6	31.5	33.8	35.9	35.8	35.4	33.7
Imports	3.3	3.3	4.1	4.1	4.0	5.7	6.3	7.0	4.6	3.9	3.9

Figure 3-2: Trade trends for the Western Cape agricultural sector (2009 to 2019) – 2019 prices

Source: Partridge *et al.*, 2020 from Quantec 2020 data

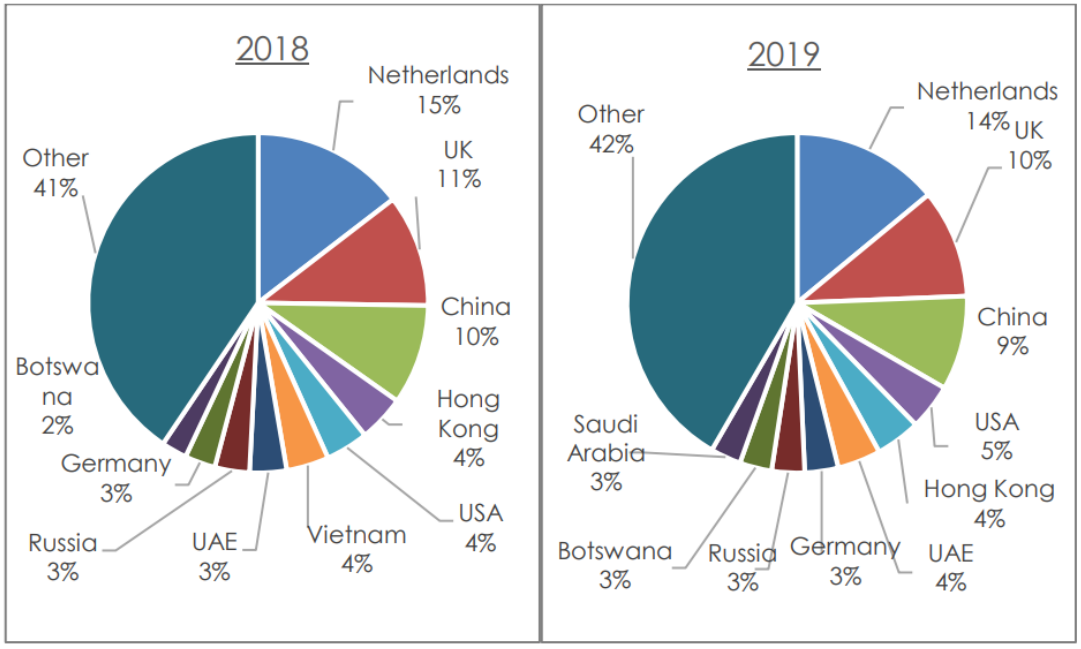


Figure 3-3: Top export destinations for the Western Cape agricultural sector (2018 and 2019)

Source: Partridge *et al.*, 2020 compiled from Quantec data 2020

3.3 African Immigrant Food Market

Kaizer (2015) conducted a comprehensive study on the African immigrant food market in the Western Cape. The study explored demand for traditional foods by the African immigrant market in the Western Cape. Following below is a condensed summary of the findings with emphasis on the opportunities for Western Cape Agriculture.

At the time of writing (2015), they estimated that there were between 200 000 and 450 000 African immigrants in the Western Cape (in 2022 the higher number is probably applicable).

They estimated demand for 15 identified products/product groupings that the research indicated might have greater potential for local supply from a market demand perspective, including: Beans, Cassava, Cocoyam, Egusi, Groundnuts, Leafy greens (various), Millet, Okra, Palm oil, Chillies, Plantain, Sweet Potato, Guinea Yam ("Yam"),Crustaceans, and Freshwater fish.

Based on their models, they estimated that:

- The total market in the Western Cape for African immigrant traditional foods is around R1.3 billion to R3.8 billion (4 to 12% of the estimated Western Cape food and beverage market).
- The market for the initial list of higher potential 15 product groupings of between R100m and R3bn in value and 13,700 tonnes to 74,500 tonnes in volume, depending on the extent of constrained demand.

- Across all scenarios, the markets for beans, cassava, leafy greens, and sweet potatoes (African varieties) are particularly large. There is also significant demand for freshwater fish and crustaceans.

In the project team's view, this could be of sufficient scale to be of interest to small-scale producers and agriculture development initiatives.

Key findings of the supply chain analysis showed that the structure of the immigrant food supply chain is typically very different from the rest of the food supply chain in the Western Cape, including:

- High reliance of imports.
- Diversity of channels for import, including buying trips, friends and family, consolidators within home countries (rather than dominant use of large distributors).
- Dominance of small specialist immigrant retailers and restaurants (estimated 100 to 200 outlets in Cape Town) as opposed to supermarket chains.

The exceptions are substitute leafy greens, okra and hot peppers, where there is some local supply and distribution channels through informal traders and supermarkets.

3.4 Inputs

Input use across Sub-Saharan Africa is more complex than prevailing beliefs and macroscale statistics suggest. Here are ten of the most striking newly verified facts (World Bank, 2014[9]):

1. Most smallholders in the countries studied use **rudimentary technologies and eschew the use of modern inputs**:

- Two-thirds report no use of inorganic fertilizer.
- Eighty-four percent do not use agro-chemicals.
- Only 1 to 3% of land cultivated by smallholders is irrigated, and no more than 10% of households have any form of water control on agricultural plots.
- Accurate data on the use of improved seeds remain hard to find.
- Inorganic fertilizer use is significant in Nigeria (41% of households), Ethiopia (56%), and Malawi (77%), and one-third of households in Ethiopia and Nigeria use agro-chemicals.

2. Tractor ownership is low, but less so in Ethiopia, Niger, and Nigeria, suggesting that **community rental or sharing schemes** facilitate mechanization.
3. Within-country input use varies strikingly across subnational regions and agro-

[9]https://www.worldbank.org/en/programs/africa-myths-and-facts/publication/africa-s-agricultural-input-landscape-in-sub-saharan-africa

ecological zones, with the richer and—surprisingly—the less educated typically using more inputs.

4. Although many modern inputs (particularly inorganic fertilizer, improved seeds, irrigation) perform best when used together on the same plot, most households do not so. **Improved agronomic practices** remain an important focus for extension services.
5. **Input intensification** is happening for maize in particular. Given that maize is not a cash crop, this finding is promising.
6. The literature suggests that yields fall with farm size and that input use falls with farm and even plot size. Household-level factors (such as distance to market and household-specific price of inputs and outputs) cannot explain this puzzle, which requires further research.
7. Farmers do not significantly vary **fertilizer application rates according to perceived soil quality, raising another opportunity for gains**.
8. Less than 1% of households (except in Ethiopia) use formal or informal credit to purchase modern inputs, corroborating evidence about the **weakness of agriculture input credit markets in Africa**. Despite recent advances, much scope remains for deepening financial rural markets.
9. **Male-headed households apply, use, and own more modern agricultural inputs** than female-headed ones. Closing this gap would help empower women and raise their income.
10. Household socioeconomic status explains little of the inter-household variation observed in input use rates. Hence, policy tools can help increase the use of modern inputs.

In summary, modern input use is not as low as is commonly believed, but there is room for considerable improvement, in both the level and method of input use. Although the conventional wisdom remains largely true, some movement is occurring on Africa's agricultural input front.

Thus, in general, there are significant opportunities for agricultural input providers based in the Western Cape in Africa. However, the three main constraints facing agricultural input business sector in Africa **include knowledge constraints, financial constraints and risks.** These are faced by both purchasers and suppliers. Successful prospective and potential business alliances to address these constraints should focus on a combination of the three at the same time.

A thorough literature review reveals that the main reasons for the attractiveness of input production and supply enterprises to private investors are high level of demand of inputs, availability of raw materials/inputs, high rate of returns on investment, and lack of competing local investors. All of these indicate the economic viability of input enterprises. Efforts invested in removing the identified constraints to investment in agricultural inputs will go a long way in stimulating the flow of investment into the

sector. Despite the numerous constraints that the private sector faces in agricultural input business, there is ample evidence that the business could be highly lucrative and profitable. Participation in input business has the potential of being financially attractive to the private sector if adequate funding and cost-recovery mechanisms are in place. Increasing profitability of input business will require investments in the entire commodity chain—from production through processing and storage to marketing—in order to add value and produce the quality the market demands. (UNECA, n.d.).

3.5 Agri-business development services

According to Bain & Company (2020[10]), in order to feed and employ the fastest-growing population in the world (Africa), we need a new approach to agricultural development in Africa, one with farmer-allied intermediaries at its centre. Farmer-allied intermediaries have changed the lives of many commercially oriented smallholder farmers. Working hand in hand with **smallholder farmers, farmer-allied intermediaries, including producer organizations, aggregators, processors and vertically integrated food brands,** can simultaneously achieve a number of critically important outcomes for a broad set of stakeholders. These include enhancing the livelihood of smallholder farmers and alleviating rural poverty, delivering quality agricultural output to buyers, creating a more efficient sales channel for input providers, making more nutritious food available to Africa's growing populations, and creating jobs and contributing to broader economic development.

In many sub-Saharan African countries, smallholder farming will continue to dominate food production for the foreseeable future, and agricultural transformation will require a critical number of scaled, profitable and competitive intermediaries allied with those farmers. There are farmer-allied intermediaries pioneering successful models of impact and innovation, as well as broader ecosystems that are effectively supporting those intermediaries. Unfortunately, too few farmer-allied intermediaries exist in sub-Saharan Africa today, and many of those that do struggle to scale profitably (Bain & Company, 2020). The development community knows well the broader challenges of scaling profitable farmer-allied intermediaries and agricultural small and medium-sized enterprises (SMEs). **The biggest is access to financing**.

New approaches to agricultural development have also more fully engaged the private sector. For example, food companies such as Mars, Nestlé, Ben & Jerry's and Unilever are making strategic investments in obtaining goods from smallholders to ensure a sustainable and diverse supply. Similarly, commodity traders and commercial buyers have shown a growing interest in providing direct support and credit to producer groups using methods such as contract farming and establishing out-grower

[10]https://www.bain.com/globalassets/noindex/2020/bain_report_farmer_allied-intermediaries.pdf

schemes. Most recently, impact investors are exploring ways to co-invest in the agricultural sector as a means to support social change and generate a return, albeit lower than a commercial return on investment (Best & Ferris and Wheatley, 2015[11]).

Key business development services support the core market chain actors and the commercial functions they carry out (and even more so in Africa). The types of services that a business needs include market access support (e.g., identification of markets, facilitation of relationships, contract negotiation), infrastructure (e.g., transport, communication, warehousing), training, technology, input supplies and finance. For example, producer groups may need advice and assistance in becoming organic or Fair Trade certified, they may require working capital at the start of the harvest season to pay farmers in advance, or they may need to build silos for storage or facilities for processing and packaging. Business development services are essential for helping the core chain actors build and grow their businesses and are often critical in driving competitiveness and sustainability of actors within value chains.

The authors are of the opinion that there are already successful businesses in the Western Cape that specialise in farmer development, incubation and intermediary services. **Linking farmers to competitive value chains- short, regional, global**. Some of them already have presence in Africa. It is clear from the condensed background that there is a demand for these services in Africa and scope of the expansion of current and new services to African countries.

3.6 Technology partnerships

Africa may in recent years have seen a growth in the number of agritech services that offer things such as farmer advisory services or access to finance via smart phone but more than 90% of the market for digital services that support African smallholders remains untapped and could be worth over $2.2-billion according to a new report by CTA (2019[12]). The Technical Centre for Agricultural and Rural Co-operation (CTA[13]) found nearly 400 different digital agriculture solutions with 33 million registered farmers across sub-Saharan Africa. These include farmer advisory services, which provided weather or planting information via SMS or apps, and financial services including loans and insurance for farmers.

Some services used satellite imagery, weather data, powerful big data analytics and machine learning techniques to deliver valuable real-time agricultural insights and forecasts at national and regional levels.

The CTA said in a statement that its Digitalisation of African Agriculture Report 2018-2019 found that in 2018 the market for the digitalisation of agricultural services netted

[11]https://www.crs.org/sites/default/files/tools-research/guide-to-strengthening-business-development.pdf
[12] https://www.cta.int/en/digitalisation-agriculture-africa
[13] https://ventureburn.com/2019/06/africa-agritech-market-untapped-report/

an estimated $143-million — out of a total addressable market of $2.6-billion. They found an annual growth of more than 40% for both the number of registered farmers and the number of digital solutions, suggesting the agritech market in Africa is likely to reach the majority of the region's farmers by 2030. Digitalisation can be a game-changer in modernising and transforming Africa's agriculture, attracting young people to farming and allowing farmers to optimise production while also making them more resilient to climate change.

Despite challenges, the economics are rapidly improving, with a handful of players beginning to develop viable, large-scale businesses. To reach its full potential, companies will need to focus on converting customer reach to actual use in order for this type of model to yield returns.

More than a third of participants in the study (CTA, 2019) said they already used at least one form of advanced technology such as drones, field sensors, big data or machine learning, and almost 60% of respondents said they expected to integrate these types of technologies into their operations in the next three years. The report's authors said early figures indicate that farmers that use these solutions, saw improvements in yields ranging from 23% to 73%, and increases of 18% to 37% in incomes.

Ranjan & Kaushik (2022[14]) is of the opinion that Public Private Partnerships can unlock the power of agricultural technologies. Public private partnerships involve collaborations between a government agency and private sector body to finance, build and deliver a public asset or service. They combine the strength of the government's mandate and ability to deliver public services, with the private sector responsible for investments, technology, products and distribution systems.

Under a PPP model for agriculture, a start-up ecosystem can drive emerging tech innovations and agile business models, while universities and research institutions can bring in domain level agricultural expertise and help validate the solutions for scaled deployments. In addition, the role of farmer producer organizations (FPOs) and non-governmental organizations are critical for building capacity and extending digital products and services to farmers.

Partnering with academic and research institutions is of paramount importance (Ranjan & Kaushik, 2022). While start-ups have good expertise of emerging technologies like artificial intelligence (AI), the internet of things (IOT), blockchain and drones, they often lack the application level domain expertise. Such digital innovations also need **testing and validation for credibility among farmers** and scaled field deployment. The existing body of agricultural research from universities and institutions can be better leveraged to scale work done by private agricultural technology players through PPPs.

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[14] https://www.weforum.org/agenda/2022/03/unlock-the-power-of-agricultural-technology-through-private-public-partnerships/

In November 2020, Dr Mogale Sebopetsa, HOD of the WCDoA announced that 14 new innovations agri-tech innovations were developed in the Western Cape. They were demonstrated at a information day at Elsenburg[15].

Thus, it can be concluded that there are certainly many opportunities for agri-tech businesses in the Western Cape to explore this opportunity. However, as pointed out, partnerships with African Governments and Research Institutions will be the key to successfully unlock these opportunities. Shirley (2020) is of the opinion that most agro-processing and storage technologies require significant investment and scale, therefore currently favouring larger, commercial farmers over smallholder farmers. To support smallholder access to value-addition supply chains in Africa, Shirley recommended that the AU-EU partnership focus on:

- The reform of cooperative structures to aggregate farming produce, leverage economies of scale, and organise farmers around price-setting and processing for value-addition.
- Rapid and targeted deployment of mini-grids in village communities engaged in staple and cash crop farming as an enabler for yield-improvement, post-harvest storage, and aggregated processing technologies.
- Incentives to increase access to micro- and commercial finance for farmers and cooperatives, and the roll-out of technology-specific micro-enterprise training that is easily accessible to rural end users.

3.7 Agricultural information & Intelligence

Smallholder farmers account for between 60–80% of the food produced in the sub-Saharan Africa region but face many challenges that impede their productivity. Such challenges include a lack of timely access to appropriate agricultural information and services, which results in poor decision-making, particularly in addressing challenges and responding effectively to opportunities.

In that context, the effective use of Information and Communication Technologies (ICTs) in improving accessibility to appropriate agricultural information and services presents substantial prospects for transforming the productivity and livelihoods of the farmers. Currently, the region experiences massive penetration and propagation of mobile and web-based applications. However, there is a dearth of compelling, comprehensive reviews evaluating their importance in enhancing agricultural information and services dissemination to smallholder farmers (Mapiye et al., 2021[16]).

Mapiye et al. (2021) recommends the development and deployment of user-driven mobile applications that provide curated skill-sharing platforms, encourage farmers

[15] https://www.foodformzansi.co.za/western-cape-showcases-top-innovation-and-agri-tech-at-wow-day/
[16] https://journals.sagepub.com/doi/10.1177/02666669211064847

to give feedback to extension systems in real-time and promote the participation of women and youth in agriculture.

Chisita (2012) attributes the failure of current agricultural extension services to meet the information needs of farmers to the absence of systems that facilitate timely information–sharing, gathering and transmission. Interactive web services and applications are radically transforming the world thus enabling users to create, share, collaborate and publish information online. Social media is the ideal tool to knot and network agricultural populations that are geographically isolated and empower them to share agricultural information and to increase productivity (Chisita, 2012[17]).

Nkambule & Agholor (2021[18]) pointed out that convergence of IT and ICT has created new ways of communication and information sharing globally, despite the inherent geographical limitations. ICT for development is informed by the belief that development, progress, growth, and globalisation can be achieved using technology for greater advantage. The adoption and use of technology benefit farmers by providing easier access to relevant agricultural information and new innovations. Findings also showed that majority of farmers does not have access to internet services due to the expensive cost of internet enabled devices and data. Other limitations in the adoption and use of ICT by farmers include lack of skills, political and cultural diversity, security, lack of infrastructure and poor approaches to promote ICT adoption. However, despite these challenges, farmers who produce in a large commercial scale are showing confidence and willingness to use ICT in their agricultural activities. Another challenge is finding an improved approach that will enable small-scale and subsistence farmers to have adequate access to ICT and thus realised the benefits of digitalisation. ICT and IT application in agriculture allows for the collection, analysis, and distribution of information about the soil and climate. ICT tools such as satellites and sensors can be used to collect and share information about the global climate, including changes in temperature levels and sea levels. With ICT, farmers can be educated about climate change from different locations around the world. ICTs can be used to promote agricultural development, sustainability growth and mitigate the effects of climate change.

In the Western Cape several new innovative agricultural information systems have been developed over the years and many recently. Amongst others:

- Fruitlook - an application that supports farmers in improving their water use efficiency and overall quality of yield.
- CapeFarmMapper - an online mapping tool designed to improve the spatial information available in order to increase efficiency through foresight for decision making in the fields of agriculture and environmental management.

[17] https://www.ifla.org/past-wlic/2012/205-chisita-en.pdf
[18] https://openscholar.ump.ac.za/bitstream/20.500.12714/469/3/Information-Communication-Technology-as-a-tool-for-agricultural-transformation-and-development-in-South-Africa-a-review..pdf

Both Fruitlook and CapeFarmMapper have seen a number of additions since its inception and has an increased user database.

- AgriStats Portal - a comprehensive web-based agricultural statistics portal designed to assist with farm business planning and decision making.
- Agricultural Information Management System (AIMS) - a workflow based system with different data input and capture methods with a strong spatial component that aims to improve the department's decision making through business intelligence and inform its strategies to deliver improved and quality service delivery.
- E-Learning Platform - established by the Elsenburg Agricultural Training Institute, in collaboration with Stellenbosch University, in order to save the academic year amidst the Covid-19 pandemic. This online learning tool is designed to assist students to stay abreast with all content, assignments and academic information.
- eCos – Online Export Certificate Platform
- Paltrac – A leading supplier of software solutions, product coding and integration services to the South African agricultural industry. Their focus is on supply chain visibility from producer to port.
- GreenCape - Through interactions with businesses, investors, government and academia, GreenCape's sector desks collect, create, and disseminate market intelligence on the green economy.
- Farmable - Farm Management App: Uniquely designed for fruits and tree crops, but can be used for a wide variety of farming. With the app, you can visualize your farm's field operations, share notes, track activities and keep it all in your pocket.
- A number of communication tools (E.g. Agriprobe, Careers in Agriculture, foodformzansi, etc.)

Some of these systems are very successful and there maybe a potential for Western Cape based businesses / organisation to expand them to other African countries.

3.8 Skills & Training

According to Allen et al., 2018[19], 22% of total food economy employment in West Africa is in off-farm food activities. Many of these jobs are vendors in small shops, street markets, hawkers or food stalls and street food. These mostly informal activities provide the bulk of urban food supply. In particular, poor urban households are dependent on these distribution networks. Beyond the direct effect on employment, these activities

[19]https://www.oecd.org/swac/topics/food-system-transformations/handout-agriculture-food-jobs-west-africa.pdf

are also important for driving agricultural development and broader structural transformations. 70% of all off-farm food system jobs are in food marketing activities – transport, storage, wholesale, retail. It is the largest off-farm segment accounting for 27% of all service sector employment.

The transformation of food systems creates new off-farm employment opportunities in rural areas. Many of the new jobs are linked to agriculture. Specialisation of agricultural production systems towards higher-value food products (fruit, vegetables, dairy, meat) and processed foods, leads to increased demand for rural labour in the off-farm segments of the food economy. Increasing agricultural productivity will be central in developing the job potential in off-farm employment opportunities, as well as in agriculture itself.

Developing these new employment opportunities - on- and off- farm and in rural and urban areas – depends on an understanding of food systems, capturing the links between agricultural productivity, off-farm employment and rural and urban areas.

Thomas (2017) pointed out that there is growing consensus that the productive agriculture of the future will be knowledge and technology intensive, and will require a greater range of technical, business and soft behavioural skills (such as problem solving, organizing and planning, working in teams) than African education and training systems are currently producing. African governments will therefore need to invest in education and skills development to enhance the productivity of the workforce and prepare workers to effectively take advantage of emerging opportunities. The skill sets required for successful farmers, entrepreneurs, employees, and professionals in Africa's agriculture and non-farm sectors are likely to shift rapidly and differ between countries, owing to differences in economic conditions. Strategies to anticipate the nature of shifts and strengthening local "educational supply chains" to provide the requisite skills will be crucial.

Given the condensed background on the transformation of the food systems in Africa, the authors is of the opinion that there is a huge potential for skills development and training to support the transformation of the food systems. Thus, there maybe educational supply chain opportunities for the Western Cape for existing and new skills development & training organisations focussed on the agricultural sector and food systems.

3.9 Agricultural logistics

The African Continental Free Trade Agreement (AfCFTA) promises to usher in a new era of economic prosperity in Africa. The agreement came into force on 30 May 2019, the historic agreement will create the world's largest free trade area since the WTO. However, the transformative potential of the AfCFTA will depend on the free flow of goods across borders - which only the logistics sector can help unlock. According to a recent Briter Bridges survey of logistics tech companies across the continent, 3 trends will shape the future of logistics in African markets: closing the urban-rural divide, the

digitization of logistics, and the continued rise of B2B logistics companies (Hashi, 2019[20]).

Unfortunately, due to poor transportation and storage in many African countries, food often rots on its way to markets. To cut their losses from growing food that they cannot sell, villages stick to subsistence agriculture while cities are forced to import food shipped in refrigerated ships and planes. As a result, despite its huge agricultural potential, Africa has become a net food importer. Farmers face two important transportation challenges that result in prices in villages to be much lower than in cities: dilapidated roads and railways that makes shipping impossible and poor logistics that make it expensive. The first challenge requires massive investment in infrastructure and fortunately, this important investment is being undertaken. In fact, thanks to Chinese and locally funded projects, roads and railways across the continent are being rehabilitated (Nyembu, 2019).

Even when there are proper roads, transportation in Africa remains highly inefficient. Farmers often transport their goods themselves by train or bus. This practice is expensive because they lose days of work en route and by selling to individual customers at the market. It is also inefficient because they can only transport a limited amount of goods and the physical space occupied by passengers would be more profitably used by transporting extra cargo (Nyembu, 2019[21]).

Africa presents great commercial logistical opportunities for those with a bold vision and persistent drive to find the right way. As an example Unitrans Africa[22] (Western Cape based) have demonstrated this ability and ongoing desire to leave a positive mark on the economic development of Sub-Sahara Africa serving more than 300 million people.

McKinsey & Company (2019[23]) found that:

- Given fragmented supply chains, companies have an opportunity to reduce costs and increase value by streamlining and expanding distribution. For input companies, this can mean gaining greater control of the distribution chain and holding more of the working-capital burden by maintaining ownership of inventory in rural aggregation points. Improved distribution could also come through stronger partnerships with other input companies to share the costs of distribution and warehousing across the value chain, again relieving the burden on agro-dealers. The Last Mile Alliance in Tanzania, a partnership of Bayer, NMB Bank, Seed Co, Syngenta, and Yara, worked to establish agro-

[20]https://www.theafricareport.com/18341/the-3-trends-shaping-the-future-of-logistics-in-african-markets/
[21]https://medium.com/@nyembo.kasole/business-opportunities-in-africa-boosting-agriculture-by-improving-logistics-b083b6f629bd
[22] https://www.unitrans.africa/
[23]https://www.mckinsey.com/industries/agriculture/our-insights/winning-in-africas-agricultural-market

dealers in remote areas, using shipping containers as storage and building resources through training and demonstration plots.

- Another approach could be incentivizing the existing distribution chain differently. In interviews with distributors and agro-dealers, they found that about 60 percent of them receive incentives in the form of volume-based discounts. But a look at the experience in consumer-goods businesses suggests that moving incentives from volume-based discounts toward those based on cross-selling with other products or expanding into underpenetrated areas could change behavior within the distribution chain to focus on expanding access and selling a more optimal product mix.
- Some innovators are using digital solutions to provide streamlined and more reliable distribution for inputs and produce. For example, iProcure (based in Kenya) is a business-intelligence and data-driven stock-management company that uses data to support retailer fulfilment (with cost savings to current distributors). Another company, Twiga Foods (based in Kenya), uses a mobile-based B2B platform to connect farmers directly to buyers of horticulture produce. It uses a network of collection points and delivery vehicles to distribute this produce efficiently.
- These shifts in the distribution chain do come with challenges, though, including managing more complex logistics and payment collections from agro-dealers as well as taking on the risk of bad debts further down the distribution chain. Moreover, cost savings may be limited, given the infrastructure constraints in more rural areas. Therefore, this approach should be tailored to the structure of the local distribution chain. For example, direct distribution may make sense in some parts of a country or to some types of farmers, while having local distributors (with improved incentives) may be a better approach in others.

Another example of innovation in cold storage logistics is InspiraFarms (active in Kenya, Rwanda, Zimbabwe and West Africa - Accra). They approached the challenge of rural logistics from a different angle. They use off grid solar solutions to provide cold storage for farmers. The flexibility provided by on-site cold storage increases opportunities for farmers to participate in regional supply chains (Hashi, 2019).

Agricultural e-commerce is at an emerging stage of development on the African continent, but there is no doubt about the enormous commercial opportunity and potential social impact it could bring as it drives growth in the agricultural sector and improves the livelihoods and inclusion of all farmers (De Bruyn, 2021[24]). Like most technological disruptors, this form of trade provides many benefits to buyers and sellers alike, but is it here to stay. However, an effective logistics network is a necessity

[24]https://www.bizcommunity.com/Article/196/741/222930.html#:~:text=The%20most%20obvious%20requirement%20is,Tridge%2C%20which%20specialises%20in%20exports.

for buying or selling any physical product online. This includes national infrastructure, such as roads and rail, as well as efficient and reliable haulage and courier operators. For fresh produce and horticulture, this transport also needs to be refrigerated to ensure that the cold chain is not interrupted enroute to market.

African countries' struggles with logistics are certainly not behind them. While closing the physical infrastructure gap that plagues the continent will continue to require billions of dollars in investment, tech-enabled logistics companies are improving supply chains and optimizing existing infrastructure in African markets. These companies bring improved efficiency that is key to the future promise of intra-African trade (Hashi, 2019).

While South Africa tops the list for having the most developed transport and logistics sector in Sub-Saharan Africa placing it on a par with some of the world's industrialised countries, logistics companies are looking to the rest of Africa for investment opportunities. As Africa has risen to prominence as an investment destination over the past few years, so the role of transportation and logistics has taken on greater significance. Smart investing in Africa means investors need to understand key regions and local markets. If South Africans make the decision to expand in Africa, they will need a solid long-term strategy. The continent needs better transport infrastructure, more connectivity across borders, and an improved business environment to reach its potential (PWC, 2013.[25]).

The condensed background indicate that, albeit challenges, there are several opportunities for Western Cape logistical companies in Africa.

3.10 Other opportunities

Competitiveness hubs: The USAID Southern Africa Trade and Investment Hub (USAID TradeHub) engages with partners across the region to increase sustainable economic growth, global export competitiveness, and trade in targeted Southern African countries. It supports these objectives by increasing exports from Southern African countries to South Africa and the United States (under the African Growth and Opportunity Act [AGOA]), boosting capital and technology flows from South Africa to other Southern African countries, and providing targeted trade facilitation support to Zambia. The USAID TradeHub works with market actors to identify and resolve enterprise constraints and implement sustainable solutions through market-based trade and investment facilitation services. The USAID TradeHub partners with the USAID Bilateral Missions through the Regional Mission to successfully deliver its objectives (USAID, 2021[26]).

Growing blueberries in Ethiopia for the export market. The cultivation of blueberries is

[25] https://www.pwc.co.za/en/press-room/transport-logistics.html

[26]https://www.usaid.gov/mozambique/documents/usaid-southern-africa-trade-and-investment-hub

one of the biggest agricultural opportunities in Ethiopia, according to Nuradin Osman, founder and CEO of Grosso Foods, an Africa-focused agribusiness company with its headquarters in the Netherlands. Thanks to its health benefits, growing global demand for blueberries presents a "huge opportunity" for Ethiopia, said Osman during the African Agri Council's Investment Food Forum 2020. Ethiopian Airlines' cargo division offers a large number of connections to all corners of the world, making Ethiopia a good location from which to export blueberries. In addition to blueberries, Osman is enthusiastic about the production of sunflower oil in Ethiopia[27].

Reliable distribution of food items to the restaurant industry. Restaurants need a steady supply of food ingredients to prepare and sell to their customers. However, in many African countries, stock availability and dependability is lacking, according to Gert Steyn, CEO of South African-based Food Supply Network, a digital marketplace aimed at eliminating inefficiencies in the food supply chain. "If your food orders do not arrive, the price is almost irrelevant. It's crucial that the food arrives on time every day. Our numbers show this stock availability and dependability is lacking in the rest of Africa. There are various reasons for this but there is an opportunity for distributors who can supply on time without fail."

Import substitution of fish in Nigeria. An estimated $600 million in fish is imported into Nigeria every year. According to Danladi Verheijen, managing partner of private equity firm Verod Capital Management, there is an opportunity for the local production of fish products. Verod has invested in the Shaldag fish farm, which grows fish at over 40 times the density of other local fish farms by using modern technology in its operations. The company produces processed, smoked catfish under the Shaldag brand. Says Verheijen: "There are villages in Norway where the entire economy is based around growing a particular type of fish (stockfish) that is sold to Nigeria, and used in sauces and soups. Trawlers from Southeast Asia also fish in the waters outside Lagos and Accra, process the fish in their own countries and then sell the same fish back into Africa. Obviously, this is inefficient and creates an opportunity for African businesses.

Supply of trustworthy agricultural inputs to Ugandan farmers. "One subsector I'm enthusiastic about is agricultural inputs – such as seeds, fertiliser and pesticide – that are critical for food security in East Africa," says Dr Edward Isingoma Matsiko, managing partner of Kampala-based Pearl Capital Partners, a fund manager that invests in agribusiness enterprises in East Africa. "We have seen fake inputs in the market; things like imported fake fertiliser and chemicals, even fake seedlings. Here in Uganda, for example, some farmers planting avocado seedlings won't know if those seedlings are viable until four years later when it is time to harvest, meanwhile they've invested all their savings in that crop."

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[27]https://howwemadeitinafrica.com/eight-agribusiness-and-food-opportunities-in-africa-worth-pursuing-in-2021/85728/

Export of high-value, niche vegetables from Rwanda. Laurent Demuynck, founder and CEO of Kigali Farms, says Rwanda is ideal for the cultivation of certain high-value vegetables and fruits for export to other East African nations. "I believe there is a future for good quality, organic and intensive horticulture in Rwanda. Owing to its proximity to Kenya – where there is a lot of purchasing power – I think it is a great business idea to set up the production of high-value crops. In terms of the product, it would likely be something like speciality or niche vegetables that you cannot find on the shelves, not even Nairobi – produce you can sell for a decent price because it is not yet a commodity product."

Gaps in the Ethiopian wheat value chain[28]

Ethiopia as a regional supplier of fertiliser: Ethiopia has managed to increase its use of fertiliser drastically across the country, thereby improving productivity. Additionally, technological innovations such as the Ethiopian Soil Information System (EthioSIS) give the country the edge in soil mapping techniques. **There are opportunities to supply better quality wheat-specific agrochemicals and produce agrochemicals locally**. Given the limited availability and use of fertiliser across SSA, domestic agrochemical producers in Ethiopia are also well placed to supply wheat producers in the rest of East Africa.

Special Economic Zones (SEZs) and special agro-economic zones: As part of the government's efforts to attract investment in the agricultural sector, various SEZs and special agro-economic zones are being created. Many of the SEZs are devoted solely to agro-processing operations and offer a variety of attractive investment incentives. These include tax holidays, preferential access to export markets (in some cases) and tax free imports of capital goods.

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Appendix 1: The Global Competitiveness Index (GCI) [29]

Basic Requirements (20-60%)			
Institutions (Pillar 1)	**Infrastructure (Pillar 2)**	**Macroeconomic Environment (Pillar 3)**	**Health and Primary Education (Pillar 4)**
Property Rights	Quality of Overall infrastructure	Government budget balance	Business impact of malaria
Intellectual Property Protection	Quality of roads	Gross national savings	Malaria incidence
Diversion of Public Funds	Quality of railroad infrastructure	Inflation	Business imppact of tuberculosis
Public Trust in politicainas	Quality of port infrastructure	Government debt	Tuberculosis incidence
Irregualr payments and bribes	Quality of air transport infrastructure	Country credit rating	Business impact of HIV/AIDS
Judicial independence	Availbale airline seat kilometres		HIV Prevalence
Favoritism in decisions of government officials	Quality of electrictiy supply		Infant Mortality
Wastefulness of government spending	Mobile telephone subscriptions		Life Expectancy
Burden of government regulation	Fixed Telephone Lines		Quality of primary education
efficiency of legal framework in settling disputes			Primary education enrollment rate
Efficiency of legal framework in challenging regulations			
Transparency of government policy making			
Business costs of terrorism			
Business costs of crime and violence			
Organized crime			
Reliablility of police services			
Ethical Behaviour of firms			
Strength of Auditing and reporting standards			
Efficacy of corporate boards			
Protection of minority shareholders' interests			
Strength of investor protection			

[29] The Global Competitiveness Index (GCI) was developed by the World Economic Forum (WEF) and is made up of three sub-indexes, each with their own multiple variables. 12 in total relating to various aspects of competitiveness including business, social and political factors. The sub-indexes include 'Basic Requirements', 'Efficiency Enhancers' and 'Innovation and Sophistication'. The GCI is a comprehensive measure of competitiveness on a global scale.

Innovation and Sophsitication Enhancers (5-30%)	
Business Sophistication (Pillar 11)	**R&D Innovation (Pillar 12)**
Local supplier quantity	Capacity for innovation
Local supplier quality	Quality of scientific research institutions
State of cluster development	Company spending on R&D
Nature of competitive advantage	University-industry collaboration in R&D
Value chain breadth	Government procurment of advanced technology products
Control of international distribution	Availability of scientists and engineers
Production process sophistication	PCT patent applications
Extent of marketing	Intellectual property protection
Willingness to delegate authority	
Reliance on professional management	

Efficiency Enhancers (30-50%)		
Financial Market development (Pillar 8)	**Technological Readiness (Pillar 9)**	**Market Size (Pillar 10)**
Financial services meeting business needs	Availability of latest technology	Domestic market size index
Affordability of financial services	Firm-level technology absorption	Foreign market size index
Finaincing through local equity market	FDI and technology transfer	
Ease of access to loans	Internet users	
Venture Cpatial availability	Broadband and internet subscriptions	
Soundness of banks	Internet bandwidth	
Regulations of securities exchange	Mobile broadband subscriptions	
Legal rights index	Mubile telephone subscirptions	
	Fixed telephone lines	

Efficiency Enhancers (30-50%)		
Higher Education and Training (Pillar 5)	**Goods market efficiency (Pillar 6)**	**Labour Market Efficiency (Pillar 7)**
Secondary Education enrollment rate	Intensity of local competition	Cooperation in labour-employer relations
Tertiary education enrollment rate	Extent of market dominance	Flexibility of wage determination
Quality of the educational system	Effectiveness of anti-monopoly policy	Hiring and firing practices
Quality if math and science education	Effect of taxation on incentives to invest	Redundancy costs
Quality of management schools	Total tax rate	Effect of taxation on incentives to work
Internet access in schools	Number of procedures required to start a busniess	Pay and productivity
Local availability of specialized research and training services	Time required to start a business	Reliance on professional management
Extent of staff training	Agricutlural policy costs	Country capacity to retain talent
	Prevalnce of trade barriers	Country capacity to attract talent
	Trade tariffs	Female participation in labour force
	Prevalnce of foreign ownership	
	Business impact of rules on FDI	
	Burdens of customs procedures	
	Imports as a percentage of GDP	
	Degree of Customer Orientation	
	Buyer Sophistication	

Source: World Economic Forum (2020)

Appendix 2: The Country Attractiveness Index (CAI) [30]

Rank	Country	Country Attractiveness Index	GDP 2017 USD (millions)	GDP Growth Expectations 2019-2024 years (%)	Population Totals ('000)	Population Growth Estimates (2017-2050)	Ease of doing business (Rank)	Human Development Index	Agriculture's share of GDP	WC Total Export Value 2017 (R millions)	WC Total Export Growth (5 year)	WC Agricultural Export Value 2017 (R millions)	WC Agricultural Export Growth (5 year growth)	Urbanisation (%)	Logistics performance Index	Distance to Market (KM)
1	Namibia	53.1	13 254	5.1	2 534	1.6	107	0.65	7.0	11 458	1.3	3 293	9.3	49.0	2.8	1 324
2	Botswana	50.8	17 407	6.5	2 292	1.2	86	0.72	2.0	6 877	-4.0	1 802	10.6	68.7	2.8	522
3	Nigeria	49.2	375 745	4.7	190 886	2.3	146	0.53	20.8	1 227	-20.3	706	17.3	49.5	2.6	4 719
4	Kenya	46.2	79 263	5.3	49 700	2.0	61	0.59	34.6	2 993	5.8	423	12.2	26.6	2.6	3 233
5	Mauritius	42.0	13 266	6.2	1 265	-0.1	20	0.79	3.1	1 469	24.9	494	15.5	40.8	2.8	3 223
6	Egypt	41.8	235 369	5.2	97 553	1.4	120	0.70	11.5	91	-11.2	25	6.6	42.7	2.8	6 582
7	Tanzania	41.5	52 090	6.8	57 310	2.7	144	0.54	28.7	858	0.8	134	4.9	33.1	2.8	2 725
8	Rwanda	41.4	9 135	10.1	12 208	1.8	29	0.52	31.0	42	-13.2	10	7.5	17.1	2.8	3 001
9	Zambia	41.3	25 868	4.8	17 094	2.7	87	0.59	6.7	2 784	6.5	677	17.5	43.0	2.3	1 587
10	Côte d'Ivoire	39.3	37 353	9.0	24 295	2.3	122	0.49	21.6	182	-11.4	65	13.7	50.3	2.9	5 162
11	Mozambique	39.2	12 646	8.8	29 669	2.5	135	0.44	21.3	1 910	0.4	638	11.5	35.5	2.2	879
12	Angola	39.2	122 124	5.3	29 784	2.9	173	0.58	10.0	2 498	-2.0	1 050	-1.7	64.8	1.9	2 539
13	Morocco	39.2	109 709	6.4	35 740	0.7	60	0.67	12.4	47	24.9	14	22.1	61.9	2.4	7 814
14	Togo	37.7	4 758	7.6	7 798	2.1	137	0.50	41.8	706	14.6	53	26.4	41.2	2.2	4 886
15	Somalia	37.6	7 052	5.7	14 743	2.7	190	0.35	75.0	27	20.3	23	155.2	44.4	1.8	4 059
16	Ghana	37.5	58 997	6.9	28 834	1.8	114	0.59	19.7	493	4.4	300	6.7	55.4	2.4	4 925
17	Djibouti	37.2	1 845	8.2	957	1.0	99	0.48	2.2	75	18.8	12	20.6	77.6	2.8	4 821
18	Sao Tome and Princip	37.1	393	7.1	204	1.9	170	0.59	11.5	8	53.9	2	49.0	72.0	2.3	3 924
19	Uganda	37.0	25 995	8.5	42 863	2.8	127	0.52	24.6	284	19.7	77	15.9	23.2	2.2	3 332
20	Malawi	36.6	6 303	8.1	18 622	2.5	111	0.48	26.1	427	8.9	160	25.4	16.7	2.2	1 726
21	Congo, Dem. Rep.	36.5	37 642	6.8	81 340	2.7	184	0.46	19.9	1 098	13.6	139	19.6	43.9	2.1	2 718
22	Algeria	36.3	167 555	3.1	41 318	1.0	157	0.75	12.3	276	22.6	34	19.3	72.1	2.4	7 643
23	Ethiopia	36.0	80 561	9.3	104 957	1.8	159	0.46	34.0	60	9.7	45	47.1	20.3	2.1	4 434
24	Senegal	35.4	21 070	10.7	15 851	2.3	141	0.51	16.0	268	6.3	189	31.4	46.7	2.2	6 756
25	Gabon	35.1	15 014	6.4	2 025	1.7	169	0.70	5.2	121	-21.4	77	13.8	89.0	2.1	3 694
26	Eswatini	35.0	4 434	3.6	1 367	1.3	117	0.59	8.4	2 454	2.7	874	14.6	23.6	2.3	428
27	Madagascar	34.8	11 500	7.2	25 571	2.3	161	0.52	20.0	180	33.9	72	23.8	36.5	2.2	2 309
28	Seychelles	34.5	1 498	5.9	96	0.1	96	0.80	1.9	221	17.5	71	23.5	56.3	2.3	4 028
29	Tunisia	34.5	39 932	6.0	11 532	0.6	80	0.73	9.5	21	77.4	2	-6.8	68.6	2.1	7 432
30	Cameroon	33.8	34 923	7.3	24 054	2.2	166	0.56	14.4	141	-21.0	79	-10.5	55.8	2.6	4 224
31	Sudan	33.6	117 488	2.4	40 533	2.1	162	0.50	30.5	106	41.2	21	17.3	34.4	2.2	4 884
32	South Sudan	32.6	2 904	8.2	12 576	2.1	185	0.39	30.5	2	81.6	1	51.0	19.3	2.3	4 884
33	Benin	32.5	9 247	5.7	11 176	2.3	153	0.51	23.0	86	-7.7	35	-24.5	46.8	2.5	4 868
34	Zimbabwe	32.5	22 041	6.1	16 530	1.8	155	0.53	8.3	1 651	1.4	588	7.5	32.2	1.8	1 101
35	Burkina Faso	32.4	12 323	5.2	19 193	2.5	151	0.42	28.7	34	64.8	9	7.4	28.7	2.4	5 551
36	Mauritania	32.2	5 025	9.2	4 420	2.2	148	0.52	23.1	27	12.4	9	-3.0	52.8	2.3	6 899
37	Mali	32.1	15 334	7.0	18 542	2.7	145	0.43	38.3	334	16.1	3	-19.9	41.6	2.3	5 954
38	Lesotho	31.8	2 578	4.1	2 253	1.1	106	0.52	6.1	2 561	4.4	480	9.6	27.7	2.0	369
39	Chad	31.3	9 871	7.1	14 900	2.5	181	0.40	49.1	5	89.4	1	-1.2	22.9	2.4	4 621
40	Congo, Rep.	31.1	8 701	3.5	5 261	2.4	180	0.61	6.4	104	-40.1	74	9.0	66.5	2.1	3 096
41	Comoros	29.8	1 068	5.3	814	1.8	164	0.50	29.9	2	-33.6	2	13.2	28.8	2.3	2 536
42	Niger	29.8	8 120	9.2	21 477	3.6	143	0.35	39.7	2	-5.0	1	-12.5	16.4	2.0	5 353
43	Liberia	29.0	3 285	3.0	4 732	2.2	174	0.44	37.1	143	7.6	25	32.3	50.7	1.9	5 595
44	Gambia, The	28.5	1 489	7.1	2 101	2.4	149	0.46	23.0	32	21.2	4	10.8	60.6	1.8	6 621
45	Cabo Verde	27.4	1 773	7.2	546	0.9	131	0.65	6.0	1	-12.1	-	-100.0	65.3	2.3	7 392
46	Eritrea	27.2	6 050	6.6	3 499	2.0	189	0.44	11.7	10	3.9	3	-13.5	33.2	1.9	5 071
47	Sierra Leone	27.0	3 775	7.4	7 557	1.7	163	0.42	60.3	28	3.7	14	13.5	41.6	1.8	5 942
48	Guinea-Bissau	26.5	1 347	7.2	1 861	2.0	175	0.46	49.0	3	-24.1	0	0.0	42.9	1.8	6 433
49	Guinea	26.4	10 473	7.7	12 717	2.3	152	0.46	16.4	16	24.6	6	43.5	35.8	1.6	6 056
50	Libya	26.0	38 108	3.6	6 375	0.7	186	0.71	1.3	14	-12.4	11	-19.0	79.8	2.2	6 902
51	Equatorial Guinea	24.8	12 294	-1.4	1 268	2.5	177	0.59	2.3	10	-11.9	5	-6.5	71.6	1.9	3 996
52	Central African Repu	24.7	1 949	7.2	4 659	2.0	183	0.37	39.6	1	-12.6	-	0.0	41.0	1.9	3 890
53	Burundi	21.9	3 172	2.6	10 864	2.7	168	0.42	30.6	5	-33.3	0	-43.2	12.7	2.0	2 848

Source: Morokong and Pienaar (2019)

[30] The Country Attractiveness Index (CAI) was developed by Morokong and Pienaar (2019) and is a composite indicator that considers 14 different variables used to determine the attractiveness of African export markets for the Western Cape agricultural sector.

Appendix 3: The variables used to construct the Country Priority Index and their sources

Variable	Source	
Global Competitiveness Index	World Economic Forum	https://www.weforum.org/
Country Attractivness Index	Morokong and Pienaar, 2019	Western Cape Government
GDP per capita	World Bank	https://www.worldbank.org/en/home
GDP Growth Expectations (2019-2024)	Morokong and Pienaar, 2019	Western Cape Government
Human Development Index	United Nations Development Programme	https://www.un.org
FDI Net Inflows (2017-2019 Average)	World Bank	https://www.worldbank.org/en/home
Political Stability	World Bank	https://www.worldbank.org/en/home
Ease of Doing Business Index	World Bank	https://www.worldbank.org/en/home
Corruption Perceptions Indes	Transparency International	https://www.transparency.org
Regulatory Quality	World Bank (World Growth Indicators)	https://www.worldbank.org/en/home
Road Infrastructure	World Economic Forum	https://www.weforum.org/
Port Infrastructure	World Economic Forum	https://www.weforum.org/
Logistical Performance Index	World Bank	https://www.worldbank.org/en/home
Distance to Market	Morokong and Pienaar, 2019	Western Cape Government

Appendix 4: Results of the Classic Linear Regression Model (CLRM) and the Subsequent full set of data

COUNTRY	Global Competitiveness Index (GCI) (2020)	Country Attractiveness Index (CAI) (2019)	Gross Domestic Product per Capita (GDP per cap) (2020)	Gross Domestic Product Growth Expectations (2019-2024 (%))	Human Development Index (HDI) (2020)	Foreign Direct Investment Net Inflows (2017-2019 Average (USD))	Political Stability (2020)	Ease of Doing Business Index (2019)	Corruption Perceptions Index (2021)	Regulatory Quality (2020)	Road Infrastructure	Port Infrastructure	Logistical Performance Index (LPI) (2018)	Distance to Markets (km)	Ease of Doing Business Index (Adjsuted for Normalization)	Distance to Markets (km) (Adjsuted for Normalization)
Algeria	56,25	36,30	3306,86	3,10	0,75	1 359 186 522,84	-0,86	157,00	33,00	9,13	4,00	3,90	2,45	7643,00	-157,00	-7643,00
Angola	38,11	39,20	1776,17	5,30	0,58	-5 983 950 189,98	-0,52	177,00	29,00	15,87	2,20	2,80	2,05	2539,00	-177,00	-2539,00
Benin	45,82	32,50	1291,04	8,70	0,51	204 394 758,09	-0,44	149,00	42,00	38,94	3,20	3,70	2,75	4868,00	-149,00	-4868,00
Botswana	55,49	50,80	6404,90	6,50	0,72	213 379 107,11	1,09	87,00	55,00	65,38	3,80	3,20	2,62	522,00	-87,00	-522,00
Burkina Faso	43,42	32,40	857,93	8,20	0,42	144 652 579,51	-1,55	151,00	42,00	37,50	2,80	2,80	2,62	5551,00	-151,00	-5551,00
Burundi	40,25	21,90	238,99	2,60	0,42	781 726,48	-1,41	166,00	19,00	12,50	3,90	3,20	2,06	2848,00	-166,00	-2848,00
Cabo Verde (Cape Verde)	50,83	27,40	3064,27	7,20	0,65	109 228 746,69	0,88	137,00	58,00	50,48	4,00	3,20	2,28	7392,00	-137,00	-7392,00
Cameroon	46,02	33,80	1537,13	7,30	0,56	868 110 063,87	-1,53	167,00	27,00	19,71	2,40	3,10	2,60	4224,00	-167,00	-4224,00
Central African Republic	43,54	24,70	492,80	7,20	0,37	16 831 148,05	-2,18	184,00	24,00	5,77	3,23	3,53	2,15	3890,00	-184,00	-3890,00
Chad	35,08	31,30	659,27	7,10	0,40	463 637 030,67	-1,26	182,00	20,00	11,06	2,87	3,50	2,42	4621,00	-182,00	-4621,00
Comoros	41,08	29,80	1420,66	5,30	0,50	4 630 875,04	-0,29	160,00	20,00	10,58	3,47	3,83	2,56	2536,00	-160,00	-2536,00
Congo, Democratic Republic	40,21	36,50	543,95	6,80	0,46	1 268 845 765,73	-1,71	183,00	19,00	5,29	2,10	2,40	2,43	2718,00	-183,00	-2718,00
Congo, Republic	36,14	31,10	1846,13	3,50	0,61	4 032 763 221,33	-0,90	180,00	21,00	7,21	2,83	3,23	2,49	3096,00	-180,00	-3096,00
Cote d'Ivoire (Ivory Coast)	48,15	39,30	2325,72	9,00	0,49	814 742 264,20	-0,98	110,00	36,00	41,83	3,60	4,00	3,08	5162,00	-110,00	-5162,00
Djibouti	45,73	37,20	3425,48	8,20	0,48	169 976 292,43	-0,32	112,00	30,00	20,19	3,54	4,17	2,63	4821,00	-112,00	-4821,00
Egypt	54,54	41,80	3569,21	8,20	0,70	8 186 700 000,00	-1,21	114,00	33,00	25,48	5,10	4,80	2,82	6582,00	-114,00	-6582,00
Equatorial Guinea	40,94	24,80	7143,24	-1,40	0,59	384 397 380,53	-0,19	178,00	17,00	4,81	3,57	3,50	2,32	3996,00	-178,00	-3996,00
Eritrea	42,17	27,20	715,36	6,60	0,44	61 199 666,67	-0,98	189,00	22,00	0,48	2,87	3,50	2,09	5071,00	-189,00	-5071,00
Eswatini	46,43	35,00	3424,28	3,60	0,59	33 818 051,74	-0,12	121,00	32,00	32,69	4,00	3,40	2,40	428,00	-121,00	-428,00
Ethiopia	44,37	36,00	936,34	9,30	0,46	3 308 774 120,22	-1,74	159,00	39,00	14,42	3,00	2,80	2,32	4434,00	-159,00	-4434,00
Gabon	47,46	35,10	6881,72	6,40	0,70	1 415 412 340,33	-0,08	169,00	31,00	17,79	2,51	3,30	2,16	3694,00	-169,00	-3694,00
Gambia	45,92	28,50	773,00	7,10	0,46	72 408 942,83	0,25	155,00	37,00	25,96	3,70	3,90	2,40	6621,00	-155,00	-6621,00
Ghana	51,20	37,50	2205,53	6,90	0,59	3 374 618 823,23	0,13	118,00	43,00	52,40	3,00	3,10	2,57	4925,00	-118,00	-4925,00
Guinea	46,13	26,40	1194,04	7,70	0,46	324 916 666,67	-0,64	156,00	25,00	19,23	3,70	5,00	2,20	6056,00	-156,00	-6056,00
Guinea-Bissau	41,71	26,50	727,52	7,20	0,46	35 971 232,17	-0,60	174,00	12,00	9,62	3,47	3,83	2,39	6433,00	-174,00	-6433,00
Kenya	54,14	46,20	1878,58	8,30	0,59	1 408 165 105,92	-1,00	56,00	30,00	35,58	4,10	4,20	2,81	3233,00	-56,00	-3233,00
Lesotho	42,90	31,80	875,35	4,10	0,52	39 591 816,48	-0,33	122,00	38,00	32,21	2,70	3,63	2,28	369,00	-122,00	-369,00
Liberia	40,55	29,00	632,94	3,00	0,44	154 551 479,44	-0,37	175,00	29,00	13,46	3,87	3,87	2,23	5595,00	-175,00	-5595,00
Libya	44,21	26,00	3699,29	3,60	0,71	459 917 194,22	-2,48	186,00	17,00	0,96	3,33	3,17	2,11	6902,00	-186,00	-6902,00
Madagascar	42,86	34,80	471,49	7,20	0,52	517 068 128,83	-0,46	161,00	26,00	22,60	3,54	3,40	2,39	2309,00	-161,00	-2309,00
Malawi	43,70	36,60	636,82	8,10	0,48	74 160 051,87	-0,24	109,00	35,00	23,56	2,80	2,20	2,59	1726,00	-109,00	-1726,00
Mali	43,59	32,10	862,45	7,00	0,43	582 356 141,84	-2,15	148,00	29,00	30,29	3,20	2,20	2,59	5954,00	-148,00	-5954,00
Mauritania	40,92	32,20	1701,99	9,20	0,52	159 182 185,38	-0,75	152,00	28,00	20,67	3,10	4,17	2,33	6899,00	-152,00	-6899,00
Mauritius	64,27	42,00	8627,84	6,20	0,79	470 643 120,63	0,89	13,00	54,00	84,13	4,70	4,50	2,73	3223,00	-13,00	-3223,00
Morocco	60,01	39,20	3058,69	6,40	0,67	2 648 440 696,21	-0,33	53,00	39,00	48,56	4,70	5,10	2,54	7814,00	-53,00	-7814,00
Mozambique	38,08	39,20	448,54	8,80	0,44	2 059 300 466,48	-1,16	138,00	26,00	25,00	2,40	3,30	2,37	879,00	-138,00	-879,00
Namibia	54,46	53,10	4179,28	5,10	0,65	112 790 479,32	0,65	104,00	49,00	49,04	5,30	4,90	2,62	1324,00	-104,00	-1324,00
Niger	43,54	29,80	567,67	9,20	0,35	507 300 207,51	-1,74	132,00	31,00	23,08	2,97	3,50	2,07	5353,00	-132,00	-5353,00
Nigeria	48,33	49,20	2097,09	4,70	0,53	1 831 107 375,98	-1,86	131,00	24,00	13,94	2,50	2,50	2,53	4719,00	-131,00	-4719,00
Rwanda	52,82	41,40	797,86	10,10	0,52	301 130 213,80	0,03	38,00	53,00	58,17	4,80	3,20	2,97	3001,00	-38,00	-3001,00
Sao Tome & Principe	45,83	37,10	2157,84	7,10	0,59	27 366 203,34	0,48	170,00	45,00	16,83	3,54	3,63	2,65	3924,00	-170,00	-3924,00
Senegal	49,69	35,40	1471,83	10,70	0,51	833 865 797,58	-0,02	123,00	43,00	42,79	4,10	4,00	2,25	6756,00	-123,00	-6756,00
Seychelles	59,60	34,50	10764,42	5,90	0,80	228 670 249,85	0,72	100,00	70,00	48,08	4,00	4,40	2,52	4028,00	-100,00	-4028,00
Sierra Leone	38,80	27,00	509,38	7,40	0,42	335 539 418,82	-0,24	163,00	34,00	18,27	3,54	4,17	2,08	5942,00	-163,00	-5942,00
Somalia	40,21	37,60	438,26	5,70	0,35	408 000 000,00	-2,52	190,00	13,00	2,40	2,93	2,90	2,21	4059,00	-190,00	-4059,00
South Sudan	43,54	32,60	715,36	8,20	0,39	19 783 333,33	-2,17	185,00	11,00	1,92	2,87	3,50	2,23	4884,00	-185,00	-4884,00
Sudan	40,21	33,60	486,42	2,40	0,50	1 008 813 545,93	-1,76	171,00	20,00	4,33	3,33	2,90	2,43	4884,00	-171,00	-4884,00
Tanzania	48,19	41,50	1076,47	6,80	0,54	1 042 170 706,15	-0,41	141,00	39,00	27,40	4,10	4,10	2,40	2725,00	-141,00	-2725,00
Togo	45,73	37,70	914,95	7,60	0,50	84 427 843,89	-0,92	97,00	30,00	30,77	3,64	4,17	2,45	4886,00	-97,00	-4886,00
Tunisia	56,41	34,50	3521,59	6,00	0,73	870 017 613,85	-0,63	78,00	44,00	39,42	3,60	3,40	2,57	7432,00	-78,00	-7432,00
Uganda	48,94	37,00	822,03	8,50	0,52	1 043 981 026,63	-0,78	116,00	27,00	36,54	3,70	2,70	2,58	3332,00	-116,00	-3332,00
Zambia	46,51	41,30	985,13	4,80	0,59	687 975 402,05	-0,13	85,00	33,00	29,33	3,40	2,70	2,53	1587,00	-85,00	-1587,00
Zimbabwe	44,24	32,50	1214,51	6,10	0,53	424 851 020,35	-1,08	140,00	23,00	7,69	2,80	3,10	2,12	1101,00	-140,00	-1101,00

Source: Annandale (2022)

Appendix 5: Results of the Country Priority Index

COUNTRY	Country Priority Index Score	Rank According to Country Priority Index
Mauritius	0,81	1
Seychelles	0,71	2
Namibia	0,68	3
Botswana	0,67	4
Rwanda	0,65	5
Morocco	0,62	6
Egypt	0,60	7
Kenya	0,57	8
Tunisia	0,52	9
Cape Verde	0,51	10
Cote d'Ivoire (Ivory Coast)	0,51	11
Eswatini	0,49	12
Ghana	0,49	13
Senegal	0,48	14
Sao Tome & Principe	0,48	15
Zambia	0,47	16
Tanzania	0,47	17
Djibouti	0,47	18
Benin	0,45	19
Togo	0,44	20
Algeria	0,43	21
Uganda	0,43	22
Gabon	0,42	23
Lesotho	0,42	24
Malawi	0,41	25
Gambia	0,40	26
Comoros	0,40	27
Madagascar	0,39	28
Guinea	0,39	29
Mauritania	0,38	30
Mozambique	0,36	31
Equatorial Guinea	0,35	32
Congo, Republic	0,35	33
Sierra Leone	0,35	34
Zimbabwe	0,34	35
Cameroon	0,33	36
Burkina Faso	0,33	37
Ethiopia	0,32	38
Liberia	0,32	39
Guinea-Bissau	0,31	40
Nigeria	0,30	41
Niger	0,29	42
Angola	0,28	43
Mali	0,28	44
Chad	0,27	45
Burundi	0,26	46
Libya	0,26	47
Sudan	0,26	48
Eritrea	0,25	49
DRC	0,23	50
Central African Republic	0,23	51
South Sudan	0,21	52
Somalia	0,16	53

Source: Annandale (2022)

Country	Western Cape Average Top 25 Agricultural Exports to Africa for 2016-2017 (ZAR Current Prices)
Namibia	1 487 048 177
Botswana	1 033 364 473
Nigeria	652 544 297
Eswatini	435 283 289
Kenya	402 673 303
Mozambique	334 458 594
Zambia	294 758 324
Mauritius	252 148 710
Senegal	244 197 673
Zimbabwe	238 884 638
Angola	226 802 264
Lesotho	200 799 483
Tanzania	143 480 727
Ghana	102 504 231
DRC	92 531 638
Cote d'Ivoire	86 780 865
Cameroon	83 466 394
Malawi	82 942 553
Uganda	67 787 681
Togo	64 817 818
Gabon	62 471 177
Congo, Republic	41 066 421
Ethiopia	39 634 967
Somalia	35 266 507
Madagascar	34 256 016
Seychelles	24 780 393
Djibouti	23 250 829
Benin	18 819 044
Liberia	16 517 961
Guinea	10 505 914
Gambia	8 617 100
Burkina Faso	8 396 182
Egypt	8 324 895
Mali	7 816 421
Rwanda	7 630 676
Sierra Leone	5 908 433
Algeria	5 236 923
Eritrea	3 699 235
Sudan	3 368 129
Niger	2 964 503
South Sudan	2 319 955
Guniea-Bisau	2 200 976
Mauritania	2 014 909
Equatorial Guinea	1 929 098
Chad	1 253 389
Comoros	1 081 368
Burundi	588 853
Libya	437 978
Morocco	172 781
Tunisia	152 151
Sao Tome and Principe	103 763
Central African Republic	80 246
Cape Verde	37 979

Source: Quantec, (2022)

Country	Trade Rank Minus Index Rank	Color Codes
Nigeria	-38	Current Trade Significantly Exceeds Country Priority Index
Congo, Democratic Republic	-35	
Angola	-32	
Somalia	-29	
Mozambique	-25	
Zimbabwe	-25	
Cameroon	-19	Current Trade Exceeds Country Priority Index
Ethiopia	-15	
Lesotho	-12	
Congo, Republic	-11	
Eritrea	-11	
South Sudan	-11	
Liberia	-10	Current Trade Correlates with Country Priority Index
Mali	-10	
Sudan	-9	
Zambia	-9	
Eswatini	-8	
Malawi	-7	
Burkina Faso	-5	
Senegal	-5	
Tanzania	-4	
Kenya	-3	
Madagascar	-3	
Uganda	-3	
Botswana	-2	
Gabon	-2	
Namibia	-2	
Niger	-2	
Chad	0	
Togo	0	
Burundi	1	
Central African Republic	1	
Ghana	1	
Guinea	1	
Libya	1	
Guinea-Bissau	2	
Sierra Leone	2	
Cote d'Ivoire (Ivory Coast)	5	
Gambia	5	
Mauritius	7	
Benin	9	
Djibouti	9	
Equatorial Guinea	12	Country Priority Index Exceeds Current Trade
Mauritania	13	
Algeria	16	
Comoros	19	
Seychelles	24	Country Priority Index Significantly Exceeds Current Trade
Egypt	26	
Rwanda	30	
Sao Tome & Principe	36	
Tunisia	41	
Cabo Verde (Cape Verde)	43	
Morocco	43	

Source: Annandale (2022)

Key for the Country Priority Index

0 to Negative
Trade is more than what the index suggests (overtrading)

0 to Positive
Trade is less than what the index suggests (Undertrading)

Description
Green: Current trade correlates with country priority index
Orange: Current trade exceeds country priority index
Blue: Country priority index significantly exceeds current trade
Red: Current trade significantly exceeds country priority index
Grey: Country priority index exceeds current trade

Appendix 6: The Top 25 Agricultural Exports by the Western Cape (Average 2016-2021) (Rand '000 current prices)

Number	Product	Top 25 Exp to Africa (Rand '000)(Average 2016-2021)
1	HST080810: - Apples	1 459 804
2	HST220421: - Wine of fresh grapes	884 484
3	HST220600: - Cider and other fermented beverages	649 540
4	HST200990: - Mixtures of fruit juices, including grape must, and vegetable juices	577 532
5	HST210690: - Food preparations n.e.s.	491 386
6	HST200989: - Juice of fruit or vegetables	210 930
7	HST040120: - Milk and cream of a fat content, by weight, exceeding 1 % but not exceeding 6 %	188 884
8	HST080610: - Fresh grapes	176 467
9	HST040690: - Cheese (excluding fresh cheese)	166 296
10	HST210320: - Tomato ketchup and other tomato sauces	166 139
11	HST220870: - Liqueurs and cordials	158 324
12	HST170490: - Sugar confectionary not containing cocoa	152 407
13	HST230400: - Oilcake and other solid residues, whether or not ground or in the form of pellets, resulting from the extraction of soya-bean oil	144 411
14	HST220820: - Spirits obtained by distilling grape wine or grape marc	142 441
15	HST080510: - Oranges	137 611
16	HST220830: - Whiskies	134 911
17	HST210390: - Preparations for sauces and prepared sauces	130 015
18	HST080830: - Fresh pears	124 260
19	HST220300: - Beer made from malt	123 986
20	HST120991: - Vegetable seeds for sowing	120 663
21	HST220429: - Wine of fresh grapes in containers more than two litres (excluding sparkling wine)	118 053
22	HST190590: - Bread, pastry, cakes, biscuit and other bakers' wares	115 084
23	HST100630: - Semi-milled or wholly milled rice, whether or not polished or glazed	114 404
24	HST200969: - Grape juice, including grpae must, unfermented	112 997
25	HST220210: - Waters, including mineral waters and aerated waters, containing added sugar or other sweetening matter or flavoured	111 467

Source: Quantec and own calculations