MPUMALANGA
GREEN CLUSTER
AGENCY

2023

Mpumalanga **Sustainable Agriculture** Market Intelligence Opportunity Brief

Mpumalanga Green Cluster Agency

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Mbombela, South Africa

Author: Sixolise Mcinga
Editorial and review: Sibusisiwe Maseko, Jane Reddick, Lauren Basson, Thula Zondi, Cilnette Pienaar and Nicholas Fordyce

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LIST OF ABBREVIATIONS AND ACRONYMS

AfCFTA	African Continental Free Trade Agreement
AFOLU	Agriculture, Forestry and Other Land Use
AGOA	African Growth and Opportunity Act
ARC	Agricultural Research Council
BFAP	Bureau for Food and Agricultural Policy
BSF	Black Soldier Fly
CBAM	Carbon Border Adjustment Mechanism
CEA	Controlled environment agriculture
CSIR	Council for Scientific and Industrial Research
CTF	Clean Technology Fund
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs

DFFE	Department of Forestry, Fisheries and the Environment
DMRE	Department of Mineral Resources and Energy
EU	European Union
FAO	Food and Agriculture Organisation
GVA	Gross Value Added
GVC	Global Value Chains
IRP	Integrated Resource Plan
MEGA	Mpumalanga Economic Growth Agency
NDC	National Development Contribution
NDP	National Development Plan
NEMA	National Environmental Management Act
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SADC	Southern African Development Community
SAIIA	South African Institute of International Affairs
TIA	Technology and Innovation Agency
WWTW	Wastewater treatment works

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EXECUTIVE SUMMARY

This market opportunity brief is part of an annually updated series of reports that highlight investment opportunities in the green economy in Mpumalanga. It is written for investors who want to understand the opportunities for investment and job creation in green economy sectors in the province. This brief highlights emerging investment opportunities in the sustainable agriculture sector in Mpumalanga.

Agriculture contributes significantly to South Africa (SA)'s economy and plays a vital role in sustaining livelihoods and providing food security. The sustainable agriculture sector is a key sector of the Mpumalanga economy, and holds great potential to contribute to labour-absorptive greener economic growth and economic diversification.

Mpumalanga houses the vast majority of coal power stations and coal mining activities. The transformation of the South African energy system to cleaner energy sources is gathering momentum. As a province, Mpumalanga has an abundance of additional resources that can be harnessed sustainably. Mpumalanga has been proactive in exploring opportunities in the green economy for opportunity-lead growth and to transition the province's economy to enable it to become a labour absorbing green focused region.

Agriculture is a labour-intensive sector both in terms of employment per unit of output and in terms of its potential as an employment multiplier. However, agriculture is resource intensive and accounts for a substantial portion of the province's natural resource use (~56% of land for cropland, pastures, and forests and ~55% of water use). Furthermore, mining and current agricultural practices in the province have led to soil degradation and environmental pollution. To address these challenges and lever the opportunities enabled by an expanded agriculture sector, efforts are required to transition to more sustainable agricultural practices. Furthermore, the extent to which climate change may negatively impact agriculture and the associated employment depends in part on the ability of farmers to adopt new sustainable and climate-adaptive practices and technologies.

This market intelligence report focuses on investment opportunities in sustainable agriculture and specifically opportunities for **economic diversification, controlled environment agriculture (CEA), and circular agriculture** and unpacks key insights that enable entry to these new investment opportunities. It further highlights Mpumalanga's macro-environment which inhibits or enables the entry into these new and emerging opportunities *(see Table 1)*.

Table 1: Summary of investment opportunities in sustainable agriculture in Mpumalanga

Opportunity	Key Drivers	Macro-environment	Risks & Barriers	Expected Timeframe	Targeted Investor
Opportunities for economic diversification					
Industrial hemp **Market size** **R1.2 billion** [1]	• Bio-remediation properties of industrial hemp, especially for post-mine land rehabilitation. • Enabling regulatory environment for industrial hemp cultivation over the last two years.	• The 2023 South African budget speech highlighted industrial hemp as a sustainability anchor with a projected market value of R426 billion by 2026. • The cannabis sector (which includes cannabis and hemp) has been identified as one of the 14 priority sectors in SA, by the Office of the Presidency. • Currently there are pilot studies exploring industrial hemp cultivation on mine land to assess economic viability. • 40 hemp permits have already been issued in Mpumalanga. • Over R100 billion is needed to fully unlock the hemp value chain in SA.	• Inconsistent financial information provided by mines and Department of Mineral Resources and Energy (DMRE) for mining rights and closure certificates. • Minimum viable size for a profitable cultivation is 50ha. • Lack of knowledge around seed genetics, which feeds into suitability for the different industries. • Possible conflict with indigenous growers. • Lack of local processing capacity - producers may battle to find off-takers in the short term.	Short to medium term	• Mining companies. • Private investors. • The sugarcane industry.
Niche agricultural products **Market size** **R250 million**	• Economic diversification under the just transition. • Growing demand for niche products to satisfy specific export markets. African Continental Free Trade Agreement which aims to eliminate barriers and boost intra-Africa trade [2]	• There is a growing local demand for niche products such as yam, cassava and other root crops, as there are high importation costs associated with these products. • SADC region is already in the top 10 export destinations for SA agricultural products e.g. grain. • Maputo development corridor for exports connecting the landlocked regions of Kingdom of eSwatini and South Africa to the Mozambique and the Port of Maputo.	• Unclear off-take agreements. • Limited market knowledge on specific commodities. • Constraints with cross-border logistics.	Short to medium term	• Mining companies. • Private investors. • The sugarcane industry.

[1] Market size of R1.2 billion: this market size is calculated based on potentially available mine-land and only accounts for the opportunity at primary production and not including the processing component of the value chain.
[2] AfCFTA: African Continental free trade agreement was established in 2018 which has 43 parties and 11 signatories, making it the largest free-trade area by number of member states, after the World Trade Organisation and the largest in population and geographic size, spanning 1.3 billion people across the world's second largest continent. The aim of the agreement was to boos intra-Africa trade and eliminate trade barriers.

Opportunity	Key Drivers	Macro-environment	Risks & Barriers	Expected Timeframe	Targeted Investor
Energy crops **Market size** **R186 million**	• Growing demand for sustainability within the aviation industry. • Price volatility of fuel and oil. • Sugar Value Chain Master Plan 2030 plan aims to diversify production to biofuels • Ability to grow crops on degraded land, unfit for human consumption.	• Part of the Sugar Value Chain Master Plan 2030 is to develop detailed strategies and plans to provide and support appropriate crop diversification by growers as alternatives to sugarcane and support enhanced financial viability of sugarcane growers. • Currently 14% of arable land in the province is underutilised, and most of it is in the former homelands. These areas lack market access (which biofuels plants could provide) and infrastructure (which agricultural and infrastructural support programmes could provide).	• Wariness by government around competition with food crops. • Unclear biofuels regulation to support growth of the industry. • Unclear business/economic model.	Medium to long term	• Mining companies. • Private investors. • The sugarcane industry.
Controlled environment agriculture (CEA)					
Aquaponics **Market size** **R146 million** Hydroponics **Market size** **R136 million** Greenhouses **Market size** **R129 million**	• Erratic rainfall making crop production in open land risky. • High potential for exports of high value crops to neighbouring countries through the Maputo corridor (e.g. dried fish, fresh vegetables etc.). • Alternative protein supply (in the case of aquaponics).	• Agriculture and Agro-processing Master Plan aims to drive more hectares under irrigation, production in controlled environments, increased productivity, and better usage of water and resources • Mpumalanga has been identified as an agro-processing node with existing infrastructure at mines which can be converted to assets. • Aquaculture cluster (TIA [3] , CSIR) is to be established to enable greater uptake of technologies.	• High capital cost of infrastructure for CEA. • Limited technical skills for running CEA systems. • High energy costs and need for consistent energy supply.	Short to medium term	• Mining companies. • Private businesses. • Technology providers. • Climate financiers.

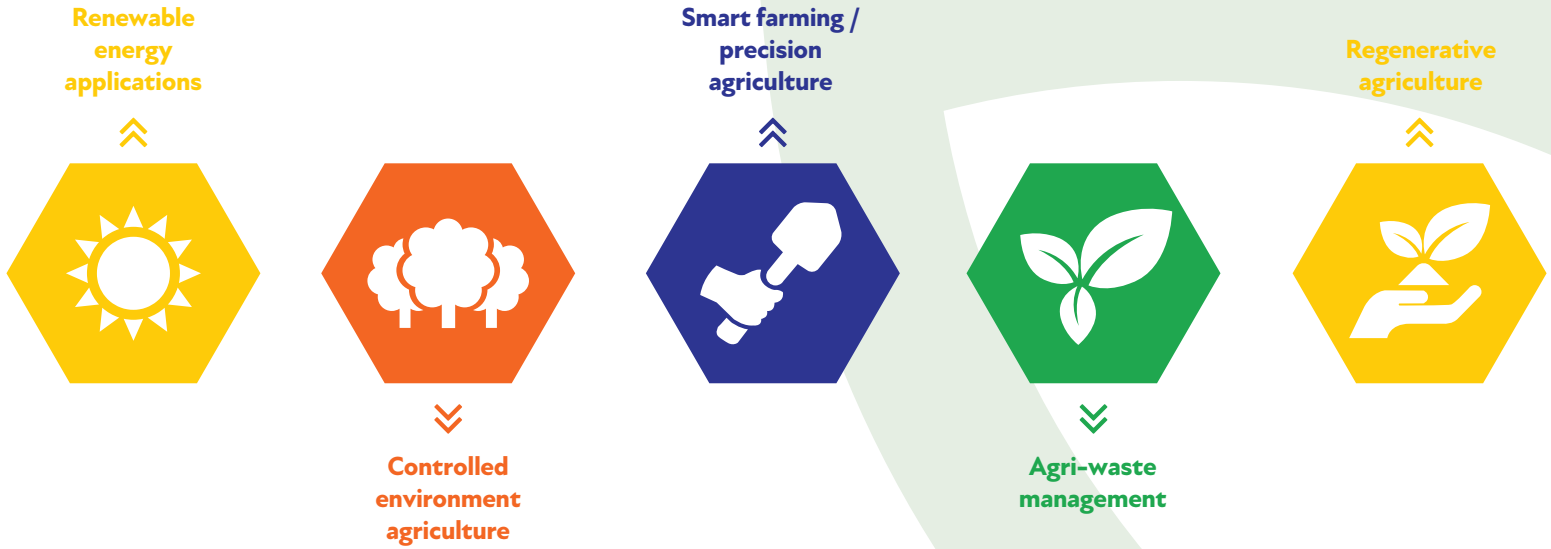
[3] Technology Innovation Agency

Opportunity	Key Drivers	Macro-environment	Risks & Barriers	Expected Timeframe	Targeted Investor
Circular agriculture					
Waste-to-fertiliser **Market size** **R426 million**	• Income diversification for wastewater treatment facilities and organic waste management companies. • Rapid urbanisation and growing food loss and waste along agri-food chain. • Price volatility of chemical fertilisers. • Chemical fertiliser bans which may come into effect in the next few years.	• There is an increasing demand for black soldier fly (BSF) farming and BSF products in Mpumalanga and various SMMEs are undertaking pilot studies on BSF products. • There is an interest in off-taking fertiliser from beneficiated wastewater treatment works (WWTWs) sludge by local farmers. • Russia-Ukraine conflict has led to spike in fertiliser costs. • Possible inclusion of agricultural products in the EU's CBAM [4] list.	• Lengthy fertiliser registration process in SA. • End product should be consistent with the product registered as fertiliser. • High capex costs for high-end technologies in BSF production. • Electricity security and costly backup needed.	Short to medium term	• Fertiliser companies. • Farmers. • Private companies. • Climate financiers. • Food waste producing companies.
Waste-to-feed **Market size** **R1.4 billion**	• Financial benefit for farms. • Maximises on-farm nutrient cycling while reducing pollution and increasing profit for farmers. • Industry master plans which are developed to increase competitiveness (e.g. poultry sector, sugarcane). • Increasing cost of landfilling waste.	• There is an increasing demand for black soldier fly (BSF) farming and BSF products in Mpumalanga and various SMMEs are undertaking pilot studies on BSF products. • There is an interest in off-taking fertiliser from beneficiated wastewater treatment works (WWTWs) sludge by local farmers. • Russia-Ukraine conflict has led to spike in fertiliser costs. • Possible inclusion of agricultural products in the EU's CBAM [4] list.	• Lack of education and awareness of waste management. • Lengthy feed registration process in SA. • Limited access to clean traceable waste resources. • More expensive than traditional feed ingredients. • Draft Feeds and Pet Food Bill still not approved which might take long for the bills to passed. • Logistics for feedstock transportation is a challenge.	Short to medium term	• Fertiliser companies. • Farmers. • Private companies. • Climate financiers. • Food waste producing companies.

[4] CBAM: Carbon Border Adjustment Mechanism (CBAM) is a mechanism that aim to increase the consistency in the application of carbon pricing between goods produced in different jurisdictions but traded between those jurisdictions. It will enter into force in its transitional phase as of 1 October 2023 and will initially apply to imports of certain goods and selected precursors whose production is carbon intensive and at most significant risk of carbon leakage: cement, iron and steel, aluminium, fertilisers, electricity and hydrogen.

WHAT'S NEW?

The 2022 sustainable agriculture market intelligence opportunity brief highlighted opportunities in five broad categories:



The 2023 market intelligence opportunity brief focusses on additional and emerging opportunities namely those associated with **economic diversification, controlled environment agriculture and circular agriculture.** New readers are advised to read the preceding opportunity briefs for more in-depth information on the previously identified opportunities.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THE MPUMALANGA GREEN CLUSTER AGENCY

South Africa's Mpumalanga province faces socio-economic and environmental challenges arising from its resource intensive economic activities that contribute to climate change. Carbon intensive industries like mining, power generation and petro-chemicals are the core economic drivers in the Province. The region is also currently navigating high levels of unemployment, inequality and poverty, even as pressure mounts to transition away from its current coal based economy.

The Mpumalanga Green Cluster Agency's mission is to stimulate a vibrant green economy for communities in the Mpumalanga province, underpinned by a collaboration between government, business and academia. The vision is a vibrant, green and sustainable economy in the Mpumalanga province, that leverages the province's rich natural resources and heritage to create a legacy for SA low carbon economic growth. The Mpumalanga Green Cluster Agency is registered as a not-for-profit organisation in SA, with an appointed board of directors. The Cluster uses the triple helix cluster model with representation from government, business and academia as part of its design set up. Independent clusters can create the context to build trust between sector players, and work to unlock new mechanisms to enhance competitiveness and resilience. The green economy, in particular, lends itself to collaborative ecosystem building approaches. Set in this system of rapidly changing technology, and the economics surrounding that technology, are commitments to social inclusion, and greater equality. Collaboration through clustering on a local scale to build competitiveness on a global scale will support the growth of the green economy in Mpumalanga, and determine the green cluster in Mpumalanga's success.

The Cluster has made significant progress to date, in particular to systematically engage with businesses and local government in the province to identify and highlight opportunities and barriers for green economy projects in Mpumalanga. The Cluster has had several hundred engagements with the private sector to understand barriers and opportunities and it has launched several capacity building programs and technical support interventions in Mpumalanga.

VISIT THE WEBSITE

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SECTOR OVERVIEW AND CONTEXT

South Africa has a market-oriented agricultural economy that is highly diversified. It includes the production of animal products, field crops and horticulture. The latter two include the production of all major grains (excluding rice), oilseeds, deciduous and subtropical fruits, sugar, citrus and vegetables.

This section describes the South African agricultural sector and delves deeper in the agricultural production in Mpumalanga. The agriculture sector plays a crucial role in the development and economy of SA, and Mpumalanga specifically.

This section highlights the significance of the agriculture sector in terms of natural resource use, production trends, economic contribution and relevant legislation. It aims to provide context for factors that promote investment in sustainable agriculture in Mpumalanga.

2.1 AGRICULTURE SECTOR IN SOUTH AFRICA

South Africa offers a diverse range of agricultural activities because of its wide range of vegetation types, biodiversity, climates and soil types. It consists of a dual economy with a well-established commercial and a thriving smallholder sector. Approximately 80% of the food produced in SA comes from large-scale commercial farms. The farming activities range from intensive crop production in winter rainfall and high summer rainfall areas, to cattle ranching in the bushveld and sheep farming in the more arid areas. Climate and soil physical and chemical properties leave only 12% of the country's soil as arable for crop agricultural production with only 3% considered as fertile land. As such, there has been an increasing trend to transition into more resilient sustainable agricultural production ecosystems. Some of the technologies to bridge the gap specifically in food production include the adoption of agricultural production in greenhouses and soil-less farming activities such as aquaponics and hydroponic systems. About 69% of the land is suitable for grazing and livestock farming which is by far the largest agricultural sector in the country. **Figure 1** indicates agricultural activities in the different regions in SA . In 2022, the sector contributed 2.4 % of the total GDP (Stats SA, 2023).

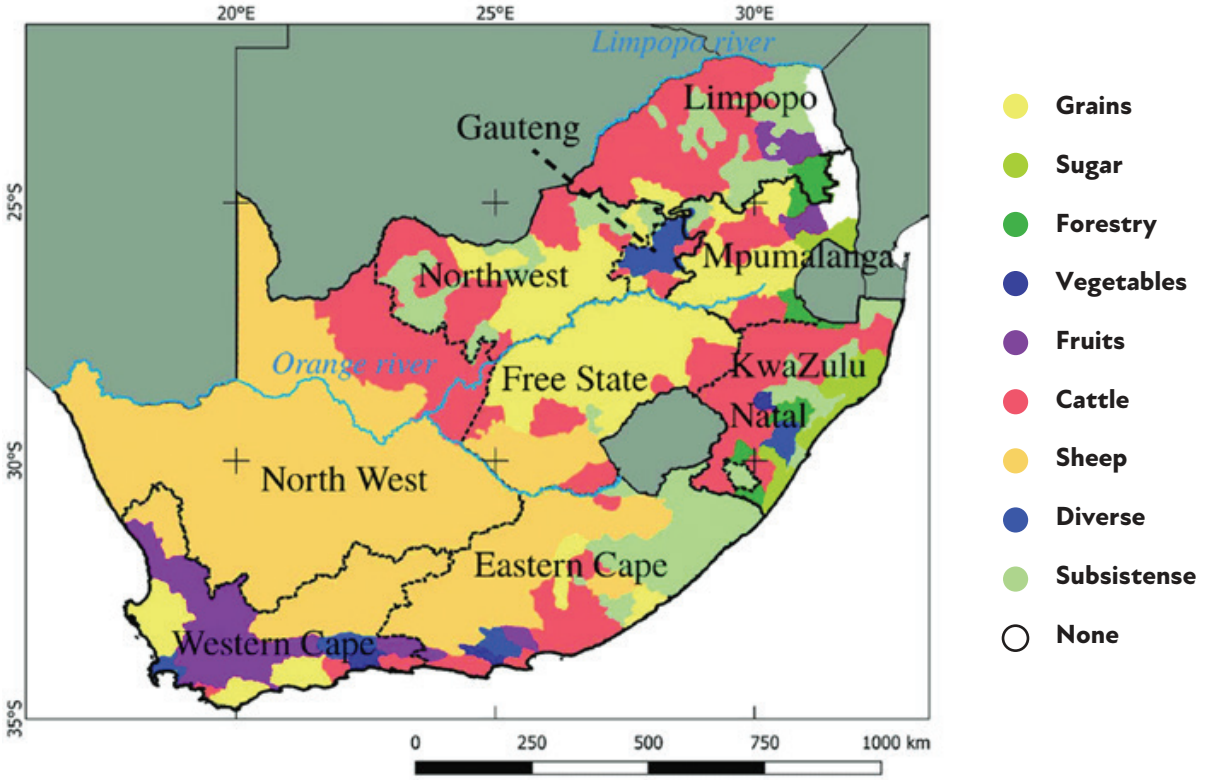

Figure 1: Breakdown of agricultural regions of South Africa
(Source: Weldner et al, 2017)

Despite challenging global economic conditions and rising inputs costs, South Africa's agriculture and agribusine ss sectors remain key priorities, with national government implementing several measures to stimulate these sectors in recent years. Agriculture contributes significantly to South Africa's economy and plays a critical role in sustaining livelihoods and employment, contributing to exports and ensuring food security. The sector provides ~890 000 direct jobs and has also been a key source of economic growth in recent years as indicated by the increasing farm total income over the top three commodity groups **(Figure 2)** and provides one of the largest sources of export revenue (Agbiz, 2023).

While the agriculture sector is critical for food security, it has suffered multiple shocks in recent years. These include:

- Extreme weather conditions as a result of climate change.
- Pests and diseases.
- Geopolitical pressures leading to increasing food insecurity and hunger.

At the same time, there is a rising global demand for agricultural commodities which is projected to grow at an average of 1.2 % p.a. over the next decade (2021-2031) (OECD-FAO, 2023).

In response, there is a shift away from conventional farming toward more resource-efficient, sustainable and technology-driven farming methods. This shift is primarily driven by climate change, population growth, scarce natural resources (water and arable land), and international market pressure for environmentally friendly products, technological advancement and growing consumer preferences for healthier products.

In Mpumalanga, this shift towards driving more resource efficient ways of growing the economy is also driven by the need for economic diversification as part of enabling economic growth and a just transition, which calls for the implementation of pathways towards an environmentally sustainable, climate-change resilient, low-carbon economy and just society.

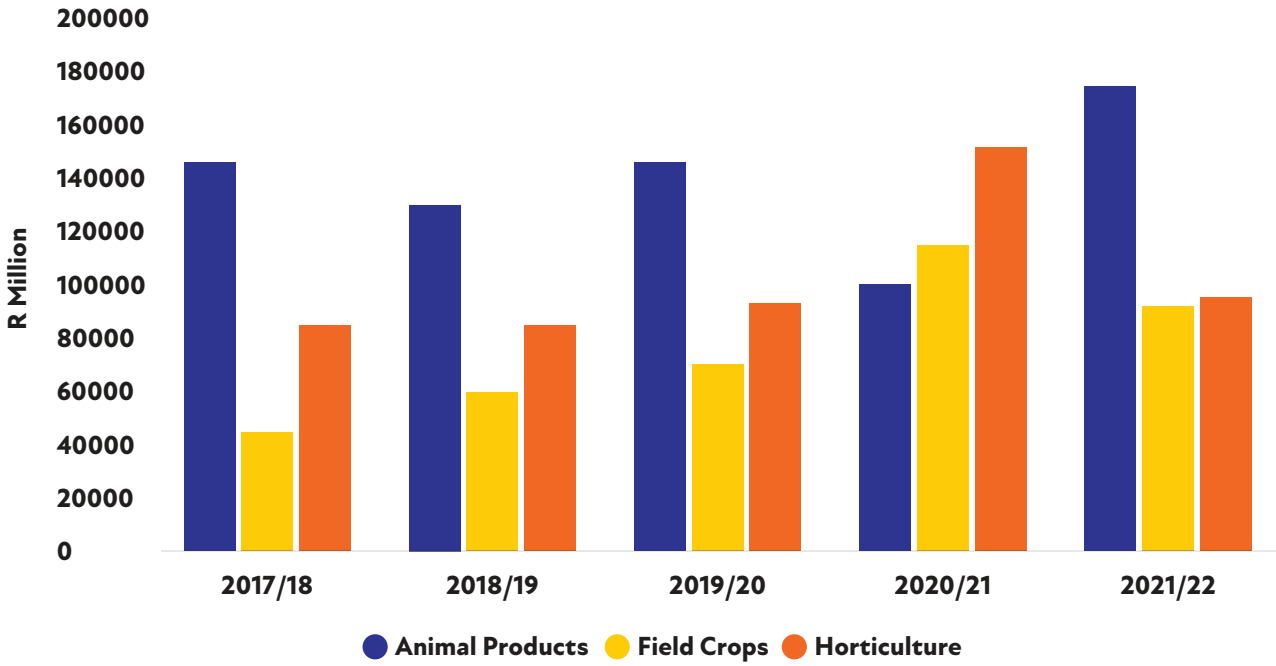

Figure 2: Gross farming income (GFI) in South Africa (2017/18–2021/22)
(Source: DALRRD, 2022)

2.2 THE JUST TRANSITION CONTEXT IN SOUTH AFRICA

South Africa has substantial just transition ambitions, as outlined in the Presidential Climate Commission's *Framework for A Just Transition in South Africa* published in 2022 (PCC, 2022). The definition of a just transition in this framework presents a transition to an economy that both reduces climate emissions and contributes to the goals of decent work for all, social inclusion, and the eradication of poverty. The *Framework for A Just Transition in South Africa* clearly puts people at the centre of decision making. At the heart of this vision is the idea of empowering and equipping South Africans to access new opportunities and build towards an environmentally sustainable and economically prosperous future.

Mpumalanga is the key source of SA's coal supply with over 60% of the province's surface area subject to mining. A number of mines that supply coal power stations will be decommissioned in line with the decommissioning plan for these power stations in the Integrated Resource Plan of 2019 (IRP 2019) which highlights these areas as just energy transition hot spots. Transitioning Mpumalanga's coal-heavy economy (**Figure 3**) to higher levels of agricultural output enables new business opportunities and associated jobs to improve the long-term economic resilience of the province.

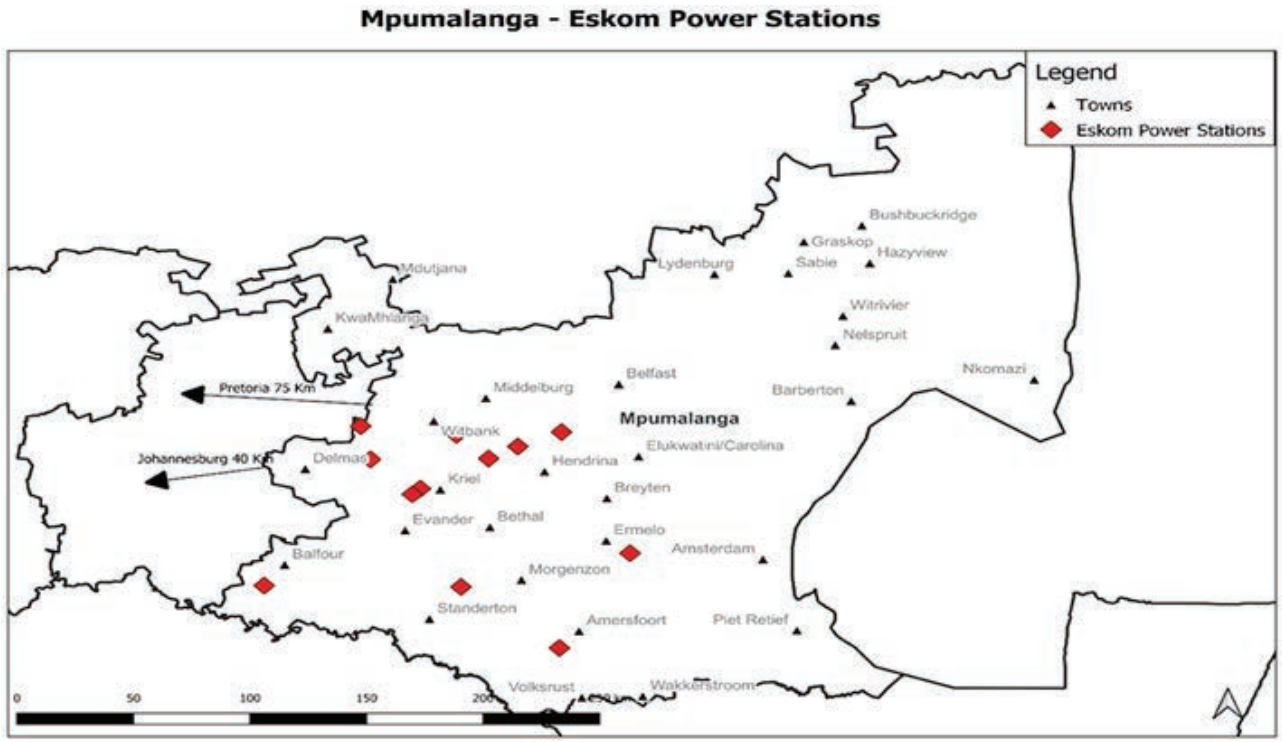

Figure 3: Eskom coal power stations in Mpumalanga, 2022
(Source: Nel et.al., 2022)

[5] Integrated Resource Plan of 2019: The plan was developed as a result of the fast changes in energy technologies, and uncertainty with regards to the impact of the technological changes on the future energy provision system. The updated version was released for public comment at the time of writing.

2.3 AGRICULTURE IN MPUMALANGA

Mpumalanga is one of SA's most productive significant agricultural regions because of its wide climatic variation which allows for the production of various crops, including for export. Farming activities in the province occur across all the three regions of the province. **Figure 5** indicates the land use applications in Mpumalanga. The Lowveld is SA's second-largest producer of citrus, while more than half of SA's soya beans are produced in Mpumalanga's Highveld areas. Agro-processing is centred primarily in the Lowveld region of the province and makes a valuable contribution to the provincial manufacturing sector. Mpumalanga produces 44% of SA's soybeans, 21% of its citrus, and 67% of the country's banana crop (DARDLEA, 2021). Primary crops include wheat, maize, sorghum, barley, sunflower seed, groundnuts, sugar cane, vegetables, coffee, tea, cotton, tobacco, subtropical and deciduous fruit.

Forestry is extensive, particularly around Sabie, and Ngodwana is the site of one of SA's largest paper mills. Natural grazing covers about 14% of the province. The province is the fourth biggest seller of cattle in South Africa and has a sizeable poultry industry. There is great potential for growth through food import-replacement investments in areas such as sugar, poultry, and maize, as well as through expansion of exports, particularly of citrus, macadamia nuts, and marula fruit. Agri-food manufacturing is set to occupy an important position

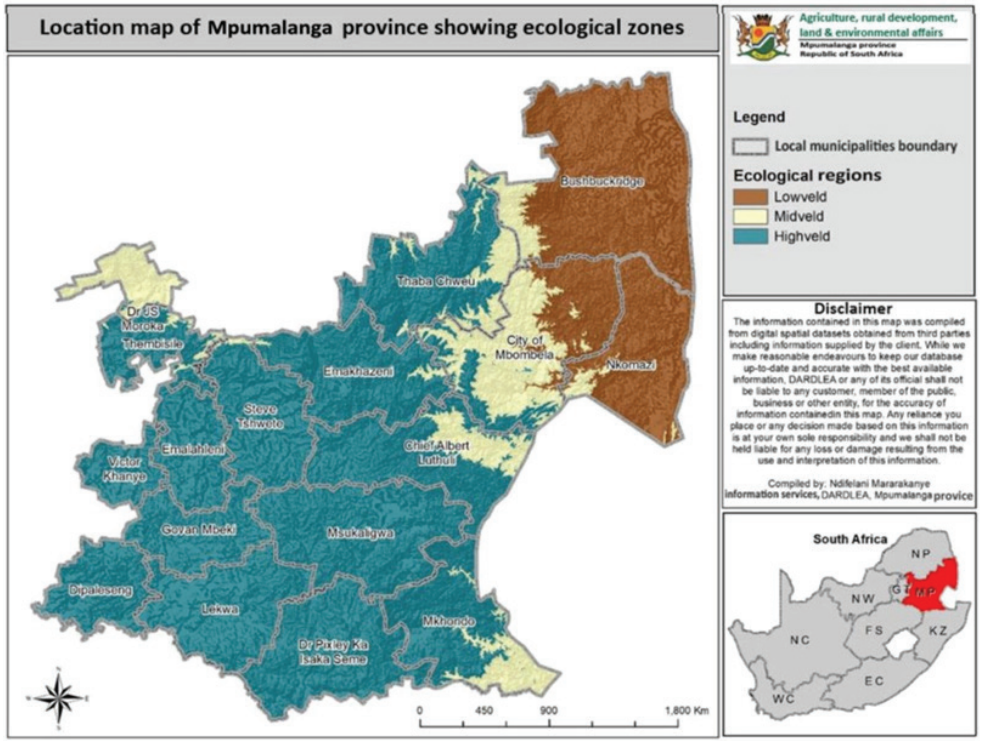

Figure 4: Mpumalanga province by districts
(Source: DALRRD, 2021)

in the agenda for the coming years because of its important contribution to both economic and social welfare. In terms of the GDP, the province contributes about 8% year-on-year to the South African economy.

In Mpumalanga, agricultural land is severely degraded as a result of poor soil management and mining activities. Degrading soils decrease land productivity, requiring farms to apply more fertilizers and chemicals for soil improvement. In addition, chemical applications increase soil acidity, causing further degradation of the soil. This impacts the province's land and water resources as well as the associated value chain activities.

To address the challenges outlined above efforts are required to promote environmentally friendly production and improve natural resource management.

Figure 5: Mpumalanga land use applications
(Source: DFFE, 2020)

2.4 AGRICULTURE IN THE CONTEXT OF MPUMALANGA'S ECONOMY

Mpumalanga's economy is mostly driven by mining, followed by manufacturing, construction and agriculture. Covid-19 has had a devastating impact on employment in Mpumalanga. Between Q1 of 2020 and Q1 of 2022, the manufacturing sector lost over 30% of jobs, followed by construction with 21% **(Figure 6)**. In 2023, the focus is growing these sectors through strengthening the industrialisation and localisation of manufacturing in the province. In contrast, the agriculture sector has been on the rise and experienced significant growth rate of 12% driven by commodity price surges since 2021. Following fertiliser supply constraints related to the pandemic in 2020, agricultural production decreased and this can be seen by the effect this had on food prices (BFAP, 2022).

Agriculture and agro-processing have been identified as key sectors from the Mpumalanga economic reconstruction and recovery plan (MERRP) and as such, a lot of focus has been directed towards increasing the sector's competitiveness and expanding exports (MERRP, 2022).

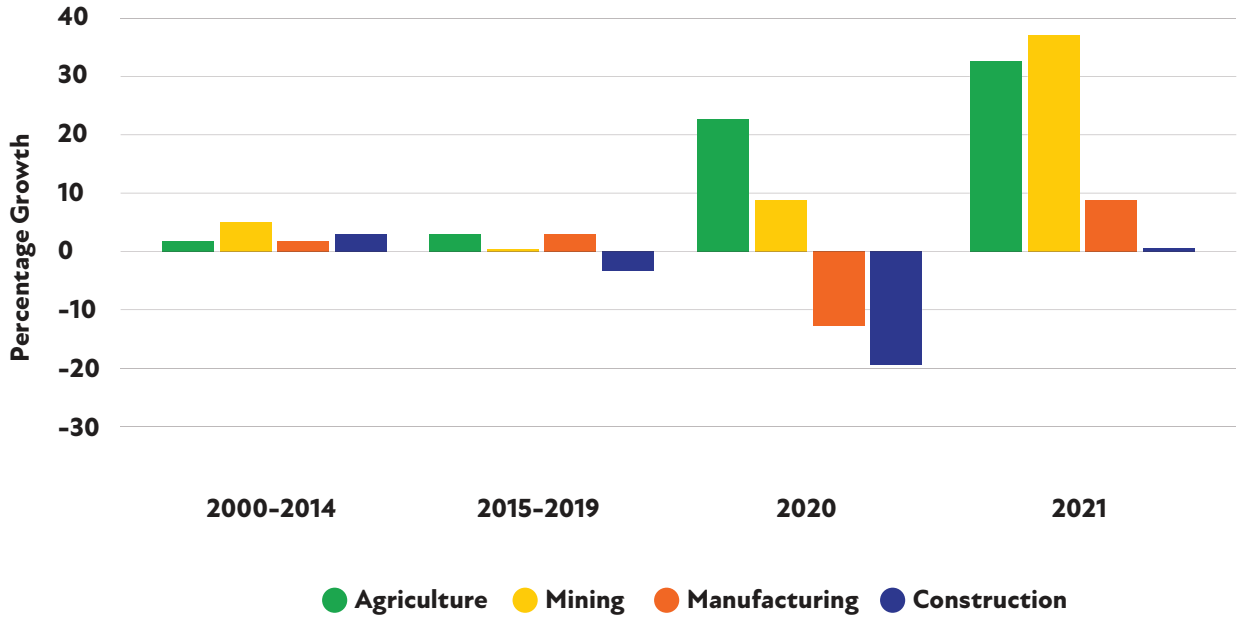

Figure 6: Average growth rate in real economic sectors of Mpumalanga
(Source: TIPS, 2022)

2.5 AGRICULTURAL TRADE AT NATIONAL AND REGIONAL LEVELS

In SA, agricultural exports reached a new record of US$12.8 billion in 2022, up 4% from the previous year **(see Figure 7)**. Maize, wine, grapes, citrus and other commodities were some of the top exportable products in 2022. The markets were spread across various key markets, with the African continent as the leading market accounting for 37% of SA's agricultural exports in 2022. The improvement in SA's agricultural export earnings in 2022 was primarily due to higher agricultural commodity prices. The volumes of exports of some products declined slightly in line with production, but this was more than compensated for by reasonably higher prices in the world market, specifically in grains.

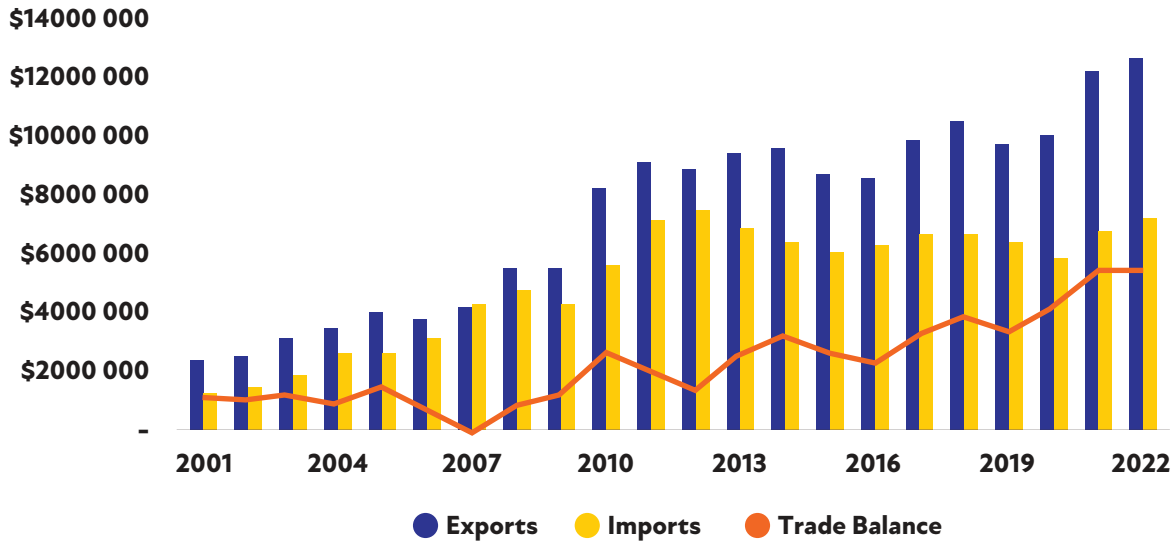

Figure 7: South Africa's agricultural exports
(Source: Quantec, 2023)

Mpumalanga exported most of its agricultural products to Asia (46%), followed by Europe (19%) and Africa (28%) (Quantec, 2021). At the same time, agricultural imports into the province were mainly attained from the continent (90%) and some parts from Asia (5%) and Europe (3%). Considering these trends, the African Continental Free Trade Agreement (AfCFTA) and revised citrus [6] protocol between SA and China present opportunities for increased agricultural trade. The AfCFTA intends to remove tariffs on 90% of all goods traded between member states in equal annual reductions toward a zero tariff. Given SA's leading position in agricultural exports, the AfCFTA could create new markets for products such as oranges and bottled wine (Morokong et al., 2021). In addition, duty-free exports of South African citrus to the USA under the African Growth and Opportunity Act (AGOA) reached 91 000 tonnes in 2020 (about $94.9 billion) and have been increasing due to strong annual growth, as the USA is still considered a premium market. Given Mpumalanga's contribution to citrus production in the country, opportunities for expanded exports to Africa and the USA are expected for the province. Furthermore, an increased number of opportunities could emerge for the top agricultural products exported into Africa from South Africa; these are shown in **Table 2**. In addition, the new market opportunities highlighted in **Section 3** of this report provide further opportunities for increased local production including in Mpumalanga.

[6] A revised protocol to relax the current regulatory requirements for cold treatment of South African lemons exported to China was signed between the South African Department of Agriculture, Land Reform and Rural Development in June 2021. The protocol is anticipated to increase volumes of South African citrus exports to China.

Table 2: Top 10 export commodities in South Africa in 2022
(Source: Quantec, 2022)

	Export value in 2022
HST10: Cereals	**R24 996 204 388**
HST02: Meat and edible meat offal	**R694 553 269**
HST04: Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	**R3 039 536 149**
HST07: Edible vegetables and certain roots and tubers	**R1 836 107 840**
HST15: Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	**R112 939 564**
HST22: Beverages, spirits and vinegar	**R103 914 433**
HST08: Edible fruit and nuts; peel of citrus fruit or melons	**R3 356 933 789**
HST19: Preparations of cereals, flour, starch or milk; pastry cooks' products	**R8 639 185 224**
HST12: Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder	**R6 969 468 779**
HST20: Preparations of vegetables, fruit, nuts or other parts of plants	**R51 213 927**

Mpumalanga is well positioned for exports. The Maputo Development Corridor is SA's leading Spatial Development Initiative (SDI), linking Mpumalanga province, Gauteng province and the Nkomazi Special Economic Zone (SEZ) with the deep water Port of Maputo in Mozambique. This corridor provides investors and exporters with good access to export markets, particularly those in South East Africa, the Indian Ocean Rim and Far East Asia (MCLI, 2022).

2.6 AGRICULTURAL VALUE CHAIN AND KEY PLAYERS

A value chain's nature and productivity is determined by a network or ecosystem of actors. Players within Mpumalanga and the broader South African agricultural ecosystem are crucial to promoting sustainable agriculture. The key players in the agriculture sector can be divided into six broad categories: producers, technology suppliers and retailers, industry associations, research/academia, labour organisations and government. The key players in Mpumalanga are indicated in **Table 3.**

Table 3: Key agricultural players in Mpumalanga

Category	Function	Key players in Mpumalanga
Producers/Farmers	Key players in adopting sustainable farming practices and technologies. Produce commodities and in most cases do their own harvesting, storage, and transport.	Range commercial and smallholder farmers in the province such as those producing citrus and other horticultural crops, grains and livestock.
Technology suppliers and retailers	Develop and supply technologies and inputs across the value chain.	Range of suppliers and retailers such as TWK Agri, VKB, Piket, Valtra, Equalizer, Ottosdal Landini.
Research & training institutions	Key players in promoting the adoption of sustainable farming practices and technologies. Pilot studies on new and emerging technologies in sustainable agriculture.	University of Mpumalanga, Agricultural Research Council, Timbali Technology Incubator, Lowveld College of Agriculture, Perdekop Agricultural School, Buhle Farming Academy.
Industry associations	They primarily act as a collective voice for farmers to support and provide them with relevant information regarding policy, regulations, logistics, cultivar development etc. They also do or support research in various fields, including soil, water, production practices and cultivars.	Citrus Association, Subtropical Fruit Association, GrainSA, Forestry SA, South African Poultry Association; Sugarcane Growers Association, Red Meat Producers, Potato Growers Association, Mpumalanga Landbou (which is the provincial affiliation of AgriSA).
Labour organisations	These are organisations that provide support for employees in the agricultural sector by assisting them in attaining the best possible financial and social position in all employment positions along the entire value chain. They also play a key role in strengthening supply chains and minimising disruptions.	Mpumalanga Farmers Union, Food & Allied Workers Union, TAU SA, AFASA, Mpumalanga Agri, NAFU.
Government	Responsible for the policy environment and incentivising business to invest in sustainable agriculture and green economy.	**National –** Department of Agriculture, Land reform and Rural Development; Department of Economic Development and Tourism Provincial **Provincial –** Department of Agriculture (DoA), Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA); Department of Social Development, District municipalities, AgriSETA [7]

[7] AgriSETA: creates and promotes opportunities for social, economic and employment growth for agri-enterprises through relevant, quality and accessible education, training and development in both primary and secondary agriculture, in conjunction with other stakeholders in agriculture.

2.7 RELEVANT POLICIES AND LEGISLATION

The agricultural sector is governed by a range of policies and legislation that influence the trajectory of sustainable agricultural production. This section highlights key regulations at national, provincial and international level impacting the sustainable agricultural sector.

2.7.1 NATIONAL LEGISLATION AND POLICIES

The following section discusses the national policies and legislation governing and driving the agriculture sector in SA to be more sustainable and resource-efficient. **Table 4** provides policies that impact and drive sustainable production, while **Table 5** highlights policies that govern agricultural resource use.


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Table 4: List of national policies and legislation that govern sustainable agricultural production

Key policy or legislation	Relevance to sustainable agriculture
The National Development Plan 2030 (NDP 2012)	• Set out to expand irrigated agriculture and develop new water schemes. • Highlights plans to support local and sectoral efforts to reduce water demand and improve water-use efficiency. • Highlights the importance of agriculture to the green economy.
The Agriculture Integrated Growth and Development Plan (IGDP 2012)	• Plans to develop equitable, productive, competitive, profitable and sustainable agriculture, forestry and fisheries sectors. • Emphasises that the sector needs to benefit all South Africans.
National Bio-economy Strategy (2013)	• Highlights strategic interventions in the agriculture sector to enhance competitiveness. • Plans to unlock value of indigenous crops. • Plans to establish a network of agro-innovation hubs that enhance technology transfer and extension.
The Agricultural Policy Action Plan (APAP) 2015	A programmatic response to key policy documents, including the National Development Plan (NDP) and the New Growth Path (NGP). • To revitalise the agriculture and agro-processing value chain
Conservation Agriculture Policy (2018)	• Promotes and establishes ecologically and economically sustainable agricultural systems to increase food security. • Recommends that government offers producers incentives to adopt conservation agriculture measures, and that tax rebates are provided to manufacturers of conservation agriculture equipment.
National Climate Change Adaptation Strategy (2019)	• Support to farmers to implement more efficient climate-smart and conservation practices. • Promotes urban agriculture, including community and household food gardens in areas not classified as agricultural land. • Increases the role of agricultural extension officers in supporting vulnerable farmers. • Promotion and subsidisation of water conservation technologies.
Draft Climate Smart Agriculture Framework Policy (2018)	• Provides management of climate change impacts and identifies new industrial opportunities in the growth of the green economy. • Enhances adaptive capacity of the country and increase reduces vulnerability to climate change. • Contributes to global efforts to reduce greenhouse gas emissions.

Table 4 continued...

Key policy or legislation	Relevance to sustainable agriculture
Industry Master Plans	There are a range of master plans that have recently been drafted or are in the process of being developed that will have an impact on the agri-sector in Mpumalanga. The overarching objectives of the master plans are to improve competitiveness of the industries, drive domestic and export demand and to support the local industry. A few of these include: • The sugar industry master plan (2020) • Poultry master plan (2019) • Draft Cannabis master plan (2021) • Agriculture and agro-processing master plan.
Draft preservation and development of agricultural land framework bill (2021)	• Provides principles for the management of agricultural land. • Provides for agricultural land evaluation and classification. • Outlines preparation, purpose and content of provincial agricultural sector plans. • Includes a declaration of protected agricultural areas. • Provides for the general objectives of agro-ecosystem management and agro-ecosystem authorisations. • Provides for listing and delisting of activities or areas within agro-ecosystems and the identification of competent authorities.
Climate Change Bill (2022)	• Provides for management of climate change impacts and identify new industrial opportunities in the growth of the green economy. • Aims to enhance adaptive capacity of the country and i reduce vulnerability to climate change. • Aims to contribute to global efforts to reduce greenhouse gas emission.

Table 5: List of national policies and legislation that govern agricultural resource use

Key policy or legislation	Relevance to sustainable agriculture
National Water Act, Act No 36 of 1998 (NWA 1998)	Redefines water rights in SA to stimulate inclusive growth • Section 21 of the National Water Act highlights different water uses that require authorisation from the Department of Water and Sanitation. • Applications for water use authorisations for water use activities may take the form of a Water Use License (WULA), or a General Authorisation (GA), depending on the nature of the proposed water use and the likely impact the water use will have on water resources. • On the 1st of April 2021, the DWS implemented a revised turnaround time to reduce the processing of water use licence applications from 300 to 90 days.
The National Environmental Management Act 107 of 1998 (NEMA 1998)	NEMA is the overarching legislative framework for environmental governance. Core values are reflected through the following principles: • Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably • Development must be environmentally, socially and economically sustainable
Carbon Tax Act, No 15 of 2019	• The carbon tax act was gazetted in May 2019 and came into effect on 01 June 2019. The carbon tax will be applied over two phases: Phase 1 will be from 01 June 2019 to 31 December 2022, and phase 2 will be from 2023 to 2030. The implications of the Act become applicable to the agriculture sector from Phase 2. • The Carbon Offset Administration System (COAS), administered by the Department of Mineral Resources and Energy, was launched 23 July 2020. It serves two main purposes: 1) to define the procedures through which project developers submit eligible projects and list their credits; and 2) to provide a platform through which emitters can surrender carbon credits against their tax obligations. • The carbon offset regulations provide opportunities for large-scale carbon sequestration and storage in the agriculture sector. To be eligible to generate credits for use in lieu of the carbon tax, projects must be located in SA.
Expropriation Bill of 2020	The Joint Constitutional Review Committee (JCRC) released its final recommendation, in which it advised that Section 25 of the Constitution of SA should be amended to allow expropriation of land without compensation as a legitimate option for land reform. The Expropriation Bill of 2020 was drafted on 9 October 2020. The bill outlines details on circumstances that permit compensation and non-compensation for the expropriation of property. The bill provides more clarity for potential and current investors of the government's intention with this constitutional amendment. At the same time, the Minister of Agriculture announced that the government is making 896 farms on 700 000 ha of underutilised or vacant state land available for emerging farmers on 30-year leaseholds, with an option to buy. About 40 206ha have been allocated to Mpumalanga.
National waste management strategy (2020)	The strategy outlines the policy and strategic approach to waste management for SA for the coming years. The set of actions to reach strategic outcomes, include: • Waste minimisation to prevent and reuse waste • Effective and sustainable waste services • Mainstream waste awareness and a culture of compliance resulting in zero tolerance of pollution, litter and illegal dumping. Agriculture is an important partner in the development and implementation of this strategy to reduce food losses and manage agricultural waste, which represents a significant volume of organic waste with beneficiation opportunities.

2.7.2 PROVINCIAL LEGISLATION AND POLICIES

The key policy frameworks in Mpumalanga that intend to drive a green economic growth in the province are the Mpumalanga Economic Growth and Development Path (2011), the Vision 2030 (2013); the Biodiversity sector plan (2014) and the Green Economy development plan (2016). The key objectives and relevance of the policies to sustainable agriculture are highlighted in **Table 6.**

Table 6: List of policies and regulations that guide Mpumalanga sustainable agriculture

Key policy or legislation	Relevance to sustainable agriculture
Vision 2030 (2013): The strategic Implementation Framework	The Mpumalanga Vision 2030 Strategic Implementation Framework (2013-2030) was established as a direct implementation response to the National Development Plan Vision, 2030. The key objectives include promoting employment and economic growth. Agricultural and forestry development are key drivers highlighted to promote economic growth and social protection.
Economic growth and development path (2011)	The Mpumalanga Economic Growth and Development Path (MEGDP) is informed by the National Economic Growth Path. The path highlights the green economy and Information and Communication Technology as a key opportunity areas.
Biodiversity sector plan (2014)	The Mpumalanga Biodiversity Sector Plan (MBSP) is a guideline which is part of a wider set of national biodiversity planning tools and initiatives that are designed for national legislation and policy. The MBSP incorporates climate change related improvements in the province.
Green Economy Development Plan (2016)	The Mpumalanga Green Economy Development Plan aims to change the province's economy from relying on coal-based energy to one boasting biomass-based energy, sustainable agriculture, and tourism and eco-conscious towns by 2030. Agriculture has been earmarked as an economic sector which could create more jobs in the province by: • Supporting sustainable small-scale community farming • Providing training in sustainable agriculture practises • Development of agriculture industry outside of agri-hubs • Agro-forestry
The Mpumalanga Provincial Five Years Plan (2020 – 2025)	The strategic plan's vision is a responsive, effective, efficient and sustainable cooperative governance system.

Key policy or legislation	Relevance to sustainable agriculture
The Mpumalanga Economic Reconstruction and Recovery Plan (2022)	Agriculture and agro-processing have been identified as key economic sectors which could play a pivotal role in the economic reconstruction and recovery of Mpumalanga. Under this, the focus will be improving competitiveness of the agriculture sector and developing the agro-processing facilities in Mpumalanga as the province has been earmarked as an agro-processing node.
Mpumalanga Industrial Development Plan (MIDP)	• Developing an integrated and diversified industrial base in the Province. • Developing and expansion medium to high technology labour intensive manufacturing industries • Developing inter-sectoral linkages that will localise the supply chains within the Province.

2.8 INTERNATIONAL REGULATIONS LINKED TO CLIMATE CHANGE

SA is a major exporter of agricultural products and therefore needs to adhere to international environmental regulations and standards, including global climate change regulations. Since the Kyoto Protocol was agreed, the number of climate change laws has increased by over a factor of 20 (Nachmany et al. 2017). In light of the Covid-19 pandemic, national governments across the globe are making the transition to a low-carbon economy as part of their economic recovery (Birol 2020; OECD 2020). Some of the relevant international regulatory developments include:

• In 2020, China pledged to reach peak carbon emissions before 2030 and reduce emissions to zero by 2060.

• The European Commission plans to reduce greenhouse gas emissions by at least 55% by 2030. The European Green Deal lists a set of policy initiatives to achieve climate neutrality by 2030, among these is the Farm-to-Fork strategy. The initiatives plan to:

- Avoid or minimise placing products related to deforestation or forest degradation into the European Union (EU) market;
- Ban imported products into the EU market that do not comply with EU environmental standards
- Require trading partners to apply sustainable practices in terms of plant protection and pesticide use.
- In addition, the EU implemented a Carbon Border Adjustment Mechanism (CBAM), a levy on all carbon-intensive imports (based on the carbon intensity of the country of origin). The CBAM was set to be introduced transitionally in October 2023 and finalised before 2026. Exports from carbon-intensive sectors such as cement, steel, chemicals and fertilisers will significantly be affected by the CBAM (European Commission, 2019).

In Mpumalanga and the rest of the country, the EU plays a vital role as a major export destination for agricultural products, therefore trade-related climate change risks equally affect the industry. The growing climate ambition targets in major agricultural export markets will likely drive many South African export farmers to adopt sustainable production practices and technologies to remain competitive.


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3

EMERGING OPPORTUNITIES, DRIVERS AND BARRIERS

This section provides an overview of the major trends and drivers behind sustainable agriculture and the associated opportunities and barriers that affect sustainable agricultural production and resource-use efficiency.

3.1 INTRODUCTION

Mpumalanga offers attractive investment prospects due to its diverse agricultural production sector and industrial export base. This section discusses the opportunities emerging in three broad categories: **economic diversification, controlled environment agriculture and circular agriculture**. These opportunities along the agricultural value chain can transform and reimagine food production to align with the realities of climate change and the changing economic landscape of the province.

A number of emerging trends in sustainable agriculture have been identified in the 2022 opportunity brief. This covered opportunities that involve reducing food loss and waste, preventing soil erosion and improving crop productivity using minimum inputs. In line with the energy transition as well as due to the increased prevalence of loadshedding [8] there has been a notable shift to the incorporation of renewable energy solutions into agricultural production. In addition, consumers are increasingly concerned not only with the quality and safety of products they buy, but with the social and environmental conditions in these products' supply chains.

More and more consumers and civil society organisations are putting pressure on producers to comply with standards for organic, fair and ethical (sustainable) agricultural production.
With climate risk now being regarded as one of the top risks facing farmers, the importance going forward is to adopt a risk-based view when tackling sustainability, both environmental and financial. Factors such as energy, water, soil health, biodiversity and food waste are all important elements that need to be considered from a risk-based perspective, with appropriate actions and solutions put in place to address the risk.

[8] Loadshedding: defined as the intentional interruption of electricity supply to avoid excessive load on the generating plant. Since 2008, loadshedding has been an almost constant part of the South African electricity landscape. In 2022 the supply shortfall has been between 4 GW and 6 GW (further explained in the energy services market intelligence report) (GreenCape, 2022).

3.2 ECONOMIC DIVERSIFICATION

SA has committed to phasing down its fleet of coal-fired power stations and associated coal mines (TIPS, 2022). As this transition accelerates, there is an opportunity to facilitate more investment and stimulate job creation in Mpumalanga's green economy, thereby driving a just energy transition. This transition has civil society, academia and private business engaged in conversation to establish alternative economic growth pathways in line with the Just Energy transition. Mpumalanga, housing over 80% of the coal mines in the country, is at the heart of these conversations. The Mpumalanga Economic Reconstruction and Recovery Plan highlighted agriculture, agro-processing and agri-tourism as some of the key sectors achieving a just transition in the province. Agriculture is already an important sector in the province, and there is a strong business case for accelerating investment into the sector. The sector is also typically relatively labour intensive so holds great potential for job creation and transition. This section explores opportunities for investment into agriculture to enable economic diversification, and provides market intelligence on the drivers, barriers and macro-environment linked to these opportunities.

3.2.1 INDUSTRIAL HEMP

Industrial hemp has been identified as a promising crop that can supply sustainable raw materials to various industries, including pharmaceuticals, manufacturing, construction and textiles. SA is in the process of removing various legal, political and social barriers for the crop across the value chain. The sector is nascent, but is estimated to have a market value of R426 billion by 2026, and a potential to create more than 130 000 direct new jobs (SONA, 2023). After the reclassification of hemp as an agricultural crop in 2021, there has been significant interest in this market, with 371 hemp permits already issued for primary production as of 11 March 2023. In Mpumalanga, over 40 permits have been issued because investors are realising the market potential of the crop and the value chains it can potentially unlock (summarised in **Table 7**). The primary production of industrial hemp has the potential to remediate polluted soil (e.g. on mine lands) through its ability to bio-accumulate heavy metals.

It is also a carbon sink, with an ability to sequester twice as much carbon as most trees (estimated 40 tonnes of CO^2 per year) (IEJ, 2023). This supports climate change mitigation and allows for income diversification through the sale of the biomass as well as agricultural carbon credits. Mining companies are therefore looking to explore this opportunity through their corporate social investment projects to promote a diversified and self-sufficient post-mining economy.

It should however be noted that tapping into this opportunity would only be for industries other than human consumption, because of the wariness around consuming products from polluted soils. Opportunities in the pharmaceutical sector can however be explored through soil-less production systems found in controlled environment agriculture. In Mpumalanga, a state-of-the-art cannabis centre of excellence is currently being established by the Department of Agriculture, Rural Development and Land and Environmental Affairs to explore cannabis production for the pharmaceutical sector.

The barriers to entry to this opportunity include:

- **Inconsistent information provided by mines and the DMRE for mining rights and closure certificates:** This makes businesses uncertain about land ownership and how farming operations can be managed. Since mining is the core business for mining companies, establishing a consortium with farmers and service providers is thus far seen as a preferable option for unlocking this opportunity.
- **Lack of knowledge around seed genetics to supply products into the different industries:** Currently, the Agricultural Research Council (ARC) together with the Council for Scientific and Industrial Research (CSIR) are working on developing cultivars that feed into the different industries that have been identified for the South African market.
- **Possible conflict with indigenous growers:** There is a rich history of indigenous hemp growers who have been participating in the informal markets. Although there are conversations around converting these growers for them to be able to tap into formal markets, others are still hesitant particularly because of the onerous process of hemp licence registrations.

3.2.2 NICHE PRODUCTS

This opportunity is of interest to agricultural producers or investors that are looking to satisfy specific markets such as high value crops, mostly for exports (summarised in **Table 7**) . This type of production is usually done at smaller scale in comparison to most commercial farms, but produces consistently high yields and quality. Saffron or high value green vegetables are examples of such niche crops for export. This is a great opportunity for Mpumalanga because of its geographical position and the enablers such as the African Continental Free Trade Agreement (AfCFTA) as well as the Maputo Development Corridor. SA's sophisticated consumer base and the diversity of the country makes it easier for such opportunities to be explored for the local market as well. Mpumalanga can benefit from localising the production of such products to stimulate job creation.

The barriers to entry for these markets include:

- **Market development:** Markets are not fully established, making entry to specific opportunities and getting off-take agreements difficult.
- **Limited market knowledge on specific commodities:** Because of the nature of the opportunity and the kind of production it entails; farmers may find it difficult to tap into this production as they are not familiar with the specific commodities.
- Constraints with **cross-border logistics** for the export markets.

3.2.3 ECONOMIC DIVERSIFICATION

Biofuels development in SA has been centred around rural development and the provision of economic opportunities for those communities by creating a new market for their produce. In addition to the international oil price - which largely determines the competitiveness of biofuels prices - the viability of the biofuels industry is predominantly a function of the cost of agricultural feedstock, which is typically 70% of total costs.

In SA, the crops that have been considered for energy production include soya beans, canola and sugar beet. The price volatility of fuel and oil has enabled businesses to consider alternative energy supplies, especially for the aviation industry. One enabler for this opportunity is the South African Sugar Value Master Plan (2030) which aims to diversify production since it is no longer profitable for the industry to focus on sugar production only. One of the objectives of the sugarcane master plan is to develop detailed strategies and plans to provide and support appropriate diversification by growers as alternatives to sugar production and support enhanced financial viability of sugarcane growers. This opportunity can be realised by mines that are currently looking to explore economic diversification opportunities, as they would be able to produce energy crops on degraded land, where it is inappropriate to grow food crops (further explained in **Table 7**).

Important considerations include:

- The quality of the rehabilitated land is important as crops require good soils for production.
- Wariness around competition with food crops by government and food system activists.
- Unclear business model/economic model as this opportunity has not been explored in SA. Mining companies (through their sustainable production portfolios) are currently exploring the use of energy crops to develop alternative feedstock for biofuels.

Table 7: Opportunities for economic diversification

Opportunity	Drivers	Macro-environment	Risks & Barriers	Expected Timeframe
Opportunities for economic diversification				
Industrial hemp **Market size** **R1.2 billion**	• Bio-remediation properties of industrial hemp, especially for post-mine land rehabilitation. • Enabling regulatory environment for industrial hemp cultivation over the past two years.	• The 2023 South African budget speech highlighted industrial hemp as a sustainability anchor with a projected market value of R426 billion by 2026. • The cannabis sector (which includes cannabis and hemp) has been identified as one of the 14 priority sectors in SA, by the Office of the Presidency. • Currently there are pilot studies exploring industrial hemp cultivation on mine land to assess economic viability. • 40 hemp permits have already been issued in Mpumalanga. • Over R100 billion is needed to fully unlock the hemp value chain in SA.	• Inconsistent financial information provided by mines and Department of Mineral Resources and Energy (DMRE) for mining rights and closure certificates. • Minimum viable size for a profitable cultivation is 50ha. • Lack of knowledge around seed genetics, which feeds into suitability for the different industries. • Possible conflict with indigenous growers. • Lack of local processing capacity - producers may battle to find off-takers in the short term.	Short to medium term
Niche products **Market size** **R250 million**	• Economic diversification under the Just Transition. • Growing demand for niche products to satisfy specific export markets. • AfCFTA	• There is a growing local demand for niche products such as yam, cassava and other root crops, as there are high importation costs associated with these products. • SADC region is already in the top ten export destinations for SA agricultural products e.g. grain. • Maputo development corridor for exports connecting the landlocked regions of Kingdom of eSwatini and SA to the Mozambique and the Port of Maputo.	• Unclear off-take agreements. • Limited market knowledge on specific commodities. • Constraints with cross-border logistics.	Short to medium term
Energy crops **Market size** **R186 million**	• Growing demand for sustainability within the aviation industry. • Price volatility of fuel and oil. • Sugarcane masterplan aims to diversify production to biofuels in SA. • Ability to grow crops on degraded land, unfit for human consumption.	• Part of the sugar value chain master plan 2030 is to develop detailed strategies and plans to provide and support appropriate crop diversification by growers as alternatives to sugarcane and support enhanced financial viability of sugarcane growers. • Currently 14% of arable land is underutilised, and most of it is in the former homelands. These areas lack market access (which biofuels plants could provide) and infrastructure (which agricultural and infrastructural support programmes should provide).	• Weariness by government around competition with food crops. • Unclear biofuels regulation to support growth of the industry. • Unclear business/economic model.	Medium to long term

3.3 CONTROLLED ENVIRONMENT AGRICULTURE (CEA)

CEA is a technology-based approach to food production. The aim of CEA is to provide protection from the outdoor elements and maintain optimal growing conditions throughout the development of the crop. Production takes place within an enclosed growing structure such as a greenhouse. Plants are often grown in a soil-less medium in order to supply the proper amounts of water and nutrients to the root zone as well as supplemental lighting to ensure a sufficient daily light exposure. CEA optimises the use of resources such as water, energy, space, capital and labour and is defined by various components (illustrated in **Figure 8**).

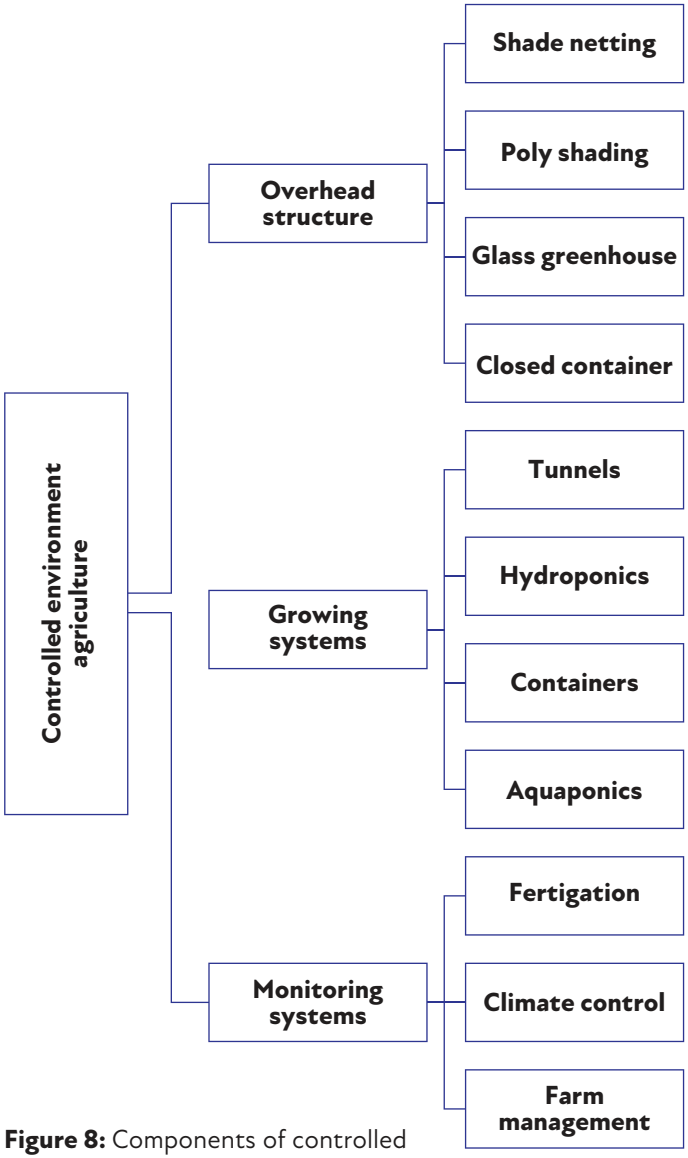

Figure 8: Components of controlled environment agriculture systems *(Source: GreenCape, 2021)*

CEA ensures continued supply of food even on lands that cannot support primary agriculture is not possible (such as mine lands that cannot be rehabilitated and in industrial areas where space for agricultural production is limited). Furthermore, growing markets for high quality products are one of the key drivers for CEA in Mpumalanga (opportunities summarised in **Table 8**). In 2022, there were prospects to build a state-of-the-art fresh produce market to attract international and domestic food retailers to Mbombela, and open markets for the province's food producers (further reading in 2022's sustainable agriculture market opportunity brief). Although CEA offers prospects of producing in environments where one would not ordinarily produce; it is important to highlight some of the barriers associated with this technology, such as:

High capital costs: the high capital costs associated with project inception are too high and many investors see any kind of agricultural production as high risk.
Limited technical skills: Because these technologies are fairly new in the South African market, there is still limited technical understanding of the different systems and their limitations in terms of production. Furthermore, each system often requires being tailored to specific environmental conditions and most of this work is still at research and development phase.
High energy costs associated with running operations: CEA is an energy-consuming operation and, with the state of the country's energy crisis, there would be need to implement renewable energy solutions to make sure the system operates even during loadshedding. Not only does this complicate the system but it also makes it more expensive to operate.

Table 8: Opportunities in controlled environment agriculture

Opportunity	Drivers	Macro-environment	Barriers	Expected Timeframe	Targeted Investor
Opportunities for controlled environment agriculture					
Aquaponics **Market size** **R146 million** Hydroponics **Market size** **R136 million** Greenhouses **Market size** **R129 million**	• Erratic rainfall making crop production in open land risky. • High potential for exports of high value crops to neighbouring countries through the Maputo corridor (e.g. dried fish, fresh vegetables etc.). Alternative protein supply (in the case of aquaponics).	• Agriculture and Agro-processing Master Plan aims to drive more hectares under irrigation, production in controlled environments, increased productivity, and better usage of water and resources. • Mpumalanga has been identified as an agro-processing node with existing infrastructure at mines which can be converted to assets. • Aquaculture cluster (TIA, CSIR) is to be established to enable greater uptake of technologies.	• High capital cost of infrastructure for CEA. • Limited technical skills. • High energy costs and need for consistent energy supply.	Short to medium term	• Mining companies. • Private businesses. • Technology providers. • Climate financiers.

3.4 CIRCULAR AGRICULTURE

Agricultural waste management (AWM) is a planned system in which all necessary components are installed and managed to control and use by-products of agricultural production in a manner that sustains or enhances the quality of air, water and soil, and maximises the value obtained from plant, animal, and energy resources. In the 2022 Sustainable Agriculture opportunity brief, it was identified that food value chain losses in SA are estimated at 10.3 million tonnes with agriculture accounting for 34% during agricultural production, with a financial loss value of R74.4 billion per annum.

Food value chain losses result in the loss of valuable natural resources (i.e. biomass) along the agricultural value chain, as well as wastage of resources such as water and energy. Circular agriculture aims to convert waste biomass into value-added products through waste-to-fertiliser and waste-to-feed. This section identifies an opportunity in the re-use of agri-waste to produce organic fertilisers and feed for the agricultural sector (summarised in **Table 10**).

A driver for the waste-to-fertiliser opportunity is an **increased demand for organically produced crops** as well as the **increasing price of synthetic fertilisers**. The food loss and waste along the agricultural value chain in Mpumalanga is not well documented. However, various studies have estimated food loss and waste at the national level. In terms of the contribution of food loss and waste, processing (49%), postharvest handling (19%), and consumption (18%) ranked highest. Table 9 highlights the estimations of the relative food losses at every level along the value chain from different studies. This waste biomass could be converted into value-added products.

Table 9: Percentage losses at each stage of the agriculture value chain

Stage of value chain	Oelofse and Nahman (2013)	Nahman and De Lange (2013)	Oelofse et al (2021)
Production	26	26	8
Post-harvest handling & storage	26	24	19
Processing	27	25	49
Distribution	14	20	6
Consumption	4	5	18

In Mpumalanga, [9] waste beneficiation can be explored at WWTWs for energy recovery, commercial and agricultural products. Although there is limited information on the sludge volumes and quality thereof; there in an opportunity to explore this circular economy solution. In agriculture, products include composts, fertilisers and the use of Black Soldier Fly (BSF). BSF can be used to produce high-value products such as protein meal, oils and frass. BSF farmers are able to treat a wide range of organic waste streams, ranging from CAPEX intense industrial scale centralised facilities, to cheap labour intense decentralised containerised operations, by feeding the material to BSF grubs, and subsequently process the pre-pupae and its excrement into a number of high value products

Barriers to entry to this opportunity include the lack of effective handling, application and storage of agricultural waste and lack of education and awareness of food-loss management. In SA, the minimum waiting period for fertiliser and feed registration is about 18 months which delays the process of commercialisation of products. Furthermore, any product produced as a fertiliser must be compliant with the Fertiliser Act of 1946. This requires consistent biomass availability to ensure uniformity of the product.

Since May 2020, there has been a substantial 230% increase in fertilizer prices which has had an effect on food prices globally. Driven upward by supply disruptions stemming from the Russia-Ukraine conflict, prices are expected to be elevated for the foreseeable future. These price hikes are the biggest contributors to the food price crisis, and agri-waste beneficiation to fertilizer is an opportunity to potentially shield domestic farmers from price volatilities as well as supply international markets with organic fertilizer.

[9] Black soldier fly: agriculture opportunities can be further explored (this industry brief)

Table 10: Opportunities in circular agriculture

Opportunity	Drivers	Macro-environment	Barriers	Expected Timeframe	Targeted Investor
Opportunities for circular agriculture					
Waste-to-fertiliser **Market size** **R426 million**	• Income diversification for wastewater treatment facilities and organic waste management companies. • Rapid urbanisation and growing food loss and waste along agri-food chain. • Price volatility of chemical fertilisers. • Chemical fertiliser bans which may come into effect in the next few years.	• There is an increasing demand for black soldier fly (BSF) farming and BSF products in Mpumalanga and various SMMEs are undertaking pilot studies on BSF products. • There is an interest in off-taking fertiliser from beneficiated wastewater treatment works (WWTWs) sludge by local farmers. • Possible inclusion of agricultural products in the EU's CBAM list.	• Lengthy fertiliser registration process in SA. • End product should be consistent with the product registered as fertiliser. • High capex costs for high-end technologies in BSF production. • Electricity security and costly backup needed.	Short to medium term	• Fertiliser companies. • Farmers. • Private companies. • Climate financiers. • Food waste producing companies.
Waste-to-feed **Market size** **R1.4 billion**	• Financial benefit for farms. • Maximises on-farm nutrient cycling while reducing pollution and increasing profit for farmers. • Industry master plans which are developed to increase competitiveness (e.g. poultry sector, sugarcane). • Increasing cost of landfilling waste.	• There is an increasing demand for black soldier fly (BSF) farming and BSF products in Mpumalanga and various SMMEs are undertaking pilot studies on BSF products. • There is an interest in off-taking fertiliser from beneficiated wastewater treatment works (WWTWs) sludge by local farmers. • Possible inclusion of agricultural products in the EU's CBAM list.	• Lack of education and awareness of waste management. • Lengthy feed registration process in SA. • Limited access to clean traceable waste resources. • More expensive than traditional feed ingredients. • Draft Feeds and Pet Food Bill still not approved which might take long for the bills to passed. • Logistics for feedstock transportation is a challenge.	Medium to long term	• Fertiliser companies. • Farmers. • Private companies. • Climate financiers. • Food waste producing companies.

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FUNDING AND INCENTIVES

South Africa ranks as one of the top 15 nations in the world in terms of driving the green growth agenda (ahead of Australia, Singapore, and Finland). This drive is on the back of a range of funding solutions and tax incentives available to green technology manufacturers and service companies, as well as those who use or procure such goods and services.

The South African Climate Finance Landscape looks at detailed projectlevel data, understanding in detail the source, disbursement, instrument and use. The insights can support public and private role-players with information to shape sectoral strategies and selected policies and improve coherence and coordination between public and private level spending in the sectors. The South African Climate Finance Landscape has tracked R131 billion in annual climate finance invested in SA. *Find out more here.*

General database web page

The GreenCape Finance Desk hosts a web page with a number of Green Finance resources that cover funding and incentives available to companies operating in the green economy. A few of the available database are highlighted below.

The Green Finance Desk (GFD) primarily acts as a facilitator in the financing of green projects and green business. The GFD works across all sector desks at GreenCape. For more support please contact jack@greencape.co.za

Green Finance Database

GreenCape maintains a database of funding sources and incentives that may be relevant to green economy investors. The database contains information on more than 150 funding opportunities, including an overview of the opportunity and relevant contact details and links. It is ideal for any entity seeking a broad range of funding solutions and financial incentives, with South African institutions being the main source of opportunities. The database is available to view and download online [9].

Government funding and incentives database

An updated document focused on South African government funding and incentives is available to view and download online [10]. These incentives cover local manufacturing, critical infrastructure grants, small enterprise development and a diverse set of sector specific incentives (i.e. Aquaculture Development and Enhancement Programme).

Finfind database

Finfind [11] is an innovative online finance solution that brings together SMME finance providers and finance seekers. With a focus on finance readiness, Finfind has more than 200 lenders and over 350 loan products available to SMEs. The database is ideal for South African SMMEs who are seeking funding and/or business advisory services, and those who want to improve their understanding of finance.

AlliedCrowds database

AlliedCrowds [12] is the first complete aggregator and directory of alternative finance providers in the developing world.

Sign-up is free and allows users to access a global database where one can filter for sector (including greentech, agriculture and social impact), type of capital (equity, lending, grant), and type of funding (crowdfunding, angel investing, venture capital, impact investing). In addition:

- Themed databases around the Sustainable Development Goals (SDGs) and the World Green Economy Organisation (WGEO) are available.

- Reports, including a number specifically about African funding sources, can also be downloaded for free.

- Businesses / organisations can also contact Allied Crowds to create a customised funding database. This resource is ideal for any entity seeking a broad range of financial solutions on a global scale.

[9] https://www.green-cape.co.za/content/focusarea/green-finance-databases
[10] https://www.greencape.co.za/assets/Uploads/Government-Funding-and-Incentive-Booklet.pdf
[11] https://www.finfindeasy.co.za/
[12] https://alliedcrowds.com/

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