Required Report: Required - Public Distribution **Date:** November 20, 2024

Report Number: SF2024-0027

Report Name: Agricultural Biotechnology Annual

Country: South Africa - Republic of

Post: Pretoria

Report Category: Biotechnology and Other New Production Technologies

Prepared By: Dirk Esterhuizen

Approved By: Oliver Flake

Report Highlights:

Post received confirmation on United States genetically engineered (GE) soybean eligibility to enter South Africa. After a mid-summer drought, South Africa needs corn and soybean imports to complement local production. South Africa allows for the importation of synchronized GE event approvals from an exporting country. Post worked closely with stakeholders to resolve the asynchronous GE events to allow trade with the United States. South Africa is amongst the top 10 global producers of GE crops and has approved numerous GE plant events for commercial cultivation since 1997. This has enabled remarkable growth in farm productivity. Though, in 2023, South Africa confirmed that products produced using genome editing would be regulated under the same risk assessment framework that currently exists under legislation governing GE products. This risk-disproportionate stance threatens further advancement of innovative biotechnologies in South Africa and will likely have trade ramifications.

Executive Summary:

Total bilateral agricultural trade between the United States and South Africa dropped by 17 percent in 2023 to US$825 million from a record high of US$997 million in 2022. The United States imported US$84 million of processed products that could contain biotech-derived food ingredients from South Africa in 2023. Biotechnology related exports by the United States to South Africa included US$42 million of processed products potentially containing biotech-derived food ingredients as well as corn planting seeds (US$6 million) which are primarily biotech varieties. Although South Africa does not typically import corn or soybeans, after a *El Niño* induced mid-summer drought in 2024 that dropped corn and soybean production by 28 percent and 35 percent respectively, South Africa needs imports to bolster regional supplies. South Africa allows for the importation of GE crops but according to the "Genetically Modified Organism" ("GMO") Act, the list of cultivated GE events in an exporting country must be synchronized with the GE crops that have been approved by the South African regulator for food and feed purposes. FAS/Pretoria worked closely with stakeholders to resolve the asynchronous GE events to allow trade with the United States. On September 30, 2024, FAS/Pretoria received confirmation on United States GE soybean eligibility to enter South Africa (also refer to GAIN report Market Opens for United States Soybeans).

South Africa has been a leader in agricultural biotechnology research and development for over 30 years, which has enabled remarkable growth in farm productivity. Several domestic and international regulations govern the use of GE products in South Africa. Since 1997, South Africa has approved thirty-three GE plant events for general release and commercial cultivation, including three new events approved in 2023. Cultivated GE events are present in corn, soybeans, and cotton. More than 80 percent of corn plantings, approximately 95 percent of soybean plantings, and virtually all cotton plantings in South Africa are from GE seeds. South Africa is also a significant exporter of corn and soybeans, except when extreme droughts limit production (also refer to GAIN reports Grain and Feed and Oilseeds and Products).

In 2023, through a public notice (Minister's final decision on NBTs), South Africa confirmed that products produced using modern genome editing would be regulated under the same risk assessment framework that exists for traditional GE products according to South Africa's "GMO" Act, regardless of foreign DNA presence. This risk-disproportionate stance, one of the strictest globally, threatens further advancement of agricultural biotechnology by creating onerous barriers for the use of new technology like CRISPR. The private sector stakeholders in South Africa continue to advocate for a risk-proportionate approach.

South Africa's second cloned calf was born in 2024. The complex cloning process began in 2023 by two local veterinarians when a piece was clipped from the ear of the 12-year-old Chianina cow and taken to the laboratory. After a multifaceted scientific process, the embryo was implanted in the recipient cow where it successfully grew. The first cloned animal in South Africa was a Holstein calf that was born in 2003.

TABLE OF CONTENTS

PLANT AND ANIMAL BIOTECHNOLOGY

CHAPTER 1: PLANT BIOTECHNOLOGY

PART A: PRODUCTION AND TRADE

(a) RESEARCH AND PRODUCT DEVELOPMENT

South Africa has been involved with biotechnology research and development for over 30 years and continues to be the biotechnology leader on the African continent. To date, South Africa has approved 33 GE plant events for commercial production, including three new events approved in 2023 (see Table A1 in the appendix). The 33 approved GE events are contained within three commodities, namely corn, soybeans, and cotton, and include herbicide tolerance, insect resistance, pollination control system and drought tolerance traits.

In the past 5 years, South Africa authorized 35 field trial permits. Table A2 in the appendix summarizes the events, traits, products, and companies involved with the permits issued for trial release clearance since 2018. To Post's knowledge, there are no GE plants used to produce antibiotics of pharmaceuticals for human or animal disease at this time.

In addition to the large multinational companies, like Bayer, Corteva, Syngenta, and BASF, several parastatals, universities and agricultural industry organizations in South Africa are involved in innovative GE research. These include the following organizations:

The Agricultural Research Council's Biotechnology Platform

The Agricultural Research Council's Biotechnology Platform (ARC-BTP) was established in 2010 as a major strategic priority of the ARC. The role of the ARC-BTP is to create the high-throughput resources and technologies required for applications in genomics, quantitative genetics, marker assisted breeding, and bioinformatics within the agricultural sector. The focus of the ARC-BTP is to establish itself as both a research and service driven institution, providing an environment in which highly skilled researchers can be hosted and trained. The technologies established within the platform are accessible as services to the ARC, collaborators, companies, science councils, and researchers across the African continent. For more information, please visit the following link: ARC-BTP.

The Forestry and Agricultural Biotechnology Institute at the University of Pretoria

The Forestry and Agricultural Biotechnology Institute (FABI) is based at the University of Pretoria, South Africa. FABI promotes the broad field of plant biotechnology through an interdisciplinary approach and with close linkages to a wide range of academic departments. The institute has been operational since 1998. For more information, please visit the following link FABI-UP.

The Institute for Wine Biotechnology at Stellenbosch University

The Institute for Wine Biotechnology (IWBT) was established at Stellenbosch University in 1995 (see also IWBT). The IWBT is an internationally recognized postgraduate training and research

institute offering training and innovative research to support the South African wine and grapevine industries. The IWBT's research programs follow a globally unique, integrated, and multidisciplinary approach, combining cutting edge high-throughput and systems-based approaches derived from the core sciences of biology and chemistry with the traditional wine sciences of viticulture and oenology. Themes include grapevine ecophysiology and molecular biology, microbial diversity, physiology and molecular biology, analytical chemistry, and computational biology. Wine and related products make up a large part of South Africa's agricultural exports to the United States with an annual value typically exceeding US$50 million.

The South African Sugarcane Research Institute

The South African Sugarcane Research Institute (SASRI) is a world-renowned agricultural research institute that contributes to the sustainability of the local sugar industry. Research at SASRI is clustered within four multidisciplinary programs, namely Variety Improvement, Crop Protection, Crop Performance and Management and Systems Design and Optimization. The Variety Improvement Program conducts research and implements strategies for the continual release of high yielding, adaptable, pest and disease resistant varieties that add value and enhance industry productivity. Modern biotechnological approaches are deployed for the commercial development of GE sugarcane for insect borer resistance and herbicide tolerance and to improve sugarcane drought stress tolerance. For more information, please visit the following link: SASRI.

(b) COMMERCIAL PRODUCTION

South Africa cultivates three GE agricultural crops commercially, namely, corn, soybeans, and cotton. In marketing year (MY) 2023/24 a total of 3.8 million hectares (MHa) of these three crops were planted in South Africa, of which an estimated 3.3 MHa were planted with GE seeds. Of the total GE area, GE corn plantings represent about 66 percent or 2.2 MHa, followed by GE soybeans, representing approximately 33 percent or 1.1 MHa and GE cotton representing approximately one percent or 20,000 ha. This places South Africa among the top 10 global producers of GE crops.

Corn

Corn is the main field crop produced in South Africa and is used for both human consumption (mainly white corn) and animal feed (mainly yellow corn) with an annual average production of more than 14.0 million metric tons (MMT). In 1997, the first GE corn event (insect resistant) was approved in South Africa. Since then, the country has seen a progressive and steady increase in GE corn plantings, leading to more than 80 percent of total corn plantings today. Table 1 illustrates the plantings of GE corn in South Africa over the past seven marketing years. Of the 2.6 MHa of corn planted in MY 2023/24, an estimated 2.2 MHa or 85 percent were planted with GE seeds.

White corn plantings in MY 2023/24 were 1.5 MHa, of which an estimated 90 percent or 1.4 MHa were planted with GE seed. Yellow corn plantings were approximately 1.1 MHa, of which an estimated 77 percent were planted with GE seed. A proportion of non-GE yellow corn produced in South Africa is used in the beer brewery industry, while the rest is exported to non-GE markets. A traceability system and dedicated non-GE grain storage facilities allow for segregation for the local and international non-GE markets.

Table 1

Planting of GE corn in South Africa over the past seven years

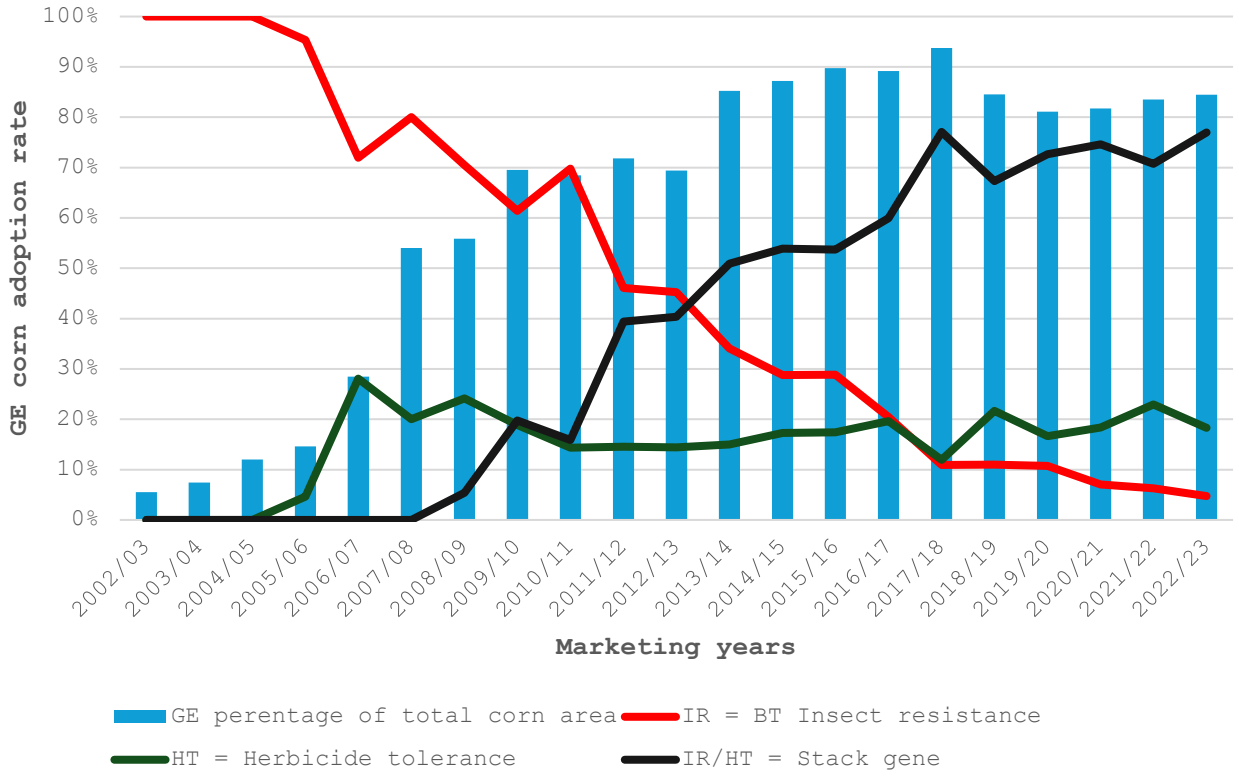
	Area planted (1,000 ha)		
Marketing years	**White corn**	**Yellow corn**	**Total corn**
2017/18			
Total area	1,643	985	2,629
GE area	1,580	885	2,465
***GE area % of total* area**	***96%***	***90%***	***94%***
2018/19			
Total area	1,268	1,050	2,318
GE area	1,103	856	1,959
***GE area % of total* area**	***87%***	***81%***	***85%***
2019/20			
Total area	1,298	1,002	2,300
GE area	1,175	690	1,865
***GE area % of total* area**	***91%***	***69%***	***81%***
2020/21			
Total area	1,616	995	2,611
GE area	1,365	769	2,134
***GE area % of total* area**	***84%***	***77%***	***82%***
2021/22			
Total area	1,692	1,063	2,755
GE area	1,535	765	2,300
***GE area % of total* area**	***91%***	***72%***	***83%***
2022/23			
Total area	1,575	1,048	2,623
GE area	1,405	810	2,215
***GE area % of total* area**	***89%***	***77%***	***84%***
2023/24 (estimate)			
Total area	1,521	1,065	2,586
GE area	1,370	820	2,190
GE area % of total area	***90%***	***77%***	***85%***

Source: FAS/Pretoria estimates and data from the Bureau for Food and Agricultural Policy and GrainSA

In MY 2022/23 approximately 77 percent of GE corn seed planted consisted of stacked varieties (insect resistant and herbicide tolerant), while single insect resistant (5 percent) and herbicide tolerant (18 percent) events in total comprised of about 23 percent of total GE corn plantings (see also Figure 1). Information for MY 2023/24 is not yet available,

Figure 1

The Adoption Trends of GE Corn in South Africa

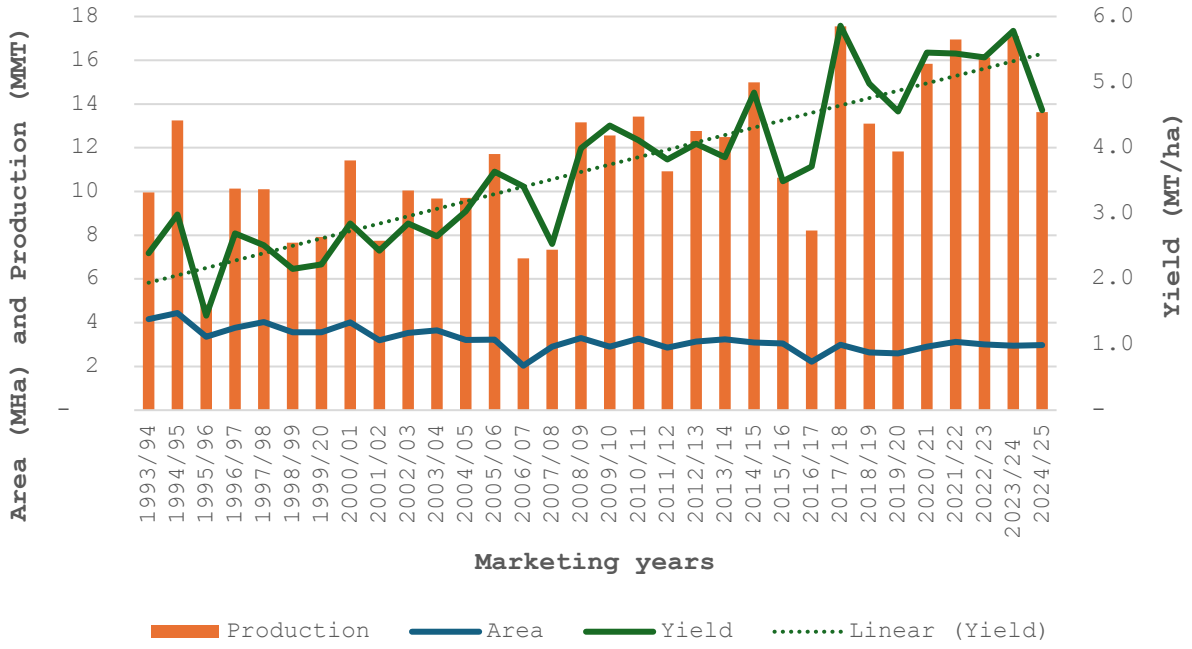


Source: FAS/Pretoria using data from the Bureau for Food and Agricultural Policy

South Africa is mostly self-sufficient in corn production and imports are limited to years when drought impacts production. The long-term trend in corn production indicates that South Africa is producing more corn on less area (see Figure 2). South Africa's corn yields have more than doubled in the past 30 years (see Figure 3) with the use of new production technologies, such as GE seed and more efficient and effective farming practices, including precision and conservation farming. Indications are that this trend of producing more corn on fewer hectares will continue in the future.

Figure 2

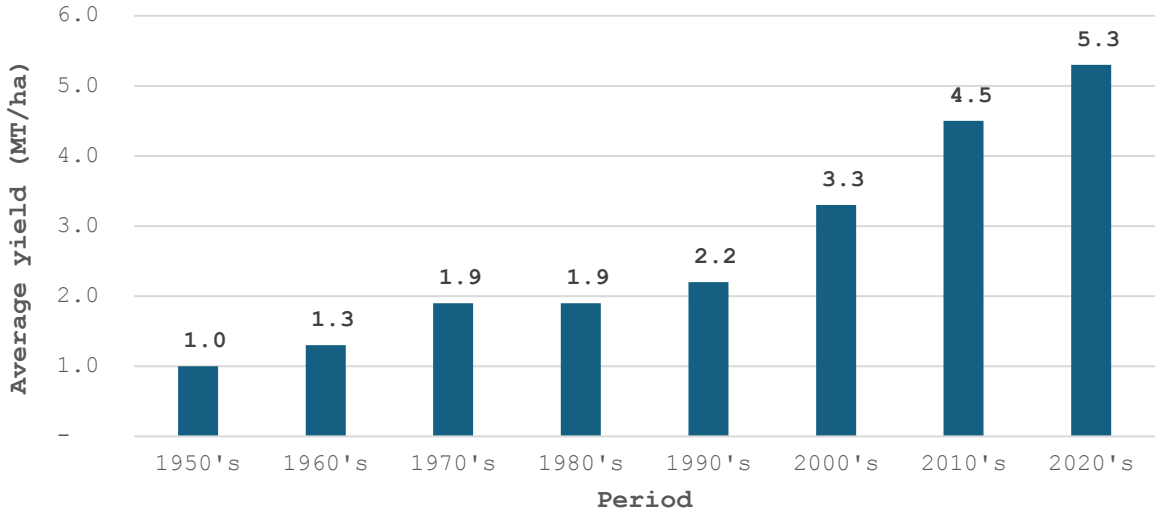
Area Planted, Production and Yields of Corn in South Africa over the Past 30 Years



Source: United States Department of Agriculture **(**USDA)

Figure 3

Trends in the Average Corn Yields in South Africa



Source: FAS/Pretoria using data from the South African Grain Information Services
Note: 2020 includes only the first four years

Soybeans

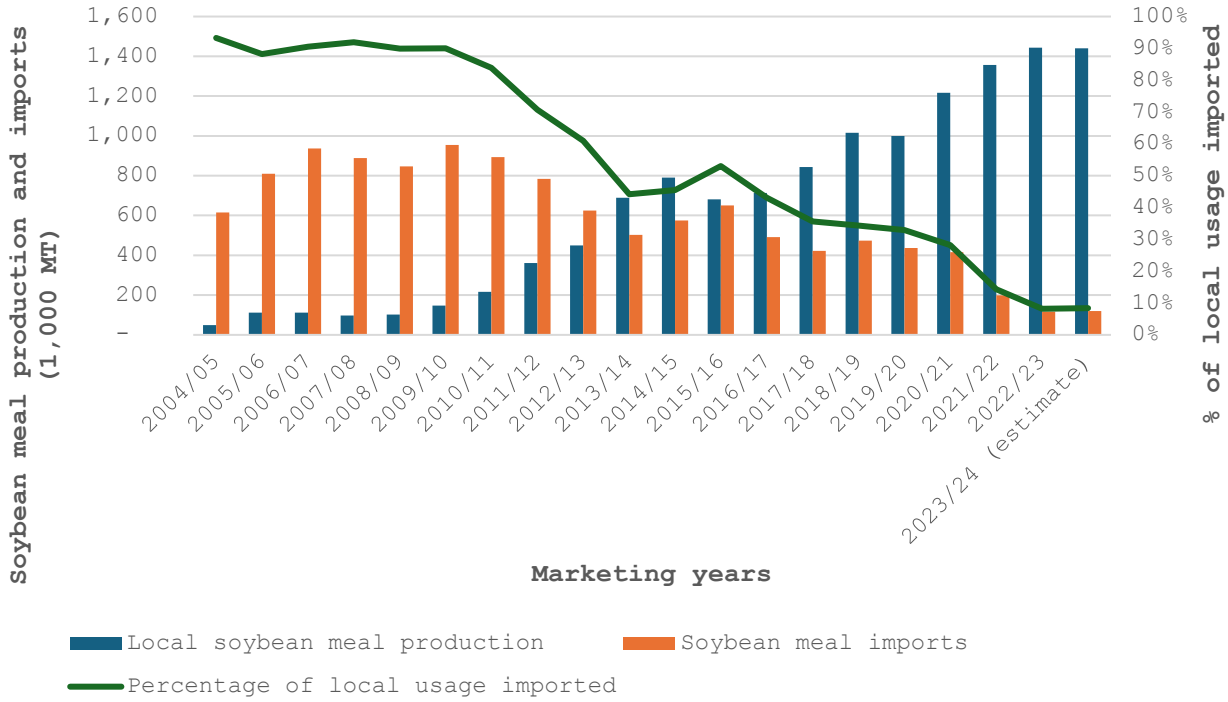
South Africa expanded its soybean area by 8-fold over the past 20 years. Farmers planted a record soybean area of 1.2 MHa in the 2023/24 production season. Twenty years ago, South African farmers planted a mere 135,000 ha with soybeans. Soybeans now represent more than 25 percent of the area planted with summer rainfall field crops, while 20 years ago it was only four percent. This surge has been driven by farmers' growing interest in using soybeans as a rotational crop with corn, a growing local demand for soybeans through extensive investments in oilseed processing plants, and the adoption of GE soybeans. GE soybeans were first approved for commercialization in South Africa in 2001. By 2006, 75 percent of the soybean crop grown was GE. Today, more than 95 percent of soybeans in South Africa are planted with GE seeds.

Oilseed meal is an important source of protein for animal feed manufacturing. Soybean meal is the most important protein used by feed manufacturers in South Africa and typically represents more than 70 percent of protein meal usage in animal feed. The average inclusion rate of protein meal in feed rations is between 20 and 30 percent. The bulk of soybeans produced in South Africa are crushed to produce protein meal for inclusion in animal feed rations.

Figure 4 illustrates the trend in the replacement of soybean meal imports with locally produced oilseed meal over the past 20 years in South Africa, after investments that enlarged crushing capacity. In recent years, less than 10 percent of soybean meal consumed in South Africa is imported. However, the high cost of transportation (mainly by road) from South Africa's summer rainfall regions in the north to the Western Cape province in the south, implies that South Africa will continue importing soybean meal to the coastal regions. Most of South Africa's oilseed meal imports originate from Argentina.

Figure 4

Trends in the Replacement of Soybean Meal Imports with Locally Produced Meal in South Africa



Sources: FAS/Pretoria using Trade Data Monitor LLC and USDA data

Cotton

In 1997, the first GE cotton event (insect resistance) was approved in South Africa and currently all local cotton plantings are from GE seeds. However, cotton production is relatively small in South Africa as farmers choose to plant more profitable crops like corn and soybeans. Cotton area stayed flat in MY 2023/24 at approximately 20,000 ha.

(c) EXPORTS

Exporters of GE products in South Africa must apply for a GE export permit according to the "GMO" Act of 1997. Permit applications should be accompanied by a permit/letter of authority from the importing countries' Competent Authority permitting GE imports.

Corn

South Africa is a net exporter of corn in most years, except when extreme droughts limit production. However, despite a reduced corn crop of 13.4 MMT, due to an *El Niño*-induced mid-summer drought, South Africa could still export about 1.0 MMT of corn in MY 2024/25. South Africa's corn exports will mainly focus on neighboring countries where import demand is elevated due to the drought conditions and GE corn is acceptable for consumption. On the other hand, Zambia

declared that only GE free corn will be permitted for imports, which largely excludes corn imports from South Africa. In the first 21 weeks of MY 2024/25, South Africa has already exported 891,376 MT of corn, including 586,590 MT of white corn and 304,786 MT of yellow corn (see Table 3).

In MY 2023/24, South Africa exported 3.4 MMT of corn, 6 percent less than the 3.7 MMT of corn that was exported in MY 2022/23. South Africa exported corn to more than 15 countries, with Zimbabwe, South Korea, Japan, Taiwan, and Botswana as the top five destinations and representing almost 70 percent of total corn exports. South Africa exported almost 1.3 MMT of white corn and 2.2 MMT of yellow corn. Exports to the Asian countries consisted mainly of yellow corn, while corn exports to South Africa's neighboring countries were largely white corn. Almost 50 percent or 1.6 MMT of corn was exported to South Africa's neighboring countries in MY 2023/24, nearly double the tonnage of the previous marketing year, indicative of the higher import demand due to the drought.

Table 2

South Africa's Exports of Corn in MY 2023/24 and MY 2024/25

MY 2023/24 May 1, 2023 – Apr 30, 2024 (1,000 MT)				MY 2024/25[1] May 1, 2024 – Apr 30, 2025 (1,000 MT)			
Countries	**White Corn**	**Yellow corn**	**Total**	**Countries**	**White Corn**	**Yellow corn**	**Total**
Export Destinations				**Export Destinations**			
Zimbabwe	447	191	638	Zimbabwe	320	171	491
South Korea	0	492	492	Botswana	88	41	129
Japan	0	468	468	Namibia	80	25	105
Taiwan	0	463	463	Mozambique	38	27	65
Botswana	262	46	308	Eswatini	15	34	49
Namibia	178	62	240	Lesotho	46	3	49
Mozambique	137	65	202	Saudi Arabia	0	3	3
Vietnam	0	179	179				
Eswatini	61	84	145				
China	0	112	112				
Lesotho	69	3	72				
Kenya	68	0	68				
Guatemala	43	0	43				
Ghana	4	2	6				
Saudi Arabia	0	5	5				
Malawi	0	1	1				
Total Exports	**1,270**	**2,173**	**3,443**	**Total Exports**	**587**	**304**	**891**

Source: FAS/Pretoria using data from the South African Grain Information Services
Note: *1. Preliminary export data from May 1, 2024, to September 20, 2024*

Soybeans

In the past, South Africa's trade in oilseeds was generally limited, as the bulk of production was destined for local crushing. As a result, exports and imports primarily consisted of soybean oil and meal. However, with the surge in the local production of soybeans and crushing capacity reaching optimal levels, South Africa's soybean exports reached a historical high level on 597,000 MT in MY 2023/24, more than double the previous year. Malaysia (269,972 MT), China (147,497 MT) and Vietnam (56,380 MT) were the major markets for South Africa's soybeans. At the end of 2022, South Africa completed export protocols with China, opening the world's largest soybean market for local producers.
So far in MY 2024/25 (March 2024 to August 2024), South Africa exported 74,221 MT of soybeans, a major drop from the previous MY due to the *El Niño*-induced mid-summer drought that resulted in a 35 percent decline in production.

Table 3

South Africa's Exports of Soybeans in MY 2023/24 and MY 2024/25

Countries	**MY 2023/24 (1,000 MT)**	**MY 2024/25* (1,000 MT)**
Malaysia	270	**0**
China	147	0
Vietnam	56	28
Bangladesh	55	0
Thailand	33	0
Portugal	30	0
Mozambique	4	1
Zimbabwe	2	44
Botswana	0	2
Total	**597**	**74**

Source: FAS/Pretoria using South African Grain Information Services data
**Preliminary export data from March 1 to June 30, 2024*

Cotton

South Africa's exports of cotton are relatively small and totaled only 2,500 MT in 2023. Bangladesh, China and Vietnam were the most important markets.

(d) IMPORTS

South Africa allows for the importation of GE crops and GE processed products that have been approved by South African regulators for food and feed purposes (commodity clearance). Table A3 in

the appendix lists the 108 GE events that received commodity clearance in South Africa since 2001 (see also Commodity Clearance Approvals). Commodity clearance is a term used to designate that South Africa allows the importation of these events for the use as food and/or feed. Typically, this means seeds that will not be planted, but rather processed in a way that will leave them non-viable for propagation through crushing or milling. A complete food safety assessment is required, but an environmental assessment is not necessary in line with the limited environmental exposure. Currently, commodity clearance approvals cover six crops, namely, corn, soybeans, rapeseed (locally called canola), cotton, rice, and wheat. Three new events in corn received commodity clearance in 2023. In 2022, also three events received commodity clearance in corn, soybeans, and wheat.

(e) FOOD AID

South Africa is not a recipient of food aid even in years of drought. However, international food aid destined for Lesotho, Eswatini, Zambia, and Zimbabwe ordinarily passes through the South African ports. For shipments containing GE commodities to pass through South Africa, the "GMO" Registrar's office requires several measures, including an advance notification to ensure that proper containment measures can be taken. A letter from the recipient country stating that it accepts the food aid consignment and acknowledging that the consignment contains GE products is also required.

(f) TRADE BARRIERS

According to the "GMO" Act, the list of GE events approved in an exporting country must be synchronized with the GE crops that have been approved by the South African regulators for food and feed purposes (commodity clearance). According to the South African regulatory procedures: "Import permits are issued for the import of GE consignments, irrespective of the crop and country, provided the exporting country has approved the same or less number and type of events as South Africa," though in practice this requires event by event synchronization. This rule is in place even though the imported GE commodities will be transported directly from the ports to the processing plants and is prohibited from being used as seed. Synchronizing inter-country GE lists can be a complex process as commodities mostly consist of stacked events. South Africa requires separate approval for GE events that combine two or more traits even if the individual traits have already been approved. In cases of events that are approved yet no longer cultivated in an exporting country, South Africa requires confirmation that cultivation has ceased. These asynchronous approvals can pose significant risks to trade since South Africa applies zero tolerance for unintentional presence of GE events in food and feed imports.

Stakeholders in the South African grain and oilseeds industry continue to monitor for asynchronous GE approvals to ensure trade between South Africa and its trading partners, including the United States, is not unnecessarily interrupted. This year, FAS/Pretoria received a request from traders interested in importing U.S. soybeans and corn into South Africa to clarify synchronicity of GE events. After a *El Niño* induced mid-summer drought in 2024 that dropped corn and soybean production by 28 percent and 35 percent, respectively, South Africa needs imports to augment local production. South Africa is expected to continue exporting corn to its neighboring countries where the demand is high, creating a situation where domestic consumption demands require imports. In addition, the high cost of transportation (mainly by road) from South Africa's summer rainfall production regions in the north to the coastal areas in the south, implies that it could cost less to

import corn at the current price levels to the coastal areas than to buy locally. FAS/Pretoria worked closely with all stakeholders to resolve the asynchronous GE events to allow trade with the United States. On September 30, 2024, the Registrar of the "GMO" Act informed stakeholders that all GE soybean events that caused asynchrony with the United States had been approved and that import permits will be issued for GE soybeans from the United States.

PART B: POLICY

(a) REGULATORY FRAMEWORK

Several local and international regulations govern the use of GE products in South Africa. The goal of these regulations is to ensure that any activity involving GE products is assessed with regards to potential risks to human health and the environment prior to undertaking any such activity.

Locally, GE agricultural plant product development is regulated by the "GMO" Amendment Act of 1997 (Act 15 of 1997) and administrated by the Department of Agriculture, Land Reform and Rural Development (DALRRD) (see also Genetically Modified Organisms Amendment Act). Additional regulations, specifically pertaining to GE products, are also contained under legislation in other departments of the South African government, namely:

- Department of Health, e.g., food safety and labelling requirements,
- Department of Forestry, Fisheries, and Environment e.g., post-release monitoring and triggers for environmental impact assessments and
- the Department of Trade, Industry, and Competition e.g., labelling.

Internationally, South Africa is a party to two agreements regarding GE products, the Cartagena Protocol on Biosafety (with an environmental focus) and the CODEX Alimentarius (with a food safety focus). Collectively, these regulations establish South Africa's National Biosafety Framework (see Table 4). Table 5 lists specific definitions related to the regulation of GE plants in South Africa.

Table 4

South Africa's National Biosafety Framework

		National	International
Health	**"GMO" Act of 1997** *(Provides for measures to promote the responsible development, use and application of GE products)*	**Foodstuffs, Cosmetics & Disinfectants Act, 1972** *Defines labelling requirements for GE containing foods (Regulation 25, 2004)*	**CODEX Alimentarius**
Environment		**National Environmental Management Act, 1998** *Provides general guidance with regards to the criteria that may trigger an Environmental Impact Assessment for GE products* **National Environmental Management Biodiversity Act, 2004** *Regulates possible impacts of GE products on biodiversity and introduces minimum monitoring requirements, implemented through the South Africa National Biodiversity Institute (SANBI)*	**Cartagena Protocol on Biosafety**
Socio-Economic		**Consumer Protection Act, 2008** *Introduced mandatory labeling requirements for all GE products (Regulation 293, 2008)*	

Source: FAS/Pretoria adapted from Biosafety South Africa

Table 5

Specific Definitions Related to the Regulation of GE Plants in South Africa

Legal Term	Laws and Regulations where term is used	Legal definition
Accident	"GMO" Act	Means any - (i) incident involving an unintentional environmental release of genetically modified organisms that is likely to have an immediate or delayed adverse impact on the environment or on human or animal health within the Republic; or (ii) unintentional transboundary movement of genetically modified organisms that is likely to have an immediate or a delayed adverse impact on the environment or on human or animal health.
Biosafety	"GMO" Act	Means the level of safety when risk management measures must be taken to avoid potential risk to human and animal health and safety and to the conservation of the environment, because of exposure to activities with genetically modifies organisms.
Commodity clearance	"GMO" Act	Means the authorization to use a genetically modified organism as a food and feed, or for processing, but excludes the planting of a genetically modified organism as a release into the environment.
General release	"GMO" Act	Means the release of a genetically modified organism into the environment by whatever means, where the organism is no longer contained by any system of barriers.
Environment	National Environmental Management Act	Means the surroundings within which humans exist and that are made up of— (i) the land. water and atmosphere of the earth: (ii) micro-organisms, plant, and animal life: (iii) any part or combination of (i) and (ii) and the interrelationships among and between them: and (iv) the physical. chemical, aesthetic, and cultural properties and conditions of the foregoing that influence human health and well-being.
Environmental	"GMO" Act	Means the process used to assess the potential

impact assessment		impact of an activity on the environment by collecting, organizing, analyzing, interpreting, and communicating information on such activity.
Genetically modified organism	"GMO" Act	Means an organism, the genes or genetic material of which has been modified in a way that does not occur naturally through mating or natural recombination or both.

The "GMO" Act of 1997

In 1979, the South African government established the Committee on Genetic Engineering (SAGENE). SAGENE comprised of a group of South African scientists and was commissioned to act as scientific advisory body to the government. SAGENE paved the way for the uptake of biotechnology in food, agriculture, and medicine in South Africa, and laid the groundwork for implementation of the "GMO" Act of 1997. For more historical information on SAGENE and implementation of the "GMO" Act, see Gain report SF2020-0056.

The "GMO" Act of 1997, along with its accompanying regulations, is administrated by DALRRD. The "GMO" Act of 1997 was modified by the South African government in 2005 to bring it in line with the Cartagena Biosafety Protocol and again in 2006 to address some economic and environmental concerns. These amendments to the "GMO" Act were approved on April 17, 2007, and came into effect in February 2010, after the regulations were published (see also GMO Regulations). The "GMO" Act, as amended, does not change the pre-existing preamble, which establishes the general ethos of the legislation, namely, to subsume the need for biosafety with the imperative to promote GE product development. This encompasses the entire pipeline of GE product development, including, research (contained use and field trail activities), production (general release activities), imports and exports, transport, and the use of GE products. All activities with GE products are monitored through the "GMO" Act and its regulations according to permits issued, including permits for imports, exports, commodity clearance, general release, field trails and contained use.

The "GMO" Act established a decision-making body (the Executive Council (EC)), an advisory body (the Advisory Council (AC)), and an administrative body (the "GMO" Registrar). The main functions of these bodies are to:

- Provide measures to promote the responsible development, production, use, and application of GE products.
- Ensure that all activities involving the use of GE products be carried out in such a way as to limit possible harmful consequences to the environment, human health, and animal health.
- Give attention to the prevention of accidents and the effective management of waste.
- Establish mutual measures for the evolution and reduction of the potential risks arising from activities involving the use of GE products.
- Lay down the necessary requirements and criteria for risk assessments.
- Establish appropriate procedures for the notification of specific activities involving the use of GE products.

The amendments to the "GMO" Act make it clear that a scientifically based risk assessment is a prerequisite for decision making and authorizes the EC to determine if an environmental impact assessment is required under the National Environmental Management Act. The amendments also added specific legislation to allow socio-economic considerations to factor into decision-making and make those considerations significantly important in the decision-making process.

The amendments also create at least eight new provisions dealing with accidents and/or unintentional transboundary movement. A new definition of "accident" was created to capture two types of situations, namely, dealing with unintentional transboundary movements of GE products and the unintentional environmental release within South Africa.

In summary, the existence and application of the "GMO" Act and its amendments provides South Africa with a decision-making tool that enables authorities to conduct scientific assessments of the potential risks that may arise from any activity involving a particular GE product.

The Executive Council

The EC functions as an advisory body to the Minister of DALRRD on matters relating to GE products and more importantly is the decision-making body that approves or rejects GE product applications. The EC consists of representatives of seven different departments within the South African government. These include:

- DALRRD.
- Department of Forestry, Fisheries and Environment.
- Department of Health.
- Department of Trade, Industry and Competition.
- Department of Science and Innovation.
- Department of Employment and Labor.
- Department of Water and Sanitation.

Before deciding on GE applications, the EC is obliged to consult with the AC. The AC is represented on the EC through its chairperson. Decision-making by the EC is based on unanimous approval by all the members. When no consensus is reached, the application before the EC will be considered as having been declined. For this reason, it is essential that all representatives on the EC have significant knowledge of biotechnology and biosafety.

The Advisory Council

The AC consists of 10 scientists who are appointed by the Minister of DALRRD. The EC advises the Minister on the appointment of members of the AC. The role of the AC is to advise the EC on GE applications. The AC is further supported by subcommittee members representing an extended pool of scientific expertise from various disciplines. The AC together with the subcommittee members is responsible for the evaluation of risk assessments of all applications as it relates to food, feed, and environmental impact and for submitting recommendations to the EC.

The Registrar

The Registrar, who is appointed by the Minister of DALRRD, is responsible for administration of the "GMO" Act. The Registrar acts on the instructions and conditions laid down by the EC. The Registrar is responsible for examining applications to ensure conformity with the Act, issuing permits, amending and withdrawing permits, maintaining a register, and monitoring all facilities that are used for contained use and trial release sites. Figure 5 illustrates the GE application process in South Africa.

The National Environmental Management Act of 1998

The National Environment Management Act is administered by the Department of Forestry, Fisheries, and the Environment (DFFE) and provides established general principles for decision making with regards to activities that affect the environment. The Act and relevant amendments include:

- National Environmental Management Act (Act no. 107 of 1998)
- National Environmental Management Act Amendment Act (Act no. 8 of 2004)

The Act provides general guidance with regards to the objectives of an Environmental Impact Assessment (EIA) of GE products, the criteria that may trigger an EIA, and the administrative procedure to follow should the trigger requirements be met.

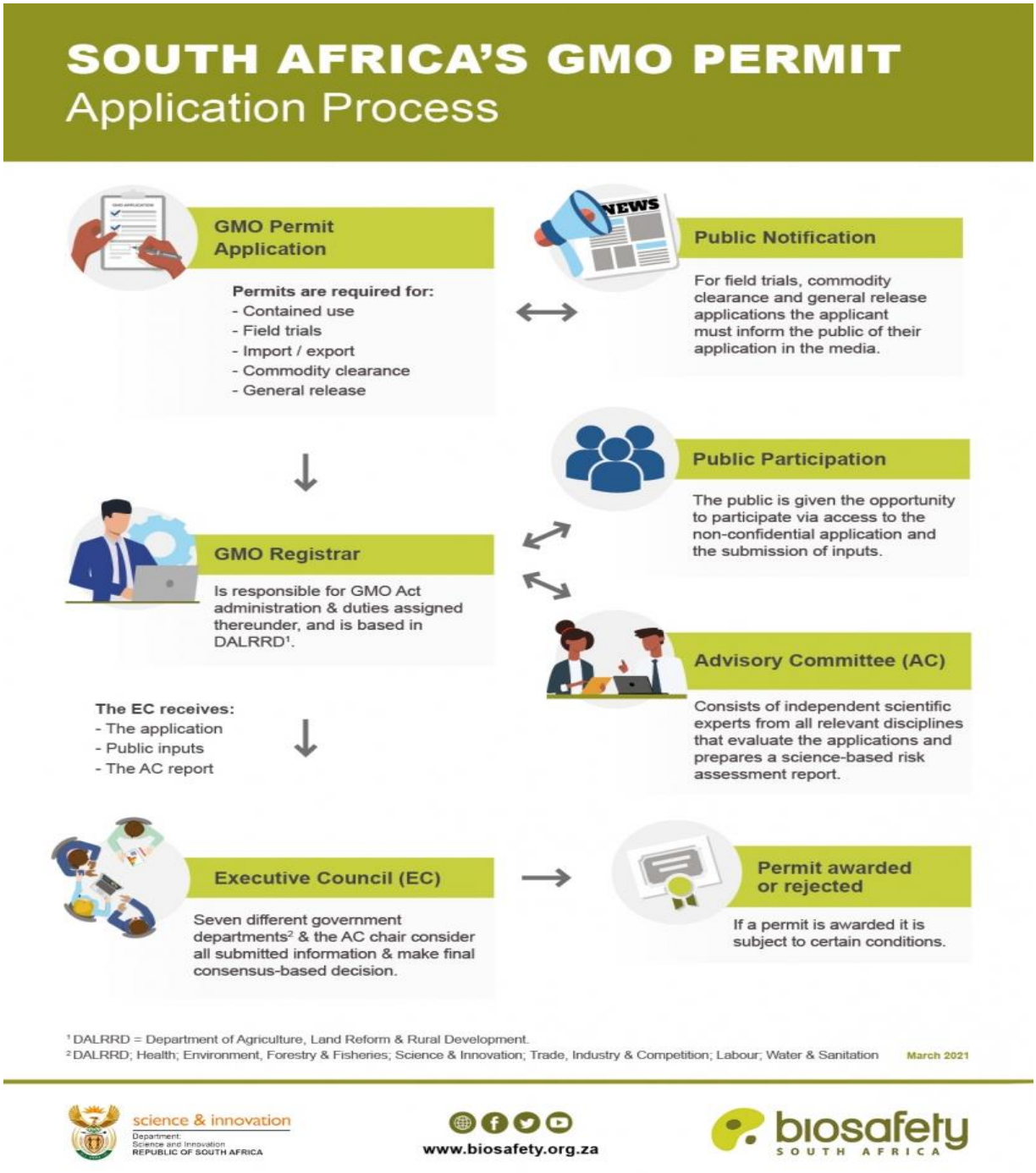
The National Environmental Management Biodiversity Act of 2004

The National Environmental Management Biodiversity Act (Biodiversity Act) of 2004 was established to protect South Africa's biodiversity from specific threats and includes GE products as one of those threats. Section 78 of the Act gives the Minister of DFFE the power to deny a permit for general or trial release applied for under the "GMO" Act, if the GE product may pose a threat to any indigenous species or the environment.

Under the Biodiversity Act, a South African Biodiversity Institute (SANBI) was also established. SANBI is tasked to monitor and report regularly to the Minister of DFFE on the impacts of any GE product that has been released into the environment. The legislation requires reports on the impact of non-target organisms and ecological processes, indigenous biological resources, and the biological diversity of species used for agriculture.

Figure 5

The GE application process in South Africa



Foodstuffs, Cosmetic and Disinfectants Act of 1972

The Foodstuffs, Cosmetic and Disinfectants Act (Act No. 54 of 1972) of the Department of Health (DoH) controls the sale, manufacture and importation of foodstuffs, cosmetics, and disinfectants to ensure their quality and safety. The DoH accepts the Codex Alimentarius principles and guidelines for the food/feed safety requirements of GE products as policy for South Africa.

The DoH also published mandatory GE food labelling regulations in 2004 under the Foodstuffs, Cosmetic and Disinfectants Act. Regulation 25 states that foodstuffs produced through genetic modification – where they differ significantly from existing foodstuffs in terms of their composition, nutritional value, mode of storage, preparation, or cooking, allergenicity or genes with human or animal origin – must be labelled.

Consumer Protection Act of 2008

In 2008, the Consumer protection Act (Act No. 68 of 2008) was promulgated under the Department of Trade, Industry and Competition which asserts that labelling is required for all GE goods. Draft amendments to the GE labelling regulations were published in October 2012. These draft amendments triggered serious concerns regarding the limitations of the Act on GE labeling by the business community in South Africa. As a result, final GE labeling regulations under the Consumer Protection Act have not yet been published, precluding any required GE labeling by stakeholders in the food supply chains of South Africa.

(b) APPROVALS

Table A1 in the appendix indicates all the GE events that have been approved for general release in South Africa under the "GMO" Act of 1997 (see also General Release Approvals). This means these events can be used for commercial plantings, for food and/or feed, and the import and export of these events are allowed. Thirty-three GE plant events have received general release approval since 1997 in South Africa. These events are present in three crops, namely corn, soybeans, and cotton (see Table 6 for a summary).

In the past two years, six new GE events received general release approval. Among these approvals are Corteva's pollination control technology (DP-056113-9) that is used in hybrid planting seed production and Corteva's stacked insect resistant and herbicide tolerant events for corn and soybeans. DP-056113-9 is not a commercial trait and there is no intent for it to enter the grain commodity supply chains. Rather, it is used to ease the hybrid corn seed production process. Syngenta received general release approval for an insect resistant event in corn and Bayer a herbicide tolerance event in corn during the past two years.

Table 6

The Traits and Companies Involved in South Africa's 32 Approved GE Plant Events for Cultivation

Crop	Traits	BAYER	syngenta	CORTEVA agriscience
Corn	Insect resistance (IR)	2	2	
	Herbicide tolerance (HT)	2	1	2
	Drought tolerance	1		
	Stacked (IR & HT)	3	3	6
	Pollination control			1
Soybeans	Herbicide tolerance	1		1
	Stacked (IR & HT)	1		1
Cotton	Insect resistance	2		
	Herbicide tolerance	2		
	Stacked (IR & HT)	2		

Source: FAS/Pretoria using DALRRD data

As previously referenced, Table A3 in the appendix lists the 108 GE events that received commodity clearance in South Africa since 2001 (see also Commodity Clearance Approvals). Commodity clearance means that South Africa allows the importation of these events for use as food and/or feed and that are not intended for environmental release.

(c) STACKED OR PYRAMIDED EVENT APPROVALS

South Africa requires separate approval for GE planting seeds for general release that combine two or more already approved traits, such as herbicide tolerance and insect resistance. This requirement means that companies effectively need to start from the beginning of the approval process for stacked events, even when the traits have already been approved individually. The EC confirmed that each stacked event must undergo a separate safety assessment as per the "GMO" Act. Currently, 15 stacked events (insect resistant and herbicide tolerant) have been approved for general release in South Africa including 12 for corn and two each for soybeans and cotton.

(d) FIELD TESTING

South Africa allows for field-testing of GE crops under the "GMO" Act of 1997. Please refer to Table A2 in the appendix for GE events that have been approved for confined field trails. All facilities conducting GE activities must be listed with the Registrar of the "GMO" Act. A separate application must be logged with the registrar for each facility and applications must include:

- the name of the person taking responsibility for the facility,
- a map of the facility that indicates the different units within the facility,
- a locality map that clearly indicates where the facility is situated, including its geographic coordinates,
- a science-based risk assessment of the activities within the facility, and
- the proposed risk management mechanisms, measures, and strategies.

After receiving the application, the Registrar approaches the AC for consideration of the application and a recommendation. Upon registration of a facility, the registrar furnishes the applicant with proof of registration and information on relevant guidelines. The registration of a facility is valid for a period of three years before an application for renewal must be submitted.

(e) INNOVATIVE BIOTECHNOLOGIES

After the introduction of innovative biotechnologies worldwide, South Africa started internal deliberations to determine regulatory policies for "New Breeding Techniques" (NBTs), including genome editing and derived products. On October 27, 2021, a public notice (see also Notice SA's regulatory approach for NBT's) was sent to all stakeholders announcing South Africa's regulatory approach for "NBTs." According to the notice, the same risk assessment framework that exists for GE products under South Africa's current "GMO" Act will apply to "NBTs." South Africa's "GMO" Act defines a "GMO" as "an organism, the genes, or genetic material of which has been modified in a way that does not occur naturally through mating or natural recombination or both." Based on this definition under the "GMO" Act, the EC concluded that the current risk assessment framework that exists for GE products would apply to all products produced using innovative biotechnologies.

The public notice caused discontent amongst international stakeholders, the local industry, and academia. As a result, the local industry launched an internal appeal, in terms of the "GMO" Act, against the ruling and requested that the Minister appoint an independent panel of experts to serve as the Appeal Board. The industry based its appeal on a defective consultation procedure, incorrect interpretation of the definition of a "GMO" in terms of the "GMO" Act, and international best practice.

In December 2022, the Appeal Board found in favor of industry in respect of all the grounds of the appeal. The Board therefore recommended that the decision of the Executive Council regarding "NBTs" be set aside and that a consultative process be initiated and concluded within 12 months to develop a new regulatory framework for "NBTs." The Appeal Board recommended a science-based, case-by-case approach for the regulation of "NBTs" in South Africa.

However, the then Minister of DALRRD, Ms. Thoko Didiza, announced on August 11, 2023, through a public notice (Minister final decision on AGBIZ appeal), that the prior EC decision to regulate "NBTs" under the "GMO" Act of 1997 would be upheld. According to the Minister, the "GMO" Act provides the appropriate framework to manage any potential risks associated with "NBTs".

The decision by the previous Minister took the local industry by surprise as it ignored the recommendations of the independent Appeal Board. South Africa has been a leader in agricultural biotechnology research and development for over 30 years, which has enabled remarkable growth

in farm productivity. This risk-disproportionate stance, one of the strictest globally, threatens further advancement of agricultural biotechnology by creating onerous barriers for the use of innovative technology like CRISPR.

(f) COEXISTENCE

Coexistence has not been an issue that has necessitated the introduction of specific guidelines or regulations in South Africa. South Africa does not currently have a national organics standard in place. The government leaves the management of the approved GE field crops to the farmers. However, seed companies in South Africa recommend farmers implement an Insect Resistance Management (IRM) strategy when planting insect resistant (Bt-technology) GE seeds. The purpose of the IRM strategy is the protection of the Bt-technology to ensure its long-term usability. According to the seed companies is the best way to prevent resistance is the planting of "refuge" areas. A "refuge" is an area planted with non-GE seed. A farmer may select one of two options to plant a "refuge", namely: (1) a 5 percent of the total area planted with non-GE seed that may not be treated with insecticides or (2) a 20 percent non-GE refuge that may be sprayed with insecticides. On-farm compliance is monitored by either an independent third party or contractors from the seed companies.

(g) LABELING AND TRACEABILITY

South Africa has had compulsory GE labelling regulations in place since 2004 when the Department of Health (DOH) introduced labelling regulations under the Foodstuffs, Cosmetics and Disinfectants Act (1972) – Regulation 25. This regulation mandates labeling of GE foods only in certain cases, including when allergens or genes with human or animal origin are present, and when a GE food product differs significantly from a non-GE equivalent in terms of their composition, nutritional value, mode of storage, preparation, or cooking. The rules also require validation of enhanced-characteristic (e.g., "more nutritious") claims for GE food products. The regulations do not address claims that products are GE-free. To date, these requirements have not been triggered for any of the GE products/foods on the South African market and as a result none of these had to be labelled – i.e., these foods are considered equivalent to their conventional counterparts.

In contrast, the Consumer Protection Act from the Department of Trade and Industry that has been in force since April 1, 2011, states that all GE goods must be labelled [Section 24(6)]:

> Any person who produces, supplies, imports, or packages any prescribed goods must display on, or in association with the packaging of those goods, a notice in the prescribed manner and form that discloses the presence of any genetically modified ingredients or components of those goods in accordance with applicable regulations.

According to the act:

- All food containing more than five percent GE ingredients, whether produced in South Africa or elsewhere, needs to carry the declaration which states, "contains at least five percent genetically modified organisms'' in a conspicuous and easily legible manner and

size.

- Those products that contain less than five percent of GE ingredients may be labeled "Genetically modified content is below five percent".
- If it is impossible or not feasible to test goods for the presence of GE traits, the product must be labeled "may contain GMO ingredients".
- Products containing less than one percent GE content – may be labeled as “does not contain genetically modified organisms”.

Regulation 25 is based on health and food safety concerns, while the Consumer Protection Act is purely value-based, hinging on the consumer’s right to information to make an informed choice or decision about food.

Draft amendments to the Act’s GE regulations were published in October 2012, in essence only changing the wording from “labelling genetically modified organisms” to “labelling genetically modified ingredients or components.” A significant implication of this change is that ingredients will have to be labelled individually as “containing GMO’s” and not the whole product.

Serious concerns were raised regarding the limitations of the Act on GE labeling by the business community in South Africa, but no further action has been taken by the Department to develop more practical guidelines. As a result, final GE labeling regulations under the Consumer Protection Act have not yet been published, precluding any required GE labeling by stakeholders in the food supply chains of South Africa.

(h) MONITORING AND TESTING

In South Africa, approved GE commodities are imported through a permit system under the “GMO” Act (1997). This system applies to living GE organisms and processed commodities. Routine inspections by authorized inspectors are allowed under the “GMO” Act to examine commodities and take samples to test if unapproved GE events are present.

(i) LOW LEVEL PRESENCE POLICY

South Africa applies a Low-Level Presence (LLP) tolerance of zero percent for imports. However, for the exports of seed and non-GE commodities the LLP threshold is less than 1 percent. Rather than testing for unapproved events, import permits are issued for the import of GE consignments, irrespective of the crop and country, provided the exporting country is not cultivating events that are not approved in South Africa.

(j) ADDITIONAL REGULATORY REQUIREMENTS

No additional seed registration is required in South Africa after GE seed is approved for general release. Seed Certification is voluntary, except for specific varieties listed in the Plant Improvement Act and on request of the breeder or owner thereof.

(k) INTELLECTUAL PROPERTY RIGHTS

Biotechnology companies operating in South Africa follow essentially the same procedure for collecting technology fees as in the United States. This policy generally works because South Africa is a signatory to the Trade-Related Aspects of International Property Rights (TRIPS) agreement of the World Trade Organization (WTO). Cotton and corn farmers buy new GE hybrid seed every year. Farmers sign a one-year licensing agreement, and the technology fee is included in the price of the bag of seed for these crops.

Intellectual property right enforcement for soybeans is more complicated. Technology developers try to collect the fee from the farmers when they deliver the harvest to the terminal. This fee can be difficult to collect because soybeans are self-pollinated, so seed need not be purchased every year. Also, farmers often use soybeans for on-farm feed so it might never enter commercial circulation. As a result, the Minister of DALRRD approved a statutory levy on soybeans in 2018, according to which seed companies can be compensated for their performance in the soybean seed market of South Africa. The seed levy is payable to the South African Cultivar and Technology Agency (SACTA) on an annual basis. SACTA was formed as a non-profit company, to guarantee that breeding and technology levies are paid to seed breeding companies and plant breeder rights holders, ensuring continuous research and cultivar development (see also Sactalevy). Levies on wheat and barley for this purpose have been collected and paid by SACTA for several years.

(l) CARTAGENA PROTOCOL RATIFICATION

South Africa has signed and ratified the Cartagena Protocol on Biosafety in 2003. As a result, revisions made in the "GMO" Amendment Act of 2006 included changes to ensure compliance with the provisions of the Cartagena Protocol.

(m) INTERNATIONAL TREATIES and FORUMS

South Africa is a signatory member of the following relevant treaties:

- The Agreement on the Application of Sanitary and Phytosanitary Measures of the World Trade Organization (WTO-SPS).
- Codex Alimentarius Commission (Codex).
- International Plant Protection Convention (IPPC) of the Food and Agricultural Organization (FAO).
- The Convention on Biological Diversity.
- International Grains Agreement.

South Africa does not actively participate in discussions related to GE plants within these international organizations.

(n) RELATED ISSUES

There are no other issues related to plant biotechnology that are not captured under the current headings.

PART C: MARKETING

(a) PUBLIC/PRIVATE OPINIONS

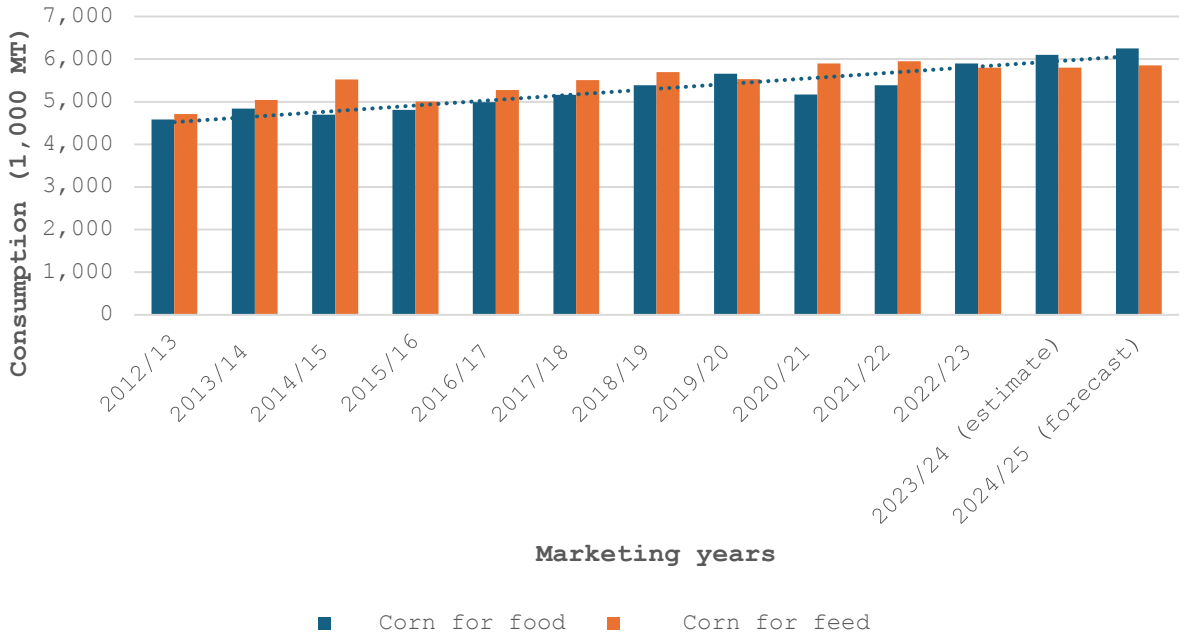
On the production side, South African farmers can be divided into two categories, commercial and small-scale/emerging farmers. GE products have a wide appeal with both groups; more than 80 percent of corn, 95 percent of soybeans, and all cotton planted within South Africa uses GE seeds. Each group appreciates that GE crops use fewer inputs and have generally higher yields. Small-scale farmers also find GE crops in terms of pest and weed management easier than traditional or conventional hybrid varieties.

Like many countries in southern Africa, South Africa consumes both white and yellow corn. White corn, in the form of a meal, is the staple food for many households as it is a relatively inexpensive source of carbohydrates. As the most important grain commodity consumed in South Africa, the annual per capita consumption of corn is estimated to be the highest at 90kg/person, followed by wheat (60kg/person) and then rice (16kg/person). On the contrary, the bulk of yellow corn is destined for the animal feed sector as the primary ingredient of most feed rations, particularly in the broiler industry. As the most important ingredient used by South Africa's animal feed manufacturers, the inclusion rate of corn is between 50 percent and 60 percent in feed rations. While white corn can also be used as animal feed depending on availability and price levels compared to yellow corn, yellow corn is not culturally acceptable for human food stuff. South Africa uses more than 12 MMT of corn on an annual basis, of which about half (mainly white corn) is used for human consumption.

Over the past 10 years, South Africa maintained an average growth rate of about two percent per annum in the consumption of corn (refer to Figure 6), driven by, among others, population growth and a continuous immigration of people into South Africa, especially from other southern African countries. Economic growth and disposable income also play a role in the consumption rate of corn. In a constrained consumer spending environment, the consumption of basic staples such as corn meal will surge while meat consumption will be under pressure restricting a growing demand for feed corn and *vice versa* when disposable income is on the rise.

Figure 6

The Consumption of Corn in South Africa

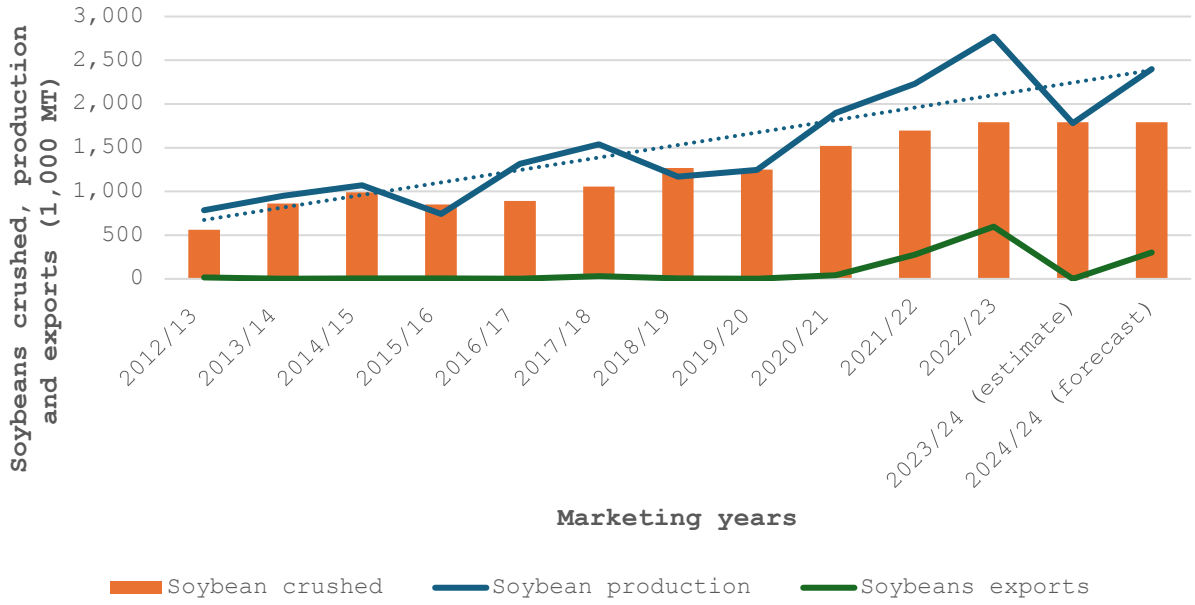


Source: FAS/Pretoria using data form the South African Grain Information Services

South Africa crushed a record 2.6 MMT of oilseeds in MY 2022/23 on higher production, which consisted mainly of soybeans (also refer to Figure 7). Soybean meal is the most important protein used by feed manufacturers in South Africa and typically represents more than 70 percent of protein meal usage in animal feed. The average inclusion rate of protein meal in feed rations is between 20 and 30 percent. The bulk of soybeans produced in South Africa are crushed to produce protein meal for inclusion in animal feed rations. On the other hand, soybean demand for food is relatively small in South Africa as it is not traditionally consumed as part of the diet.

Figure 7

Trends in Oilseeds Crushed in South Africa



Source: FAS/Pretoria using data from the South African Grain Information Services

(b) MARKET ACCEPTANCE/STUDIES

A study evaluating public perceptions of biotechnology in South Africa was released by the Human Science Research Council (HSRC) in November 2016. Post is not aware of a more recent study on biotechnology perceptions in South Africa. The results of the 2016 study clearly indicated that more than half of the South African population believe that biotechnology is good for the economy, and many are in favor of purchasing GE food. The study also indicated major shifts in the public awareness of biotechnology and attitudes that favor the purchasing of GE food from 2004 to 2015. Public familiarity with the term 'biotechnology' more than doubled during this period, from 21 percent of the population to 53 percent. Public awareness that GE foods form a part of their diet more than tripled, from 13 percent to 48 percent (for more information see Public Perceptions to Biotechnology).

CHAPTER 2: ANIMAL BIOTECHNOLOGY

PART D: PRODUCTION AND TRADE

(a) RESEARCH AND PRODUCT DEVELOPMENT

In South Africa, animal biotechnology is also regulated by the "GMO" Act of 1997 and any application for research or product development will have to be approved by the EC. Up till now no animal biotechnology product has applied for review in South Africa. However, scientists in South Africa have been involved in the cloning of animals.

South Africa's second cloned calf was born in June 2024. The calf was cloned by two South African veterinarians from a 12-year-old Chianina cow. The complex cloning process began in 2023 when a piece was clipped from the ear of the 12-year-old Chianina cow and taken to the laboratory. Stem cells were grown from it and placed in the enucleated egg cell of a slaughtered cow to develop it into an embryo for seven days in a test tube before the embryo was implanted in the recipient cow where it successfully grew. The cow was cloned due to her exceptional genetic traits as a breeding cow. The first cloned animal in South Africa was a Holstein calf that was born in 2003.

(b) COMMERCIAL PRODUCTION

There is no commercial production of GE or cloned animals in South Africa.

(c) EXPORTS

South Africa does not export products from GE or cloned animals as no commercial production is currently taking place.

(d) IMPORTS

South Africa allows the importation of products from GE animals that have been approved by South African regulators for food and feed purposes (commodity clearance). Commodity clearance means that South Africa allows the importation of these GE events for use as food and/or feed and that are not intended for environmental release. South Africa's regulators have not yet received any application for the importation of products from GE animals.

(e) TRADE BARRIERS

Not applicable

PART E: POLICY

(a) REGULATORY FRAMEWORK

As mentioned, animal biotechnology is regulated by the "GMO" Act of 1997 (see Chapter 1, Part B, sub paragraph a). On the other hand, animal cloning is not specifically regulated in South Africa,

although related regulations and Research and Development ethics guidelines are applicable, including the Animal Improvement Act and the guidelines of the National Health Research Ethics Council (NHREC).

The National Health Research Ethics Council (NHREC) is a statutory body established under the National Health Act No 61 of 2003. The Act mandates the Minister of Health to establish the Council and it sets out the NHREC's functions, which in short involves giving direction on ethical issues relating to health and to develop guidelines for the conduct of research involving humans and animals. The Council observes and advises on international developments in health ethics issues through liaison with relevant international organizations.

(b) Approvals

There are no GE animals approved for production in South Africa.

(c) INNOVATIVE BIOTECHNOLOGIES

Not applicable.

(d) LABELING AND TRACEABILITY

The mandatory labeling of GE products as stipulated in South Africa's Consumer Protection Act that came into law on April 1, 2011, is on hold. However, if implemented, GE labeling regulations under the Consumer Protection Act would apply to GE animals.

Currently, the label requirements for GE products under the Foodstuffs, Cosmetics and Disinfectant Act would apply to GE animal products only in certain cases when the product differs significantly from a non-GE equivalent.

(e) ADDITIONAL REGULATORY REQUIREMENTS

Not applicable.

(f) INTELLECTUAL PROPERTY RIGHTS

South Africa is a signatory to the Trade-Related Aspects of International Property Rights (TRIPS) agreement of the WTO; hence Intellectual Property Rights are supported by the government.

(g) INTERNATIONAL TREATIES and FORUMS

South Africa is a signatory member of the following relevant treaties and forums:

- The Agreement on the Application of Sanitary and Phytosanitary Measures of the World Trade Organization (WTO-SPS);
- Codex Alimentarius Commission (Codex)*;*
- The World Organization for Animal Health (OIE).

South Africa does not actively participate in discussions related to GE animals within these international organizations.

(h) RELATED ISSUES

Africa's first cultivated meat company, based in South Africa, has initiated the process of producing cell-cultured protein products, moving away from the traditional methods of harvesting livestock for meat. Founded in 2020, Newform Foods (previously Mzansi Meat Company) uses smart cellular agriculture technology and advanced science to create different kinds of cultivated meat and food products. Another South African company, WildBio (previously Mogale Meat) seeks to provide affordable healthy and nutritious cell cultivated meat products to a growing population through advanced biotechnologies. However, consumer acceptance, production costs and regulatory restrictions are major challenges to overcome. South Africa's current food regulations do not provide for any classification regarding lab-grown meat. Without concerted government effort to update regulations, it could take years before lab-grown meat can legally be sold in South Africa.

PART F: MARKETING

(a) PUBLIC/PRIVATE OPINIONS

Post is not aware of any research that was done to determine the public's opinion regarding livestock clones or GE animals in South Africa.

(b) MARKET ACCEPTANCE/STUDIES

Not applicable

CHAPTER 3: MICROBIAL BIOTECHNOLOGY

PART G: PRODUCTION AND TRADE

(a) COMMERCIAL PRODUCTION

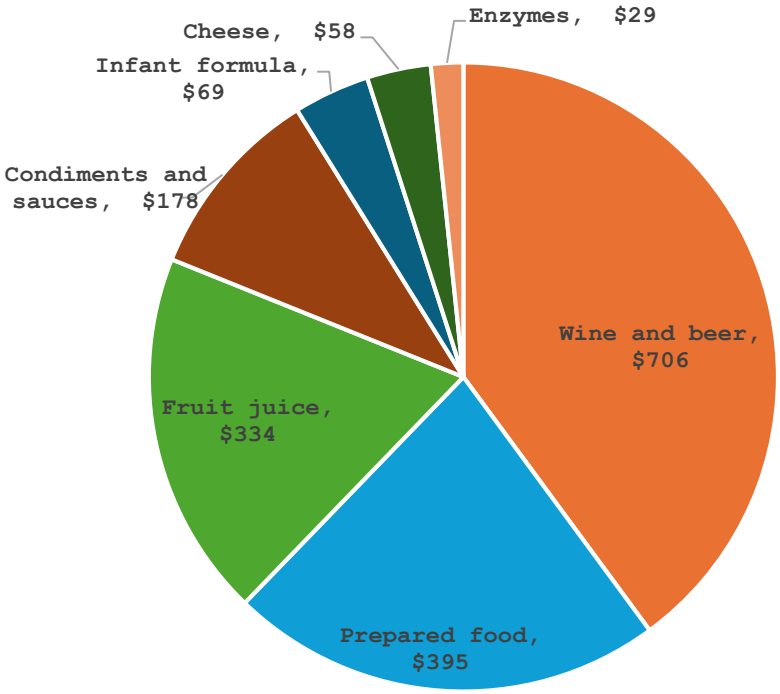
Various companies in South Africa are involved in the commercial production of food ingredients. Many of these companies use microbial biotechnology in the production process for enzymes, additives, flavorings, colorings, vitamins, and seasonings. Food ingredient manufacturers in South Africa are represented by two associations, namely, the South Africa Association of Food Science and Technology (SAAFOST) and the South Africa Association of the Flavor and Fragrance Industry (SAAFFI). Many research institutions are also involved in microbial biotechnology, such as: The Institute for Microbial Biotechnology at the University of the Western Cape (see Institute for microbial biotechnology and metagenomics); Microbial, Biochemical and Food Biotechnology Department at the University of the Free State (see Microbiology and biochemistry) and the Institute of Biomedical and Microbial Biotechnology at the Cape Peninsula University of Technology (see Research technology and innovation).

b) EXPORTS

There are no official statistics on exports of microbial biotechnology products. However, South Africa exported US$1.8 billion of processed products that might contain microbial biotech derived ingredients in 2023 (see Figure 7). Most of the trade in microbial biotech derived products are from value-added product categories, such as wine and beer, prepared food, fruit juice, and condiments and sauces. The United States represents a relatively small portion of less than 5 percent or US$84 million of South Africa's export markets of these products.

Figure 7

South Africa's Exports of Processed Products that Could Contain Microbial Biotech Derived Ingredients in 2023 (millions of USD)



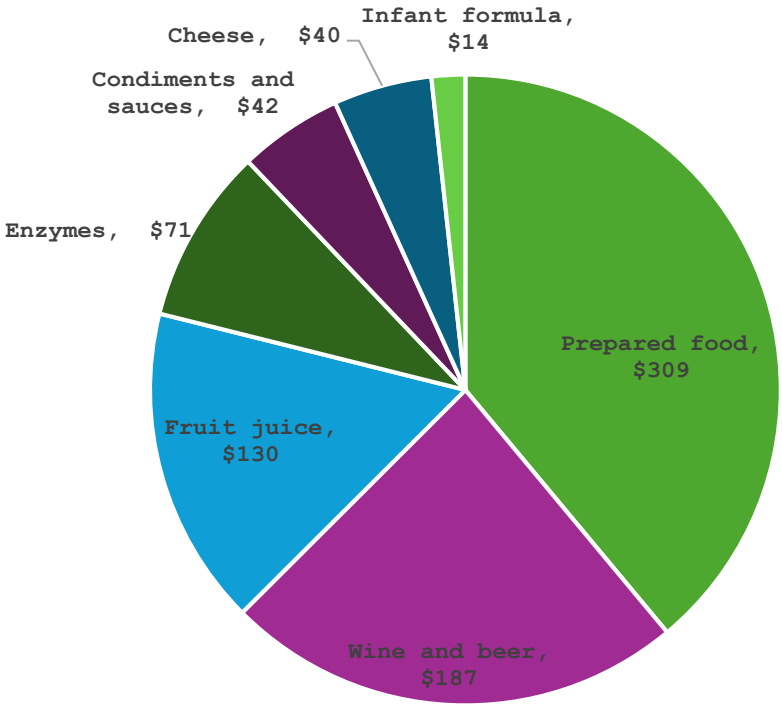
Source: FAS/Pretoria using Trade Data Monitor LLC data

c) IMPORTS

South Africa imported US$793 million worth of food ingredients, such as enzymes, or processed products that could contain microbial biotech-derived food ingredients in 2023 (see Figure 8). These imports include US$42 million of processed products, potentially containing microbial biotech-derived food ingredients from the United States. South Africa also imported US$71 million worth of microbial biotech derived enzymes in 2023, of which US$10 million were imported from the United States.

Figure 8

South Africa's Imports of Processed Products that Could Contain Microbial Biotech Derived Ingredients in 2023 (millions of USD)



Source: FAS/Pretoria using Trade Data Monitor LLC data

d) TRADE BARRIERS

Post is not aware of any specific trade barriers that hinder the trade in processed products containing microbial biotech derived ingredients.

PART H: POLICY

a) REGULATORY FRAMEWORK

South Africa has not employed a "process-based" review approach for food ingredients from microbial biotechnology sources. As a result, food ingredients from microbial biotechnology are not regulated under South Africa's "GMO" act as described in Chapter One, Part B of this report. Food ingredients, however, are regulated under the Foodstuffs, Cosmetics and Disinfectants Act no. 54 of 1972 (Foodstuffs, Cosmetics and Disinfectants Act) with specific regulations for food additives, food colorants and microbiological standards. As a result, South Africa's food additives food colorants and microbiological standards regulations are developed and administered by the Ministry of Health, under the Food Control Division. This Division also represents the Department of Health on the

Executive Council of the "GMO" Act and serves as the Codex point of contact.

Table 7 stipulates the list of applicable additives, food colorants and microbiological standards regulations in South Africa. These regulations also specify the requirements on the use of additives, including labelling requirements.

Table 7

Existing Food Additives, Food Colorant and Microbiological Standards Regulations in South Africa (with website link)

Name of regulation
Miscellaneous additives
Regulations Relating to Food Colorant
Regulations - Additives - Sweeteners - List of Permissible Sweeteners
Regulations Relating to the Use of Sweeteners in Foodstuffs (R733/201)
Codex General Standards for Food Additives
Regulations Governing Microbiological Standards for Foodstuffs and Related Matters (R692/1997)

Source: Department of Health: Food Control Division

In the absence of a regulation pertaining to a specific additive, South Africa normally adopts the General Standard for Food Additives (GSFA) of the Codex Alimentarius Commission (CAC). If an additive is not available under the South African positive list or covered by Codex, an exporter may request permission from the Department of Health to use such an additive. Notably, this may be a long process as the Department of Health may request supporting evidence that the additive is safe for consumption.

b) APPROVALS

Lists of permitted additives and colorants are included in the specific regulations as specified in Table 7.

c) LABELING AND TRACEABILITY

Labelling of GE-derived products in South Africa is regulated under the Foodstuffs, Cosmetics and Disinfectants Act (1972) – Regulation 25, and under the 2011 Consumer Protection Act. For a description of these laws, see Chapter 1, Part B, sub-paragraph g (Labeling and Traceability).

General labeling regulations for processed foodstuffs and liquor also fall under the Foodstuffs, Cosmetics and Disinfectant Act. Inspectors under the Ministry of Health at the ports of entry are responsible for ensuring compliance with labeling regulations. According to the current regulations it is not mandatory to include nutritional information tables on labels. However, should a label contain

nutritional information, it has to comply with the existing labeling regulations (also see Foodstuffs, Cosmetics, and Disinfectants Act of 1972).

d) MONITORING AND TESTING

South Africa does not actively test for evidence of genetic engineering in imports and exports of processed products.

e) ADDITIONAL REGULATORY REQUIREMENTS

Not applicable

f) INTELLECTUAL PROPERTY RIGHTS (IPR)

South Africa is a signatory to the Trade-Related Aspects of International Property Rights (TRIPS) agreement of the WTO; hence Intellectual Property Rights are supported by the government.

g) RELATED ISSUES

There are no other issues related to microbial biotechnology that are not captured under the current headings.

PART I: MARKETING

a) PUBLIC/PRIVATE OPINIONS

Post is not aware of any research that was done to determine the public's opinion regarding microbial biotech in South Africa. However, as the public, in general, is relatively uninformed about the use of microbial biotechnology, neither strongly positive nor negative opinions have been formed.

b) MARKET ACCEPTANCE/STUDIES

South Africa has a well-developed and advanced food sector, which is a key driver in the use and demand for food ingredients. See also reports done by FAS/Pretoria on the topic (for example South Africa Food Processing Ingredients). Although no studies could be found focusing on an assessment of market acceptance issues relating to the sale and use of microbial biotech derived food ingredients in South Africa, it is safe to assume it is widely accepted in the food sector.

APPENDIX

Table A1

GE plant events approved for general release in South Africa

Company	Event	Crop/product	Trait	Year approved
Bayer	MON87427	Corn	Herbicide tolerant	2023
Corteva	DP-056113-9	Corn	Pollination Control System	2023
Corteva	MON89034xTC1507xMIR162x NK603xDAS-40278-9	Corn	Insect resistant Herbicide tolerant	2023
Corteva	DAS-44406-6xDAS-81419-2	Soybean	Insect resistant Herbicide tolerant	2022
Corteva	DAS-44406-6	Soybean	Herbicide tolerant	2022
Syngenta	MIR162	Corn	Insect resistant	2022
Bayer	MON87701xMON89788	Soybeans	Insect resistant Herbicide tolerant	2021
Syngenta	BT11xMIR162xGA21	Corn	Insect resistant Herbicide tolerant	2021
Syngenta	BT11xMIR162x MON89034xGA21	Corn	Insect resistant Herbicide tolerant	2021
Bayer	MON87427xMON89034x MIR162xNK603	Corn	Insect resistant Herbicide tolerant	2020
Dow AgroSciences SA	DAS40278-9	Corn	Herbicide tolerant	2019
Dow AgroSciences SA	MON89034xTC1507xNK603xD AS40278-9	Corn	Herbicide tolerant	2019
Dow AgroSciences SA	DAS40278-9xNK603	Corn	Insect resistant Herbicide tolerant	2019
Dow AgroSciences SA	MON89034xTC1507xNK603	Corn	Insect resistant Herbicide tolerant	2018
Monsanto	MON87460	Corn	Drought tolerance	2015
Du Pont Pioneer	TC1507 x MON810 x NK603	Corn	Insect resistant Herbicide tolerant	2014
Du Pont Pioneer	TC1507 x MON810	Corn	Insect resistant Herbicide tolerant	2014

Du Pont Pioneer	TC1507	Corn	Insect resistant Herbicide tolerant	2012
Syngenta	BT11xGA21	Corn	Insect resistant Herbicide tolerant	2010
Syngenta	GA21	Corn	Herbicide tolerant	2010
Monsanto	MON89034xNK603	Corn	Insect resistant Herbicide tolerant	2010
Monsanto	MON89034	Corn	Insect resistant	2010
Monsanto	Bollgard II x RR flex (MON15985 x MON88913)	Cotton	Insect resistant Herbicide tolerant	2007
Monsanto	MON88913	Cotton	Herbicide tolerant	2007
Monsanto	MON810 x NK603	Corn	Insect resistant Herbicide tolerant	2007
Monsanto	Bollgard RR	Cotton	Insect resistant Herbicide tolerant	2005
Monsanto	Bollgard II, line 15985	Cotton	Insect resistant	2003
Syngenta	Bt11	Corn	Insect resistant	2003
Monsanto	NK603	Corn	Herbicide tolerant	2002
Monsanto	GTS40-3-2	Soybeans	Herbicide tolerant	2001
Monsanto	RR lines 1445 & 1698	Cotton	Herbicide tolerant	2000
Monsanto	Line 531/Bollgard	Cotton	Insect resistant	1997
Monsanto	MON810/Yieldgard	Corn	Insect resistant	1997

Source: DALRRD

Table A2

GE plant events approved for trial release since 2018

Company	**Event**	**Crop**	**Trait**	**Year approved**
Monsanto	MON87427xMO89034xMIR162xNK603	Corn	Insect resistant Herbicide tolerance	2018
	MON87701 x MON89788	Soybean	Insect resistant Herbicide tolerance	2018
	MON87460xMON810	Corn	Insect resistant Drought tolerance Antibiotic resistant	2019
	MON87701 x MON89788	Soybeans	Insect resistant Herbicide tolerance	2019
Bayer	GHB614 x LLCotton25	Cotton	Herbicide tolerance	2018

	MON87427 x MON89034 x MIR162 x NK603	Corn	Herbicide tolerance Insect resistant	2020
	MON87460 x MON810	Corn	Insect resistant Abiotic resistant	2020
	MON87701 x MON89788	Soybeans	Herbicide tolerance Insect resistant	2020
	MON87460xMON810	Corn	Insect resistant Drought tolerance Antibiotic resistant Abiotic tolerance	2021
Bioceres	HB4	Soybean	Herbicide tolerance Abiotic tolerance	2022
	HB4 x GTS-40-3-2	Soybean	Herbicide tolerance Abiotic tolerance	2022
Dow AgroSciences	DAS40278-9	Corn	Herbicide tolerance	2018
	NK603 x DAS40278-9	Corn	Herbicide tolerance	2018
	MON89034 x 1507 x NK603	Corn	Herbicide tolerance Insect resistant	2018
	MON89034 x 1507 x NK603 x DAS40278-9	Corn	Herbicide tolerance Insect resistant	2018
	DAS-44406-6	Soybeans	Herbicide tolerance	2020
	DAS-81419-2 x DAS-44406-	Soybeans	Herbicide tolerance Insect resistant	2020
Pioneer	DP-0561139	Corn		2019
	NK603 x T25 x DAS-40278-9	Corn	Herbicide tolerance	2020
	DP-056113-9	Corn		2020
	TC1507 x MIR162 x NK603	Corn	Herbicide tolerance Insect resistant	2020
	MON89034xTC1507xMIR162xNK603x DAS40278-9	Corn	Herbicide tolerance Insect resistant	2020
Syngenta	BT11 x MIR162 x GA21	Corn	Herbicide tolerance Insect resistant	2018
	BT11xMIR162xMON89034xGA21	Corn	Herbicide tolerance Insect resistant	2018
	BT11 x MIR162 x GA21	Corn	Herbicide tolerance Insect resistant	2019
	BT11xMIR162xMON89034xGA21	Corn	Herbicide tolerance Insect resistant	2019
	MIR162	Corn	Insect resistant	2020
	BT11xMIR162xGA21	Corn	Herbicide tolerance Insect resistant	2020

	BT11xMIR162xMON89034xGA21	Corn	Herbicide tolerance Insect resistant	2020
	MIR162	Corn	Insect resistant	2021
	BT11xMIR162xGA21	Corn	Herbicide tolerance Insect resistant	2021
	BT11xMIR162xMON89034xGA21	Corn	Herbicide tolerance Insect resistant	2021
BASF	GHB614xLLCotton25	Cotton	Herbicide tolerance	2020
	GHB614xLLCotton25	Cotton	Herbicide tolerance	2021
Sensako	HB4	Soybeans	Abiotic Resistant Herb tolerance	2020

Source: DALRRD

Table A3

GE events with commodity clearance

Company	Event	Crop	Trait	Year approved
Corteva	DP202216 x NK603 x DAS-40278-9	Corn	Enhanced grain yield, Herbicide tolerance	2023
Syngenta	3272 x Bt11 x MIR162 x GA21	Corn	Insect resistance, Herbicide tolerance	2023
Corteva	DP202216	Corn	Enhanced grain yield, Herbicide tolerance	2023
Bioceres	HB4	Soybean	Abiotic resistance, Herbicide tolerance	2022
Trigall Genetics	HB4	Wheat	Abiotic resistance, Herbicide tolerance	2022
Syngenta	3272 x Bt11 x MIR162 x MIR604 x TC1507 x 5307 x GA21	Corn	Insect resistance, Herbicide tolerance	2022
Corteva	NK603 x T25 x DAS-40278-9	Corn	Herbicide tolerance	2021
Pioneer Hi-Bred RSA (Pty) Ltd	DAS-81419-2 x DAS-44406-6	Soybean	Insect resistance, Herbicide tolerance	2021
BASF	GMB151	Soybean	Insect resistance, Herbicide tolerance	2021
BASF	GHB811	Cotton	Herbicide tolerance	2021
Pioneer Hi-Bred RSA (Pty) Ltd	MON89034 x TC1507 x MIR162 x NK603 x DAS-40278- 9	Corn	Insect resistance, Herbicide tolerance	2020
Monsanto	MON87427 x MON87419 x	Corn	Insect resistant	2020

	NK603		Herbicide tolerant	
Monsanto	MON87427 x MON89034 x MIR162 x MON87419 x NK603	Corn	Insect resistant Herbicide tolerant	2020
Monsanto	MON87427 x MON89034 x MON810 x MIR162 x MON87411 x MON87419	Corn	Insect resistant Herbicide tolerant	2020
Monsanto	MON87427 x MON89034 x MON87419 x NK603	Corn	Insect resistant Herbicide tolerant	2018
Monsanto	MON87427 x MON89034 x TC1507 x MON87411 x DAS59122-7 x MON87419	Corn	Insect resistant Herbicide tolerant	2018
Monsanto	MON87751 x MON87701 x MON87708 x MON89788	Soybeans	Insect resistant Herbicide tolerant	2018
Bayer	FG72 x A5547-127	Soybeans	Herbicide tolerant	2018
DowAgroSciences	MON89034 x TC1507 x MIR162 x NK603	Corn	Insect resistant Herbicide tolerant	2018
Syngenta	BT11 x MIR162 x MIMR604 x 5307 x GA21	Corn	Insect resistant Herbicide tolerant	2018
Monsanto	MON87705 x MON87708 x MON89788	Soybeans	Herbicide tolerant	2018
Monsanto	MON87427 x MON87460 x MON89034 x TC1507 x MON87411 x DAS-59122-7	Corn	Insect resistant Herbicide tolerant Drought tolerance	2018
Monsanto	MON87427 x MON89034 x MIR162 x MON87411	Corn	Insect resistant Herbicide tolerant	2018
Monsanto	MON87427 x MON89034 x TC1507 x MON87411 x DAS-59122-7	Corn	Insect resistant Herbicide tolerant	2018
Monsanto	MON87427 x MON87460 x MON89034 x MIR162 x NK603	Corn	Insect resistant Herbicide tolerant Drought tolerance	2018
Monsanto	MON87708 x MON89788 x A5547-127	Soybeans	Herbicide tolerant	2018
Syngenta	BT11 x MIR162 x MON89034	Corn	Insect resistant Herbicide tolerant	2018
Monsanto	MON87427 x MON89034 x MON88017	Corn	Insect resistant Herbicide tolerant	2017
Monsanto	MON89034 x MIR162	Corn	Insect resistant	2017
Syngenta	BT11 x MIR162 x MON89034 x GA21	Corn	Insect resistant Herbicide tolerant	2017
Du Pont Pioneer	DP114 x MON810 x MIR604 x NK603	Corn	Insect resistant Herbicide tolerant	2017

Monsanto	MON87705 x MON89788	Soybean	Herbicide tolerant Modified oil/fatty acid	2016
Monsanto	MON87708 x MON89788	Soybean	Herbicide tolerant	2016
Bayer	FG72	Soybean	Herbicide tolerant	2016
Bayer	A5547-127	Soybean	Herbicide tolerant	2016
DowAgroSciences	DAS68416-4 x MON89788-1	Soybean	Herbicide tolerant	2016
DowAgroSciences	DAS81419-2	Soybean	Insect resistant	2016
Syngenta SA	3272 x BT11 x MIR604 x GA21	Corn	Insect resistant Herbicide tolerant	2016
Du Pont Pioneer	TC1507 x MON810 x MIR162	Corn	Insect resistant Herbicide tolerant	2016
Syngenta SA	BT11 x TC1507 x GA21	Corn	Insect resistant Herbicide tolerant	2016
Monsanto	MON87427 x MON89034 x MIR162 x NK603	Corn	Insect resistant Herbicide tolerant	2016
Monsanto	MON87427 x MON89034 x 1507 x MON88017 x 59122	Corn	Insect resistant Herbicide tolerant	2016
Monsanto	MON87460 x NK603	Corn	Drought tolerance Herbicide tolerant	2016
Monsanto	MON87427 x MON89034 x NK603	Corn	Insect resistant Herbicide tolerant	2016
Du Pont Pioneer	TC1507 x MON810 x MIR162 x NK603	Corn	Insect resistant Herbicide tolerant	2016
Du Pont Pioneer	TC1507 x MIR604 x NK603	Corn	Insect resistant Herbicide tolerant	2016
Du Pont Pioneer	TC1507 x MON810 x MIR604 x NK603	Corn	Insect resistant Herbicide tolerant	2016
Du Pont Pioneer	TC1507 x 59122 x MON810 x NK603	Corn	Insect resistant Herbicide tolerant	2016
Du Pont Pioneer	TC1507 x 59122 x MON810 x MIR604 x NK603	Corn	Insect resistant Herbicide tolerant	2016
DowAgroSciences	DAS81910-7	Cotton	Herbicide tolerant	2016
DowAgroSciences	DAS-24236-5 x DAS-21023-5	Cotton	Insect resistant	2016
DowAgroSciences	MON89034 x TC1507 x MON88017 x DAS-59122-7 x DAS-40278-9	Corn	Insect resistant Herbicide tolerant	2016
DowAgroSciences	MON89034 x TC1507 x NK603 x DAS-40278-9	Corn	Insect resistant Herbicide tolerant	2016
Syngenta	3272 x BT11 x MIR604 x TC1507 x 5307 x GA21	Corn	Insect resistant Herbicide tolerant	2016
Du Pont Pioneer	DP4114	Corn	Insect resistant Herbicide tolerant	2016

Monsanto	NK603 x T25	Corn	Herbicide tolerant	2016
Syngenta	MZHG0JG	Corn	Herbicide tolerant	2016
Du Pont Pioneer	DP73496	Canola	Herbicide tolerant	2016
Monsanto	MON87460 x MON89034 x NK603	Corn	Drought tolerance Insect resistant Herbicide tolerant	2015
Syngenta	BT11 x MIR162	Corn	Insect resistant Herbicide tolerant	2015
Monsanto	MON87460 x MON89034 x MON88017	Corn	Abiotic resistance Insect resistant Herbicide tolerant	2015
Syngenta	GA21 x T25	Corn	Herbicide tolerant	2015
Syngenta	SYHT0H2	Soybean	Herbicide tolerant	2014
Syngenta	BT11 x 59122 x MIR604 x TC1507 x GA21	Corn	Insect resistant Herbicide tolerant	2014
Syngenta	BT11 x MIR604 x TC1507 x 5307 x GA21	Corn	Insect resistant Herbicide tolerant	2014
Syngenta	BT11 x MIR162 x MIR604 x TC1507 x 5307 x GA21	Corn	Insect resistant Herbicide tolerant	2014
Syngenta	MIR162	Corn	Insect resistant	2014
Monsanto	MON89034 x MON88017	Corn	Insect resistant Herbicide tolerant	2014
Monsanto	MON87701 x MON89788	Soybeans	Insect resistant Herbicide tolerant	2013
Monsanto	MON89788	Soybeans	Herbicide tolerant	2013
DowAgrowScience	DAS-44406-6	Soybeans	Herbicide tolerant	2013
DowAgrowScience	DAS-40278-9	Corn	Herbicide tolerant	2012
BASF	CV127	Soybeans	Herbicide tolerant	2012
DowAgrowScience/ Monsanto	MON89034 x TC1507 x NK603	Corn	Insect resistant Herbicide tolerant	2012
Syngenta	MIR604	Corn	Insect resistant	2011
Syngenta	BT11 x GA21	Corn	Insect resistant Herbicide tolerant	2011
Syngenta	BT11 x MIR604	Corn	Insect resistant Herbicide tolerant	2011
Syngenta	MIR604 x GA21	Corn	Insect resistant Herbicide tolerant	2011
Syngenta	BT11 x MIR604 x GA21	Corn	Insect resistant Herbicide tolerant	2011
Syngenta	BT11 x MIR162 x MIR604 x GA21	Corn	Insect resistant Herbicide tolerant	2011
Syngenta	BT11 x MIR162 x GA21	Corn	Insect resistant Herbicide tolerant	2011
Syngenta	BT11 x MIR162 x TC1507 x	Corn	Insect resistant	2011

	GA21		Herbicide tolerant	
Pioneer	TC1507 x NK603	Corn	Insect resistant Herbicide tolerant	2011
Pioneer	59122	Corn	Insect resistant	2011
Pioneer	NK603 x 59122	Corn	Insect resistant Herbicide tolerant	2011
Pioneer	356043	Soybean	Herbicide tolerant	2011
Pioneer	305423	Soybean	Higher oleic acid content Herbicide tolerant	2011
Pioneer	305423 x 40-3-2	Soybean	Higher oleic acid content Herbicide tolerant	2011
DowAgroScience	TC1507 x 59122	Corn	Insect resistant Herbicide tolerant	2011
DowAgroScience	TC1507 x 59122 x NK603	Corn	Insect resistant Herbicide tolerant	2011
Bayer	LLRice62	Rice	Herbicide tolerant	2011
Bayer	LLCotton25	Cotton	Herbicide tolerant	2011
Monsanto	MON863	Corn	Insect resistant	2011
Monsanto	MON863 x MON810	Corn	Insect resistant	2011
Monsanto	MON863 x MON810 x NK603	Corn	Insect resistant Herbicide tolerant	2011
Monsanto	MON88017	Corn	Insect resistant	2011
Monsanto	MON88017 x MON810	Corn	Insect resistant	2011
DowAgroScience & Monsanto	MON89034 x TC1507 x MON88017 x 59122	Corn	Insect resistant Herbicide tolerant	2011
Monsanto	MON810 x NK603	Corn	Insect resistant Herbicide tolerant	2004
Monsanto	MON810 x GA21	Corn	Insect resistant Herbicide tolerant	2003
Pioneer Hi-Bred	TC1507	Corn	Insect resistant Herbicide tolerant	2002
Monsanto	NK603	Corn	Herbicide tolerant	2002
Monsanto	GA21	Corn	Herbicide tolerant	2002
Syngenta	Bt11	Corn	Insect resistant	2002
AgrEvo	T25	Corn	Herbicide tolerant	2001
Syngenta	Bt176	Corn	Insect resistant	2001
AgrEvo	Topas 19/2, Ms1Rf1, Ms1Rf2, Ms8Rf3	Oilseed rape	Herbicide tolerant	2001
AgrEvo	A2704-12	Soybean	Herbicide tolerant	2001

Source: DALRRD

Attachments:

No Attachments