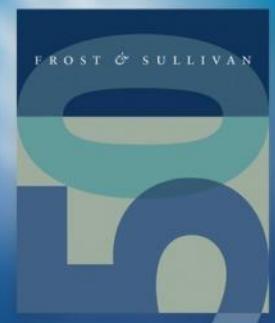


Overview of the Maize and Sugar Cane Markets in South Africa and Other Selected African Countries

African GM Crop Cultivation Remains Limited in the Short to Medium Terms

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Executive Summary



Executive Summary

- Maize is the largest cereal crop in Africa contributing 41.3% to an overall production of 167.1 million tonnes in 2012/2013.
- The top 5 maize-producing countries (South Africa, Nigeria, Egypt, Ethiopia, and Tanzania) contributed 57.5% to the total maize crop (69.1 million tonnes) in 2012/2013.
- South Africa and Egypt were the only two African countries cultivating genetically modified (GM) maize until 2013/2014, when Egypt halted GM maize production pending a government review. Nigeria is expected to join South Africa in cultivating GM maize by 2015.
- GM field trials for crops such as maize, bananas, sweet potato, cotton, and cowpeas are underway in Nigeria, Ghana, Cameroon, Kenya, Uganda, Malawi, and Egypt.
- Challenges in the African maize market include pre- and post-harvest losses, limited access to markets, reliance on rainfall to cultivate crops, droughts and floods, and fluctuating prices.
- Opportunities within the African maize market include:
 - Greater agricultural inputs, such as fertilisers and pesticides, as well as improved farming methods to raise the low maize yields experienced in Nigeria and Tanzania.
 - Innovative grain storage designs to assist in bridging the time period between maize harvests and food deficits.
 - Commercial maize flour mills in Ethiopia.

Source: Frost & Sullivan

Executive Summary (continued)

- Sugar cane is the second largest crop in Africa with a production of 94.5 million tonnes in 2012/2013. The top 2 sugar cane-producing countries (South Africa and Egypt) contributed 35.7% to this total in 2012/2013.
- Neither South Africa nor Egypt cultivates GM sugarcane. Indonesia became the first country to approve the planting of GM sugar cane in 2013 for commercial cultivation in 2014. South Africa will probably follow suit should a locally developed option become available.
- Export profitability remains problematic for South Africa—a sugar exporting nation. Overproduction as a result of sugar subsidies significantly reduces the global sugar price. In addition, preferential trade agreements and high import tariffs further reduce profitability.
- Egypt is a net importing country, with the sugar deficit growing annually. The Egyptian government would like sugar consumption per capita to be reduced from 34kg to 25kg to curb this demand. Emphasis is placed on developing sugar beet, not sugar cane.
- Opportunities within the African sugar cane market include:
 - Cross-country collaborations at a sugar research institute level to assist Egypt in developing sugar cane with a higher sucrose content.
 - The use of sugar cane to develop biofuels (ethanol) to reduce the dependence on crude oil.

Source: Frost & Sullivan

Market Overview



Introduction and Scope

This market insight provides an overview of maize and sugar cane production and agro-processing in selected African countries. The current and potential future expansion of GM crops in Africa has also been provided.

Application scope

The 2 crops analysed in this market insight are maize, the largest cereal crop grown in Africa, and sugar cane, the second largest crop grown in Africa.

Geographic scope

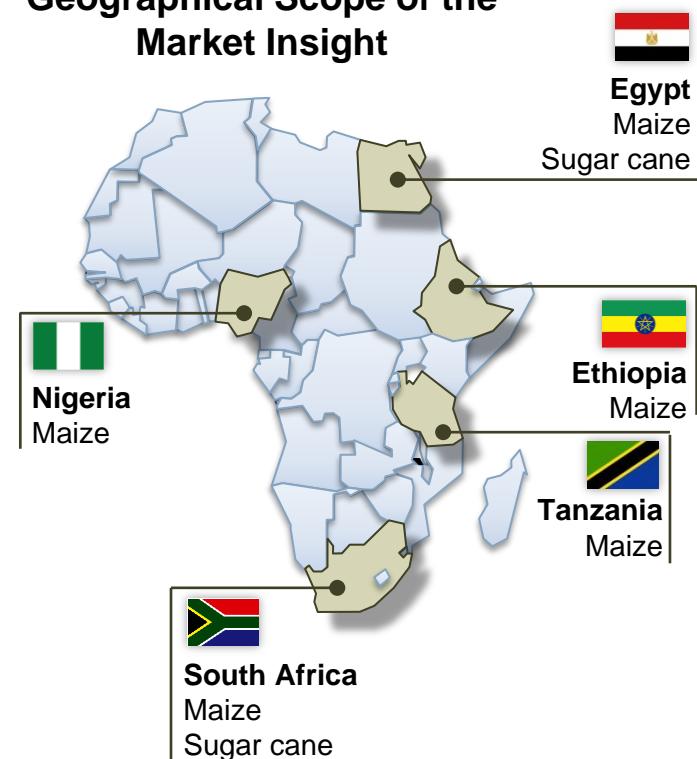
- Maize: South Africa, Nigeria, Egypt, Ethiopia, and Tanzania.
- Sugar cane: South Africa and Egypt.

Objectives of the study

The main objectives are to:

- Provide a historical account of revenue, volume, prices, yield, and area harvested.
- Supply trading data as well as important trading partners.
- Outline the agro-processing flow from farm to fork.
- Indicate important processors and provide one company profile per country.
- Highlight the use or potential use of GM crops.

Geographical Scope of the Market Insight



The base year of the study is the 2013/2014 agricultural financial year for countries and crops within scope

Source: FAO Statistics Division; Frost & Sullivan

Research Definitions

Cereal Crop

- Cereal crops are gramineous plants, related to grasses, and include barley, buckwheat, canary seed, fonio, maize, millet, mixed grain, oats, quinoa, rice, rye, sorghum, triticale, and wheat.
- Cereal crops differ from fodder crops, as the former are harvested for dry grain, while the latter are harvested green.

Marketing Season: Maize

- Maize statistics are provided according to the production year or the marketing year (financial years)—neither of which are calendar years. Most data sources, such as the South African Grain Information Service (SAGIS) and USDA Foreign Agricultural Service, provide information according to the marketing year. As such, the marketing year has been used in this market insight.
- To clarify, in South Africa, the Department of Agriculture, Forestry, and Fisheries (DAFF) indicates that the 2011/2012 production year translates into the 2012/2013 marketing year.
- The respective marketing year for the 5 countries within scope are:
 - South Africa: 1 March to 28 February
 - Nigeria: 1 October to 30 September
 - Egypt: 1 July to 30 June
 - Ethiopia: 1 October to 30 September
 - Tanzania: 1 July to 30 June

Source: FAO GIEWS (Global Information and Early Warning System); SAGIS; USDA Foreign Agricultural Service; Frost & Sullivan

Research Definitions (continued)

Production Season: Sugar

- Sugar statistics are provided according to the production season (financial year), not a calendar year. The production season for the 2 countries within scope are:
 - South Africa: 1 April to 31 March
 - Egypt: 1 October to 30 September

Raw Centrifugal Sugar

- Raw centrifugal sugar is produced in a sugar mill and refers to sugar crystals that have been extracted from sugar cane or sugar beet using a centrifuge, and contains 96% to 98% sucrose. The crystals are brown in colour and require further processing in a refinery to produce white sugar.

Source: Frost & Sullivan

Overview of Maize in Africa



Maize is the Largest Cereal Crop in Africa

In the 2012/2013 marketing year, 69.1 million tonnes of maize were produced in Africa, contributing 7.9% to the global maize production of 874.7 million tonnes. Net imports of maize in Africa range from 10 million to 12 million tonnes per year.

Maize is the largest cereal crop in Africa contributing 41.3% to Africa's cereal crop production. Maize was followed by rice (27.3 million tonnes) and wheat (24.1 million tonnes) in the 2012/2013 production year with these 3 crops contributing 72.1% to African cereal crops.

In 2012/2013, maize revenue was estimated to be \$22.60 billion, showing a 12.3% annual growth over \$20.13 billion in 2011/2012. The revenue CAGR over the 2007/2008 to 2012/2013 period was 18.2%. This growth rate is mostly attributed to a sharp increase in maize volume of 10.8 million tonnes and a price increase of \$62 a tonne in 2008/2009. South Africa accounted for 51.5% of the volume increase, as the country recovered from 2 years of poor harvests.

*Cereal Crops: Volume, Africa, 2004/2005–2012/2013

African Cereal Crops (Marketing Year)	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013
Maize ('000 Tonnes)	47,388	49,711	49,198	48,128	58,954	59,903	64,638	65,748	69,070
Rice ('000 Tonnes)	19,035	20,289	22,016	21,015	24,356	23,527	25,914	26,062	27,269
Wheat ('000 Tonnes)	21,995	20,896	24,623	18,874	19,682	25,589	21,666	25,012	24,074
Other ¹ ('000 Tonnes)	44,239	50,269	52,761	51,192	52,867	50,051	50,673	47,070	46,680
Total ('000 Tonnes)	132,657	141,165	148,599	139,209	155,858	159,071	162,890	163,891	167,092

*Data for this exhibit has not been provided for 2013/2014

¹ Other includes sorghum, millet, barley, fonio, oats, rye, triticale, buckwheat, and other cereals

Source: FAO Statistics Division; Frost & Sullivan

Maize Production—Top 5 African Countries

The data in the exhibit below has been averaged over the marketing period 2010/2011 to 2012/2013 in order to reduce fluctuations caused by weather conditions and poor crop harvests. Over this time period, South Africa, Nigeria, Egypt, Ethiopia, and Tanzania contributed 56.0% to the total African maize production, while the top 10 (which includes Malawi, Kenya, Zambia, Uganda, and Ghana) contributed 77.5%.

It is interesting to note the differences in maize yield between these countries. The yield, which is measured in hectograms per hectare (Hg/Ha), takes into account production as well as the area harvested. Countries such as Egypt and South Africa make relatively good use of their available land, while countries such as Nigeria and Tanzania do not. Such variations are largely attributed to differences in farming inputs and technologies used. Smallholder farmers rely on rainfall for this staple crop, with traditional seed varieties incurring low yields. Adverse weather conditions further impact the yields of this type of farming.

Maize Market: Top 5 Maize-producing Countries, Africa, 2010/2011–2012/2013

Country	Average Production ('000 Tonnes)	African Ranking	Global Ranking	Average Value (\$ Million)	Average Maize Yield in Hg/Ha	Average Price (\$)
South Africa ¹	11,765	1	10	2,287	38,033	196 *
Nigeria	8,756	2	14	3,084	17,292	350 **
Egypt ²	6,973	3	15	2,777	81,147	400 *
Ethiopia	4,984	4	20	1,306	25,846	255 **
Tanzania	4,726	5	24	1,238	13,704	260 **

¹ SAGIS and DAFF data have been used for South Africa, not FAO data.

² Value and price excludes 2012/2013 data, as price for this year is unknown

* Producer prices

** Wholesaler prices

Source: FAO Statistics Division; South African Grain Information Service (SAGIS); South African Department of Agriculture, Forestry, and Fisheries (DAFF); Frost & Sullivan

Use of Agricultural Inputs

Although the data in the exhibit below is not specific to maize production, it correlates to the maize yield incurred in each country, as shown on the previous slide. Both Nigeria and Tanzania have comparatively low maize yields and only use small volumes of fertilisers compared to the other 3 countries within scope. Their fertiliser consumption is also below the average of sub-Saharan Africa, to which these 2 countries belong.

Agricultural Use of Fertiliser in Selected African Countries, 2004/2005–2013/2014

Fertiliser use (kg/ha of arable land)	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013 / 2014
South Africa	60.3	47.3	62.3	61.0	56.3	55.8	53.2	54.0	n/a	n/a
Nigeria	4.8	7.4	10.0	4.1	5.7	5.0	5.7	4.2	n/a	n/a
Egypt	557.6	672.9	492.1	521.8	696.6	502.8	605.1	587.5	n/a	n/a
Ethiopia	11.7	11.3	11.5	16.8	16.7	18.1	22.8	21.7	n/a	n/a
Tanzania	5.3	5.8	5.4	5.1	4.7	7.5	6.6	8.7	n/a	n/a
Sub-Saharan Africa	13.1	11.1	13.1	12.6	12.1	11.8	12.9	13.2	n/a	n/a

Comparative statistics on the number of tractors used per thousand hectares of arable and permanent cropland show that Ethiopia (0.3 tractors) and Nigeria (1 tractor) lag behind countries such as South Africa (4.6 tractors) and Egypt (26.1 tractors) in terms of mechanisation of farming activities.

n/a data is not available from FAO

Source: FAO Statistics Division; Nation Master; Frost & Sullivan

Maize Prices

There are various factors that impact the final price of domestic maize in the 5 countries within scope. Generally, these include:

- Chicago Board of Trade (CBOT) Gulf prices per tonne of Number 3 yellow maize, measured in US dollars; alternatively the South African Johannesburg Stock Exchange SAFEX commodity prices can be used considering East Africa mostly trades white maize;
- Storing and transportation costs;
- Fertiliser and pesticide prices, amongst other input requirements;
- Exchange rates; and
- Import tariffs.

In countries such as Ethiopia and Tanzania, in addition to local traders, the government (via a food agency) buys and sells maize at a set price, which can be pegged above or below the international price depending on the state of food security in the respective country. Maize prices are lower in surplus maize-producing regions within a particular country than in other areas that don't produce maize or run a consumption deficit. For example, the Ministry of Industry and Trade in Tanzania maintains a record of maize wholesale prices in 22 different markets, each charging a different maize price. As such, prices fluctuate within 1 country depending on the supply and demand for maize.

Source: Monitoring African Food and Agriculture Policies: Analysis of Incentives and Disincentives for Maize in the United Republic of Tanzania (October 2012); Frost & Sullivan

Maize in South Africa



Maize in South Africa



South Africa is the largest maize producer in Africa, contributing 17.5% to the continent's total maize production and 1.4% to global production in 2012/2013 in volume. Maize is by far the largest cereal crop in South Africa, followed by wheat (1.9 million tonnes in 2012/2013).

Generally, white maize accounts for 60% of the total volume produced in South Africa. However, this dropped to 47.6% in the 2013/2014 season due to the lack of rainfall in white maize-producing areas.

Maize Market: Production, South Africa, 2004/2005–2013/2014

Marketing Year	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013/2014 *
Production ('000 Tonnes)	9,482	11,450	6,618	7,125	12,700	12,050	12,815	10,360	12,121	11,690
Value (USD Million)	1,229.8	1,135.8	965.6	1,467.0	2,560.3	1,882.2	1,760.8	2,196.3	2,904.8	3,002.7
Price** (USD per Tonne)	130	99	146	206	202	156	137	212	240	257
Area Harvested ('000 ha)	3,204	3,223	2,032	2,552	2,799	2,428	2,742	2,372	3,250	2,781
Yield (hg/ha)	29,593	35,526	32,562	27,921	45,373	49,640	46,736	43,671	37,294	42,035

Note: Figures are rounded

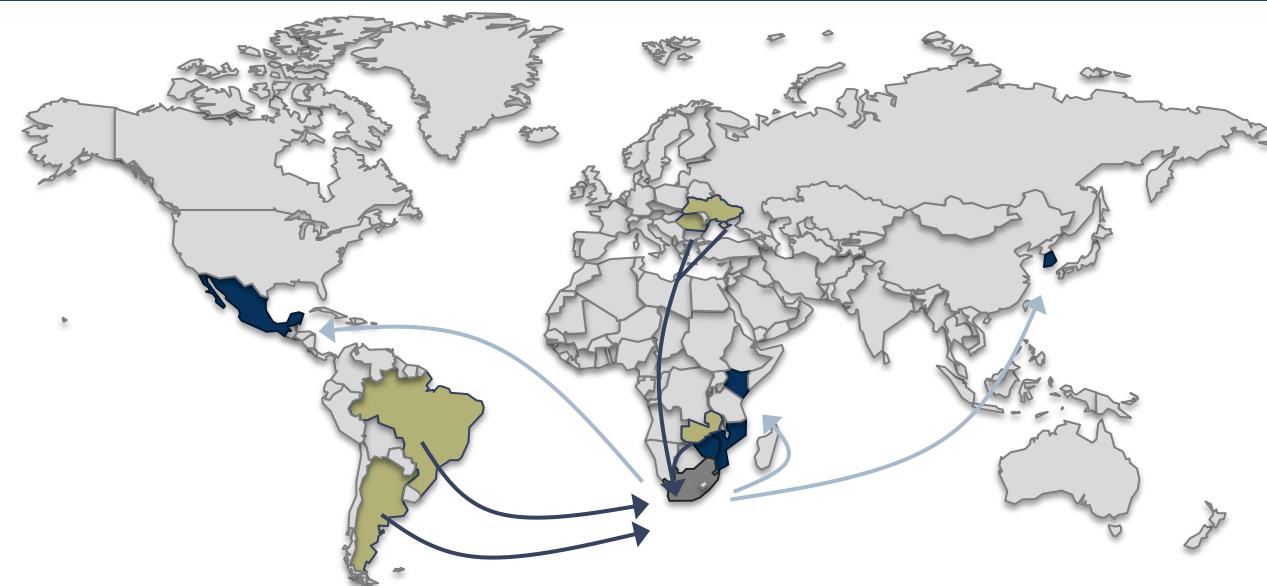
SAGIS, NAMC, and DAFF statistics have been used and differ slightly from that of FAO.

* Data for 2013/2014 are estimates and not official values

** Producer prices

Sources: FAO Statistics Division; International Trade Centre; South African Department of Agriculture, Forestry, and Fisheries; South African Grain Information Service (SAGIS); Frost & Sullivan

South African Trading Partners



Maize Market: Trade, South Africa, 2004/2005–2013/2014

Maize Trade (Marketing Year)	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013 / 2014*
Net Exports ('000 Tonnes)	613	1,877	(334)	(586)	2,242	1,769	2,194	2,154	1,935	2,118
Exports ('000 Tonnes)	832	2,237	597	534	2,269	1,796	2,194	2,575	1,946	2,218
White Maize Exports (%)	85.6	82.4	80.4	80.7	86.6	82.2	51.3	69.7	75.4	44.2
Imports ('000 Tonnes)	219	360	931	1,120	27	27	0	421	11	100
Yellow Maize Imports (%)	100.0	100.0	99.9	95.9	100.0	100.0	-	68.4	0.0	100.0

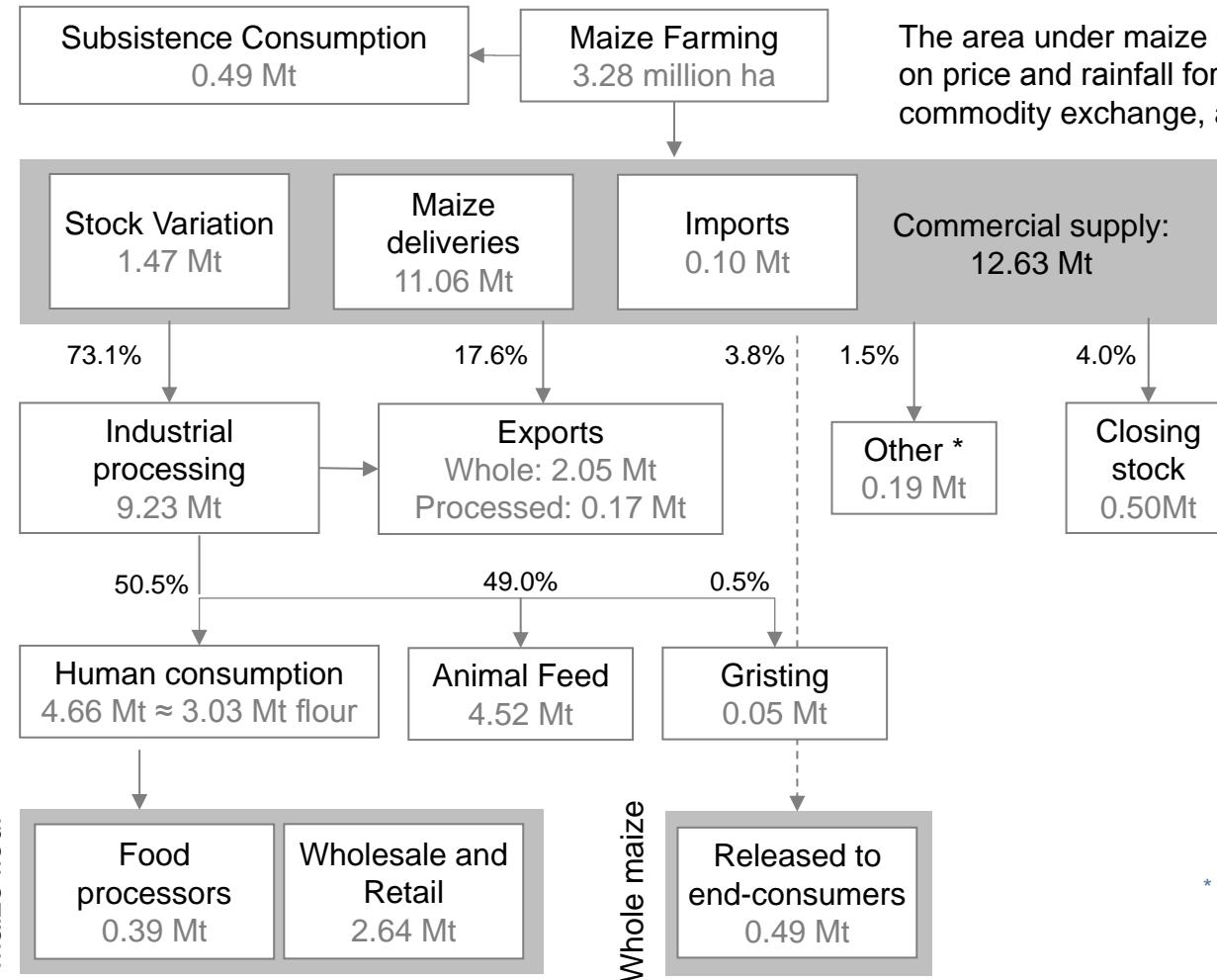
Note: Figures are rounded

* Data for 2013/2014 are estimates and not official values

Source: South African Grain Information Service (SAGIS); Frost & Sullivan

Maize Agro-Processing—South Africa

Maize Agro-Processing: Value Chain, South Africa, 2013/2014



The area under maize crop varies from year to year depending on price and rainfall forecasts. However, SAFEX, South Africa's commodity exchange, allows farmers to hedge production.

Consumption of maize as a vegetable rather than flour is very small – most of it is processed into maize flour

Some maize is further processed by the brewing industry, by food processors manufacturing snacks and cereals and for the production of starches

* Other includes grain withdrawn by producers and waste.

Note: Figures are rounded
Million tonnes (Mt)

Source: South African Grain Information Service (SAGIS); Frost & Sullivan

Major Flour Processors—South Africa



Pioneer Food Group Limited

Description	Diversified food manufacturing company
Up/Downstream	Both
Origin	Formed in 1997 from two agricultural cooperatives
Employees	>11,000
Product Scope	Flour milling, Pasta and noodles Beverages, Baking Animal Feed, Grain Storage
Main Brands	Bokomo, Sasko
Operations / Market	Botswana, Namibia, Zambia, Uganda
Revenues	\$1.84 billion to September 2013
Production Assets	10 flour mills, bakeries, processing plants, distribution depots
Ownership	South African Listed on the JSE
Head office	Paarl, Western Cape

Note: Outlines approximate

Source: Company websites; DAFF; Frost & Sullivan

Maize in Nigeria



Maize in Nigeria



Nigeria is the second largest maize producer in Africa, contributing 13.6% to the continent's total maize production and 1.1% to global production in 2012/2013 in volume. In the 2010/2011 marketing year, maize overtook sorghum and millet to become the largest cereal crop in Nigeria. However, floods in the latter half of 2012 resulted in a decrease in the 2013/2014 maize crop (2012/2013 production).

Maize Market: Production, Nigeria, 2004/2005–2013/2014

Marketing Year	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013/2014 *
Production ('000 Tonnes)	5,567	5,957	7,100	6,724	7,525	7,358	7,677	9,180	9,410	7,700
Value (USD Million)	1,997.2	2,550.4	1,680.6	1,560.5	3,690.2	2,711.5	2,486.7	3,216.8	3,549.1	3,230.4
Price (USD per Tonne)	359	428	237	232	490	369	324	350	377	420
Area Harvested ('000 ha)	3,479	3,589	3,905	3,944	3,845	3,351	4,149	6,008	5,200	4,250
Yield (hg/ha)	16,002	16,598	18,182	17,049	19,571	21,961	18,502	15,279	18,096	18,118

Note: Figures are rounded

* Data for 2013/2014 are estimates and not official values

Sources: FAO Statistics Division; International Trade Centre; USDA Foreign Agricultural Service; Frost & Sullivan

Nigerian Trading Partners

Maize Market: Trade, Nigeria, 2004/2005–2013/2014

Maize Trade (Marketing Year)	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013 / 2014 *
Net Imports (‘000 Tonnes)	0	15	6	(10)	(1)	0	1	1	75	0
Exports ('000 Tonnes)	0	2	4	10	1	0	0	0	27	100
Imports ('000 Tonnes)	0	18	10	1	0	0	1	1	102	100

Despite the removal of an import ban on maize by the Nigerian government in 2008, traders are reluctant to import large quantities in case customs officials prevent its thoroughfare to support local maize producers. Unofficially, the import ban status is questionable. Informal trade across the Nigerian border for both imports and exports continues.

The recent increase in imports is due to local maize shortages, which has led poultry producers to import the shortfall or revert to using wheat. However, the latter has been reduced as the government raised import tariffs on wheat.

In terms of recent trading partners, mirror data from the International Trade Centre shows that Nigeria exported maize almost exclusively to Niger, and imported maize from Brazil, the US, and Argentina during 2008 to 2012.

Significant Maize Importers (2008-2012)

- 1. Niger

Significant Maize Exporters (2008-2012)

- 1. Brazil
- 2. US
- 3. Argentina

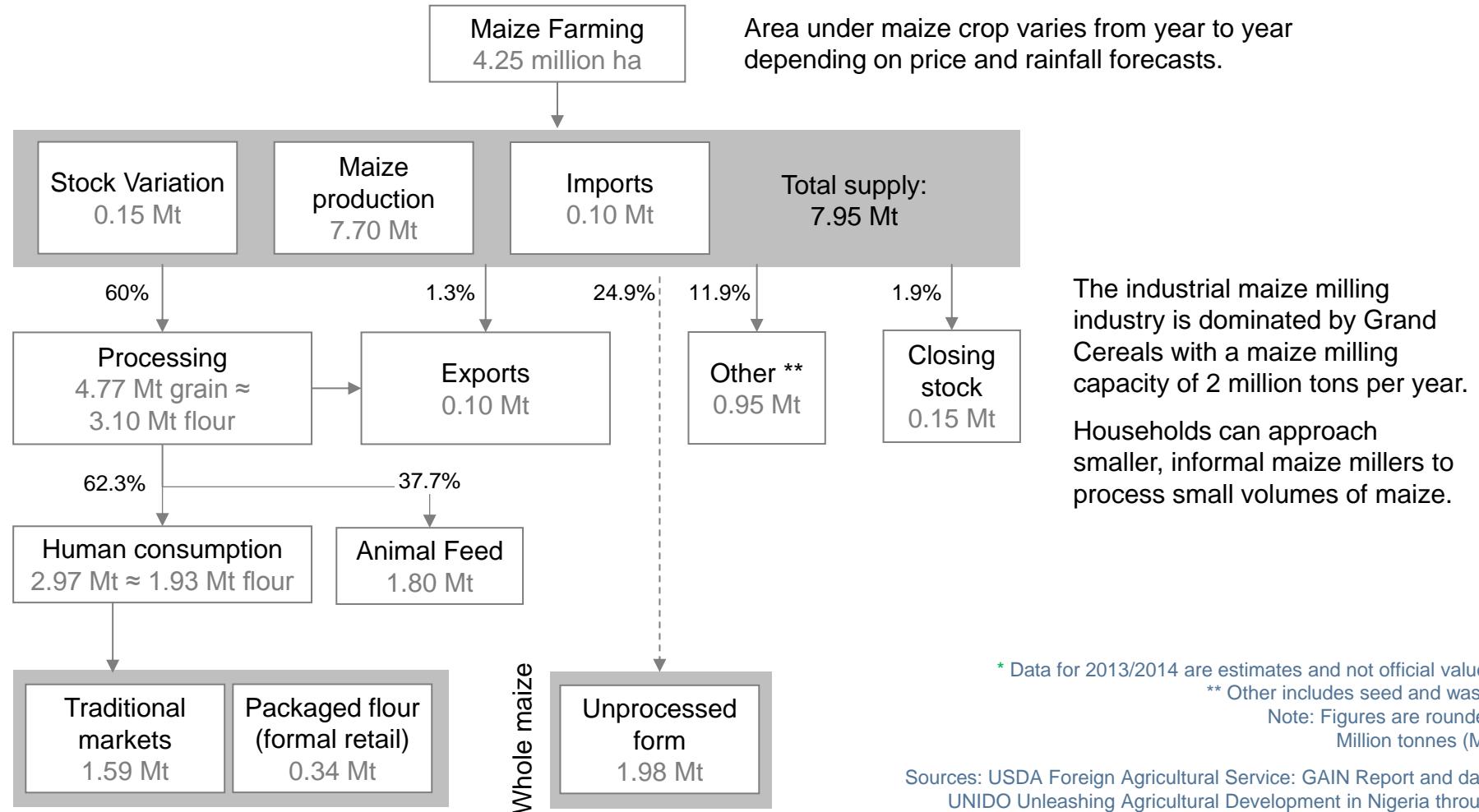
Note: Figures are rounded

* Data for 2013/2014 are estimates and not official values

Sources: FAO Statistics Division; International Trade Centre; USDA Foreign Agricultural Service: GAIN Report; Frost & Sullivan

Maize Agro-Processing—Nigeria

Maize Agro-Processing: Value Chain, Nigeria, 2013/2014*



Major Flour Processors—Nigeria



● Grand Cereals

Maize 1 mill

Grand Cereals Limited

Description	Integrated food manufacturing company
Up/Downstream	Both
Origin	Formed in 1983; UAC of Nigeria PLC acquired a major stake in the company in 1997
Employees	unknown
Product Scope	Cereals, vegetable oil, animal feed
Main Brands	Cereals: Grand Maize Flour, Grandvita, Richfil, Grand Brabusco
Operations/Market	Nigeria (all states)
Revenue	\$432 million (UAC of Nigeria PLC)
Production Assets	1 cereal (maize) mill, 1 oil mill, 1 animal feed plant, silos (16,000 tonnes)
Ownership	Nigerian (UAC of Nigeria PLC)
Head office	Jos South, Plateau State

Note: Outlines approximate

Sources: Company websites; USDA Foreign Agricultural Service; IITA; Frost & Sullivan

Maize in Egypt



Maize in Egypt



Egypt is the third largest maize producer in Africa, contributing 10.1% to the continent's total maize production and 0.8% to global production in 2012/2013 in volume.

Maize is the second largest cereal crop in Egypt, after wheat (8.8 million tonnes) and only marginally ahead of rice (6.5 million tonnes) in the 2012/2013 marketing year. On average, 20% of the crop is yellow maize and 80% is white maize.

Maize Market: Production, Egypt, 2004/2005-2013/2014

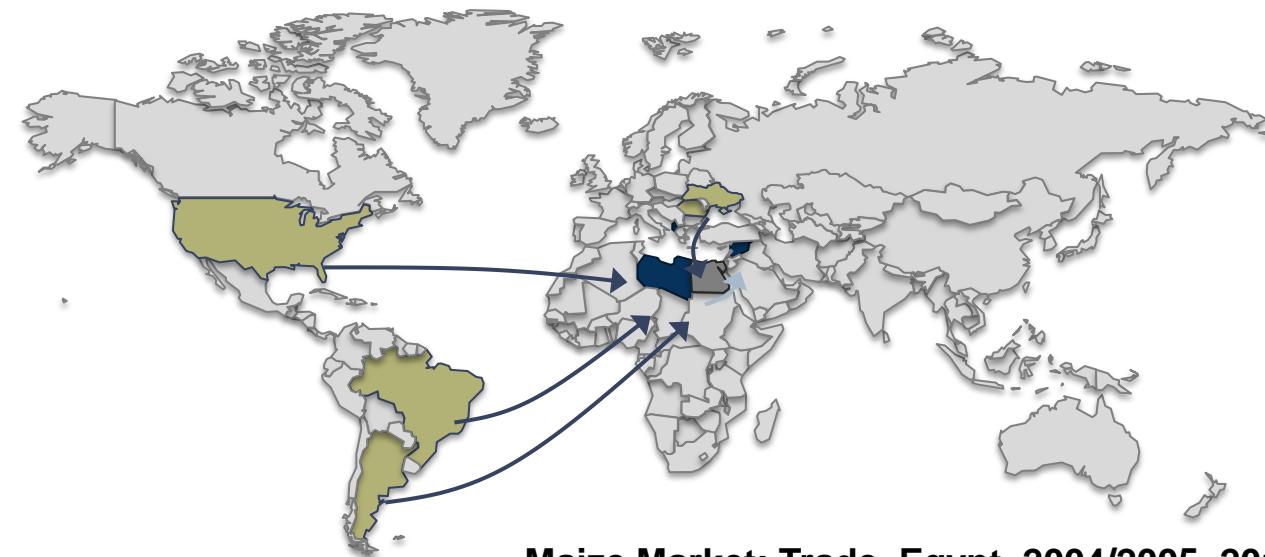
Marketing Year	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013/2014 *
Production ('000 Tonnes)	6,236	7,085	6,374	6,243	7,401	7,686	7,041	6,876	7,000	6,500
Value (USD Million)	1,042.7	1,269.7	1,199.6	1,753.7	1,925.8	1,932.3	2,362.3	3,192.0	3,303.8	3,023.9
Price (USD per Tonne)	167	179	188	281	260	251	336	464	472	465
Area Harvested ('000 ha)	789	868	762	776	936	983	969	888	750	825
Yield (hg/ha)	79,087	81,607	83,705	80,463	79,053	78,184	72,700	77,409	93,333	78,788

Note: Figures are rounded

* Data for 2013/2014 are estimates and not official values

Source: FAO Statistics Division; GIEWS (FAO data); International Trade Centre; USDA Foreign Agricultural Service; Frost & Sullivan

Egyptian Trading Partners



Top 3 Maize Importers, 2008–2012

1. Syrian Arab Republic
2. Albania
3. Libya

Top 5 Maize Exporters, 2008–2012

1. US
2. Ukraine
3. Argentina
4. Brazil
5. Romania

Maize Market: Trade, Egypt, 2004/2005–2013/2014

Maize Trade (Marketing Year)	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013/ 2014 *
Net Imports ('000 Tonnes)	2,428	5,091	3,765	5,258	3,978	5,396	6,161	7,046	6,057	4,390
Exports	2	4	5	5	2	20	9	2	4	10
Imports	2,429	5,095	3,769	5,263	3,980	5,416	6,170	7,048	6,062	4,400

Imports for 2013 have been negatively affected by the decrease in foreign currency reserves, US dollars, as well as the negative impact of avian influenza on the demand for maize by the local poultry industry. In addition, imports from the US temporarily decreased as a result of the 2012 drought and which resulted in higher prices. This deficit was supplied by Ukraine, Argentina, and Brazil.

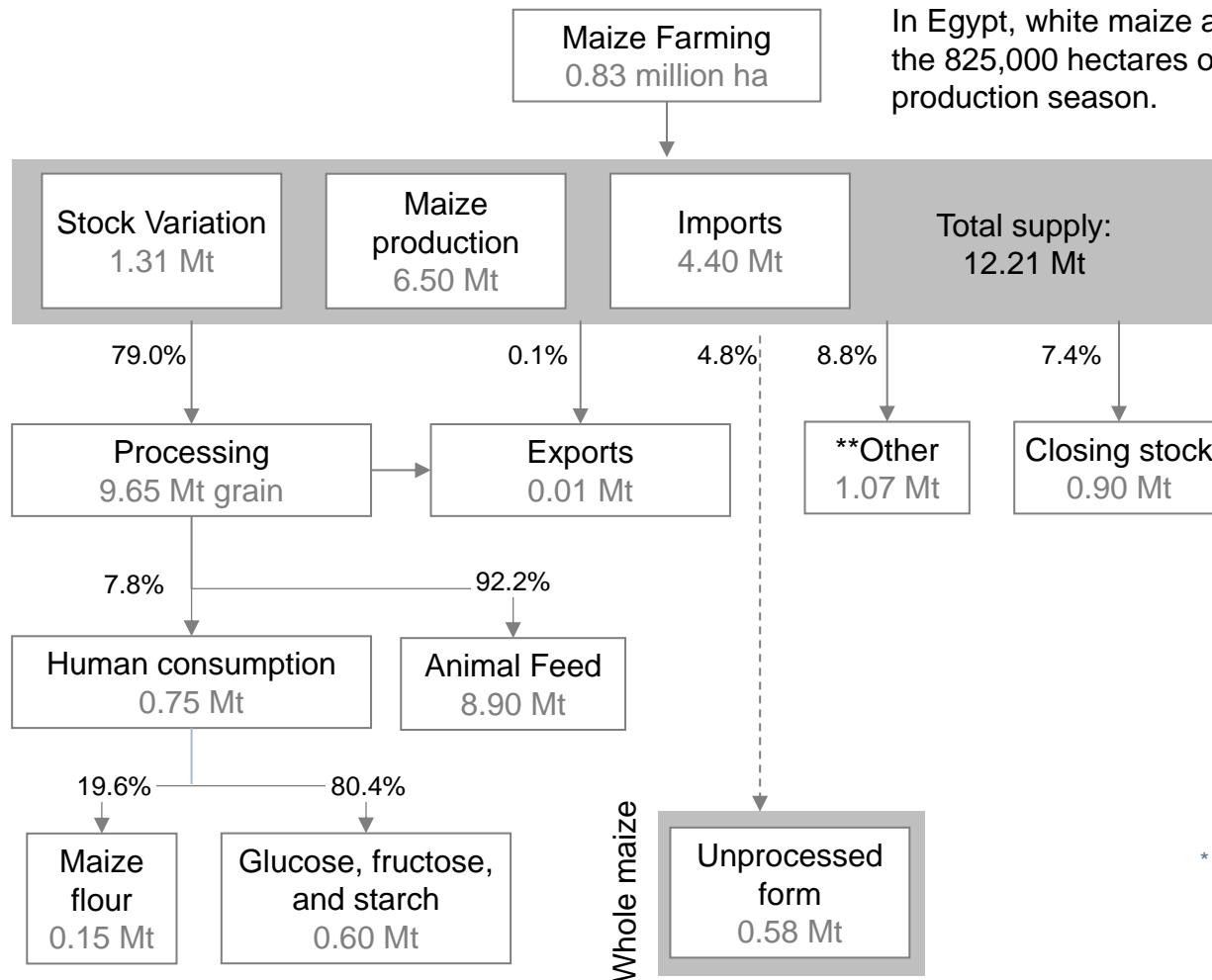
Note: Figures are rounded

* Data for 2013/2014 are estimates and not official values

Source: FAO Statistics Division; International Trade Centre; USDA Foreign Agricultural Service: GAIN Report; Frost & Sullivan

Maize Agro-Processing—Egypt

Maize Agro-Processing: Value Chain, Egypt, 2013/2014*



Source: USDA Foreign Agricultural Service: GAIN Report and data; Frost & Sullivan

In Egypt, white maize accounts for 660,000 hectares (80%) of the 825,000 hectares of maize planted for the 2012/2013 production season.

Maize used for human consumption is mostly processed for fructose, glucose, and starch production or consumed in its fresh capacity.

* Data for 2013/2014 are estimates and not official values

** Other includes seed and waste

Note: Figures are rounded
Million tonnes (Mt)

Major Flour Processors—Egypt



Upper Egypt Flour Mills Company
 South Cairo and Giza Mills and Bakeries Company
 National Company for Maize Products

South Cairo and Giza Mills and Bakeries Company

Description	Produces high-quality flour at 72% and 82% extraction rates. Own warehouses, distribution centres, and has a wide geographical presence in Egypt.
Up/Downstream	Both
Origin	Established under Presidential Decree No. 2472/1965
Employees	3,500
Product Scope	Produces flour, breads, and other baked goods.
Main Brands	Unavailable
Operations / Market	Throughout Egypt (aim to supply the international market)
Revenue	\$3.2 million (July 2012–June 2013)
Production Assets	11 mills, 12 storage facilities, 4 bakeries
Ownership	Holding Company for Food Industries (51%), Workers Union (10%), Individuals (39%)
Head office	366 King Faisal Street, Talbia, Cairo

Note: Outlines approximate

Source: Company websites; Egyptian International Trade Point; Frost & Sullivan

Maize in Ethiopia



Maize in Ethiopia



Ethiopia is the fourth largest maize producer in Africa, contributing 8.8% to the continent's total maize production and 0.7% to global production in 2012/2013 in volume.

Maize is the largest cereal crop in Ethiopia, followed by teff (an indigenous cereal) and sorghum, which rival for second and third places annually. Approximately 95% of the maize is produced by smallholder farmers, with commercial farmers producing the rest 5%. There are two maize-growing seasons in Ethiopia: March to August (belg) and April to February (meher).

Maize Market: Production, Ethiopia, 2004/2005–2013/2014

Marketing Year	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013/2014 *
Production ('000 Tonnes)	2,906	3,912	4,030	3,337	3,776	3,933	3,897	4,986	6,069	5,588
Value (USD Million)	429.4	687.8	684.0	630.5	1,685.3	1,196.5	786.7	1,341.1	1,788.7	1,815.7
Price (USD per Tonne)	148	176	170	189	446	304	202	269	295	325
Area Harvested ('000 ha)	1,802	1,950	1,526	1,695	1,767	1,768	1,772	1,963	2,013	2,150
Yield (hg/ha)	16,132	20,060	26,404	19,692	21,367	22,241	21,990	25,398	30,150	25,991

Note: Figures are rounded

* Data for 2013/2014 are estimates and not official values

Source: FAO Statistics Division; International Trade Centre; USDA Foreign Agricultural Service; Frost & Sullivan

Ethiopian Trading Partners

Maize Market: Trade, Ethiopia, 2004/2005–2013/2014

Maize Trade (Marketing Year)	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013/ 2014 *
Net Exports (‘000 Tonnes)	0	28	60	32	36	54	(7)	(53)	3	0
Exports ('000 Tonnes)	11	3	1	0	0	0	36	60	0	0
Imports ('000 Tonnes)	11	30	60	32	36	54	29	8	3	0

The Ethiopian government banned maize exports in 2008, unless there is sufficient local production, as determined by the government.

Nevertheless, informal trade across the Ethiopian border for both imports and exports continues.

Overall, trade is minimal as the vast majority of the maize grown (80%) is consumed by subsistence and smallholder farmers, with the remainder (20%) being sold, used as wages, kept as seed, or used for animal feed.

In terms of recent trading partners, the International Trade Centre shows that Ethiopia exported maize to countries, notably Italy, the former Sudan, the United Kingdom, Israel, and Jordan; and imported maize from India, Italy, and Argentina during 2008 to 2012.

Significant Maize Importers, 2008–2012

1. Italy
2. Sudan (former)
3. United Kingdom
4. Israel
5. Jordan

Significant Maize Exporters, 2008–2012

1. India
2. Italy
3. Argentina

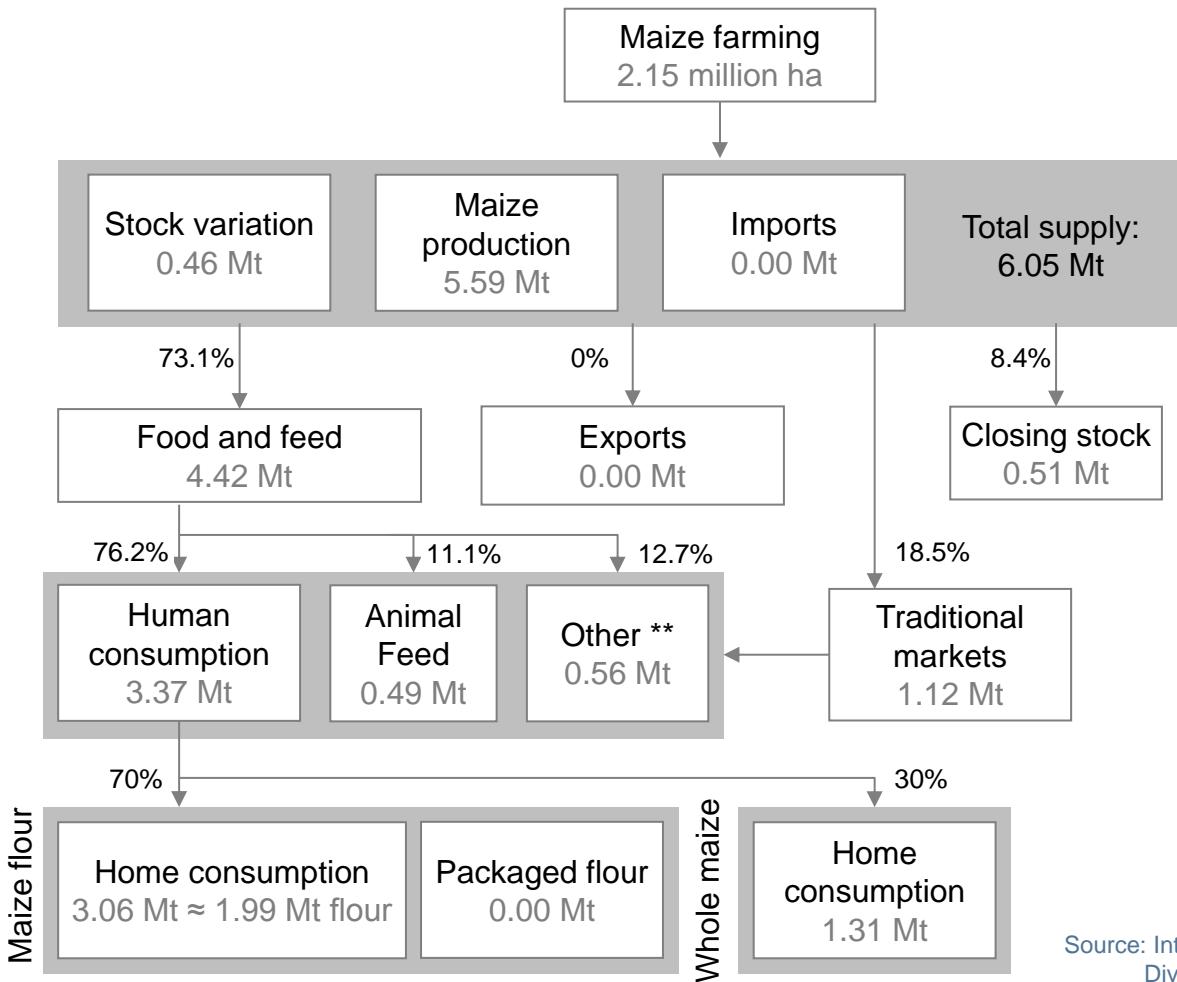
Note: Figures are rounded

* Data for 2013/2014 are estimates and not official values

Sources: FAO Statistics Division; International Trade Centre; USDA Foreign Agricultural Service; GAIN Report; Frost & Sullivan

Maize Agro-Processing—Ethiopia

Maize Agro-Processing: Value Chain, Ethiopia, 2013/2014*



Commercially, factories only mill wheat flour. As such, only wheat flour is supplied in a packaged format.

Ethiopians use local hammer mills to make maize flour.

Excluding any stock variation, only an estimated 20% of the harvested maize is sold in traditional markets, while 80% is kept for immediate home consumption, seed, or waste.

* Data for 2013/2014 are estimates and not official values

** Other includes seed and waste

Note: Figures are rounded

Source: International Food Policy Research Institute (IFPRI); FAO Statistics Division; USDA Foreign Agricultural Service: GAIN Report and data; Ethiopian Government; Frost & Sullivan

Maize in Tanzania



Maize in Tanzania



The United Republic of Tanzania (Tanzania) is the fifth largest maize producer in Africa, contributing 7.4% to the continent's total maize production and 0.6% to global production in 2012/2013 in volume.

Maize is by far the largest cereal crop in Tanzania, followed by rice (1.8 million tonnes in 2012/2013). However, in terms of staple crops, maize is surpassed by cassava, a tuber. Smallholder farmers account for 98% of the maize produced.

Maize Market: Production, Tanzania, 2004/2005–2013/2014

Marketing Year	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013 / 2014 *
Production ('000 Tonnes)	4,651	3,132	3,423	3,659	5,441	3,326	4,733	4,341	5,104	4,200
Value (USD Million)	726.9	408.0	587.4	445.2	1,523.4	1,068.4	1,195.6	1,015.8	1,501.5	1,481.9
Price (USD per Tonne)	156	130	172	122	280	321	253	234	294	353
Area Harvested ('000 ha)	3,173	3,110	2,570	2,600	3,982	2,961	3,051	3,288	4,118	3,100
Yield (hg/ha)	14,659	10,071	13,318	14,071	13,662	11,232	15,515	13,203	12,395	13,548

* Data for 2013/2014 are estimates and not official values

Source: FAO Statistics Division; International Trade Centre; USDA Foreign Agricultural Service; Frost & Sullivan

Tanzanian Trading Partners

Maize Market: Trade, Tanzania, 2004/2005–2013/2014

Maize Trade (Marketing Year)	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013/ 2014 *
Net Exports (‘000 Tonnes)	158	(54)	272	(80)	8	3	14	4	75	75
Exports ('000 Tonnes)	54	99	24	87	12	6	4	7	14	25
Imports ('000 Tonnes)	211	45	296	7	20	9	19	12	89	100

Overall, trade is minimal and is occasionally interrupted by an official maize export ban when the Tanzanian government identifies regions that are food insecure or to assist in price stabilisation. However, as food security is an ongoing problem in Tanzania, the ban is unofficially ongoing. Continued exports still occur, albeit at lower levels, despite these bans. The government's aim is to be self-sufficient in maize production.

Regardless, international trade does take place, although largely contained to neighbouring countries in the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA). In terms of recent trading partners, mirror data from the International Trade Centre shows that Tanzania exported maize mostly to Rwanda, Burundi, and Kenya. It imported maize from Uganda, South Africa, Zambia, and Argentina during 2008 to 2012.

Significant Maize Importers, 2008–2012

- 1. Rwanda
- 2. Burundi
- 3. Kenya

Significant Maize Exporters, 2008–2012

- 1. Uganda
- 2. South Africa
- 3. Zambia
- 4. Argentina

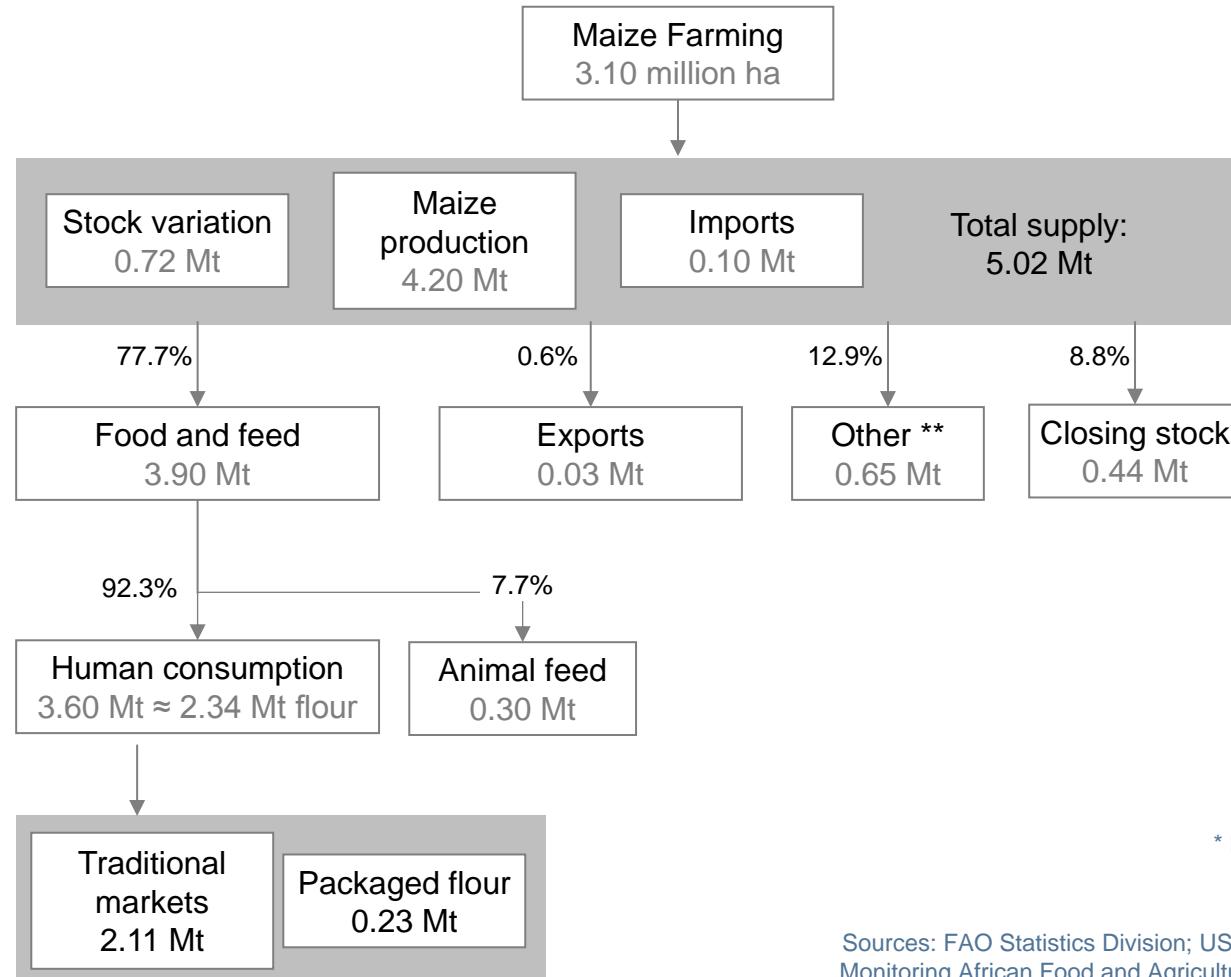
Note: Figures are rounded

* Data for 2013/2014 are estimates and not official values

Source: FAO Statistics Division; International Trade Centre; International Food Policy Research Institute (IFPRI); USDA Foreign Agricultural Service; GAIN Report; Frost & Sullivan

Maize Agro-Processing—Tanzania

Maize Agro-Processing: Value Chain, Tanzania, 2013/2014*



The majority of the maize produced in rural areas is for subsistence consumption. Currently, an estimated 60% of the maize produced in Tanzania is consumed on the farm and is processed in rural, small mills.

Maize flour is mixed with water to make Ugali (stiff porridge). The use of Ugali by local school feeding programmes in more than 1,064 primary schools has boosted consumption of maize flour in Tanzania.

Small retailers mainly buy 25kg but also 50kg bags and weigh smaller volumes for customers.

Packaged maize flour is a very small market (10%), more expensive, and found in supermarkets.

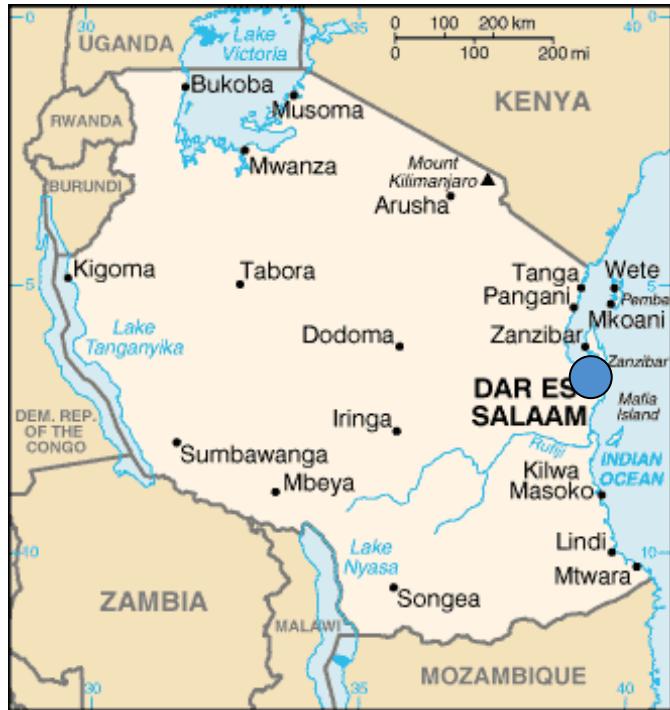
* Data for 2013/2014 are estimates and not official values

** Other includes seed and waste

Note: Figures are rounded

Sources: FAO Statistics Division; USDA Foreign Agricultural Service: GAIN Report and data; Monitoring African Food and Agriculture Policies: Analysis of Incentives and Disincentives for Maize in the United Republic of Tanzania (October 2012); Frost & Sullivan

Major Flour Processors—Tanzania



- Said Salim Bakhresa (Dar es Salaam)
- Mikoani Traders (Dar es Salaam)
- Coast Millers (Dar es Salaam)
- Mohammed Enterprises Tanzania Ltd (Dar es Salaam)

Said Salim Bakhresa and Company

Description	The largest wheat milling and storage capacity in East Africa. The group also manufactures ice-cream, bottled water, packaging, petroleum products, real estate etc.
Up / Downstream	Upstream
Origin	Established in 1983
Employees	unknown at this stage
Product Scope	Bakers flour, biscuit flour, whole wheat flour, wheat flour, bread mix, maize flour etc.
Main Brands	Azam (covers all of the above)
Countries	Tanzania, Uganda, Malawi, Mozambique
Revenue	unknown at this stage
Production Assets	3 wheat, 1 maize & 1 rice mill (Tanzania)
Ownership	Local (Family-run empire)
Head office	Dar es Salaam, Tanzania

Sources: Said Salim Bakhresa website; Frost & Sullivan

Overview of Sugar Cane in Africa



Sugar Cane is the Second Largest Crop in Africa

In the 2012/2013 production season, 94.5 million tonnes of sugar cane was produced in Africa and contributed 5.2% to global sugar cane production (1.83 billion tonnes). Refined sugar net imports range from 2.8 million tonnes to 3.4 million tonnes per year, while raw centrifugal sugar net imports showed a dramatic rise from 108,000 tonnes in 2002 to 4.2 million tonnes in 2011. This is largely due to the increased imports by Algeria, Egypt, and Nigeria over the same time period to meet domestic demand.

The top 5 sugar cane-producing countries in Africa contributed 54.1% to the total African sugar cane production in 2012, while the top 10 (which includes Mauritius, Zambia, Zimbabwe, Mozambique, and Madagascar) contributed 73.5%. Due to the prominence of South Africa and Egypt in the African sugar cane market, only these 2 countries will be covered in this study.

Sugar Cane Market: Top 5 Sugar Cane-producing Countries, Africa, 2003/2004–2012/2013

Production ('000 Tonnes)	2003 / 2004	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013
South Africa	20,419	19,095	21,265	20,275	19,724	19,255	18,655	16,016	16,800	17,278
Egypt	16,245	16,230	16,317	16,656	17,014	16,470	15,482	15,709	15,765	16,500
Sudan (former)	6,500	6,984	7,186	7,000	7,467	7,453	7,527	6,728	6,055	6,173
Kenya	4,204	4,661	4,801	4,933	5,204	5,112	5,611	5,710	5,339	5,823
Swaziland	4,600	4,800	5,200	5,000	5,000	5,000	5,000	5,000	5,000	5,400
Other *	37,454	37,608	37,858	38,467	36,867	37,890	40,176	41,321	42,624	43,332
Total	89,422	89,378	92,628	92,332	91,277	91,181	92,451	90,483	91,583	94,505

Note: Data for this exhibit has not been provided for 2013/2014

* Other includes Mauritius, Zambia, Zimbabwe, Mozambique, and other African sugar cane-producing countries

Source: FAO Statistics Division; Frost & Sullivan

Sugar Cane and Sugar Prices

In **South Africa**, sugar cane millers (millers) pay growers a recoverable value (RV) per tonne of sugar cane delivered. The RV rate is based on the value of the sugar and molasses in the sugar cane taking into account the percent of cane fibre, non-sucrose content, and sucrose lost in production. Therefore, the RV rate is not calculated on the sucrose content alone. A provisional monthly RV rate is applied to all growers, with the final rate announced in March each year. The South African Sugar Association (SASA) offers a Cane Testing Service (CTS), thereby providing objective content analysis that enables millers to calculate the RV rate. This also provides an incentive to improve the quality of sugar cane produced.

However, export profitability remains problematic for South Africa. Some countries are encouraged to overproduce as a result of sugar subsidies and this significantly reduces the global sugar price. In addition, preferential trade agreements and high import tariffs further reduce profitability. Less than 20% of exported sugar reaches the open market—the arena where South Africa mostly operates—and is sold at significantly reduced prices compared to domestic prices in South Africa. To ensure industry fairness, the proceeds are redistributed amongst sugar cane growers and millers in accordance with the Sugar Act No 9 of 1978 (as amended) and the Sugar Industry Agreement of 2000.

In **Egypt**, sugar is produced from sugar cane and sugar beet. Sugar cane growers are paid by weight and sugar beet growers are paid according to the sucrose content. Despite Egypt obtaining a higher sugar cane yield than South Africa, the sucrose content is lower. Payment by weight does not provide an incentive to improve the sucrose content of cane sugar thereby substantiating the government's claim that beet yields more sucrose than sugar cane. Additional payments to beet growers further encourage crop switching.

Source: South African Sugar Association; Growing the Sugar Industry of South Africa (Conningarth Economists);
USDA Foreign Agricultural Service; Frost & Sullivan

Sugar Cane in South Africa



Sugar Cane in South Africa



South Africa is the largest sugar cane producer in Africa, contributing 18.3% to the continent's total sugar cane production of 94.5 million tonnes, and 0.9% to global production (1.83 billion tonnes) in 2012/2013 in volume. South Africa is a net exporter of both raw and refined sugar.

Between the 6 sugar companies, there are 14 sugar mills and 4 refineries, also known as "white end" mills.

Sugar Cane Market: Production, South Africa, 2004/2005–2013/2014

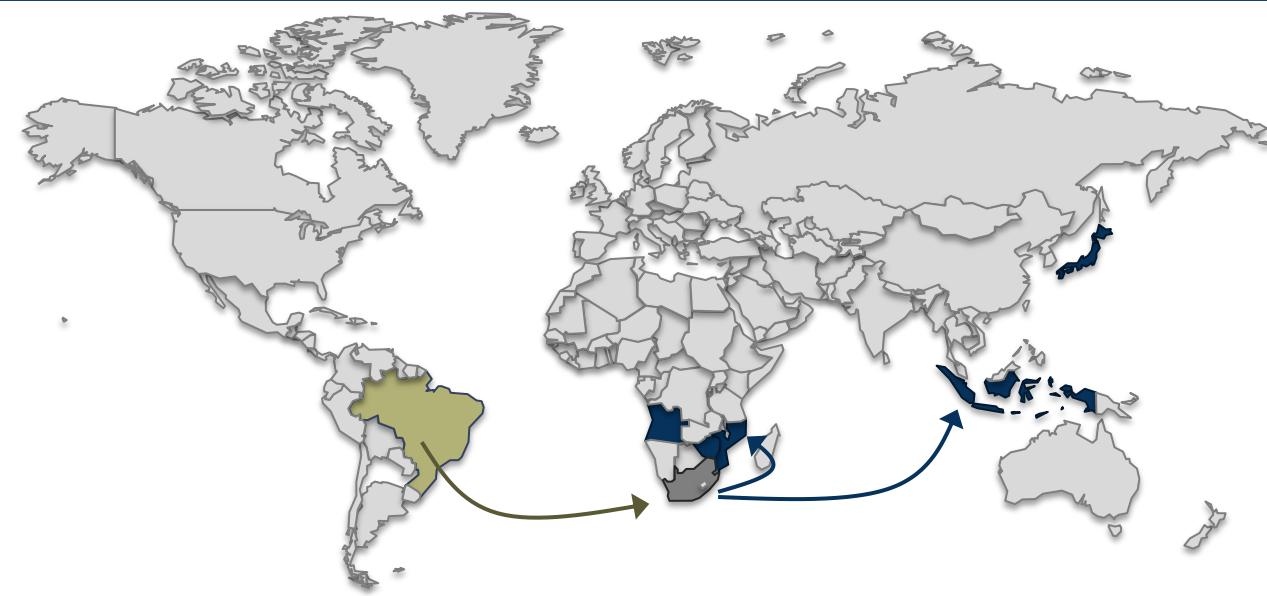
Sugar Cane Season	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013 / 2014 *
Cane Production ('000 Tonnes)	19,095	21,052	20,278	19,724	19,255	18,655	16,016	16,800	17,278	20,033
Area Harvested ('000 ha)	316	319	306	307	287	278	271	253	272	310
Yield (hg/ha)	604,253	660,235	663,547	641,681	670,019	670,722	590,822	664,546	635,959	646,226
Sugar Production ('000 Tonnes)	2,235	2,507	2,235	2,282	2,269	2,188	1,919	1,832	1,961	2,343
Gross Value (\$ Million)	448.6	547.8	564.2	550.9	551.5	598.3	675.1	764.8	764.3	749.6
Price per tonne (USD)	201	219	252	241	243	273	352	417	390	320

Note: Figures are rounded

* Data for the 2013/2014 season are estimates and not official values.

Source: FAO Statistics Division; South African Department of Agriculture, Forestry, and Fisheries; South African Sugar Association (SASA); USDA Foreign Agricultural Service ;Frost & Sullivan

South African Trading Partners



Top 5 Sugar Importers, 2008–2013

1. Mozambique
2. Japan
3. Indonesia
4. Zimbabwe
5. Angola

Significant Sugar Exporter, 2008–2013

1. Brazil

Sugar Cane Market: Trade, South Africa, 2004–2013*

Sugar Trade (Refined and Raw Centrifugal)

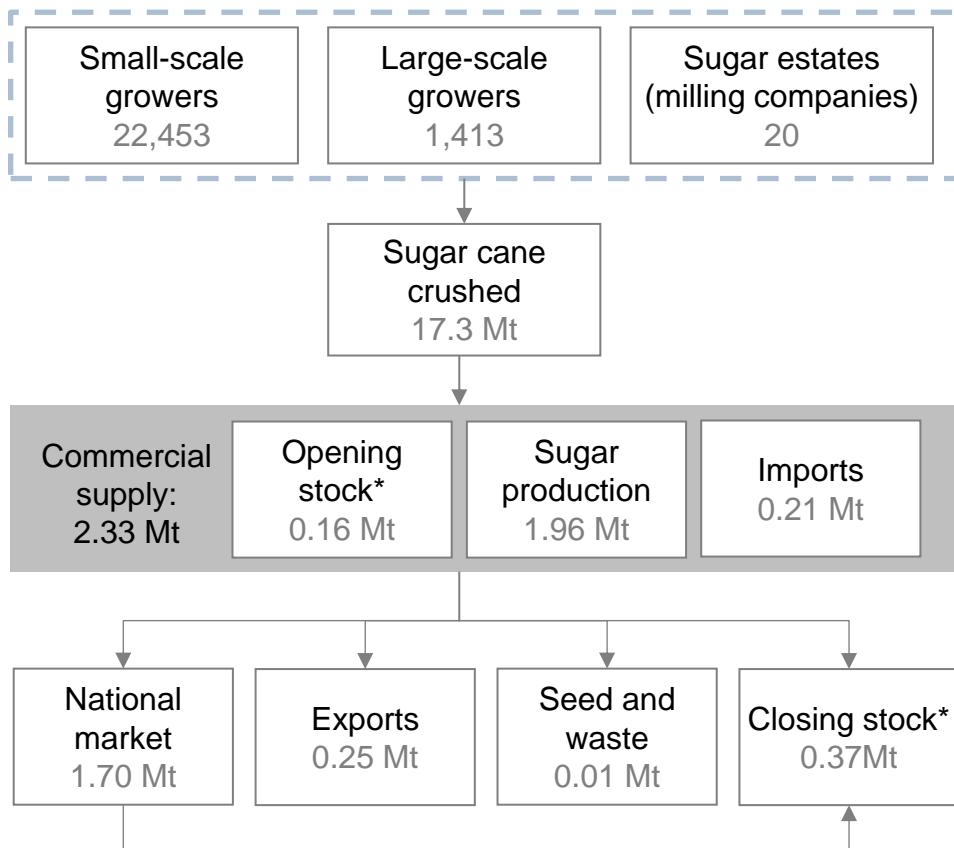
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Net Exports ('000 Tonnes)	924	1,034	1,306	930	527	785	318	119	97	438
Exports ('000 Tonnes)	963	1,073	1,338	1,032	685	905	421	263	304	804
Raw Centrifugal Exports (%)	69.8	83.0	81.7	70.9	67.5	69.7	48.4	48.2	41.2	52.3
Imports ('000 Tonnes)	39	38	31	103	158	120	104	144	207	366
Raw Centrifugal Imports (%)	69.9	92.0	93.5	86.4	67.4	36.6	50.1	54.7	27.8	49.9

* Most sources (DAFF, ITC, FAO) provide trade data for sugar according to a calendar year.
Note: Figures are rounded

Source: FAO Statistics Division; International Trade Centre; Frost & Sullivan

Sugar Cane Agro-Processing—South Africa

Sugar Cane Agro-Processing: Value Chain, South Africa, 2012/2013



In the 2012/2013 season, 371,662 hectares of land were under sugar cane, although 271,684 hectares were harvested for milling. There was a total of 23,886 sugar cane growers in the season.

Imports and exports include raw and refined sugar. The export figure provided in this exhibit (0.25 million tonnes) refers to the 2012/2013 season and is not the same number provided in the trade table, which uses a calendar year.

Direct sales and contracts accounted for 54.5% of the national consumption (1.61 million tonnes), while industrial use accounted for the remaining 45.5%. Illovo Sugar Limited, Tongaat Hulett Sugar Limited, and TSB Sugar Holdings Limited provide 100% of the industrial requirement.

Soft drinks consume an estimated 60% of industrial sugar, followed by bakeries with 16%, sweets with 10%, and other food producers with the remainder.

Although licenses for bio-ethanol production using sugar cane have been processed, no plants have been built to date due to problems with the bio-fuel pricing mechanism. An ethanol plant using sugar beet is also envisaged.

* Numbers are estimates
Million tonnes (Mt)
Note: Figures are rounded

Source: South African Sugar Association (SASA); Frost & Sullivan

Sugar Processors—South Africa



Tongaat Hulett Sugar Limited

Positioning	One of the top 3 sugar producers in South Africa
Up/Downstream	Both
Origin	Dates back to 1854
Product Scope	Sugar plantations, refining, sugar derivatives, electricity generation, and animal feed
Main Brands	Huletts
Operations/Market	South Africa, Mozambique, Zimbabwe, and Swaziland
Revenue	\$461.4 million (2013 financial year)
Production Assets	Sugar mills, sugar refineries, ethanol plants, animal feed plant
Ownership	South African, BEE ownership Listed on the JSE
Head office	Glenashley, Kwazulu Natal

Note: Outlines approximate

Source: Company websites; DAFF; Frost & Sullivan

Sugar Cane in Egypt



Sugar Cane in Egypt



Egypt contributed 17.5% to the continent's sugar cane production and 0.9% to global production in 2012/2013 in volume.

The Egyptian government actively encourages the cultivation of sugar beet rather than sugar cane, due its higher sugar content and reduced water consumption. As such, sugar beet cultivation almost tripled in the last 10 years (2,860 to 7,826 tonnes) compared to the marginal increase from sugar cane (16,230 to 16,630 tonnes). The volume of sugar produced from sugar beet is estimated to overtake that of sugar cane for the first time in the 2013/2014 season.

Sugar Cane Market: Production, Egypt, 2004/2005–2013/2014

Season	2004 / 2005	2005 / 2006	2006 / 2007	2007 / 2008	2008 / 2009	2009 / 2010	2010 / 2011	2011 / 2012	2012 / 2013	2013 / 2014 *
Cane Production ('000 Tonnes)	16,230	16,317	16,611	17,015	16,470	16,452	15,709	17,949	16,500	16,630
Area Harvested ('000 ha)	135	135	137	141	136	149	135	145	144	140
Yield (hg/ha)	1,199,509	1,208,869	1,213,190	1,209,311	1,211,865	1,103,411	1,167,617	1,235,136	1,149,826	1,187,875
Sugar Production ('000 Tonnes)	1,002	1,048	1,072	1,075	1,083	1,001	1,036	990	1,131	1,048
Gross Value (\$ Million)	217.9	267.6	297.3	379.7	418.6	423.6	562.1	548.1	787.2	668.0
Price per tonne (USD)	217	255	277	353	387	423	542	554	696	638

Note: Figures are rounded

* Data for the 2012/2013 season are estimates and not official values

Source: FAO Statistics Division; International Trade Centre; USDA Foreign Agricultural Service; Central Bank of Egypt; Frost & Sullivan

Egyptian Trading Partners

Egypt is a net importing country, with the sugar deficit growing by an average of 50,000 tonnes a year. The Egyptian government would like sugar consumption per capita to be reduced from 34kg to 25kg. No time frame has been given for this.

In December 2012, Egypt imposed import tariffs of 17% on raw and 20% on refined white sugar in an attempt to protect the profitability and capacity utilisation of the local sugar industry. However, this was scrapped in August 2013, when an investigation found that imports had little impact on local profitability and capacity utilisation. The Egyptian government did not comment on what was driving these constraints.

Sugar Market: Trade, Egypt, 2004–2013*

Sugar Trade (Refined and Raw Centrifugal)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Net Imports ('000 Tonnes)	894	802	937	662	1,042	539	956	967	714	n/a
Exports ('000 Tonnes)	71	114	101	252	212	200	167	282	178	n/a
Raw Centrifugal Exports (%)	22.9	52.9	19.7	9.9	17.6	15.0	48.9	1.7	33.0	n/a
Imports ('000 Tonnes)	965	916	1,038	914	1,254	739	1,124	1,248	892	n/a
Raw Centrifugal Imports (%)	85.7	68.9	93.9	86.5	92.6	88.5	95.6	91.7	85.5	n/a

* Most sources (ITC, FAO) provide trade data for sugar according to a calendar year.

n/a data is not available

Note: Figures are rounded

Top 5 Sugar Importers, 2008–2012

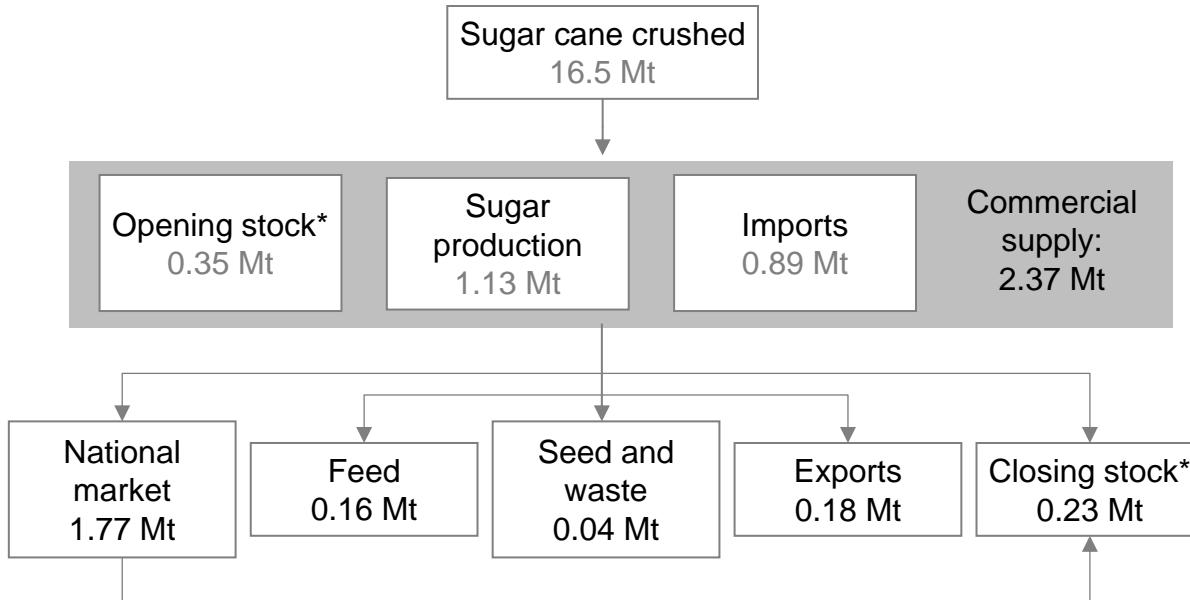
1. Former Sudan
2. Kenya
3. Libya
4. Syrian Arab Republic
5. Lebanon

Significant Sugar Exporter, 2008–2012

1. Brazil

Sugar Cane Agro-Processing—Egypt

Sugar Cane Agro-Processing: Value Chain, Egypt, 2012/2013



The Sugar and Integrated Industries Company (SIIC) monopolises sugar agro-processing in Egypt with 8 sugar factories and supplies white sugar to ration card suppliers. More than 60 million Egyptians are able to purchase low-cost sugar on the ration card system.

Opening stock, closing stock, import volumes, and export volumes may include sugar beet as this information is not split out for sugar cane.

The Egyptian government plans to construct an ethanol plant in the Kafr el-Sheikh province valued at \$120 million. However, the plant will use sugar beet (beet pulp), not sugar cane, and the ethanol will be blended with fuel for use in vehicles. Production is not expected before 2017/2018.

* Numbers are estimates

Million tonnes (Mt)

Note: Figures are rounded

Source: FAO Statistics Division; International Trade Centre; USDA Foreign Agricultural Service; Central Bank of Egypt; Frost & Sullivan

Sugar Processor—Egypt



Sugar and Integrated
Industries Company (SIIC)

8 sugar factories

Sugar and Integrated Industries Company (SIIC)

Description	Government-owned company involved in sugar, sugar derivatives, food, and chemical industries.
Up/Downstream	Downstream
Origin	Dates back to 1868
Product Scope	Sugar refining, molasses, ethanol, animal feed, chemical derivatives, equipment manufacturer
Operations/Market	Egypt, Iran, Sudan, Nigeria, Syria, and Saudi Arabia
Revenues	Unknown
Production Assets	17 industrial units in Egypt, 5 sugar factories in Iran
Ownership	Affiliated with the Food Industries Holding Company of Egypt
Head office	Gorga, Sohag Governorate, Egypt

Note: Outlines approximate

Source: Company websites; DAFF; Frost & Sullivan

The Future of GM Crops in Africa



Overview of Global GM Crop Use

Statistics on GM Crops, Global, 2008–2013

GM Crops	2008	2009	2010	2011	2012	2013
Global (Million Hectares)	125.0	134.0	148.0	160.0	170.3	175.2
US (Million Hectares)	62.5	64.0	66.8	69.0	69.5	70.1
Brazil (Million Hectares)	15.8	21.4	25.4	30.3	36.6	40.3
Argentina (Million Hectares)	21.0	21.3	22.9	23.7	23.9	24.4
Total Africa (Million Hectares)	1.8	2.2	2.5	2.6	3.2	3.5
Number of Countries Cultivating GM Crops	25	25	29	29	28	27

The global cultivation of GM crops has grown by 40% during the past 5 years (from 125.0 million hectares in 2008 to 175.2 million hectares in 2013). In 2013, the top three GM-growing countries, led by the US, comprised 77% of the global GM crops cultivated. The three GM crop-producing countries in Africa, however, contributed 2% to this market in 2013: South Africa (2.9 million hectares), Burkina Faso (0.5 million hectares), and Sudan (0.06 million hectares). South Africa remained the only African country to plant GM crops until 2008 when Egypt and Burkina Faso joined, followed by Sudan in 2012.

Source: International Service for the Acquisition of Agri-Biotech Applications (ISAAA); Frost & Sullivan

Use of Genetically Modified (GM) Seed

Overview of GM Seed

In 1983, a tobacco plant displaying a chimaeric antibiotic-resistant gene was created. It was a matter of time before the molecular defence in a transgenic plant was further developed to create insect-resistant plants (1987) from the bacteria *Bacillus thuringiensis* (Bt), and herbicide-tolerant (HT) plants (1994). Other ongoing developments include gene stacking, where 2 or more novel genes are incorporated into a single plant line, either through traditional hybridisation or technological methods, to construct a GM crop that displays a combination of insect-resistant and herbicide-tolerant traits. The first gene stack was granted regulatory approval in the US in 1995. Although various countries, including the UK and US, started to conduct crop trials with GM seeds from 1985, it was only from 1996 onwards that GM crops were grown on a commercial scale globally.

Use of GM Seeds in Africa

South Africa first cultivated Bt yellow maize on a commercial scale in the 1998/1999 production season, followed by Bt white maize in 2001/2002. The latter event placed South Africa in the global spotlight as the first GM-dependent subsistence nation. The HT maize crop was commercialised in 2003/2004, followed by stacked maize in 2007/2008. This brisk adoption of GM maize, as well as cotton and soybean, has placed South Africa at the top 10 GM-producing countries globally.

Of the total maize crop in 2011/2012, GM maize comprised 89% of the hectares cultivated. This represents approximately 80% of white maize and 93% of the yellow maize planted.

Source: Stevens, J et al., Chapter 12: Biotechnological Approaches for the Control of Insect Pests in Crop Plants, Pesticides – Advances in Chemical and Botanical Pesticides, InTech Open Access Company; Centre for Environmental Risk Assessment; Food Standards Australia and New Zealand; International Service for the Acquisition of Agri-Biotech Applications; GeneWatch UK; Grice, A, GM crops needed in Britain, says minister, The Independent, 19 June 2008, Harvest SA, 7 March 2013, “Record GMO crops in 2012,”; Gouse, M. 2012. GM Maize as Subsistence Crop: The South African Smallholder Experience, AgBioForum; Biosafety South Africa; Frost & Sullivan

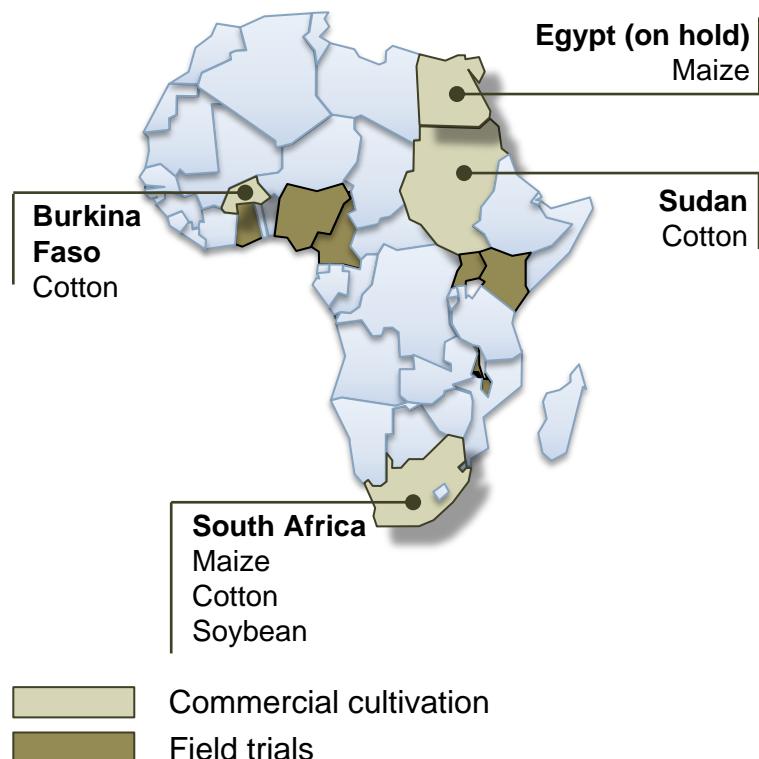
Use of Genetically Modified (GM) Seed (continued)

There are only 3 other African countries besides South Africa that have cultivated GM crops on a commercial scale. However, their contributions to the global production of GM crops (175.2 million hectares in 2013) are small to negligible. Burkina Faso increased its Bt cotton cultivation from 0.3 to 0.5 million hectares in 2012/2013, while Sudan planted 62,000 hectares of Bt cotton in 2012/2013 compared to 20,000 the previous season. Egypt, however, has put the cultivation of GM maize on hold awaiting government review. Egypt cultivated less than 20,000 hectares of maize in the 2011/2012 production season.

Field trials for various GM crops such as maize, bananas, sweet potato, cotton, and cowpeas are underway in 6 other African countries: Nigeria, Ghana, Cameroon, Kenya, Uganda, and Malawi, as well as countries such as Egypt, where GM crops are or have been grown.

In Nigeria, the Minister of Science and Technology has indicated that GM crops such as cowpea and maize would be commercially available by 2015.

Countries Growing GM Crops, Africa, 2013



Source: International Service for the Acquisition of Agri-Biotech Applications (ISAAA); allAfrica.com; Frost & Sullivan

Use of Genetically Modified (GM) Seed (continued)

Of the 5 countries analysed in this market insight, only Ethiopia and Tanzania are not involved in GM crops. In Tanzania, a liability clause in the 2004 National Environmental Management (NEM) Act prevents the implementation of GM maize field trials. Scientists conducting laboratory trials expect the NEM Act to be amended in 2014, as neighbouring countries Kenya and Uganda progress to GM maize commercial cultivation following successful field trials. Experts express concern that Tanzania will be left behind and that technological progression regarding GM maize is inevitable. Limited information is available regarding GM crops in Ethiopia.

GM Seed in Sugar Cane

Attempts to develop GM sugar cane have been underway for up to 2 decades in countries such as Brazil and South Africa. However, the sugar cane DNA (deoxyribonucleic acid) is complex and genetic modifications are specific to the area in which the sugar cane is grown. This does not provide financial incentives for large GM seed developers to pursue this avenue of research. There are 4 broad areas where research is focused: to increase the sucrose yield; to improve crop yield; to facilitate cellulosic ethanol production; and to create biofactories for industrial and medical applications.

In 2013, Indonesia became the first country to approve the planting of GM sugar cane. The drought-resistant plant is expected to increase Indonesia's yield of 6.5 tonnes per hectare by 10% to 20%. The country is one of the largest net importers of sugar (specifically raw centrifugal sugar) and increased sugar cane production would assist the national objective of becoming self-sufficient in staple crops. The first commercial GM sugar cane crop is expected to be planted in 2014.

Source: International Service for the Acquisition of Agri-Biotech Applications (ISAAA); African Centre for Biodiversity; Daily News (Tanzania); The Financial Times (2013); Ethical Sugar; GMO Compass; Malaya Business Insight Frost & Sullivan

Use of Genetically Modified (GM) Seed (continued)

Other countries besides Indonesia that are involved in GM sugar cane research include Brazil, the world's largest sugar cane producer, Argentina, Australia, Cuba, Egypt, India, South Africa, and the US. Such research has been accompanied by various field trials. However, none of these varieties have been approved for commercial planting so far. No time estimates for such introduction have been provided.

Research in **South Africa** is led by the South African Sugarcane Research Institute (SASRI). Field trials have been conducted with herbicide tolerant traits, insecticide tolerant traits, and enzymatic changes for sucrose metabolism. It has been suggested that commercial cultivation of GM sugar cane is being held back by intellectual property-related and market-related concerns.

In **Egypt**, research is led by the Sugar Crops Research Institute (SCRI), which focuses on improving sugar cane yield using, amongst other techniques, biotechnology.



Source: International Service for the Acquisition of Agri-Biotech Applications (ISAAA); GMO Compass; Malaya Business Insight; ISHS; Frost & Sullivan

The Future of GM Crops in Africa

The use of GM seeds is a hotly contested and emotionally charged debate. Concerns have been raised over the long-term environmental and health impacts of GM crops, the seed-related oligopoly in the food supply chain, and the need to preserve indigenous crops and seeds. Amidst this debate, a limited number of African countries have commercially cultivated or partaken in experimental field trials of GM crops.

However, the commercialisation of GM crops may negatively impact local agriculture chemical manufacturers in favour of those developed by companies such as Monsanto, Syngenta, and Du Pont. Due to the patenting activities of GM seed companies, farmers are tied into agreements that, amongst other things, prevent them from planting saved seed and require the use of agrichemicals designed to be co-used with the patented GM seed. Considering that an estimated 80% to 90% of African farmers are smallholders, the requirement to buy seed and associated chemicals every season adds an additional layer of costs to already poor farmers. Yet the allure of greater yields, resistance to drought, pest management, and other suggested benefits may influence governments in favour of GM use.

In terms of GM sugar cane, it is only a matter of time before countries such as Brazil, the US, and South Africa do implement GM sugar cane. From South Africa's perspective, improved yields would create further opportunities for export. However, additional international supply could further distort the global sugar price, making it even less profitable to export sugar. For Egypt, GM sugar cane could be a viable solution, as it attempts to overcome its dependence on sugar imports. However, considering that the government has put the cultivation of GM maize on hold, GM sugar cane is unlikely to make an appearance during the next 5 years. One country to look out for is Nigeria—there could be commercial GM maize and cowpea crops in 2015.

Conclusions



Maize—Key Opportunities

Field of Interest	Key Opportunities Identified
The use of GM seeds	South Africa has embraced the use of GM maize seeds, while Egypt has cultivated less than 20,000 hectares of GM maize. Although some other African countries are still hesitant to adopt this technology, Nigeria is expected to be the next major country to commercially produce GM maize. This opens the door for producers of GM seeds to access the second biggest maize-producing country in Africa. Tanzania may provide another market for GM seeds during the next five years.
Maize yield	Low yields in Nigeria and Tanzania indicate an opportunity for greater agricultural inputs such as fertiliser and pesticide as well as improved farming methods.
Infrastructure and market access	The vast majority of maize is grown by smallholder farmers with limited access to food markets and storage facilities. This results in significant price fluctuations, even within one country, accompanied by periods of plenty and those of hunger. Innovative grain storage designs could assist in bridging the time period between harvests to alleviate food deficits.
Maize processing	Although there are commercial wheat mills in Ethiopia, 3.06 million tonnes of maize flour is produced by rustic millers. Opportunities for commercial maize mill development exist and could be investigated.

Sugar Cane: Key Opportunities

Field of Interest	Key Opportunities Identified
The use of GM seeds	Neither South Africa nor Egypt currently use GM sugar cane. However, ongoing research could result in GM opportunities in South Africa over the next 5 to 10 years. This would probably centre on even higher sucrose levels as well as increased yields due to herbicide and insecticide tolerance. Egypt's attitude towards GM sugar cane will depend on the government review of GM maize, now placed on hold.
Sugar cane yield	Despite Egypt having a higher sugar cane yield than South Africa, the latter cultivates sugar cane with a greater sucrose content. Egypt would certainly benefit from such developments in an effort to reduce sugar imports. Opportunity for cross-country collaborations at a sugar research institute level could be investigated.
Biofuel usage	South Africa, amongst other countries, is investigating the use of sugar cane in biofuel development to reduce complete reliance on crude oil. Egypt has planned an ethanol plant; however, it will use sugar beet pulp, not sugar cane. This provides South African sugar cane growers with additional markets for their crops and income. GM sugar cane tailored for such use could be explored.

Appendix



Acronyms

Acronyms

Bt	Bacillus thuringiensis
GM	Genetically modified
Hg/hg	Hectogram per hectare
HT	Herbicide tolerant
Mt	Million tonnes
NEM Act	National Environmental Management Act
RV	Recoverable value
SIIC	Sugar and Integrated Industries Company
UK	United Kingdom
US	United States of America

Source: Frost & Sullivan

The Frost & Sullivan Story

The Journey to Visionary Innovation



The Frost & Sullivan Story

Emerging Research



1961

Growth Partnership



1990

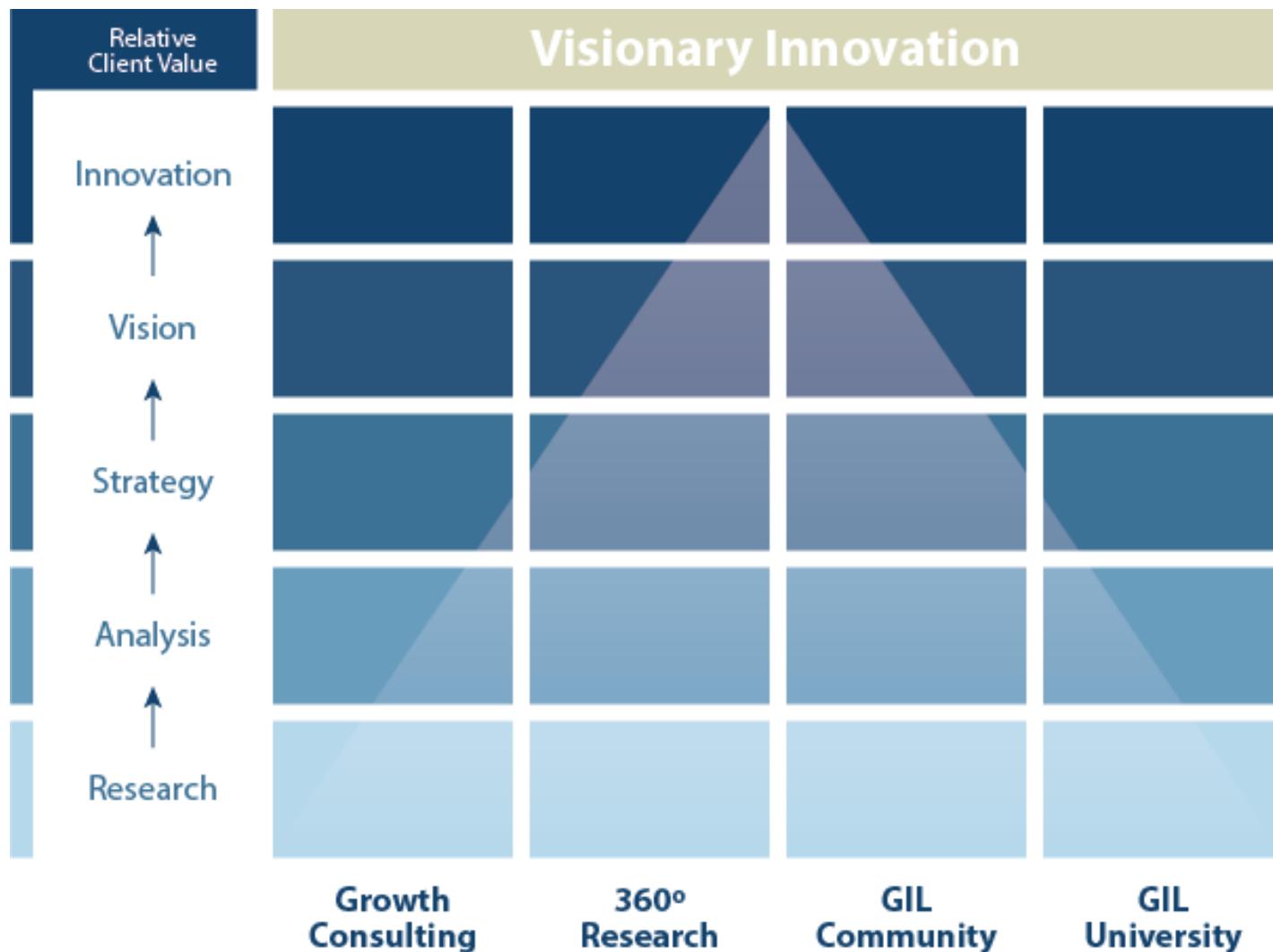


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Visionary Innovation

Value Proposition: Future of Your Company & Career

Our 4 Services Drive Each Level of Relative Client Value



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Industry Convergence

Comprehensive Industry Coverage Sparks Innovation Opportunities



Aerospace & Defense



Measurement &
Instrumentation



Consumer
Technologies



Information &
Communication Technologies



Automotive
Transportation & Logistics



Energy & Power
Systems



Environment & Building
Technologies



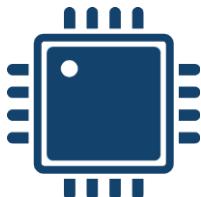
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