SOUTH AFRICAN GRAIN SEEDS MARKET ANALYSIS REPORT

2020




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Key Acronyms

AFSTA—Africa Seed Trade Association;

ARC—Agriculture Research Council;

MNC—Multinational Corporation;

NGO—Non-Governmental Organization;

OSTS—Official Seed Testing Station;

SANSOR—South African National Seed Organization;

SME—Small and Medium Enterprise

GM – Genetically Modified

1. DESCRIPTION OF THE SEED INDUSTRY

A competitive seed sector is key to ensuring timely availability of appropriate and high quality seeds at affordable prices to farmers in South Africa. The seed industry in South Africa is comparatively advanced than in other African countries and primarily serves the needs of commercial farmers. The South African seed industry has evolved over more than a century into a mature sector with some 107 seed companies that are members of the South African National Seed Organization (SANSOR). In 2010, agronomic crop seeds accounted for about 73% of the total South African industry while horticultural crops and forage and pasture crop seed accounted for 18.5% and 7.5% respectively. During 2012-2013 the formal seed trade exported some US$73 million worth of seeds and imported seeds with a value of US$89 million (TASAI, 2015), accounting for half of formal seed business in Africa. The seed market for local and export sales of main crops total R5.562 billion: R4.296 billion for agronomic seed, R892 million for vegetables, and R374 million for forage/pasture crops. Maize dominated the agronomic market with local and export sales of R3.600 billion, of which only R90 million is open pollinated varieties, the balance being hybrid conventional and genetically modified. Even though the environment in South Africa is not always favourable for seed production, sufficient seed is produced for export purposes. During 2017/18 (see Table 2 and Figure 1), maize (white and yellow) has commanded 79.27% of total seed market value, followed by barley and sunflower. Table 1 below presents the key role players in the South African seed sector and the roles they undertake.

Table 1: The role of key players in the South African formal seed sector

ROLE	KEY PLAYERS
Research and breeding	ARC; MNCs; Local seed companies; Universities
Variety registration & regulation	Department of Agriculture, Land Reform and Rural Development
Administration of National and International Seed Certification Schemes	SANSOR
Breeders and foundation seed production	ARC; MNCs; Universities; Local seed companies
Seed production	SME Seed Companies; MNCs; ARC
Education, training, extension	Seed companies; NGOs; ARC; Government
Distribution and sales	Private sector seed merchants; Agricultural supply outlets; Cooperatives; Local government

Source: TASAI

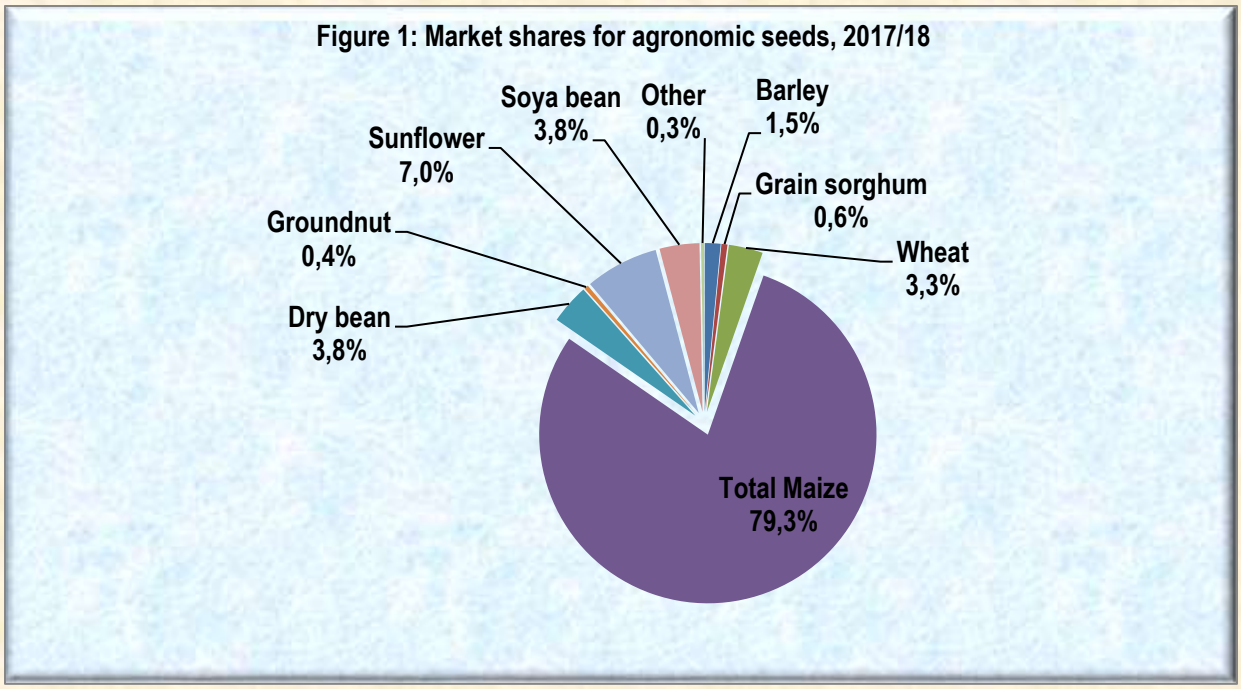
Four companies dominate ownership of maize seed varieties, with 68% between them. These companies are Bayer/Monsanto SA, Pioneer Hi-Bred, Pannar and Klein Karoo Seed. This is not the same as their market share, since some varieties have a greater share than others. Monsanto/Bayer is taken to be the largest maize seed company in the country by sales (DAFF, 2011). Market share is impossible to establish, as companies keep this information confidential. According to confidential industry sources, top 10 companies hold 76% of the top 10 seed varieties, with the same four dominant companies owning more than half of all varieties of the top 10 crops. The shares of various South African commercial agronomic seed crops are presented in Table 2 and Figure 1 below. The highest valued seed crop is maize (white and yellow) at 79.27% of the total market share.

Table 2: Top 10 South African commercial agronomic seed crops by value, 2017/18

Crop	Value (R'000)	% of total market value
Total Maize	4 456 025	79.27
Sunflower	395 594	7.04
Soya beans	214 388	3.82
Dry bean	214 388	3.81
Wheat	184 088	3.3
Barley	84 804	1.51
Grain sorghum	32 391	0.58
Groundnut	22 829	0.41
Other	16 400	0.29
Total Market	5 621 269	**100**

Source: SANSOR

Figure 1 below illustrates the market share of South Africa's agronomic seeds during 2017/18.



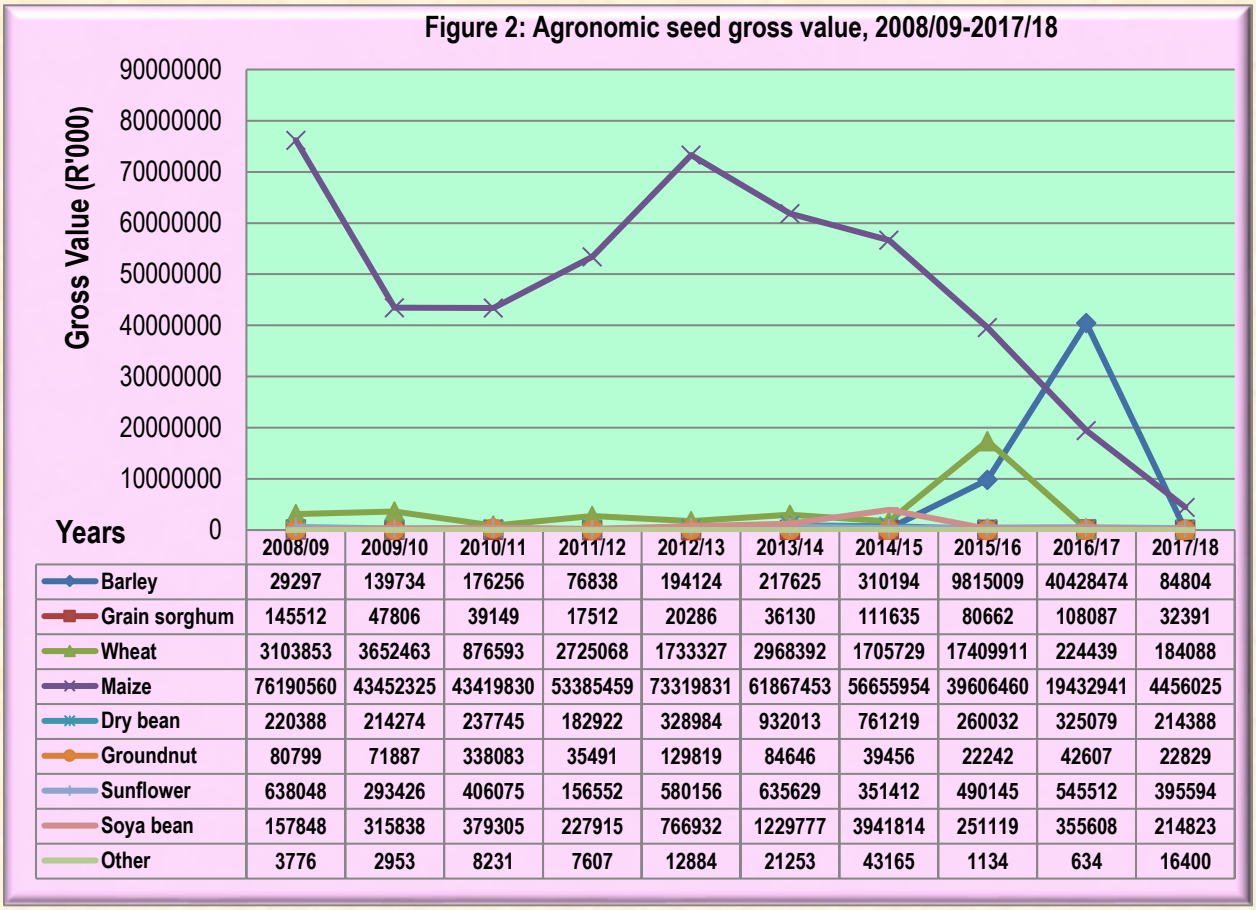
Source: Calculated from SANSOR data

Figure 2 below illustrates the value of agronomic seeds during a ten year period. From 2008/09 to 2017/18, maize seed had comparably higher gross value compared to other agronomic seeds and this can be ascribed to maize being the South Africa's staple food. Wheat seed was the second crop with high seed value followed by sunflower. During 2009/10 and 2010/11 maize seed gross values fell notably lower when compared to other years. These can be attributed to 8.3% and 10% lower production outputs respectively, during the same production seasons. Barley, grain sorghum and groundnut seeds had the least gross values during the period under review and this can be attributed to small hectares planted. High groundnut seed gross value was recorded in 2010/11 and high grain sorghum seed gross value was noted during 2008/09. During 2008/09 and 2013/14, sunflower seed gross value has notably increased. In 2012/2013 all seeds gross values have notably increased except for wheat, which experienced a 16% drop.

During 2013/14 all seed gross values experienced an increment, with the exception of groundnut gross value which dropped slightly by 1% in comparison to the previous year. Barley, grain sorghum and soya bean showed an increase in gross value in 2014/15 as compared to wheat, maize, dry bean, groundnut and sunflower that declined in gross value. During 2015/16, maize gross value notably dropped by 30% when compared to 2014/15 value and this can be attributed to the low export value for white maize, which can be ascribed to drought experienced in the same year. During the same season, barley, wheat, sunflower and

dry beans gross values have notably increased, whilst grain sorghum, groundnut and soya bean gross values experienced increments in gross value. As of 2016/17 season, maize seed gross value dropped sharply by 51%, wheat gross value fell drastically by 98.7%, barley seed has experienced 58.8% decline in value and other seed gross value declined by 44%. At the same season, grain sorghum gross value grew by 34%, soya bean seed increased sharply by 41.6 % and sunflower seed value has gone up by 11% relative to 2015/16 value.As of 2018, there was a overall notable drop in total agronomic seed gross value. According to Sansor, this can be ascribed seed sales which were mainly affected by delayed raining season in the major production areas.

Figure 2: Agronomic seed gross value, 2008/09-2017/18



	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Barley	29297	139734	176256	76838	194124	217625	310194	9815009	40428474	84804
Grain sorghum	145512	47806	39149	17512	20286	36130	111635	80662	108087	32391
Wheat	3103853	3652463	876593	2725068	1733327	2968392	1705729	17409911	224439	184088
Maize	76190560	43452325	43419830	53385459	73319831	61867453	56655954	39606460	19432941	4456025
Dry bean	220388	214274	237745	182922	328984	932013	761219	260032	325079	214388
Groundnut	80799	71887	338083	35491	129819	84646	39456	22242	42607	22829
Sunflower	638048	293426	406075	156552	580156	635629	351412	490145	545512	395594
Soya bean	157848	315838	379305	227915	766932	1229777	3941814	251119	355608	214823
Other	3776	2953	8231	7607	12884	21253	43165	1134	634	16400

Source: calculated from SANSOR data

2. GLOBAL AGRONOMIC SEED MARKET OVERVIEW

The seed industry plays an increasingly vital role in the global pursuit of sustained development and wellbeing of the planet and its people in an environmentally responsible manner. The seed industry's traditional role was as one of the major contributors to sustainable food production. Now the industry is also at the forefront

of developing technological innovations and alternative uses for plants as renewable sources of bio-energy, bio-materials, and plants that will provide food and feed of increased nutritional and even medicinal value to humans and animals. The industry is highly competitive, ensuring an efficient and responsible global seed trade that offers farmers a continuous supply of new high-yielding varieties suitable for different environmental conditions, and for producing crops and products that will continue to meet changing consumer demands and the concerns of civil society (International Seed Federation, 2015). The global seed market is highly concentrated with a few international players. According to Agropages, during 2018 there were big wave os mergers and acquisition in the global seed segment. Dow and Dupont has merged, and Corteva Agriscience, the separated agricultural business division of DowPont was listed separately at the stock exchange. China National Chemical Corporation (ChemaChina) acquired Syngenta; Bayer purchased Monsanto: and Basf completely took over Bayer seed business. These major mergers and acquisitions serve to enable the new big four business portfolio in agrochemicals, seed and biotechnology. The proprietary seed market (that is, brand name seed that is subject to intellectual property), accounts for 82% of the commercial seed market worldwide. Table 3 below indicates the top 10 seed producing companies in the world in terms of sales in 2018. Bayer (Monsanto) from the Germany has the highest seed market sales of US$10 773 million, followed by Corteva Agriscience (from the United States of America), with US$8 007 million) and Syngenta (ChemaChina) from China, with US$3 004 million).

Table 3: Sales of global top 10 seed companies in 2018 (US$m)

Company	Country	2018 sales (US$ mn)
Bayer(Monsanto)	Germany	10 773
Corteva Agriscience (Dow DuPont)	United States	8 007
Syngenta (ChemaChina)	China	3 004
BASF	Germany	2 000
Limagrain	France	1 573
KWS	Germany	678
DFL	Denmark	574
Sakata Seed	Japan	520
Long Ping High-Tech	China	483
Rijk Zwaan	Netherlands	471

Source: AgroPages, 2018

3. AGRONOMIC SEED PRODUCTION TRENDS IN SOUTH AFRICA

The formal seed system in South Africa was worth R3.6 billion in 2010-11 (SANSOR). Maize is by far the largest seed sector in South Africa, with nearly 59% of the total seed market by value. White maize is mainly for human use, and yellow maize is mainly for animal feed, though some is also used for human consumption. Wheat and sunflower, the next biggest seed sectors by value, were far behind maize with a combined just over 9% of the total value between them. The top 10 commercial seed crops in South Africa constituted 81% of the total value of the seed market in 2010-11. Overall, Open Pollinated Varieties (OPVs) are a very important part of the formal seed sector, constituting over 56% of the total market by volume, although a large proportion of OPVs were for export, especially maize.

3.1 Number of active seed breeders

Unlike other African countries, plant breeding in South Africa is dominated by the private sector. Maize has the highest number of active breeders (27), of which 26 are in the private sector. Underlining the predominance of maize, the other three crops combined had only 26 active breeders (seven for soybean, 10 for sunflower and 9 for wheat), only two of which are in the public sector. There are only two public breeders for maize and two for wheat, while there are no public breeders for soybean and sunflower. Three dominant MNCs (Bayer/Monsanto, Pannar and DuPont-Pioneer) employ 80% of private sector maize breeders, 100% of soybean and 100% of sunflower breeders in the country. Most small and medium-scale companies do not have plant breeders.

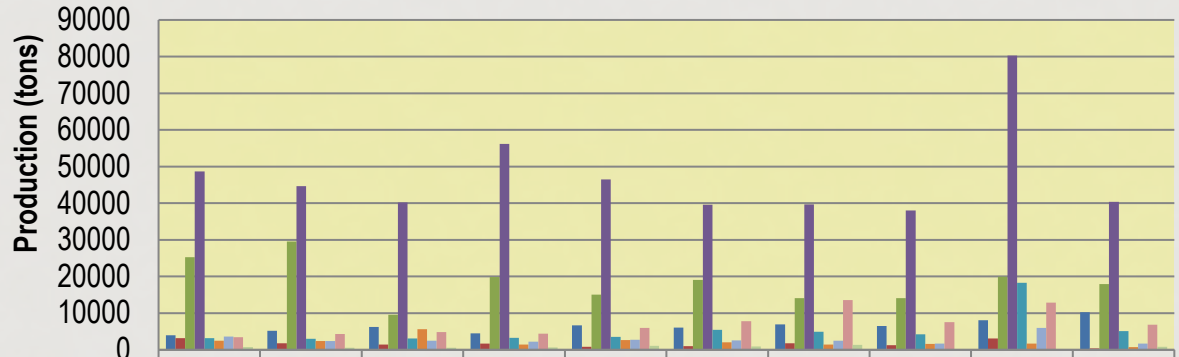
The ratio of technical assistants to breeders is almost 1:1 for all the crops. Although plant breeders at public universities are not included in the numbers above, they are nevertheless an important component of the seed sector research overall. There is at least one plant breeder at all public universities with an agriculture faculty, such as the University of KwaZulu-Natal (UKZN), the University of the Free State (UFS), the University of Limpopo, the University of Venda, and the University of Zululand. For example, UFS has eight plant breeders and UKZN has six. South Africa is the first country in Africa to allow the commercial growing and import of GM seeds for human and animal consumption. Bayer/Monsanto is a leading producer of GM seeds in the world and 80% of South Africa's maize seed are genetically modified. Bayer/Monsanto produces 45% of registered maize seeds traits. South Africa has become a base for Bayer/Monsanto GM seed exports to other countries and for experimenting with new GM crops.

3.2 Agronomic seed production in South Africa

Figure 3 below illustrates total agronomic seed production between 2008/09 and 2017/18. During the period under review, maize seed production was by far the most produced seeds, followed by wheat and dry bean.. During 2010/11, maize seed production output declined by 10% in comparison to 2009/10 season. According to SANSOR reports, farmers were advised to reduce the number of hectares of maize they usually plant, as there was a surplus of maize recorded for the two previous seasons. Dry bean seed production was stable above 3 000 tons from 2008/09 to 2012/13 season. Groundnut seed production was stable above 2 000 tons from 2008/09 to 2009/10 season.There was a notable rise in barley seed production in 2009/10 and in 2010/11, 2012/13 to 2014/15 barley seed were stable above 6 000 tons. Soya bean seed production was stable above 4 300 tons from 2009/10 to 2011/12. During 2012/13 maize seed production has dropped by 17.3% to just over 46 000 tons. According to SANSOR annual report 2012/13, this can be attributed to extremely dry conditions, that have occurred in the large parts of the western areas of the country. This has negatively impacted on the harvested output. In the same season barley, groundnut and soya bean seed production have notably increased. During 2013/14, soya bean, dry bean and wheat seed production has considerably increased, while the maize seed has dropped by 14.8%, when compared to the previous season.

In 2014/15, barley seed has notably increased, while the soya bean seed has almost doubled and this can be attributed an increase in annual soybean plantings. At the same season wheat, dry bean, groundnut and sunflower seed have dropped. In 2015/16, maize seed production fell by 4.5%, grain sorghum seed dropped by 30.8%, dry bean seed went down by 14%, sunflower and soya bean seed production eased lower by 32% and 44% respectively. The drop in seed production can be ascribed to a drought season that occurred in the same season. During 2016/17, there was a surge in maize, sunflower, grain sorghum, dry bean and soya bean seed production, and this can be attributed to the good weather conditions, which resulted in a record high production output. At the same time, barley seed production grew by 24.5%, wheat seed has increased by 42% and groundnut seed production eased higher by 4.7%. As of 2018, there was an overall decline in total agronomic seed production output except for barley seed which grew by 21% relative to 2016/17 production season. This can be attributed to a decline in the total production seed output.

Figure 3 : Total agronomic seed production, 2008/09-2017/18



Years	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Barley	3997	5224	6211	4460	6710	6050	6971	6493	8085	10280
Grain sorghum	3228	1778	1411	1715	798	964	1804	1247	3058	363
Wheat	25235	29560	9555	19879	15021	19034	14062	14091	19973	17965
Maize	48709	44649	40200	56200	46465	39594	39669	38003	80302	40396
Dry bean	3213	3018	3082	3264	3504	5469	4952	4232	18269	5086
Groundnut	2510	2409	5667	1482	2701	2081	1445	1623	1700	705
Sunflower	3632	2392	2479	2209	2763	2612	2507	1708	5957	1726
Soya bean	3467	4341	4823	4367	6016	7849	13595	7556	12883	6833
Other	701	586	527	659	1052	883	1368	88	80	871

Source: SANSOR

4. AVERAGE SEED PRICES

The baseline for seed prices is the combined cost of research and development, production, storage and distribution. Each node in the chain will have its base costs, which are the operational costs. In a capitalist system, a margin of profit or surplus is added to this. This is a cost plus margin pricing, incorporating the cost of the product and overheads plus a profit margin. The distribution of profit between the different nodes is shaped by the relationships of power between the agents in the chain. Another way of setting prices is to include operating expenses and the expected volume of sales. If a co-operative or other farmer-owned entity is selling the seeds, overall operating costs can be divided across all products and services, including staff costs. Most seed in South Africa is sold in bulk order because commercial farmers constitute a very large share of the seed market. Approximately 70% of the maize seed is sold by kernel count, and the common package size is 60 000 or 80 000 kernels, whilst the sunflower size is 180 000 kernel. Soya bean and wheat are mostly sold in 25 kg packages. Table 4 below shows that during 2019, the average price of white maize increased by 1.8% relative to 2018 price. As of 2020, there was a 1.3% increment in the average maize seed price relative to 2018 price.

Table 4: Average price (Rand) of white maize seeds (60 000 kernels/bag) for the period 2018-2020

Cultivars	Years			% change (2019-20)
	2018	2019	2020	
GM	3 080	3 138	3 180	1.3%

Source: Grain SA data

From table 5 below show the average price of GM yellow maize seed (60 000 kernels/bag). As of 2019, the average price of yellow GM maize increased by 1.5% relative to 2018 price. During 2020, the average price for yellow GM maize was 1.6% higher relative to 2019 average price.

Table 5: Average price (Rand) of yellow maize seeds (60 000 kernels/bag) for the period 2018-2020

Cultivars	Years			% change (2018-19)
	2018	2019	2020	
GM	3 298	3 350	3 404	1.6%

Source: Grain SA data

Table 6 below shows that the average price of non GM white maize seed (80 000 kernels/bag) has experienced an decrement of 2.6% when comparing the average price of 2019 and 2020. At the same time, the average of GM white maize has increased by 1.8%. The average price for yellow maize seed (Table 7) was 9.3% higher while the average price for yellow GM maize seed has increased by 5.9% comparing 2018 and 2019. During 2020, the average price of non GM maize grew by 0.2% and the average price of GM maize eased higher by 1.9% relative to 2019 price.

Table 6: Average price (Rand) of white maize seeds (80 000 kernels/bag) for the period 2018-2020

Cultivars	Years			% change (2019-20)
	2018	2019	2020	
Non GM	2 647	2 860	2 934	2.6%
GM	4 183	4 327	4 403	1.8%

Source: Grain SA data

Table 7: Average price (Rand) of yellow maize seeds (80 000 kernels/bag) for the period 2018-2020

Cultivars	Years			% change (2019-20)
	2019	2019	2020	
Non GM	2 754	3 011	3 004	0.2%
GM	3 960	4 196	4 279	1.9%

Source: Grain SA data

From Table 8 below, the average price of 20Kg grain sorghum seed has gone up by 7.6% when comparing 2018 and 2019 while the average price for 25Kg seed was 6.7% higher. In 2020, the average price for 20Kg bag increased slightly by 4.9% whilst the average 25Kg seed price has gone up by 4.6% relative to 2019 average price.

Table 8: Average price (Rand) of grain sorghum seeds for the period 2018-2020

Weight	Years			% change (2019-20)
	2018	2019	2020	
20Kg	1 720	1 850	1 940	4.9%
25Kg	2 015	2 150	2 250	4.6%

Source: Grain SA data

Table 9 below shows that during 2019, the soya bean seed average of 25Kg price dropped by 8.8% and the average price of 25Kg was 2.8% higher when comparing 2019 and 2020 price. As of 2020, the average price of 25Kg GM seeds went down by 4.5%, whilst the 140DP GM soya bean seed price was 19.8% lower when compared to the price in 2019.

Table 9: Average price (Rand) of Soya bean seeds for the period 2018-2020

Weight	Years			% change (2019-20)
	2018	2019	2020	
25Kg (Non GM)	693	632	650	2.8%
25Kg (GM)	809	793	757	-4.5%
140DP/bag (GM)	851	867	695	-19.8%

Source: Grain SA data

Table 10 below shows that the average price of 150 000 kernels/bag sunflower seed was 4.5% up and the price of the 180 000 kernels/bag was 5.1% higher when comparing 2018 and 2019 average prices. In 2020, the average price of 150 000 kernels/bag sunflower seed has gone up by 3.3% and the price of the 180 000 kernels/bag was 3% higher when compared to 2019 average prices.

Table 10: Average price (Rand) of sunflower seeds for the period 2018-2020

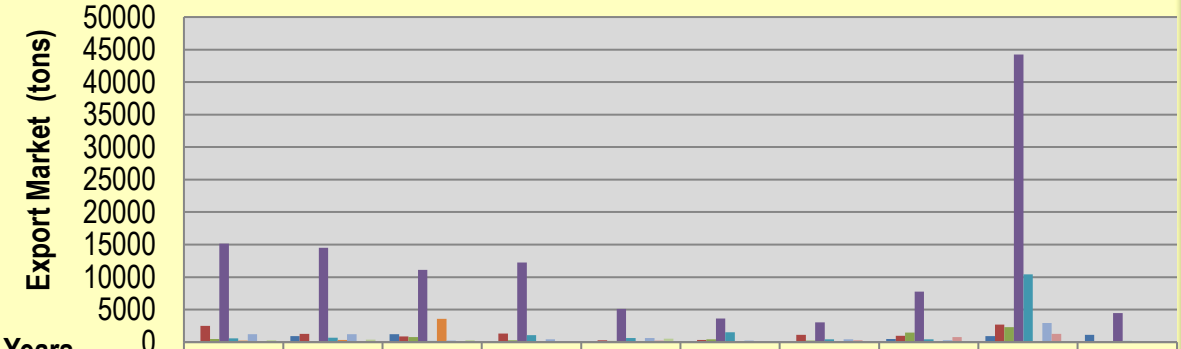
Weight	Years			% change (2019-20)
	2018	2019	2020	
150DP/bag	2 285	2 388	2 467	3.3%
180DP/bag	2 253	2 370	2 443	3%

Source: Grain SA data

5. EXPORTS OF AGRONOMIC SEEDS

Figure 4 below is an illustration of South Africa's Agronomic seed export during the period 2008/09 to 2017/18.

Figure 4: South Africa's Agronomic seeds export



Years	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Barley	0	912	1221	1	0	35	0	483,5	940	1142
Grain sorghum	2491	1289	867	1332	268	325	1130	962	2698	55
Wheat	468	132	780	267	184	443	226	1467	2312	2
Maize	15153	14493	11124	12265	5111	3644	3040	7765	44230	4490
Dry bean	604	701	171	1051	634	1492	412	431	10437	197
Groundnut	220	355	3607	75	44	107	20	0	0,56	0,7
Sunflower	1230	1215	249	450	612	231	413	293	2920	96
Soya bean	98	114	94	8	226	0	289	791	1273	29
Other	263	394	297	0	512	0	0	0	0	0

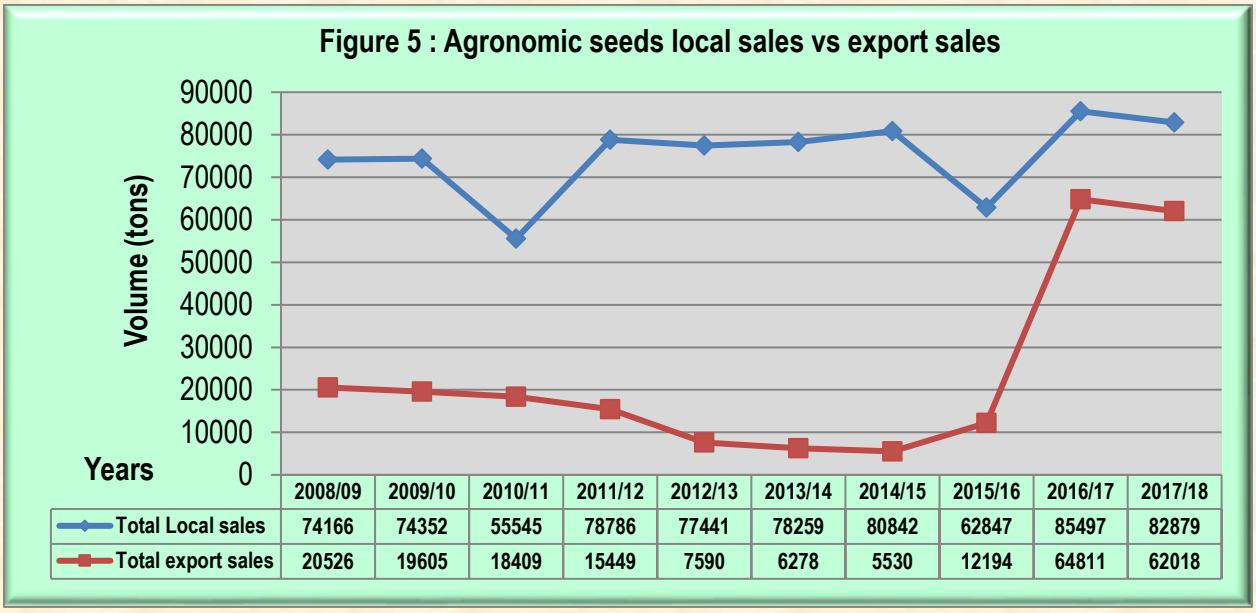
Source: SANSOR

Figure 4 above illustrates agronomic seed export during the ten year period. South Africa has generally exported high volumes of maize, followed by grain sorghum and sunflower. South Africa has exported the highest volume of maize seed in 2008/09 and in the following years, the export volume has notably dropped by 11%. High maize seed export can be attributed to high production volumes of maize from South Africa. From 2008/09 to 2010/11 maize seed export was stable above 11 000 tons and this can be ascribed to high production of maize seed in the same seasons. Notable high volume of groundnut was exported in 2010/11 season. Barley was the least exported seed and notable seed export was in 2009/10 and 2010/11. A notable wheat export was in 2010/11 season and high volume of dry bean was exported in 2013/14.

Maize seed export has drastically dropped by 16% during 2014/15 due to decline in domestic maize seed output. During 2015/16, maize exports surged and this can be ascribed to exports of available seed, which were not planted due to severe drought, which occurred in the same season. In the same season, 483 tons were exported, wheat exports were incomparably higher, soya bean exports surged by 173% and sunflower exports went down by 29%, whilst grain sorghum seed export experienced a notable decrement of 14.8%. In 2016/17, barley exports grew to 940 tons; grain sorghum seed exports surged to 2 698 tons, maize and sunflower seed exports were incomparably higher, which can be ascribed to a record high production output during the same season. At the same time, soya bean exports grew by 61% and wheat seed exports grew notably by 58% relative to the previous season. During 2017/18 season, there was an overall decline in grain seed export except for barley export which rose by 21% relative to 2016/17 season, and these can be ascribed to

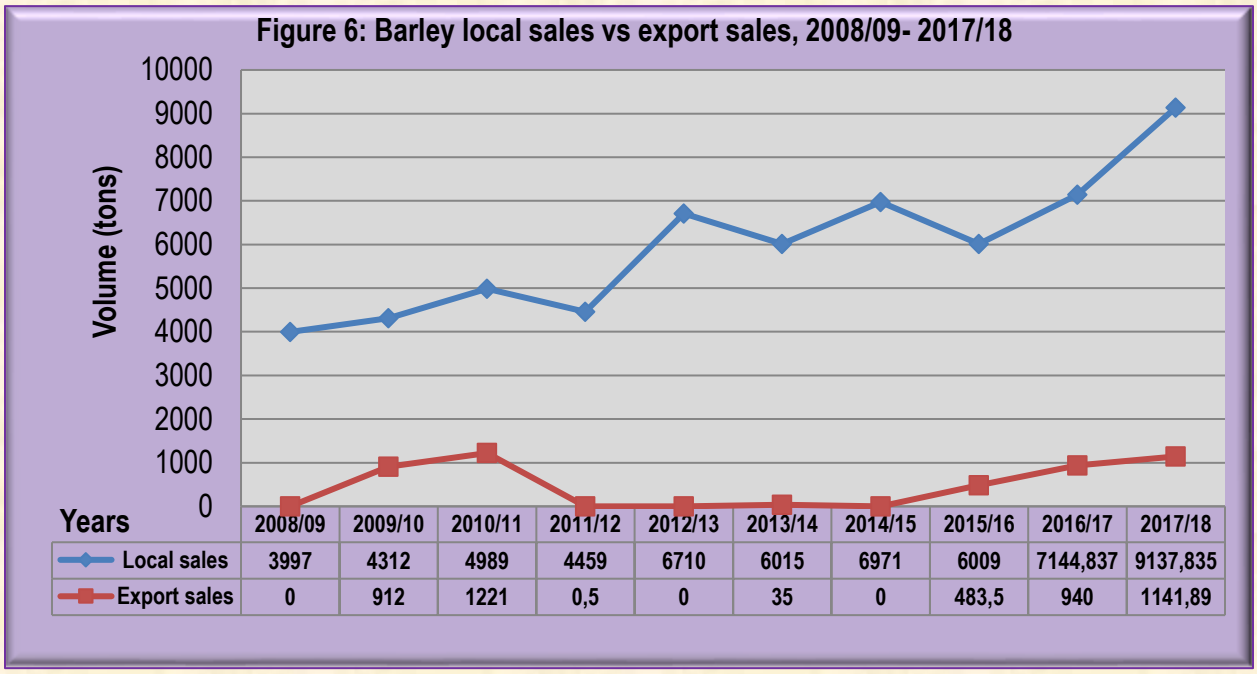
Figure 5 below illustrates South Africa's agronomic seed local sales compared to the export sales. South African local seed sales are generally higher when compared to export sales. This indicates that most seeds produced in South Africa are for the local market. During 2007/08, local seed sales were just above 68 200 tons, while total export sales were just above 11 200 tons. In 2008/09 to 2009/10, local sales have gradually increased. This can be attributed to higher domestic production in the same seasons. A notable increase in seed export volume was recorded in 2008/09 season. During 2010/11 season local sales experienced a notable decline of 25%, when compared with the previous season and in the following season the local sales has sharply increased by 42%. From 2012/13 to 2014/15 local seed sales were stable above 75 000 tons, while the export sales have steadily declined during the same period. During 2015/16, there was a 22% drop in local seed sales, which can be ascribed to the drought and export sales has surged when compared to exports in 2014/15. The surge in exports can be ascribed to available seeds being exported to other countries

as South Africa was experiencing drought in the same season. As of 2016/17, total local seed sales grew by 36%, whilst the export sales were incomparably higher relative to 2015/16 and this can be ascribed to a record high production output during the same season.



Source: SANSOR

Figure 6 below illustrates barley seed local sales vs export sales.

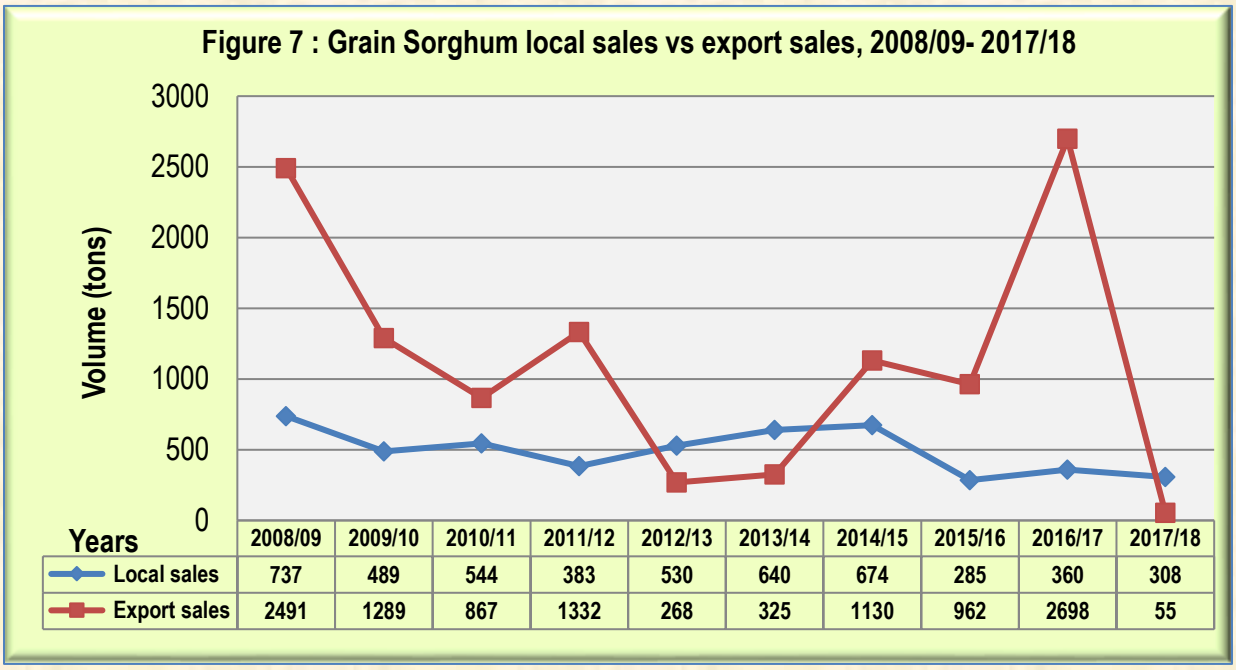


Source: SANSOR

South Africa generally consumes all barley seed it produces. During 2008/09, South African barley seed sales were just above 3 900 tons. During the following year, the seed sales notably increased by 7.8% in comparison to the 2008/09 season. In 2008/09, there were no barley seeds recorded as export sales. During 2009/10 and 2010/11, there was a notable increase in barley production, which resulted in increased local sales and South Africa also recorded 912 tons and 1 221 tons of barley exports in the same years. In the following year, the barley seed exports were insignificant and local sales also dropped. During 2014/15, local sales have increased by 16%, while there were no export sales recorded. In 2015/16, barley local sales went up by 24% in comparison to the previous year sales, whilst the export sales were trivial. As of 2016/17, local barley sales grew by 18.9% and export sales surged by 94% relative to 2015/16 volumes. As of 2017/18 , local sales grew by 27,8% and export sales increased by 21.4% relative to 2016/17 season.

Figure 7 below illustrates grain sorghum seed local sales compared to the export sales.

Figure 7 : Grain Sorghum local sales vs export sales, 2008/09- 2017/18



Years	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Local sales	737	489	544	383	530	640	674	285	360	308
Export sales	2491	1289	867	1332	268	325	1130	962	2698	55

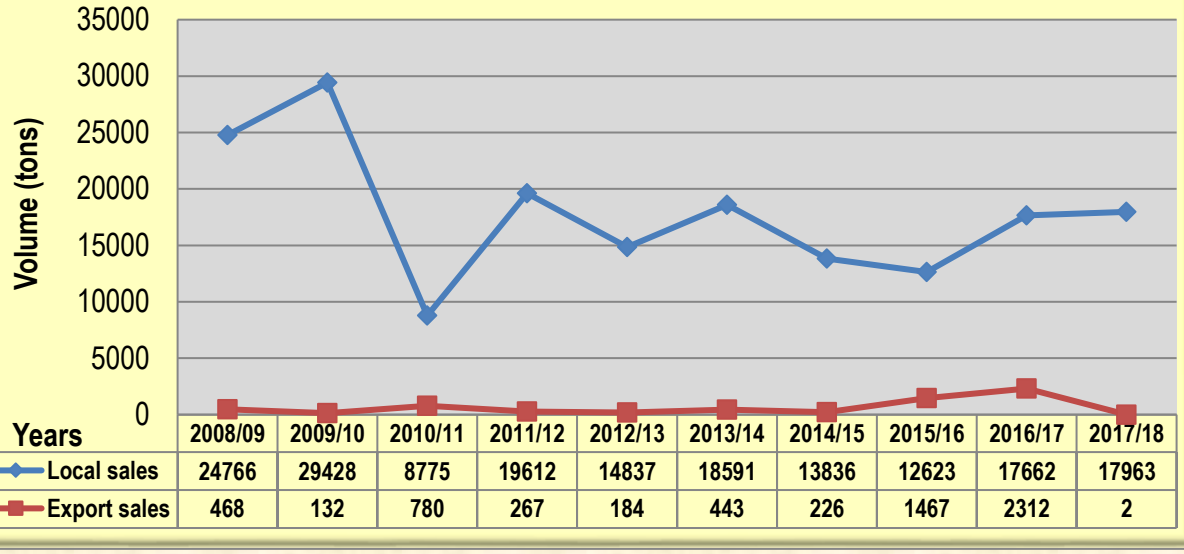
Source: SANSOR

Figure shows that South Africa generally produces grain sorghum seed for both the local and export markets. In 2008/09, local sales were just above 700 tons, while exports were just above 2 400 tons. During 2009/10, grain sorghum export sales declined to 489 tons, while the local sales dropped notably to 1 289 tons during the same year. There was a further decline in export sales during 2010/11. As of 2011/12, local sales fell to a low volume of 384 tons, while the export sales went up by 54%. There was a gradual increase in local sales during 2012/13 and 2013/14. Export sales fell to a record low volume in 2012/13. During 2014/15, grain

sorghum export sales were significantly higher when compared to local sales. Grain sorghum local sales grew slightly by 10% in 2015/16, whereas local exports slightly dropped by 41% in comparison to 2014/15 season. As of 2016/17, export sales surged relative to 2015/16 sales and local sales have increased by 26%. As of 2017/18, grain sorghum local sales dropped slightly 14% and export sales were incomparably lower relative to 2016/17 season.

Figure 8 below illustrates wheat seed local sales compared to the export sales.

Figure 8: Wheat local sales vs export sales, 2008/09- 2017/18



Years	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Local sales	24766	29428	8775	19612	14837	18591	13836	12623	17662	17963
Export sales	468	132	780	267	184	443	226	1467	2312	2

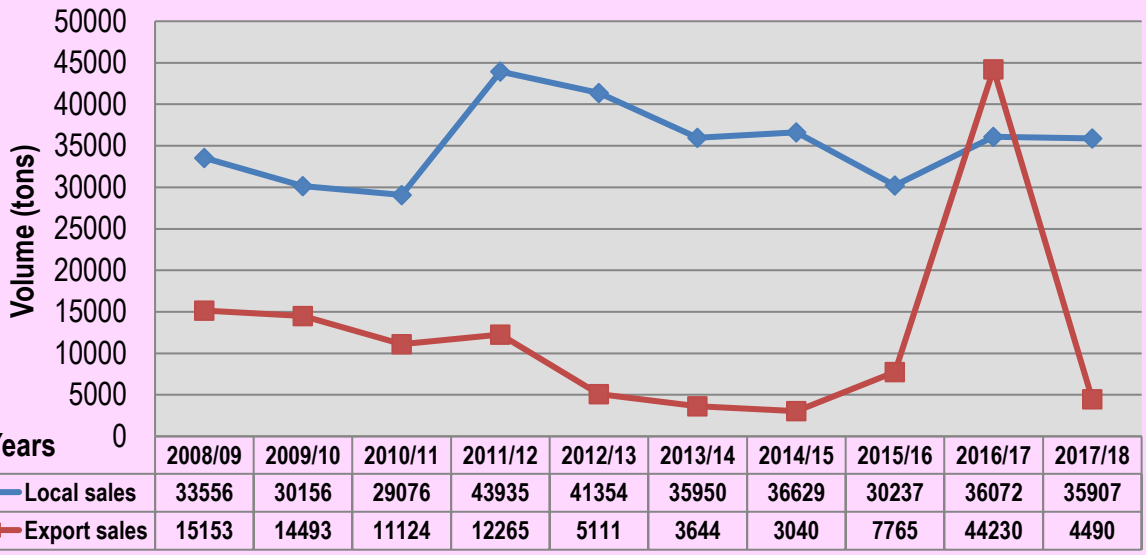
Source: SANSOR

Figure 8 below shows the wheat seed local sales and export sales. South African seed production is primarily for local consumption. During 2008/09, local sales were just above 24 700 tons, while just 468 tons of wheat seeds were exported. There was a drastic drop of local wheat sales during 2010/11 while export sales attained a record high during the same period. During 2011/12 local sales doubled, while export sales dropped by 66% when compared to the previous season. In 2012/13, both local sales and export sales notably dropped and in the following year local sales and export sales increased. During the following year local sales experienced an increase of 25%, while the export sales also increased by 141% when compared to the 2012/13 sales. During 2014/15, local sales decreased by 25.5% and export sales declined by 48.9% in comparison to previous year sales values. There was a 17% increase in wheat local sales in 2015/16, and export sales increased from 226 tons to 364% in comparison to the previous year sales. As of 2016/17, wheat local sales has increased notably by 39.9% and export sales surged by 118% relative to 2015/16 season. As

of 2018, wheat local sales grew slightly by 1.7% and wheat export sales were incomparably lower in comparison 2016/17 season.

Figure 9 below is an illustration of maize local sales compared to export sales.

Figure 9: Maize local sales vs export sales, 2008/09- 2017/18

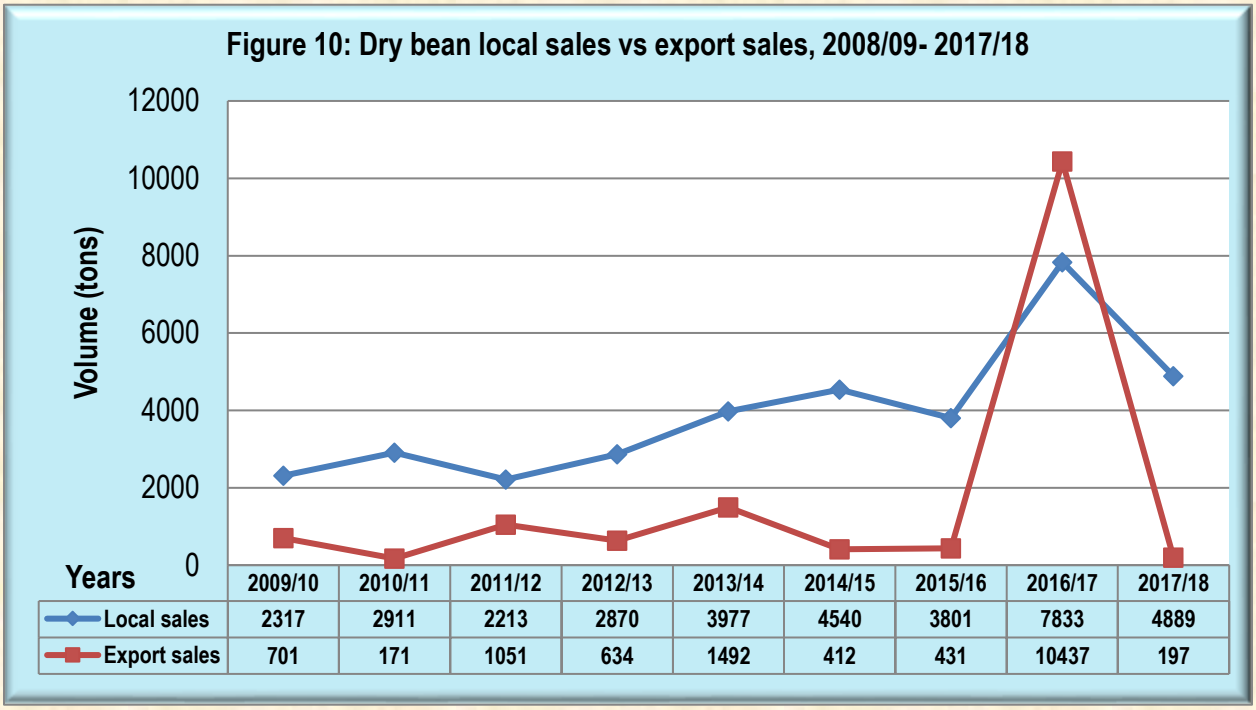


Years	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Local sales	33556	30156	29076	43935	41354	35950	36629	30237	36072	35907
Export sales	15153	14493	11124	12265	5111	3644	3040	7765	44230	4490

Source: SANSOR

Figure 9 above illustrates the maize seed local sales compared to the export sales. South Africa produces maize seed mainly for local production. During 2008/09, local seed sales were just above 33 700 tons and exports were just above 13 600 tons. In 2009/10, local sales volumes were stable just above 30 000 tons, while the export sales were stable above 13 000 tons. There was a slight decline in local sales and export sales during 2010/11 and this can be attributed to a decrease in the domestic seed production in the same season. The local and export sales have notably during 2011/12 and in the following two seasons the local and export sales have notably gradually declined. During 2014/15, maize seed local sales increased slightly by 1.6%, whilst the export sales have gone down by 17% when compared to the previous year. During 2015/16, maize local seed sales dropped by 2.8%, while the seed exports surged in comparison to exports in 2014/15. The surge in exports can be ascribed to available seeds being exported to other countries as South Africa was experiencing drought in the same season.

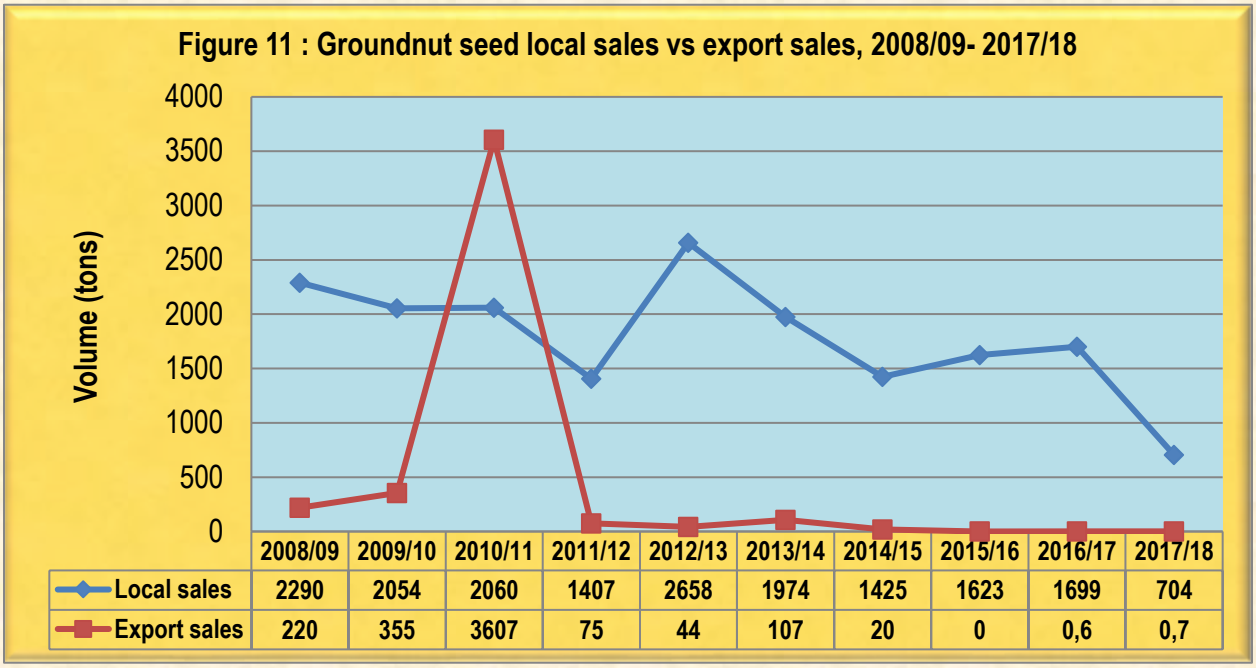
Figure 10 below is an illustration of dry bean local sales compared to export sales.



Source: SANSOR

Figure 10 above shows the comparison between dry bean local sales and the export sales during the ten year period. South Africa's dry bean local sales by far exceed the export sales. This means that South African dry bean seed production is primarily for the local market. During 2008/09, local seed sales were just above 2 600 tons, whilst export sale was just above 600 tons. From 2009/10 to 2012/13, local sales volumes were stable above 2 000 tons, while the export sales were very unstable. There was a drastic increase in export sales during 2011/12 whilst the local sales dropped by 24% in comparison to the previous year figure. In 2013/14, dry bean local sales and export sales surged to record highs and this can be attributed to record high dry bean seed production in the same season. Dry bean local sales experienced a further 14% increase in 2014/15 while export sales dropped from 1 492 tons to 412 tons. During 2015/16, dry bean seed local sales increased by 29.9%, whereas export sales dropped by 42% in comparison to the previous year sales. In 2016/17, there was a surge in dry beans local sales and export sales when compared to 2015/16 sales. As of 2017/18, local seed sales decreased by 37% and export sales was incomparably lower compared to 2016/17 sales.

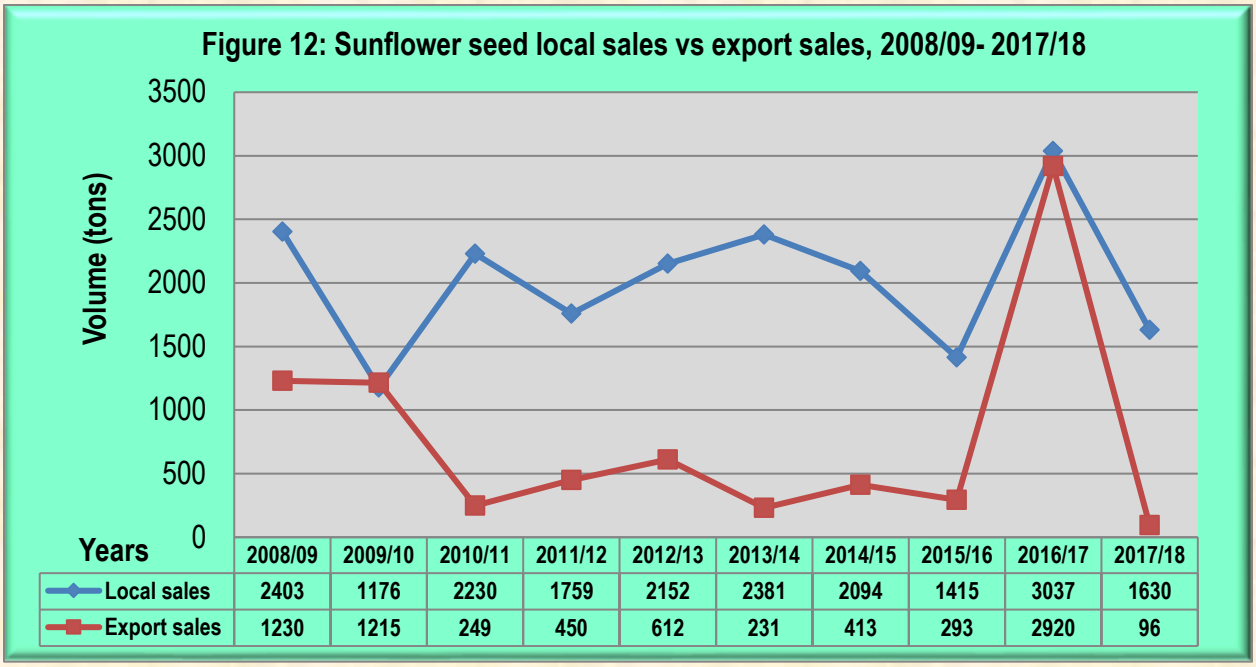
Figure 11 below is an illustration of groundnut seed local sales compared to export sales.



Source: SANSOR

Figure 11 above shows the local sales of groundnut seed compared to export sales during a ten year period. During 2008/09, groundnut local sales were just above 2 200 tons, while export was just above 200 ton. From 2009/10 to 2010/11, local groundnut seed sales have been stable just above 2 000 tons. In 2010/11, groundnut seed export sale was 75% more than the local seed sales. During 2011/12, there was a sharp decline in both local and export seed sales, which can be attributed to the 74% decrease in the domestic output. In 2014/15, local sales dropped to just above 1 400 tons and export sales went down to 20 tons. During 2015/16, local sales dropped further by 44%, whilst export sales increased from 20 to 38 tons in comparison to the previous year sales. In 2016/17, groundnut local sales grew slightly by 4.7% and the export sales were just 0.6 tons. As of 2017/18, groundnut local sales dropped significantly by 59.6%, whereas export sales grew notably 16% relative to 2016/17 volumes.

Figure 12 below is an illustration of sunflower seed local sales compared to export sales.



Years	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Local sales	2403	1176	2230	1759	2152	2381	2094	1415	3037	1630
Export sales	1230	1215	249	450	612	231	413	293	2920	96

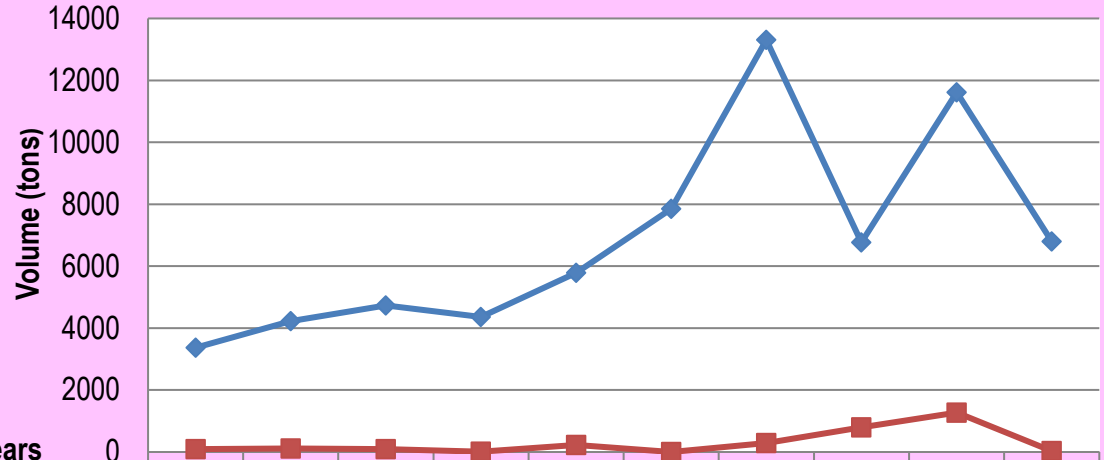
Source: SANSOR

The local sales are by far higher than the export sales and this indicates that South African sunflower seed production is mainly for local production. In 2008/09, local sales was just above 2 400 tons and export sales was just above 1 200 tons. During 2009/10 groundnut local sales dropped by half and in the following year export sales drastically dropped from 1 215 ton to 249 tons. In 2011/12 and 2012/13 local sales and export sales increased steadily and in 2013/14 local sales increased further. During 2014/15, export sales increased by 78%, while local sales decreased by 12% when compared to the previous year. In 2015/16, sunflower local sales dropped slightly by 5,2%, whereas export sales increased by 14% in comparison to 2014/15 season. As of 2016/17, local sales volume surged by 114% and exports were incomparably higher relative to 2015/16 season. In 2017/18, sunflower locales sales declined notably by 46% and export sales volume was incomparably lower compared to 2016/17 volume.

Figure 13 below shows soya bean seed local sales compared to export sales during a ten year period. During 2008/09 local sales were just above 3 360 tons and just 98 tons of seed were exported. From 2009/10 to 2011/12 local sales have been stable just above 4 000 tons. In the following year local and export sales significantly increased and in 2014/15 a record high local sales volume was recorded. High local sales can be ascribed to an increase in the area planted with soya bean. During 2015/16, there was a sharp decline of 42% in local sales, whilst the export sales increased notably by 38% in comparison to the previous season.

In 2016/17, soya bean sales surged by 71.6% and the export sales grew drastically by 61% relative to 2015/16 season. As of 2017/18, soya bean local sales dropped drastically by 41% and export sales volume was incomparably lower in comparison to 2016/17 volume.

Figure 13 : Soya bean seed local sales vs export sales, 2008/09 - 2017/18



Years	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Local sales	3369	4228	4730	4359	5789	7849	13306	6765	11610	6803
Export sales	98	114	94	8	226	0	289	791	1273	29

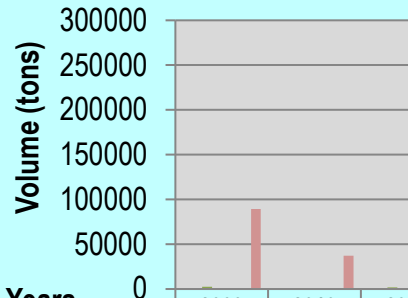
Source: SANSOR

6. IMPORTS OF AGRONOMIC SEEDS

Figure 14 below illustrates agronomic seed imports during a ten year period. Figure 14 shows that from 2009 to 2011, South Africa has recorded zero imports for wheat seed, barley seed, grain sorghum seed, soya bean seed and groundnut seed. In 2009, maize seed imports were just about 2.477 tons and sunflower seed imports was about 89 219 tons. During 2010, maize seed imports notably dropped by 52.6% and sunflower seed imports has drastically decreased by 58.5% compared to 2009 imports. In 2012, South African maize seed imports drastically increased and this can be attributed to a significant decrease in maize seed domestic production. In the same year, South Africa also imported grain sorghum, barley, soya bean and groundnut seeds for the first time in a ten year period. During 2013, maize, barley and grain sorghum seeds imports significantly dropped, whilst soya bean and sunflower seed imports notably increased. At the same time, South Africa imported wheat for the first time in a ten year period but the import volume was insignificant. There was a surge in sunflower seed imports in 2014, which can be attributed to a 16% decline in domestic seed production. In the same year, there was a notable increase in wheat, barley, maize and soya bean seed

imports. In 2015, sunflower and grain sorghum seed imports drastically dropped whilst maize seed imports surged. During 2016, South Africa's maize and grain sorghum seed imports surged when compared to 2015 seed imports. Wheat, barley, sunflower and soya bean imports have also slightly increased. During 2017, South Africa's maize, grain sorghum and sunflower seed imports dropped sharply, which can be ascribed to high domestic production output. In the same season, there were notable increments in soya bean, groundnuts and barley seed imports relative to the 2016 season. In 2018, wheat seed import has increased to 15 tons, dry beans seed imports has surged to 183 tons, whereas barley, maize, grain sorghum, soya beans and sunflower seed imports have drastically dropped relative to 2017 seed imports.

Figure 14: South Africa's agronomic seed import, 2009-2018



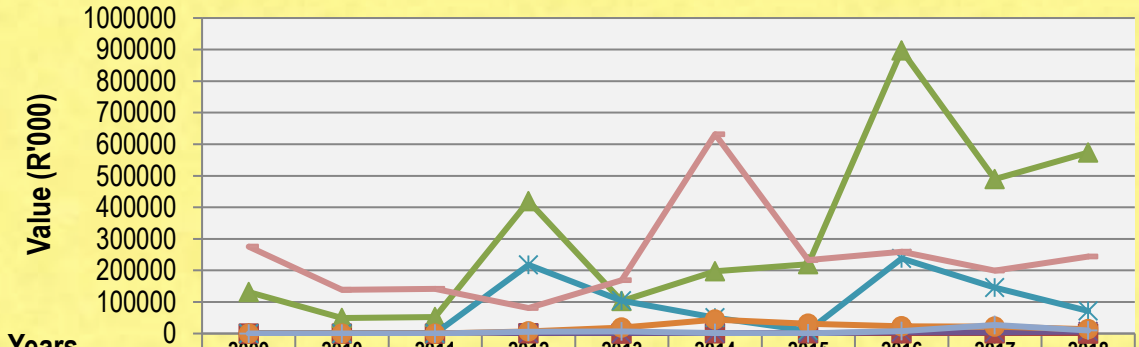
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Wheat	0	0	0	0	1	197	1	10	0,7	15
Barley	0	0	0	144	3	13	15	22	31	1
Maize	2477	1175	1645	159412	2280	3497	35079	253485	43512	6661
Dry bean	0	0	35	178	64	45	36	462	50	183
Grain Sorghum	0	0	0	99605	44540	19954	385	88581	59086	25056
Soya bean	0	0	0	821	2014	4579	3099	3479	4815	1944
Groundnuts	0	0	0	516	471	162	53	554	3144	1957
Sunflower	89219	37032	37444	13633	34464	127133	41558	42221	32268	3209

Source: Quantec Easydata

Figure 15 below shows the value of agronomic seed imports during a ten year period. High import values were recorded for maize and sunflower seeds due to high imported volumes. It was cheaper to import maize seed in 2010, while it was relatively also expensive to import sunflower seed, when compared to 2009 import values. During 2011, South Africa recorded trivial import value the for dry bean seeds. In 2012, sunflower was more expensive to import while the maize seed was imported at a lower value compared to the previous year. During 2015, it was more expensive to import barley, groundnut, grain sorghum, sunflower, and soya bean seeds since higher values were recorded for less volumes imported when compared to the previous year. In 2016, it was relatively more expensive to import grain sorghum, followed by soya bean and sunflower,

whilst maize seeds were cheaper to import when compared to 2015 imports. During 2017, it was relatively more expensive to import barley followed by maize, groundnuts, sunflower, soya bean, whilst it was relatively cheaper to import grain sorghum seeds. As of 2018, fairly more expensive to import maize, followed by sunflower, dry beans, barley, soya beans, groundnut, whereas wheat was relatively cheaper to import.

Figure 15: Value of South Africa agronomic seed imports



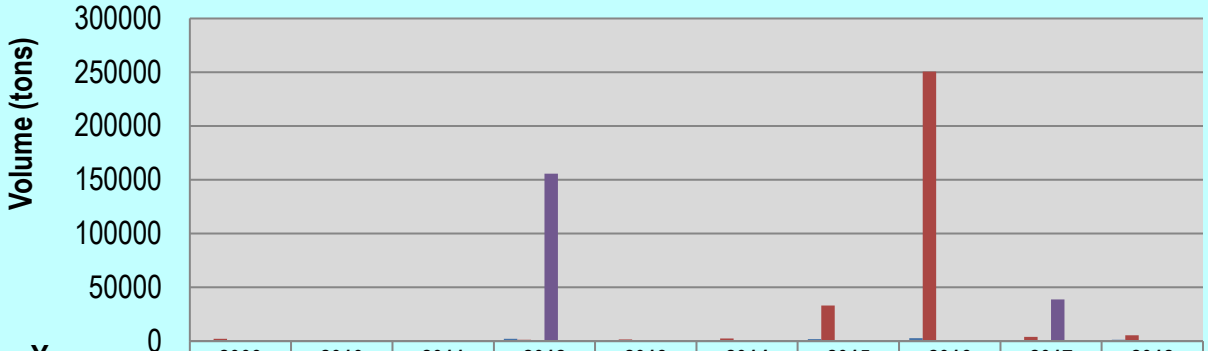
Years	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Wheat	0	0	0	0	1	1848	11	111	12	31
Barley	0	0	0	489	35	135	214	225	617	20
Maize	131681	49253	51844	418977	102949	197385	219703	897476	489745	573633
Dry bean	0	0	208	1114	681	645	459	5133	3384	6588
Grain Sorghum	0	0	0	217733	104290	49882	8234	237820	145451	71848
Soya bean	0	0	0	6249	18670	44047	30983	23162	21458	13697
Ground nuts	0	0	0	5576	6378	1969	923	7680	27189	10009
Sunflower	275397	138638	141334	80799	169305	631768	232433	259494	199316	243602

Source: Quantec Easydata

Figure 16 below shows the regions that supplied South Africa with the maize seeds during the ten year period. America regions is by far the primary supplier of South Africa maize seeds imports, while Africa region has also contributed to a lesser extent. During 2009, there was a considerable volume of maize seed imports were sourced from Europe and Asia region. In 2010, there was a notable increase in maize seed imports from Africa and import from Americas region has drastically dropped. There was a surge in maize seeds imported from Europe, America and Africa during the 2012 season. During 2014 and 2015, maize seeds from America gradually increased while seed imports from Oceania have decreased. In 2016, America region was the primary supplier of maize seed and the import was a record high in a ten-year period. At the same time, just above 2 800 tons of maize seed were sourced from Africa region, 68 tons were sourced from Oceania while seed imports from Asia have dropped from 53 tons to just 17 tons. In 2017, Europe region was the main supplier of maize seed, followed by Americas region and Africa. At the same season, there was a sharp

decline in maize seed sourced from Oceania and Asia. During 2018, maize seed import from Oceania has surged. In the same year, there was a 39.8% increase in maize seed from America region, Maize seed from Africa region has gone up by 35.7% whilst imports from Asia has dropped by 11% relative to 2017.

Figure 16: South Africa's maize seed import



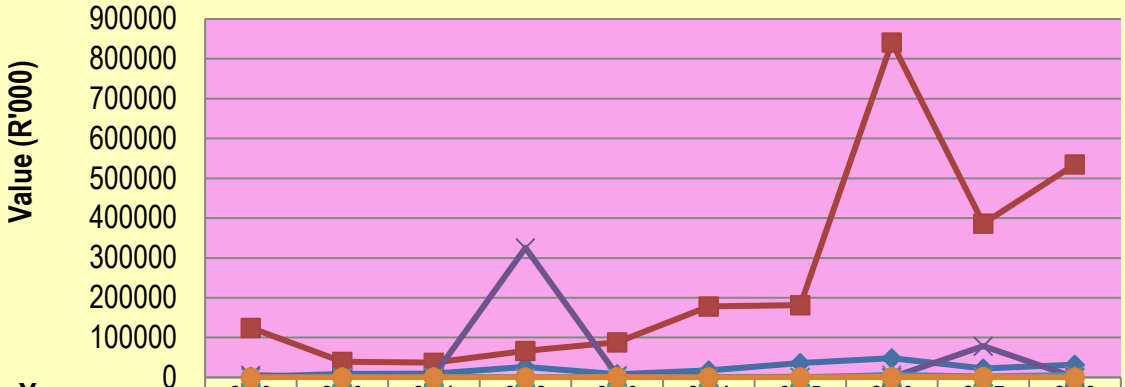
Years	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Africa	156,72	441,35	753,98	2150,60	544,69	1010,73	1825,31	2803,91	888,51	1205,82
Americas	2196,37	672,10	771,02	1405,99	1560,87	2455,98	33195,69	250547,34	3858,95	5398,15
Asia	42,51	44,90	19,39	9,02	71,03	25,79	53,17	17,15	4,25	3,78
Europe	81,79	16,76	80,63	155792,90	40,37	1,68	4,83	0,07	38731,43	1,65
Oceania	0,06	0	18,55	15,55	6,57	2,61	0	68,22	9,89	51,26
Not allocated	0	0	1,50	37,54	56,42	0,50	0	48,00	19,01	0,00

Source: Quantec Easydata

Figure 17 below shows the value of South Africa's maize seed imports from 2009 to 2018. It was generally cheaper to import maize seed from the African region while seed imports from Europe were relatively more expensive. In 2009, South Africa imported seeds from Europe with high values. It was relatively more expensive to import maize seed from Americas region in 2010, followed by Oceania and Europe, whilst the seed from Africa was relatively cheaper. During 2012, it was cheaper to import maize seeds from Europe, followed by imports from the Asia. In 2014 maize seed imports from America were comparatively more expensive compared to the other years. In 2015, Oceania was by far the most expensive market for South Africa maize seed imports, whereas it was relatively cheaper to import maize seed from America. It was relatively more expensive to import maize seeds from Oceania and Asia regions, whilst the seeds from Africa and America regions were cheaper to import. During 2017, maize seed imported from Oceania was relatively expensive, followed by America and Asia, whereas imports from Africa and Europe regions were relatively

cheaper. As of 2018, maize seed imports sourced from Oceania region was fairly expensive, followed by Americas, Europe and Africa region, whilst seed imports sourced from Asia region was relatively cheap.

Figure 17: Value of South Africa maize seed imports, 2009-2018



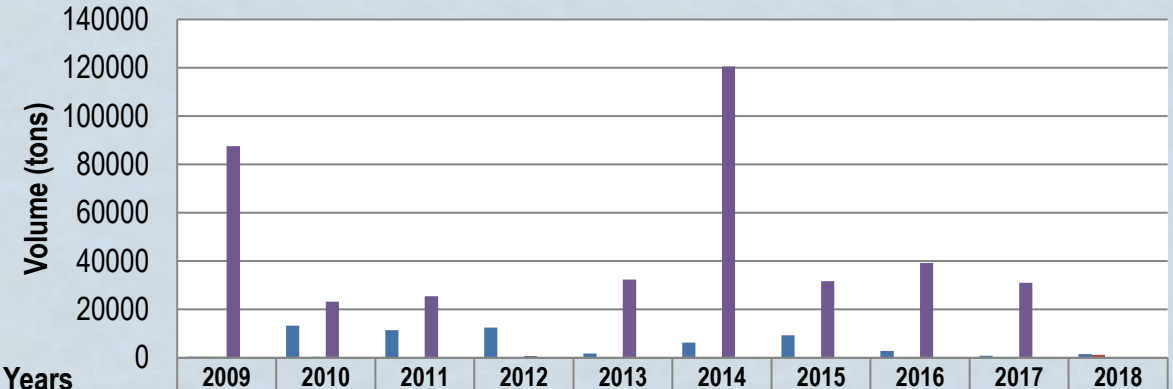
Years	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Africa	1376,27	8297,97	9601,22	26078,33	7642,77	17860,88	36269,57	48277,15	21954,48	32085,79
Americas	124138,2	39396,31	37040,90	66463,15	88036,91	178318,6	181284,6	841302,9	386724,6	535017,4
Asia	713,40	885,28	288,04	77,49	1070,19	826,26	1691,66	984,64	326,86	64,44
Europe	5449,22	673,67	4576,99	325502,0	4443,01	339,59	456,66	0,34	78336,74	132,59
Oceania	3,95	0	331,01	737,60	1152,68	16,92	0,75	5946,16	1890,21	6332,37
Not allocated	0	0	6,00	118,86	603,19	22,31	0,03	965,21	512,47	0

Source: Quantec Easydata

Figure 18 below shows South Africa's sunflower seed imports from 2009 to 2018. The biggest suppliers of sunflower seed imports during the past ten years were Europe and Africa. The Americas, Asia and Oceania also contributed some significant import volumes during the period under review. During 2009, Europe region was the primary source for South Africa's sunflower seed imports, followed by Americas and Asia regions. As of 2010 and 2011, the import from Europe region fell to just above 23 000 tons, whilst imports from Africa region has surged to 13 337 tons. In 2012, there was a notable increment in sunflower seed imports from Africa, whilst seed import from Americas, Asia and Europe have experienced significant decrements. During 2013, there was a significant increase in sunflower seed imports sourced from Europe region and in the following year, the imports from this region has surged to just above 120 000 tons. During 2015, imports from Europe has dramatically dropped, while sunflower imports from Africa region has increased by 46.9% when compared to 2014 import volume. In 2016, Europe region has continued to be the main supplier of South Africa's sunflower seed imports. In 2017, Europe region was still be the primary supplier of South Africa's sunflower seed imports, however the import volume has dropped by 20.7% relative to 2016 imports. At the same time, the imports from Africa region sharply declined by 70%, whilst imports from Asia were

incomparably higher relative to 2016 imports. As of 2018, Africa region was the primary supplier for sunflower seed, followed by Americas, whilst the imports from Europe and Asia have sharply dropped relative to 2017 imports

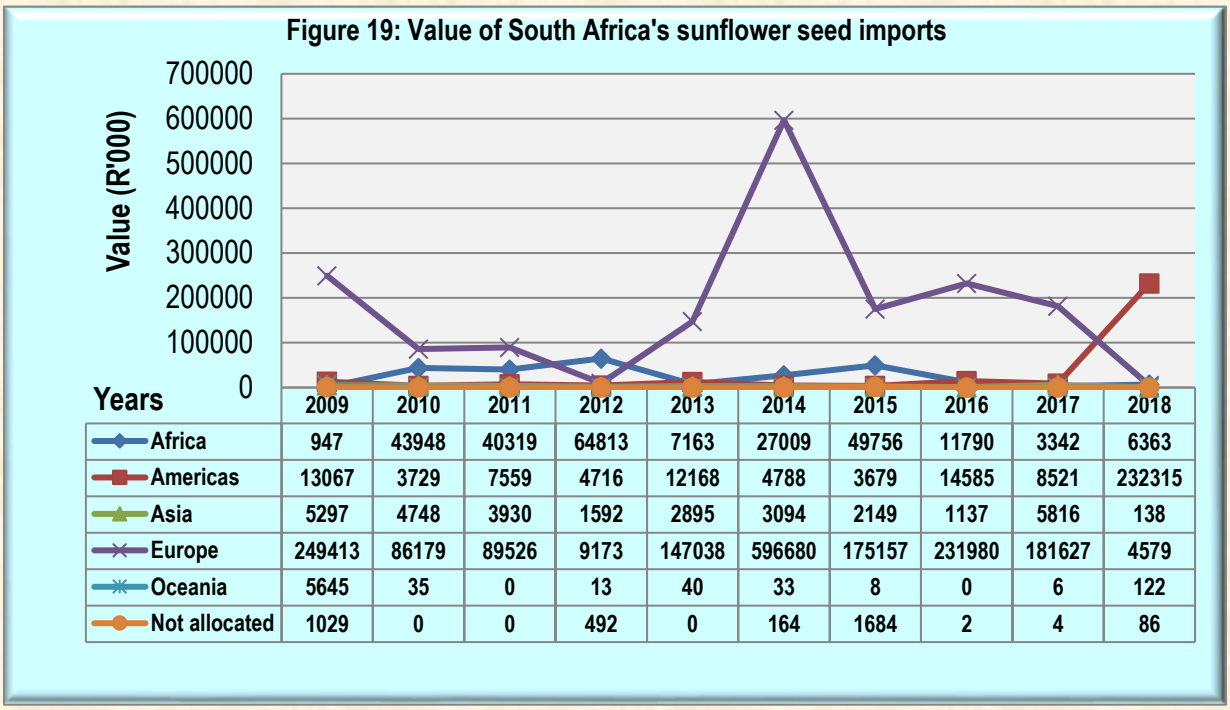
Figure 18: Sunflower seed imports from regions



Years	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Africa	510,00	13337,43	11513,14	12563,20	1833,13	6322,02	9291,23	2812,82	842,56	1489,05
Americas	486,05	80,14	176,59	83,07	174,83	85,49	139,80	169,13	157,05	1308,28
Asia	396,81	430,53	252,38	92,45	114,38	75,59	67,81	10,23	191,28	4,01
Europe	87627,18	23183,21	25502,30	776,64	32341,13	120618,2	31765,53	39229,17	31077,09	381,63
Oceania	176,04	0,58	0	0	0,84	0,12	0,31	0,01	0,05	0,48
Not allocated	22,50	0	0	117,66	0	31,82	293,06	0,07	0,17	25,45

Source: Quantec Easydata

Figure 19 below shows the value of South Africa's sunflower seed imports from 2009 to 2018. Generally, it was relatively more expensive to import sunflower seed from Oceania and America, whilst seed imports from Africa region were relatively cheaper. During 2009, sunflower seed imports from Africa and Europe were relatively cheaper. In 2010, it was relatively more expensive to import sunflower seeds from Americas region, followed by Europe and Africa regions. In 2012, imports from Oceania and America were imported at a higher value when compared to the previous year imports. During 2013, America and Oceania continued to supply South Africa with sunflower seeds at a higher value. In 2014 and 2015, it was relatively cheaper to import seeds from Europe and Africa. During 2016, it was still relatively more expensive to import sunflower seed from the Asia region, followed by America and Oceania regions, whilst imports from Europe and Africa were still much cheaper. In 2017, sunflower seed imports from Oceania were expensive, followed by imports from Americas and Asia, whereas seed imports from Europe and Africa were relatively cheaper. During 2018, sunflower seed sourced from Oceania region was relatively more expensive, followed by America, Asia, Europe, whilst imports from Africa region were relatively cheaper



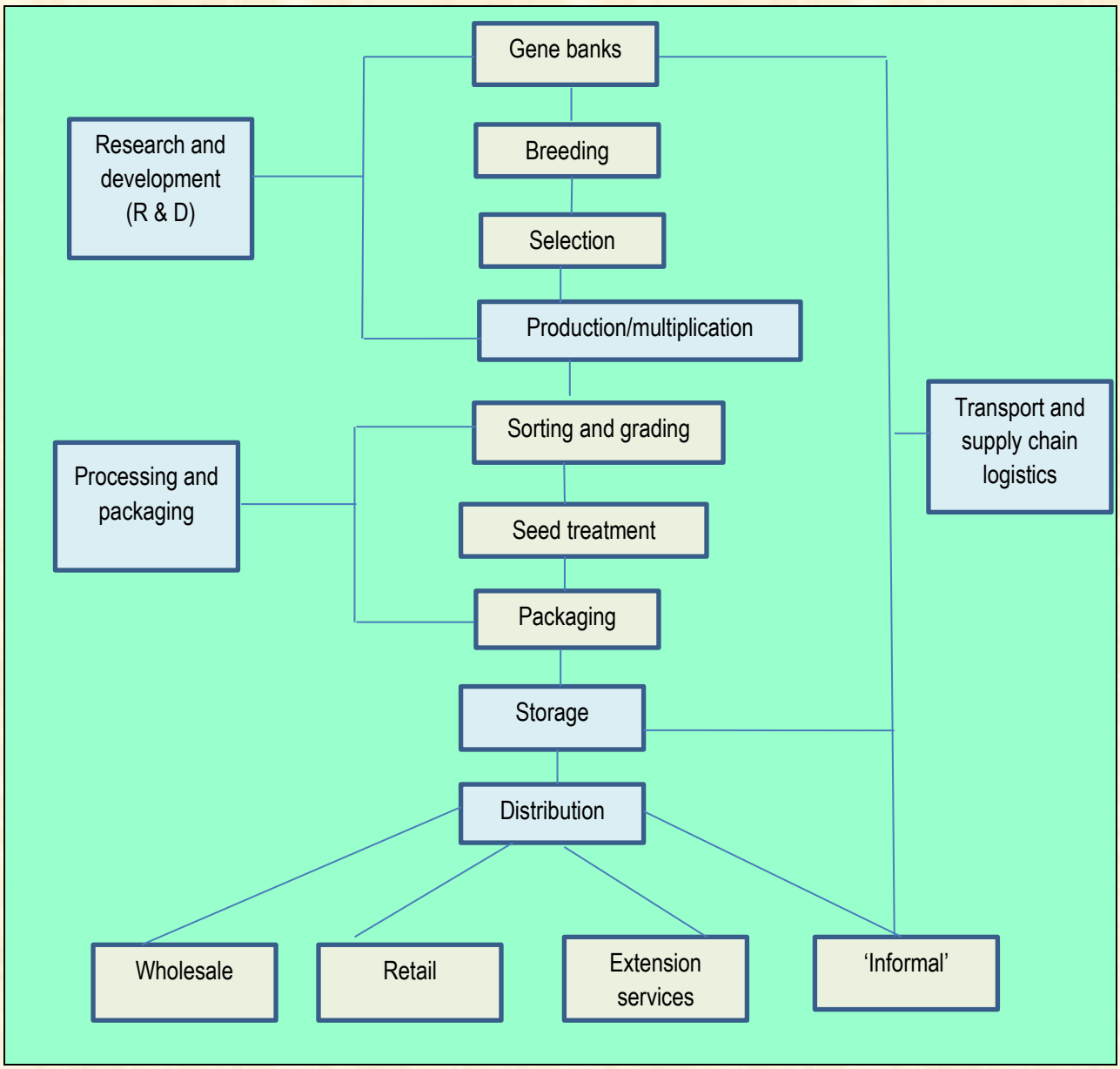
Years	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Africa	947	43948	40319	64813	7163	27009	49756	11790	3342	6363
Americas	13067	3729	7559	4716	12168	4788	3679	14585	8521	232315
Asia	5297	4748	3930	1592	2895	3094	2149	1137	5816	138
Europe	249413	86179	89526	9173	147038	596680	175157	231980	181627	4579
Oceania	5645	35	0	13	40	33	8	0	6	122
Not allocated	1029	0	0	492	0	164	1684	2	4	86

Source: Quantec Easydata

7. VALUE CHAIN OF SEED

The agronomic seed value chain is presented in Figure 20 below.

FIGURE 20: Agronomic seed value chain



Source: African Centre for Biosafety

8. DIVISION OF ACTIVITIES FOR SEED PRODUCTION WITHIN A VALUE CHAIN

8.1 Research and Development

Seed consists of genetics and technology. Genetically Modified Organism (GMO) genes (traits) are the technology that is transported by the genetics of a parent seed. Seed is developed to enhance yield, improve disease resistance and growth patterns. The germ plasma (genetics) may be developed locally or imported. The traits (technology) are developed internationally and imported. There are two basic types of products: open or self-pollinating (wheat, soybean and groundnuts) and the hybrids (maize, sunflower, cotton, vegetable seed, forage). Hybrids start with the development of two genetically pure parent seeds through a selective inbreeding process that may take up to seven years. Companies are licensed for the use of the GMO traits and pay a technology fee to the patent owner. Where the company does not develop the genetics, royalties are paid to the breeders. Because growing conditions and diseases in South Africa may differ from where the germ plasma and traits are developed, a lot of research and development is necessary to adapt to local requirements. The inbreeding or selective breeding process is done through various trials. The research facilities are in different locations for the purpose of disease, yield and drought resistance testing. The seed cultivars are then registered in terms of the Plant Breeders Act and Plant Improvement Act. Further semi-commercial trials are conducted for two more years before the seed is commercially released. Various companies spend billions annually on research into new technologies and hybrids. The development of a new GM-crop can cost as much as R520 million, before the crop is introduced commercially. These new technologies enable breeders to shorten the breeding period considerably. Companies spend between 10% and 15% of turnover on Research and Development.

8.2 Seed Production

Once a variety has been selected for commercialization, the formal seed system enters into the production stage. There are three stages of seed multiplication in the formal seed system (Setimela et al., 2006:6): (i) breeders' and pre-basic seed; (ii) foundation or basic seed; (iii) certified seed under contract. Limited amounts (about 7 kg) of breeders' seed are produced with high varietal purity. This is then multiplied to produce pre-basic seed with a ratio of 1:10x. In some cases, a second pre-basic batch is produced, again multiplied by 10. Breeders produce this seed on small plots (0.3 ha) to monitor that there is no cross-pollination and to make sure the plants are 'true to type'. The breeder or variety developer is responsible for maintaining genetically pure breeders' seed.

8.3 Sales and marketing

All of the role-players in the seed production industry have their own workforce for the production, marketing and sales of their seed. These also include agronomists. Seeds are sold through agents, cooperatives or directly from production plants. Carryover stocks are returned to the plant at the end of the season. Maize seed stock is fumigated for insects before returning to storage. No carry over stock is resold without being tested again for germination. Should there be any reason why the seed cannot be resold, then it is destroyed because of the chemical treatment. Should there be damage or quality problems before the chemical treatment; the seed is sold as grain. No carry over stock of soybeans are stored, these are sold to processors. For open pollinating crops, a non-propagation agreement is signed with the farmers to limit the use of seed for replanting. Farmers receive discount for early ordering, early payment and bulk buying. There are also discounts for the cooperatives who take ownership of the seed. Price formation is based on the cost of production, the value of the product in the market as well as ensuring competitiveness. The recovery of Research and Development costs are very difficult to determine for a specific cultivar that is sold now but developed over the last 7 years. This leads to some cross financing between cultivars and between crops.

8.4 Processing, packaging and storage

After harvesting, seed is conditioned or processed and then packaged for sale to farmers. The first stage is assembly, where the seeds produced in different places are gathered at a central point for cleaning, sorting, grading and packaging. This can be at the homestead or an industrial level. Seed is pre-tested for purity and pre-cleaned (removal of other material that got mixed in with the seed when it was harvested). After grading and sorting seed is usually then treated with herbicides or fungicides for storage and germination. Processors aim to delay treatment for as long as possible because this can negatively affect germination. They will only treat enough seed to meet expected demand. Beans and groundnuts are not treated as seed, but are treated on the farm by farmers a day before planting.

8.5 Distribution

The final stage of the seed production process is distribution to the end user, the farmer. Distribution can take the form of direct sales, wholesale, retail, agents, extension services, between individuals, groups and networks. There are three main channels for distribution: direct, dealer and distributor seed systems. In direct distribution, the seed producer sells directly to the farmer. This works when farmers are geographically

concentrated and can generate high returns for seed producers. In dealer-distribution systems, producers sell the seed through dealers. The latter is usually more in touch with the needs of local farmers, but the retailer (the agro-dealer) captures a share of the value added. In a distributor system, producers sell to distributors, who then sell to merchants and agents, who then sell to retailers/dealers, who then sell to the farmer. Here the producer outsources the distribution network, but loses value added. Furthermore, companies are listed by activities as Breeders, Broker/Agent, Conditioner/Cleaner, Exporter, Grower/producer, Importer, Retailer, and Wholesaler. The same company may do various and/or all activities.

8.6 Costs involved in seed production

Research and Development costs can only be recovered in the long term. Constant breeding programs are needed because diseases and plant requirements change constantly (NAMC, May 2012). The following costs are incurred during commercial seed production:

- ✓ Breeders are highly skilled, scarce professionals;
- ✓ Technology fees (GMO cultivars);
- ✓ Royalties;
- ✓ Accreditation;
- ✓ Certification;
- ✓ DNA tests for genetic purity;
- ✓ Safety equipment in plants;
- ✓ Logistics and storage to ensure traceability of the lots back to the farm;
- ✓ Technology owner needs to monitor the use of refuge areas where the GMO seeds are planted and thus responsible for the product stewardship;
- ✓ Down time of plants for cleaning; dry runs on the machines and labour intensive without product output;
- ✓ Premium prices to producers because seed compete with other crops under irrigation;
- ✓ Assistance for spray programs;
- ✓ Credit to farmers by some of the companies;
- ✓ Contractors for the removal of by-products (husks and cobs);
- ✓ Infrastructure costs for production plants is high because most of the equipment is imported;

- ✓ Labour cost, highly skilled breeders to be retained in a competitive environment and additional casual workers during peak times in seed multiplication and production plants; and
- ✓ Finance costs, as it takes several years and seed generations, for which the seed production farmers have to be paid, before any return is realized when the cultivar is finally sold for commercial production.

8.7 Quality of seed regulation and enforcement

Quality of seed regulation and enforcement in South Africa's seed sector is regulated through four acts, namely the Plant Improvement Act no. 53 of 1976 (as amended), the Plant Breeders' Rights Act no. 15 of 1976 (as amended), the Agricultural Pests Act no. 36 of 1983 (as amended), and the GMO Act no. 15 of 1997 (as amended). Various secondary acts affect seeds and varieties such as the Fertilizers, Farm Feeds, Agricultural Remedies, and Stock Remedies no. 36 of 1947 (as amended). At 70% satisfaction, the quality of the regulatory enforcement was rated as very good. Most of the acts that regulate the South African seed industry are in a state of being amended, with some being completed and some in process and some forthcoming.

8.8 National seed trade association

The seed industry in South Africa has an organized and effective national seed trade association, the South African National Seed Organization (SANSOR). SANSOR is a registered non-profit association. The association has a total membership of 118 of which 72 are full members (seed companies), 21 are associate members (service providers), seven are affiliate members, nine are international company members, two are third party distributors, and seven are honorary members. SANSOR was rated excellent for all aspects such as activeness (92%), effectiveness in advocacy (92%), management ability (93%), democracy in election and decision-making (90%) and the capacity to mobilize resources (90%). The overall rating of SANSOR is excellent at 92%, a score that is much higher than any of the other national seed traders associations. SANSOR is the designated authority for conducting official seed certification on behalf of the Ministry of Agriculture, Forestry and Fisheries. It employs some 210 contracted seed inspectors and samplers for seed certification and is a regular participant in meetings or congresses of the International Seed Federation (ISF), International Seed Testing Association (ISTA), American Official Seed Certifying Authorities (AOSCA), African Seed Trade Association (AFSTA), Organization for Economic Cooperation and Development (OECD), and other international organizations. Its organizational structure comprises three divisions:

agronomy, horticulture, and pasture/forage. Its various specialist committees assist with SANSOR functions, which include seed testing, plant breeders' rights, phytosanitary issues, arbitration and licensing of public seed varieties.

8.9 Challenges

- ✓ Poor infrastructure, especially roads;
- ✓ Old varieties susceptible to diseases and pests;
- ✓ High operational costs (especially investment in processing and storage facilities);
- ✓ Lack of linkages with public sector breeding initiatives and public-private sector partnerships;
- ✓ Over-regulation and lack of capacity in the regulator;
- ✓ Empowering smallholder farmers to produce quality seeds in a legal and organized manner, including the certification of the seed under the auspices of the SA Seed Certification Scheme; and
- ✓ It is extremely difficult to attract suitable candidates from the target group of previously disadvantaged individuals, who are committed to a career in the seed industry.

9. RECENT DEVELOPMENT IN THE INDUSTRY

On the 08 May 2017, the Competition Commission approved, with conditions, a merger whereby Bayer Aktiengesellschaft (Bayer) acquired Monsanto Corporation (Monsanto). Bayer is active in the crop protection business in South Africa selling fungicides, insecticides, herbicides and seed treatment products among others. On the other hand, Monsanto is active in the supply of seeds, bio-technology traits and herbicides in South Africa. Both Bayer and Monsanto are also involved in research and development (R&D) for bio-technology traits and the discovery and development of active ingredients globally, which are critical inputs in the development of genetically modified (GM) seeds and agro-chemicals, respectively. The Commission identified competition concerns in the market for the supply of GM cotton seeds. The merger also results in the removal of potential competition as it removes the opportunity for Bayer to independently enter into South Africa and compete against Monsanto, particularly in the development and production of traits for seeds and the accompanying herbicides used in a number of agricultural markets. There are also several structural factors in this seed industry, which are conducive for coordinated conduct, which would be enhanced by the merger through the prevalence of cross licensing agreements. In order to remedy all the identified concerns, the Commission imposed conditions for the merged entity to divest and sell the entire global Liberty Link trait

technology and the associated Liberty branded agro-chemicals business of Bayer. The Commission has also imposed a condition that requires the potential buyer of the divested businesses to commercialize the divested products in South Africa, or alternatively, oblige the potential purchaser to license the divested business to a South African third party to commercialize anywhere in the world should the purchaser be unable to do so. The Commission identified public interest concerns specific to South Africa relating to employment and support for emerging farmers, that have been remedied. The merging parties have now applied to the tribunal to reconsider the commission's conditions to the merger.

Agriculture, Land Reform and Rural Development Minister Thoko Didiza has upheld a decision to reject agriculture chemical company Monsanto's application for the commercial cultivation of its triple stacked drought-tolerant maize seed. The maize is genetically modified (GM) to be tolerant to drought as well as resistant to certain insects. Minister Didiza made a final decision on an appeal lodged by Monsanto SA against the decision taken by the executive council regarding the general release application of a GM maize event, MON87460 x MON89034 x NK603. Its refusal was based on the fact "that kernel count per row and kernel count per ear showed that there were no statistically significant differences between the MON87460 x MON89034 x NK603 maize event and conventional maize in water limited conditions. "The yield benefits associated with the MON87460 x MON89034 x NK603 maize event were inconsistent and in some trials the MON87460 x MON89034 x NK603 maize event had lower yields than the conventional maize.

The department has mentioned that "The insect resistance data presented was insufficient since it was only collected from one trial site for two planting seasons," Monsanto lodged an appeal in November against the refusal of its general release application by the executive council. The appeal board upheld the decision to refuse the application and recommended more sites and seasons were needed to demonstrate efficacy of the drought tolerance gene. On 28 August 2019, Didiza made the final decision, upholding the appeal board's decision "and as such the refusal of a general release application for the MON87460 x MON89034 x NK603 maize event is sustained". The decision revealed that insect resistance data was insufficient since it came from only one trial site for only two planting seasons.

10. ACKNOWLEDGEMENTS

The following organizations are acknowledged:

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