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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 2014/2015 (see Table 2 and Figure 1), maize (white and yellow) has commanded 88.6% of total seed market value, followed by, soya bean, wheat, dry bean 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

<table>
<thead>
<tr>
<th>ROLE</th>
<th>KEY PLAYERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research and breeding</td>
<td>ARC; MNCs; Local seed companies; Universities</td>
</tr>
<tr>
<td>Variety registration &amp; regulation</td>
<td>Department of Agriculture, Forestry and Fisheries</td>
</tr>
<tr>
<td>Administration of National and</td>
<td>SANSOR</td>
</tr>
<tr>
<td>International Seed Certification</td>
<td></td>
</tr>
<tr>
<td>Schemes</td>
<td></td>
</tr>
<tr>
<td>Breeders and foundation seed</td>
<td>ARC; MNCs; Universities; Local seed companies</td>
</tr>
<tr>
<td>production</td>
<td></td>
</tr>
<tr>
<td>Seed production</td>
<td>SME Seed Companies; MNCs; ARC</td>
</tr>
<tr>
<td>Education, training, extension</td>
<td>Seed companies; NGOs; ARC; Government</td>
</tr>
<tr>
<td>Distribution and sales</td>
<td>Private sector seed merchants; Agricultural</td>
</tr>
<tr>
<td></td>
<td>supply outlets; Cooperatives; Local government</td>
</tr>
</tbody>
</table>

Source: TASAI
Four companies dominate ownership of maize seed varieties, with 68% between them. These companies are 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 is taken to be the largest maize seed company in the country by sales (DAFF, 2011). Market share is impossible to establish as this information is kept confidential by companies. 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 88.6% of the total market share.

Table 2: Top 10 South African commercial agronomic seed crops by value, 2014/15

<table>
<thead>
<tr>
<th>Crop</th>
<th>Value (R'000)</th>
<th>% of total market value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Maize</td>
<td>56655954</td>
<td>88.63</td>
</tr>
<tr>
<td>Soya bean</td>
<td>3941814</td>
<td>6.17</td>
</tr>
<tr>
<td>Wheat</td>
<td>1705729</td>
<td>2.67</td>
</tr>
<tr>
<td>Dry bean</td>
<td>761219</td>
<td>1.19</td>
</tr>
<tr>
<td>Sunflower</td>
<td>351412</td>
<td>0.55</td>
</tr>
<tr>
<td>Barley</td>
<td>310194</td>
<td>0.49</td>
</tr>
<tr>
<td>Grain sorghum</td>
<td>111635</td>
<td>0.17</td>
</tr>
<tr>
<td>Other</td>
<td>43165</td>
<td>0.07</td>
</tr>
<tr>
<td>Groundnut</td>
<td>39456</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Total Market</strong></td>
<td><strong>63920578</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: SANSOR
Figure 2 below illustrates the value of agronomic seeds during a ten year period. From 2005/06 to 2014/15, 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 which declined in gross value.
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 proprietary seed market (that is, brand name seed that is subject to intellectual property), accounts for 82% of the commercial seed market worldwide. In 2007, the global proprietary seed market was US$22,000 million. The total commercial seed market was valued at $26,700 million during the same year. The
commercial seed market does not include farmer-saved seed. With the global commercial market for planting seed currently estimated at $38.5 billion, the U.S. market is estimated to be 30 percent of the global market. The domestic share of U.S. seed exported is equal to approximately $1.25 billion, which is approximately 10 percent of the overall value of the U.S. seed industry. Table 3 below indicates the top 10 seed producing companies in the world in terms of market shares in 2007. Monsanto from the United States of America has the highest seeds market share in the world, taking up 23% of the total seeds market, followed by DuPont (also from the United States of America, with 15% of the total market share) and Syngenta (from Switzerland, with a 9% market share). The market share taken up by the top 10 companies totalled 67%.

Table 3: The world's top 10 seed companies in 2007

<table>
<thead>
<tr>
<th>Company</th>
<th>USA $ - Million</th>
<th>% of market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monsanto (US)</td>
<td>4 964</td>
<td>23%</td>
</tr>
<tr>
<td>DuPont (US)</td>
<td>3 300</td>
<td>15%</td>
</tr>
<tr>
<td>Syngenta (Switzerland)</td>
<td>2 018</td>
<td>9%</td>
</tr>
<tr>
<td>Groupe Limagrain (France)</td>
<td>1 226</td>
<td>6%</td>
</tr>
<tr>
<td>Land O’ Lakes (US)</td>
<td>917</td>
<td>4%</td>
</tr>
<tr>
<td>KWS AG (Germany)</td>
<td>702</td>
<td>3%</td>
</tr>
<tr>
<td>Bayer Crop Science (Germany)</td>
<td>524</td>
<td>2%</td>
</tr>
<tr>
<td>Sakata (Japan)</td>
<td>396</td>
<td>&lt;2%</td>
</tr>
<tr>
<td>DLF-Trifolium (Denmark)</td>
<td>391</td>
<td>&lt;2%</td>
</tr>
<tr>
<td>Takii (Japan)</td>
<td>347</td>
<td>&lt;2%</td>
</tr>
<tr>
<td>Top 10 Total</td>
<td>14 785</td>
<td>67%</td>
</tr>
</tbody>
</table>

Source: NAMC

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 total of 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 (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. Monsanto is a leading producer of GM seeds in the world and 80% of South Africa’s maize seed are genetically modified. 45% of registered maize seeds traits are produced by Monsanto. South Africa has become a base for Monsanto’s GM seed exports to other countries and for experimentation with new GM crops.

3.2 Agronomic seed production in South Africa

Figure 3 illustrates total agronomic seed production between 2005/06 and 2014/15. During the period under review, maize seed production was by far the most produced seeds, followed by wheat and dry bean. At the same time a very low soya bean seed was produced. In 2006/07, maize seed production sharply increased by 59% when compared to the previous year. During 2008/09 there was a notable increase in grain sorghum seed production. From 2006/07 to 2008/09, maize and wheat seed production has gradually increased. Maize went on to decrease by 8.3% in the 2009/10 season and the output has
declined further by 10% in 2010/11 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 2005/06 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.
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 there was a notable 17.37% increase in the average price of 60 000 kernels/bag, Non GM white maize seed whilst the average price for GM has increased by 4.67% when comparing 2015 and 2016. The GM maize seed price was far higher when compared to the non-GM maize seed price.

### Table 4: Average price (Rand) of white maize seeds (60 000 kernels/bag) for the period 2014-2016

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Years</th>
<th>% change (2015-16)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2014</td>
<td>2015</td>
</tr>
<tr>
<td>Non GM</td>
<td>1 310</td>
<td>1 350</td>
</tr>
<tr>
<td>GM</td>
<td>2 167</td>
<td>2 353</td>
</tr>
</tbody>
</table>

Source: Grain SA data

The average price of Non GM yellow maize (see Table 5) was 6.52% higher in 2016 in comparison to 2015 average price while the GM seed price has increased by 3.78% during the same period. From Tables 4 and 5 it is evident that the average price for GM maize seed is by far higher than the non GM maize seed. Over 80% of South African maize seed are genetically modified.
Table 5: Average price (Rand) of yellow maize seeds (60 000 kernels/bag) for the period 2014-2016

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Years and prices</th>
<th>% change (2015-16)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2014</td>
<td>2015</td>
</tr>
<tr>
<td>Non GM</td>
<td>1 653</td>
<td>1 755</td>
</tr>
<tr>
<td>GM</td>
<td>2 639</td>
<td>2 766</td>
</tr>
</tbody>
</table>

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 increment of 4.9% when comparing the average price of 2015 and 2016. At the same time the average of GM white maize has increased by 6.61%. The average price for yellow maize seed (Table 7) was 7.71% higher while the average price for yellow GM maize seed has increased by 8.14%.

Table 6: Average price (Rand) of white maize seeds (80 000 kernels/bag) for the period 2014-2016

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Years</th>
<th>% change (2015-16)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2014</td>
<td>2015</td>
</tr>
<tr>
<td>Non GM</td>
<td>2 151</td>
<td>2 231</td>
</tr>
<tr>
<td>GM</td>
<td>2 971</td>
<td>3 125</td>
</tr>
</tbody>
</table>

Source: Grain SA data

Table 7: Average price (Rand) of yellow maize seeds (80 000 kernels/bag) for the period 2014-2016

<table>
<thead>
<tr>
<th>Cultivars</th>
<th>Years</th>
<th>% change (2015-16)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2014</td>
<td>2015</td>
</tr>
<tr>
<td>Non GM</td>
<td>2 156</td>
<td>2 363</td>
</tr>
<tr>
<td>GM</td>
<td>2 852</td>
<td>3 045</td>
</tr>
</tbody>
</table>

Source: Grain SA data

From Table 8 below, the average price of 20Kg grain sorghum seed has gone up by 5.5% when comparing 2015 and 2016 while the average price for 25Kg seed was notably 26.6% higher.
Table 8: Average price (Rand) of grain sorghum seeds for the period 2014-2016

<table>
<thead>
<tr>
<th>Weight</th>
<th>Years</th>
<th>% change (2015-16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20Kg</td>
<td>1 336</td>
<td>1 476</td>
</tr>
<tr>
<td>25Kg</td>
<td>1 568</td>
<td>1 751</td>
</tr>
</tbody>
</table>

Source: Grain SA data

In Table 9, the average price of 25Kg soya bean seed was 4.4% higher in 2015 when compared to the price in 2014. During 2016, the average price has went up by 6.56%, in comparison to 2015 average price.

Table 9: Average price (Rand) of Soya bean seeds for the period 2013-2015

<table>
<thead>
<tr>
<th>Weight</th>
<th>Years</th>
<th>% change (2015-16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25Kg</td>
<td>659.75</td>
<td>693.59</td>
</tr>
</tbody>
</table>

Source: Grain SA data

At the same time, the average price of 150 000 kernels/bag sunflower seed was 4.3% up and the price of the 180 000 kernels/bag was 6.2% higher when comparing 2014 and 2015 average prices. In 2016, the average price of 150 000 kernels/bag sunflower seed has gone up by 8.5% and the price of the 180 000 kernels/bag was 8.8% higher when comparing 2015 and 2016 average prices.

Table 10: Average price (Rand) of sunflower seeds for the period 2014-2016

<table>
<thead>
<tr>
<th>Weight</th>
<th>Years</th>
<th>% change (2014-16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150DP/bag</td>
<td>1 245.00</td>
<td>1 331</td>
</tr>
<tr>
<td>180DP/bag</td>
<td>1 681.30</td>
<td>1 802</td>
</tr>
</tbody>
</table>

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 2005/06 to 2014/15.

Figure 4: South Africa's agronomic seeds exports, 2005/06-2014/15

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. High maize seed can be attributed to high production volumes of maize by South Africa. From 2007/08 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 from 2013/14 to 2014/15 due to decline in domestic maize seed output.
Figure 5 below illustrates the total local sales against the export sales during the ten year period. 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 2005/06, local seed sales were just above 38 000 tons while total export sales were just above 17 000 tons. In 2006/07 export sales notably dropped compared to the previous year sales. Local sales sharply went up between 2005/06 and 2006/07 and from 2006/07 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.

Source: SANSOR

Figure 6 below shows the local sales of barley seed compared to export sales during a ten year period. South Africa generally consumes all barley seed it produces. During 2005/06, South African barley seed sales were just above 2 000 tons. During the following year the seed sales considerably increased by 42% in comparison to the 2005/06 season. Seed sales gradually increased in 2006/07 and 2007/08 season. From 2005/06 to 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.

![Figure 6: Barley seed local sales vs export sales, 2005/06-2014/15](image)

Source: SANSOR

Figure 7 below is an illustration of grain sorghum seed local sales and export sales. Figure shows that South Africa generally produces grain sorghum seed for both the local and export markets. In 2005/06 local sales were just above 700 tons, while exports were just above 1 000 tons. During 2006/07 export sales and local sales decreased. In 2007/08, the local sales were higher by 85% when compared to export sales which decreased by 18%. During 2008/09, grain sorghum export sales surged to 2 491 tons, while the local sales dropped to 737 tons during the same year. There was a gradual decline in export sales during 2009/10 and 2010/11. In 2011/12 local sales fell to a record 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.
Figure 8 below shows the wheat seed local sales and export sales. South African seed production is primarily for local consumption. Local sales in 2005/06 were over 13 000 tons and the wheat seed export sales were 20 tons. During 2006/07 local sales surged to just above 19 000 tons, while just above 40 tons of wheat seeds were exported. From 2007/08 local sales gradually increased peaking during 2009/10. A notable volume of 468 tons was exported in 2008/09 season. 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.
Figure 9 below is an illustration of maize local sales compared to export sales.

Source: SANSOR

![Figure 8: Wheat seed local sales vs export sales, 2005/06-2014/15](image)

![Figure 9: Maize local sales vs export sales, 2005/06-2014/15](image)

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 2006/07, local seed sales surged while the export sales dropped by 42% in comparison to the previous year volumes. In 2007/08 to 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.

![Figure 10: Dry bean seed local sales vs export sales, 2005/06-2014/15](image)

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 2005/06, local seed sales significantly increased by 58% and export sales went up by 90% when compared to the previous year sales. There was a sharp decline in export sales and local sales during 2007/08 and this can be attributed to the 40.3% drop in domestic dry bean seed production. From 2008/09 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.

Figure 11 below shows the local sales of groundnut seed compared to export sales during a ten year period. Local groundnut seed sales were generally higher than export sales except in 2010/11. During 2006/07, there was a 37% decrease in local sales while export sales went up by 22%. A record low export sales volume was recorded during 2007/08 and the local sales notably increased by 55.7% in comparison to the previous year. From 2008/09 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.

![Figure 11: Groundnut seed local sales vs export sales, 2005/06-2014/15](image)

**Source:** SANSOR

Figure 12 below illustrates sunflower seed local sales compared to the export sales. 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. From 2005/06 to 2007/08 export sales gradually increased and in 2008/09 export sales
and local sales experienced significant increments when compared to the previous year. 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.

Figure 13 above shows soya bean seed local sales compared to export sales during a ten year period. During 2005/06 local sales were just above 1 800 tons, while there was 11 tons of seed exports. In 2006/07 local seed sales increased to 2 737 tons and the export volume increased from 11 tons to 142 tons. There was a significant decrease in export and local sales during 2008/09 season. 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.
6. IMPORTS OF AGRONOMIC SEEDS

Figure 14 below illustrates agronomic seed imports during a ten year period. Figure 14 shows that from 2006 to 2011, South Africa has recorded zero imports for wheat seed, barley seed, grain sorghum seed, soya bean seed and groundnut seed. During 2006 and 2007, South Africa imported just above 400 and 2 000 tons of maize seeds, respectively. In the same years South Africa also imported sunflower seeds. During 2007, maize seed and sunflower seed imports significantly increased. In 2008 maize seed imports were just about 4 400 tons and sunflower seed imports dropped to 1 363 tons. The decline in maize and sunflower seed imports can be attributed to an increase in the domestic seed production. During 2009, sunflower seed imports surged despite an increase in domestic sunflower seed production. In the following year, maize seed imports notably dropped 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 soyabean seed imports. In 2015, sunflower and grain sorghum seeds imports drastically dropped whilst maize seed imports surged. During 2016, South Africa’s maize and grain sorghum seed imports has surged when compared to 2015 seeds imports. Wheat, barley, sunflower and soya bean imports have also slightly increased.

![Figure 14: South Africa's agronomic seed import, 2007-2016](image)

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. In 2006, it was more expensive to import maize whilst it was cheaper to import maize seed during 2007 and 2008. It was relatively more expensive to import sunflower seed in 2008. From 2009 to 2010, South Africa imported sunflower seed at a low value. 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.
Figure 15: Value of South Africa agronomic seed imports

Figure 16 below is an illustration of South Africa’s maize seed imports from 2007 to 2016.

Figure 16: South Africa’s maize seed import, 2007-2016

Source: Quantec Easydata
Figure 16 above shows the regions that supplied South Africa with maize seeds during the ten year period. Africa and America regions have generally supplied South Africa with high volumes of maize seeds. In 2007, there was a notable volume of imports from Europe and seed imports from Asia were less significant. There was a considerable increase in seed imports from Europe region in 2009 after imports dropped in 2008. In 2008, maize imports from Africa and America regions significantly increased when compared to the previous year. During 2009 and 2010, there was a notable increase in maize seed imports from Asia. 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.

Figure 17: Value of South Africa maize seed imports, 2007-2016

Source: Quantec Easymeta

Figure 17 above shows the value of maize seed imported by South Africa. It was generally cheaper to import maize seed from the African region while seed imports from Europe were relatively more expensive. In 2006, seed imports from Oceania region were more expensive, followed by Europe and Asia. From 2007 to 2009, South Africa imported seeds from Europe with high values. During 2014 maize seed imports from
America were comparatively more expensive compared to the other years. During 2012, it was cheaper to import maize seeds from Europe, followed by imports from the Asia. 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 more cheaper to import.

![Figure 18: Sunflower seed imports from regions, 2007-2016](image)

Source: Quantec Easydata

Figure 18 above is an illustration of sunflower seed imports from the regions. 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. In 2009, there was a surge in sunflower seed imports from Europe region. As of 2010 and 2011, the import from Europe region fell to just above 23 000 tons. 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.
Figure 19 above indicates the value of South Africa’s sunflower seed imports from various regions. Generally, it was relatively more expensive to import sunflower seed from Oceania and America, whilst seed imports from Africa region were relatively cheaper. In 2006, seed imports from Europe were expensive when compared to other regions. During 2009, sunflower seed imports from Africa and Europe were relatively cheaper. 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 Asia region, followed by America and Oceania regions, whilst imports from Europe and Africa were still much cheaper.
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 genetics are not developed by the company, 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 can’t 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. Various and/or all activities may be done by the same company.

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). There are various secondary acts that impact on 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 amendments, some completed, 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’s 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

The Competition Commission of South Africa has received an application on the proposed merger in terms of Section 12 of the Competition Act No. 89 of 1998 (as amended). In terms of the proposed transaction, Bayer Aktiengesellschaft (Bayer) will acquire Monsanto Corporation (Monsanto). Bayer is active in the crop protection business in South Africa, where it sells fungicides, insecticides, herbicides and seed treatment products. In the seeds business, Bayer sells vegetable seeds, cotton seeds and rapeseed (canola) seeds. In South Africa, Monsanto is active in seed and traits and crop protection. In relation to crop protection, Monsanto produces herbicide products. Monsanto sells vegetable seeds, maize seeds, soybean seeds and cotton seeds and traits.
10.ACKNOWLEDGEMENTS

The following organizations are acknowledged:

South African National Seed Organization (Sansor)
5 Glenwood Road, Lynnwood Glen, Pretoria, 0081, South Africa
PO Box 72981, Lynnwood Ridge, 0040, Pretoria, South Africa
Tel: +27 12 472 9516
Fax: +27 86 646 2680
genman@sansor.co.za
www.sansor.org

Quantec Research
P. O. Box 35466
Menlo Park
Pretoria
0102
Tel: 012 361 5154
Fax: 012 348 5874
Website: www.quantec.co.za

National Agricultural Marketing Council (NAMC)
Tel: +27 12 341 115
Fax: +27 12 341 1811
www.namc.co.za

The African Seed Access Index
www.tasai.org

Agricol
www.agricol.co.za

Pannar
www.pannar.com
African Centre for Biosafety
www.biosafety.net

Du Pont Pioneer
+27 12 683 5700
+27 12 683 4190
www.pioneer.com

Food and Agriculture organization of the United Nations
www.fao.org

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