The Potential Impact of a Breeding and Technology Levy Collection System in South Africa

Prepared for the South African Cultivar and Technology Agency (SACTA)

By

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Executive summary

South African farmers compete in the international agricultural market where crop prices are determined based on production levels in large agricultural countries, and farmers using the most advanced technologies. In real terms, grain commodity prices have declined over the long run and are projected to continue on this declining trend at least over the next decade. South African commodity prices have followed a similar pattern with real prices declining over time and in order to ensure economic survival, farmers consistently have to drive on-farm efficiency by producing a higher output per unit of input.

'Farmer Privilege' allows for farmers to save and replant the grain they produced on their own holdings as seed. For self-pollinated crops (like soybeans, wheat and barley) where the offspring (seed) is genetically identical to the parent, this means that farmers only have to buy seed once, and can continue planting the same variety in subsequent seasons. As a result, the financial motivation for seed companies to invest in local, long-term, expensive breeding programmes or to import new germplasm or traits, is limited as they are unable to recoup a significant portion of their costs or collect the due return on innovation.

In line with a number of leading agricultural countries that have implemented End-Point Royalty (EPR) collection systems, South Africa has recently introduced a Breeding and Technology statutory levy whereby an agreed fee is (will be) paid on every tonne of soybeans, wheat and barley that is delivered. This fee is then transferred to the seed breeding companies and research institutions based on their seed sales market share. Because this will be a statutory levy, 20% of the divisible amount will be contributed to developmental initiatives.

A dynamic maize seed sector, where cross-pollination necessitates farmer to buy new seed on an annual basis, has contributed to an average annual growth rate of 3.5% for maize between 1999 and 2017. In contrast, soybean yields increased at only 0.43% per year on average and wheat yields at 2.51%. In the barley industry, considerable continued investment by the main malting barley buyer has contributed to an annual average yield increase of 4.67%. Although improved farming practices also play a decisive role in the drive for higher yields, these growth rates illustrate the need for investment in improved seed varieties and technologies in the soybean and wheat industries and support of the existing barley research initiatives. It is important to note that comparing absolute yield growth only presents part of the full picture since the grain or oilseed quality that is produced also plays a crucial role in determining the price and ultimately the overall output that is produced per unit of input.

Continued investment in seed research, breeding and technology transfer, is vital for a competitive and sustainable agricultural sector. Without a competitive and thriving agricultural industry, the targets for food security, inclusive growth and job creation as determined by the National Development Plan 2030 will not be achieved. It is estimated that with continued investment in seed and seed technology R&D, made possible through a Breeding and Technology statutory levy, yield growth in soybeans, wheat and barley can be sustained, resulting in an additional annual revenue of up to R1.5 billion per annum, for the three crops.

1. Introduction

Commercial farmers find themselves on a 'technology treadmill' where new technologies result in increased productivity, increased adoption of the technology results in increased production, which in turn results in lower commodity prices, thus necessitating increased productivity. The technology treadmill concept was originally described by economist Willard Cochrane in a 1958 publication aiming to explain increasing farm sizes in the US, stating that "laggard farmers who do not adopt new technologies are lost in the price squeeze and leave room for their more successful neighbours to expand".

South African farmers compete in the international agricultural market where crop prices are determined based on production levels in large agricultural countries and farmers using the most advanced technologies. In the globalised agricultural market, South African farmers' neighbours are Brazilian, Argentinian, American, Canadian or Australian and Gouse, Pray and Schimmelpfennig (2005) noted that the only thing worse than being on the technology treadmill, for South African producers, could be not being on the treadmill.

Figure 1.1 presents a more than 100-year price trend in global agricultural commodity prices. Apart from specific periods of upward spikes due to exogenous shocks like the weather or the more recent events in 2008 when the mandatory blending of agricultural-based biofuels caused prices to spiked, real prices have declined over the long run and are projected to continue on this declining trend at least over the next decade. South African commodity prices have followed a similar pattern with real prices declining over time and in order to ensure economic survival, farmers consistently have to drive on-farm efficiency by producing a higher output per unit of input.

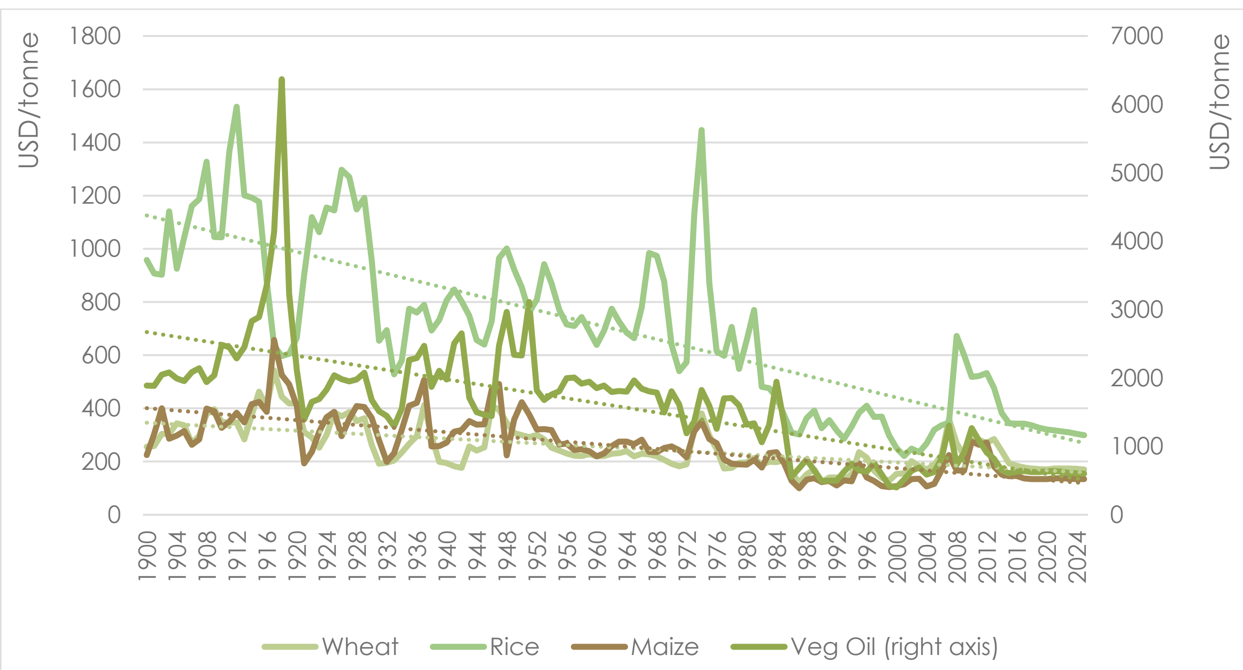

Figure 1.1: Long-term global commodity prices in real terms
Source: FAPRI, August 2017

Figure 1.2 presents a comparison of establishment costs for a tonne of wheat that is produced in various parts of the world, over the past four to eight years. From the comparison, it is clear that South African wheat farmers in all the main production regions (Eastern Free State, Northern Cape and Overberg) are under pressure with establishment costs approximately $30/tonne above the global average. Although South African farmers receive an import parity derived price for most of the season, the only way that local wheat production will be able to compete against imports is if local farmers have access to comparable seed technology and breeding specifications, similar to those of their international counterparts. This principle also holds for soybean and barley production.

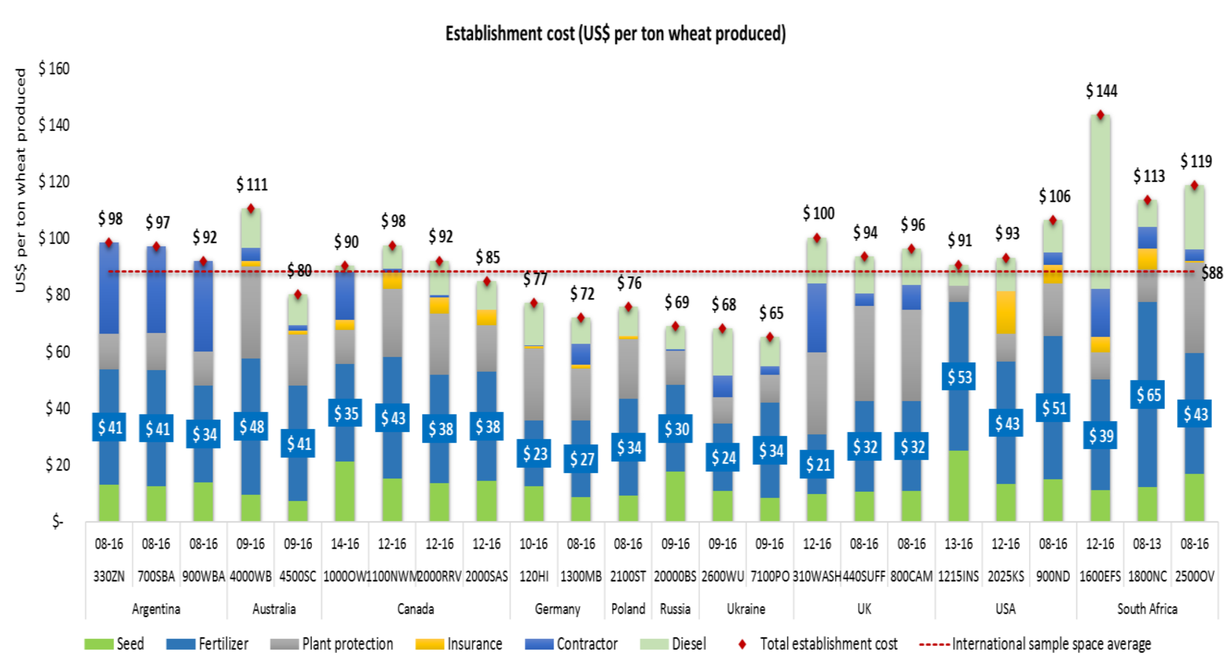

Figure 1.2: Long-term global commodity prices in real terms
Source: BFAP, March 2018

Plant Variety Protection legislation in South Africa and many other countries allow for 'Farmer Privilege', i.e. a farmer's right to save and replant the grain he produced on his own holdings as seed. For self-pollinated crops (like soybeans, wheat and barley) where the offspring (seed) is genetically identical to the parent, this means that farmers only have to buy seed once, and can continue planting the same variety in subsequent seasons. The South African seed organisation (SANSOR) estimates farm-saved seed for soybeans as high as 80% and wheat at 70%. Because of the low seed sales volumes (compared to the actual market size) and an effective seed price ceiling (a higher seed price will result in more saved seed), the return on self-pollinated crop seed R&D is limited. The financial motivation for seed companies to invest in local long-term, expensive breeding programmes or to import new germplasm or traits, is thus limited.

Continued investment in seed research, breeding and technology transfer, is vital for a competitive and sustainable agricultural sector. Without a competitive and thriving agricultural industry, the targets for inclusive growth and job creation as determined by the National Development Plan 2030 will not be achieved.

In line with a number of leading agricultural countries that have implemented End-Point Royalty (EPR) collection systems, South Africa has recently introduced a Breeding and Technology Levy (BTL) whereby an agreed fee is (will be) paid on every tonne of soybeans, wheat and barley that is delivered. The levies are then transferred to the seed breeding companies and research institutions, according to each company or institution's seed sales market share. The overall objective of the BTL would be to boost the economic climate and income of local and multi-national seed companies and research institutes to ensure that South Africa remains an attractive destination for new and superior germplasm and cutting-edge international Intellectual Property (IP) associated with self-pollinated crops. In line with South African agricultural statutory conditions, 20% of the divisible amount will be contributed to transformation and developmental initiatives.

Based on the crop size in the 2016/17 production season, the potential income from the BTL would amount to approximately R85.5 million, R47.7 million and R7.7 million for soybeans, wheat and barley respectively. For a farmer in 2016/17, on average, this would have meant an additional expense of R149 / ha for soybeans, R94 / ha for wheat and R87 / ha for barley on top of his normal farm-saved seed costs (grain cost, sifting, chemical treatment etc). In comparison, a dryland maize farmer in SA spent between R1100 and R2480 / ha on seed in 2016.

The purpose of this report is to provide a high-level quantitative assessment of key trends in yields and the potential economic impact of a BTL system over the next decade. The next section will shed light on the long-term yield trends of some of SA's main grain crops and compare these to international yield trends. The objective of this section is to compare the local and international performance of South African maize, a cross-pollinated crop where farmers buy hybrid seed every season, with soybeans and wheat, self-pollinated crops where farmers largely make use of farm-saved seed. Barley, also a self-pollinated crop, but where the main commodity buyer has invested substantially in seed variety research and development, is also presented and discussed. This will be followed by a brief comparison of the seed sectors for cross-pollinated and self-pollinated crops. The final section highlights the potential economic value of a BTL system by generating alternative future scenarios in BFAP's sector model (partial equilibrium model) and by illustrating how the competitiveness of the primary agricultural industry is critical to ensure the long-run competitiveness of integrated value chains.

2. Production and crop yields

Crop yields are often used as a productivity indicator as it indicates the measure of production against the fixed production means, land. Yield is however not an ideal measure of productivity as it excludes the quantity and quality of other inputs that influence production volumes. Furthermore, it is important to mention that the comparison of yields alone only provides part of the answer, since the quality of the crop and the consistency with which it can be produced also plays a critical role. This argument is taking further in the final section of the report. Nevertheless, long-term yield trends are useful to show advances in plant genetics and the complementary inputs and practices that are applied and aimed at pushing the plant material to reach its genetic potential.

2.1 Maize

Although maize is not a self-pollinated crop, historic yield growth trends can serve as a useful benchmark for the growth trends that have been achieved in self-pollinated crops. With the bulk of the South African maize crop being produced on dryland, the biggest limiting factor on the production of maize in South Africa is rain. The maize area planted has gradually declined from more than 5 million hectares in the mid-sixties and seventies to an average of around 3 million hectares (including non-commercial area under production) over the last ten years. Although the area planted has declined significantly, production has increased due to technological advances.

As can be seen in Figure 2 from 1919 to 1950 yields were fairly stagnant at around 1 t/ha. The first public sector maize hybrids were introduced in 1950 and this stage also coincided with improved farming practices, increased fertiliser use, and better pest control, and yields increased to 1.5 and 1.7 t/ha. In 1959 the first private hybrid seed programme was established and by 1980, the total commercial maize crop was planted to hybrid maize (Rusike, 1995). The third stage started in the mid-1960s when more dynamic breeding and research by the private sector resulted in a significantly expanded range of hybrids with improved yield potential and disease resistance. Production practices continued to improve and yield averages went up to 2.0 to 2.3 t/ha. The fourth era started in the mid-1990s with a move towards precision farming practices, an increase in the number of high-yielding hybrids resulting from competitive breeding combining improved US germplasm and elite South African breeding material, as well as the advent of genetically modified (GM) maize in 1999-2001. Between 1990 and 2017, maize yields in South Africa increased by an average of 3.66% per year. If the 2016/17 ‘best year ever’ is excluded from the calculation, the average yield increase is still an impressive 3.44% per year. Though the yield trend is driven by advances in genetic material, GM traits, improved farming practices and complementary and damage limiting inputs, the reduction in maize production on more marginal soils and increased irrigation production also played a significant role.

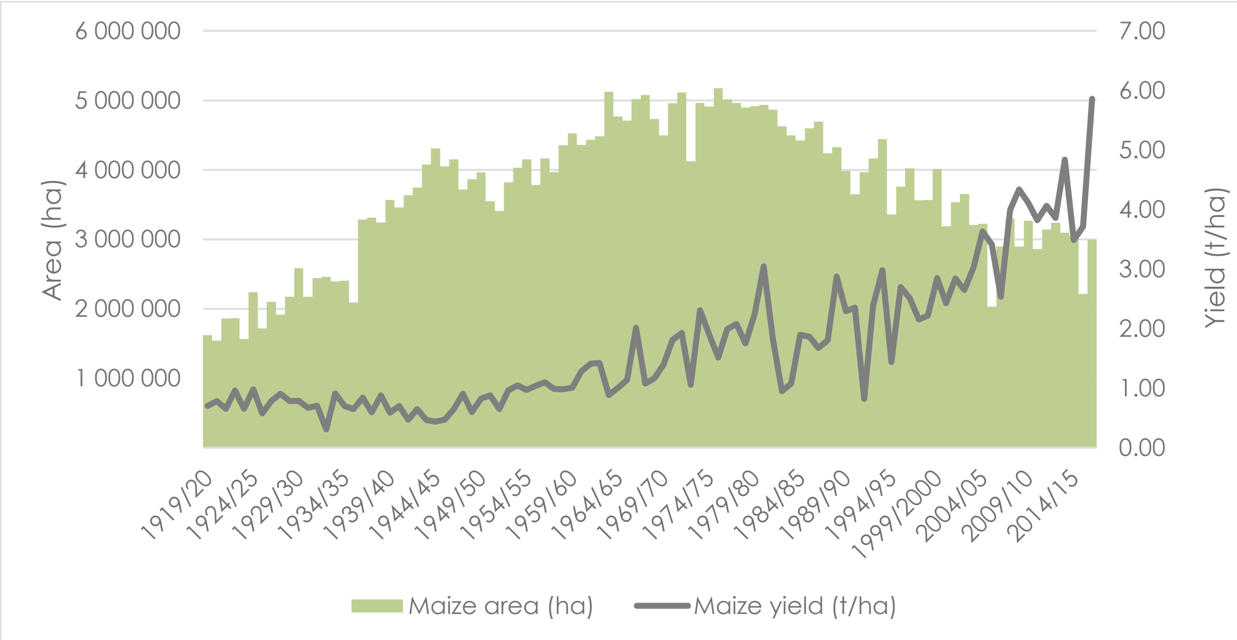

Figure 2.1: SA maize area and yields

Source: SAGIS

In an effort to account for the effect of less marginal soil plantings and irrigation, Free State and Mpumalanga maize areas and yields are compared for the period 1999/2000 to 2015/16. During this period and in these provinces, the area under maize was relatively stable and there was only a limited move towards irrigated maize. Over this 17-season period, maize yields saw an average annual increase of 3.66% in Mpumalanga and 2.61% in the drier Free State Province.

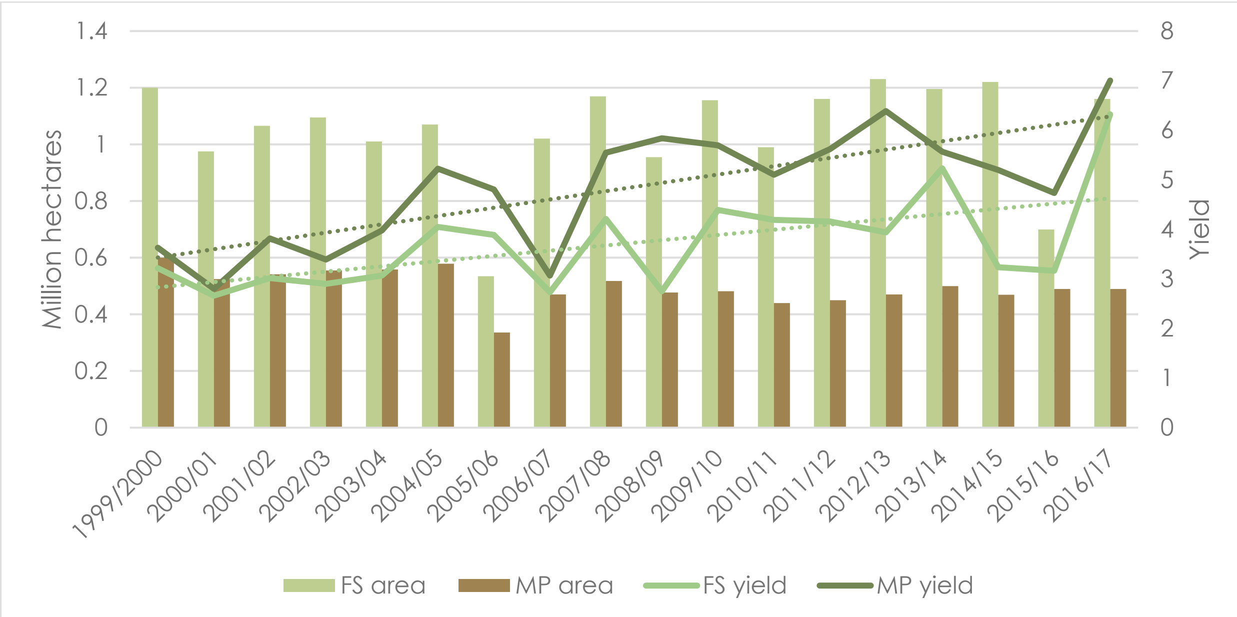

Figure 2.2: Provincial maize area and yields trends
Source: SAGIS

Due to a drier climate, SA's average maize yield is lower than that of the leading international maize producers, the US, Argentina and China. SA farmers' yields, however, compare well with that of Brazilian farmers and between 1998 and 2017 SA's average annual maize yield increase was higher than that of the US, Argentina and China (see Table 2.1).

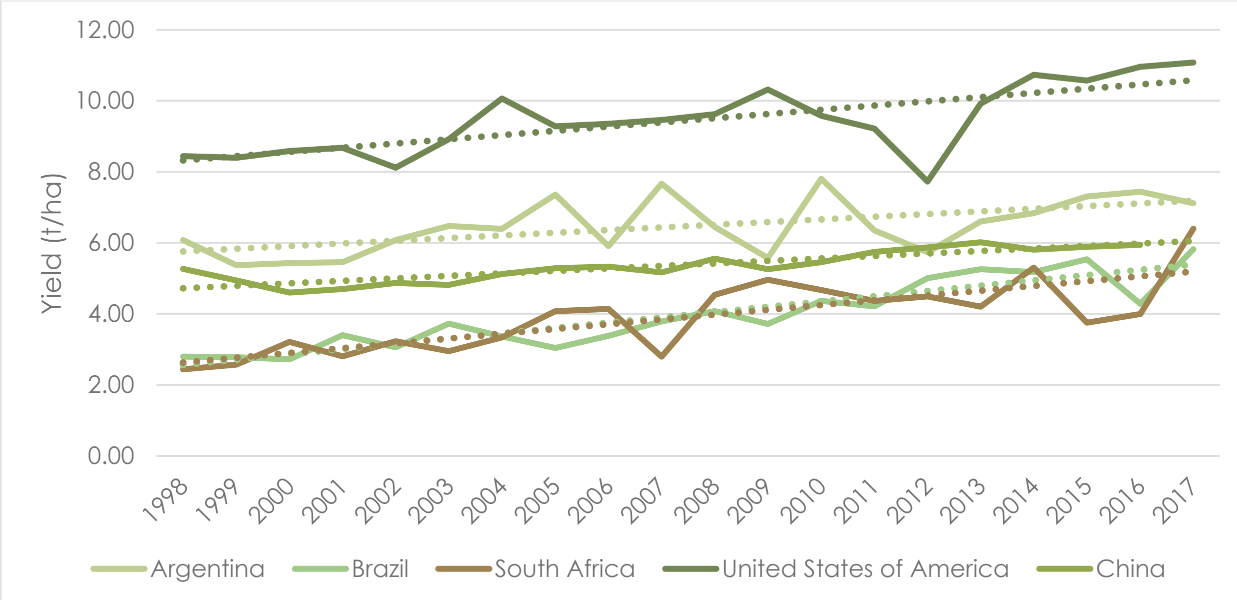

Figure 2.3: International maize average yield trend comparison

Source: SAGIS and FAOSTAT

Table 2.1: Annual average maize yield increase between 1998 and 2017

Country	Percentage
Brazil	3.74%
South Africa	3.52%
USA	1.23%
China	1.21%
Argentina	1.18%

2.2 Soybeans

The SA soybean area has increased considerably over the last 50 years, from less than 10 thousand hectares to 787 thousand hectares in 2017/18. As early as 1996 SA farmers still planted less than a 100 thousand hectares but with increased crushing capacity ensuring local demand for soybeans, the active promotion of the benefits of including soybeans into a rotational cropping pattern with other crops, and management ease brought by genetically modified herbicide-tolerant soybean varieties (released in 2001), more and more farmers choose to plant soybeans in rotation with maize. In 2017, soybeans surpassed sunflower seed as SA's second biggest summer crop.

Conversely to maize, the yield increase for soybeans has been significantly slower; 1.91% for 1970-2017. One important fact to take into consideration when interpreting the lower yield for soybeans, is that the area under soybean production has increased rapidly and western production regions that have traditionally been regarded as climatically more marginal areas for soybean production, are gradually coming into production. Despite the significant variation in yields in recent years, SA has managed to produce a soybean crop with an average yield of 2.29 t/ha on 574 000 ha in 2017. In the current season, average yields have fallen back again to an estimated 1.77 t/ha due to more adverse climatic conditions. The following section will also report on the rapid increase in the number of soybean varieties available for planting over the past few years. Although average yields do not reflect the full potential of this expansion in the availability of seeds in combination with improved farming practices and investment in suitable mechanisation (planters and combines), it is expected that these investments will start to pay off in the next few years, if it can be maintained.

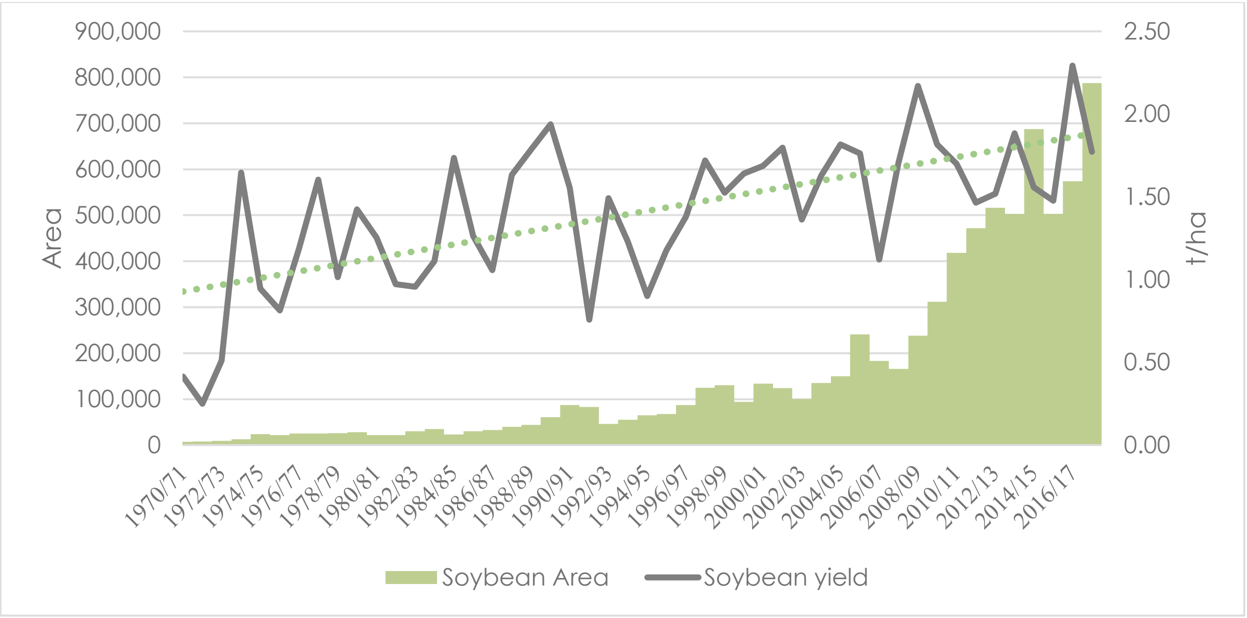

Figure 2.4: SA soybean area and average yield
Source: SAGIS

Although seed companies have taken the opportunity of expanding sales and market share on the back of the rapid growth of the industry, current market information indicates that companies are not willing to introduce the latest seed technology in SA without a guarantee that they will be able to earn a return on their investments. This could have a significant impact on the competitiveness of SA soybean farmers, who are facing very stiff competition from the major international soybean producers, not only from a yield perspective but also from the ability to produce a consistent quality of bean. Considering the same 20 year period as for maize (1998-2017), the average annual yield increase for soybeans in the US was 1.46%, while yields increased by 1.33% in Brazil and 0.64% in Argentina. Over this same period, soybean yields increased marginally in SA, at 0.43%. Over the 20 year period, SA's average soybean yield was 40% lower than the average obtained in the three leading soybean countries. Although the recent droughts have played a role in the SA average yield trends (especially for shorter periods), it is clear from Figure 2.5 that yields over the long-run have increased at a higher pace in major soybean exporting countries like the US and Brazil than in SA (see Table 2.2).

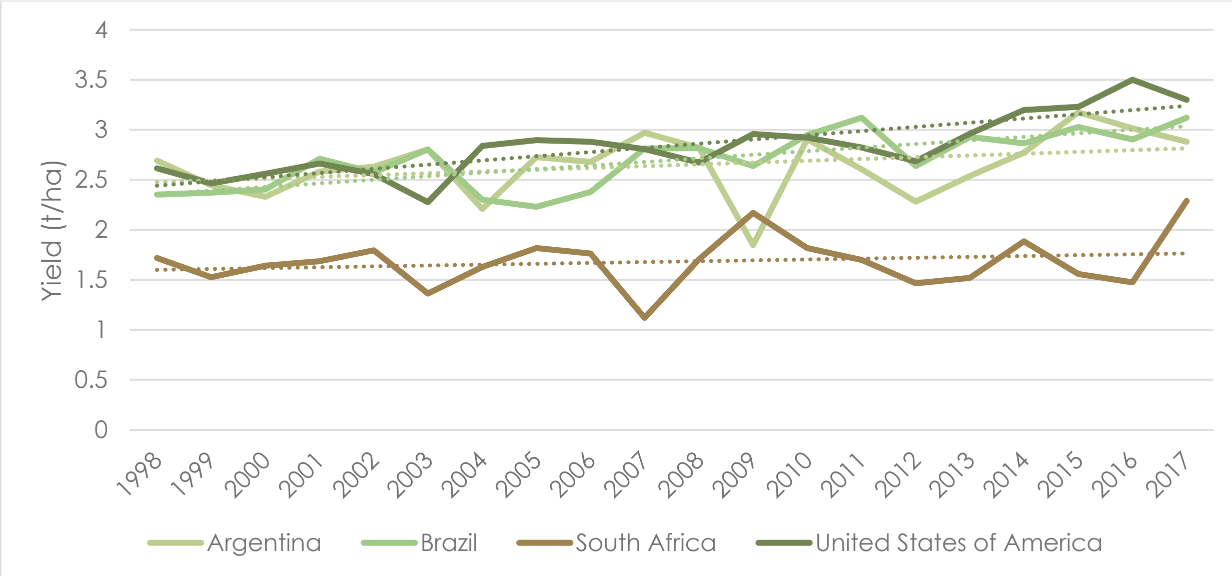

Figure 2.5: International soybean average yield trend comparison
Source: SAGIS and FAOSTAT

Table 2.2: Annual average soybean yield increase between 1998 and 2017

Country	Percentage
USA	1.46%
Brazil	1.33%
Argentina	0.64%
South Africa	0.43%

2.3 Wheat

Modern wheat breeding commenced around 1902 in the Western Cape and breeding initiatives at the Elsenburg Research Station lead to the release of 26 wheat varieties, which between 1914 and 1961, formed the core of SA wheat production material. Collaboration with US researchers led to new variety releases in the 1960s with new parent lines, combining good yield, quality and disease resistance (Nhemachena & Kirsten, 2017). The ARC Small Grains Institute (SGI), under the Department of Agriculture, was established in 1975 to harness different research initiatives into one center aiming at improving the production of small grains. The SGI bred and supplied at least 65% of all nationally bred wheat cultivars up to 1996 (Nhemachena & Kirsten, 2017).

The SA wheat area expanded to reach a peak of 2.025 million hectares in 1974. The wheat area remained stable around the 1.6-2 million hectares band between 1968 and 1990 but dropped significantly in 1991 and 1992 following a SA government programme that provided an incentive for farmers to convert cultivated fields to grazing pasture and natural grazing, as well as the 1992 drought. While the wheat area remained relatively stable in the Western Cape, the bulk of wheat hectares were lost in the Free State. The decline continued long after the Government incentive disappeared and close to a million hectares of wheat was lost in the Free State to summer crops maize, soybeans and sunflower as well as veld for grazing.

In the process of area consolidation, the better performing areas and land stayed in wheat production while marginal land was substituted into other crops or grazing. Although there have been improvements in seed, inputs and production practices, the rapid yield increase visible in Figure 2.6, from the 1990s to around 2007, was largely due to less productive wheat land going out of production.

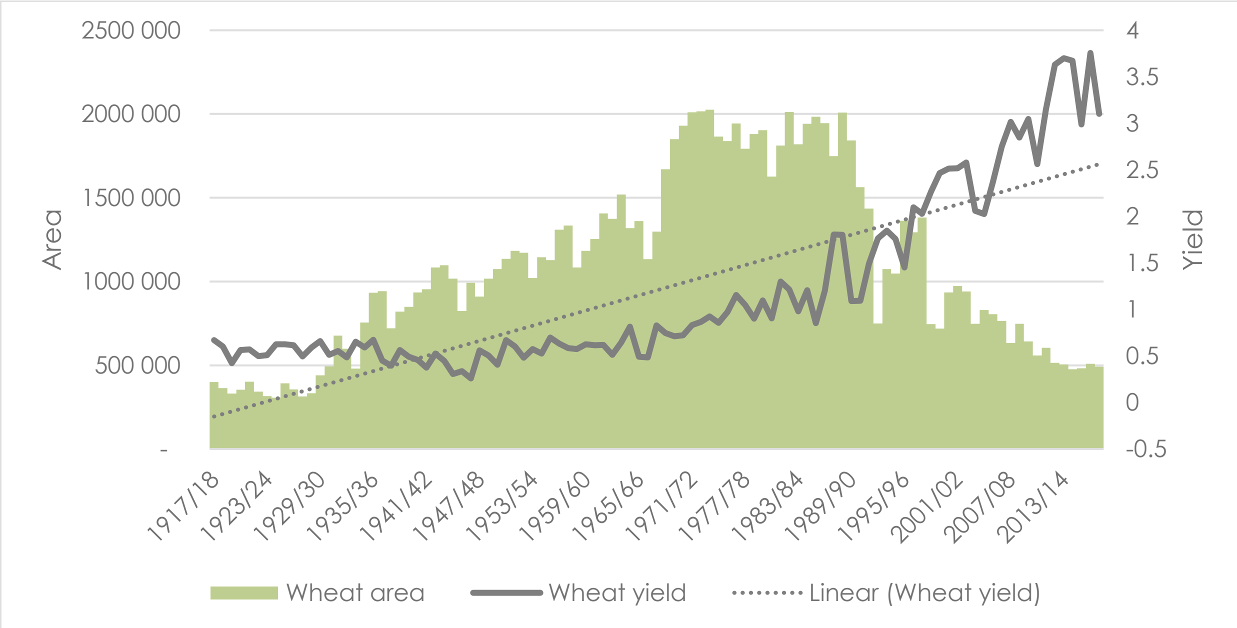

Figure 2.6: SA wheat area and yields
Source: SAGIS

The Western Cape dryland wheat area remained relatively stable over the last 20 years and therefore presents a more realistic wheat yield trend for SA. Between 1998 and 2017, wheat yields in the Western Cape increased by 1.91% per annum on average. According to industry role-players as well as BFAP's *agri benchmark* farms, this average yield increase should be attributed more to a number of good rainfall seasons in especially the southern Cape region as well as production intensification (higher input use) and improved production practices, rather than better wheat varieties. The reason for this is that wheat seed breeding over the last 20 years has focussed on producing varieties resistant in terms of specific agronomic characteristics (e.g. pest and disease resistance) and on good-quality varieties, as opposed to high-yielding varieties (Nhemachena & Kirsten, 2017).

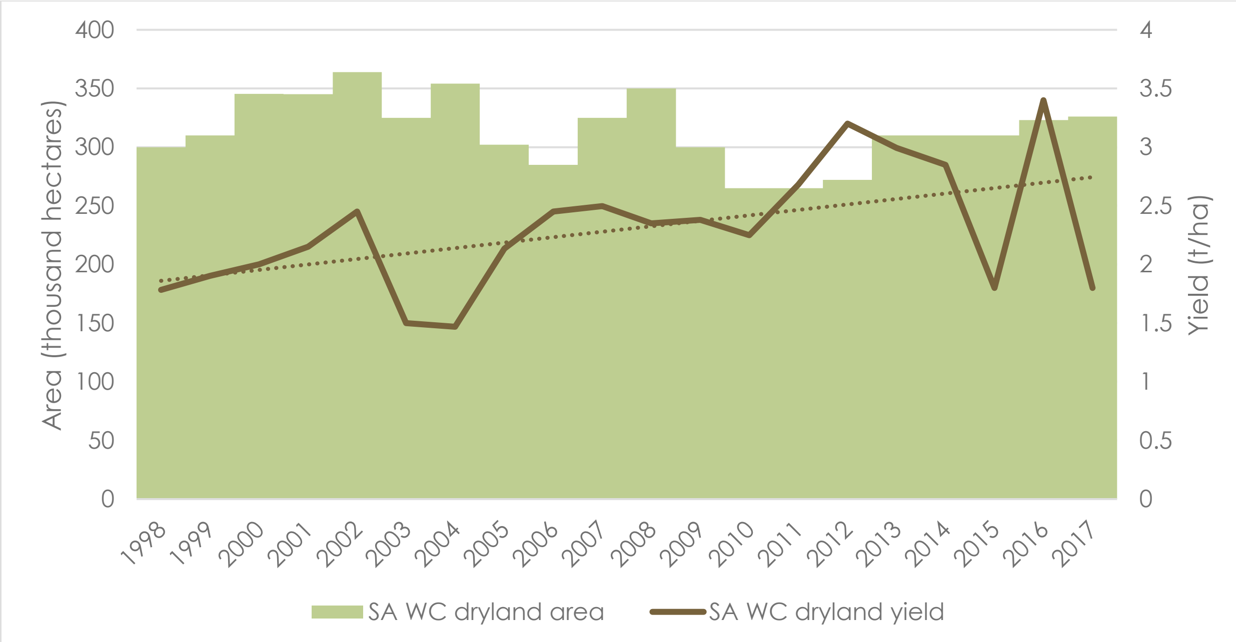

Figure 2.7: Western Cape wheat area and yields
Source: SAGIS

While increased use of fertiliser and damage abatement inputs was able to drive yield increases in the Western Cape, this increasing yield trend is not sustainable without new genetics with increased yield potential. Furthermore, changes in grading regulations will continue to dictate the direction of seed breeding and having access to a bigger pool of international breeding technology can benefit the industry greatly. WC dryland farmers' yields compare well with their international counterparts and the average yield trend is on par with the large wheat producing countries. Industry players, however, suggest that wheat yields in SA seem to have had reached a plateau. Although the analysis of long-term trends does not support this view, one can observe a step change in yields around 2010 which was followed by a period where average yields did not increase. Also, when one compares dryland wheat yields with that of barley yields in SA, it is clear that wheat yields are lagging behind (see next barley section).

Interesting to note is that Australian wheat yields have stagnated even though they have implemented an EPR system in 1996. Research by CSIRO scientists found that Australia's wheat yield potential (based on climate, soil and best practices and current technology) has declined by 27% over the past 25 years, mainly due to a 28% decline in rainfall during the cropping season (CSIRO, 2017). In other words, despite a significant deterioration in the climatic conditions, Australia was able to keep average yield levels relatively constant around 1.5 t/ha.

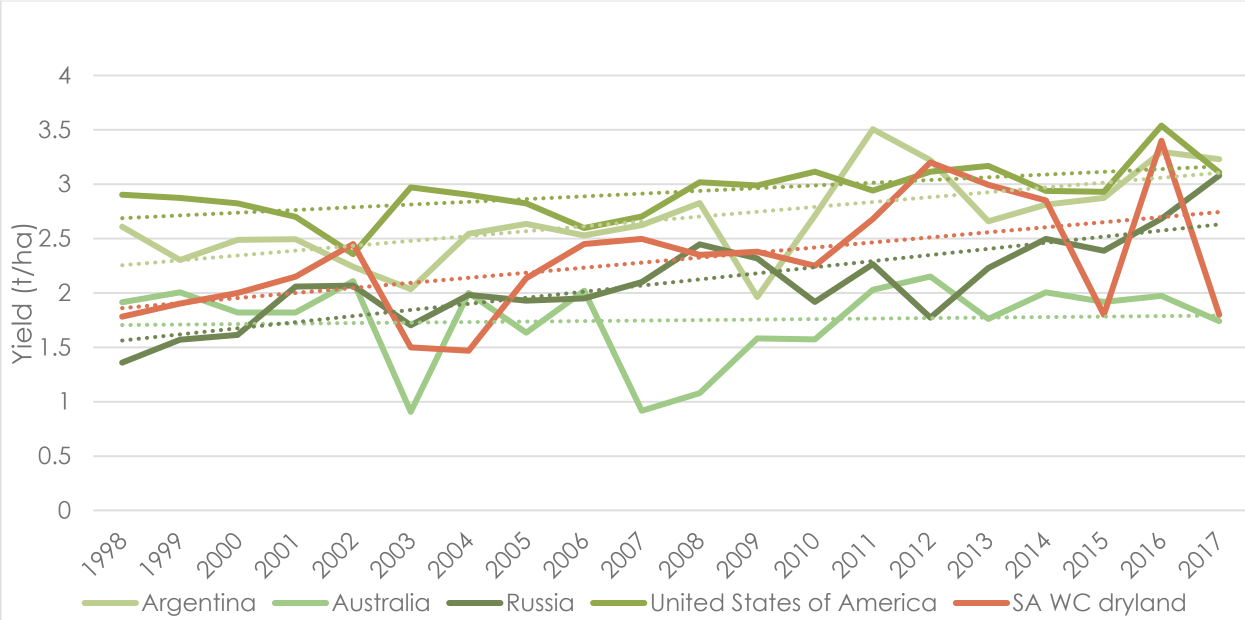

Figure 2.8: International wheat average yield trend comparison
Source: SAGIS and FAOSTAT

Table 2.3: Annual average wheat yield increase between 1998 and 2017

Country	Percentage
Russia	2.69%
SA WC dryland	1.91%
Argentina	1.62%
USA	0.85%
Australia	0.38%

2.4 Barley

Barley is planted in South Africa largely for malting purposes as there is no significant feed market for barley. Public sector barley focussed research had been limited (compared to other priority crops) and in 1978, Sensako (a private seed company) began evaluating local and imported varieties to find suitable varieties for cultivation in the Southern Cape. In 1983 a breeding programme was initiated and in 2000 the programme became part of an international enterprise when Sensako was taken over by Monsanto. After Monsanto terminated its SA barley activities at the end of 2001, the programme known as the South African Barley Breeding Institute (SABBI) was taken over by SA Breweries Ltd. SAB, recently taken over by ABInbev, is the main consumer of barley in SA and SABBI receives about 90 percent of its funding from seed sales to farmers that supply barley to ABInBev. Operational funding started to increase significantly from 2014 and reached R41.47 million in 2016. In 2016 SABBI exported R7.08 million worth of barley seed to Uganda, Tanzania and Zambia 2016.

Though similar to wheat where improved production practices and intensification have also played a considerable role in increasing barley yields, yields have also received a boost from active market focussed breeding (Figure 2.9). By selling seed to farmers (who produced for SAB) and collecting a small levy on barley deliveries (which is shared with the Winter Cereals Trust), SABBI was able to invest in variety development.

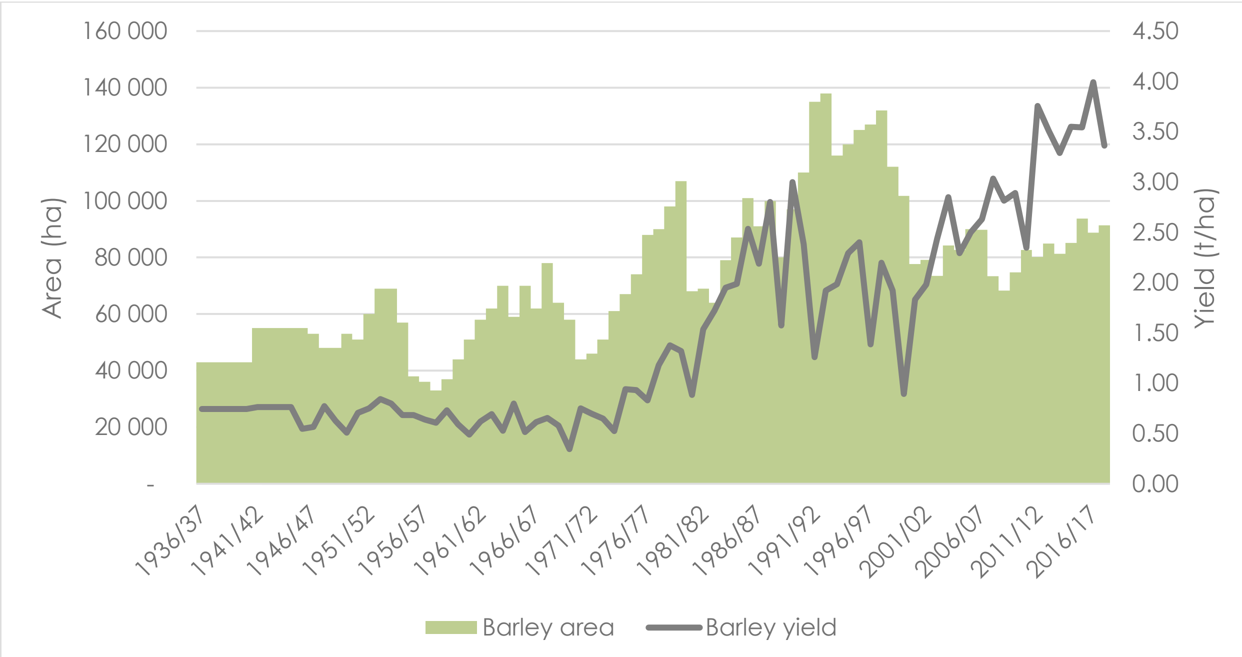

Figure 2.9: SA barley area and yields
Source: SAGIS

Figure 2.10 compares Western Cape dryland barley yields with some large international barley producers. Starting from a comparatively low base, SA barley yields have increased at an average annual rate of 4.67% per year for the 20 year period 1998-2017, closing the yield gap with countries from which SA imports barley, namely Canada, Argentina and the USA.

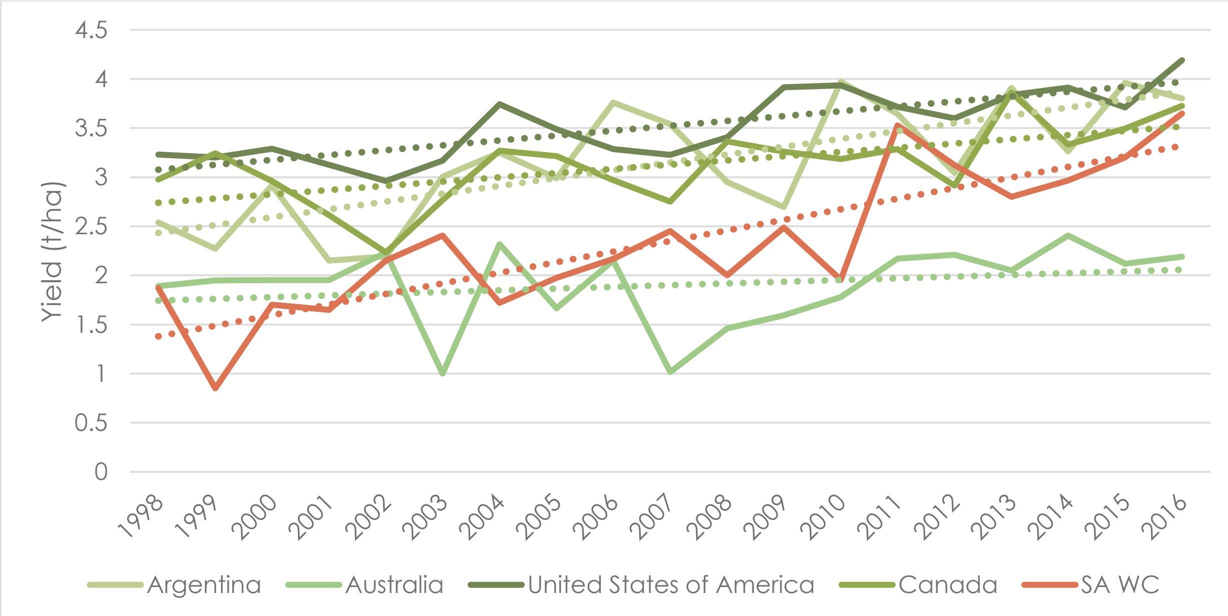

Figure 2.10: International barley average yield trend comparison
Source: SAGIS and FAOSTAT

Table 2.4: Annual average barley yield increase between 1998 and 2017

Country	Percentage
SA WC dryland	4.89%
Argentina	2.64%
USA	1.40%
Canada	1.38%
Australia	0.97%

Figure 2.11 compares Western Cape dryland wheat and barley yields for the last 20 years. Barley's yield has increased at a faster rate than that of wheat and it seems as if in the last couple of years, barley has done better than wheat especially in the drier seasons.

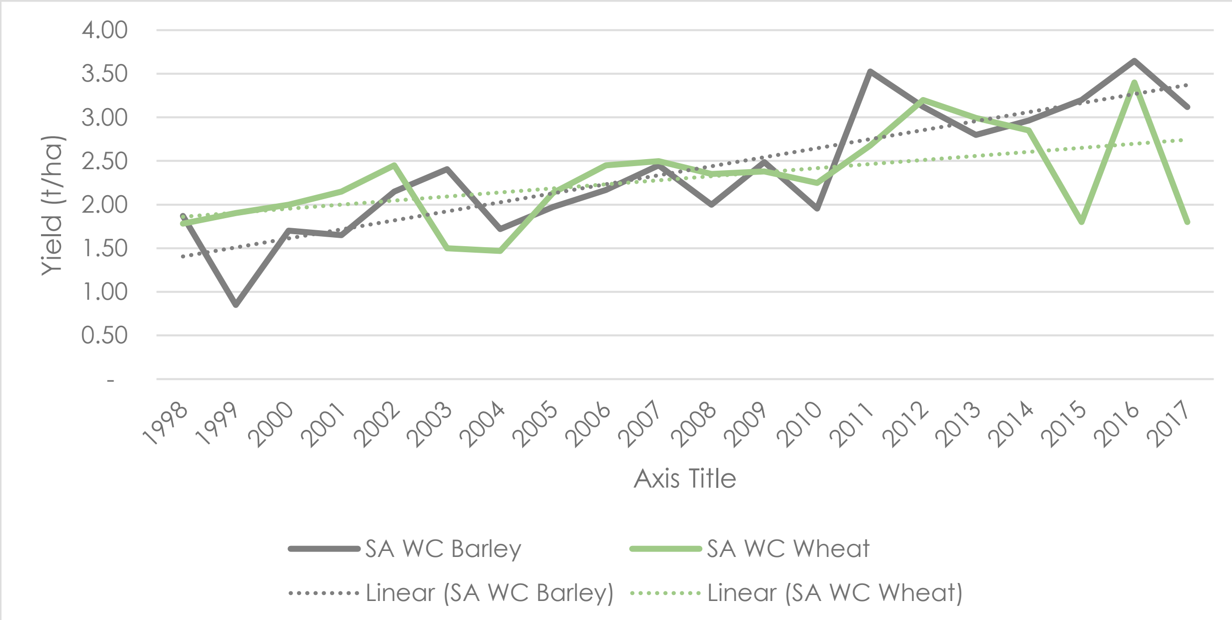

Figure 2.11: SA wheat and barley yield trend comparison
Source: SAGIS

3. Comparison of the seed sectors

Figure 3.1 indicates the number of new varieties added to the national variety lists for maize, soybeans and wheat on an annual basis since 2000. It is clear that in the dynamic maize seed market, where farmers buy hybrid seed every year, the number of varieties farmers can choose from is substantially higher than in the soybean and wheat seed markets where farmers plant largely farm-saved seed.

In 2016 there were 751 maize varieties on the national variety list for farmers to choose from, 402 conventional and 349 GM. For soybeans, there were 140 varieties (29 conventional and 111 GM), while 116 wheat varieties were listed. There has been a considerable increase in the number of new soybean varieties in the last three to four years; as recent as 2013 there were only 69 varieties listed and available for sale to farmers.

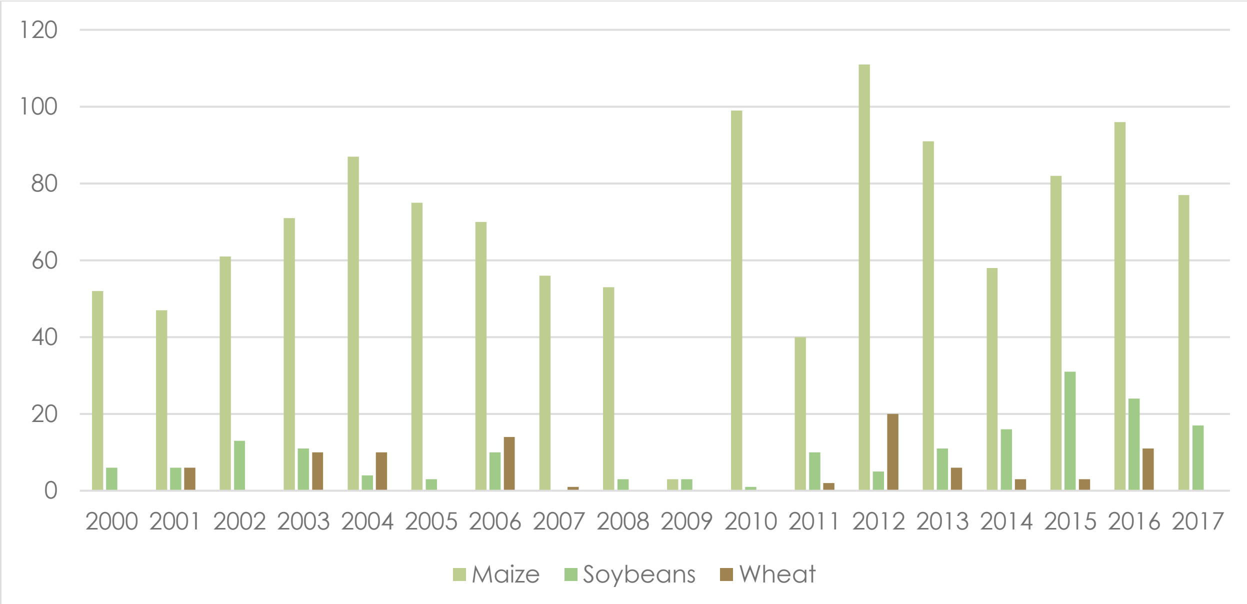

Figure 3.1: New varieties added to the national variety list
Source: South Africa National Variety lists

According to the 2016 National variety list, there are 33 companies selling or breeding maize varieties in South Africa. However, it is estimated that only 16 were directly and actively involved in seed production and or sales and a couple were affiliates of one another. Smaller companies or even larger multinationals with only a couple of varieties tend to rather license their seed (production and sales) to some of the larger and active companies as this makes more economic sense. In 2016, there were 12 companies with soybean seed and 4 with wheat seed. Of the 4 wheat seed companies/entities, the ARC SGI is one, and two others recently merged.

Multinational companies entering SA, have generally followed the trend of buying one or two local seed companies and as a result, these companies then have access to foundation seed lines from all over the world. Older local companies have their own foundation seed, compiled over the years, but also collaborate with international companies, research institutions as well as individual breeders to source seed and variety lines that might be useful in the South African climate or have certain resistance traits. Most maize and wheat foundation seed originates from parent companies and research institutions in the US and Europe, while particularly Argentina, Brazil and Uruguay seem to be the source of soybean varieties.

4. The Potential Economic Value of a Breeding and Technology Levy System

As already mentioned, in order for the SA agricultural sector to remain economically sustainable and reach its envisioned targets with respect to growth, employment creation and food security, set by the NDP, continued investment in and access to cutting-edge technology will remain a key driver. First, this section presents an outlook of the potential economic value that can be unlocked under alternative growth paths with respect to yield trends. As already mentioned, comparing only absolute yield growth only presents part of the full picture since the quality that is produced also plays a crucial role in determining the price and ultimately the overall output that is produced per unit of input. There is also a correlation between the quality/content of grain and the yield that can be produced and the general rule of thumb is that this correlation is negative. In other words, the higher the yield, the lower the quality/content of the grain or oilseed that is produced. The final section of the report highlights some of these elements by illustration of the value of continued investment in seed technology within an integrated value chain.

4.1 Yield growth – alternative future scenarios

The potential economic value of yield improvements is based on alternative assumptions regarding the outlook of yields that are introduced in BFAP's sector level model. The sector model is a partial equilibrium model that solves for an equilibrium in the market taking a range of exogenous factors into consideration. In other words, total supply has to equal total demand at a simulated market equilibrium price. BFAP publishes a Baseline each year where a 10-year outlook is presented for 44 agricultural commodities. The most import assumption for the purpose of this exercise is that 'normal' weather is used for the outlook, which obviously makes the outlook on yields far more stable than what the reality would be, but it also provides the opportunity to measure the impact of various growth paths over time. Figures 4.1, 4.2 and 4.3 present the yields of the past decade as well as the projected yields for the next 10 years of soybeans, wheat and barley, respectively. The latest BFAP baseline is used as the point of departure to measure the impact of alternative growth paths. It is important to note that the baseline and alternative growth paths are different for each of the commodities to account for the salient market features and realities in each of the markets.

In the case of soybeans (Figure 4.1), the BFAP baseline projects an average annual growth rate of 2% over the next decade compared to the growth rate of 0.33% over the past decade. In other words, the Baseline already presents a positive outlook on yield increases due to the significant investment that has already taken place in the recent years as explained in the previous section. Based on this growth rate, an average yield of 2.1 t/ha is projected by 2027 on approximately 1 million hectares under production. If it is assumed that a step change occurs in the annual average growth rate due to increased investment in seed technology and it increases by 1% above baseline projections to reach 3.5% over the outlook period, it implies that the average yield will be 2.5 t/ha in 2027. At the projected equilibrium price, this alternative growth path in yields would represent an increase in industry revenue of just over R1 billion per annum by 2027.

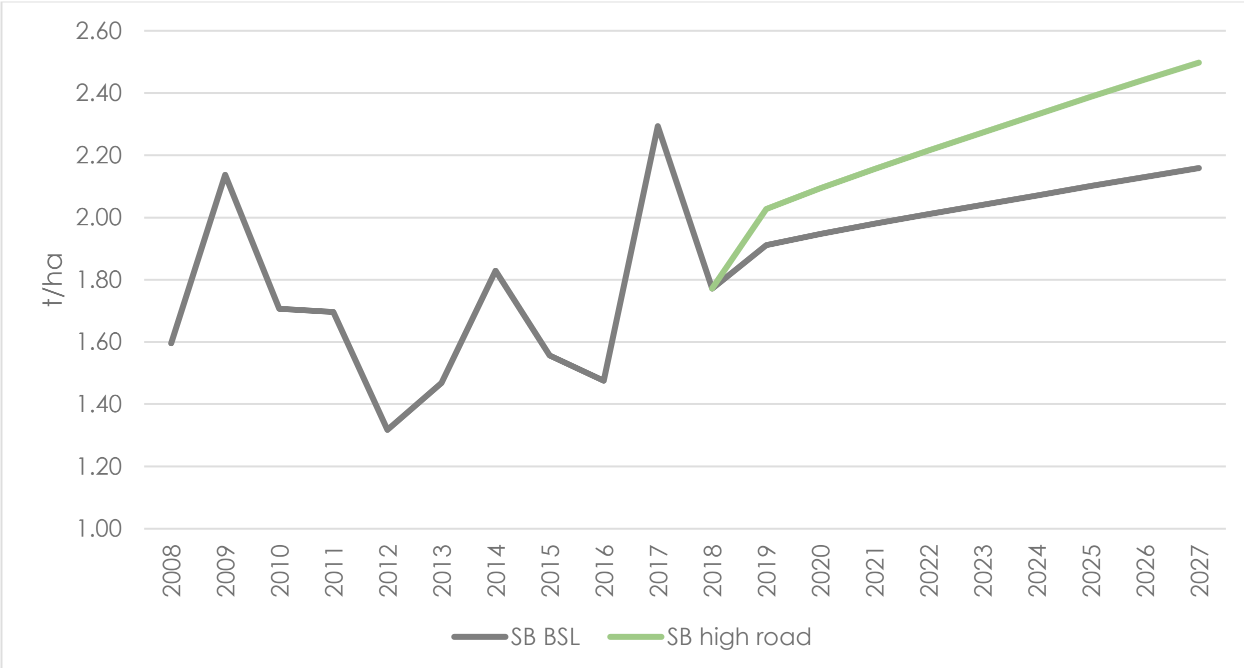

Figure 4.1: Alternative yield scenarios for soybeans

Although wheat and barley are both planted in the winter rainfall region and under irrigation, the previous section has illustrated that the trend yields have differed, with barley yields increasing at approximately double the rate of wheat. There is further distinction in the sense that the barley area has expanded in the winter dryland production region in the past decade and the area under wheat production has remained fairly stagnant. For both commodities, there has been a step change in yields over the past decade and industry specialists argue that yields are unlikely to increase at the same rate over the next decade. In fact, growth rates have already come down considerably in the past few years. Hence, taking these drivers into consideration, the BFAP Baseline projects that wheat yields will rise to 3.3 t/ha in the winter rainfall region by 2027 (Figure 4.2), which represents an annual average growth rate of 1.35%. Similarly, barley yields are projected to reach 3.8 t/ha by 2027 (Figure 4.3), which represents an annual average growth rate of 1.28%.

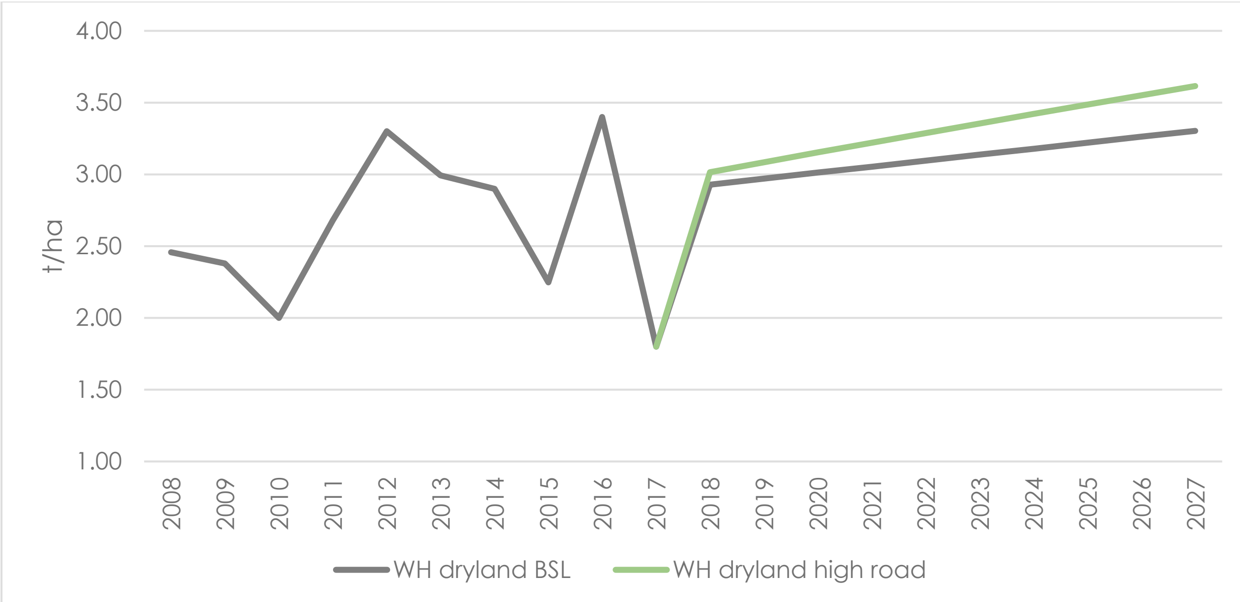

Figure 4.2: Alternative yield scenarios for wheat in the dryland winter rainfall region

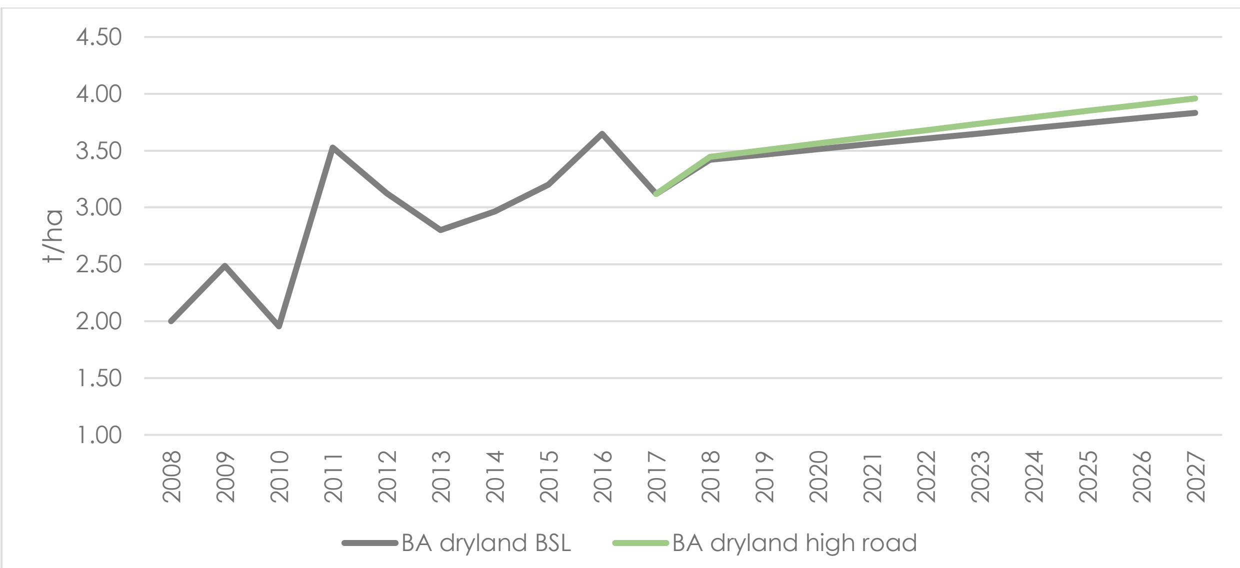

Figure 4.3: Alternative yield scenarios for barley in the dryland winter rainfall region

For the alternative scenarios, it is assumed that due to the introduction of the BTL collection system additional investment in the seed industry results in a further increase in yields above the baseline. Under this alternative scenario wheat yields are projected to increase to 3.62 t/ha by 2027 and barley yields are projected to increase to 3.96 t/ha. This will amount to additional wheat production of 91 000 tonnes with a gross value of R483 million and for barley 12 000 additional tonnes of production with a gross value of R59 million tonnes.

In summary, taking the potential high-road future scenario for soybeans, wheat and barley into consideration that can unfold under the implementation of an effective BTL collection system, the additional annual revenue that can be generated by all three industries over the next decade amounts to more than R1.5 billion per annum.

4.2 Competitiveness of integrated value chains

The integration of the primary soybean industry into the feed industry and consequently the production of broilers and chicken meat serves as a useful illustration of the importance of the competitiveness of a primary industry for the economic sustainability of downstream industries. Since 2012, 1.75 million tonnes of dedicated soybean crushing capacity was developed in SA, which represents a total capital investment of approximately R2 billion. Figure 4.4 presents the current and projected utilisation rate of this crushing capacity based on the projected production levels under the BFAP Baseline.

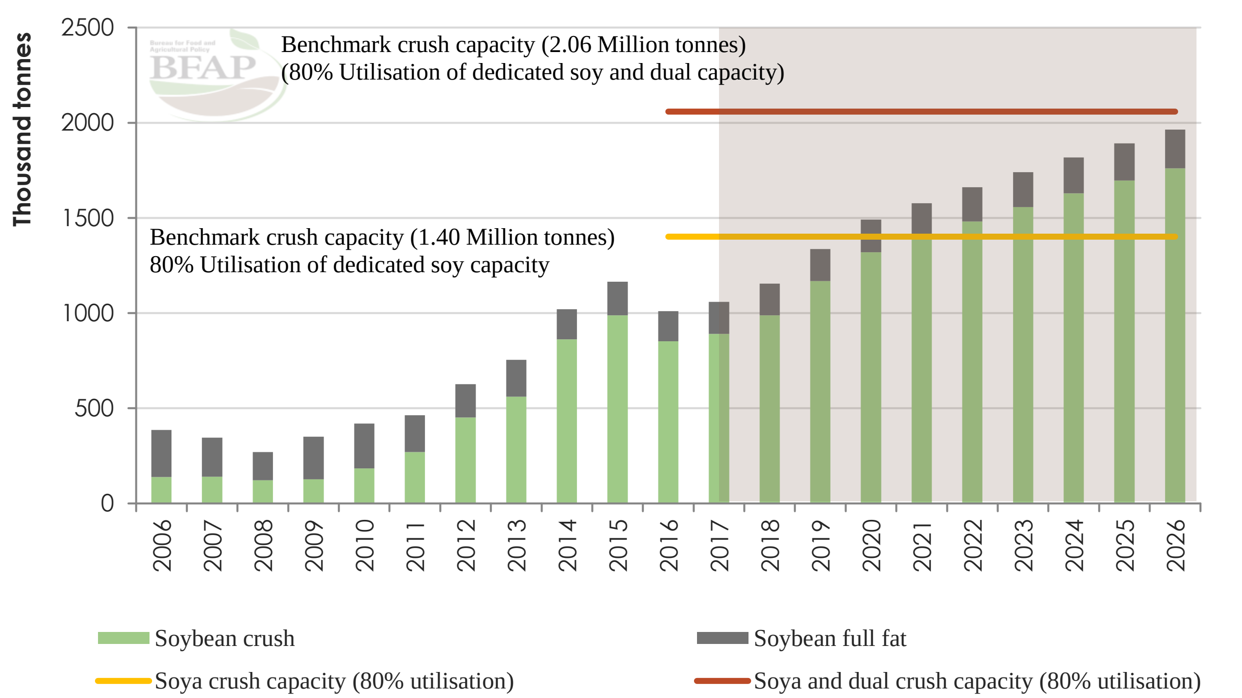

Figure 4.4: Soybean crushing capacity and utilisation

Currently, the local demand for soybean cake exceeds the local levels of production, and despite the fact that the development of these new plants has resulted in an increasing replacement of imports by local production, there is still a significant amount of soybean cake that is being imported. Under these market conditions, the local soybean prices are expected to trade in a range between import parity and the derived price from cake and oil. Consequently, these newly developed crushing plants are competing directly with imported soybean cake from major surplus producers of soybeans, like Argentina, where soybean prices are trading at export parity. This implies that the crushing plants in these countries are sourcing soybeans from a relatively lower cost base compared to their SA counterparts, which makes them highly competitive.

However, price is not the only driver in the evolution of the SA soybean cake market. The current (2017/18) marketing year is a point in case with soybean prices trading closer to export parity levels with a crop estimated close to 1.4 million tonnes and positive crushing margins that should boost the uptake of soybeans in the crushing market. However, the demand for locally produced soybeans remains subdued, mainly due to the fact that one of the major chicken producers in SA still prefers the imported soybean cake above the locally produced cake and according to reports, the preference is based on the consistent quality of the imported cake. The result is that around 500 000 tonnes of soybean cake will be imported in the current season despite the fact that SA can supply a significant share of this volume. There are many arguments in the market around the local quality of the soybean cake versus the imported quality, which underlines the fact that the quality and consistency of seed that is delivered to the crushing plant also plays a significant role in the economics of the integrated value chains.

It is anticipated that the current question around quality will be resolved and it is only a matter of time until the major producer of chicken meat will also start consuming locally produced cake in greater quantities. Figure 4.5 illustrates this scenario and presents an outlook over the next few years where soybean prices in SA are back trading again between the import parity price and the derived price for meal and oil and this is where the pricing scenarios starts playing a role again. In the alternative scenario that was presented for soybean trend yields in the previous section, the projected increase in production is large enough to result in soybean prices trading significantly lower, in other words between export parity and the derived price for oil and cake. This will have a positive impact on the relative competitiveness of the crushing plants and will drive the demand for locally produced soybeans and consequently the cake to a significantly higher level. In other words, the investment in the primary seed market is also a key driver for a thriving agro-processing industry and based on the targets set by the NDP, the agro-processing industry is responsible for one-third of all the additional jobs that have to be created by the agricultural sector.

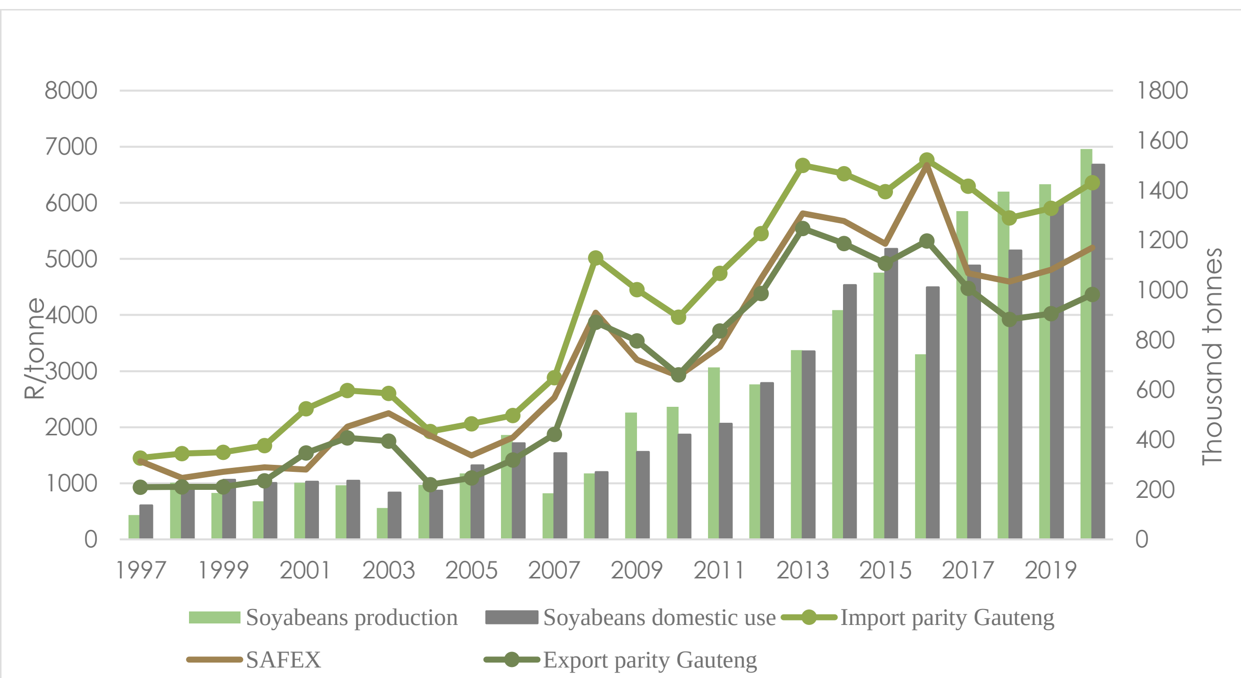

Figure 4.5: Soybean local and parity price band

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