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The South African Feed Industry – A Strategic Perspective

By the Bureau for Food and Agricultural Policy (BFAP)

This publication is a technical report by the Bureau for Food and Agricultural Policy (BFAP) commissioned by the Animal Feed Manufacturers Association (AFMA) of South Africa.

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EXECUTIVE SUMMARY

The animal feed industry is a critical role player in South Africa's agricultural economy, providing nutritious feed inputs to animal farming, whilst at the same time being a major buyer of raw materials from farms (grains) and other manufacturing (oilcake, grain milling residues and other raw materials) industries. The animal feed industry in South Africa generated around R55 billion in gross sales in 2020 and employed around 17 000 individuals. The Animal Feed Manufacturers Association (AFMA) of South Africa commissioned this study whereby BFAP conduct an industry assessment or Deep-dive Analysis of the animal feed industry which details important economic considerations and value chain linkages. The findings in this report highlights the importance of local economic conditions to drive demand for animal products such as poultry and dairy products through which animal feed derives increased demand for manufactured feed.

Feed mill profitability is highly dependent on competitive sourcing or raw materials and require high utilisation rates of manufacturing capacity in a market with thin margins. In the past decade, the average net profit per ton of feed produced was on average R417 per ton and achieved net earnings before interest and tax of 4% of total income generated. It is expected, based on the BFAP Baseline Outlook, that some growth is forthcoming in animal feed demand, with volumes growing by 1.2% per annum towards 2030 under baseline conditions.

Throughout this research the importance of trade and spatial economic realities need to be considered in making policy and trade decisions, which were highlighted. The BFAP Baseline Outlook for grains and oilseeds, coupled with the newly developed model for animal feed milling provides insights into the direction of the industry within current market conditions. The scenario analysis then anticipates the impact on animal feed opportunities if some of the Agriculture & Agro-processing Master Plan (AAMP) interventions are implemented towards boosting inclusive growth beyond baseline projections. The final section is an input from AFMA's own SWOT analysis.

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1. INTRODUCTION

South Africa's animal feed industry has a long history of supporting agricultural activities as both a critical input supplier to various livestock industries, as well as being a large buyer of raw material used as an input from both primary and secondary industries. Severe droughts and the devastating impact of the great depression during the 1930's resulted in the development of the animal manufacturing industry in South Africa (DAFF, 2017). Since then, the industry's modern, competitive and capital-intensive operations result in the production of a variety of quality feeds, high in nutritional food components and specifically tailored for the different animal consumption segments for increased productivity.

Animal feed production is continually becoming an essential economic activity globally as the demand for animal products are increasing with population and income growth, as well as urbanisation. Rapid growth in per capita income in developing countries is driving increased meat consumption, which in turn leads to strong growth in feed consumption of cereals such as maize and oilseeds (Msangi et al., 2014). Nutrition is the foundation for sustained global livestock productivity and critical driver for competitiveness. Animal feed is often the biggest expenditure item in livestock systems, as is the case in South Africa. Furthermore, the impending impact of increased climate variability and more frequent droughts suggest that animal feed optimisation will be critical for future growth and sustainable economic development (Hartog & Sijtsma, 2013).

The Animal Feed Manufacturers Association (AFMA) of South Africa commissioned BFAP to conduct an industry assessment or Deep-dive analysis which provides important insights of the industry structure, current trends and critical factors affecting its success and future growth. This comes at a time when the agricultural sector is in another planning phase with the process of compiling the Agriculture & Agro Processing Master Plan (AAMP). It is envisioned that the AAMP will form part of the social compact based on a partnership between government, labour, civil society and industry whereby practical and actionable reforms will be designed to address pertinent growth and development challenges. The research undertaken in this report utilises BFAP's comprehensive analytical platform already used in conducting Deep-dives for 17 commodities as part of the AAMP process.

The research seeks to provide the detailed analytics to assist decision-making in the animal feed sector to support viable interventions. To date, there has been limited research undertaken in animal feed manufacturing when compared to available research in primary agricultural industries. Phase 1 of this research project entails a fast-tracked analysis which provides AFMA the required insights on the linkages between proposed interventions in livestock, grain and oilseed value chains. Starting with a brief overview of world feed production, the animal feed industry's role in agricultural value chains is unpacked by a Product Flow Map and its contribution to the economy discussed. Asides from covering key aspects of trade, the structure of the industry, long-term trends and spatial dynamics, the newly developed Feed Mill Model provides forward-looking projections for the industry. Finally, we run the new model suggesting the impact of the proposed AAMP intervention on the animal feed industry, if these result in greater demand from increased production of animals.

2. RESEARCH APPROACH

BFAP has recently launched its holistic analytical framework designed to meet the rapidly increasing complexity inherent to the agriculture and agro-processing sectors. Figure 1 shows how this framework is used to provide support to analyse a specific industry based on the five consecutive steps, from contextualisation through to ultimately provide action plans and interventions through prioritisation and investment. The findings for each value chain should lead to informed decision making and proposed policy reforms that are aligned to the national development goals whilst at the same time ensure competitiveness and sustainability within the global, regional and local context. To do this, it is critical to understand the natural resource endowment and constraints, as well as the potential and prevailing market realities.

The final output of this approach provides a knowledge base and the projected Baseline identifies opportunities for growth, inhibitors and interventions to address these.

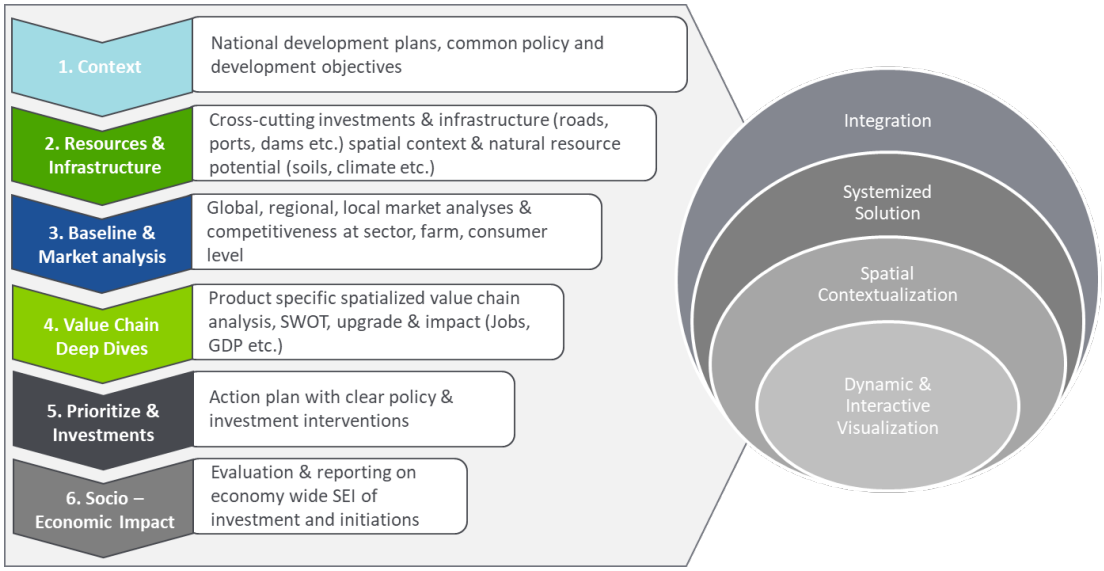

FIGURE 1: BFAP'S DEEP-DIVE ANALYTICAL FRAMEWORK
Source: Own Compilation

3. WORLD PRODUCTION

The global animal feed manufacturing industry plays a critical role in supplying the world with safe, abundant and affordable animal protein (IFIF, 2021). An estimated one billion tons of feed is produced annually, which generated feed turnover of around US $400 billion. The demand for animal feed has been increasing as global demand for animal protein has grown, particularly in developing countries. The major macro-economic drivers for increased demand for feed comes from population growth, increased per capita consumption of animal protein, urbanisation and general growth in income levels. These factors broadly affect changes in food consumption patterns away from starchy staples and towards meats, dairy products, fruits and vegetables, oils. This phenomenon, named Bennett's law, states that as income rises, per capita consumption of starchy food staples decline (Henson & Cranford, 2009). Furthermore, urbanisation, increased female participation in labour markets and greater ownership of appliances (e.g., refrigerators and

microwave ovens) all induce higher global demand for value-added products and animal protein (Wilkinson & Rocha, 2006).

Figure 2 provides a breakdown of the compound feed manufacturing per country in 2019. World feed production is estimated at 1.1 billion tons, of which the United States of America (USA) were the leading producer with 19% of the total (Alltech, 2020). China (15%) and Brazil (6%) made up the top three, followed by Russia, India and Mexico. South Africa made up 1% of world production in 2019. Commercial production or sale of animal feed is produced in 130 countries and directly employs more than 250 thousand skilled workers. Figure 2 also provides the breakdown of feed production dedicated to the various animal species. As expected, poultry (both broilers and layers) was the largest consumer of animal feed worldwide with 44%, followed by pigs, dairy and beef (Alltech, 2020).

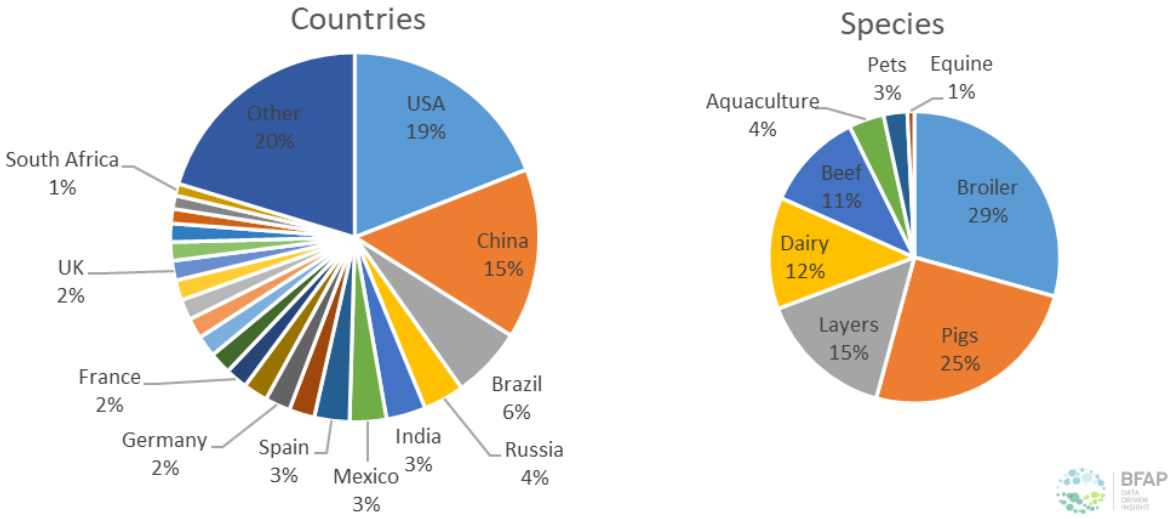

FIGURE 2: WORLD FEED MANUFACTURING BY COUNTRY
Source: Alltech, 2020

More recent statistics have been presented by Alltech at their 2021 Agri-Food Outlook (2021), suggesting that world feed production increased by 1% to 1.19 billion tons in 2020, despite the global disruptions caused by the COVID-19 pandemic. China saw a 5% growth from the previous year (driven mainly by the rebuilding of the pig heard following the devastating impact of African Swine Fever), producing 240 million tons and in the process regained its position as the world's largest manufacturer of animal feed in 2021. The USA and Brazil's output growth increased by 1% and 10% respectively.

A recently released report further provides some details on the impact of COVID-19 on the USA animal feed industry (IFEEDER, 2020). In broad terms, there was a significant increase in retail and grocery sales for most food products, and sharp declines in food products normally consumed through hotels, restaurants and other food outlets. As a result, there were major disruptions in processing facilities for cattle, pigs and poultry meat which caused significant price fluctuations. The total projected losses estimated because of the impact of COVID-19 during 2020, were income declines of 8.8% for fed cattle and 21.5% for broilers, followed by milk (-6.9%) and pigs (-20.6%). In contrast, income earned from eggs and turkey were positively impacted, growing by 19.9% and 11.8% from baseline levels in 2019 (IFEEDER, 2020). Regardless of these increases, the aggregate losses experienced by the entire USA

livestock industry was a loss of $15.9 million. This impact then spilled over to feed consumption, which produced around 4.2 million fewer tons of feed in 2020 than would have occurred if the pandemic did not occur. Thus, the feed manufacturing industry lost around $1.5 billion in income due to the pandemic.

In order to get a sense of the production capacity of leading animal feed producing countries, the section concludes with a brief summary of each:

- **USA:**

The latest estimate of animal feed manufacturing in the USA suggests that there are more than 5 800 facilities, producing more than 284 million tons of finished animal feed both for farm animals and pets (AFIA, 2021). The total value of sales was 297 billion USD in 2017 and the main market segments were cattle (32%), broilers (24%) and pigs (20%). Major States consuming animal feed are Iowa, Texas, Nebraska, North Carolina and Minnesota, whereas the top feed producing States were Missouri, California and Texas. The feed industry created 944 277 jobs, generated around $297 billion in total sales and paid $23 billion in taxes at local, state and national level (AFIA, 2021).

- **China:**

China's total output sales for manufactured feed is valued at 81 billion Yuan and the main market segments were for poultry (37%), pigs (33%), layers (14%) and aquaculture (10%) (International Milling, 2020). There has been an estimated 5% drop in feed production in 2020 due to reduced pig population caused by the African Swine Fever (ASF) outbreak (Alltech, 2020). However, due to the rebuilding of pig herds, output has grown substantially during 2020. In 2008 there were more than 13 000 feed enterprises in the country, of which 242 were state-owned enterprises (HG, 2021). Some of these mills have very large capacity, with around 621 feed mills exceeding production capacity of 100 000 tons per annum that reached total production of 107 million tons, contributing to 46.6% of total feed production. Further to that, there are another 7 larger feed mills producing greater than 500 000 tons per year of feed each and one mill producing more than 1.1 million tons per year in 2019 (International Milling, 2020).

- **Brazil:**

The Brazilian feed industry is the third largest producer by volume, mainly driven by its significant production of raw materials available at relatively low costs, coupled with a strong animal husbandry sector that exports meat. Brazil also has a large population consuming a variety of meat and animal products. The main feed market by animal type was poultry (46%), swine (24%), layers (10%), dairy (9%), beef (4%) and pets (4%). Total feed sales were valued at $27 billion which is projected to reach $33 billion in 2025. Around 25% of the feed value chain is in the State of Sao Paulo and produced 11% on total animal feed volumes (Sindiracoes, 2021).

- **Russia:**

Russian feed manufacturing is categorised by large and vertically integrated firms which made around 90% of the total market share of $18 billion in 2019. Largely driven by growing local consumption of meat and animal products such as milk and eggs, manufactured feed is directed to pigs (38%), poultry (25%) and cattle (11%). The country has however struggled

to break its import dependence on microbial additives and high protein products (Businesswire, 2021).

- **Europe:**

Combined, European Union (28) countries produced animal feed valued at around 50 billion Euros in 2019 and employs more than 100 000 workers in around 3 500 production facilities (FEFAC, 2021). The total compound feed production was 164.9 million tons in 2019, with the major feed segments being poultry (34%), pigs (31%) and cattle (29%). Germany, Spain and France are the leading producers in Europe, and feed costs have generally increased more than livestock producer prices over the past few decades, putting pressure on farmers to improve productivity.

Global trends in the use of grains dedicated to animal feed, provides the final perspective on world animal feed production. Figure 3 gives a breakdown of these grains from 2008 to 2020, as well as the estimated and projected numbers looking ahead to 2021. In total, grains used in feed increased from 745 million tons to 989 million tons; an annual average growth of 2.4% over this period. As expected, maize was the largest grain product used in animal feed with 68% of the total use, followed by wheat (15%) and barley (10%) (IGC, 2021). Clearly, the share of maize used in animal feed manufacturing has increased, growing from 65% to 68%, at the expense of barley and sorghum.

The International Grains Council (IGC) is projecting strong growth in the use of grains for animal feed production by growing by 3.6% in 2021 from the estimated use of 1.02 billion tons.

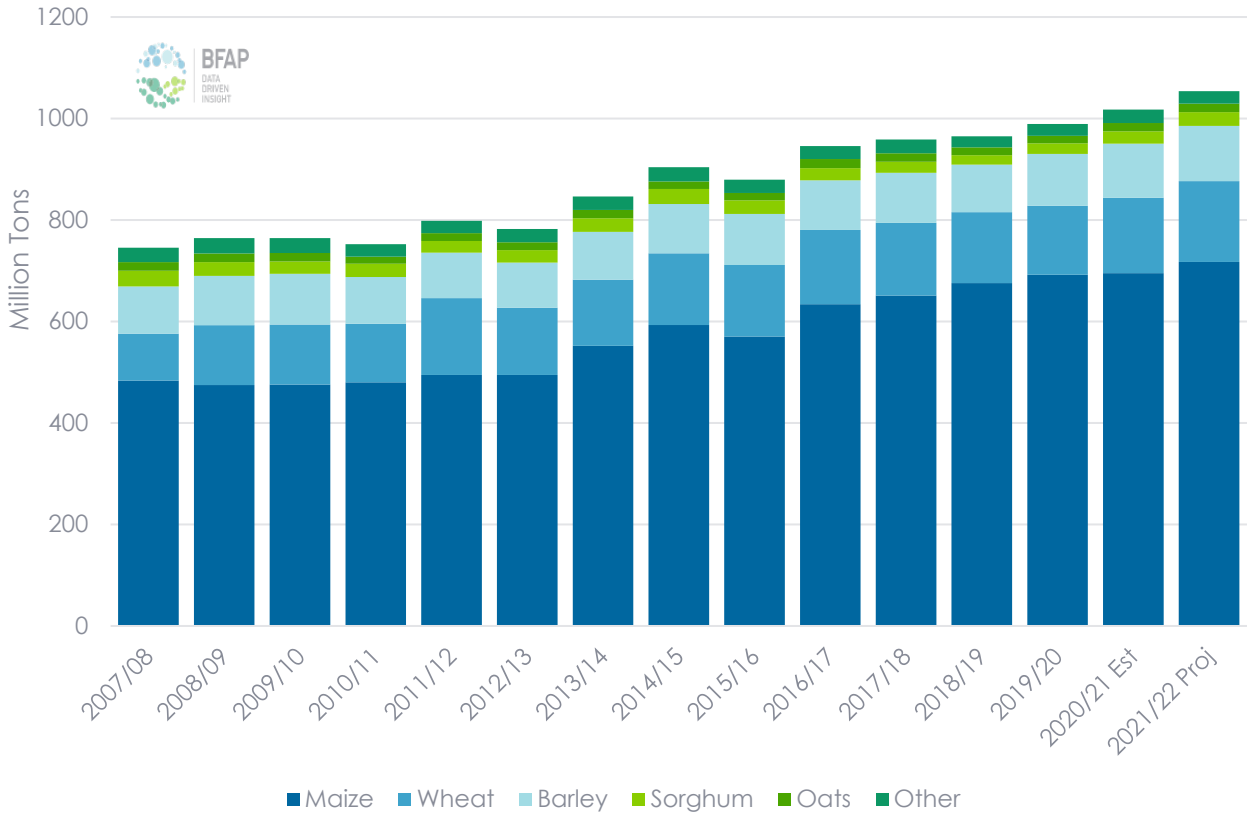

FIGURE 3: GLOBAL GRAINS USED IN ANIMAL FEED
Source: ICG, 2021

4. SOUTH AFRICAN ANIMAL FEED

South Africa's animal feed industry has a long-standing history of more than 80 years, producing feed to support the production of animals and animal products. There is limited information on this industry from public resources, which necessitates a study such as this Deep-dive analysis. Any analysis of this industry should consider its interconnectedness to primary agricultural industries, as well as its linkage across various secondary industries. As explained in the methodology to the BFAP Deep-dive approach, the next few sections cover various aspects of the South Africa's animal feed industry.

4.1 CONTEXT

South Africa's animal feed industry has a unique role in various agricultural and agro-processing sub sectors. Not only is the industry both a major buyer of raw agricultural and agro-processed products, but also is a critical input supplier to animal farming in South Africa. The animal feed industry is, therefore, a critical player in providing animals with adequate, balanced diets, free of toxins and contaminants, which is essential to promote productivity and animal welfare.

Figure 4 below provides a schematic diagram of where the animal feed industry is located within the broader South African economy. Using the sectoral breakdown Gross Domestic Product (GDP) in 2019, agriculture makes up around 2% of the economy, whilst agro-processing adds another 5% (StatsSA, 2021a). As one moves to the right, both sectors are further broken down into the various industries according to their contribution of total income to the sector. In the case of agro-processing, the most detailed and available data on its breakdown comes from Manufacturing Industry survey (StatsSA, 1993-2017).

The economic activities of animal feed mills are mostly classified under the manufacturing sector, with the Standard Industrial Classification (SIC) defining manufacturing as the "physical or chemical transformation of materials, substances, or components into new products" (StatsSA, 2012: p.63). Prepared animal feeds made a 5% contribution to the total output of agro-processing, valued at around R37 billion in 2017 (StatsSA, 1993-2017). It should however be noted that the SIC includes the manufacture of prepared pet feed, prepared feeds for farm animals and unmixed preparations of feeds for farm animals, but excludes fishmeal production, which is categorised under the processing of fish. It is also highly likely that parts of the feedlot industries' feed milling activities are captured under primary agriculture's activtities.

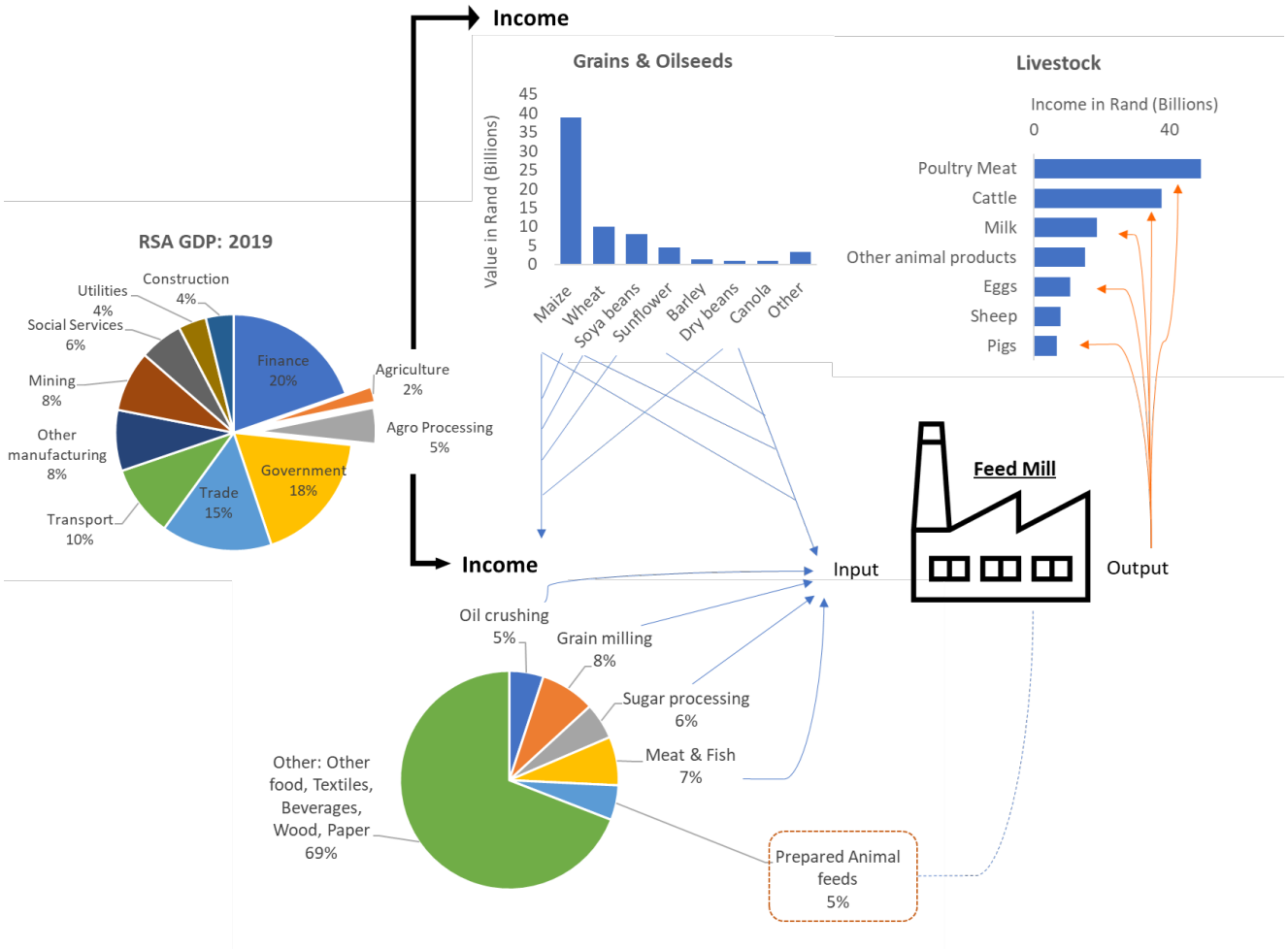

FIGURE 4: LOCATING ANIMAL FEED'S CONTRIBUTION TO THE ECONOMY
Source: StatsSA, 2021; StatsSA, 2017; DALRRD, 2020

The animal feed mills source various raw materials from both the primary agricultural sector and residual products from other agro-processing firms. The major products that come directly from agriculture include maize (mostly yellow), oilseeds and other grains and dry materials such as hay. Agro-processing products used as an input to produce animal feed come from oil crushing (oilcake), grain milling (various meals, flour, germ and hulls), sugar processing (molasses & bagasse) and from meat processing (animal & fish meal). Additional value chain linkages not specifically shown in Figure 4, include sourcing products from mining (limestone & phosphates) and chemical manufacturing (vitamins & medicine).

These raw materials are then used in a process whereby prepared animal feed is tailored for specific output markets, mainly poultry, dairy, beef, sheep and pigs. Thus, the animal feed industry produces products used in the farming of animals and animal products, which in turn has a secondary feedback affecting secondary agro-processing firms such as abattoirs, milk processing facilities and tanneries to name a few.

The demand for animal feed in South Africa has been largely driven by the expansion of animal production for local meat consumption markets, particularly chicken meat. Figure 5 below shows the consumption levels in the various meat category for various periods since 1998 and provides BFAP's projected consumption up until 2030 (BFAP, 2021). The strong demand for poultry meat has mainly occurred during the period of large-scale roll-out of conditional grants across South Africa that started in the early 2000's tied with robust growth

by the economy exceeding 5% by 2006 and thereby boosting consumers' disposable income.

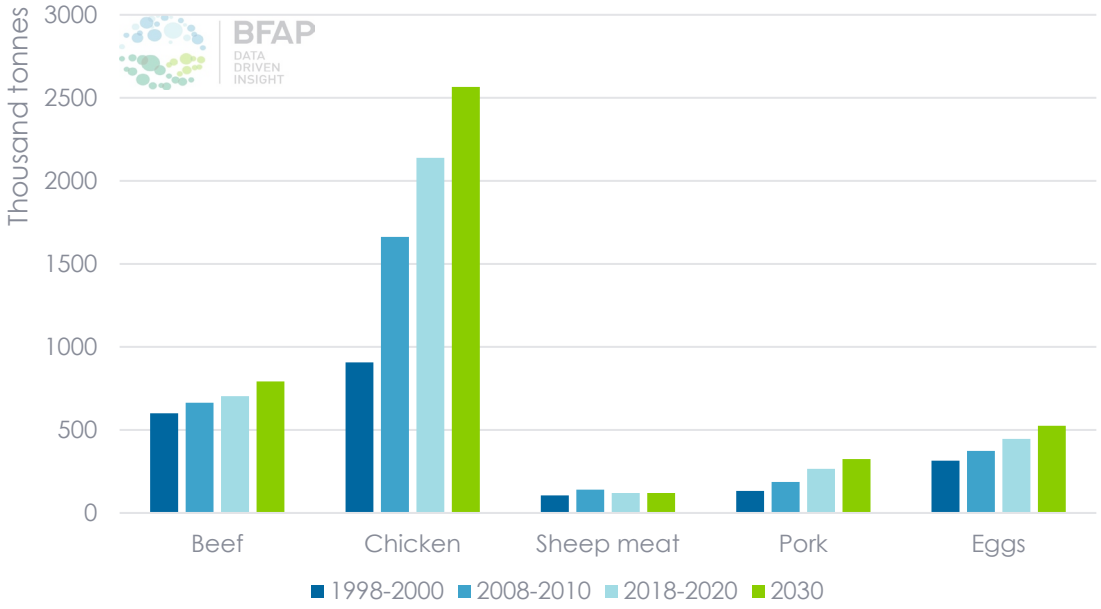

FIGURE 5: SOUTH AFRICAN MEAT CONSUMPTION
Source: BFAP, 2021

The resultant increased purchasing power of large parts of South Africa's poorer population and increased spending on cheaper meat options. Between 2000 and 2010, chicken meat consumption increased from 907 thousand tons to 1.7 million tons which represents an average annual growth of 6.2% throughout this period. That growth slowed somewhat in the next decade as the prevailing health of the South African economy deteriorated in the subsequent period, but still growing at a decent rate of 2.5%, on average. Given the more recent impacts of COVID-19 on the South African economy and slow economic growth projection, the Outlook suggests that this pace will further decline to around 1.8% towards 2030. There was also strong demand growth in the consumption of pork meat, growing from 132 thousand tons to 266 thousand tons over the past two decades, but is also expected to stabilise under baseline conditions. As will be seen later in this report, this has implications for expansion in the animal feed industry, of which its demand is mainly derived from the demand for meat and other animal products.

As part of the contextualisation of animal feed manufacturing, it is important to understand the importance of feed as an input to farming and in turn assess the importance of livestock farming as a share of total farming in South Africa. The recently released Census of Commercial Agriculture from Statistics South Africa (2020) provides a breakdown of all farm inputs by value of total farm expenditure. Asides from this, the trends in the gross income for the different agricultural subsectors are given in Figure 6 to show the importance of livestock production. Livestock production continues to be the main agricultural subsector in terms of South African gross farm income, traditionally hovering between 47% and 53% of the total. Horticulture's income of R101 billion and field crop of R78 billion for 2020 gave it a share of 31% and 24% respectively (DALRRD, 2020).

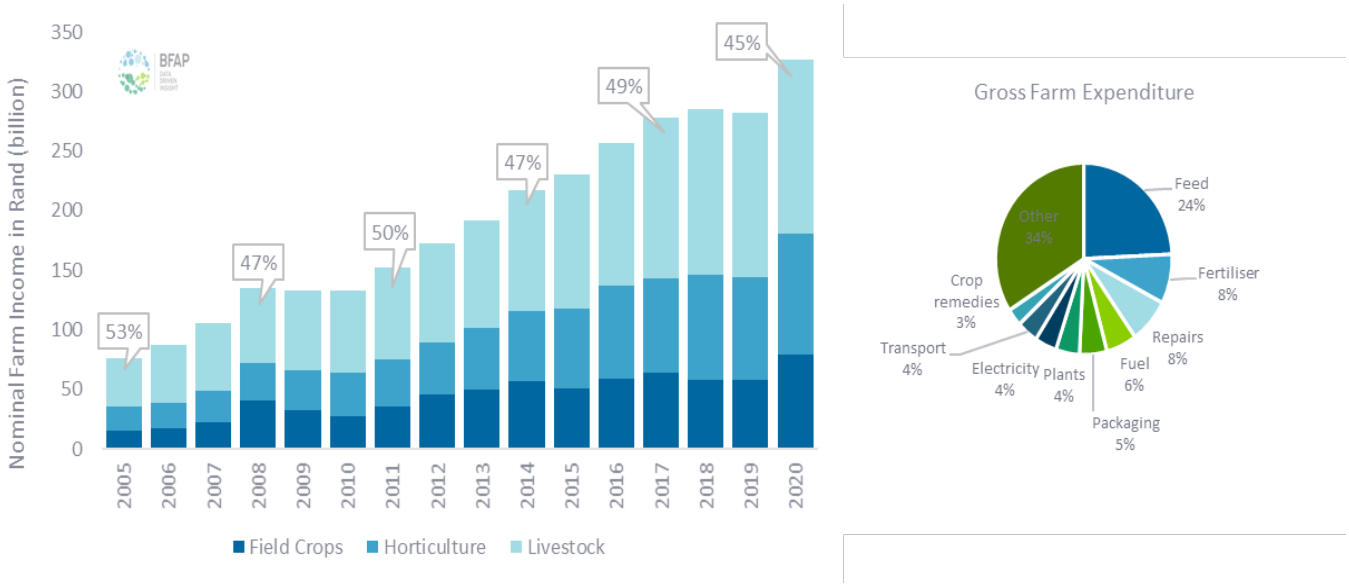

FIGURE 6: GROSS FARM INCOME (LEFT) AND GROSS FARM EXPENDITURE (RIGHT)
Source: DALRRD, 2020; StatsSA, 2020

The large contribution of animal production in South Africa is also reflected in that animal feed purchases by commercial farmers was valued at R45.6 billion in 2018 and by far the largest expenditure item with 24% of the total input costs. One can further break down farm income according to its contribution to gross farm income. In 2020, the top two income generating industries were poultry meat and maize production activities. The animal feed industry is one of the largest consumers of maize production used as a raw material in feed, whilst at the same time delivering inputs to the various livestock industry, of which all make a significant contribution to agricultural GDP in South Africa. These realities of critical value chain linkages point to the importance of the animal feed industry as a critical input supplier, buyer of both primary and secondary products.

Finally, the last discussion on the context where in the importance of the animal feed industry is highlighted relates to South Africa's natural resource base. Agricultural activities are directly dependent on the availability and quality of natural resources, particularly land and water. Unfortunately, South Africa is considered a water-scarce country and the agro-ecological endowment (terrain, climate, soil) directly affects the agricultural land capability. Figure 7 shows a map of the broad classes of land capability (DAFF, 2016) and the pie chart gives an estimated breakdown of farming activities based on land-use. Around 55% of land is utilised as extensive natural grazing for animal production as given in orange. A further 28% are used for intensive pasture-based livestock farming, which means the remaining 17% can be used for crop production activities. The recent examples of droughts both in South Africa's main summer grain producing regions in 2015/16, as well as the more recent 2018/19 drought in the Western Cape, suggest that the animal feed industry also plays a critical role to supply food to animals during times when natural grazing and pasture-based systems are experiencing water shortages. In such circumstances, the purchasing of animal feed, though much more expensive than natural grazing, provides a mitigating strategy to keep livestock alive and fed without having to slaughter animals, often diminishing the herd's future economic potential significantly.

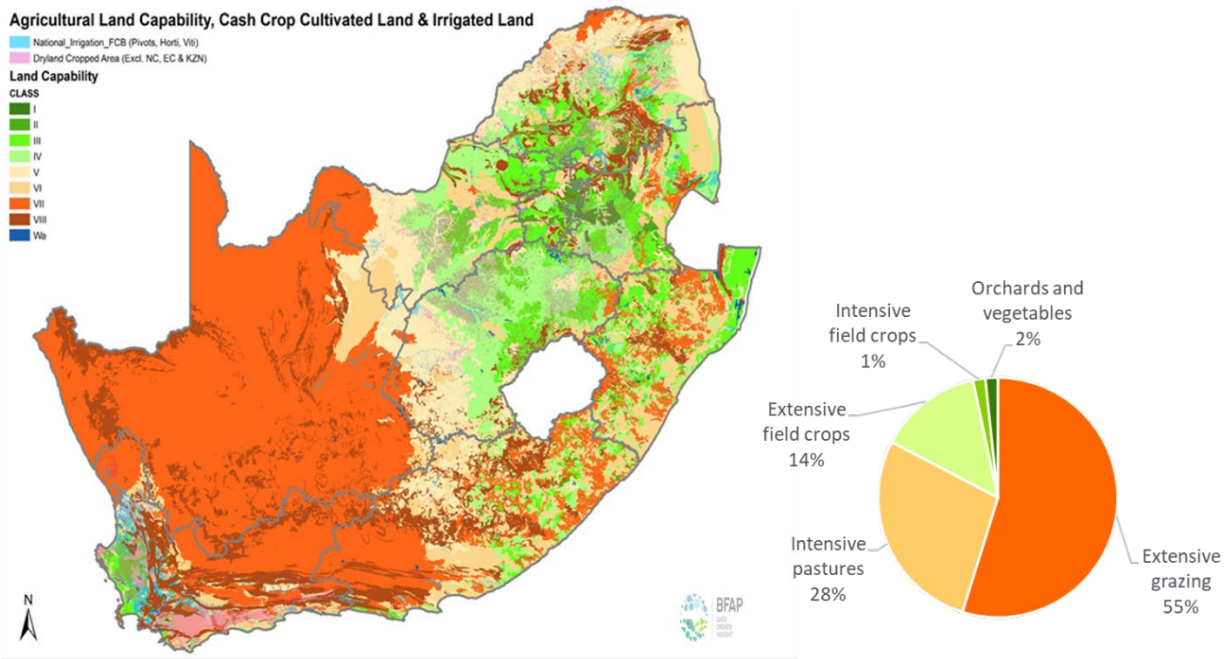

FIGURE 7: SOUTH AFRICAN LAND CAPABILITY CLASSES & FARMING SYSTEMS
Source: DAFF, 2016

Often in times of widespread and prolonged drought conditions, larger slaughter numbers result in low prices at auctions for farmers. Thus, the farmer needs to consider the trade-off of feeding livestock at higher immediate costs in the hope of improving climatic conditions arriving soon or selling the livestock at lower prices, which will result in a longer-term impact of having to rebuild the herd once the drought dissipates. Indeed, one of the reasons the industry was born in the 1930s was to be able to better manage droughts.

4.2 ANIMAL FEED INDUSTRY

4.2.1 Structure

From the outset, it is important to note that there are no official statistics that show the volume of animal feeds produced for the entire industry. This is partly due to the structure of the industry and some technical differences in the way that feeds are produced and used for. In broad strokes, one can divide the industry into feed manufacturers (dedicated processors of feed for direct sales), feedlots and informal feed milling. Feed manufacturers can further be divided into balanced feed manufacturers and those that mainly manufacture pre-mixes are also used as an input into the feed milling process. South Africa's total feed production has been estimated by an Agricultural Product Requirement (APR) feed simulation model developed by Briedenhann (2001) that calculates the national feed consumption based on the livestock population, per capita consumption of products, product import and export and a feed matrix for each species. AFMA members tend to generally represent feed manufacturing firms, whereas the South Africa Feedlot Association (SAFeedlot) mainly produce feeds for their own livestock operations. The feedlot sector is an intensive production system with the goal of growing and or fattening livestock until they reach slaughter weight. Thus, the feed rations produced in these operations do not end up being marketed as animal feeds but is used as an input. Furthermore, the rations used in

these activities are high in grain content (86%) combined with roughage (10%) and several additives (4%) fed as a premix (Futurebeef, 2021).

South Africa's animal feed industry structure is summarised in Figure 8 in which a Product Flow Map is developed. It provides a detailed breakdown of the value chain linkages between animal feed production, showing the volumes produced, utilisation and imports of raw materials, as well as the market segments of the animal feed market output. The analysis presented below is informed, calibrated and compiled by data from various public sources, largely by using data from AFMA (2021), SAGIS (2021), the Protein Research Foundation (PRF, 2021) and discussions with industry role players. To calculate the total feed output in South Africa, the Product Flow Map aggregates the total use of raw materials utilised in feed processing compiled for the calendar year of 2020.

Starting with the sourcing of raw products used in animal feed manufacturing from the primary agricultural sector, around 5.6 million tons of maize (mostly yellow) were utilised. The majority (98%) of these materials are procured from local sources, whilst around 2% are imported. The industry also utilises around 183 thousand tons of full fat oilcake, of which 82% is from soybeans. In terms of other grains used directly to mill feed, barley, wheat, oats and sorghum is most often used, which had a combined total of 123 thousand tons. Other agricultural products such as hay from various crops are also used in feed formulations as a dry raw material. Though strictly not originating from primary farming, minerals such as salts and a variety of phosphates and sulphates are procured from various mining industries, which amounted to 650 thousand tons.

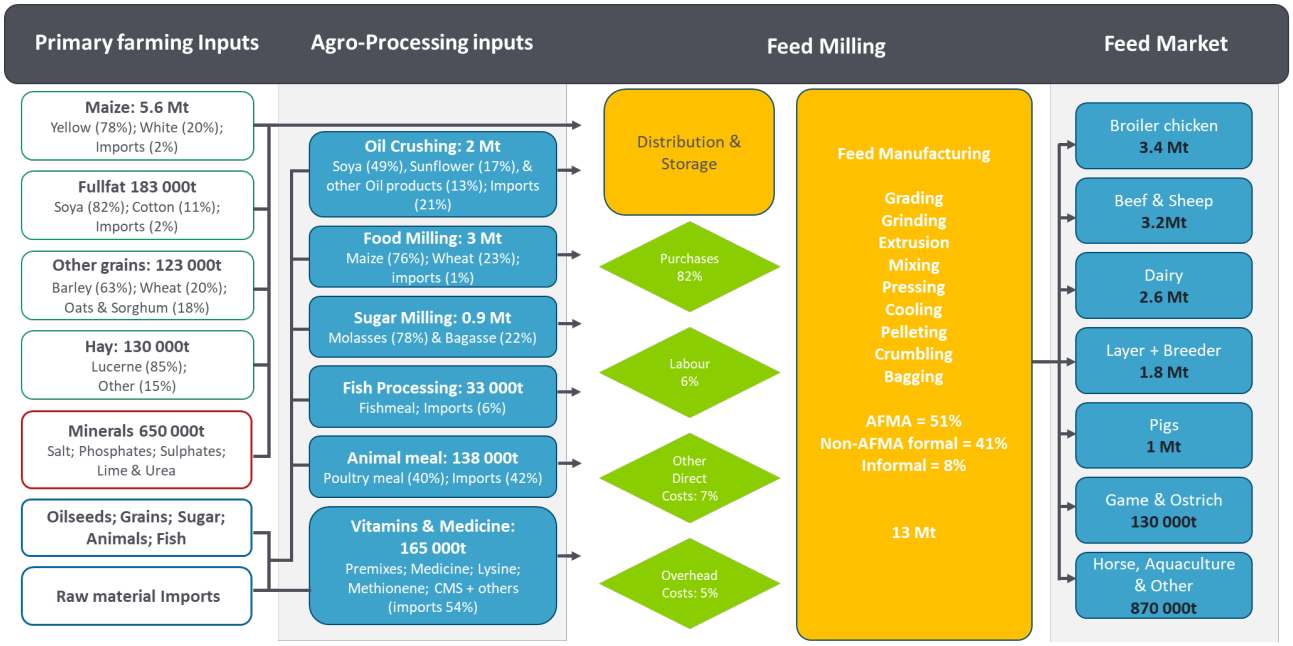

FIGURE 8: PRODUCT FLOW MAP OF SOUTH AFRICA'S ANIMAL FEED INDUSTRY IN 2020
Source: BFAP Compilation from various

The next segment of the value chain shows the volumes of raw material used in feed milling that arise as a by-product from other secondary manufacturing industries. On their part, a mix of products is directly purchased from local farming and imports. Since our focus is primarily on animal feeds, these input details are not provided. Rather, Figure 8 shows the volume of utilisation originating from secondary manufacturing. Oilcake from oil crushers and residues from the food milling industry was the largest sources used in animal feed. In terms of the former, soyabean oilcake made up 67% of the 2. million tons of oilcake procured, followed by sunflower oilcake (19%) and others (15%). Thus, if one adds the use of soybean seeds, full-fat and oilcake, it adds up to a significant raw material in the feed milling industry. Wheat and maize residues of around 3 million tons were used, consisting mainly of wheat bran and flour, and maize chop, gluten meal, germ and straw. The linkage between food and feed milling is a crucial link in the grains value chain.

Feed manufacturers also link directly to the sugar industry by procuring around 678 thousand tons of molasses and using around 190 thousand tons of bagasse (dry pulp material). Fishmeal supply in South Africa comes from local manufacturing (66 thousand tons) and imported products from Namibia and other areas (7 700 tons). However, South Africa is also a net exporter of fishmeal, which implies that local consumption of fishmeal is around 32 thousand tons, mainly used in animal feed products, and the remaining are exported. Feed mills also utilise around 138 thousand tons of animal meal, mostly made up of poultry by-products from the local market, although a significant share is also imported. Finally, there is a large volume of vitamins and mixtures such as medicines, amino-acids and lysine used in animal feeds, unfortunately, these products are mainly produced in manufacturing industries located outside of South Africa and imported.

All of the above-mentioned materials are stored in silo's or in flat storage areas on the mill floor or at the feedlot. The process of manufacturing balanced animal feeds, the following process is followed. The grains are transported from the silos to the grinders where it is grinded to a suitable coarseness dependent upon the specific feed mixture. Other raw materials that do not require grinding is then mixed with the prescribed premixes and vitamins, minerals and medications (DAFF, 2017). This mixture is then steamed to raise the heat and moisture, after which it is either forced through the pellet press for pelletising or made into mash, crumbs or liquids. After these processes, pellets are then cooled, and the feed is passed through a shaker which separates unwanted material and is then bagged. Some feed mills also do their own full-fat extrusion whereby oilseeds are thermally processed to destroy anti-nutritional factors and to increase the oil availability whilst also preserving the protein nutritional quality.

Each manufactured feed follows strict formulations based on the nutritional requirements of different animals, and within each category, a range of products are developed, depending on its use. For instance, of the estimated 13 million tons of feed produced, around 3.4 million tons are for broiler feeds. Within this category, feed volumes are further split into feeds dedicated to the different growth stages of the bird, starter feeds (day-old chicks to about 16 days); grower feeds (17-30 days) and finisher feeds (31-38 days). The broiler diet can be further augmented by ranges in between these main products (pre-starters, post-finishers and maintenance feeds). For every animal type, different feed products are developed to support optimised growth, which will not be discussed here in detail. However, the market for manufactured feed is given on the far right of Figure 8, showing the importance of poultry with broilers feed totalling 3.4 million tons and layer and

breeders another 1.8 million tons. Other notable market segments were for cattle and sheep (3.2 million tons), dairy (2.3 million tons) and pigs (1 million tons).

Table 1 provides a summary of the estimated feed volumes according to the segments that feeds are used for. The analysis of total raw materials used suggest total feed production is estimated to be 13 million tons in 2020. Modelling work conducted by PRF (2021) however, suggest that the total national feed production was 11.97 million tons in 2020, derived from South Africa's commercial farm animal numbers. AFMA, who represents a significant proportion of all balanced feed manufacturing, had a total production of 6.7 million tons, which suggest that the remaining 5.2 million tons are utilised in feedlots and other on-farm mixing. The only publicly available volumes for pet feed production of 187 thousand tons as given from the StatsSA (2017). This implies that the remaining 868 thousand tons are informal feed production either by means of independent firms or small enterprises operating in informal value chains.

TABLE 1: TOTAL FEED PRODUCTION IN SOUTH AFRICA IN 2020

Segment	Volume in Tons	Percentage of Total
Manufactured Balanced Farm Feeds	6 732 571	51.67
Feedlot & On-farm mixed Farm Feed	5 240 821	40.22
Pet Feed (2017)	187 628	1.44
Informal Feeds	868 746	6.67
Total Feed	13 029 766	100.00

Source: **AFMA, 2021; PRF, 2021; StatsSA, 2019**

The green blocks in Figure 8 shows the share of total expenditure within feed milling operations, 85% allocated to purchases of materials, whilst labour and other direct expenditure were 4% and 6% respectively. Overhead costs made up 5% of the total cost to manufacture feeds. These breakdowns of the share of expenditure are based on both AFMA (2018) and StatsSA (2019) data but is skewed towards the cost breakdown of manufacturing firms, rather than a typical feedlot.

4.2.2 Trade

An essential part of the animal feed value chain, as already alluded to in the previous figure, is the importance of international trade. Competitiveness in local feed manufacturing is highly dependent on sourcing raw materials at low prices, whether from local production or imports, in an attempt to produce feed at the lowest possible cost. Figure 9 below shows the overall trade position for South Africa in terms of the value of imports and exports since 2001 (ITC, 2021). The dotted trendline summarises the trade balance (exports minus imports) and reveals the import dependence of the industry. Trade in cereals such as maize and wheat is not included in these calculations since these have their own separate trade codes. In the case of maize, the trade data also does not disaggregate between white and yellow maize, the latter being mostly used in animal feeds. However, in the previous figure it was shown that South Africa mostly produce maize in surplus, with import dependence for maize used in animal feed only 2%. These small quantities of imports is largely used in coastal regions and brought into the country when import parity levels at the coast are more competitive. Traditionally, South Africa is a net exporter of maize, which implies that maize prices tend towards being competitively low and trending towards export parity levels, lower than the average international price for yellow maize. However, in years where

production levels have been significantly affected by droughts, South Africa has had to import yellow maize at higher prices, closer to import parity levels.

Asides from cereals used in animal feed, Figure 9 shows all other raw material, mixes and products used in animal feed manufacturing, located under the Harmonised System (HS) of trade classification 23: "Residues and waste from food industries; prepared animal fodder". South Africa's negative trade balance has gone through various phases, starting with an overall weakening of the trade balance from around 2001 to 2013. In this period soybean oilcake imports have grown from R756 million to R3.1 billion as indicated in the green bars.

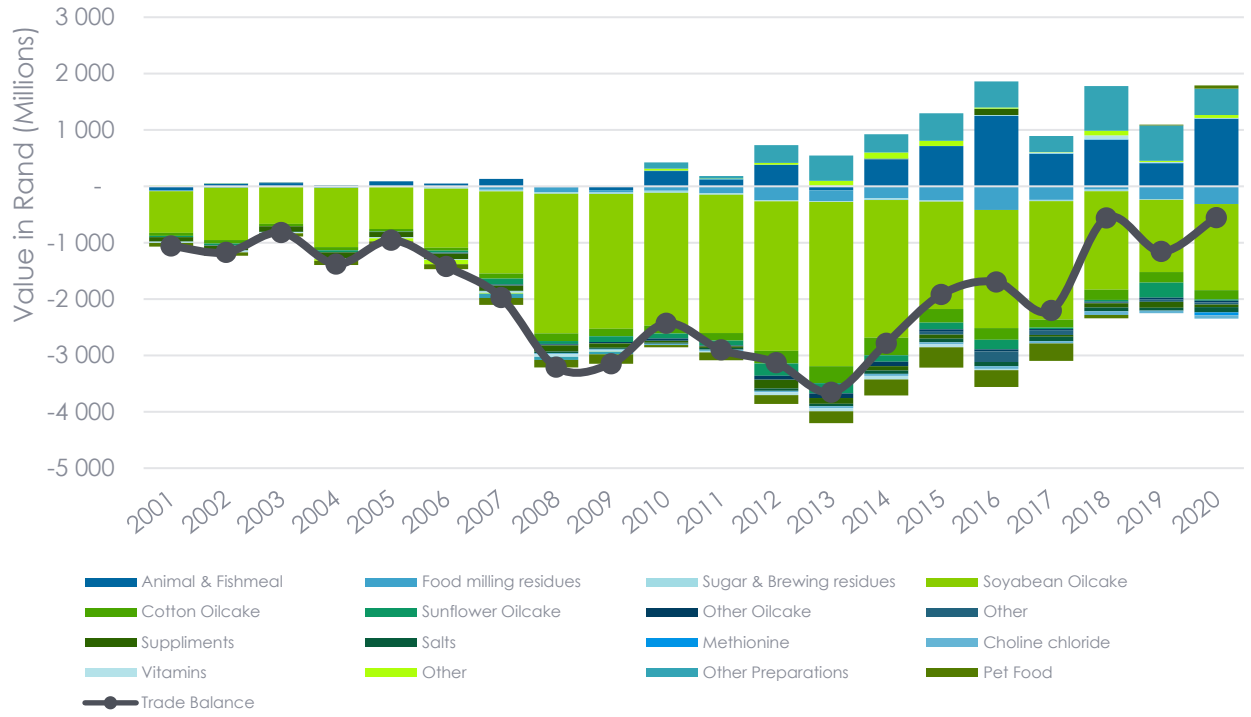

FIGURE 9: SOUTH AFRICAN TRADE IN ANIMAL FEED PRODUCTS, 2001-2020
Source: ITC, 2021

This situation has been turned around dramatically and is seen of one of the success stories of local industry to ramp up local production of soybean production and oil processing. This has resulted in the animal feed industry being able to procure more oilcake from local oil crushers. Other products that South Africa mainly imports were other oilcake (mainly from cotton & sunflower), salts, supplements and amino acids. In terms of exports, South Africa has in recent years become a stable net exporter of animal and fishmeal which had a positive trade balance of R1.2 billion in 2020, whilst other feed preparations exported were valued at R470 million.

Figure 10 provides further insights on South Africa's trade dependence in oilcake, this time given in volumes and by country traded (ITC, 2021). Total imports in oilcake have declined remarkably from the highest volume in 2007 of 1.2 million tons to 487 thousand tons in 2020. South Africa mainly imported oil cake from soybeans coming from Argentina, whereas in recent years some oilcake has been exported to neighbouring countries such as Botswana, Eswatini and Mozambique.

The continued drive towards import replacement of oilcake will be driven by further expansion in local production of soybean, sunflower, canola and cotton production. More detail on the crop outlook from the BFAP baseline will shed more light on this trend, but there are also critical limits to fully replace oilcake imports as a result of spatial considerations and economic costs.

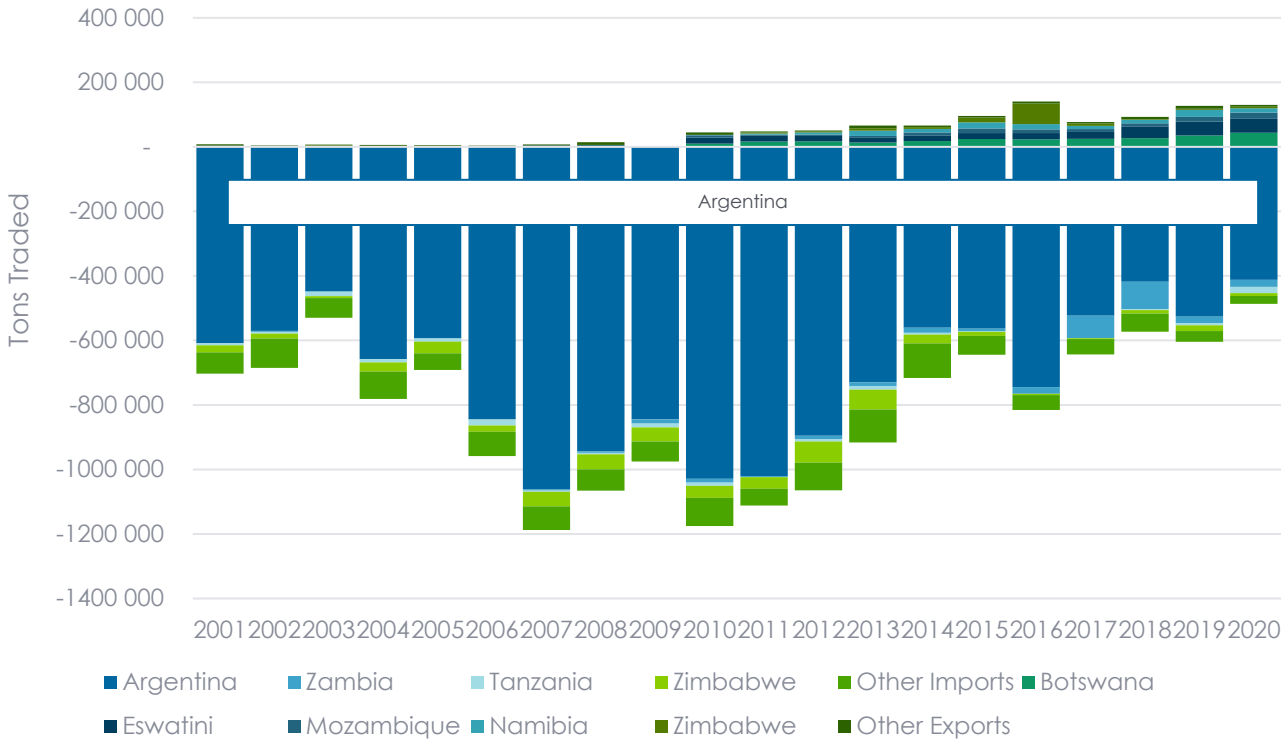

FIGURE 10: SOUTH AFRICAN TRADE IN OILCAKE PRODUCTS, 2001-2020
Source: ITC, 2021

4.2.3 Industry Trends

There are mainly two public sources available to assess the animal feed manufacturing industry in terms of their performance over time. StatsSA (2021b) publishes the gross sales performance and index of volumes produced every month for the grain mill industry (food, starch & feed milling), but unfortunately does not routinely report disaggregation of these metrics to the sub-industry level. However, the detailed Manufacturing Industry Survey, which is conducted every three years, provides a breakdown of sales for animal feed separately, but only in value terms (StatsSA, 1993-2017). This data is then summarised, giving the gross sales for the grain mill industry in real 2020-prices in Figure 11. The sales share of feed milling is given in the years that this breakdown is possible and suggests that over time the share for feed milling has increased over time. In the early 1990's this share was 30% and has increased to 44% in 2017. It is important to note, again, that the feed milling total sales of R33.9 billion used in Figure 11 only covers feed milling by manufacturing firms and does not include large parts of the feedlot industry. Thus, the total value of feed production for the entire feed industry is much higher.

In aggregate, the total grain mill industry sales grew from R13.5 billion in 1993 to R89 billion in 2020, which suggests an annual average growth rate of 1.1% (StatsSA, 1993-2017). The

milling industry's growth in volume terms is given from 1998 and onwards. Volumes produced since then have increased by 1.3%, but as explained earlier, the major growth period being from 2000 to around 2008. To get a sense of feed production volumes, an index volume for AFMA totals, as well as Briedenhann's APR trend for the estimated total feed production (including feedlots). Clearly, the growth in the volume of animal feed production have grown faster than total milling industry, highlighting different underlying drivers in these industries. The strong growth stage in the early 2000's, brought by increased spending on animal protein in the form of chicken meat has driven feed demand higher.

FIGURE 11: GRAIN MILL GROSS SALE AND VOLUME INDEX, 1993-2020
Source: StatsSA, 2021; 1993-2021

These different growth stages are reflected in the summary of average annual growth rates for both value of sale and production volumes in the grain mill industry in Table 1 below. Between 2000 and 2005 production volumes expanded by 4.3% every year and in value terms by 5.2%. In the next five years there were still decent growth of 2% and 2.4% for sale and volumes produced, but since then growth in this industry has been hampered by the prevailing local market conditions and slowing down of demand growth for meat, causing a declining phase recently.

TABLE 2: GRAIN MILL GROSS INCOME ANNUAL GROWTH

Period	Annual Volume Growth (%)	Annual Value Growth (%)
2000-2005	4.3	5.2
2005-2010	2.0	2.4
2010-2015	0.9	1.9
2015-2020	-0.3	-0.4

Source: **StatsSA, 1993-2021**

An additional source of long-term trends in animal feed production comes from BFAP's annual balance sheets, which provides the volumes of some of the major raw material utilised in feed use. Additionally the total feed production of AFMA members are also given

in the same figure. The main raw products have already been explained previously under section 4.2.1, but the long-term trend seen in Figure 12 provides an indication of actual production volumes. Since 1994, the major animal feed materials usage has increased from around 4 million tons to 7.7 million tons in 2020. AFMA feed production volumes have a high correlation 2001 and 2015, after which production from AFMA members deviates to a lower trajectory, mainly attributed to the impact of the Highly Pathogenic Asian Avian Influenza outbreak and the subsequent forced culling of broilers and layers in 2017.

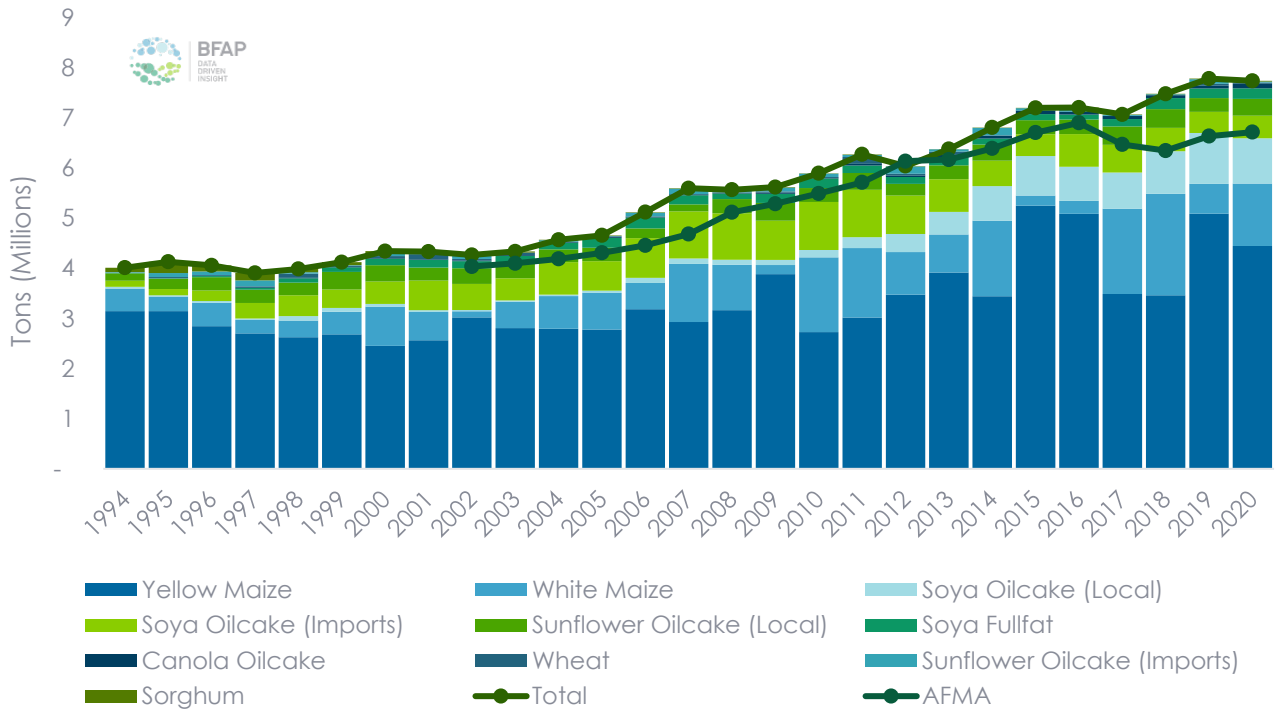

FIGURE 12: FEED RAW MATERIAL USES, 1994-2020
Source: BFAP, 2021; AFMA, 2021

4.2.4 Baseline & Market Outlook

Since animal feed manufacturing is so closely linked and dependent on grains and oilseeds as an input, this section provides insights into BFAP's latest 10-year Outlook on relevant commodity markets. Despite slower growth in the demand anticipated for animal protein in South Africa, the commitments made in the Poultry Masterplan, which should result in some import replacement and consequently a decline in the share of imported products in domestic consumption, combined with export led expansion in the beef sector still imply substantial growth in the demand for animal feed over the coming decade. As shown in Figure 13, yellow maize consumption as animal feed is projected to rise by 34% over the next 10 years as a result of increased demand from animals. Similarly, soybean processing volumes are projected to increase by 43% over the same period, partly due to increased feed demand, but also due to replacement of currently imported soybean meal with domestically processed products.

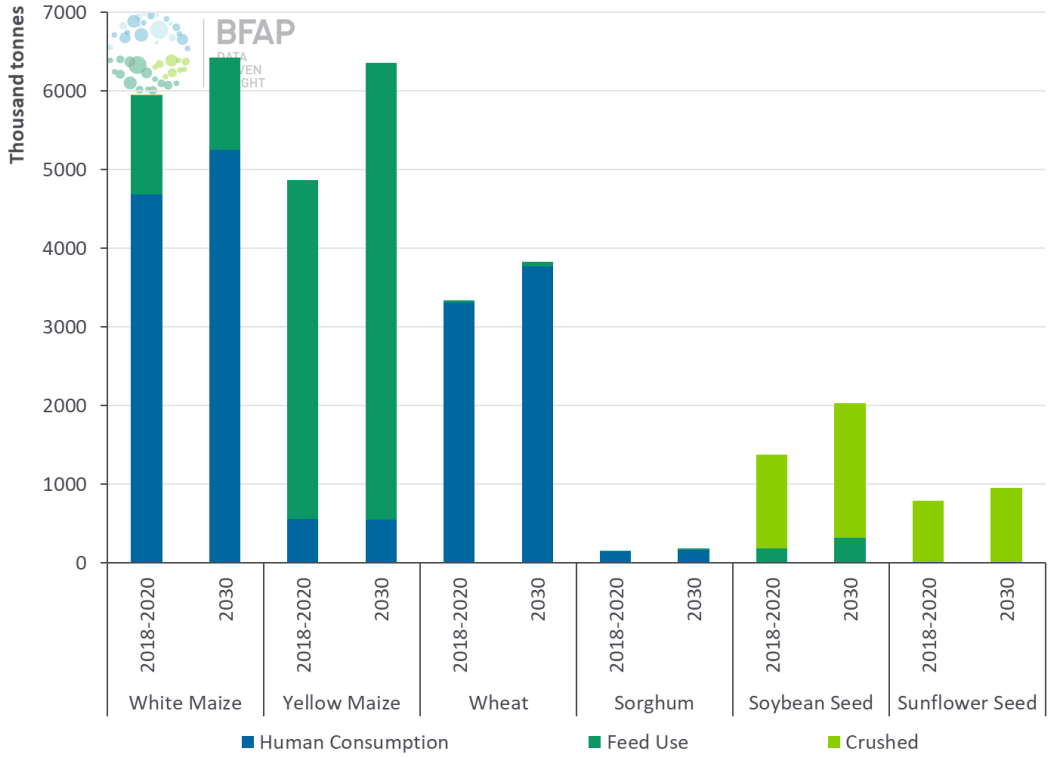

FIGURE 13: DEMAND FOR SUMMER GRAINS IN SOUTH AFRICA: 2018-2020 VS 2030
Source: BFAP, 2021

Figure 14 shows the area cultivated for summer crops important for feed use, both historic and projected values. Yellow maize and soybeans area continue to increase, expanding by 8% and 34% respectively over the 10-year period to 2030.

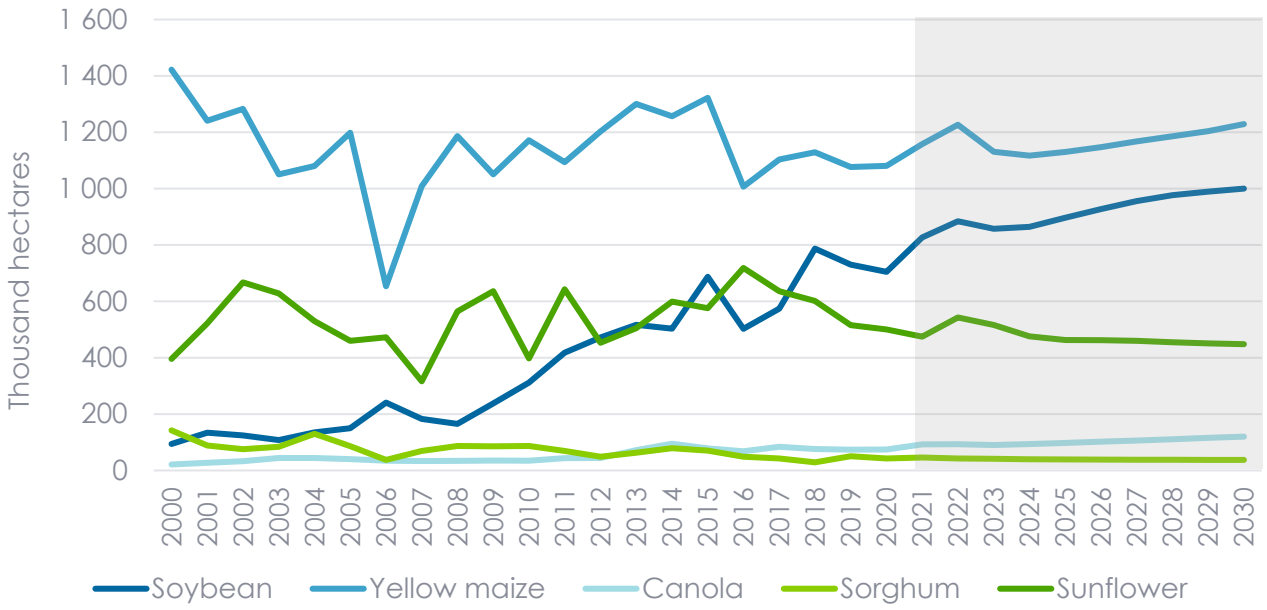

FIGURE 14: AREA PLANTED FOR SUMMER CROPS RELATED TO ANIMAL FEED: 2000 - 2030
Source: BFAP, 2021

Yield gains for yellow maize are still expected to improve by 20% over the coming decade, whilst soybeans are expected to gain 24% in yield and 34% in area planted. Sunflower is expected to have a significant yield gain with an aid in technology improvements, despite decreases expected in area planted. Since yellow maize is by far the largest raw material used in feed formulations, Figure 15 elaborates on how price movements are impacted by trade dynamics. Yellow maize is easily traded in the global market and South Africa is mainly a net exporter of the products. This results in prices trending towards export parity, but in cases as can be seen in 2016 and 2017 where drought conditions affected local supply, local prices increased rapidly to import parity levels.

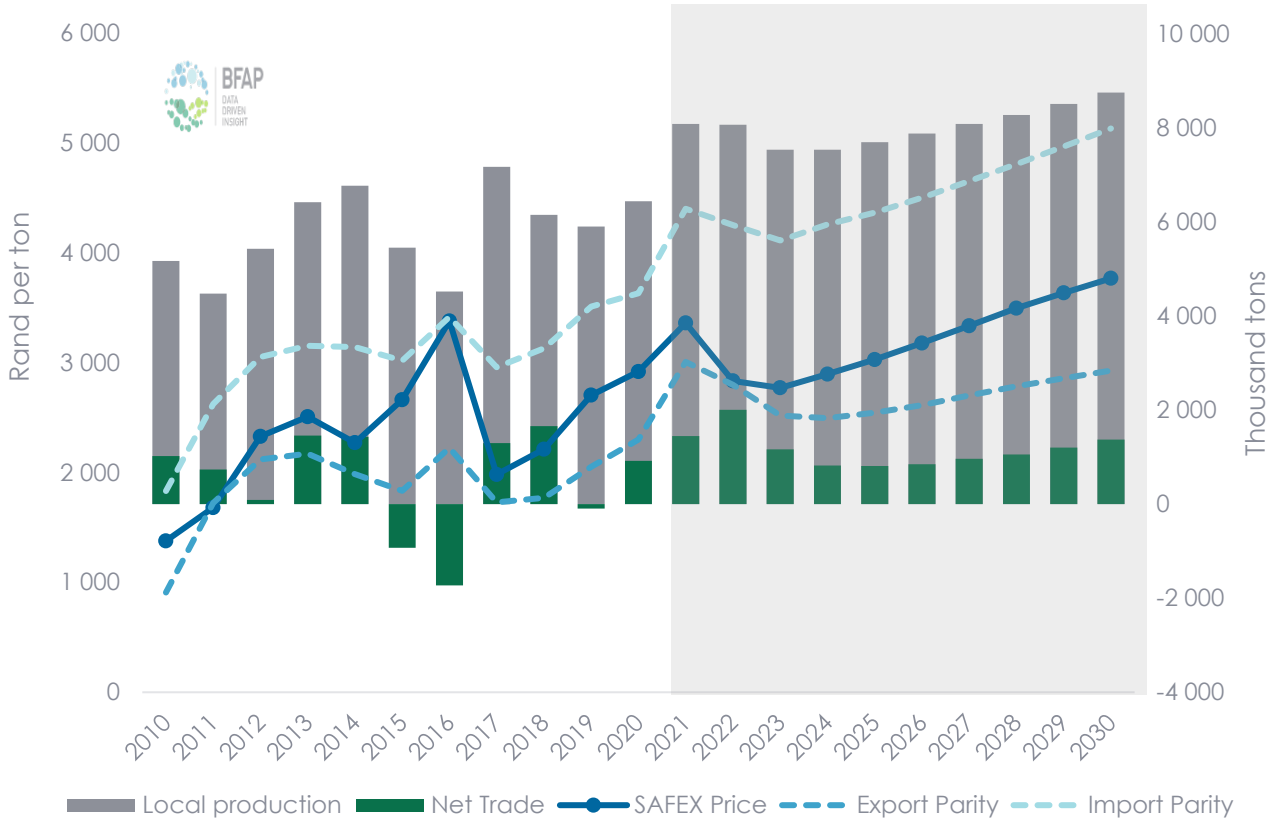

FIGURE 15: YELLOW MAIZE PRODUCTION, TRADE BALANCE AND PRICES
Source: BFAP, 2021

Looking ahead, after an initial consolidation as yields normalise from its current record levels in 2021, yellow maize exports are projected to increase over the Outlook period. With a smaller share of the total crop exported over time, prices trend marginally above export parity, more in line with parity levels calculated from favourable export locations such as the Eastern Free State. This does however result in a decline in the short term, as international markets normalise. With an increasingly competitive regional export market and an excess of a million tonnes of white maize set to be utilised as animal feed by 2030, prices are expected to trade marginally below yellow maize prices.

South Africa remains a net importer of soybean products, which tend to trade closer to import parity. Soybeans have become increasingly dominant in South Africa's oilseed complex, with utilisation increasing from 1.1 million tonnes in 2010 to 1.3 million tonnes in 2020. Over the course of the projection period, soybean production is expected to increase

by 260 000 tonnes from the record crop in 2021, to 2.19 million tonnes in 2030 – an expansion of 2.4% per year. This reflects a growth in livestock production, supported by actions such as the poultry masterplan, as well as favourable long term price ratios relative to alternative proteins such as fish meal. The expansion is however slowing down compared to the past decade when the soybean sector was one of the most dynamic sectors in agriculture, as it is now becoming more mature.

The projected production growth is expected to support increased processing over time, to the point where current capacity will be utilised completely towards the end of the Outlook. Consequently, South Africa is projected to produce a small surplus of beans, resulting in equilibrium prices trading between export parity and the derived value of the products, such as oil and meal. Despite sufficient soybean production, the high cost of transportation from South Africa's summer rainfall regions to the Western Cape in particular, implies that South Africa will continue to import some soybean oilcake into coastal regions. Investment in rail infrastructure to reduce this cost would enable South Africa to become self-sufficient in oilcake production.

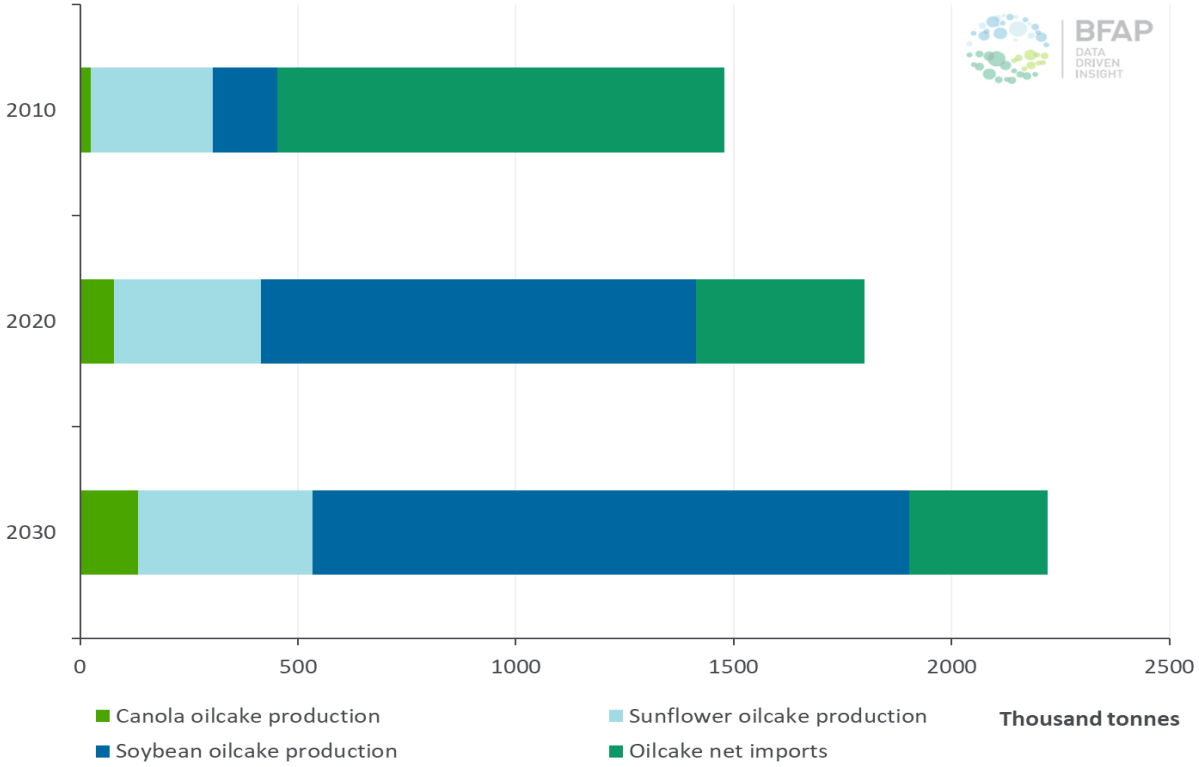

FIGURE 16: OILCAKE SUPPLY AND DEMAND IN SOUTH AFRICA
Source: BFAP, 2021

4.2.5 Feed Milling Profitability

As part of the Deep-Dive analysis undertaken in this report, BFAP developed a model that simulates the feed manufacturing industry's use of raw materials, inclusion rates and typical costs structures. The model is based on manufacturing of balanced feed dedicated to producing animal feed products that is traded in the market and excludes on-farm feed production in feedlots and other informal millers. The approach that was followed was to aggregate the total value of production based on historic sales volumes and average annual prices for feed, between 2010 and 2020. This is informed by both BFAP partial

equilibrium framework and augmented with AFMA industry data. As previously noted, total costs are made up of the purchasing of various raw materials and the model breaks down the use of different raw material at market prices, and additionally adds average direct costs required to manufacture feed, according AFMA industry norms. The cost calculation excluded overhead costs such as depreciation, interest and tax and therefore calculates profit as Earnings Before Interest, Tax & Depreciation (EBITD). Linking this model based on actual inclusion rates and historic prices to the BFAP Baseline Outlook allows us to give insight into feed manufacturing profitability and future growth trends.

South Africa's feed mills currently operate at approximately 75% utilisation capacity and the average feed mills processes about 150 thousand tons of feed per year. The feed price used in the model, is a weighted average between chicken, egg, cattle and pork feed prices. It should be noted, however, that the model seeks to determine the overall industry's performance, based on available information and that large variation in specific feed mills away from the mean can be observed on the ground. Factors such as management, infrastructure, capital gearing, location and marketing have a significant impact on profitability. Furthermore, there is also different business models in this particular industry, with many firms vertically integrated in the value chain.

Before the model results are presented, the average values used will be explained briefly. In 2020, a total of 6.7 million tons of prepared animal feed were sold, which generated a gross income of R32.2 billion. Total industry costs were valued at R29.68 billion, which translates to an average net operating profit of R2.5 billion or R380 per ton of feed produced. The industry had good operating margins in 2020, especially if one considers that the average net operating profit for the past decade was much lower at R362 per ton and some years as low as R95 per ton. Figure 17 shows the trend in the gross value of production and total costs of the industry to get to the net operating profit.

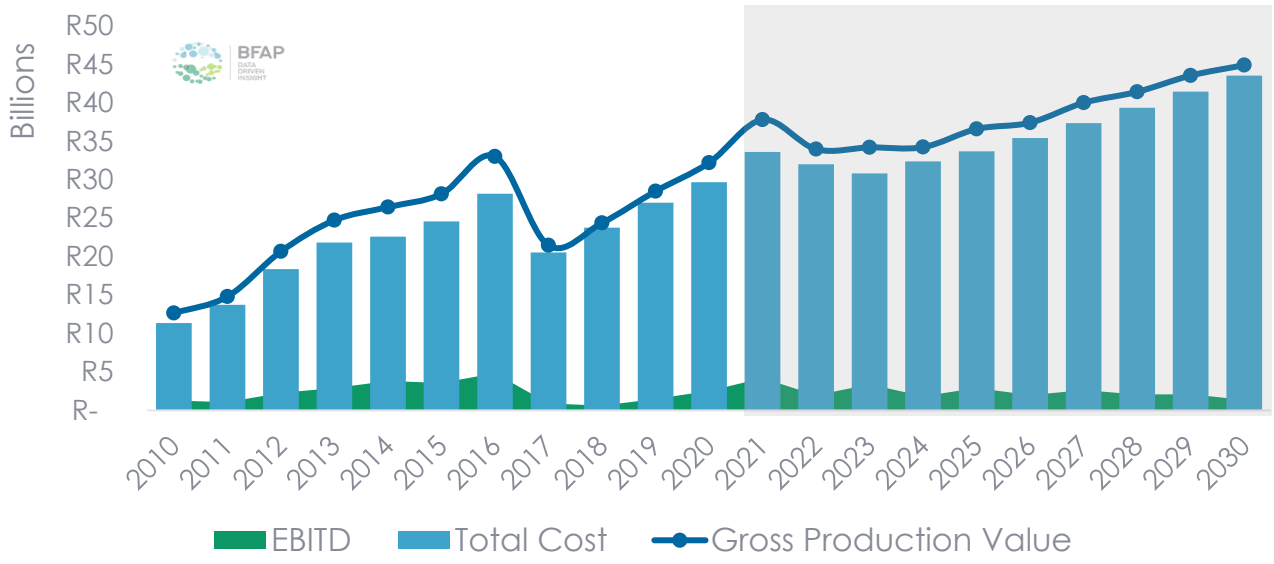

FIGURE 17: NET OPERATING PROFIT FOR THE FEED MANUFACTURING INDUSTRY
Source: BFAP compilation

The model shows how strong growth in sales between 2010 and 2016 was still evident and EBITD following the same trend. In 2015/16 South Africa's major summer planting areas experienced severe drought conditions, pushing the prices of locally sourced grains and oilseeds much higher. More farmers needed to buy feed due to the resultant condition of grazing areas. Thereafter, profits were under pressure and drastically declined in 2017/18 due to a record harvest driving down raw material prices, but also after the outbreak of avian influenza affecting poultry production.

Using BFAP's most recent Baseline projections on raw materials, feed prices and cost inflation adjustment, Figure 17 also projects the animal feed industries profitability toward 2030. Under the current baseline assumptions, animal feed sales are expected to increase to R45 billion growing annually by 7.2% in nominal terms. Output volumes are set to increase by 1.16% per annum, manufacturing around 1.2 million tons of additional animal feed in the next decade. The average expected gross profit per ton of feed produced is expected to be R337, highlighting the impact of cost inflation outpacing income growth.

In order to compare the model's profitability, Table 3 summarises information available from StatsSA's Annual Financial Statistics (2019) for the feed mill industry. The trend between years is not comparable since the sample range changes annually, but the resultant EBITD as a percentage of total income can used for comparison. The average EBITD between 2017 and 2019 was 3.47%, suggesting that once all expenditure items have been covered, margins in this industry are slim. BFAP's model estimates closely matches the finding from the financial information given by StatsSA (2019). This reality highlights the importance of driving high utilisation of milling capacity to spread expenditure over a larger throughput.

TABLE 3: INCOME, COSTS AND EARNING OF FEED MILLS

Feed milling	2017	2018	2019
	Rand Millions		
Gross Sales Income	19 486	19 237	23 101
Total Expenditure	18715	18573	22411
EBITD	771	664	690
EBIDT (% of Total Income	3.96	3.45	2.99
BFAP (% of Total Income)	4.26	2.51	5.23

Source: StatsSA, 2019

4.2.6 Employment & Socio-economic Impact

South Africa's animal feed industry's socio-economic impact can be measured by looking at the employment capacity and the overall wage levels. Unfortunately, there is limited time series data available on employment for feed milling specifically, but StatsSA's Manufacturing Surveys indicate the employment in the years that the survey was undertaken. Figure 18 provides the trends in employment for the grain milling industry as a whole from various available sources. Quantec (2021b) employment numbers are estimated, whereas StatsSA's (2021) Labour Force Surveys are used as the offical employment statistics. Using the average for all three sources in 2017, total employment in the grain milling industry was 28 870 workers.

The Manufacturing Survey for 2017 suggests that animal feed milling employment made up 32% of the total grain milling jobs and suggests that 10 523 workers were working in feed mills. Employment statistics from AFMA's internal and annual surveys, suggest that amongst member firms, total employment was 10 282 in 2018. Important to note is that many of South Africa's pet feed manufacturers are not represented by AFMA, but rather the Pet Food Industry Association of Southern Africa and that many more feed jobs are created by on-farm and feedlots producing feed. Thus, the economic activity of producing feed, whether for direct sales or own results in an estimated employment of 17 000 workers.

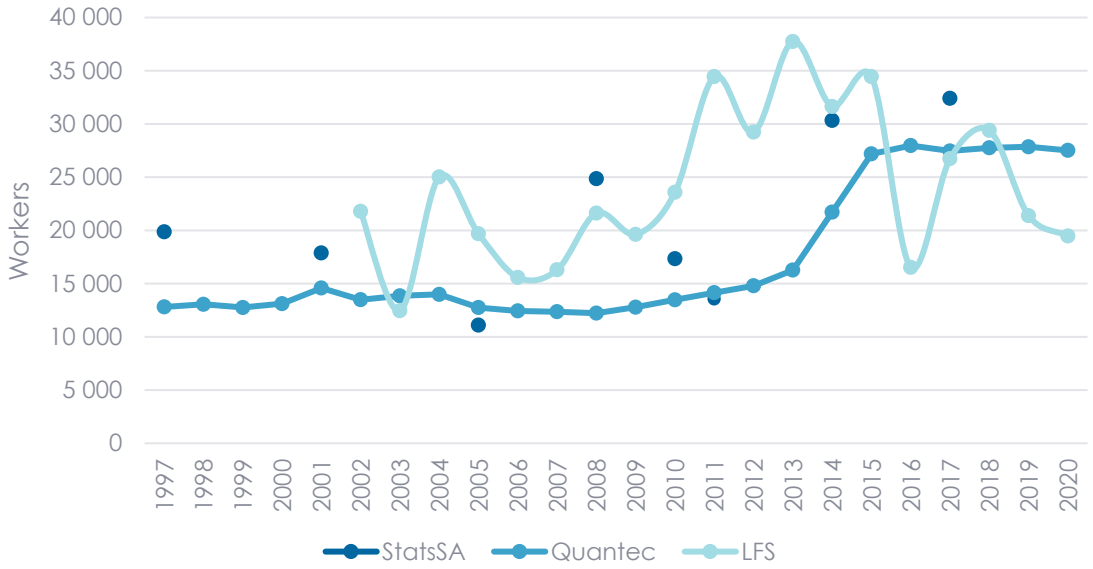

FIGURE 18: GRAIN MILL EMPLOYMENT NUMBERS, 1997-2020
Source: StatsSA, 2021; Quantec, 2021

Not only does the industry make a significant employment impact, but the type of jobs created is mainly of a more permanent nature, which is good for creating sustainable livelihoods for those dependent on these jobs. Between 85-93% of workers employed in feed mills are permanently employed and the industry's total wage bill was around R2.4 billion in 2017 (StatsSA, 2017). The available data suggest that for every 630 tons of feed produced, 1 job is created in the feed mills. Furthermore, for every additional R1 million worth of animal feed output produced, 0.49 jobs are created. South Africa's current average household size is 3.3 persons, which suggests that the animal feed industry's wider livelihoods impact through job creation affects 55 thousand individuals, substantial given South Africa's current level of unemployment and joblessness. Using the BFAP model results as presented in the previous section, the growth in animal feed production towards 2030 will result in the industry creating around 1900 additional jobs.

4.2.7 Animals and Feed Markets

Expansion and growth in animal feed manufacturing is largely dependent on the demand for animal products, and in particular feed intensive industries such as poultry, dairy and pork. The fundamental factors that underpin meat consumption are income levels and the resultant changes in spending power, population growth and urbanisation. The sensitivity of meat products to collapsed GDP growth and consequently also spending power was evident in 2020, when per capita consumption of beef, pork and lamb declined by 5.8%, 8.4% and 16.5% respectively. Consumption of poultry products, which is the most affordable

amongst the four major meat types, increased by less than 1% year on year. While consumption levels in 2020 were also influenced by reduced food service operations and are therefore not attributable to spending power alone, the stagnation in economic activity in recent years prior to any influence by the pandemic, already resulted in weaker consumption growth during the past decade relative to the early 2000s. The prolonged nature of the economic recovery from COVID-19, combined with further increases in unemployment will likely result in markedly slower meat consumption growth in the coming decade.

Apart from the volatility in feed costs over the past 5 years, one of the biggest challenges facing livestock producers is animal disease outbreaks. The importance of the livestock subsector is reflected in its almost 50% contribution to the gross value of agricultural production. Unlocking and accelerating inclusive growth in the sector will require a well-coordinated strategy with interventions that speak to animal health, competitiveness, market access and inclusivity.

By 2030, chicken consumption is expected to increase by 20% relative to the 2018-2020 base period (Figure 19). This is significantly slower than the 29% growth over the past decade and pales in comparison to the 71% growth achieved from 2000 to 2010. Beef, pork and eggs are expected to increase as well, while sheep are expected to stay constant. The import share of all imported products (chicken, sheep and pork) is expected to decrease, while beef and eggs' export share is projected to increase.

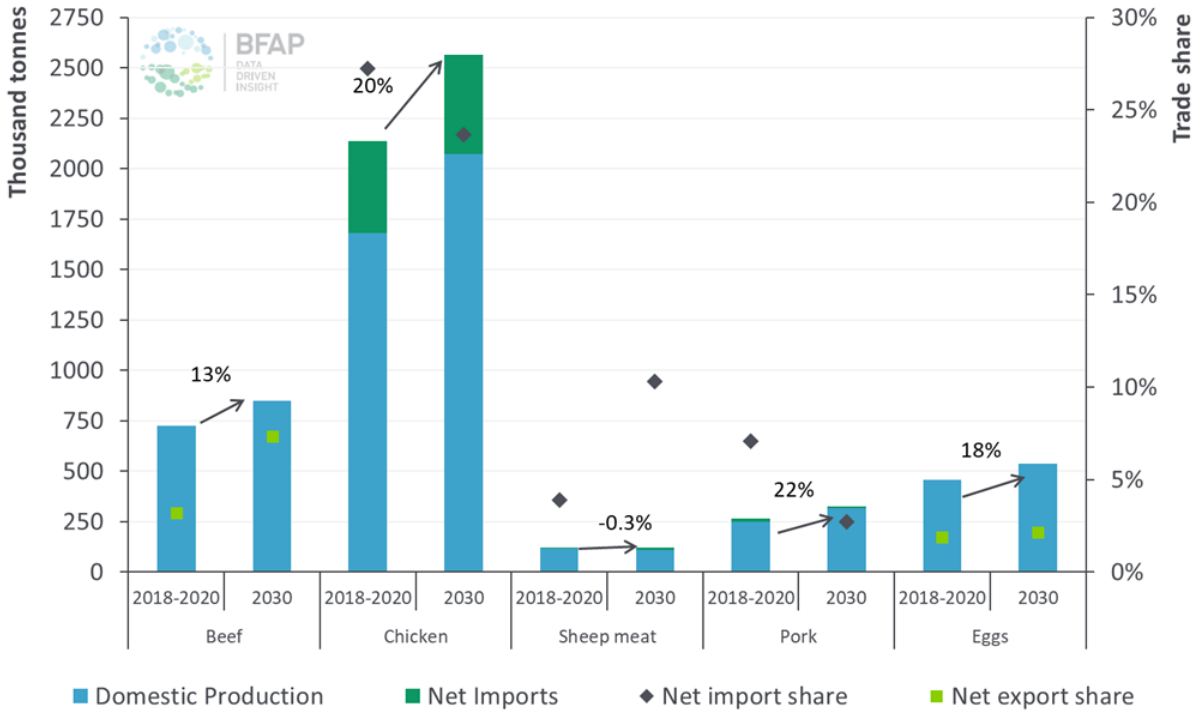

FIGURE 19: MEAT CONSUMPTION IN SOUTH AFRICA: 2018-2020 VS 2030
Source: BFAP, 2021

Traditionally the commercial farming sector utilised manufactured feed as a critical input into their businesses. As already mentioned, the majority of intensive production of chickens, pork and dairy are the main segments for animal feeds. One way to assess where the major markets are for animal feeds, is to assess where animals are located on commercial farms.

Figure 20 shows where the different animal categories are concentrated according to their municipal boundaries. As expected, poultry production is concentrated in Gauteng and the Western Cape. There were around 134 million broilers and 23-million-layer chickens on farms in 2018. Dairy cattle are mostly concentrated around coastal areas of the Eastern Cape and KwaZulu-Natal where the suitability of pasture-based systems and milk production are the most competitive. Beef and sheep are more widely spread across South Africa's main natural grazing areas that are more suitable for extensive farming of animals. There were around 5 million head of cattle, concentrated in the Free State (29%) and Mpumalanga (15%), whilst most of the 8 million sheep population was in the Northern Cape (StatsSA, 2020).

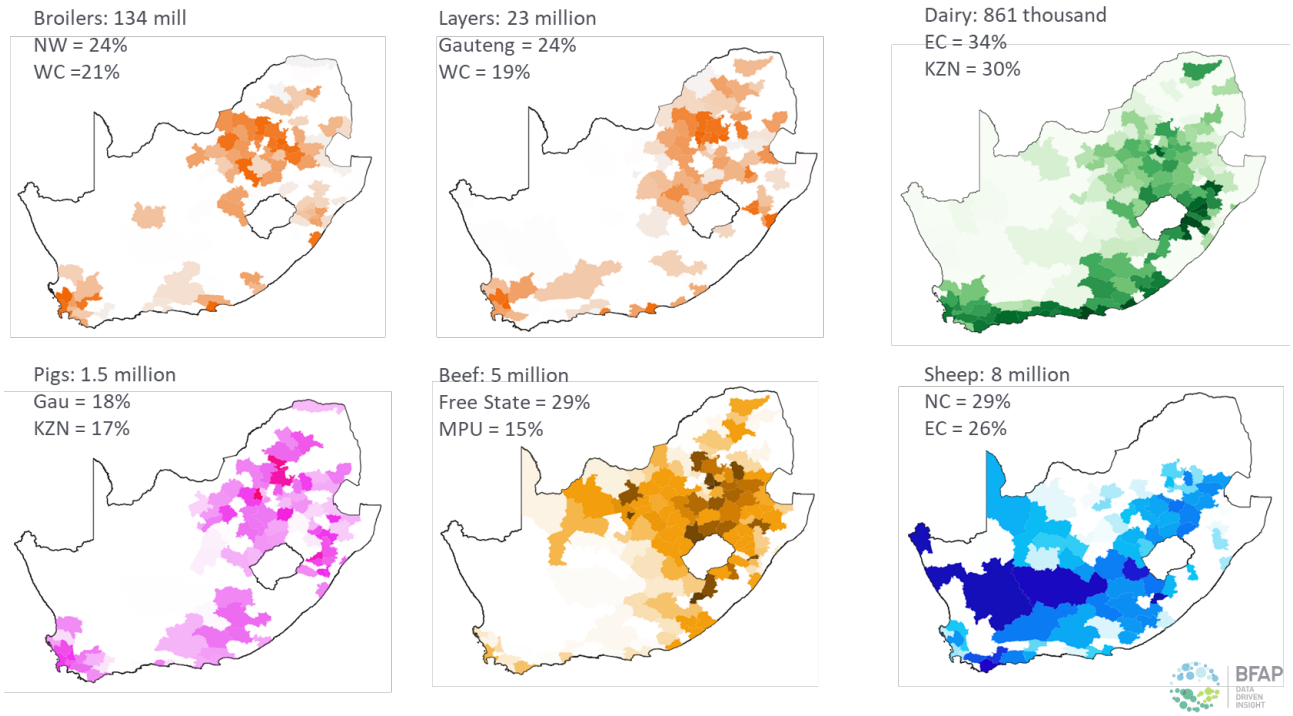

FIGURE 20: ANIMALS ON COMMERCIAL FARMS
Source: StatsSA, 2020

The South African agricultural economy is well-known to have a dualistic structure consisting of a capital-intensive and globally competitive commercial farming sector and a smallholder and informal sector, mostly located in the Former Homeland areas. These realities have an impact on the characteristics and spatial location of animal feed manufacturing and its subsequent market output. Figure 21 seeks to replicate the information given in the previous figure, this time showing where animals are owned by black agricultural households (StatsSA, 2016). There were around 975 thousand households owning livestock, with the concentration for chickens, cattle and pigs concentrated in the former homeland areas. For the purposes of looking at expanding animal feed production, households producing animals at some scale are of interest. There were close to a thousand households that produced more than 1 000 birds, these located in rural areas in the Eastern

Cape, as well as in Limpopo and KZN. There were around 1 300 agricultural households that had pig herds bigger than 50 being spread similar to poultry production. Finally, around 1 600 households owned cattle herds greater than 300.

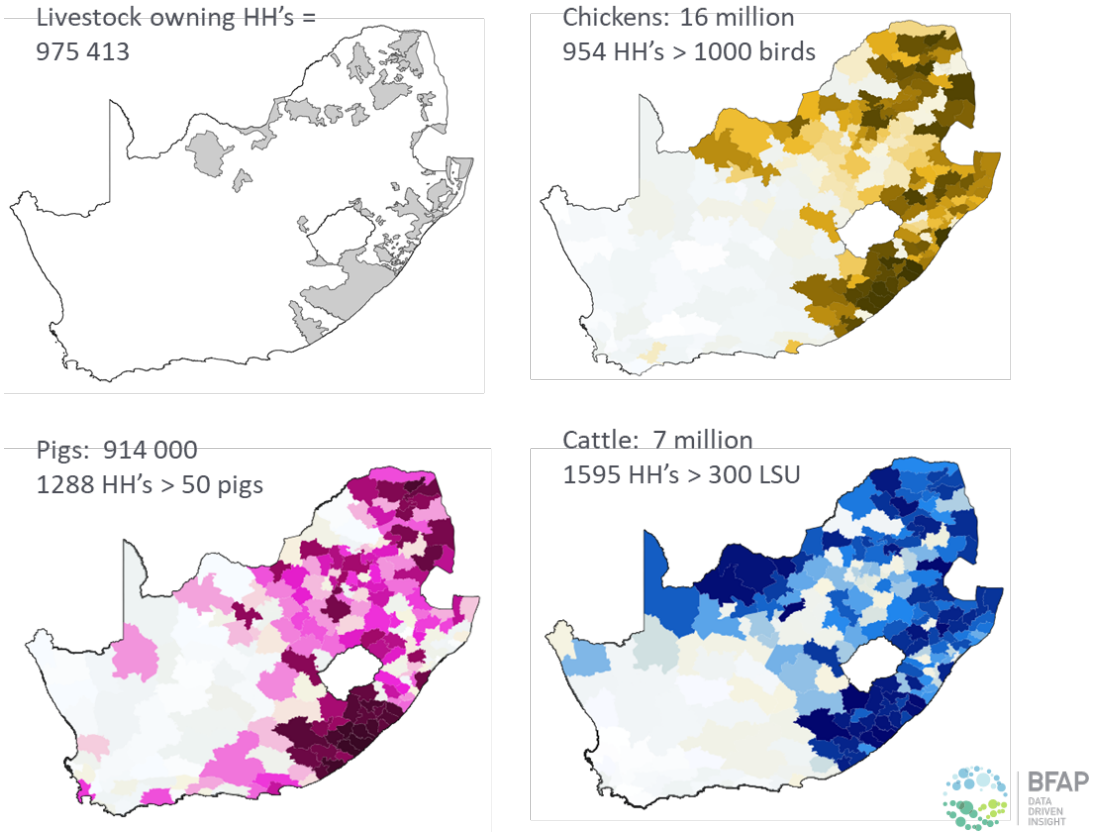

FIGURE 21: ANIMALS OWNED BY BLACK SMALLHOLDER HOUSEHOLDS
Source: StatsSA, 2016

4.2.8 Location and Infrastructure

Figure 22 disaggregates the commercial farm expenditure as a proportion of the total farm expenditure according to the Census of Commercial Farming (2020). The Western Cape farming sector spent R8.3 billion on animal feed, which made up 38% of the total input purchases, whilst Gauteng was in second with R6.7 billion, but with a larger share of 57%. The total spend on animal feeds has grown from R10.1 billion in 2007 to R45.7 billion in 2017; a nominal average annual increase of 16.2%.

Another means to assess the spatial differences in production of manufacturing of feeds is using AFMA's feed sales volumes disaggregated according to the province where production takes place. Like the spending patterns shown in Figure 22, the Western Cape was the leading manufacturer of prepared animal feeds with 1.35 million tons, which made up 21% of the total. Closely followed in second and third were Mpumalanga and Gauteng with 18% and 16% of the total respectively. When looking at the annual growth between 2004 and 2020, feed manufacturing in the Free State had the fastest growth with 6.5%, with Mpumalanga increasing by 6.2%. Output growth in Gauteng has performed poorly and is currently trending at more or less the same volumes as it did in 2004/5. In aggregate, the total volume of AFMA members has grown on average per annum by 2.7%. There are also

some developments in feed manufacturing in areas such as the Eastern Cape and Limpopo. Given the relatively low uptake of animal feed and potential of agricultural development in the Former Homeland regions, growth in these provinces is expected to continue.

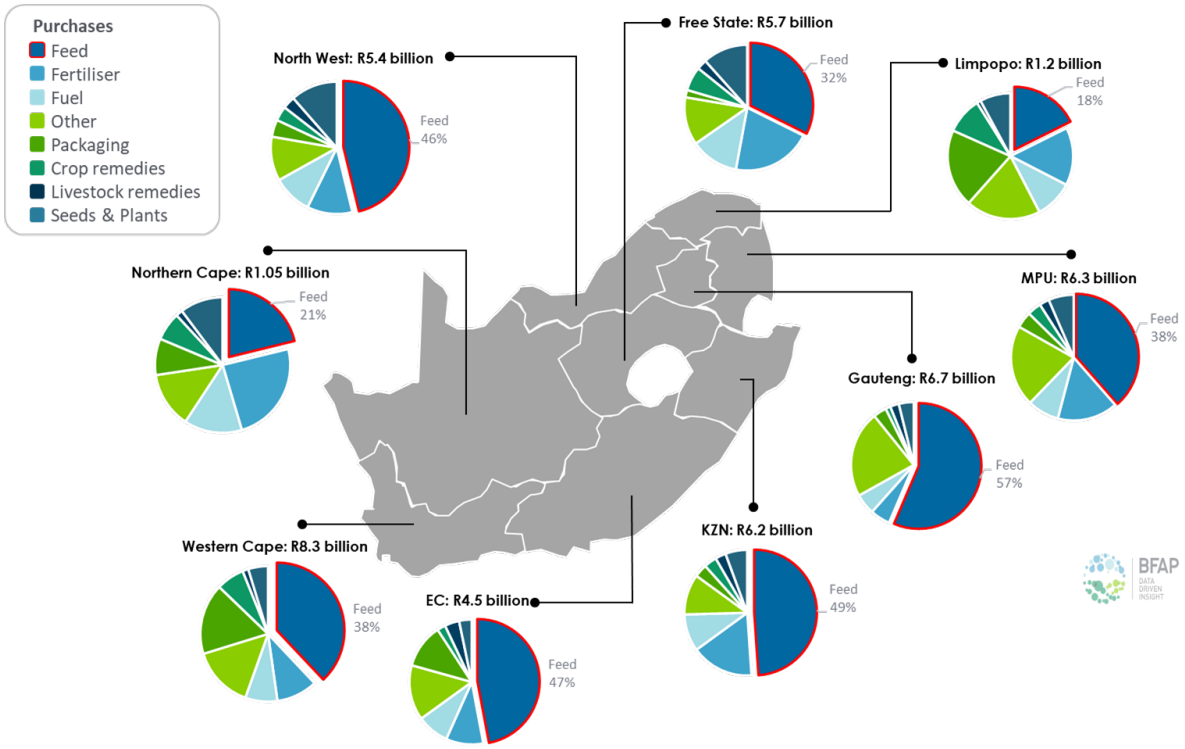

FIGURE 22: COMMERCIAL FARMING SPEND ON FEED PER PROVINCE
Source: StatsSA, 2020

There is a clear correlation between where the location of animal feed production and where intensive, commercial livestock production systems are concentrated. However, another critical element to consider is the location and sourcing of raw material used to manufacture feed, as well as the infrastructure utilised in these value chains.

TABLE 4: AFMA PROVINCIAL FEED SALE

Province	Tons: 2004/5	Tons: 2019/20	Share of total (%)	Average Annual Growth 2005-2020 (%)
WC	1 067 436	1 353 397	20.87	1.59
MPU	477 300	1 177 280	18.16	6.20
GAU	1 082 002	1 040 731	16.05	-0.26
FS	332 863	853 290	13.16	6.48
KZN	761 623	845 668	13.04	0.70
NW	358 829	598 237	9.23	3.47
EC	233 012	516 668	7.97	5.45
LIM	0	99 313	1.53	-
Total RSA	4 313 065	6 484 584	100.00	2.76

Source: **AFMA, 2004-2020**

There are also distinct spatial considerations that exist between the price of raw materials used in animal feeds between coastal and inland areas, largely due to the impact of importing products. Figure 23 shows a map that is given to explain the reasons behind this, which is two-fold. First, the two main products used in animal feed as raw materials, maize and soybeans, are located in South Africa's main summer planting regions, mainly around Randfontein, Mpumalanga and the Eastern Free State, commonly referred to as the area where the majority of grains and oilseeds are traded in South Africa. This is clearly shown in the yellow and green areas in Figure 23. The figure also shows the location of silos, oil crushers and animal feed mills, which are mostly located and concentrated where the production of raw materials is located.

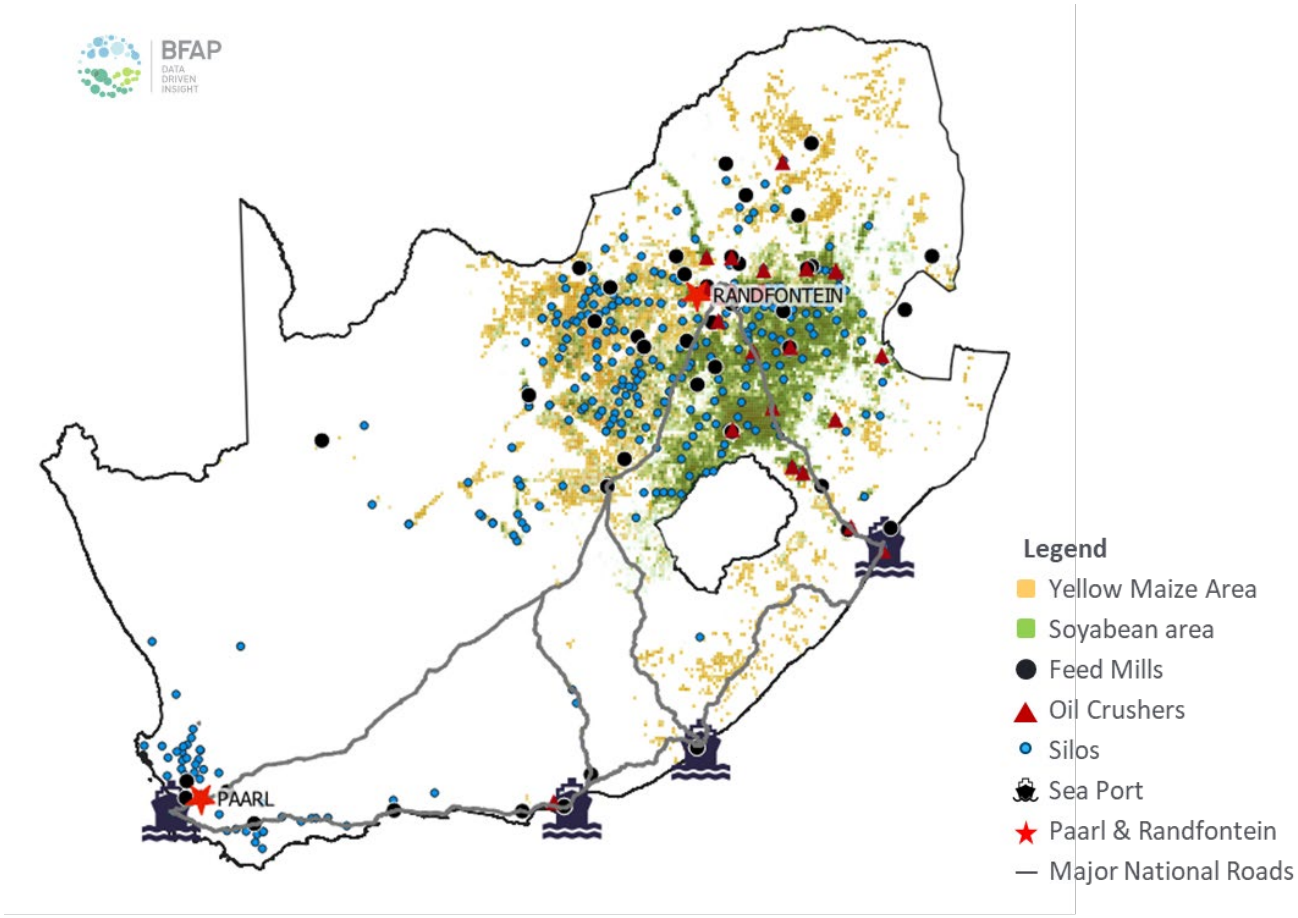

FIGURE 23: MAP OF SOUTH AFRICA'S GRAINS & OILSEEDS VALUE CHAIN
Source: Compilation for various

Coastal areas in the Western Cape, Eastern Cape and Kwa-Zulu Natal, which had a combined 44% of animal feed production as given in Table 3, are in closer proximity to ports, relative to Randfontein. Thus, the second reason for the location differential is the highly competitive sourcing of raw materials such as soybean oilcake imports. In 2020, around 96% of all imported soybean oilcake was imported from Argentina and entered the country through Cape Town and Durban Sea ports. Since South Africa is a net importer of oilcake local prices tend to move closely to import parity levels, as explained in the previous section.

A feed mill located in coastal areas is faced by the decision to source oilcake from locally produced oilseed, which as pointed out in Figure 23 are mainly around Randfontein and where oil crushers are located, or use imported oilcake. Since firms are already squeezed

by thin margins and operate in a highly competitive value chain, the lowest cost alternative will be chosen. In the case of yellow maize, South Africa is a net exporter and prices tend to move closer to export parity levels which suggest that, based on the lowest price, locally product will in most cases outcompete imported product, although small amounts are occasionally still imported into Cape Town if and when the product can be sourced more competitively.

Back to soybean oilcake, Figure 24 shows the prices for imported oilcake, both brought in through Cape Town and Durban, as well as the import parity price to land the imported product at Randfontein. Import parity pricing is the price level at which imported oilcake can be delivered to clients in Rand terms plus any transport, tariffs and other costs the customer would bear if oilcake was imported. On average, between 2010 and 2020, Cape Town imported soya oilcake CIF value was R833/t lower than import parity in Randfontein. Durban's average import CIF was around R710/t cheaper. However, the imported oilcake still needs to be delivered to the feed mill in coastal towns. Thus, unless large volumes of locally produced oilcake can be competitively transported to feed mills located in coastal areas, feed mills will opt to source from outside the country.

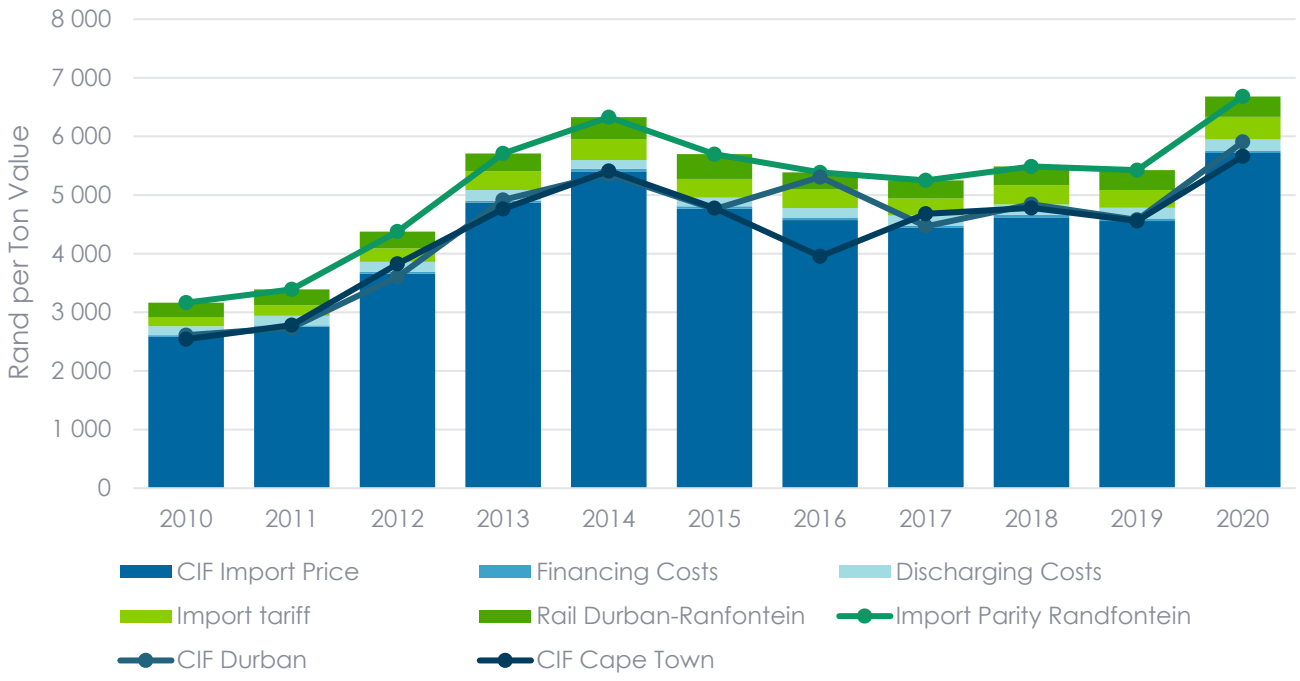

FIGURE 24: SOYBEAN OILCAKE PRICE TRENDS
Source: Compilation for ITC, 2021 & BFAP, 2021

Table 5 elaborates on the parity price calculation. Asides for the 4.5% tariff applied to these imports, the additional cost of transportation to move products from the harbour to the nearest town, plus the cost of finance, storage and discharge costs results in a price differential between coastal areas and Randfontein. Imported soybean oilcake had a CIF import value of R5 662 delivered at Cape Town Sea port in 2020, whilst the CIF value delivered at Durban Sea port was slightly higher at R5 905 in 2020 (SARS, 2021). The import parity for soybean oilcake in 2020 delivered in Paarl was around R6 605 per ton, whilst at Randfontein was slightly higher at R6 704 per ton. Soybean oilcake traded on the local market tends to move closer to import parity levels, which suggests that coastal areas have a slight cost advantage due to the relatively cheaper imported product from Argentina.

Thus, unless locally produced soybean oilcake can be transported and landed at the coastal town, but is currently not realistic given the reality of needing to truck products from the Randfontein area. These realities needs to be considered when discussing any import replacement strategies that involves further tariffs on oilcake imports.

TABLE 5: IMPORT PARITY PRICE ITEMS IN 2020 FOR SOYBEAN OILCAKE

Import Parity Paarl	Rand/Ton	Import Parity Randfontein	Rand/Ton
CIF Cape Town	5 662	CIF Durban	5 905
Tariff	383	Tariff	383
Port Discharge	203	Port Discharge	190
Storage	180	Storage	0
Financing Cost	42	Financing Cost	42
Transport CPT to Paarl Rail	134	Transport Durban to Randfontein	240
Import Parity Paarl	6 604	Import Parity Randfontein	6 760

Source: **Own Compilation**

5. MASTER PLAN SCENARIOS

South Africa's agriculture value chain is currently in another planning phase whereby an envisioned social compact between government, labour, civil society, and industry role players is drafted to overcome growth and developmental challenges. The Agriculture & Agro-processing Master Plan (AAMP) seeks to establish practical and actionable reforms that, if implemented, will address structural constraints limiting inclusive growth and development across various value chains. The already agreed vision for AAMP is to create globally competitive agricultural and agro-processing sectors, driving market-oriented and inclusive production to develop rural economies, ensure food-security, and growing, decent and inclusive employment and entrepreneurial opportunities for all participants in agriculture and agro-processing value chains.

Whilst the AAMP is still being drafted at the time of writing, the Poultry Sector Master Plan has already been completed and signed by the various poultry stakeholders (DAFF, 2019). This front-runner industry sets the benchmark for what to expect from negotiations and agreed reforms and involves animal feed manufacturing directly. For instance, one of the key targets under Pillar 1 is expanding and improving production of locally produced maize and soybeans to be used to expand poultry feed consumption by 300 000 tons. Further to that, the South African Poultry Association's (SAPA) members are set to produce 1.7 million additional birds per week, as a result of R1.5 billion investment in production facilities, whilst at the same time expanding and improving the contract farming sector. Some of these investments have already been made and in 2020, chicken production expanded by almost 80 thousand tonnes year on year. Part of Governments commitment was to review the trade environments, in order to curb growing imports and address the potentially harmful impact thereof. This review relates to the legislative environment, operations related to ports and animal health, as well as beginning a process of reviewing the tariff framework.

BFAP's industry Deep-dive reveals the impact of chicken imports in recent years. In the decade between 2000 and 2010, domestic chicken consumption in South Africa increased by 678 thousand tonnes, with 86% of this increase supplied by domestically produced chicken and only 14% imported. Between 2010 to 2019, consumption growth slowed, adding only 498 thousand, but in this period 57% were supplied by imported meat, mainly

bone-in portions and mechanically deboned chicken (MDM). There is a widespread view that the continued imports of chicken meat into the country is indirectly hampering further growth and job creation in feed manufacturing, which would otherwise have resulted in more locally produced chicken and therefore lead to increased demand for feed. Conversely, products such as MDM are not currently being produced in South Africa, which also has alternative options available for the use of chicken carcasses, such as soup packs. Consequently, a balanced approach is needed when assessing the positive and negative impacts of policy options related to trade protection. Products such as bone-in portions and whole chickens could be produced locally and while the Masterplan does not aim to replace all imported products, it is still anticipated that a drive towards scaling local poultry production will stimulate growth and jobs in secondary industries such as prepared animal feed.

As part of the value chain deep dives conducted as background research for the AAMP, BFAP evaluated the impact of an improved future state, where a number of interventions are applied to accelerate inclusive growth across the agricultural sector. Given that the poultry masterplan has been concluded, these interventions within the poultry sector were aligned to those discussed and agreed upon in the poultry masterplan. While all actions are not quantifiable in the modelling framework, the simulated improved state provides a solid indication of the opportunity that can be unlocked through a combined set of interventions by both public and private sector. In the case of poultry, the improved future state that was simulated can be summarised briefly as follows:

- Large-scale commercial producers must be globally competitive, utilising top technology, which requires large investment in highly specific assets and relies on high feed intensity in production
- Commitments made in the poultry Masterplan will add another 50 contract producers, delivering a total of 1.7 million broilers per week – an investment of R1.5 billion by SAPA members
- Growth in industrial scale processing to enable industry to supply additional demand domestically and product mix enable exports
- Comprehensive support to emerging producers – enabling smaller producers to co-exist with large scale producers by growing local production networks & improving access to affordable, quality inputs that can significantly increase productivity in this sector
- Funding models that enable new producers to enter the sector sustainably and enables successful smaller producers to bridge the gap to larger scale production
- Evaluation of market offtake opportunities for smaller producers, including micro abattoirs and cold storage, which enables more consistent supply through the year
- State procurement programs focussed on local production, particularly from SMME's
- Combination of actions to make sure that imported products compete on level footing with domestic production

Some of the actions contained in the poultry masterplan have already been implemented and are therefore captured in the baseline, but further investments are yet to enter production and many policy related commitments are ongoing – such as the tariff review that has been initiated, but not completed by ITAC. While current high feed prices are a

concern that is weighing on profitability, prices are a result of strong global markets, as South Africa has produced to consecutive bumper crops. Nevertheless, it will likely slow growth in chicken production in the short term under baseline conditions. Figure 25 presents the opportunity for accelerated growth if the actions and interventions detailed in the Masterplan, which have not been fully implemented to date, can be achieved. By 2030, poultry production would be 130 thousand tonnes higher compared to the baseline. Given that the bulk of actions related to the Masterplan that have already been taken occurred in the large-scale commercial sector, further growth above the baseline is incurred by a combination of large-scale commercial and SMME producers. This will imply that significant productivity gains be achieved amongst the smaller producers, to yield a 25% gain in production relative to the baseline in 2030 and a 50% increase relative to the average level over the past 3 years. It also suggests that feed utilisation will not only be centred around large scale, contract producers, but will also need to supply smaller producers more cost-effectively. Imports are expected to decline by 120 thousand tons by 2030.

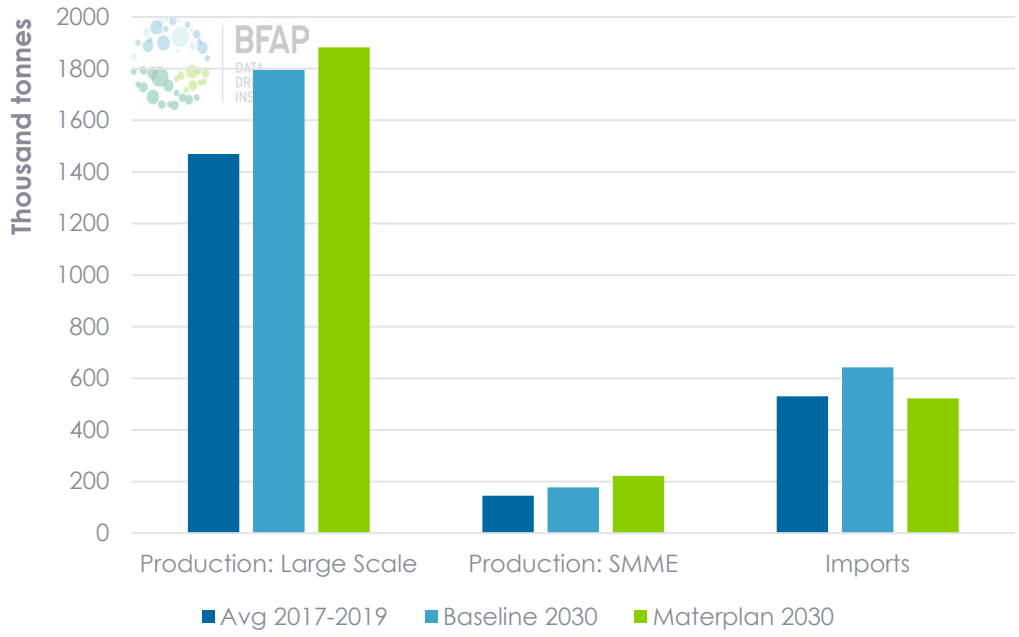

FIGURE 25: IMPACT OF MASTER PLAN ACTIONS ON POULTRY PRODUCTION AND IMPORTS
Source: Compilation

Figure 26 shows the impact of these combined interventions as it relates to the additional feed sales and feed demand. In 2022 the impact starts to show more prominently with the demand for animal feed increasing marginally by 85 thousand tons, but by 2030 around 240 thousand tons of feed will be manufactured as is the case with no interventions. This increase over the baseline period suggests that an additional 80 thousand tons of yellow maize will be utilised in feed manufacturing and 29 thousand tons of soya oilcake.

Important to note that some of the Poultry Master Plan interventions are already present in the Baseline numbers, since some have already been implemented. The impact on employment is projected to result in 376 jobs being created at the feed mill level, but since part of the growth is already in the Baseline, the industry is set to create 2 286 jobs, bring the total employment in prepared animal feeds to 12 873 if all interventions are implemented.

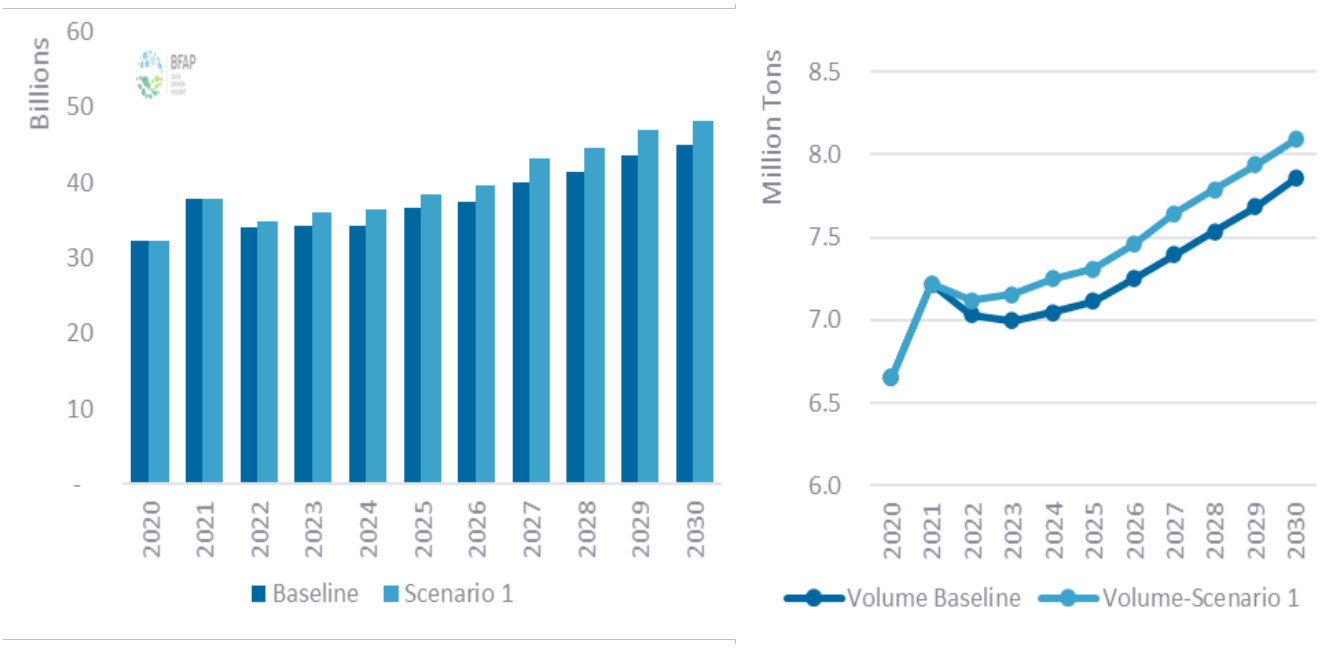

FIGURE 26: SCENARIO IMPACT ON GPV
Source: Compilation

6. AFMA SWOT ANALYSIS

As part of the Deep-dive process for the specific industries analysed for the AAMP initial commodities, SWOT analysis (strengths, weaknesses, opportunities and threats) was developed to assist decision making. The AFMA Board set out to compile a SWOT analysis of feed manufacturing, which is presented in Table 6 below. Without summarising its contents in detail, the analysis points to some factors already describe in this report as it related to the nature of the industry.

The animal feed manufacturers industry is well structured, organised and based on leading technology innovations and a strong focus on a self-regulatory system. Its interconnectedness with other value chain actors is seen as a great strength and is determined to contribute to growth and self-sufficiency in oilseed production. The weaknesses highlighted were the outdated regulatory framework, the high barrier to entry into this market due to the high capital start-up costs and the difficulty of monitoring the Code of Conduct. A further weakness is that the industry is struggling to attract youth for careers in animal feed manufacturing, particularly those with the required skills that are in short supply.

There seems to be widespread acknowledgement that there are opportunities for the industry to tap into informal and rural markets and to make an impact on rural development, food security and transformation in agriculture. Significant opportunities for feed manufacturing expansion are possible if new interventions in the AAMP can lead to strong agricultural growth and there is scope to fund skills development and to improve the monitoring of the industry's Code of Conduct.

The impact of the continued outbreak of animal diseases (AI, ASF, FMD) are a major threat to livestock industries. It is felt that the relevant government authorities should make progress in dealing with their impacts, especially since limited progress has been made on the issue

of vaccinations. This has the potential to threaten the livelihoods of all players, negating all the gains made also with emerging farmers and have a severe impact on the feed industry. The lack of maintenance and investment in rural infrastructure and transportation networks present another threat, whilst the current weak supply of electricity and water affect feed mill operation significantly. The recent civil unrest across part of South Africa has also highlighted the importance of maintaining order for the agricultural value chain to continue to operate. Finally, the reality that manufactured feed demand is mainly derived from growth in livestock sectors poses a threat to future growth prospects, as does increased state interference in the market.

TABLE 6: AFMA SWOT ANALYSIS

Strengths	Weaknesses
*Well-structured industry based on Tech Science *Well entrenched Self-Regulatory System (Code of Conduct) *Mature and developed manufacturing infrastructure – world standard *Majority of larger stakeholders integrated with customers *Principal supplier to Poultry and Livestock Industries *Manufacture all ranges of feed *Largest off-takers of soybean meal and maize in SA *Suppliers (Ass. Members) majority – Multi-Nationals *Well established (Local & International) value chain linkages and networks resulting in excellent collaboration to make chain efficient *Main ingredient (yellow maize) of feed in surplus supply, working towards that for soybean oilcake	*Outdated legislative Framework (Act 36, Capacity in Registrar's Office) *National Training & Skills development structures not functioning at optimal levels – AgriSETA *Highly capital intensive for start-ups businesses not backed by a supply contract *Main barriers to entry and to facilitation of Transformation (Investment, IDC, Gov.) *Raw material logistics and infrastructure hampering growth (Road, Rail & Ports) *Monitoring of the Code of Conduct *Major shortage of skilled and trained personnel *Attracting younger generation for careers in feed manufacturing
Opportunities	**Threats**
*Independent informal rural market in need of feed to drive productivity and profitability *Transformation / Empowerment, coupled with investment can lead to 1) Uplifting in rural economic development 2) Training & Skills development following investment *Completion of Feed Legislation *Potential Industry Skills Fund *Improved monitoring of Code of Conduct *If AAMP works – leading to growth – job growth *Broaden horizon for Skilled people to enter our industry *Development of informal sector can improve rural Food Security and growth in rural economies.	*Volatile international raw material market (75-85% of total cost) *Growing poultry imports are replacing ± 1.5 million tons of feed annually *Energy & Water Supply – Load shedding, water quality and supply *Deteriorating national road network & maintenance of rural agricultural infrastructure *Feed demand is derived from the demand for livestock *Political unrest can result in compromised supply routes and disruptions *Leaf Levy – additional costs impact profitability with already low margins *Increased market regulations resulting in volatile commodity markets – examples in some African commodity markets *Notifiable diseases (AI, ASF, FMD) are major threats to the livestock industries and there is no progress being made with DALRRD on vaccinations.

7. CONCLUSION

This South African feed manufacturing Deep-dive has highlighted the inner workings and functioning of an industry critical to various other value chain actors. The global analysis point to South Africa not being amongst the world's largest producers of feed, but certainly in a strong and growing position, given the strong growth in many developing countries as a result of economic development, urbanisation and income growth affecting major dietary changes.

This research project, a first of its kind in South Africa, has shown the critical role that animal feed plays in agricultural chains, particularly as one of the major buyers of agricultural products and as the most important input to South Africa's farming sector. Additional linkages with other manufacturing firms such oil production, food milling, meat processing and others further consolidate the importance of animal feed production in South Africa's economy. Strong growth in animal feed manufacturing has come as a result of significant growth in demand for poultry and pig meat, largely driven by the widespread roll-out of conditional grants to South Africa poorer population. The BFAP 10-year Outlook projects that due to increased demand as a result of some of the poultry Master Plan interventions, yellow maize use in feed will grow by 34% and soybean processing volumes by 43%. However, due to the sluggish growth of South Africa's economy and the impact of COVID-19, it is anticipated that growth in key livestock sectors will be considerably lower than the strong growth period between 2000 and 2010. Further to that, continued animal disease outbreaks coupled with an un-coordinated strategy to address animal health creates downside risk to this Outlook.

The analysis on utilisation of raw materials used in feed shows that around 13 million tons are used by the various segments producing feed. This includes manufactured animal feed (52%), on-farm mixing and feedlots (40%), pet feed manufacturing (1%) and the remaining 7% suspected to be from informal markets. Trade in the form of import dependence on oilcake is an important consideration for feed manufacturers of which soybean oilcake is the most dominant. Between 2001 and 2013, soybean oilcake imports grew from R756 million to R3.1 billion but have since been reversed as more local oil production has resulted in the replacement of imported meals.

The Western Cape, Mpumalanga and Gauteng have traditionally been the largest manufacturers of prepared animal feed, whilst strong growth has been realised in Mpumalanga and the Free State. Total feed manufacturing by AFMA-member firms has grown by 2.8% per annum between 2005 and 2020.

The feed industry also makes a significant socio-economic impact by employing around 17 000 workers, with more than 85% in a permanent capacity. The wider impact of these job opportunities affects around 55 thousand households if one adds family members benefitting from income in the home.

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