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Full Length Research Paper

Pork and broiler industry supply chain study with emphasis on feed and feed-related issues

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The main purpose of this study was to understand the feed and feed-related issues experienced in the supply chains of the pork and broiler subsectors in South Africa. Special attention was given to the different players in the input and feed (own and manufactured) industries. To understand problems in the domestic feed supply chain, a value chain analysis of feed in the pork and broiler industries, including the related links and reference to the international feed commodity input markets was required in order to deliver a study that would benefit the industry and stakeholders involved. Interviews, by means of structured questionnaires, were conducted to obtain accurate information from feed manufacturers, and major role players and organisations in these industries. The main issues studied in the feed supply chain were, among others, the various players in feed inputs, manufacturing and procurement, the competitiveness and profitability in the animal feed supply chain, and overall impact of these issues on the pork and poultry markets. Barriers to entry exist in these value chains. These barriers include high capital requirements, relevant experience and track records, and the significance of research and biotechnology in the provision of seeds. High levels of vertical integration, as well as concentration levels, increase the level of competition between larger organisations. In the South African feed industry, there are a small number of role players who, together, control the largest market share (more than 90%). The main issues determined by this study are the number of players in feed inputs, manufacturing and procurement; the competitiveness and profitability in the animal feed supply chain; and the overall impact on the pork and poultry markets. A degree of competitive advantage can be established in both the pork and broiler industry by investigating input factors further upstream in the supply chain (e.g. maize and soya beans from farmers). Policies and methods of effective price hedging must be put in place to ensure sufficient grain stocks at the best or lowest possible prices.

Key words: feed processing, value chains, industry concentration, maize, soy beans, commodities, development, barriers to entry, agribusiness, risk, finance.

INTRODUCTION

The animal feed industry is of strategic importance to the beef, milk, poultry, sheep, pork and other animal and pet industries. These subsectors are major buyers, processors and suppliers of processed commodities to the retail sectors and final consumer markets. The various risks that these markets are exposed to include input-commodity price volatility, high capital requirements, the inherent business and climatic risks of the different subsectors, and various other challenges.

All of these factors have a major impact on decision-making which affect from large to micro role players in

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the agricultural supply chain, especially in the feed and livestock markets. Role players have to cope with price-cost squeezes from buyers' and sellers' points of view. In general, the feed industry forms part of the value chains of these industries, as feed is a major component of production costs.

Internationally, the feed industry is represented by the International Feed Industry Federation (IFIF) and Food and Agricultural Organization (FAO) in the United Nations (UN). In 2011, the world compound feed production was an estimated 870 million tons and the turnover of global commercial feed manufacturing generated was an estimated annual turnover and sales value equivalent to US$350 billion worldwide. China is the chief producer of feed at 175.4 million metric tons, followed by the US and Brazil with 164.9 million metric tons and 59.6 million metric tons respectively. According to the IFIF, compound feed production is dominated by the US, European Union, China and Brazil. The 2012 Alltech Global Feed Survey, however, indicates that several new countries, such as Japan, India and Canada, are emerging among the top ten as strong players in the global feed scene (Alltech, 2012). The poultry and pig sectors are dominant players in the feed environment. The chicken industry uses 44% of the world's feed market, followed by the ruminant sector with 26%. The pig industry uses the third-most feed that is 23% in the world (Alltech, 2012).

The UN's FAO estimates that the world will have to produce ca. 70% more food by 2050,while IFIF is of the opinion that animal protein production will grow even more, i.e. meats (poultry/swine/beef), as well as dairy, will double and fish production will almost triple by 2050(International Feed Industry Federation, 2012).One of the challenges is that, on top of the 870 million tons of feed produced by the feed industry, around 300 million tons of feed is produced directly by on-farm mixing. This poses challenges, as food safety authorities do not regularly audit mixing by farmers and regulatory authorities only inspect when problems exist (International Feed Industry Federation, 2012).

In South Africa, the feed industry is represented by the Animal Feed Manufacturers Association (AFMA). They represent the industry in matters where it is necessary to enhance or protect the interest of the feed industry (NDA, 2009). AFMA is also the representative of the IFIF in South Africa. The IFIF, which is a strong voice for the feed industry worldwide, is exploring work in the feed situation in Africa. Their annual report reflects insight into the South African feed industry as well as current feed statistics (Briedenhann, 2009).The role that organisations such as AFMA play in ensuring self-regulation and improved regulation by Government in the animal feed supply chain is one of the critical success factors involved in managing changes in the animal feed industry.

There are two issues of great importance to the feed industry: the availability of sufficient raw materials and a sustained demand for animal feed. Of course, other factors such as price and raw material quality, the foreign exchange rate, the current economic situation, the political climate, and food safety and security, must all be taken into consideration. Manufacturers of animal feed are able to produce animal feed from expensive or poor quality raw materials, but without these raw materials there will be no feed production. It is therefore important to look into this essential aspect of feed manufacturing. Maize, soybeans, sunflower and other by-products provide adequately for approximately 60-90% of the raw products used to manufacture animal feed. Raw material prices are the strongest driver of animal feed prices, as it comprises more than 80% of the total costs. Challenges continue to arise in the feed industry due to escalating costs and also the associated problems of supply, price volatility, and optimisation within the links in the integrated supply chains. The five main feed producers are Meadow Feeds, Epol, Afgri Foods, Nova Feeds and Nutri Feeds (Lovell, 2010).

To understand these problems, a value chain analysis of feed in the pork and broiler subsectors, including all the links, was performed. Special attention was paid to the different role players on the input side of the feed industry. For example, an agribusiness (cooperative) is a major buyer, manufacturer and seller of feed, while there are other players who are independent. Feed costs contribute to high meat and broiler prices, and the different aspects surrounding these costs must be analysed in order to identify the degree of change taking place in feed components. The industry that this study focused on was the animal feed industry, with special emphasis on the pork and broiler feed industries. Studies on these two subsectors of the feed industry were limited, and in certain instances out-dated. This study provides findings on the current situation with respect to the industry and the subsectors mentioned above. The results of the study were obtained by means of a structured questionnaire conducted in the agro-feed industry. A total of 53 questionnaires were completed. The participants in the feed industry represent the major and smaller feed manufacturers and own mixers who were randomly selected.

DATA COLLECTION AND METHODOLOGIES

In order to understand the impact of the feed industry on the pork and broiler subsector supply chains, further impact on producers, and eventually the consumer market, this study focuses on the agro-feed industry. Interviews, by means of structured questionnaires, were conducted to obtain information from feed manufacturers, major role players and organisations in the industry.

Strategies to mitigate risks were also explored in order to develop an updated feed supply chain structure, in which all the links are clearly defined and understood. As required, information was included to assist industries and emerging markets involved.

The methodologies described below were used to identify the impact of the feed industry on the industries concerned, given the measured challenges. For the purpose of establishing the industries' backgrounds, desktop studies were conducted to structure the current workings of the industries. To answer certain research questions, structured questionnaires were used to obtain objective views from industry role players regarding the current trends and issues in the industry. In the study's structure, conduct and performance framework, the following methodologies were followed:

(A) Vertical integration in the animal feed industry of South Africa

Vertical coordination describes the way relationships between producers and processors are organised in food supply chains. This is not a yes-or-no decision; instead, there is a broad spectrum of alternatives that farms and firms can choose from when designing their business relationships. It provides a better understanding of the two studied supply chains.

(B) Porter's analysis on the barriers to entry

Strategy consultants occasionally use Porter's Five Forces Framework when making a qualitative evaluation of a firm's strategic position. Porter's analysis focuses on the forces that determine the competitive intensity, and therefore attractiveness of a market. In this context, attractiveness refers to the overall industry profitability. An "unattractive" industry is one in which profitability are driven down by the combination of these five forces. A very unattractive industry would be one in which available profits for all firms are driven to normal profit and thus approaching "pure competition", Three of Porter's five forces refer to competition from external sources. The remainder are internal threats. The three forces focussing on external sources are: threat of substitute products, the threat of established rivals, and the threat of new entrants. The two forces focussing on internal threats are the bargaining power of suppliers and customers. This study only focussed on the barriers to entry, as these sectors are normally a preferred sector for new farmers to enter the farming environment.

(C) Price volatility, which is a measure of the possible variation or movement in a particular economic variable. It provides a measure that describes the tendency of a commodity's price to move up or down, and the extent of the anticipated move.

Agricultural commodity price volatility is an ongoing concern. Policymakers, as well as all the participants along the food supply chain, have an interest in the issues regarding agricultural price volatility. Changes in volatility can affect market variables by directly affecting the marginal value of storage and, by affecting a component of the total marginal cost of production and hedging, the opportunity cost of producing the commodity now rather than waiting for more price information. Price volatility will therefore directly influence all participants in the feed value chain.

(D) Risk analysis in the feed and related pork and broiler industries.

SOUTH AFRICAN FEED OVERVIEW

The South African feed over view provides an understanding of the factors influencing the domestic feed industry and statistics on demand and supply for animal feeds. By understanding and accurately interpreting the growth in demand and supply, the future demand for animal feeds to meet the required demand can be projected. This study shows some projections done by the main role players.

South African demand

South Africa has been slow to feel the actual impact of the global economic recession; their recovery rate is also behind that of the world. These assertions are evident in the lower levels of national output, increased unemployment and lower disposable incomes. Unemployment is still one of the biggest challenges in the country that needs to be addressed due to its social and economic cost implications. A lack of consumer spending in South Africa, also impacts on input sectors. Animal feed sectors have experienced an immediate downbeat shock due to the animal production reductions (AFMA, 2009). Global meat prices have recovered significantly from 2009 levels, following positive economic signals. Beef prices were most affected by the economic crises, as consumers switched to cheaper animal protein, resulting in chicken markets remaining relatively strong throughout the crisis. Though increased demand has been a factor, the recovery in prices is also due to a contraction of supply (Bureau of Food and Agricultural Policy, 2012). South Africa imported 7 000 metric tons of beef and veal, along with 192 000 tons of broilers in 2009 in a bid to balance out the supply and demand for the meat industry. The feed industry is directly combined with livestock consumption (Taljaard, 2003) and, since the rate of growth for livestock demand has declined, the feed demand has decreased.

South Africa produced more than 10 million tons of animal feed during 2011, with about 0.8 million tons taken up by the pork industry and 4.3 million tons absorbed by the chicken industry (Alltech, 2012). Figure 1 provides a breakdown of the main players in the feed industry.

Nearly 77% of the total feed manufactured from AFMA members was produced by five main players (Boshoff, 2012). This supports the hypothesis that severe barriers

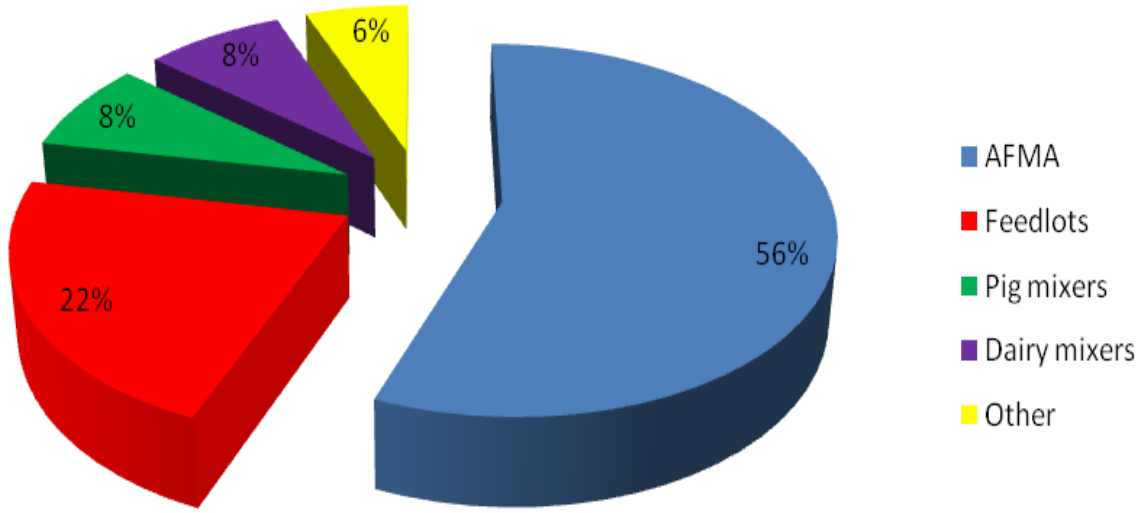

Figure 1. Main players in the South African feed industry (based on 2011 production). Source: Boshoff, 2012.

to entry exist in the feed supply chain.

Over the next decade, the growth in the consumption of chicken meat is projected to outpace the growth for all the other types of meat. With an increase of 48% over the next decade, the total consumption of chicken meat in South Africa is projected to reach almost 2.4 million tons by 2020.

The consumption of eggs is expected to increase by 35%, beef consumption is expected to grow by 23%, mutton by 20%, and pork consumption is projected to grow by 46% by2020 (Bureau of Food and Agricultural Policy, 2012). These increases will put tremendous strains on the main inputs used by the feed industry.

Supply

To a great extent, the feed industry depends on the domestic crop production sector and on imported soya cake.

Maize is the main input used for most feeds (maize represents 54% of inputs used in feed). During 2011/2012, the feed industry consumed 3.23 million tons of maize. Total oilcake used during the same period amounts to 1.33 million tons (AFMA). Given the projected growth in demand, this will put tremendous strain on the grain and oilseed sectors. The demand for maize will grow by 38% over the next decade to meet the needs of the feed sector alone. This will result in a total maize usage of nearly 4.5 million tons for the feed industry alone. Feed prices will rise substantially if South Africa will not be able to increase the local production of maize. More maize and maize products will be imported, pushing the local maize price closer to import parity levels. It is projected that oilcake production will have to increase by 41% over the next decade in order to meet the growing need of oilcake products (Joubert, 2011).

Review on production and processing of raw materials

South Africa is currently in the fortunate position to have access to sufficient raw material (of good quality) and sufficient storage capacity. On balance, with the exception of soybeans (only 300 tons imported during 2011 and 2012 marketing season (SAGIS, 2013) and sunflower seeds (only 10 900 tons and 11 800 tons imported during the 2011 and 2012 marketing seasons (SAGIS, 2013)), there is sufficient raw materials for feed production in South Africa in the short term, as depicted by Figure 2.

Most of the grain silo capacity in South Africa is situated with agricultural cooperatives or former co-operatives, which now have converted into private companies. According to the Department of Agriculture, Fisheries and Forestry (2012), the total grain silo storage capacity in South Africa is estimated at 17.5 million tonnes, 85% of which is owned by 22 silo owners (private companies).

There are stringent quality control measures in place at point of intake where the raw product has to comply with standards and the producer is paid according to the grading of the produce.

The production facilities and feed rations for the industrialised feed mixing at agribusinesses (large cooperatives), have to comply with various legal requirements and have to be inspected on a regular basis.

There is also a high level of self regulation which is supported and driven by AFMA through Agri-inspect, an independent private company who certifies the facilities. This process gives a high level of comfort and credibility to the feed industry at that level. In the case of home feed mixing, the stringent control and self regulation is

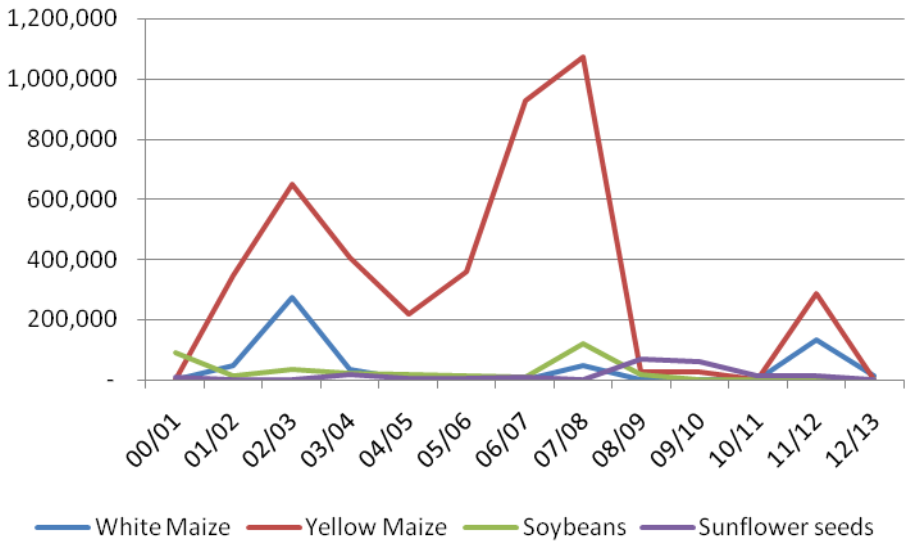

Figure 2. Total imports since the 2000/01 to 2012/13-marketing season. Source: SAGIS (2013).

not there but new legislation is being put into place to capture this. It does however impact on smallholders.

FEED INDUSTRY SUPPLY CHAIN

A major issue of concern for the Competition Board in South Africa is the perceived high concentration of feed manufacturers.

Figure 3 illustrates the interrelationship and dynamics in the feed industry between the different stakeholders involved in the animal feed supply chain. The levels of integration between the different role players in this complex yet very dynamic industry, as well as the different legislation applicable to each stage in the feed manufacturing and distribution processes, are noteworthy.

Figure 3 shows the complexity of the feed supply chain. The number of firms or companies, and the concentration in the feed and animal sector are relatively high in South Africa (Mather, 2005). This results in a situation where small and medium agricultural enterprises, such as feed and poultry, are not able to take part and get actively involved in the national market. Even though Mather (2005) shows that the liberalisation of agricultural markets has opened a few opportunities for small and medium enterprises since 1960, there is still a number of emerging farmers who are distinguished by inadequate access to the agricultural market. High levels of vertical integration, as well as concentration levels, increase the level of competition between the largest organisations. In the South African feed industry, there is a small numbers of role players who control the largest market share (more than 90%). This leaves only a limited market share for the smaller producers in the industry. The five main feed producers examined are Meadow Feeds, Epol, Afgri Foods, Nova Feeds and Nutri Feed (Figure 4).

Each one of these feed companies is owned by a holding company. This explains why the feed industry is characterised as a vertically integrated system. Vertical integration is the firm's approach to increasing control over its suppliers of inputs, improving economies of scale and lowering of prices. The feed-producing companies are owned by animal producers, as holding companies, especially in the case of poultry producers. In turn, these holding companies control their feed suppliers and vertical integration follows by combining the feed supply chain with the holding company's poultry supply chain.

Results from the research questionnaires indicated that structural shifts in the feed industry, especially where feed manufacturers are part of the holding company chain, lead to an extreme impact on growers. The 'control' that the holding companies have over contract growers is a growing concern to farmers. The trend is that growers experience less freedom to choose a feed supplier that is more beneficial to them. Binding contracts further restrict the competitive negotiation power of broiler growers when feed procurement is done.

The price fluctuation on raw commodities is another issue that impacts heavily on the supply chain. When prices of raw commodities increase, producers in especially the poultry industry feel the effect immediately but only get compensated for such increases at a later stage. The multiplier effect further downstream causes the consumer to end up paying substantially more because of the increase in cost early on in the production process. The prices of agricultural commodities vary more than any of the other commodity prices (Alexandratos, 2009). Prices could rise, for example, by 50% and then drop in a short

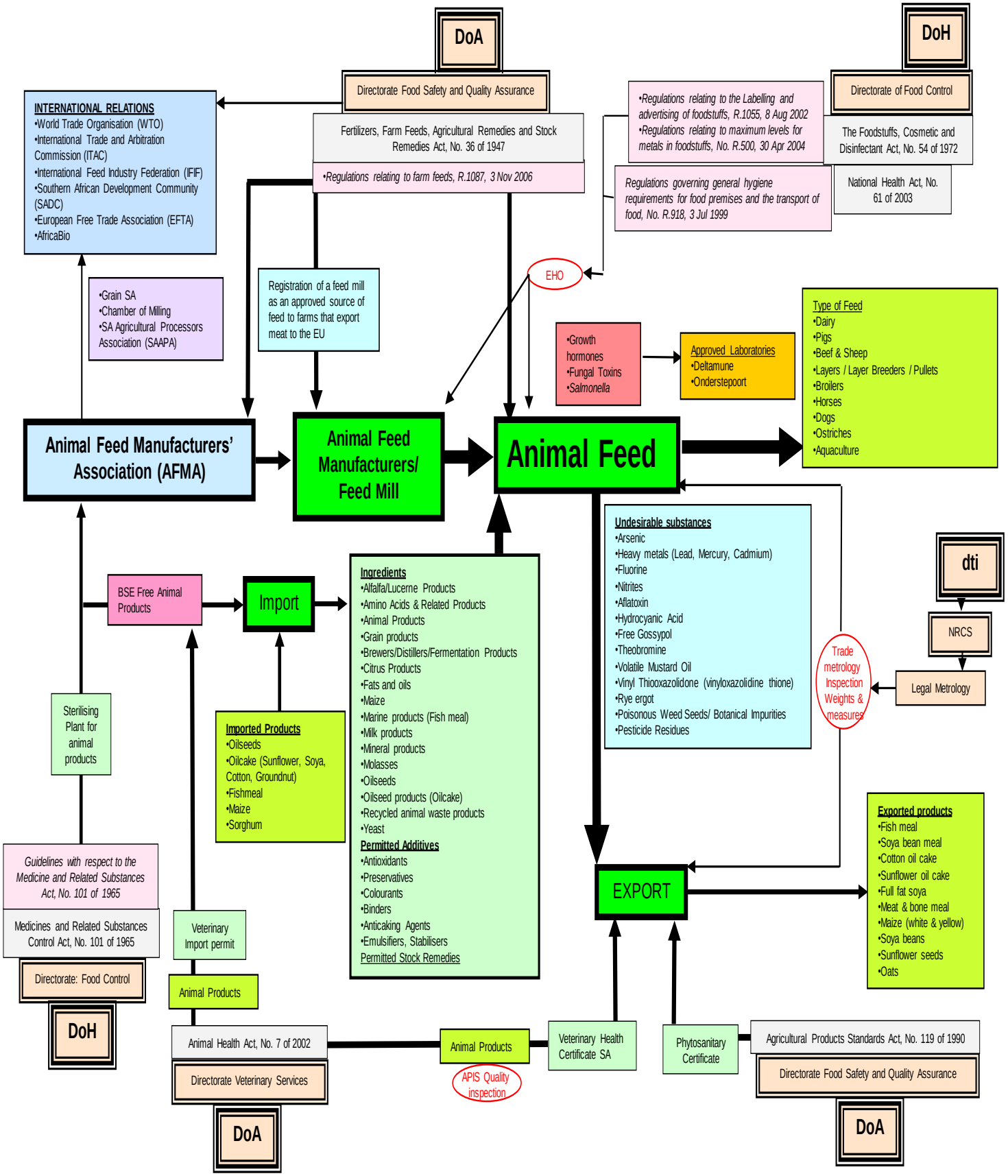

Figure 3. Animal feed industry. Source: Köster, 2009.

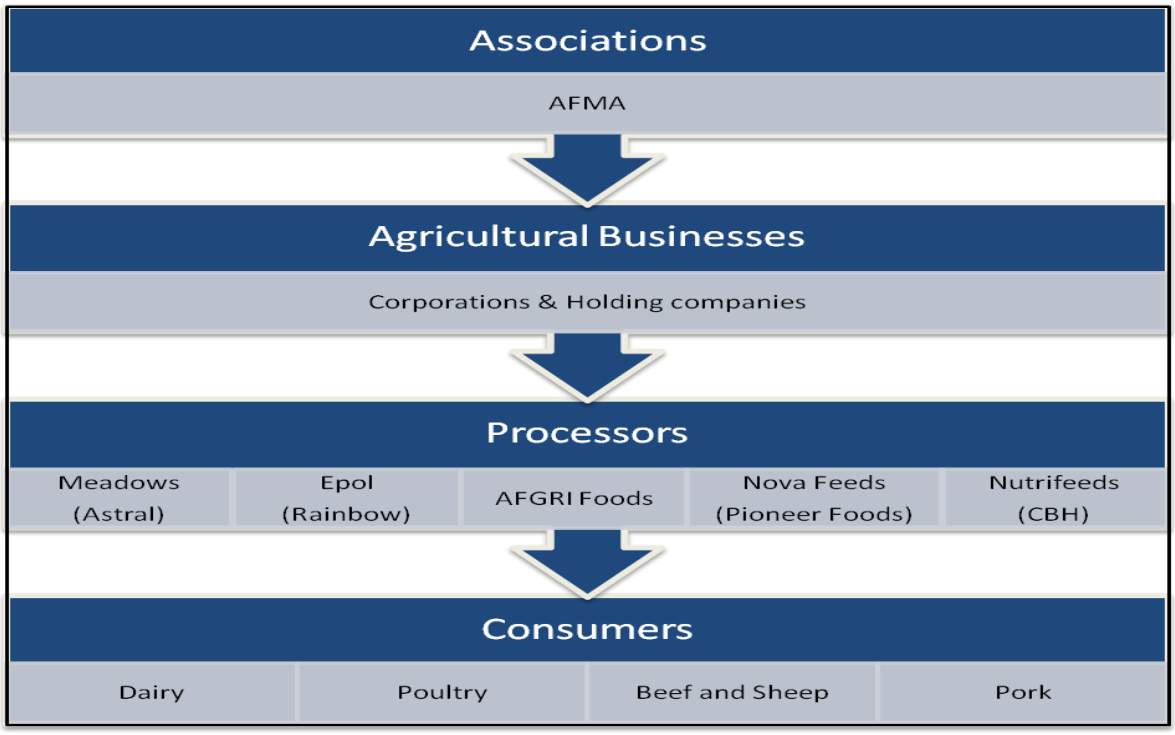

Figure 4. Outline of the different role players within the animal feed industry. Source: Own figure based on AFMA, 2009.

time period.

The structure of the world cereal markets is also quite thin, as only a small proportion of world cereal production ends up on the world market because of a large portion of the produced cereal being consumed in the domestic market (FAO, 2008).Historical (realised) volatility represents past price movements and reflects the resolution of supply and demand factors. It is a statistical measure of the volatility of a futures contract, security, or other instrument over a specified number of past trading days (CFTC Glossary, n.d.) and indicates past volatility in the market place. Historical volatility is calculated as the annualised standard deviation of the first difference in the logarithmic values of nearby futures settlement prices.

Mathematically,

$$Volatility = STDEV_{Day1}^{DayN}\left(LN\frac{SettlePx\ T}{SettlePx\ T-1}\right)*\sqrt{252}$$

As volatility is usually described in annualised terms, a factor of square root of 252 (estimated number of trade days in a year) are used to calculate the historical volatility. Table 1 shows the historical volatility of the maize contract traded on the Chicago Mercantile Exchange (CME). Table 2 shows the volatile nature of the South African white maize contract traded on the South African Futures Exchange (SAFEX). One can clearly see that the South African contract is much more volatile than the CME contracts. Interesting to note is the fact that, during 2008 and 2009 (the world financial crisis), the volatility of the white maize contract traded on SAFEX was less than the volatility of the corn contract traded on the CME. A possible explanation maybe that the South African market has a smaller portion of funds to trade the contract on, compared to the CME.

In this study, the cost of feed in the animal livestock industry was illustrated as having an impact on the profitability levels of livestock producers, especially in the pork and broiler industries. The vision of all agribusinesses is to grow and be as competitive as possible. Shareholders need to be satisfied in order for them to invest in expansion and sustainable growth. Without this growth (in the face of an ever-increasing demand for produce), the local industry will be at a disadvantage and will be flooded with large quantities of imports from agro-industries abroad. The concern of the Competition Commission is that, because an entire value chain is sometimes owned by one organisational group, very little protection is given to other role players in the industry, including the consumer.

Seeking a competitive advantage over a rival implies that the phenomenon of one organisation owning an entire value chain is more appealing from an investor's point of view. Business models have to be adapted and strategies revised by management teams to ensure a competitive industry in a changing environment, with an added benefit of sustainable growth. The interest shown

Table 1. Historical volatility of the maize contract traded on CME (percentage).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly average
2000	22.4	14.4	25.6	16.8	26.0	28.8	20.4	16.2	18.5	17.4	17	15.7	19.9
2001	17.9	12.1	19.2	20.8	21.3	16.6	41.6	19.1	17.3	15.0	21.4	11.2	19.4
2002	12.0	13.1	11.6	11.4	23.2	20.2	42.1	24.7	28.0	19.2	16.7	13	19.6
2003	20.2	11.4	18.5	12.5	22.6	19.7	16.6	25.4	22.8	28.6	25.2	18.3	20.1
2004	26.0	17.9	23.6	26.3	27.6	29.9	20.4	23.4	15.1	18.0	15.5	16.7	21.7
2005	20.1	20.9	22.6	20.1	25.0	33.8	42.2	22.4	16.0	10.5	9.5	19.5	21.9
2006	19.1	23.1	30.7	19.8	31.3	28.8	26.7	30.2	39.5	43.5	26.9	26.3	28.8
2007	38.1	27.9	23	36.8	42	38.1	30.1	27.3	39.2	31.4	22.6	20.1	31.4
2008	32.2	22.2	40.8	28.9	29.2	35.1	36.5	51.2	49.4	63.9	46	59.8	41.3
2009	50.9	30.2	36.3	28.7	16.6	41.4	46.3	28.4	55.2	43.0	35.2	29.2	36.8
2010	31.7												31.7
Mean	40.23	25.05	31.9	32.85	42	38.1	33.3	39.25	49.4	37.2	23.6	22.98	
High	50.9	30.2	40.8	36.8	42	56	54.8	51.2	55.2	63.9	46	59.8	
Low	12	11.4	11.6	11.4	21.3	16.6	16.6	16.2	15.1	10.5	9.5	11.2	

Source: Based on own calculations from SAFEX data (2010).

Table 2. Historical volatility of the white maize contract traded on SAFEX (percentage).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly average
2000	15.5	14.9	39.2	67.7	45.9	15.6	18.9	20.4	18.1	26.1	23.4	15.6	26.77
2001	38.6	58.3	28.5	10.7	16.5	21.7	23.7	11.1	18.7	35.4	30.5	39.1	27.73
2002	48.8	39.1	42.6	22.4	24.4	25.6	17.0	14.0	9.3	14.5	14.2	34.7	25.55
2003	41.0	59.8	63.3	47.4	53.6	36.2	26.7	30.7	19.9	47.9	21.8	52.0	41.70
2004	55.4	45.0	47.8	42.3	24.5	31.5	36.8	30.8	23.5	41.0	43.2	49.5	39.28
2005	61.8	36.2	36.4	30.2	25.7	20.5	28.6	20.1	34.5	30.4	37.4	43.4	33.77
2006	47.6	40.5	20.9	51.3	16.5	21.0	19.9	21.2	23.2	40.7	31.3	30.4	30.37
2007	34.7	41.5	39.6	44.4	31.0	32.0	31.1	22.4	24.5	21.6	13.1	38.7	31.22
2008	29.9	33.0	33.5	23.6	26.8	28.6	34.1	42.2	22.6	30.3	20.7	46.5	31.00
2009	27.9	24.4	13.2	26.8	28.3	22.2	36.4	28.4	20.9	28.6	27.1	21.8	25.49
2010	38.9	38.3											38.61
Monthly average	40.0	39.2	36.5	36.7	29.3	25.5	27.3	24.1	21.5	31.6	26.3	37.2	
High	61.8	59.8	63.3	67.7	45.9	36.2	36.8	42.2	34.5	47.9	43.2	52.0	
Low	15.5	15.0	13.2	10.7	16.5	15.6	17.0	11.1	9.3	14.5	13.1	15.6	

Source: Based on own calculations from SAFEX data (2010).

by the Competition Commission in the industry is not aimed at discrediting the industry, but at looking after the welfare of the different stakeholders and consumers in the supply chain.

The multiplier effect caused by a multiplication of costs in the beginning of the chain can lead to a large impact on the final consumer price. A balance has to be established between the consumer and industry, by monitoring the manner in which the Competition Commission allow the industry to grow and expand without causing any disadvantage to the consumer.

Various feed manufacturers across the country participated in a questionnaire conducted by the University of Pretoria. The issues described below, identified in the pork and broiler feed industries as restrictions currently being faced in doing their business, were included in the questionnaires. Issues regarding infrastructure for feed manufacturers refer to the costs and competitiveness of doing business. A good infrastructure aids the optimisation of the feed industry at a higher level of operations. The issues and their impact on feed manufacturers are as follow:

- Weak road infrastructure: deliveries not on time and at a much higher cost than by rail danger of heavy vehicles involved in accidents due to badly-maintained roads
- Weak railway systems: increase in road freight, and higher costs;

- Water: good quality and quantity required for optimal operational performance
- Electricity: lack of power means no operational machinery, resulting in increased business costs
- Communications: a major lifeline for any business wanting to succeed.

The significant barriers to entry in the value chain were identified by applying the SCOR model. These barriers include:

- High capital requirements;
- Relevant experience and track records;
- The significance of research and biotechnology in the provision of seeds;
- Economies of scale for other major inputs, such as fertiliser, the costs of establishing large grain silos, large-scale milling operations and sophisticated logistics; and
- Infrastructure.

Such barriers to entry make it difficult for new and smaller entrants to compete with existing market players.

Barriers to entry

Barriers to entry include the following:

- Switching cost being the cost of switching suppliers in the feed industry – a relatively high barrier
- Government policies regarding health and safety, traceability, the use of GM products, and other standards and policies
- The high cost of implementing and maintaining food safety practices, increasing rivalry in the feed sector
- Bio-security and traceability, and quality and traceability also being major concerns to the animal feed industry. The new feed act (if instated) will better control the procurement and milling of animal feeds to ensure that it is of high quality, and in accordance with HACCP, QACCP and ISO standards.
- The dominant feed manufacturers being price-setters with market control, instead of price-takers
- Abnormally high profits maintained for long periods
- Feed products being relatively homogenous
- Perfect knowledge of own prices and demand among manufacturers, with consumers lacking knowledge of prices and demand for animal feeds
- Large capital investments requiring the gain of necessary resources and infrastructure
- Feed margins being under pressure for the foreseeable future and returning to more moderate levels in the short term, as supply and demand economics dictate (Roosendaal, 2009).
- With the review of Act 36 of 1947, regulations for feed legislation changing, thereby stipulating that all feed manufacturing plants must be registered, including own farm mixing on farm level. The Government does not have the current capacity to deal with all the registrations of mixing facilities.

The pork industry opposes this Act due to the impracticality and manpower required to govern it. There is also none or limited data bases available for registered animal feed (Boshoff, 2008).

- Production of meat being consolidated to produce corporate farms with improved scales of economy and increased professionalism. They have in turn increased bargaining power with their supplying feed companies. The demand for tailor-made feed is increasing, while the demand for ‘one size fits all’ type feed is falling. The impact on the feed company is often reduced plant efficiency. Inventories are made up of increasing numbers of tailor-made orders, usually in low volumes, which subsequently leads to complicated production schedules and increasing bottle necks in throughput (Cardy-Brown, 2006).

According to Friedman (2007), the market attractiveness of the feed manufacturing industry depends on:

- The size and growth of the market – demand will increase dramatically for livestock as South Africa’s economy recovers from the recession, and growth in livestock production leads to feed demand increases.
- The increase in feed production – in order to feed the animals that will supply the meat for a growing world population, feed grain production will have to increase. Gilbert (2007) confirms this attractiveness as the use of grain for food is expected to increase by 45% by 2030, while cereal consumption in the form of animal feeds will increase by 60%.
- Economic factors relating to investment, along with interest rates – since one of the barriers to entry is large fixed amounts for infrastructure, expansions and emerging feed manufacturers will arise the moment their company can afford loans for it.
- Technological factors in conjunction with the availability of raw materials – South Africa’s stock levels are high, which means that raw materials are available for feed manufacturing.
- Competitive factors accounting for the bargaining power of suppliers – an emerging company entering into the market has very high bargaining power, since the feed industry is an oligopoly market.
- Environmental factors – the new trend toward going green and limiting the impact that feed companies have on the environment.

In trying to identify risks in the feed industry, risk management has focused on the macro- as well as the micro-risk levels. On a macro-risk level, the following risks were identified subjectively by role players in the industries, as well as by the organisational boards such as AFMA (the organisational board for the animal feed

Table 3. SWOT analysis of the South African feed industry.

Strengths	Weaknesses
• Well-trained personnel in organisation • Cultural qualities through which organisations do business • Well-known trademarks and customer basis • Part of an integrated business structure • Quality, control and technological innovation	• Price volatility and its effect lower down the value chain • Procurement of good-quality raw ingredients • Old levels of technology • Lack of capital for expansion • Uncertainty of buyers for the feed manufactured
Opportunities	**Threats**
• Technological advancement • Growing markets, especially in Africa • Increased value-adding through integration • Growth of the chicken industry, resulting in increased demand for feed • Conversion of low-quality protein to better-quality protein with the help of enzymes	• Unreliable supply of electricity • Infrastructure not maintained by government departments • Changes in legislation, and the effect of the Competition Commission • GMO issues and how they are managed • Uncertainty of agriculture with regard to political involvement

Source: Interviews, 2010.

industry), SAPPO (the organisational board for the pork industry), and SAPA (the organisational board for the poultry industry):

- Macro risks: export risks, political risks, economical risks, social risks and technological risks;
- Micro risks: environmental risks, operational risks, product market risks, financial risks and input risks.

SWOT analysis

A strengths, weaknesses, opportunities and threats (SWOT) analysis of the feed industry was conducted as part of the study. The SWOT analysis of the feed industry must be viewed in conjunction with the pork and broiler SWOT analysis, as a strategic method or focus to enable agro-food businesses and farmers to position themselves in the industry, so as to exploit opportunities and reduce or eliminate threats. These SWOT analyses combine the perceptions of different role players and industry leaders on the level of strategic thinking in their own organisation or business. The changes being experienced in the external, as well as the internal, markets forces industry leaders to think and strategise proactively, so as not to experience the pitfalls of losing market share or investor interest.

Table 3 shows the SWOT model derived from the interviewed members who represented various feed manufacturers. These SWOTs represent the most important elements that need to be considered by the industry (as well as by individual businesses) when focusing on and adjusting their business models.

In Table 3, the most predominant issues were highlighted. Although identified by individual feed manufacturers, these are typical issues for all manufacturers. Presenting a generalised SWOT analysis gives the industry an opportunity to experience harmonisation between different feed manufacturers. The aim of the Competition Commission is to ensure that accurate information is made available to all, thus also promoting this concept.

The greatest strength identified was the core culture of the businesses and how their perceived ways of doing business and striving towards their vision and mission added value to their businesses. The biggest weakness for feed manufacturers was the price fluctuations of raw feed ingredients. This, along with procurement, made it difficult to adjust feed prices in order to remain competitively priced without losing market share.

The two main opportunities that feed manufacturers will have to look into in order to expand is their level of technological advancement (to be on par with international trends and standards) and expansion opportunities in Africa. The potential for growth in Africa is tremendous and could possibly create various prosperous opportunities. Resources are available but the lack of utilisation, control and management of these resources results in inefficiency.

However, along with these substantial prosperous opportunities lie old enemies, namely, government governance. The impact of policy, legislation changes, talks on nationalisation, and the inability to maintain infrastructure are feed manufacturers largest threats. Before expansion into Africa can take place, the general infrastructure which impacts on local businesses will first have to be upgraded and maintained. Expansion costs

money, and investors will only invest if they feel that the relevant risk is being minimised or managed.

The purpose of this SWOT analysis was to give insight into how feed manufacturers need to think and plan scenarios of what could possibly happen in the industry and external environment, and how to prepare for these envisaged events.

CONCLUSIONS AND RECOMMENDATIONS

The feed industry, especially in the South African context, is a complex and very dynamic, growing agricultural industry. Producers face various challenges on a daily basis, in a dynamic, ever-changing environment, which increase risk to such a degree that, in order to be able to farm sustainably, a competitive advantage in the form of lower-cost and higher-quality produce has to be established. Primary production is relatively un-concentrated and relatively fragmented which implies that farmers are price-takers on the input and output sides.

This study highlighted the degree of importance of the feed industry in South Africa, and focused on the level of integration in the poultry and pork industries. The purpose of this project was to study and understand the pork and broiler industry supply chains, by focusing on the feed and feed-related issues experienced within the supply chains. Special attention was given to the different role players in the input and feed (own and manufactured) industries. Government plays a major role in terms of creating an environment that is conducive to well-performing business. The lack of appropriate Government policy and policing of the feed, pork and poultry industries is restricting the competitiveness of these industries.

These industries are all exposed to very weak infrastructural support and maintenance from Government. Roads (secondary and tertiary) and railways account for almost all grain transportation and delivery systems in and around South Africa. Transporting feed ingredients is becoming alarmingly expensive. Maintenance on vehicles is an additional cost that needs to be added to transportation costs. The end result is that agribusinesses cannot be competitive while costs keep escalating.

The consumer will end up paying more for protein foods, such as pork and poultry, due to the high costs of transportation which results from the multiplier effect throughout the value chain. Large feed manufacturers have the capacity to produce optimally, but market conditions are forcing them to produce below the desired potential levels. The constant threat of land claims and the nationalisation of farm lands are creating a trust barrier between producers and Government. Economies of scale are one of the principles that will ensure that food security does not become an issue. However, if identified threats become realities, agricultural industries will fall prey to high quantities of imports as well as negative growth in the agricultural sector.

In order to compete with international markets, a high level of technological innovation is necessary. South Africa is at the forefront in leading technological innovation in Africa and benchmarks with the best in the world. This is a feature that will ensure that a level of growth is maintained in all of the industries. Excellent genetic material is available to producers, and high-quality parenting stock to growers. Funds should be made available to the producer organisations (through distributing funds obtained from corporate fines) to obtain statistical data and conduct relevant research and development from within the industry. It is not the task of Government to grow an industry, but it is its responsibility to ensure that barriers are lowered in order for innovation to take place and that policy restriction and infrastructural obstacles are removed. The ultimate goal of sustainable growth must be maintained.

The main issues identified in this study are:

- The number of players in feed inputs, manufacturing and procurement;
- Competitiveness and profitability in the animal feed supply chain; and
- The overall impacts of the above on the pork and poultry markets.

Input factors further upstream in the supply chain (e.g. maize and soya from farmers) are researched on a procurement-process basis by producers in order to optimise profit through hedging and discount risk efficiently to consequently lower costs. In this manner, a degree of competitive advantage can be established in both the pork and broiler industries.

Policies and methods of effective price hedging must be put in place to ensure sufficient grain stocks at the best or lowest possible prices. In general, Farmers do not know how to discount their risks and are very vulnerable in this regard.

Price volatility was seen as the main risk that has the largest impact on daily operations and planning structures. The raw commodity components that make up feed rations are maize, soya beans, sunflower seeds, wheat and additives. These commodities, except for the additives that are vitamin-, mineral- and growth stimulant-based, are traded on the SAFEX grain market. The prices of these commodities are thus formed at this market. The impact of sudden short-term changes in large parity bands of these commodities was analysed, and the impact thereof explained in this study. The general observation was that risk-hedging on the markets is a strategic method of discounting a percentage of short-term risk, but not of eliminating commodity risks entirely.

Significant barriers to entry exist in the value chain. These barriers include:

- High capital requirements;
- Adequate relevant experience and track records;
- The significance of research and biotechnology in the

provision of quality inputs;

- Economies of scale in other major inputs such as fertiliser, including the costs of establishing large grain silos, large-scale milling operations, and sophisticated logistics; and
- Infrastructure.

Branding and marketing can be significant barriers, as can access to prime retail space-suitable sites for new stores, capital outlay and retailing experience. Such barriers to entry make it difficult for new and smaller entrants to compete with existing market players.

By evaluating these issues and studying the impact (statistically, from the data obtained from participants in interviews) they have on feed manufacturers, it became clear that not only are industry changes necessary but Government intervention as well. AFMA's role is to represent members of the feed manufacturing division.

AFMA plays an important liaison, coordination, information-gathering and distributing role between Government and the feed industry. When necessary, it advises Government about policy changes and legislation, or other changes that can affect its members. AFMA is currently enjoying recognition as the national role player that takes part in all forums related to animal feeds and the grain value chain.

These include the various forums, both Government and the private sector, where AFMA fulfils its rightful role as one of the leading decision-makers (AFMA, 2009). AFMA members are responsible for 55% of national animal feed production (AFMA, 2009).

The role that organisations such as AFMA play in ensuring self-regulation and improved regulation by Government is one of the critical success factors involved in managing the changes required in the issues stated above. The task of regulating the industry is too large for Government to handle on its own. However, the main issue that currently exists is the vision of self-regulation in the industry. The lack of capacity of Government to police its own legislation is troublesome. The solution is not for Government to regulate, monitor and control the entire feed industry, but rather for it to place appropriate policies in place to allow the industry to function optimally, without uncompetitive advantages in the industry.

In this study, the impact that the cost of feed in the animal livestock industry (especially in the pork and broiler industries) has on the profitability levels of livestock producers was illustrated. The vision of all agribusinesses is to grow and be as competitive as possible. Shareholders need to be satisfied with returns and growth prospects in order for them to invest in expansion and sustainable growth. Without this growth (in the face of an ever-increasing demand for produce) the local industry will be at a disadvantage and will be flooded with large quantities of imports from agro-industries from abroad. The concern of the Competition Commission is that, because an entire value chain is sometimes owned by one organisation, very little protection is given to other role players in the industry and to the consumer.

High levels of integration, as well as concentration levels, increase the level of competition between the largest organisations. In the South African feed industry, there is a small number of role players that, together, control the largest market share. This leaves only a limited market share for the smaller producers in the industry. The five main feed producers examined were Meadow Feeds, Epol, Afgri Foods, Nova Feeds and Nutri Feeds. Each one of these feed companies is owned by a holding company. This explains why the feed industry is described as a vertically integrated system. Vertical integration is afirm's approach to increasing control over its suppliers of inputs, improving economies of scale and lowering prices. The feed-producing companies are owned by the animal producers as holding companies, especially the poultry producers. In this manner, these holding companies control their suppliers of feeds and vertical integration follows, by combining the feed supply chain with the holding company's poultry supply chain.

A competitive advantage over rivals is achieved when one organisation owns an entire value chain, which is more appealing from an investor's point of view. Business models will have to be adapted and strategies will have to be revised by management teams to ensure a competitive industry, with the added benefit of sustainable growth in a changing environment. The interest by the Competition Commission in the industry is not aimed at discrediting it, but rather at looking after the welfare of the consumer in the supply chain. The ripple effect caused by a multiplication of costs in the beginning of the chain can lead to a large impact on the final consumer price. The balance has to be established by the Competition Commission monitoring the industry's growth and expansion, so that consumers are not disadvantaged in the process.

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