



**COMPETITION AND CONSUMER PROTECTION
COMMISSION**

ANIMAL FEED VALUE CHAIN STUDY IN ZAMBIA

**STUDY CARRIED OUT UNDER THE ZAMBIA AGRIBUSINESS
AND TRADE PROJECT (ZATP)**

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Acronyms

CCPC	Competition and Consumer Protection Commission
CFS	Crop Forecast Survey
CUTS	Consumer Unity and Trust Society
GTAZ	Grain Traders Association of Zambia
FRA	Food Reserve Agency
GDP	Gross Domestic Product
USD	United States Dollar
FAO	Food and Agriculture Organisation
SOE	State Owned Enterprise
ZAMACE	Zambian Agriculture Commodities Exchange
ZCSA	Zambia Compulsory Standards Agency
ZMA	Zambia Metrology Agency
MCTI	Ministry of Commerce Trade and Industry

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Executive Summary

The Zambian animal feed sector has undergone tremendous transformation over the years. Animal feed, grown or developed for livestock and poultry is produced by carefully selecting and blending ingredients to provide highly nutritional diets that both maintain the health of the animals and increase the quality of such end products as meat, milk or eggs.

The animal feed sector is part of Zambia's growing agro-processing industry. The sector falls under the manufacturing sector. Though specific contributory statistics for the animal feed sector are scanty, the manufacturing sector contributes around 7.5% to Zambia's Gross Domestic Product (GDP) as of 2018. In terms of value, the value of animal feed produced in Zambia is about K1.5 billion per annum, which is mainly biased towards poultry, which constitutes about 50% of all meat consumed in Zambia, resulting in about 80% of the feeds produced being destined for the poultry market. The animal feed value chain is generally characterised by a number of sub-sectors, value added services and support services. The availability of throughput across these sub-sectors of the value chain are critical in influencing competition across the entire value chain.

There are possibilities that trade between grain producers (maize, soya beans and cotton) and traders is largely riddled with coordinated decision making by buyers as farmers have no power to influence market outcomes. There is great convergence in the prices at which traders buy grain from farmers, giving possibilities of collusion and or an element of exploitation. There are also concerns that those that are vertically integrated leverage

on other lucrative segments of the value chain to engage in predatory behaviour at the feed production stage.

Inefficiencies in the production of the main crop inputs results in poor yields, which also imply that the costs of producing the crops are unnecessarily too high, feeding into the value chain. In addition, there is excess demand for feed, which allows the millers to adjust prices upwards without experiencing serious decrease in revenues. In addition, there is a high cost premium associated with overreliance on using US dollar-based contracts. These apply even for products that are not imported as a way of cushioning against fluctuations in the exchange rate which erodes profit margins.

INTRODUCTION

1. Globally, animal feed production takes place in more than 130 countries with production estimated at one billion tonnes annually, annual turnover of over US \$400 billion and skilled employment levels (technicians, managers and professionals) estimated at more than a quarter of a million¹. The Zambian animal feed sector has undergone tremendous transformation over the years. Animal feed, grown or developed for livestock and poultry is produced by carefully selecting and blending ingredients to provide highly nutritional diets that both maintain the health of the animals and increase the quality of such end products as meat, milk, or eggs².
2. Animal feeds refers to a diverse range of feed items including feed ingredients, feed additives, pet foods, ruminant and non-ruminant feeds and feeds for fresh water and sea fish, birds, dogs and cats and other companion animals³. The demand for animal feed is derived demand, as it is generally responsive to the consumption of livestock and fish at both the local and export markets. Thus, the animal feed value chain can be influenced by the nature of demand, which in turn responds to the manner in which livestock production industries are structured and how they have evolved over time. On the other hand, the availability of feed is also influenced by the supply side. The ability to meet demand is largely influenced by the availability of raw materials, which also makes the raw material supply industry important to the value chain players.

¹ <https://ifif.org/global-feed/industry/>

² <https://www.britannica.com/topic/feed-agriculture>

³ http://cowsoko.com/publications/1453820122BLGG_Report_III_Feed_Sector_Policy_Issues.pdf

3. The animal feed sector is part of Zambia's growing agro-processing industry. The sector falls under the manufacturing sector and its contributory importance has been witnessed by the tremendous growth in the Zambian livestock sector⁴ which is currently estimated at around USD1.5 billion and accounting for around 35% of agriculture production share of national gross domestic product⁵.
4. About 83% of the agriculture, forestry and fisheries products are used by the manufacturing sector⁶. The share of the agriculture, forestry and fishing industries to GDP, as reflected by gross value added increased from 6.2% in 2016 to 7.2% in 2017⁷. The manufacturing sector on the other hand has a share of about 7.6% in GDP⁸. The animal feed industry is therefore critical in influencing both the contribution of the manufacturing sector and agriculture sectors. At 7.6%, the manufacturing sector is fourth after wholesale and retail (19.1%), mining and quarrying (14.8%) and construction (10.3%) in contributing to GDP⁹.
5. Given the important role played by the demand side, the animal feed industry's importance is also related to the consumption habits of the Zambian population. Meat consumption in Zambia is dominated by poultry which constitutes about 50% of all meat consumed, ahead of beef at 28%¹⁰. As a result, the animal feed industry is dominated by poultry, with 80% of the feeds produced destined for the poultry market¹¹. The poultry industry in Zambia has been growing at an average of about 8%

⁴Beef and dairy products have been growing at around 7% and 10% annually - <https://thebestofzambia.com/categories/food-and-agriculture/farming-produce/livestock/>

⁵ <https://thebestofzambia.com/categories/food-and-agriculture/farming-produce/livestock/>

⁶ The Zambia Statistician report as at June 2018

⁷ Ibid

⁸ Ibid

⁹ Ibid

¹⁰ Krishnan and Petersburs (2017)

¹¹ https://mitc.mw/trade/images/Regional_Oilcake_Demand_Executive_Summary_141202.pdf

per annum, triggered by multinational firms that invested heavily between 2012 and 2015¹².

6. The broiler sector accounts for about 80% of the poultry products, with the egg sector taking up the remainder¹³. Zambia has an estimated stock feed processing capacity of between 450,000-500,000 metric tonnes per annum, although production can now be estimated at only 300,000 metric tonnes¹⁴. At an average price of K250 for 50kg¹⁵, the value of animal feed produced in Zambia can be estimated at about K1.5 billion per annum. This would also imply that about K1.2 billion worth of animal feed is used for the poultry industry, which in turn contributes about 4.8% of agriculture GDP and accounts for 48% of livestock value addition as the largest livestock sub-sector¹⁶.
7. Beef production also contributes to the demand for animal feed. The Livestock and Aquaculture Census Results of 2017 shows that out of the total cattle population of about 3,654,668, the household sector accounted for 94% while firms (establishments) constituted the remainder. However, demand for feed for beef producers is limited by the fact that feed is only purchased to supplement natural pastures, as grass is the main source of feed by households. Large commercial beef producers, however, rely heavily on the use of animal feed from the millers, which also makes the demand for feed destined for beef important.
8. Zambia is the 6th largest producer of formal fish in Africa, with 20,000 tons produced in 2014, out of which about 75% came from intensive pond

¹² Samboko et al (2018)

¹³ Krishnan and Petersburs (2017)

¹⁴ Ibid

¹⁵ Ibid

¹⁶ Ibid

based rearing units of the commercial sector¹⁷. Zambia has about 15 million hectares of water (rivers, lakes and swamps) from which freshwater fishing activities are concentrated. Fisheries and aquaculture contribute about 3% of the GDP share contributed by agriculture, forestry and fisheries¹⁸. Although the commercial production requires feed from formal markets, the small-scale sector largely use locally sourced materials, which are mainly promoted by Government or donor driven programmes. However, due to the presence of the commercial sector, feed millers have already responded to the needs by producing fish feed.

Objectives of the Study

9. The main objectives are:

- To understand the market structure of the animal feed value chain and what stifles effective competition dynamics in the animal feed value chain,
- To understand how Government interventions shape incentives for firms to compete and invest; and
- To provide recommendations on the design of more effective policies that foster competition in the animal feed value chain.

¹⁷ Genschick et al (2017)

¹⁸ Krishnan and Petersburs (2017)

Rationale

10. Despite the fact that Zambia is self-sufficient in both soya beans¹⁹ and maize²⁰ production, which are key ingredients to the animal feed, the prices of animal feed are alleged to be high by the users. The industry attributes the recent increases in animal feed prices to the volatility in the exchange rate²¹, while users generally feel prices cannot be justified.
11. It is therefore important to understand the animal feed value chain in general in order to identify possible areas for anticompetitive behaviour as well as understand the main drivers of price distortions. This can be done by getting an understanding of the state of competition in the animal feed sector and make recommendations that will increase the competitiveness and in turn performance of all subsectors of the animal feed value chain.
12. The performance of the animal feed value chain from the crop input to consumers of final meat products and other products (milk/eggs) depends on the performance of each sub-component of the value chain. An understanding of the animal feed value chain in general and identifying possible anticompetitive practices in particular would require tracing four different feed types in particular; fish, cattle, poultry and pig feed from both the demand side and supply side.

¹⁹ <http://www.technoserve.org/files/downloads/technoserve-bmgf-zambia.pdf>

²⁰ http://fsg.afre.msu.edu/zambia/MarketOutlook_Sept2015.pdf

²¹ For instance, on 10th March, 2015 Novatek, a subsidiary of Zambeef Products Plc, announced a 10 per cent price increment due to the depreciation of the local currency as most of the transactions by the company were said to be quoted in United States Dollar. See story at <http://www.times.co.zm/?p=55923>

Study Methodology

13. Based on field interviews as well as various secondary data sources, a thorough analysis of the value chain segments was done to understand the animal feed value chain and how it plays an important role in the Zambian economy. Firm specific information at different segments of the value chain was used to understand the structure of the market as well as the characteristics of the competition environment at each value chain segment.
14. The study strategically targeted a number of areas to draw interviews from, especially for crop and livestock producers. For poultry, the Copperbelt Province is the leading egg producer while Lusaka Province is the leading broiler producer while the Central Province is the leading pig producer. The report is based on findings from 15 randomly selected poultry farmers in the Copperbelt Province. This report also covers findings from ten (10) randomly selected pig producers in Central Province, which were done concurrently with soya bean farmers in the same province.
15. The report is also based on findings from five (5) randomly selected large-scale cattle producers in Monze District of the Southern Province, who produced an average of 790 herds per farmer. Interviews were also conducted with three (3) large scale producers of fish in Siavonga, which included [REDACTED], the largest fish producers in the country. In addition, the study utilised findings conducted with three millers and edible oil producers to understand the nature of their interaction with farmers.
16. With respect to crops, the study mainly targeted soya bean and sunflower farmers. Cottonseed is supplied by ginners whose main focus is the

production of lint and hence their conduct is only remotely connected to the animal feed industry. Maize is grown mainly for subsistence purposes by the communal farmers, who would sell their excess output, with the majority marketed through the FRA; hence the production of maize is not expected to be driven by the millers. The Central Province, in particular Kapiri Mposhi and Chibombo districts are the main soya bean producing districts. This report is thus based on findings from interviews involving a sample of 15 randomly selected soya bean producers in Kapiri Mposhi district of the Central Province. On the other hand, about 56% of the sunflower produced in Zambia in the 2017/18 season came from the Eastern Province and this is the reason a. randomly selected sample of 15 sunflower producers in Chipata district also informed this report.

17. The study also benefited from findings from a previous study which CUTS undertook in 2016 focusing on the soya bean value chain²², which saw interviews being conducted with 6 millers, 14 traders and 29 soya bean farmers. The findings are generally in line with those obtained under the interviews conducted under this study.

Limitations of the Study

18. Although literature review and published information was very instrumental in informing the study, there was limited timeframe to be able to interview all the key players in the value chain. A qualitative approach rather than a quantitative approach, where field findings would have been regarded as being representative of all the players in that segment of the value chain, was adopted. This study is also based on

²² The Implications of the Market Structure and Nature of Competition in the Zambia Agriculture Sector: A Case Study of Soya Beans and Banana Agro-Processing Value Chains at website <https://cuts-lusaka.org/pdf/Report-Nature of Competition in the Zambia Agriculture Sector.pdf>.

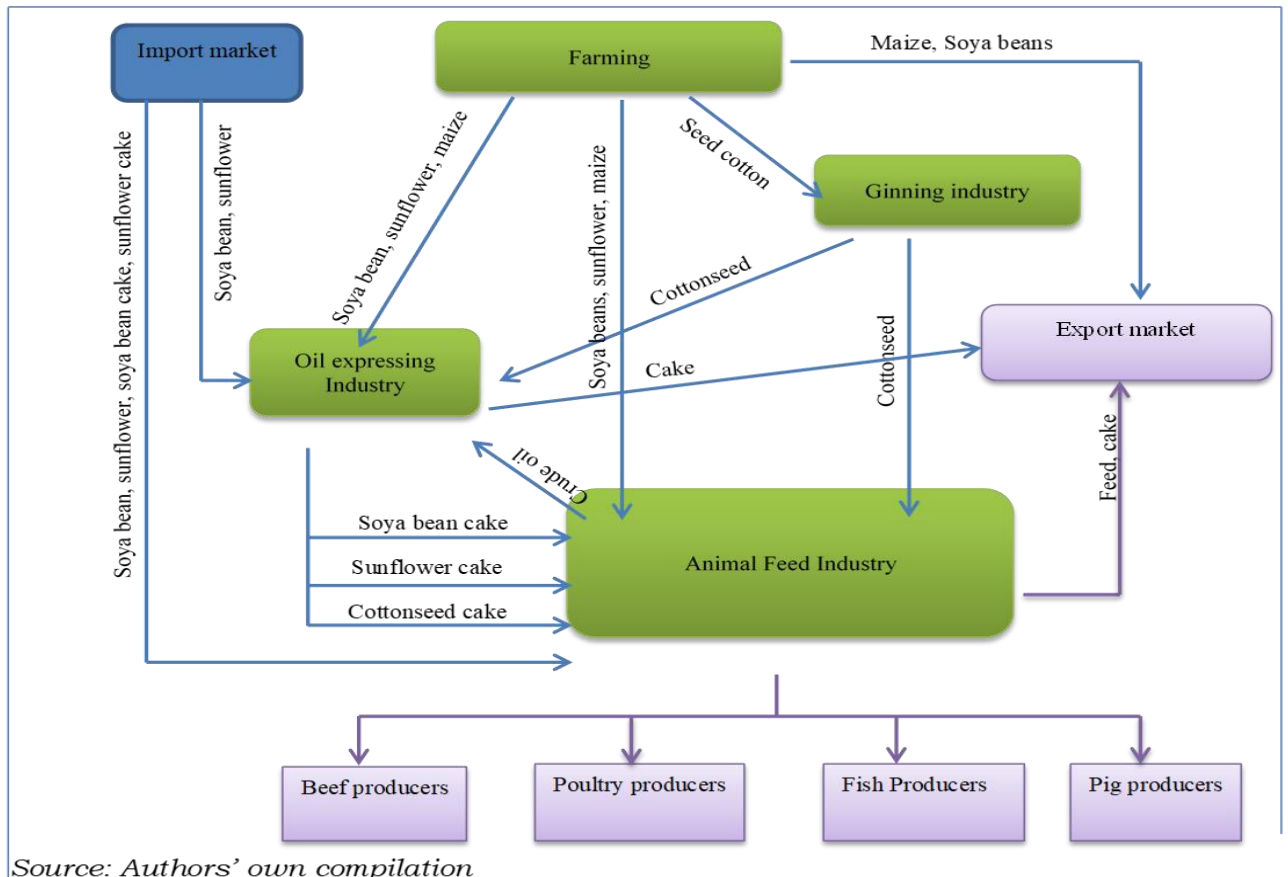
estimates about market shares which have been produced using averages of field findings from farmers and the producers interviewed.

ANIMAL FEED VALUE CHAIN AND SEGMENTS

19. The Zambian animal feed industry is a K1.5 billion per annum industry, which is shared across all the investors involved in animal feed industry. Most of the value within the value chain is localised in Zambia. Data from the Food and Agriculture Organisation (FAO) shows that between 1975 and 2016, imports of soya beans into Zambia constituted on average only about 7% of total soya beans available in the economy, demonstrating that Zambia largely grows its own soya beans. The FAO statistics also reveal that Zambia imports only about 19% of its soya bean cake, which also shows that cake demand is largely sourced from the local market. This implies that the K1.5 billion animal feed industry largely rewards the local value chain, which demonstrates that the industry is very critical for sustaining livelihoods.

20. The animal feed industry is generally shaped by the characteristics of the other segments which are downstream in the value chain. There are five industries/production stages that influence the characteristics of animal feed production as input suppliers. The availability of throughput across these stages of the chain is critical in influencing competition at the feed production stage. Thus, the animal feed value chain together with the critical products produced and used as input can be described as shown in Figure 1 below.

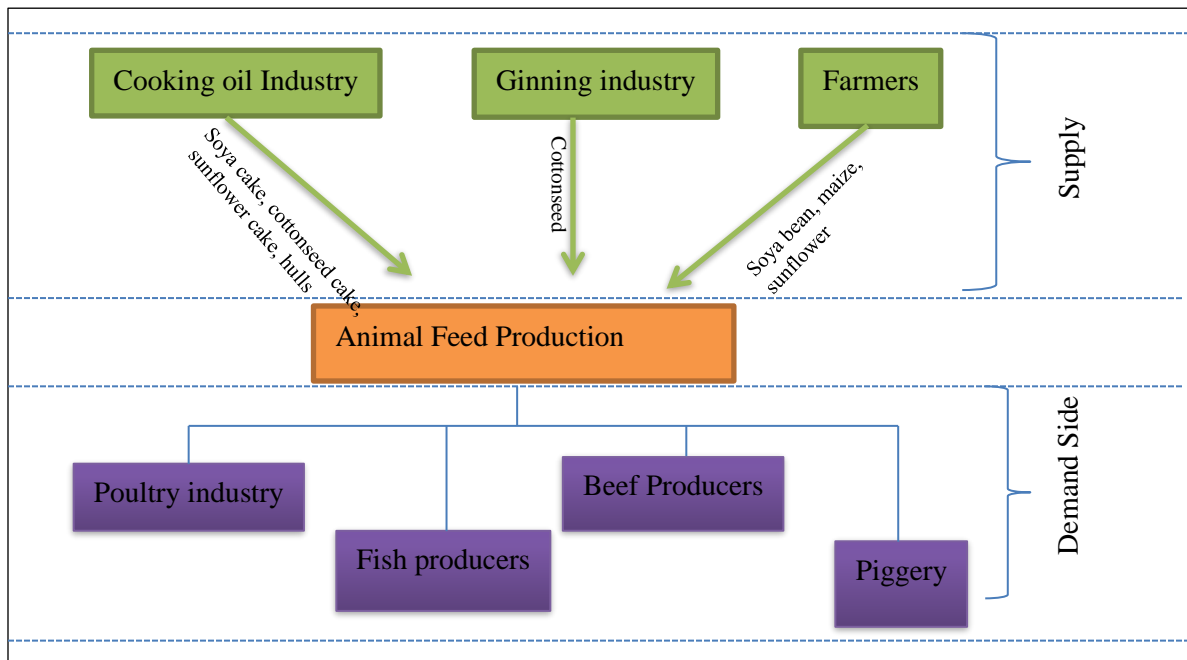
Figure 1: Zambia Animal Feed Value Chain



21. There are eight products which directly or through their by-product feed into the production of animal feed. Animal feed in Zambia is mainly produced from four agriculture products; soya beans, sunflower, maize and cotton. These crops are processed by different processors, which include ginners, millers, and edible oil producers, resulting in some products which are used as raw materials in the animal feed industry. The oilseeds (soya beans, cottonseed and sunflower) are crushed to produce cake or meal, which is then used as a raw material in the production of feed.

22. There is a strong interdependency and competition for raw materials between the feed producers and the edible oil producers. Both can compete in buying oilseeds directly from farmers, but edible oil producers would need to sell the cake to feed animals as a by-product while feed producers would also need to sell crude oil to edible oil producers as a by-product. This implies that the importance of the animal feed value chain can be easily seen based on the critical roles played by all the segments of the value chain.
23. The segments that influence the animal feed production trends and characteristics can be disaggregated into two, the demand side and the supply side. These interactions from both the demand side and the supply side are shown in Figure 2. It is important to note that there could be further interactions with other players beyond those shown in Figure 2 but whose influence on the animal feed value chain would be too indirect or remote.

Figure 2: Demand and supply side interactions-



Demand side value chain segment

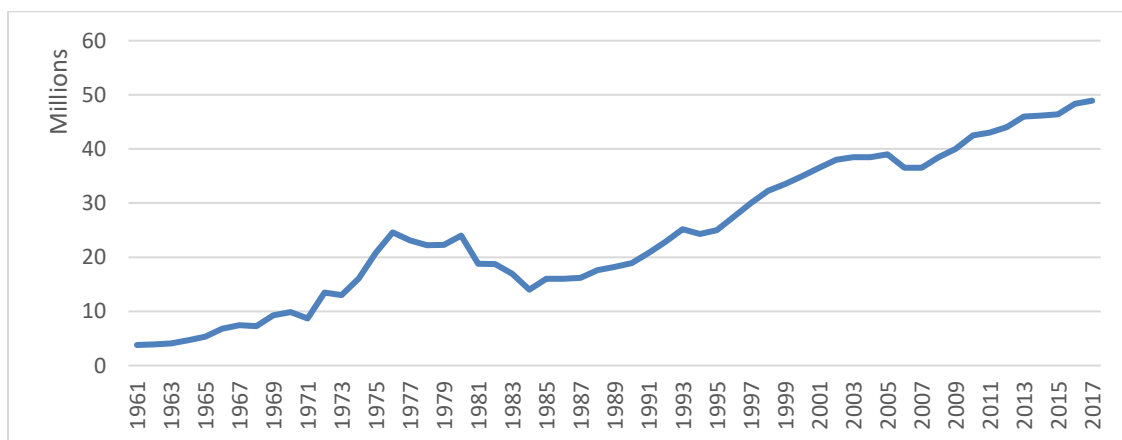
24. The animal feed value chain is made up of a series of inter-connected markets that rely on each other for the efficient functioning of the value chain. The demand and supply for inputs in one market depends on the demand and supply of those inputs in another market. Therefore, demand is determined by or originates from the demand for the product the inputs are supposed to produce. The performance of the animal feed industry is anchored on characteristics and performance of the poultry, beef, fish and pock markets. Therefore, the animal feed industry can best be understood by the shape of the livestock production trends over the years.

25. There are a lot of similarities in terms of the raw materials that are used in the production of feed for poultry, beef, fish and pig. Although there are some differences, there is great convergence in terms of raw material usage. While cotton seed is a source of high protein for feed, it is not suitable for poultry, as it contains gossypol, a substance which is an anti-nutrition factor and harmful to poultry. Cotton cake is only used in the production of stock feed for ruminant animals such as cattle, goats and sheep. While it is possible to engage in some transformation to remove the gossypol, the costs involved would not be worth it as alternative sources of products such as soya exists which are even cheaper. Thus, poultry and pig feed is mainly based on soya beans, maize and sunflower, while beef feed can also be blended with cotton based inputs.

Poultry production

26. The poultry industry in Zambia has been growing tremendously since 1985, with statistics showing that by 2017, about 50 million birds were slaughtered in Zambia, having increased from only 16 million in 1985 (Figure 3). This shows the important role that the animal feed industry plays in sustaining livelihoods in Zambia.
27. The industry generates about 5% of GDP and an estimated 47% of livestock GDP. In 2014 more than 68 million day old chicks were sold translating into K300 million annually and 360,000 metric tons of feed consumed annually creating market for small scale farmers²³. The sector growth in 2018 was at 89% compared to 75% recorded in 2017. The broiler subsector which is the largest and the driver of the sector recorded a 4.2% reduction representing 83 million day old chicks produced in 2017 compared to 80 million in 2018. There was a 10% increase in layers which stood at 37.6 million trays in 2017 to 41.1 million trays of eggs in 2018.²⁴

Figure 3: The growth of the poultry industry (head) in Zambia, 1961-2017



Source: FAOSTAT

²³ Statement by Minister of Agriculture Hon Given Lubinda (2015)

²⁴ www.mfl.gov.zm/?p=5405

28. The poultry industry generally consists of two main sub-segments; the broiler (meat) segment and the layers (egg) production segment. The broiler sector constitutes about 80% of the poultry sector²⁵, with 64% of what the animal feed industry produces consumed by the broiler subsector while the layers take up about 16% of the animal feed produce.
29. Small scale players constitute about 60% of the total poultry produced, even though egg production is also characterised by large scale producers. The sector is expanding rapidly, which creates increased demand for feed. The study interviewed players that produced a total of 148,300 birds in 2018, which was a significant jump of about 116% compared to their output in 2017 of 68,600 birds. This expansion created significant demand for feed. However, the large number of players of which none has any ability to influence price implies that the poultry production market is not expected to create any competition concerns at the feed production stage, as their behaviour is largely not coordinated and thus have no market power.

Poultry feed

30. Poultry feed in Zambia is comprised of about 65% maize content and 30% soya bean cake²⁶. Sunflower cake is not used significantly in poultry feed, even though it is also an input. Other inputs into poultry feed include vitamins and amino acids, though crop inputs constitute the main costs. Small scale players largely use mixed inputs, which include maize mixed in crushed format with other protein sources, including soya bean. Interviews with farmers in the Copperbelt Province in Ndola established that on average, about 23% of the feed used by the poultry farmers was

²⁵ Krishnan and Petersburs (2017)

²⁶ Krishnan and Petersburs (2017)

own produced feed. Further, interviewed players produced a total of 148,300 birds in 2018, which was a significant jump of about 116% compared to their output in 2017 of 68,600 birds. This expansion created significant demand for feed.

Fish production

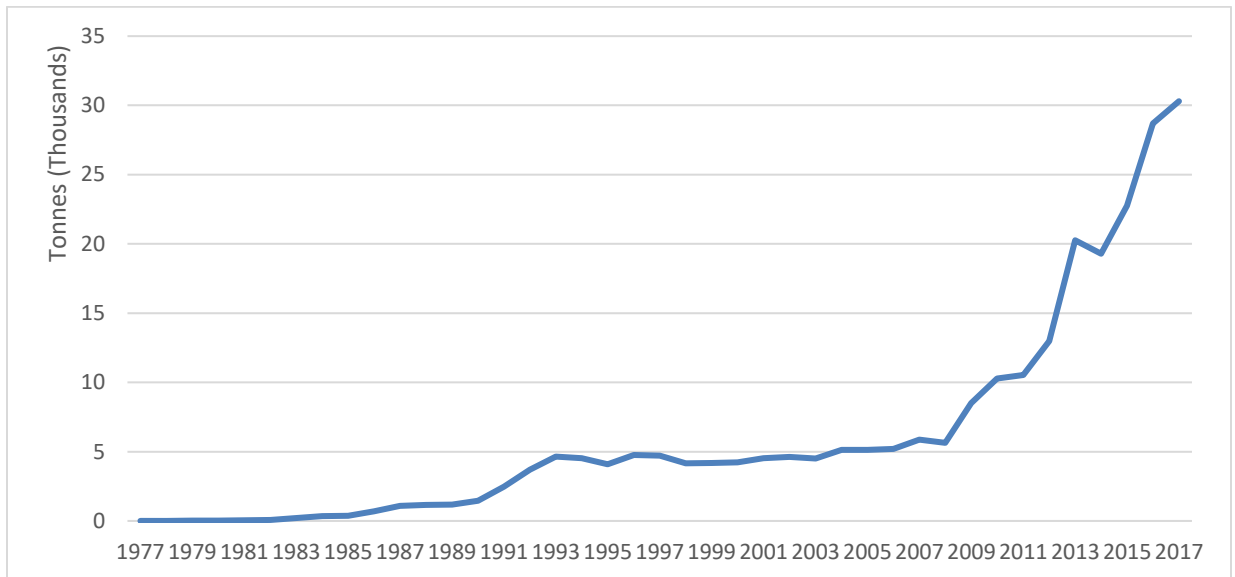
31. Although Zambia produces a lot of fish, the increasing human population has generally led to an over-exploitation of fish, resulting in dwindling yields. Significant production of fish started after 2009, where production increased from about 5,000 tons to 30,000 by 2017 when Zambia started experiencing large investment in fish production (Figure 4).

32. Currently, Zambia fish deficit stands at 85,000 metric tons with the country producing 100,000 metric tons of which 80,000 from rivers and lakes and 20,000 from aquaculture²⁷. The fish value chain contribution to the Gross Domestic Product (GDP) was of 0.32% in 2016 and of 6.1% to the agricultural GDP. The rate of integration into the national economy (total value added /production) amounts to 65%. Large and medium farms, especially cage farms, have been mainly responsible for this growth. These have achieved a higher level of productivity because of their use of high-quality seed, commercial feeds, good management practices and employment of farm labour²⁸.

²⁷ www.daily-mail.co.zm/480000-set-to-establish-fish-farm-reduce-deficit/

²⁸ **Aquaculture value chain analysis in Zambia** N°7 SEPTEMBER 2018 - Based on the report "Aquaculture Value Chain Analysis in Zambia", by Froukje Kruijssen (KIT), Angel Avadí (CIRAD),

Figure 4: Fish production trends in Zambia, 1977-2017



Source: FAO Fishstat

33. Traditionally, the main fish variety produced in Zambia was the three spotted tilapia. It is still dominant in the western catchment areas. However, the dominance of the three potted tilapia has since ended, as investors now concentrate on the Nile tilapia, which is mainly produced in the central Kafue/Kariba catchments. The Nile tilapia is preferred after it was observed that it is more tolerant to cold than the three-spotted tilapia, which saw most aquaculture promotions as well as private hatcheries in Zambia concentrating on the Nile tilapia fingerlings²⁹.
34. Zambia had six established fish feed producers in 2016, having a cumulative production of about 30,000 metric tonnes per annum³⁰. Millers such as [REDACTED] had fish feed in their product ranges, largely targeting large scale commercial fish farms. In 2017, [REDACTED] in partnership with

²⁹ <https://www.farmersweekly.co.za/animals/aquaculture/fish-farming-booming-zambia-not-sa/>

³⁰ Krishnan and Petersburs (2017)

██████████ opened up their joint venture ██████████ fish feed plant in Zambia to the market, with a reported capacity of ██████████. Located in ██████████ the feed miller is expected to supply mainly ██████████. In addition, there are other fish feed millers that only focus on fish feed and are not active in supplying other animal feed. The fish feed industry is highly concentrated, with three players namely ██████████ dominating. However, the respective market shares cannot be conclusively estimated, given that so many other independent small scale producers also buy from other millers who have invested in fish feed production.

Fish feed

35. Conventional fish feed include fish meal as well as crop inputs such as groundnut cake, soya bean meal, maize meal and wheat offal³². Fish feed is usually not complete without fish meal, which is also a high protein source. Fish meal is produced from fish waste from the canning industry or trawling process³³. Soya bean meal is fast gaining acceptability and is replacing a substantial part of fish meal. However, due to the presence of a high fat content, soya bean meal needs to be complimented with other inputs such as fish meal and wheat offal. Maize is largely used as an energy source and hence protein sources would be needed. Just as the case in poultry, the gossypol component in cottonseed meal makes it produce undesirable effects on fish. Poultry by-product meals are also used as conventional fish feed sources, which include waste material from poultry processing, such as offal, blood and heads of birds. These can also replace fish meal without adverse effects on the fish. In Zambia, it is

³¹ <https://thefishsite.com/articles/zambian-feed-breakthrough>

³² Pandey (2013)

³³ Ibid

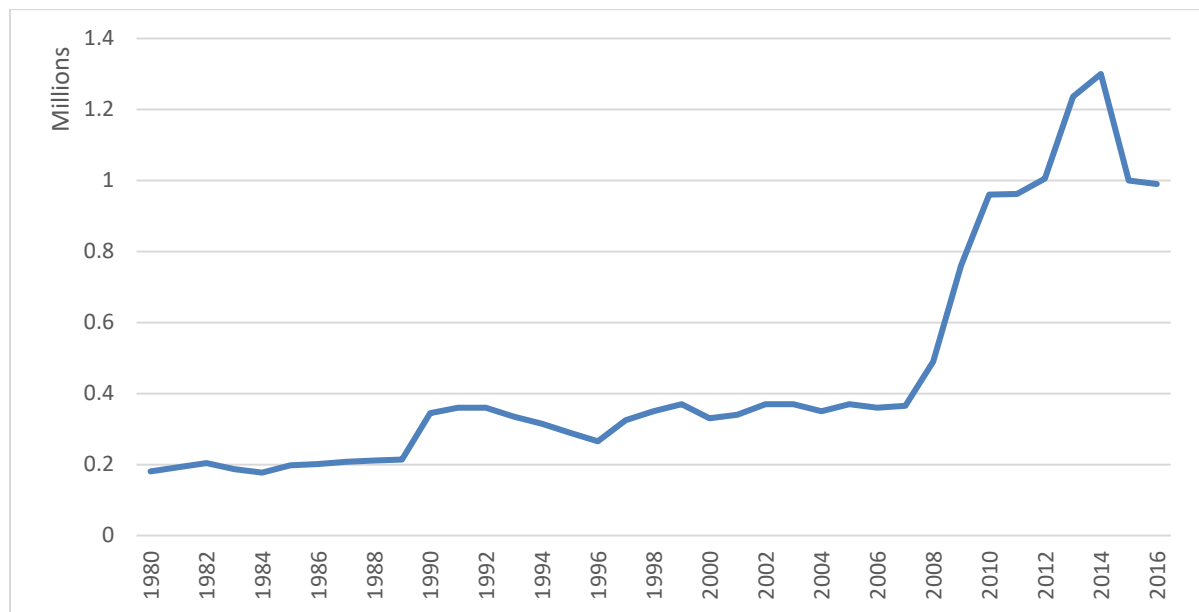
estimated that about 55% of the fish feed uses soya beans while maize usage is only about 40%³⁴. Fish feed is mainly expensive and not used largely by small scale farmers.

Cattle production

36. Commercial beef production has been expanding steadily since 1980 until 2014 when there was a noticeable decline to 2016 due to some disease outbreaks. However, beef slaughtered increased from only less than 200,000 in 1980 to about 1 million beasts in 2017, having peaked at about 1.3 million in 2014.
37. Although there are some large-scale producers of cattle, they are dominated by household level production. The Livestock and Aquaculture Census Results of 2017 shows that out of the total cattle population of about 3,654,668, the household sector accounted for 94% while firms (establishments) constituted the remainder of 6%.
38. The numbers of cattle slaughtered for beef has equally been increasing in Zambia since 1980 (Figure 5). The production of crops naturally creates availability of feed for beef, hence input availability matters for the beef feed industry.

³⁴ Ibid

Figure 5: Cattle slaughtered (head) in Zambia, 1980-2017



Source: FAOSTAT

Cattle Feed

39. Beef producers rely on natural pastures as well as own made feed to complement what they purchase from the formal feed suppliers. Based on the interview results, about 50% of animal feed for beef is from natural pastures as well as own made feed, while formal feed constitute the other 50%. However, there is excess demand for formal feed, which implies that the reliance on natural pastures is basically due to failure to access feed. The shortages are also taking place at a time when there is an expansion in beef production, interviewed farmers in Monze district increased output from an average of 511 cattle in 2017 per farmer to 790 per farmer in 2018. Availability of feed is therefore critical.

40. Feed is the single largest production expense for cattle operations³⁵. However, there are many different options of feedstuffs that are available for beef, unlike poultry. In most instances, beef production is heavily reliant on forages, especially natural rain fed pastures, these need to be supplemented with energy or protein to ensure that the nutritional needs of cattle are satisfied. As ruminants, cattle require fiber to enable them to function, especially to maintain digestive health. However, fiber comes largely from pasture, hay and some by-product feeds but it is low in most grains, including maize.
41. Other main feed elements for beef based on their nutrient content can also be identified³⁶. Maize concentrate is the main energy source for cattle, having about 90% energy nutrients and 10% protein, while hay, especially leafy, green and well-made, also has high energy content of about 60% and a protein content of around 15%. Soya bean meal is rich in both energy and protein; it has about 80% energy content but more importantly, about 45% -50% protein content. This makes soya bean meal the most preferred feed input as it is palatable and readily consumed by animals. Soya bean hulls (seed coats), which are a by-product from the cooking oil extraction process, are also important as beef feed. They have an energy content of about 75% and a protein content of about 14%. The whole soya bean can also be used as a source for beef feed, albeit at a higher opportunity costs given the oil content of about 18%. The whole soya bean seed has a high energy content of about 94% and a high protein content of about 40%.
42. Other important inputs into the cattle feed industry include cottonseed. Cottonseed can be used as a whole seed, though this has a high opportunity cost in terms of value addition potential to extract edible oil

³⁵ Wahlberg (2009)

³⁶ According to Wahlberg (2009)

that would have been foregone. Cottonseed has a high energy content of up to 90% while crude protein of 22% is also critical. However, cottonseed meal, which is a by-product after edible oil is extracted, is also preferred as this ensures more value to the economy. Cottonseed meal is rich in energy at about 77% and also rich in protein at about 44%. Cottonseed hulls, which are the outside portion of the cottonseed separated during cottonseed oil production, also have an energy content of about 45% and a low protein content of only 4% but are very rich in fibre.

Pig production and feed requirements

43. Consumer demand for pork is lower compared to that of chicken and beef. Pig production in Zambia is mainly done by both large and small scale farmers. About 65% of the Zambian pig herd are from indigenous breeds due to difficulties associated with obtaining commercial feeds³⁷. Indigenous breeds can also forage for feed, even though they are fed on home grown sources of nutrients. Commercial breeds, which mostly include the Large White and associated crosses, are confined to medium and large-scale farms. The formal feed manufacturing sector produces only about 4.5% of total feed output for the pig industry, largely due to the fact that even large-scale farms opt to mix 'on-farm' feeds to reduce costs³⁸.
44. Pig production input requirements are not significantly different from poultry and cattle. Soya bean meal is the most important protein source, accounting for about 85% of the protein supplements fed to pigs³⁹. Also important is sunflower meal, which is a by-product from the sunflower cooking oil extraction process. Sunflower meal helps ensure higher

³⁷ Zambia Development Agency (2011)

³⁸ "A review of the animal and aquafeed industries in Zambia" - G. Bentley and M. Bentley at website <http://www.fao.org/tempref/FI/CDrom/aquaculture/a0844t/docrep/008/a0042e/a0042e08.htm>

³⁹ Florou-Paneri *et al* (2014)

content of polyunsaturated fatty acids in muscle and fat samples of the animals⁴⁰. The advantage of sunflower meal is that it has a great value for digestibility of crude protein, which can exceed soya bean meal. Sunflower is also a valuable source of calcium, phosphorus and vitamins B in pigs. There are also some anti-nutritional factors in soya bean meals which are not found in sunflower meals, though it also has limited fiber content and the amino acids that are found in soya bean meals.

45. Pig feed can also include rapeseed meal, which is also a protein source, with an advantage that it is also grown as a winter-cover crop, providing coverage of the soil in winter and limiting nitrogen run-off. Cottonseed meal can also be used in piggery feed, with the only drawback being that as a non-ruminant, the gossypol component can become harmful.
46. Interviews with a sample of pig farmers in the Chibombo District of Central Province established that there is excess demand for feed among the pig producers as there is a noticeable expansion by the pig producers. For example, the farmers interviewed produced an average of 585 pigs each in 2016, which increased to 981 and 2,137 per farmer in 2017 and 2018 respectively. The expansion is generally hinged on official feed from the formal market. About 92% of the feed that was utilized by the pig producers interviewed came from the official feed millers, while the remaining constitutes own made feed to complement due to unreliability of supply.

⁴⁰ Ibid

Supply side value chain segment

Maize production

47. Maize is the staple food in Zambia. Maize accounts for over 70 percent of total food availability and 60 percent of human consumption requirements. Over the past years, Zambia experienced an increase in the production of maize and thereby becoming a surplus producer in the Southern African region. It is for this reason that the country is able to export its maize produce to neighboring countries such as the Democratic Republic of Congo and Malawi⁴¹. Maize can therefore not only be said to be important as a source of food for local consumption, but also as a source of income at the household level and of GDP growth at the national level.
48. During the years 2012 to 2016, production of maize in Zambia increased enabling the country to export to regional markets. It became the lead supplier for the region in the 2015/16 marketing year, nearly matching South Africa⁴². Most of Zambia's maize is produced by smallholder farmers who depend on rain for their irrigation. Due to the presence of a readily available market smallholder farmers in Zambia focus significantly on the production of maize. In 2011/12, 86 percent of all smallholders grew maize⁴³. However, the majority of smallholder farmers are still net purchasers of maize⁴⁴.
49. During the 2016/2017 maize production season, it was projected that the crop forecast for maize production in Zambia would be 3,606,549 MT, with a surplus of 1,178,516 MT. Due to the La Niña weather conditions and an

⁴¹ FEW NET Zambia Maize Market Fundamentals, (2017).

⁴² Ibid.

⁴³ Sitko et al., (2011).

⁴⁴ Siegel, (2008)

increase in the area of maize planted, maize production in Zambia was expected to increase by 26 percent, between 2015/2016 and 2016/2017 seasons according to the Crop Forecast Survey (CFS). This maize supply response from the previous season was mainly due to high maize market prices prevailing in Zambia, and the region due to the El Niño weather patterns. The total area for the maize production was reported to have increased by 21 percent from 1,364,977Ha in 2015/2016, to 1,644,741Ha in the 2016/2017 agricultural season. Whilst, maize yield, only changed marginally from 2.10 MT/Ha to 2.19 MT/Ha in 2015/2016 and 2016/17 agricultural seasons respectively⁴⁵.

50. The maize marketing system and trade flows are complex as they involve a number of key players which includes the Government (FRA), producers such as millers and stock feed producers, traders with their associations such as the Grain Traders Association of Zambia, and consumers. Both formal and informal market networks coexist and have separate well-defined market chains, but these are also well integrated. The majority of the maize that is produced and sold on the Zambian market is mainly from smallholder farmers and medium holder farmers.
51. Approximately 50 percent of all maize produced is consumed at household level⁴⁶ and never enters the market. The percentage of maize produced that is consumed at household level is even higher among emergent farmers⁴⁷. The proportion of maize that emergent farmers retain for home consumption is greater than the proportion retained by commercial farmers for labor or stock feed. At the national level, majority of the maize that is sold on the markets is mainly bought by the Food Reserve Agency

⁴⁵ Ministry of Agriculture, (2017).

⁴⁶ USAID/COMPETE, (2009).

⁴⁷ Sitko and Jayne, (2014).

(FRA) with more than 35 percent of all maize sold by smallholder farmers in some years being purchased by FRA⁴⁸.

Soya beans

52. Soya bean is mainly grown by smallholder farmers, even though the crop is also now grown on a commercial scale by large scale producers as well as by cooperatives. The Crop Forecast Surveys show that nearly half of the entire soya bean that was expected to be sold in the 2017/18 season was coming from the Central Province. Kapiri Mposhi and Chibombo Districts are the main producers of soya bean for sale in the province with 30.7% and 27.8 % respectively. Interview results confirm that contract farming arrangements in soya bean production are not common in Zambia. This is mainly due to lack of proper legislation governing contract farming, which could give an assurance to the contractors (edible oil producers and feed millers) that the farmers would not sell contracted crops to other producers.
53. However, some edible oil producers have entered into contracts with farmers under special arrangements where it is easy to create relationships. These contracts are competitive and do not foreclose the market. For example, [REDACTED] produces its own soya bean seeds which it distributes to women in cooperatives in Mumbwa and Chibombo of the Central Province to grow the beans and sell to it. The terms of the contract are such that the women farmers would be in registered cooperatives, with the company only dealing with the cooperative rather the individual farmers. The company then trains the farmers at its own expense to ensure that risks are minimised, including

⁴⁸ World Bank, (2014).

training about the importance of honouring their contractual arrangements. The company only buys from other farmers if the women run cooperatives, which the firm has virtually become vertically integrated with, produce inadequate soya bean. The farmers are virtually out-growers and can only sell to the company. Other firms also have out-grower schemes, where farmers are growing the crop on behalf of the millers. However, the cases of contract farming among millers are rare and most millers and edible oil producers go into the market to buy independently produced soya beans from the farmers.

54. The soya bean farmers are mainly affected by the size of their land, which determine their output and hence bargaining power. Although the soya bean farmers interviewed in Kapiri Mposhi had land available for soya bean ranging from a minimum on 5 hectares to a maximum of 70 hectares, they utilize, on average, about 30.4% of the land to grow soya bean in 2016, which increased to 33.2% and 47.3% in 2017 and 2018 respectively. In general, farmers are expanding soya bean output through increasing land utilization. Interviews with sunflower farmers in Chipata show that, unlike in the case with soya bean, there is a limited availability in terms of land for cultivating sunflower. The average size of the land available for sunflower is only about 3.6 hectares per farmer. This does not contribute positively towards improved production.
55. Although some farmers market directly to processors, the bulk of their produce is sold through traders. The traders generally serve as aggregators and are capable of buying small volumes which they aggregate for sale in bulk. At the national level, traders are the main buyers of soybeans from farmers in Zambia, buying about 60% of the farmers' output⁴⁹. Interview

⁴⁹ Lubungu, Burke and Sitko (2013)

results show that only about 11% of the output from the interviewed soya bean farmers in Central Province is purchased by feed millers, while about 73% is purchased by the traders, with only about 5% is purchased by FRA. The remaining output is purchased by other buyers buying in small quantities, including other farmers and households. The advantage that traders have over FRA and millers is that they buy on the farm and therefore save the farmers the transport and marketing costs which they would have struggled to afford. This makes traders preferred buyers even though farmers complain that the prices they offer are exploitative.

56. Production volumes of soya beans are low, mainly as a result of poor agronomic practices. The farmers lack access to any support in the absence of contract farming arrangements. Access to seed and fertilizer is compromised by affordability, resulting in farmers resorting to the use of recycled seeds. Only five (5) farmers out of the 15 interviewed in Kapiri Mposhi district indicated that they use seed from official seed suppliers, while the rest use only recycled seed. Soya bean seed is considered expensive by farmers, which farmers estimate during the interviews averaged about K840 per 50kg bag, which is beyond the reach of many. There is also a tendency to rely on traditional fertilizer systems, which include the cut and burn (*Chitemene*) fertilizer system as a result of failure to afford fertilizer from official suppliers. This partly explains why soya bean production is characterized by low yields.
57. The low production volumes allow the traders to gain access to a high proportion of output, which they can have the ability to inflate prices when selling to millers and edible oil producers, translating into high prices of feed. There is need to increase the amount of oilseeds that are grown under

contract farming arrangements, with farmers gaining access to inputs while the contractors are also assured of access to the output.

Cake production

58. Edible oil producers have the option of buying soya bean, sunflower and cottonseed and then process them into oil or only buying crude oil from the millers. The sunflower seed has the highest oil content producing 35% while the soya bean produces about 18% oil and 77% soya cake/meal, with the remainder being waste material⁵⁰. The cottonseed produces about 18% oil, 44% cotton meal/cake, 9% hulls and 7% linters⁵¹. The edible oil producers would then serve as the main sellers of cake to the millers. However, millers can also buy oilseeds from the farmers and hence serve as sellers of crude oil to the edible oil producers. Thus, millers and edible oil producers have a buyer-seller relationship. However, there are no pre-signed contracts to guide the relationships. Millers are also engaged in toll crushing arrangements to get cake. This would involve the millers who have not invested in crushing capacity sourcing soya beans and then having them crushed by edible oil producers to get cake rather than buying the cake from the edible oil producers.
59. Despite a fairly large number of producers, the edible oil industry is highly concentrated. Estimates from one edible oil producer, a recent entrant that is only about two years into production, are that there is a dominance of only one producer, [REDACTED], ahead of all the other players. It is estimated that [REDACTED] has a market share of about 60% following their aggressive entry into the industry, with [REDACTED] being a distant second with a market share of about 25%. This would therefore

⁵⁰ Presentation by the Oil Expressors Association of Zimbabwe, 'Soya Value Chain', 17 September 2018, at website https://drive.google.com/file/d/1D7aRjV4_mueqznRr-FXqhQkVC1pR-cgu/view

⁵¹ See Chigumira (2017)

imply that two players in the edible oil industry have a market share of over 80%, hence the market is highly concentrated.

Animal feed milling market

60. Despite the high number of players, estimated market shares based on interviews show that the market is highly concentrated. The average estimated quantities purchased by the different feed users (poultry, cattle and pig farmers) from each player were averaged to give an estimate about the share of the output that each feed miller sells to each of the users. Interviews conducted with the three feed producers were also averaged before being blended together with the estimates from the demand side to estimate the total market share that can be attributed to each player. The results are shown in Table 1. This presents a highly concentrated market structure with a three firm concentration ratio (CR3) of about 81.2% and a Herfindahl-Hirschman index (HHI) of about 2,272. This market structure gives rise to possible competition concerns.

Table 1: Estimated market shares among the animal feed producers

	Market shares
██████████	██████
██████████	██████
██████████	██████
██████████	██████
██████	██████
██████████	██████
██████████	██████

COMPETITION ASSESSEMENT

Grain trade

61. Input crop production by small holder farmers who are the majority is often economically produced. The use of recycled seeds, poor application of fertiliser and generally poor agronomic practices, all point to the need of support by the farmers. Crop production output is largely homogenous and hence crop marketing by small holders farmers occurs in a perfect market. Farmers are largely price takers largely due to (i) limited marketing options and (ii) weak bargaining power.
62. Although there are many traders for the different crops, the number of visible traders in any particular district is generally regarded as very low. For example, in the visited districts where interviews were conducted for both soya bean and sunflower farmers, the number of traders known to the farmers ranged from as few as two to a maximum of four. Thus, at any given district, the traders market can be regarded as highly concentrated. The difficult to access farmers due to terrain and access road implies that only a few dedicated grain traders are willing to access farmers in far areas. The study found that the offered prices are intended to ensure that traders in turn enjoy a margin when they sell to processors.

Feed production

63. Most of the key firms producing animal feed in Zambia are owned by primary producers of meat and are heavily involved in animal rearing. In addition to the fish industry, this is also true with respect to the feed industry in general. There are some animal feed producers that are

primarily owned by producers of broilers. Examples include [REDACTED] [REDACTED] [REDACTED]). Approximately one third of [REDACTED] production is for internal consumption within the [REDACTED] while the remaining two thirds is sold both within Zambia and the surrounding regions.

64. There are concerns from small feed millers that large and established millers that are vertically integrated are out pricing them due to their ability to leverage on other lucrative markets to sustain break even prices of feed as a way of trying to gain market shares. Further, they are concerns that feed millers that are also involved in maize milling for mealie meal take advantage of the cheap maize prices from the FRA which they divert into feed milling as it offers better returns and is less political than mealie meal.

Feed Prices

65. Feed prices in Zambia are generally considered as high by stock producers and are generally considered to be triggered by exchange rate and grain prices. For example, Zambeef Products Plc's once issued a statement that it was reducing its feed prices by between 2% and 5% on a range of its Novateck stock feed due to the "*strengthening Kwacha*" and production efficiencies⁵². The most important ingredients for the poultry feed industry are maize, soya, wheat and sunflower all of which are produced locally. The national prices of maize and soybeans which are the major ingredients of poultry feeds were US\$ 180 per ton and US\$ 310 per ton in 2015. The world market prices for maize (corn) was US\$ 186 per ton and for soybeans

⁵² <https://zambeefplc.com/zambeefnovatek-discount-stockfeed-prices/>

US\$ 410. Maize prices were close to world price whereas soybeans prices were below the world price making the crop more competitive for export⁵³.

66. The prices of feed during the first quarter of 2016 were around K205 for broiler starter feeds largely due to an uptrend in prices of key ingredients as well as depreciation of the kwacha against other tradable currencies⁵⁴. In 2017/2018 price of stock feed skyrocketed by 25 percent from an average K200 to K250 following reduced soybean output and the closure of Cargill⁵⁵.
67. Given that the crops are seasonal, most contracts along the value chain are done in US dollars to safeguard value against inflation as well as erosion of value due to Kwacha fluctuations. However, as the dollar-based transactions become mature, they are payable in Kwacha. This explains most of the cost build ups for feed. Further, cost build ups exist due to excess demand for feed. As confirmed by the interviews, there is not enough feed to satisfy the growing demand due to the expanding livestock sector. This is also confirmed by the importation of processed feed to supplement domestically produced feed. For example, in 2018, Zambia imported about US\$17.7 million⁵⁶ worth of feed, mainly from South Africa to augment increasing demand.

Consumer concerns

68. The study also established some possible consumer rights violations. There are concerns from farmers that agro-dealers engage in

⁵³ AGRIPROFOCUS ZAMBIA (2015); Market **Study – Poultry -Investment Opportunities in the Zambian Poultry Sector (and in the Katanga Region of the DR Congo)**

⁵⁴ <http://www.daily-mail.co.zm/high-feed-price-injure-poultry-sector/>

⁵⁵ <http://www.daily-mail.co.zm/stock-feed-price-up-25/>

⁵⁶ TradeMap data, HS code 230990

underweighting of feed, with more than 60% of the interviewed players having this concern.

REGULATIONS AND GOVERNMENT INTERVENTIONS

69. The animal feed industry does not have a sector specific regulator and is therefore regulated by the general business laws. These include the Agriculture (Fertilisers and Feed) Act of 1966, as amended by Act 13 of 1994, which provides for the regulation and control of the manufacture, processing, importation and sale of agricultural fertilisers and farm feed. It also provides for minimum standards to be observed in the manufacture of feeds. Manufacturing plants for feed would need to be registered, with specifications checked for compliance with the Act, including plant specifications, of effectiveness and purity of such fertilisers and feed. In general, the law cannot be regarded as posing some anticompetitive challenges as it only provides for minimum standards to be observed for safety.
70. Players are subject to other national laws, especially those aimed at ensuring that the safety and health of animals is protected. The Animal Health Act, 2010 (No. 27 of 2010), which is administered by the Department of Veterinary & Livestock is an example. Under this piece of legislation, the importing, manufacturing and sale of any animal feed is prohibited unless the holder has a permit which is issued by the Department of Veterinary & Livestock. In addition, the feed which can be imported, sold or manufactured has to conform to the standards and specifications for animal feed that are prescribed under the Act. However, the law is only intended to ensure health and safety of animals and might not be regarded as anticompetitive.

71. Two pieces of legislation allow the Government to intervene in trade of maize grain. The FRA Act section 5(2)(d) provides that the purpose of the national food reserve shall be to correct problems relating to the supply of designated commodities which result from the manipulation of prices or monopolistic trading practices. As a result, millers have to compete with the FRA to buy maize from the farmers, at times unfairly since the FRA would be the buyer of first resort. Government therefore through FRA purchases the maize from the market and sells it back to the market. However, FRA's off-loading of maize in the market at below cost and or below the market price has contributed to distortions in the prices of maize. The actions of FRA are carried out pursuant to the Food Reserve Agency Act section 8(1)(a) which provides that the Agency may sell any designated commodity in the national food reserve to meet local shortfalls in the supply of the commodity.
72. Further, section 3(1)(c) of the Control of Goods Act provides that whenever it appears to the President necessary or expedient to prevent the hoarding of any goods, commodities or animals, he may, by Statutory Instrument, make such regulations as appear to him to be necessary or expedient for such purposes. Most of the times, most of the regulations that have been issued out pursuant to the exercise of this power in the agriculture sector distort competition. For example, trade policy instruments, such as variable export bans and restrictions, variable import tariff rates, and government import programmes⁵⁷, affect the animal feed value chain.
73. Government's rationale to intervene in the maize market through FRA is aimed at addressing welfare concerns. Maize is a staple food and is produced primarily by smallholder farmers. The attempt by government is to ensure

⁵⁷ <https://www.econstor.eu/bitstream/10419/81063/1/731514246.pdf> accessed 8/11/2018

that food security in the country is established, maize prices are stabilized and the average maize price levels are high enough to support small-scale production. FRA typically enters the market with its own buying price to purchase maize from smallholder farmers and because of the volumes involved, the price acts as a floor price. For example, FRA's activities between 2003 and 2008 raised the mean maize market prices by 19 percent, and reduced price volatility (covariance) by 36 percent⁵⁸. This affects maize affordability from the point of view of the millers and traders.

CONCLUSION

74. The study focused on the animal feed industry, with particular focus on feed for poultry, cattle, fish and pig. The importance of the animal feed industry in Zambia is reflected by the fact that it has anchored the expansion of the poultry industry from about 16 million birds slaughtered in 1985 to about 50 million birds by 2017. The animal feed industry has also backed the expansion of fish production from about 5,000 tons in 2009 to 30,000 by 2017. Similarly, cattle slaughtered increased from less than 200,000 in 1980 to about 1 million beasts in 2017, having peaked at about 1.3 million in 2014.
75. Animal feed in Zambia is mainly produced from four agriculture products; soya beans, sunflower, maize and cotton. However, it is mainly maize and soya beans that can influence the structure of the animal feed industry in Zambia as they dominate input usage in feed. There is a strong interdependency and competition for raw materials between the feed producers and the edible oil producers. Both can compete in buying oilseeds

⁵⁸ CUTS (2016), Zambia Food Reserve Agency Pricing Mechanisms and the Impact on Maize Markets, CUTS, Jaipur, retrieved from http://www.cuts-ccier.org/CREW/pdf/Zambia_Food_Reserve_Agency_Pricing_Mechanisms_and_the_Impact_on_Maize_Markets.pdf accessed on 8/11/2018

directly from farmers, but edible oil producers would need to sell the cake to feed animals as a by-product while feed producers would also need to sell crude oil to edible oil producers as a by-product.

76. Maize and soya beans are grown under perfectly competitive conditions where there are several small-scale producers who have no power to influence market outcomes. However, most of the crops are purchased by traders where there are possible competition concerns, particularly possibilities of collusion on prices and market allocation, which might require a more detailed investigation.
77. The edible oil production industry is a highly concentrated industry. A highly concentrated edible oil industry would normally be expected to have control on cake/meal prices, which would impose cost build ups into the feed industry. However, the possibility of the feed millers to be able to bypass edible oil producers and buy directly from farmers implies that there is a countervailing force against abuse of the dominance by edible oil producers.
78. The feed production stage is characterized by a number of players but estimated market shares show that the market is highly concentrated. A highly concentrated market structure with a three firm concentration ratio (CR3) of about 81% and a Herfindahl-Hirschman index (HHI) of about 2,272 gives rise to possible competition concerns. The study also established that the fish feed industry is highly concentrated, with three players dominating the fish feed manufacturing sector.
79. The highly concentrated animal feed milling industry is also accompanied by some competition concerns raised by the stakeholders. Such concerns

include those players that are vertically integrated would leverage on other lucrative segments of the value chain to engage in predatory behaviour at the feed production stage. Diversion of maize from the food security role by some millers is also alleged, where the privilege would be used to engage in predatory pricing, with the intention being to squeeze out smaller millers.

80. With respect to price build ups, however, the study has established that there are generally four main reasons for high feed prices. Firstly, there is a high cost premium associated with overreliance on using US dollar-based contracts. Secondly, inefficiencies in the production of the main crop inputs results in poor yields, which also imply that the cost of producing the crops are unnecessarily too high, feeding into the value chain. Thirdly, there is excess demand for feed in the market, which would naturally enable to millers to adjust prices upwards. Fourthly, the absence of a functional agriculture commodity exchange which can smoothen the purchase window for inputs implies that firms are forced to buy all the inputs in one window, which would increase storage costs.

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