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Analysis of the animal feed to poultry value chain in Zambia

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Abstract: Rapid population growth, urbanization, and income growth are triggering increased demand for high-value agricultural products across Southern Africa with scope for gains from trade and regional integration. We analyse the animal feed to poultry value chain in Zambia focusing on the industry capabilities with a view to enhancing its competitiveness and production for the regional market. The industry has exhibited rapid growth with investments, which has increased competition to consumers' benefit. However, challenges remain if it is to contribute to the regional market; animal feed input production and productivity remain low despite improvements. Similarly, produced poultry is in low quantities. Consequently, there is limited export of products due to higher prices. Enhancing value chain capabilities will require technology investments and public expenditure allocations that enhance productivity and production of animal feed inputs, and limited government intervention in maize marketing and trade which adversely impacts on maize prices.

Keywords: value chain, Southern Africa, poultry, animal feed, Zambia

JEL classification: L66, O55, Q13, O25

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1 Introduction

The world population is increasing and is expected to reach 2.5 billion by 2050. Around 90 per cent of the people added to the world population will come from Africa and Asia. In sub-Saharan Africa (hereinafter Africa), incomes are rising, and there is a growing middle-income class. Urbanization is also increasing, with the share of the urban population now equal to the developing world, and its growth faster than anywhere else in the developing world. These trends are expected to induce further changes in the structure and functioning of food systems—with increased demand for processed agricultural produce and agricultural raw materials from rural areas (Potts 2009; Habitat UN 2010; Reardon et al. 2013; UN 2014). Consumption patterns are already changing, with an increasing preference for cheaper and processed white meat and a declining share of cereals in the total food budget in line with Bennet’s law (e.g. Alexandratoss and Bruinsma 2012; Tschirley et al. 2013; Chisanga and Zulu-Mbata 2017).

Further spillovers in the farm and rural non-farm sectors via consumption and production linkages are expected, with benefits expected to be highest in agriculture given that most African countries are in the early stages of development where agriculture growth plays a crucial role in driving development. Sources of spillovers include: (i) commuting to nearby cities from temporary migration and from remittances of migrants; (ii) technology spillovers to the non-farm sector; (iii) increasing demand for rural amenities and non-farm goods; and (iv) firm location in rural areas to escape rising wages in urban areas (Foster and Rosenzweig 2003; Haggblade et al. 2007a, 2007b). Within agriculture, the poultry industry has exhibited rapid growth in many Southern African countries over the last decade, and this presents opportunities for industrialization and trade in poultry and animal feed products across the region if competitiveness can be enhanced. Since the poultry industry has strong backward linkages with the animal feed industry, given that animal feed accounts for 65 per cent to 70 per cent of the broiler production costs (Bagopi et al. 2014; Zengeni 2014), spillovers will be highest in animal feed manufacturing and further upstream for soya beans and maize producers.

Zambia is strategically placed to contribute to regional development while also benefiting from the local and regional trends. Its near-central geographic location and relative advantage in maize and soya bean production make it ideal for agricultural investments (Zengeni 2014; Chisanga and Chapoto 2016). Compared to the industrialized world and other countries within Africa, Zambia has abundant arable land under customary tenure, the majority (86 per cent) of which is unutilized. This makes it ideal for agricultural investments, more so in that, even with population growth, arable land per capita will still be 1.8 ha in 2035 (Sinkala et al. 2013; Samboko and Henley forthcoming).

However, for the regional market, the challenge is how best to improve the competitiveness of animal feed and poultry products. This is crucial given evidence that prices of Zambian animal feed and poultry products are higher than in South Africa—which is likely to be the major export destination for Zambian feed and poultry products given its very large market size (see Bagopi et al. 2014). Moreover, world food demand prospects up to the year 2060 make the case for enhancing competitive capabilities within Southern Africa, more so because food imports will be important for meeting demand across countries.

Against this backdrop, this paper discusses the evolution of the poultry industry in Zambia, the key players, and their role in its development. It highlights the industry’s competitive capabilities and scope

for improving these. More importantly, the state of animal feed input availability and its pricing, given the crucial role animal feed plays as an input to poultry production, is discussed. To do this, the study relies on qualitative data collected via semi-structured interviews with poultry firms, animal feed producers, and the poultry industry association (see Table A1). This is backed by secondary data collected from various sources.

The rest of the paper is organized as follows: section 2 discusses the growth and development of the poultry industry in Zambia, and section 3 presents the key drivers of growth and trajectory of the Zambian poultry industry. In section 4, the status of animal feed input availability as a key component of poultry production is discussed. Section 5 discusses Zambia's prospects for a regional linkage development. A conclusion is then presented in section 6.

2 The growth and development of the animal feed to poultry value chain in Zambia

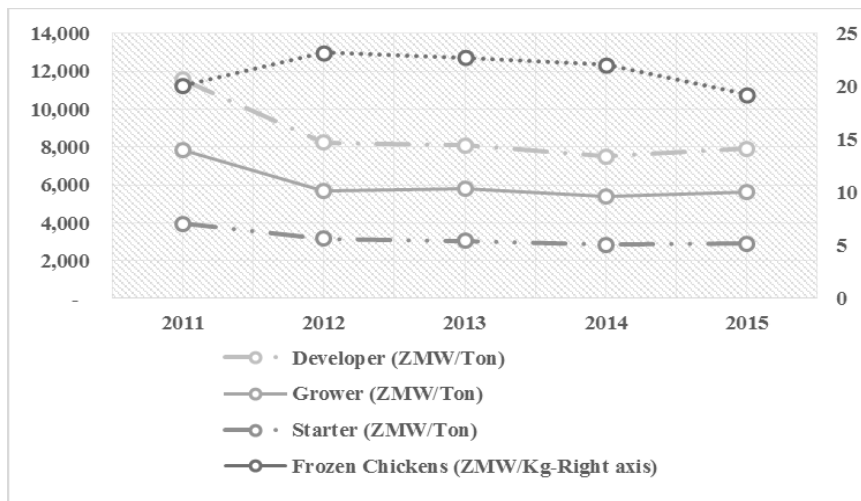
2.1 History and development of the value chain

Zambia's animal feed to poultry value chain has evolved from one with very few players—usually farms producing chickens and own feed (e.g. Hybrid Poultry in 1961)—to one involving multinational companies such as Ross Breeders, Rainbow Chickens Limited, and Quantum Foods.

Over the last two decades, there has been rapid growth in the poultry industry with recent annual growth rates averaging 8 per cent. This has triggered investments by existing and new firms in both animal feed and poultry, with major investments occurring between 2012 and 2015. The nature of investments has been such that primary producers of broiler parent breeding stock and day-old chicks have also invested in animal feed production. These investments have involved firms that mostly have a footprint in South Africa. Given that poultry firms are mainly responsible for investments, it is unsurprising that 65–70 per cent of produced animal feed in Zambia is for poultry. However, more recently, fish feed demand has increased rapidly pulling firms into its production, with growth driven by government policy and rising fish demand, which is also driven by the demographic and income trends.

Investments in the industry have increased competition among industry players. This has benefited consumers as the quality of produce has now increased—especially among firms that produced lower quality feed. Animal feed and poultry prices have also reduced in line with increased competition and productivity (Figure 1).

Figure 1: Trends in animal feed and poultry prices¹



Source: Authors' illustration based on unpublished data from the Poultry Association of Zambia (2011–15) and unpublished data from the Zambia Central Statistical Office (2011–15).

Firm strategies have also evolved to ensure they stay ahead of the competitors. Strategies now revolve around: (i) ensuring product quality; (ii) strategic collaboration; (iii) strategic location; (iv) vertical integration; (v) continuous research and development; (vi) technology upgrades; (vii) product pricing; and (viii) product diversity. For the international market, having internationally recognized standards will ensure that firms access the international market.

2.2 Key players and their role in the poultry and feed industry's development

The broiler value in Zambia has a number of levels, with varying degrees of concentration, which ultimately has implications for the overall competitiveness. Figure 2 shows the broiler value chain in Zambia, with players ranging from primary producers of parent breeding stock to the final consumer. We discuss the key players operating at various levels below.

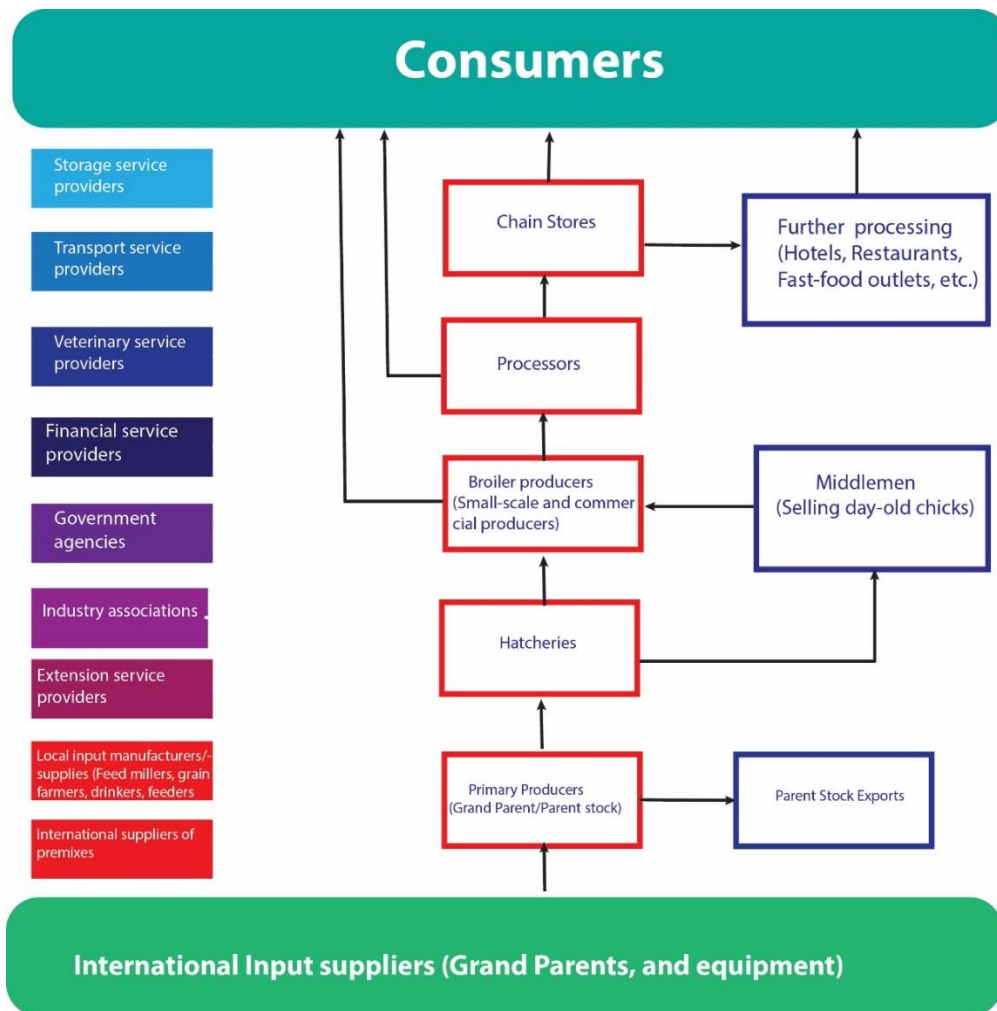
Primary producers

At the primary producer level, there is a high degree of concentration for firms producing parent breeding stock (i.e. only Ross Breeders and Hybrid Poultry)—these are the only firms owning grandparent breeding stock imported from Europe. This means that the two firms control the industry's production parameters. However, the concentration reduces when primary producers of day-old chicks are considered. Firms producing day-old chicks include Hybrid Poultry, Zamhatch, Tiger Chicks, Ross Breeders, Quantum Foods (formerly Bokomo), Panda Hatcheries, and Chipata Hatcheries. With the exception of Chipata and Panda Hatcheries, all firms own parent breeding stock. Only two breeds of grandparent breeding stock are on the market, namely Cobb and Aviagen which are supplied by Hybrid Poultry and Ross Breeders, respectively. Hybrid Poultry is the oldest operating on the market having started as a farm in the 1960s; other primary breeders only started operating in

¹ Note that we are unable to present price data for the period 2000–11.

the early 2000s, contributing to increased competition, lower prices, and increased product quality in the industry.

Figure 2: Zambia's broiler value chain



Source: Authors' illustration.

Total installed capacity at the primary producer level is 1,363,000 birds per week (Table 1). In terms of market shares, 70 per cent of the market is shared between Ross Breeders, Hybrid Poultry, and Quantum Foods. With the coming of Zamhatch on the market, these shares are likely to be redistributed because, once completed, Zamhatch's capacity will be in line with the two largest primary producers of day-old chicks (i.e. Hybrid Poultry and Ross Breeders).

Hybrid Poultry is the oldest primary producer in Zambia, having being established in 1961 as a farm producing crops and livestock. It operates grandparent and parent breeder farms in Chisamba, Kitwe, and Lusaka, and owns hatcheries in Lusaka and Kitwe districts. Hybrid Poultry also sells day-old broiler and layer chicks, operates broiler farms and co-owns a processing plant with Verino Agro Industry Limited (located in Chongwe district). Zamhatch only entered in 2013 following Rainbow Chicken's acquisition of 49 per cent of shares in Zambeef. With the entry of Zamhatch, which will have a similar capacity to Hybrid Poultry, the price of day-old chicks is likely to reduce further, in line

with increased competition. Only two breeds of broiler day-old chicks are on the market—Cobb and Aviagen. With Hybrid supplying the Cobb breed as an agent of great grandparent breeding farms in Europe, Ross Breeders supplies the Aviagen breed.

Table 1: Industry capacities

Industry	Installed capacity	Notes
Broiler processing	64,715 metric tons per month	Among the major processing companies, Southern Chicken and Supreme Chicken are the most recent entrants.
*Oil seed crushing	161,616 metric tons per annum	For all oil seed crushers, capacity utilization was estimated at 91% in 2013. From our interviews, we find that capacity utilization for animal feed firms ranges from 70% to 80%.
Primary Production (breeders and hatcheries)	1,363,000 birds per week	Zamhatch is the most recent entrant with current capacity indeterminate but expected to equal that of the two market leaders (i.e. Hybrid Poultry and Ross Breeders).

Sources: Authors' illustration based on *Chisanga and Sitko (2013) and unpublished data from Poultry Association of Zambia (2016).

Secondary producers

Secondary producers refer to the broiler producers. Secondary production of broilers is done by commercial (including contract growers and outgrowers) and small-scale producers. Small-scale producers account for 65 per cent of the broiler market (total production in 2014 stood at 125,691.45 metric tons) (Table 2). Other output is produced by the large processors; however, this is usually about 35 per cent of the processed output.

The small-scale and commercial broiler producers largely exhibit a fragmented value chain structure (see Gooch 2012 for value chain typologies). Vertically integrated firms in the Zambian poultry industry exhibit a collaborative value chain structure in which different units engage in mutually beneficial long-term strategic partnerships (e.g. Zambeef through their Zamchick segment has linkages with its own feed production unit Novatek), processing facilities, and chain stores countrywide.

Once produced, the broiler chickens are either sold dressed or live. Of the total annual production, 65–70 per cent are sold live while the remainder are processed. Most of the live sales occur at informal markets countrywide (with some negligible leakage into the international market especially the Democratic Republic of Congo (DRC)). Suppliers of live birds on the market are mainly the small- to medium-scale producers (including households or individuals producing in their backyards).

Processors

In 2016, the installed processing capacity in Zambia stood at 64,715 metric tons per month. However, in 2015 only 3.3 per cent (2,125 metric tons per month) was utilized by the major processing firms. Among the players operating at this level, Zambeef (Zamchick) is the largest, followed by Verino (co-owned by Hybrid Poultry and Verino Agro Industry), and Crest Chicken. Southern Chicken and Supreme Chickens have an almost equal capacity, but these are more recent—having entered the market in 2014 and 2015, respectively. Others include Copperbelt Chicken who have a large footprint in the Copperbelt province despite only entering the market in 2014. The large processing firms only account for 3.42 per cent of the processed output in Zambia. Other smaller processors account for the remainder of the market share. Note that further processing of chickens is also done in the hospitality industry, restaurants, and fast food outlets.

Support services and the industry association

A number of support services exist within the chain; these are usually not directly involved in poultry production. They include input suppliers and service providers (e.g. international suppliers of grandparent stock, suppliers of vaccines and drugs, suppliers of sawdust, feeders, drinkers, energy, transportation, extension, etc.). Others such as the Poultry Association of Zambia (PAZ), an affiliate of the Zambia National Farmers Union (ZNFU), lobby for the industry members. PAZ acts as a channel through which its members table industry-related issues to government. PAZ gives a poultry perspective to Zambia's agricultural sector when participating in ZNFU stakeholder meetings.

The main import and export facilitators include the Zambia Revenue Authority, Ministry of Agriculture (MoA), Ministry of Fisheries and Livestock (MFL), Ministry of Health, Zambia Veterinary Services, Zambia Bureau of Standards, Ministry of Commerce Trade and Industry, and the Zambia Development Agency (which also handles investment-related issues). In addition to these, the Consumer Protection and Competition Commission is responsible for protecting consumers. As well as facilitating imports, MoA and MFL are responsible for policy formulation in the industry.

Animal feed manufacturers

Key firms producing animal feed in Zambia include: National Milling Corporation (NMC), Novatek Animal Feeds, Tiger Animal Feeds, Nutrifeds, Pembe Milling, Simba Milling, Olympic Milling, and Emmans Feed Enterprises. Most of these feed firms are also owned by primary producers of broilers, originally set up to supply breeder operations with poultry feed, and have now evolved to supply the rest of the market. For example, Nutrifeds supplies to Ross Breeders, Tiger Animal Feeds supplies to Tiger Chicks, while Novatek is Zamhatch's (and Zambeef's) feed supplier. Others such as NMC, Pembe Milling, Simba Milling, and Olympic Milling do not own any poultry businesses. However, NMC has partnered with some vertically integrated poultry firms such as Hybrid Poultry to supply feed mainly to their contract growers and outgrowers. Only Novatek is ISO 22000² certified among animal feed firms, which is an advantage for penetrating the export market as its feed standards are internationally recognized.

Notable investments among animal feed producers include: (i) capacity increases by NMC in Chilanga district; and (ii) a 10,000 metric tons/month capacity mill by Novatek to feed into Zamhatch's breeder operation in Mpongwe district. There are a number of new firms—such as Emman Farming Enterprises (in 2012/13), and Pembe Milling (in 2013)—and these may have a territorial dominance in some districts on the Copperbelt province.

Operations in other countries

Of the feed and poultry firms interviewed, Nutrifeds has operations in South Africa. Tiger Animal Feeds is a part of Meadow Feeds operating in South Africa. Being 49 per cent owned by Rainbow of South Africa, one would say Zamchick/Zamhatch has operations in South Africa. Novatek Animal Feeds have an outlet in the DRC and also operate a feed mill in Zimbabwe. Quantum Foods are also

² The certification coincidentally came at a time when Rainbow Chicken of South Africa acquired shares in Zamchick. However, it appears that other firms are not certified because they initially intended to supply only their breeder operations with the surplus sold on the local market.

known to have operations in Uganda. This shows that the same firms are investing across Southern Africa in both animal feed and poultry.

2.3 Production and trade statistics

Over the last five years, the poultry industry has almost tripled and is expected to grow at annual rates of 8 per cent. Table 2 shows production trends in the animal feed and poultry industries. Broiler day-old chick production increased by 140 per cent. Annual broiler meat production increased from 52,221 metric tons to 125,691 metric tons (over 140 per cent growth for the period 2010–14). Animal feed production also grew by 117 per cent for the period 2010–14 in line with the poultry industry’s growth.

Table 2: Trends in production of poultry and animal feed (2010–14)

Year	Day-old chicks (millions)	Broiler meat (metric tons)	Animal feed (million metric tons)
2010	30.7	52,222	171.4
2011	41.9	71,274	222.3
2012	58.5	99,476	310.0
2013	69.0	117,360	372.4
2014	73.9	125,691	372.3

Source: Authors’ illustration based on unpublished data from Poultry Association of Zambia (2010–14).

Most output from Zambia’s animal feed and poultry industries is absorbed by the local market, rendering feed exports minimal (in 2014, only 3 per cent of the manufactured feed was exported, 2 per cent of day-old chicks, and no formal broiler meat exports). Southern Africa has been a key market for Zambia’s animal feed with 65 per cent of feed exports to Zimbabwe, while the rest is mainly exported to South Africa, Namibia, and Botswana. There are animal feed exports to the DRC; however, for this market, it is likely that informal trade exceeds formal trade as firms prefer not to transport inland, but rather leave the trading to traders at the Kasumbalesa border. Between September 2014 and September 2015, Zambia’s animal feed exports were at 3,360,344 metric tons. Imports on the other hand were at 558,638 metric tons.

Table 3 shows that export destinations for Zambian animal feed include Zimbabwe, Burundi, Botswana, Namibia, Malawi, Rwanda, South Africa, and the DRC. Animal feed exports to the DRC are mainly informal given the instability in the mineral-rich Katanga province which borders Zambia. Within Zambia, feed firms also supply to breeder farms or corporate firms that are not strictly into the animal feed business. This may be done through some partnership especially with firms operating outgrower schemes. It is common practice among the large vertically integrated poultry producers to manufacture their own feed.

For hatching eggs and parent breeding stock, local companies owning grandparent breeding stock export to firms in other African countries (Table 3).

Table 3: Export destinations for animal feed, day-old chicks and hatching eggs

	Animal feed	Day-old chicks and hatching eggs
Botswana	X	
Burundi	X	
Democratic Republic of Congo	X	X
Ethiopia		
Kenya		X
Malawi	X	X
Mozambique		X
Namibia	X	X
Rwanda	X	
South Africa	X	
Tanzania		X
Zimbabwe	X	X

Source: Authors' illustration based on unpublished export data from the Central Statistical Office export data (2000–16).

Most of the parent breeding stock is sold on the local market to other firms. However, while the share of locally sold breeding stock is unclear, it is likely to be large, given that only 2 per cent of hatching eggs and day-old chicks are exported. Export destinations for the hatching eggs and breeding stock include the DRC, Kenya, Malawi, Tanzania, Mozambique, Namibia, and Zimbabwe.

The market for broiler meat includes individuals, the hospitality industry, and government departments—especially the defence forces (army, air force, police, and the national service). The same applies for the live bird sales. Some outgrowers enter into contracts with the large firms to supply live birds and these come with specific obligations in terms of quality and quantity. The majority of the broiler producers sell their product on the live-sales market. This is mainly informal and takes the form of spot market transactions.

Broiler day-old chick sales are mainly to smallholder poultry producers who make up 65 per cent of the broiler market. Some day-old chicks are also sold to commercial poultry producers. About 97 per cent of the day-old chick sales are for the local market; exports account for only 3 per cent of the annual production.

3 Key drivers of growth and trajectory of the Zambian poultry industry

The observed growth in the animal feed to poultry value chain has been in line with theory whereby income growth and urbanization increase the demand for processed foods, and also their share in food budgets (see Tshirley et al. 2015; Timmer forthcoming). For Zambia, identified growth triggers include a growing middle-income class and protectionist policies by the government. Other drivers include rising population and urbanization, changing tastes and preferences (Chisanga and Zulu-Mbata 2017), and growth in the hospitality industry. In addition, the cost of other sources of animal protein is highly prohibiting for many consumers, and this renders poultry products more attractive. Growth has also been driven by improved supply chains and the Kwacha's stability in the past. This, coupled with other reasons discussed below, has triggered investments by local and foreign firms operating in animal feed and poultry.

Since 2011, entry into the feed and poultry business by some feed firms has mainly been driven by the shortage of day-old chicks on the local market and the associated negative effect on poultry feed sales.

In other cases some animal feed millers felt the need to increase their feed sales by producing and supplying day-old chicks on the domestic market. Similarly, some firms were born out of a call for day-old chicks by smallholder farmers, and the need to satisfy their own vertically integrated poultry units. Other firms wanted to explore the emerging markets in Africa and beyond.

In the animal feed market, entry by the vertically integrated firms was mainly driven by the need to meet internal needs. For example Novatek was set up to mainly meet the animal feed needs for Zambeef. However, Novatek opened up to meet the domestic market as the internal feed demand from Zambeef is only 30 per cent of Novatek's feed output. Similarly, Nutri Feeds Mill was also set up to supply its own grandparent breeder farm (i.e. Ross Breeders) and the domestic market.

Other firms, such as National Milling Corporation (a former parastatal), enjoyed some first-mover advantage. It was the only company operating in the industry until the country liberalized the economy during President Chiluba's reign in the early 1990s. Additionally, the entry of NMC (as a company incorporated in 2000 following SEABOARD's acquisition of the parastatal) entry was also driven by local demand and the fact that infrastructure was already in existence. Similarly, Hybrid Poultry has been in operation for over 60 years. It first started out as a broiler farm and has since expanded into one of the leading vertically integrated firms.

However, while firms have invested in the animal feed and poultry industries, future investments are likely to be made with more caution given the country's economic challenges, such as the highly volatile currency which has had adverse effects on investment planning.

While the industry has exhibited rapid growth in the last decade, there remain a number of issues that need to be addressed if it is to take advantage of the trends at the local and regional levels. These include:

- i. The use of multiple currencies for traded animal feed inputs within Zambia (i.e. soya beans) has in some years adversely affected firms' planning given currency exchange volatility when copper prices drop.
- ii. Over time, there has been heavy government involvement in the maize market and this tends to reduce maize availability to the private sector. Moreover, trade policies have been inconsistently applied, limiting private sector participation in the maize export markets (Nijhoff and Chapoto 2009). This was also observed in 2016 when a serious regional maize shortage necessitated maize export bans by the Zambian government amid pressure to open the borders.
- iii. Low soya bean output, coupled with rising regional demand (especially from Zimbabwe) is pushing the local soya bean price upwards as local traders now prefer to sell outside Zambia.
- iv. In terms of trade, there is a lack of truly free trade areas between Zambia and its neighbours with countries using non-tariff barriers and unnecessary charges to restrict trade or protect their manufacturing industries. This is despite membership to regional bodies such as COMESA (Common Market for Eastern and Southern Africa), and SADC (Southern African Development Community).
- v. Despite Zambia having a well-regulated poultry industry, industry regulations are old and outdated. As examples, we find that sanitary and phytosanitary legislation in Zambia is not

fully developed. Breeder operations are governed by the veterinary institutions. The Public Health Act governs most of the industry, but this in itself does not offer much hope to the industry players. Improvements to these would increase investor confidence. Moreover, most regulatory wings have commercialized their role in the industry. A good example is the Zambia Medicines Regulatory Authority who are demanding 2 per cent of invoice value on pre-mixes imported by feed manufacturers. This has been viewed as inappropriate in that no industry impact assessment was conducted, thus violating the Company Protection Act. The feed industry is self-regulatory because of the high competition levels. Some guidelines, for example, exist on the classification of feed raw materials (e.g. what constitutes soya cake?).

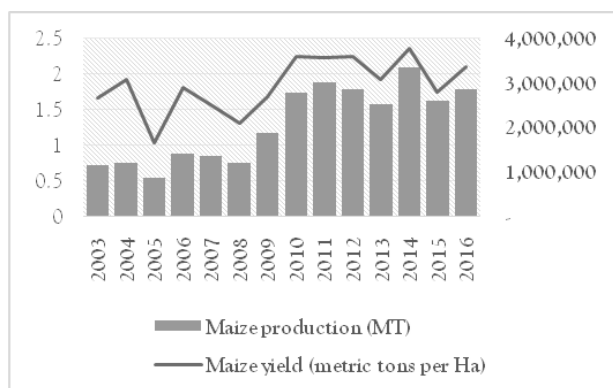
- vi. Limited budgetary allocations to livestock development and extension: over time, there has been very limited allocation to the livestock sector in Zambia, with budgets highly skewed towards maize production and marketing and with adverse impacts on the growth of livestock (including poultry), and crop diversity among smallholders—especially for the growth of animal feed inputs such as soya beans and sunflower. Further, limited public extension limits how much production information goes to the majority of poultry producers across the country; there is only so much that the private sector extension can achieve. With limited extension, best practices in animal feed inputs are not followed, and this manifests in low crop productivity and production.
- vii. Confusion in the industry’s regulation: there is a lot of overlap among regulatory agencies in the industry, leading to inefficiencies in the system. This also creates confusion on who is mandated to do what when it comes to industry regulation. In summary, the current institutional framework does not give the private sector the peace they deserve for their operations. Improvements to the system would benefit the industry in the long run.

4 Status of animal feed input availability and its pricing

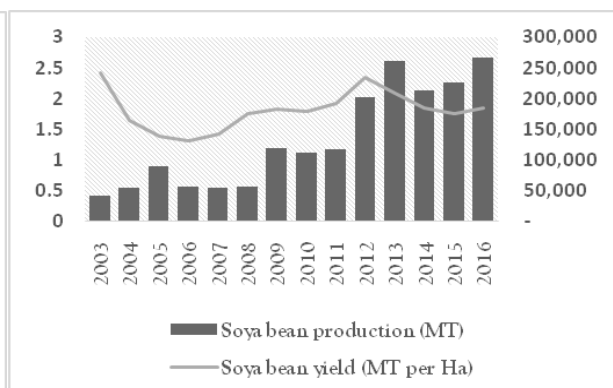
To take advantage of a growing export market, it is necessary to understand the state of animal food input availability and potential supply. The general narrative is that present production levels of feed inputs are sufficient to meet local demand, with limited surplus owing to low and slow-growing productivity (Figure 3). Future production levels are likely to increase but this will depend partly on adequate extension service provision, site-specific fertilizer recommendations, and increased input use intensity to close the yield gap among smallholder farmers (Namonje-Kapembwa et al. 2015; Chapoto et al 2016). More importantly, recent changes in the way the input subsidy programme is administered could have profound impacts on diversity of crop production among smallholder farmers and in this case for soya bean production. Previously, the input subsidy programme was restricted to maize—something which has since changed with farmers now allowed to freely choose their inputs including livestock inputs and selected crop inputs (including for soya beans) from agro-dealers through an electronic voucher.

Figure 3: Trends in maize and soya bean yields and production

(a) Trends in maize production and yields



(b) Trends in soya bean production and yields



Source: Authors' illustration based on unpublished data from the Central Statistical Office and Ministry of Agriculture Crop Forecast Surveys (2003–16).

It is estimated that by 2025, Zambia's net maize exports will be about 500,000 metric tons (Chisanga and Chapoto 2016). This is still low to meet demand from the rest of the region, which can be as high as 7,982,532 metric tons in deficit (El-Nino) years (Chisanga and Chapoto 2015, 2016). The implication of this is that other quick and innovative ways of increasing production are necessary. For example, the Zambian government has to create incentives for the commercial farm sector to actively produce maize under irrigation for export. This could include production of early maize with supplemental irrigation a month or so before the rainfall season as well as winter maize.

In addition, the speed with which agricultural intensification develops will be crucial, especially among the 1.5 million smallholder farmers. However, even though South Africa may be touted as a potential major export destination for feed and feed inputs, the most benefits from trade arise if Zambia exports its maize to Malawi and Zimbabwe (Table 4). The same conclusion is expected for soya beans.

Table 4: Export parity prices for soya beans and maize

Country	Soya beans (export parity price) US\$/metric ton	Maize (export parity price) US\$/metric ton	Soya meal (export parity price) US\$/metric ton
Zimbabwe	480	330	550
Malawi	-	310	-
South Africa	-	176	-
Tanzania	-	201	-
Kenya	-	112	-
Uganda	-	72	-
Mozambique	-	193	-

Sources: Authors' illustration based on Chisanga and Chapoto (2016) and unpublished data from the Grain Traders Association of Zambia (2016).

One important consideration in animal feed relates to the pricing of feed inputs. While soya beans are subject to the market forces in Zambia, government involvement in the maize market, through operations of the Food Reserve Agency, has in the past been shown to reduce maize availability pushing the price upwards—especially when the government sets the maize price above the market price. This arises because smallholders prefer to sell most of their maize to the government through the Food Reserve Agency (FRA), thus crowding out the private sector. This is likely to change going

forward because the government in 2016 announced through the highest office, the Republican President, that the FRA's role was going to be limited only to managing strategic reserves and that the maize market was being deregulated, allowing the market forces to determine maize prices. Previously, maize prices have been shown to be highly volatile due to government's inconsistent application of export bans (see Nijhoff and Chapoto 2009). It is perhaps one of the reasons why animal feed prices have remained almost the same in real terms since 2011 (Figure 1).

This development is likely going to attract more private sector participation in the maize and maize product market, particularly for exports, given the high regional demand. If such a policy is consistently applied, maize price volatility could reduce.

5 Zambia's prospects for regional trade

On paper, Zambia is well positioned to supply nine of its neighbours and other countries within the region with poultry and animal feed products (Figure 4). However, the challenges faced by local firms in the animal feed to poultry value chain lead us to conclude that, the specialized niche markets (i.e. breeding stock, hatching eggs, and day-old chicks) offer promise for regional trade in the poultry industry. As one goes down the value chain, there are more players in the market and non-tariff barriers that kick in. There is a lot of protectionism across countries via import duties to the extent that there is no 'truly' free market between Zambia and her immediate neighbours. Opportunities exist for exports of animal feed into Zimbabwe given that Harare is located nearer to Lusaka than Johannesburg, but this would be predominantly for raw materials, given Zimbabwe's protectionist policies for its value added industries.

Figure 4: Zambia's regional trade opportunities



Source: Chisanga and Chapoto (2016), reproduced with permission.

The export of soya beans to South Africa is currently impossible because of the cheaper and heavily subsidized soya beans from the South American countries (i.e. Brazil and Argentina) with which Zambian soya beans cannot compete, given low production, productivity, and a high cost of doing business (see World Bank 2015). Moreover, the fact that Zimbabwe is currently draining most of its soya beans leaves very little for export to other destinations across Africa.

To change the regional dynamics in this respect, there is a need to improve local production and productivity. Production will only increase if the commercial farmers are involved. Even with the expansion of the government's e-voucher programme for the 2016/2017 agricultural season aimed at promoting diversification by increasing farmer access to other inputs such as soya beans, it will take decades for the 1.5 million smallholder producers to significantly increase their productivity and contribute greatly to national soya beans output. Further, with a rise in presence of South African firms operating in Zambia, innovative ways of reducing transportation costs to make Zambian animal feed and poultry competitive could replace some deep sea feed and poultry imports entering South Africa.

Zambian feed firms have an advantage in the region especially in countries where genetically modified organism (GMO) products are not allowed (e.g. Zimbabwe, Malawi). Zambia can take advantage of this because South African GMO products, which would otherwise be cheaper, are not allowed. Nevertheless, the dynamics would change if Zimbabwe relaxed its GMO policy.

Furthermore, non-tariff barriers limit firms' exploitation of the regional market, as countries move to protect their manufacturing industries. For instance, there are reports by Zambian feed millers that Zimbabwe uses non-tariff barriers on Zambia's feed. One way to get around this problem is to increase the competitiveness of local feed by addressing some of the challenges that contribute to the high cost of feed production. This is possible considering that Novatek currently exports such high-value commodities to Zimbabwe (perhaps because they already operate a feed mill there and because of their relative size).

The distance to Tanzania makes exports unattractive, except for the southern-most parts of the country. Botswana is self-sufficient through South Africa, as such exports to Botswana would account for a small share. Malawi's poultry sector is small and is served mostly by its own feed poultry industry. Namibia is promising in that it has maize shortages, but the population is still low. Exports to Mozambique are unlikely given the Latin American influence on the local poultry industry. Mozambicans are more likely to trade with Brazil. The DRC on the other hand is a highly potent market. But the systems in the DRC deter firms from crossing the borders because armed fighting is frequent in the mineral-rich Katanga province. Instead, Zambian firms prefer to export unofficially by delivering to Congolese traders on the Zambian side of the Kasumbalesa border. It seems unlikely that this situation will change in the near future—even though efforts are underway by both governments to ease trade. The only firms who can trade directly in the DRC are those with the very large financial muscle to influence the systems in the DRC. Angola offers an opportunity for trade if the railway network through north-western Zambia is completed, but, similar to Mozambique, the Portuguese influence via Brazil is likely to be a major factor negatively impacting trade with Zambia. Currently, the rail-line construction to Angola is still at planning stage and it will be interesting to see how this will influence firm location and international trade.

Evidence also suggests that competitiveness on the international market for feed and specialized niche markets is dependent on where firms locate within Zambia. In India, Foster and Rosenzweig (2003)

have previously shown that firms locate in areas where labour is cheap. In the Zambian case, most feed and poultry firms are concentrated around Lusaka, where wages are higher than the rural areas. Of late, large firms are locating in the rural areas (e.g. Southern Chicken, Emman Feed Enterprises, and Zamhatch). Zamhatch and their planned feed mill construction in Mpongwe are a particularly good example. The geographically strategic location has had the effect of reducing the cost of doing business overall. As such, Zamhatch and its feed mill in Mpongwe are well positioned to compete with Brazilian chicken coming into the DRC while supplying feed to the same market. It is also at an advantage to export to Angola. Similar investments can be followed in southern Zambia, further reducing the distance to South Africa, and making poultry and feed products cheaper than they would if transported from Lusaka.

Because the poultry industry is governed by the availability of, and amount of, disposable income, further growth of the local and regional feed-poultry value chain will require policies that increase incomes of the people. Given future population prospects where the youth population will rapidly rise and only slow down after 2060, creating youth employment will trigger higher income growth, and hence demand for processed products. One way to achieve this is through making the industry more attractive for the small–medium firms as these will employ a large share of the people triggering a virtuous cycle that ultimately increase incomes among the population. Generally, policies that put income into the pockets of the local people would benefit the industry as a whole. The local industry would also benefit from grant financing for infrastructural development (i.e. road networks and bulk storage facilities). This will reduce input-related transport costs, given that most firms acquire inputs from smallholders.

Lastly, a stable Kwacha against the US dollar will assist investment planning among firms. Given Zambia's dependence on copper as a foreign currency earner, diversifying exports away from copper will help stabilize the Kwacha.

6 Conclusion and main implications

This study sought to analyse Zambia's feed and poultry value chain with a view to develop the industry for the Southern African market. We find the broiler industry to be highly concentrated at the primary producer level for parent breeding stock (a duopoly), implying that two firms exhibit high market power controlling most of the production parameters. However, the broiler value chain becomes less concentrated as you go higher.

Results show that the poultry industry tripled over the last five years, and in response, the animal feed industry has also grown. The rapid growth experienced by Zambia's feed and poultry industry is a direct consequence of favourable policies, changing tastes and preferences, a growing middle-income class, increased urbanization, and population increases. A number of multinational firms have invested in the country and these also have a footprint in South Africa and produce both animal feed and poultry products. Industry competition has increased, improving product quality and driving prices downward.

For the regional market, Zambia's current production levels of animal feed, animal feed inputs, and poultry are insufficient to meet growing regional demand. Increasing this will require coordinated investments by firms into Zambia—something which is already underway. However, animal feed

input production will also have to increase. Current production and productivity is extremely low. Further, a number of issues need to be addressed for Zambia to benefit from the regional trends. Increasing competitiveness will come from improved production efficiencies. This will require reducing the input costs (especially for manufactured feed) and training of the many small- to medium-scale producers in the industry. Since feed is the single largest cost among the poultry producers, it is not surprising that most interventions aimed at improving competitiveness start from reducing the costs of animal feed. Reducing feed costs will require trading in one currency for inputs (especially soya beans) and manufactured animal feed and public investments or expenditure that promotes agricultural growth. Improved competitiveness will also come from increased commercial production of soya beans.

From a regional linkage perspective, the specialized niche market is presently the only realistic option for Zambia. There is potential for animal feed trade if soya beans production and competitiveness can be increased. Otherwise trade will mostly be in raw materials particularly maize. Easing non-tariff trade barriers will be central to the trade process. Zambia needs to improve the competitiveness of its animal feed for it to compete with Zimbabwean crushers. To alter the regional dynamics relating to feed, there is a need to increase commercial soya beans production. Currently, the countries to which Zambia exports feed still have small populations. Population growths in these areas offer promise for the future (e.g. Namibia and Botswana).

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Appendix

Table A1: Primary data sources

Firm	Interview Date	Interviewer(s)
Hybrid Poultry	21 October,2015	Paul Samboko
Zamhatch/Zamchick	27 September,2015	Paul Samboko, Olipa Zulu
Navajo Agro Minerals	September,2015	Paul Samboko
Tiger Chicks	30 September,2015	Paul Samboko
Tiger Animal Feeds	30 September,2015	Paul Samboko
Nutri Feeds Mill	24 September,2015	Paul Samboko, Olipa Zulu
Ross Breeders	24 September,2015	Paul Samboko, Olipa Zulu
Novatek Animal Feeds	26 September,2015	Paul Samboko
National Milling Corporation	September,2015	Paul Samboko
Poultry Association of Zambia	8 September, 2015	Paul Samboko, Olipa Zulu
Outgrower	18 September,2015	Paul Samboko, Olipa Zulu

Source: Authors' illustration.