GOVERNANCE OF POULTRY VALUE CHAINS – A COMPARATIVE PERSPECTIVE ON DEVELOPING CAPABILITIES IN SOUTH AFRICA AND BRAZIL

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Abstract

South Africa has a substantial poultry industry, and continues to grow on the back strong demand locally and regionally. However, the increasing demand for poultry in South Africa and the region has been met with an increase in imports. Improving the competitiveness of the value chain to meet this demand requires concerted effort from multiple fronts, including learning from experiences of established value chains in countries such as Brazil and USA. As an example, Brazil has implemented effective national strategies to develop an integrated value chain from the main feed inputs of maize and soya to penetrating export markets. In contrast, there has been a lack of coordinated approach to capabilities development in the poultry value chain in South Africa, with interventions being piecemeal. The paper contrasts the experiences of South Africa and Brazil, looking at how governance has impacted on competitiveness and capabilities development in the two value chains. We conclude that the ability of the South African industry to compete internationally is dependent on producing poultry cheaply. Regrettably, production costs have been higher than for leading producers like Brazil and the United States (who are surplus producers of soybean), with the differences being attributed mainly to feed costs. Given the centrality of feed to poultry production, bringing the costs of feed down is critical. With the challenges in expanding soybean production in South Africa, the value chain needs to take soybean production capabilities in the greater region into account. That is, developing a competitive poultry industry in Southern Africa requires a regional strategy for the production of low-cost animal feed inputs (maize and soya bean).

JEL Classifications: D4, L1, L16, L66

Keywords: poultry, South Africa, Brazil, animal feed, competitiveness, capabilities, region, soya

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1. Introduction

Poultry production is part of a long integrated value chain that includes backwards linkages to agriculture (production of maize and soya), the processing of these into feed (required for energy and protein needs), the growing of chickens, and the slaughtering, packaging, distribution and retailing of the final product. This means that the industry has significant employment and income multipliers into the rest of the economy. This paper contrasts governance and power in the poultry value chains in Brazil and South Africa, and how these have impacted on capabilities development.

Brazil and South Africa are both upper middle-income countries[1], though GDP per capita in Brazil is higher than South Africa (US$ 9,897 for Brazil compared to US$ 6,182 for South Africa in 2017). Brazil also has a much larger population at around 208 million compared to 57 million for South Africa.[2] Brazil is the most successful example of a developing country building a competitive value chain in poultry. It has achieved enormous success in the last 20 years in both agriculture and agro-processing products like poultry. In contrast, the South African poultry sector has experienced increasing consolidation and an inability to ramp up production, despite significant demand in the region.

Using the immensely successful Brazilian poultry value chain as a comparator, we contrast the experiences of South Africa and Brazil, looking at how governance has impacted on capabilities development in the two value chains. In doing so, we consider the role of technology and investment incentives in developing capabilities to promote competitiveness. Contrasting the Brazilian experience with South Africa's provides insight into the kinds of measures that can be taken in order to help develop capabilities. Information from interviews in South Africa and Brazil are supplemented with existing research and information.[3]

South Africa's poultry value chain is substantial, producing around 1.7 million tons of poultry in 2018. It employed around 112,000 of the 800,000 people in agriculture in 2017[4], and accounted for 19.6% of total agricultural value (SAPA, 2017). With strong demand for poultry in both South Africa and the region, the poultry value chain presents opportunities for domestic and regional industrialisation. However, increasing demand for poultry in South Africa and the region has been met with an increase in imports. In 2017, imports accounted for 24% of domestic demand.

The process of structural transformation or industrialisation is the movement of factors of production to higher productivity and more complex activities (see, for example, McMillan et al. 2017). In the agriculture sector, there are industrial capabilities in moving to higher value agricultural production – in improving yields, moving to higher quality agricultural products, as well as the co-ordination required with logistics and packaging (Cramer and Sender, 2015).

Growing the poultry value chain requires development of a number of different capabilities. This includes capabilities in agricultural production – growing sufficient maize and soya competitively – as well as capabilities related to production of poultry – productive breeds for broiler production; technically efficient broiler production at scale; large scale investment in production facilities; and technical and organizational capabilities required in commercial poultry production. Furthermore, there are competencies required in services too (logistics).

[1] https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups
[2] http://www.statssa.gov.za/wp-content/uploads/2018/11/BRICS-JSP-2018.pdf
[3] See Appendix 1 for list of interviews.
[4] See SAPA (2016) for poultry employment and DAFF (2018) for total agriculture employment

The poultry value chain in South Africa is characterized by large, vertically integrated producers who have control over key inputs, namely animal feed and licenses for breeding stock. At the upstream level, given that South Africa does not produce sufficient soybean (a key ingredient for animal feed), soybean or oilcake is imported in order to produce animal feed. Literature on value chains emphasizes the importance of linkages in vertical stages of processing, governance and power within value chains, and upgrading at the firm-level. Using the value chains framework, the paper reflects on the inability of the poultry sector in South Africa to respond to the increased demand by looking at the role that governance has played in upgrading the value chain and developing capabilities through a comparison of the South African and Brazilian experiences.

2. Global value chains: a framework to understand governance and power

The global value chain (GVC) framework is useful to identify opportunities for, and bottlenecks to, upgrading and development of capabilities in global industries. It provides a methodology for tracing patterns of value creation as well as understanding power and governance across the full range of economic activities within an industry. It does so by exploring the linkages amongst geographically dispersed economic activities and actors (Gereffi and Fernandez-Stark, 2011).

The traditional GVC literature employs two core concepts to assess global industries, (1) governance and (2) industrial upgrading. Governance refers to authority and power relationships that determine the allocation and flow of resources within a value chain (Gereffi, 1994; Dallas, Ponte and Sturgeon, 2017; Gereffi and Lee, 2012; Gereffi and Fernandez-Stark, 2011). While governance is about understanding the value chain in a 'top-down' manner, upgrading takes a 'bottom-up' approach, exploring how firms or countries can maintain or improve their positions within global value chains.

The role played by powerful 'lead' firms in coordinating production activities and shaping the distribution of profits and risk within an industry is central to understanding governance structures (Gereffi and Lee, 2012). Lead firms in GVCs control production through setting and enforcing product and process parameters including standards and protocols that must be met by other players operating in the value chain. This includes controlling decisions about what to produce, how to produce and how much to produce (Humphrey and Schimtz, 2002; Gereffi, and Fernandez-Stark, 2011). Thus, governance is one of the critical elements for competitiveness of global value chains.

Specific patterns of governance can become a hindrance for the building up of innovation capabilities (Lema, et al., 2018). The ability of local producers within the GVC to engage in different forms of upgrading can be constrained by the ways in which local firms are inserted into the GVC and the power asymmetries between them, lead firms and other actors. GVC structures and chain leaders' strategies set the pace and direction of knowledge flows and upgrading either in favour or against the interest of local producers (Morrison, et al., 2008).

The exertion of power is not always limited to a 'lead' or powerful firm exercising their authority on other actors in the value chain. There are often other multiple dimensions of power exercised in GVCs, beyond the simple bargaining power between buyers and suppliers captured in most of the GVC literature[5] (Dallas, et al., 2018). Clarifying the concept of power has become increasingly important following the growth of new forms of GVC frameworks with

[5] Bargaining power typically captures the power asymetries between lead firms in advanced countries and suppliers in developing countries.

multiple stakeholders and mechanisms. Governance can be shaped by various factors and actors including standards and certifications on quality and sustainability, multi-stakeholder initiatives, corporate social responsibility and social movements.

Building on existing frameworks, Dallas et al. (2018) try to capture the emerging collective approaches to power and governance in GVCs by considering the role of government, business associations, social and consumer movements. They categorise the different types and usages of power exercised in GVCs into four groups - bargaining, demonstrative, institutional and constitutive power. These forms of power are an interaction of two principal dimensions – 1) transmission mechanisms, which can be direct or diffuse, and 2) arena of actors, which can be dyadic or collective (Appendix 2).

Power can be transmitted through direct and diffuse mechanisms. Within the direct forms of transmission, the actor or collective wielding power and those who are objects of it are relatively easy to identify by all parties. The exertion of direct power is most often intentional and the goals of powerful actors are well known. These actors 'possess' power either by wielding material or ideational resources, or by leveraging their structural or network position within a GVC. Transmission mechanisms can also be diffuse, based on less direct and more demonstrative processes. Such mechanisms follow broader societal trends or are based on taken-for-granted or emergent 'best practices' (e.g. corporate conduct and organisation) or dominant quality conventions.

The arena of actors specifies how power is exercised in both dyadic and collective relationships. Most GVC literature focuses on direct power in dyadic relations between individual buyers (lead firms) and suppliers. Collective power on the other hand is a function of the collective behaviours of multiple players acting simultaneously (intentionally or not). For example, institutional power is a form of direct power that is exercised by collectives that are more formally organised, such as through business associations, multi-stakeholder initiatives, shared technological platforms, or within the state.

The state, in regulating the conduct of all actors, or categories of actors, applies institutional power. Various levels of state action and authority have structuring effects on GVCs (Jespersen et al 2014), by setting more or less transparent rules for all, or for specific groups of actors. The state may also impact on coordination in the value chain through specific measures. It may however also "outsource governance", in that it may engage in a process of delegating a variety of governance functions and authority to private actors (Mayer and Phillips, 2017), impacting on who holds power and how much of power they hold.

3. Overview of the Poultry Industry in SA and Brazil

3.1. Poultry production system in SA and Brazil

The poultry value chain has multiple levels - from the production and processing of agricultural commodities through to a quasi-industrial process of batch production in the rearing, processing, to the distribution of poultry in fresh and frozen form.

Production system: The poultry production systems in Brazil and South Africa are similar, with production carried out under production contracts between poultry producers and independent poultry farmers (called an integrated system).

In Brazil, the poultry producers negotiate contracts with growers and provide growers with all the raw materials namely, day old chicks, feed, vaccine and veterinary services. Large

companies in Brazil provide support to contract growers through dedicated support staff. For instance, Aurora (the 3rd largest producer in Brazil) employs six technical people that provide assistance to farmers with regard to a number of issues, like ventilation, litter, etc.[6]

Growers provide labour and housing for chickens. Growers must grow the chickens to meet market weights required by producers. They receive payment for the service they provide with premiums and discounts tied to efficiency, that is, the rate at which feed is converted to live-weight broiler production. There are an estimated 180,000 poultry farmers in Brazil, and around 85% of total poultry produced in 2014 was being done through the integrated system of broiler production (Valdes et al, 2015). Implementation of the integrated system in the poultry industry has been key to the development of an industrial poultry production system in Brazil, bringing in technical and scientific developments, and unifying the entire production chain (UBABEF, 2011).

There is significant concentration in the poultry industry in Brazil. Eight producers account for 55% of broiler production, while the top four account for 38% of production (EMBRAPA 2014). Furthermore, two Brazilian multinationals JBS and BRF account for almost 70% of poultry exports. However, there is participation in the industry, with a significant number of cooperatives involved in poultry production. Cooperatives came about in the 1930/1940s when the Ministry of Agriculture organized the National Poultry Cooperative in order to set up poultry cooperatives throughout Brazil. The 3rd largest producer in Brazil is a cooperative Aurora Alimentos, which itself consists of 11 affiliated cooperatives, representing more than 75,000 associated families and 28,000 employees.[7]

The vast majority of South African poultry is produced by large-scale commercial players who are generally vertically integrated with key inputs such as animal feed, all the way to slaughtering operations.[8] Most of the broiler meat from commercial is sold through abattoirs which slaughter broiler meat and sell it as carcass to processors and packers, who sell chicken fresh, frozen or further processed to retailers or further processors (or exports some of the chicken). Processors and packers and further processors also rely on imports for their supplies. Further processors sell to retailers for final distribution to the consumer.

The industry in South Africa is dominated by two large producers, namely Astral Foods and RCL Foods (RCL). Together these two companies produced 46% of the total broiler meat production in both 2014 and 2018 (Figure 1), with the remaining 54% produced by smaller producers. Market shares of key producers have changed slightly in the past five years. Astral increased its market share from 22% in 2014 to 27% in 2018, replacing RCL as the leading producer. RCL's market shares declined by 5 percentage points in the same period, due to a restructuring process that saw the company sell off some of its poultry facilities.

Broiler production by contract growers in South Africa has increased over the years and is currently at approximately 60-80% of total broiler production (Bosiu et al., 2017). The entry of contract growers has been partly facilitated by the sale of the poultry farms by the major poultry producers to new contract farmers, for example, Daybreak Farms sold off seven of its farms to black poultry producers. The shift towards a greater reliance on contract growing has largely

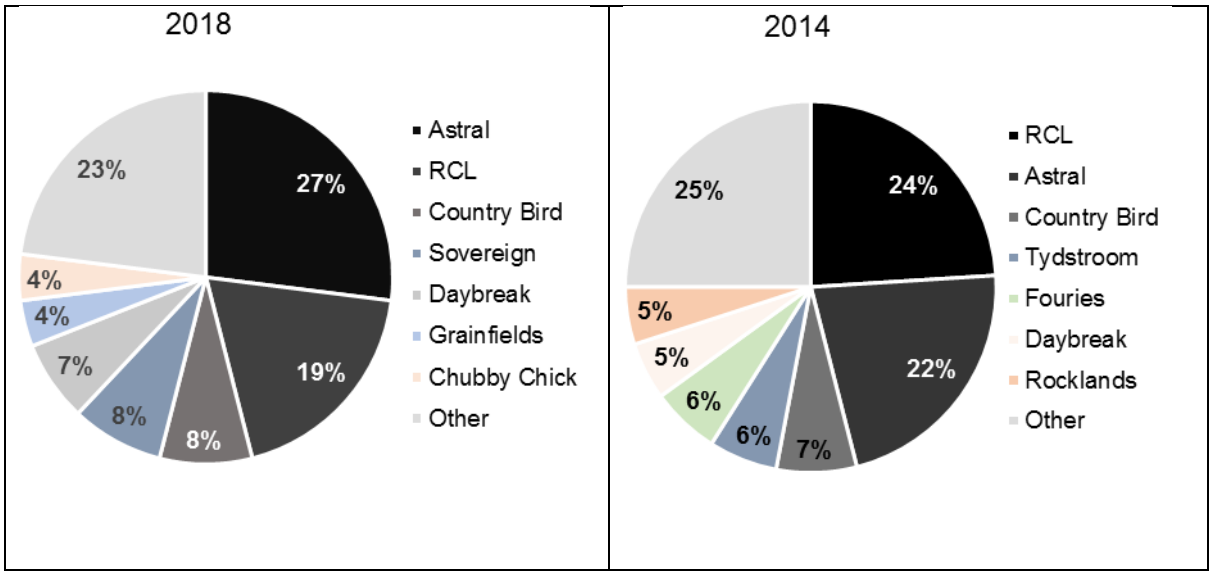
[6] Interview at Aurora, 22/02/2019

[7] Aurora produces poultry as well as swine and dairy.

[8] Producers are vertically integrated in that key segments of the production chain (i.e. feed, breeding stock, farming and abattoirs) are under a single ownership structure. This is different from the Brazilian case where, for instance, breeding companies have farms from which producers purchase day old chicks. Like in South Africa, the processing level (abattoirs) is highly concentrated

been as a result of an increasing desire by the major poultry producers to shift costs associated with owning large pieces of farm land from themselves to the contract growers.

Figure 1: Market shares of key poultry producers in South Africa



Source: Astral (2018) and DAFF (2014)

Contract growing creates opportunities for entry given the low cost of capital required to start up in comparison with other stages of the value chain which require a significantly higher level of expertise. The increasing prevalence of contract growers is also important in the context of inclusive growth. However, despite the opportunities created by contract farming, to become effective competitors entrants still need to enter at multiple levels of the value chain for vertical coordination and to leverage inputs. The entry of Grain Fields Chicken (GFC) illustrates this.[9] This may not be the case if access to breeding stock and competitive feed was available at fair terms (discussed below).

Feed: The poultry value chain starts with the two main inputs—animal feed and breeding stock. Feed constitutes around 70% of the cost of poultry production (Ravindran, 2010). The cost of feed is an important driver of both poultry production and day-old chick costs, effectively influencing the cost of production at two levels.

Brazilian producers have access to cheap maize and soya since both are grown locally, and these makes up about 90% of the cost of feed (Ncube and Zengeni, 2016). Access to animal feed has been a key determinant of success of Brazilian poultry producers. The movement of crop production into the central (cerrado) region of Brazil has been crucial for the success of the industry in Brazil. We discuss this further in section 5 below.

In South Africa, animal feed, which is generally made from milled maize and soybean or sunflower, accounts for between 50 and 70% of the total input costs (Bagopi et al., 2014). Animal feed production is carried out in the feed mills where the main ingredients (maize and soya), including vitamins and antibiotics, are combined to produce stock feed. Feed production

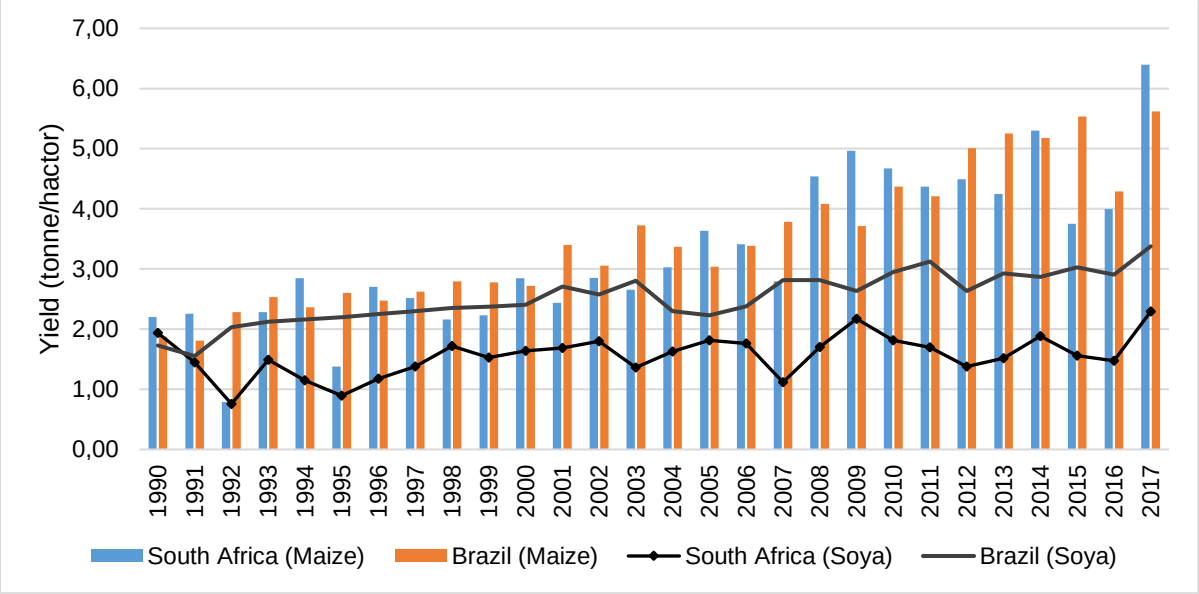
[9] See Ncube et al (2016).

typically comprise of 60% maize, 25-30% of soya, and vitamins/supplements (Ncube et al, 2016).

South Africa is a net exporter of maize, but a net importer of soya. This means the prices of feed are driven by the international prices of soya and local prices of maize. Despite soybean production increasing significantly from 282,000 tonnes in 2008 to 1,070,000 tonnes in 2017, South Africa still does not produce enough soybean to meet local consumption. Furthermore, less than ideal agro-ecological conditions mean that production is unlikely to meet demand of around 2 million tonnes per annum (AFMA, cited in Ncube et al., 2016:22).

Brazil is the world's largest exporter of soybeans, followed by the US, Argentina and Paraguay and Canada (USDA, 2018).[10] South African soybean farms are less competitive than international counterparts such as Brazil, Argentina and the US – their yields are lower (Figure 2) and they have higher costs for selected input items such as seeds, fertilizer and crop insurance (BFAP, 2018). While the yields of soybean producers in the USA, Brazil and Argentina have increased by upto 1.5% over the last decade, South African soybean yield over the same period improved by around 0,4% per year. Part of the reason has been a shortage of new cultivars and biotechnology.[11] Maize yields between South Arica and Brazil are comparable, with the impact of the drought in 2015/16 evident (Figure 2).

Figure 2: Yields in South Africa and Brazil (1990 – 2017)



Source: FAOSTAT

Breeds: Breeds are a global business, where high quality breeds are developed to meet market requirements. The diverse gene pool ensures flexibility to meet a range of different requirements, for example, birds that can thrive in high temperatures versus more temperate climates or birds that thrive on wheat versus maize-based diets.[12]

[10] https://agribook.co.za/agronomy/soybeans/

[11] https://www.bizcommunity.com/Article/196/742/187884.html

[12] Using natural selection within pure lines, breeding companies improve appropriate performance traits, and pure lines are then multiplied by breeding to produce great grandparents which produce grandparents and parents stock which are then sold to producers (who provide them to farmers) who breed the broilers to be sold for consumption.

Table 1: Summary of Production system in Brazil and South Africa

	Brazil	South Africa
Inputs		
Feed	• Accounts for the majority of cost of producing broilers • *Sufficient maize and soybean grown locally* – buyers subject to export price	• Accounts for the majority of cost of producing broilers • Sufficient maize grown locally (except in drought years) – subject to export prices; *insufficient soybean grown locally – buyers subject to import parity prices*
Breeding Stock	• Use international breeds: Dos Grupos Tyson (Cobb (60%) and Aviagen (Ross (35%)) • *Chicks are bought from breeding companies which have multiplier farms which producer parent stock and day-old chicks*	• Use international breeds: Ross 308; Cobb 500; and Arbor Acres • *Rainbow Chicken, Astral and CBH are holders of exclusive commercial genetic breeding licenses. Producers need to purchase breeding stock from them, whether for their own production or for comm. sales*
Chicken farming		
Chicken farming	• Mainly contract farming– production contracts between poultry producers and contract growers • Contract farming accounts for 85% of poultry produced in 2014	• Mainly contract farming– production contracts between poultry producers and contract growers • Contract farming accounts for 60%-80% of poultry produced (Bosiu et al., 2017)
Production/Processing		
Broiler producers	• Significant concentration at processing level • 8 processors account for 55% of broiler production • *Participation of smaller producers through cooperatives*	• Significant concentration at most levels of the value chain • 2 vertically integrated producers account for 46% of broiler production

Note: major differences between Brazil and SA are in italics

Globally, there have been a number of different primary breeders which have consolidated into three major companies over time (Tyson, Aviagen, and Grimaud). While Brazil's research institution focused on poultry and swine (EMBRAPA Swine and Poultry) was initially involved in the production of poultry breeds, this was not widely used commercially in Brazil.[13] Given the advancement in the global breed business, Brazil, like other major poultry-producing nations uses international breeds. For industrial chicken meat production, there are two major international breeds in the Brazilian market (Dos Grupos Tyson (Cobb[14]) and Aviagen (Ross[15]).[16] About 60% of poultry production in Brazil is produced using Cobb, while Ross has about 35%, with the remaining 5% covered by other breeds.[17]

[13] Interview at EMBRAPA Swine and Poultry (21/02/2019)
[14] A USA-based multinational.
[15] Privately owned by German-based EW Group.
[16] Interview at EMBRAPA Swine and Poultry (21/02/2019).
[17] Interview at EMBRAPA Swine and Poultry (21/02/2019).

Like in Brazil, the two main global firms provide poultry breeding stock to South Africa. Cobb and Ross broiler breeders are imported into SA at grandparent or great grandparent level.[18] Rainbow Chicken, Astral and CBH are the only holders of exclusive commercial genetic breeding licenses in South Africa. Astral holds a license for the Ross 308 breed, Rainbow Chicken for the Cobb 500, while CBH holds a license for Arbor Acres breed.[19] As a result, any producer seeking to participate within the poultry value chain in South Africa would need to purchase breeding stock from Rainbow Chicken, Astral or CBH, whether for their own production or for commercial sales (Bagopi et al., 2014). Breeding stock (grandparent stock or great grandparent stock) is imported into South Africa by the owners of franchise rights; setting up a great grandparent stock requires huge capital outlays (Grimbeek and Lekezwa, 2013). [20]

This is unlike Brazil, where breeding companies have multiplier farms which produce parent stock and day-old commercial chicks. Big parent stock farms have contracts with large contract-system producers, while smaller farms sell chicks in the open market where smaller producers are able to purchase them. According to APINCO (Meat Chicks Association), 85% of chicks produced go to contract-system producers while 15% are sold in the open market. In 2015, there were 235 registered hatcheries, of which about 200 were producing commercial day old chicks for meat and for egg production.[21]

Day-old chick costs account for about 20% of variable costs (Davids and Meyer, 2017). In 2017, day-old chick costs in South Africa were among the highest compared to a range of other significant producers (in Eurocents per live kg) (BFAP, 2019). The cost of feed is an important driver of day-old chick costs, while the exchange rate represents another important component of costs. There is significant variation in the cost of day-old chicks in South Africa, as some integrated companies deliver at cost while others deliver at market value (BFAP, 2017). The successful entry of Arbor Acres breed in 2007 (as a result of a case taken to the Competition Commission on the grounds of exclusionary conduct) resulted in growth in local production and declining margins by the three major poultry-producing companies in South Africa (Grimbeek and Lekezwa, 2013). This highlights the importance of access to breeds at competitive prices for the poultry industry.

3.2. Performance

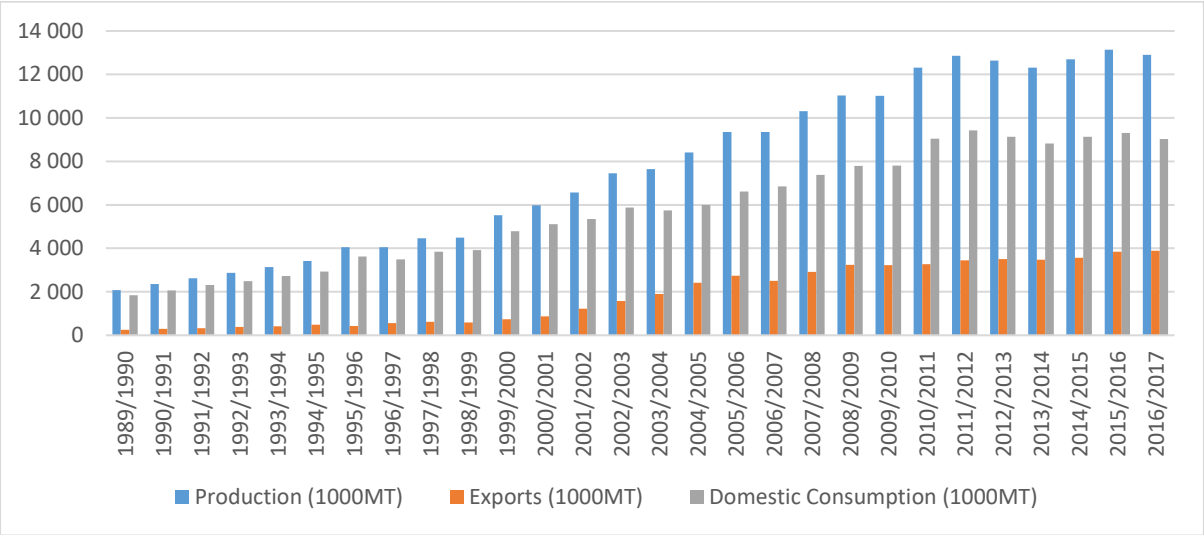
Production and Consumption of poultry in SA and Brazil

Production of poultry in Brazil has increased dramatically since the 1970s, increasing from production of 217 thousand tons in 1971 to 12.9 million tons in 2016/2017 (Figure 3). While the majority of poultry is consumed domestically (estimated at around 66%)[22], Brazil is the largest exporter of poultry in the world, exporting to over 150 countries.[23] Production of poultry is concentrated in the southern states of Brazil (see Appendix 3) (UBABEF, 2012). Family

[18] The complete cycle involves breeding and rearing of grandparent and parent stock prior to commercial day old chick production and hence the complete production cycle requires 12-22 months to complete.
[19] Quantum also holds a license for the Cobb breed but it is only for internal production and not for commercial sales like the other licenses held by Rainbow, Astral and CBH.
[20] South Africa seems similar to Mexico where breeding companies have incentives to care for genetic lines, so the management of breeding grandmothers is reserved for some national companies that show the ability to control risks as well as economic capacity (OECD, 2018) (check).
[21] Based on email correspondence with EMBRAPA (2019-04-26).
[22] ABPA website.
[23] Interview at ABPA (25/02/2019).

farming accounts for a significant proportion of production in Brazil[24], producing 50% of all poultry.[25] The poultry industry accounts for 4.5million direct and indirect jobs (UBABEF, 2011).

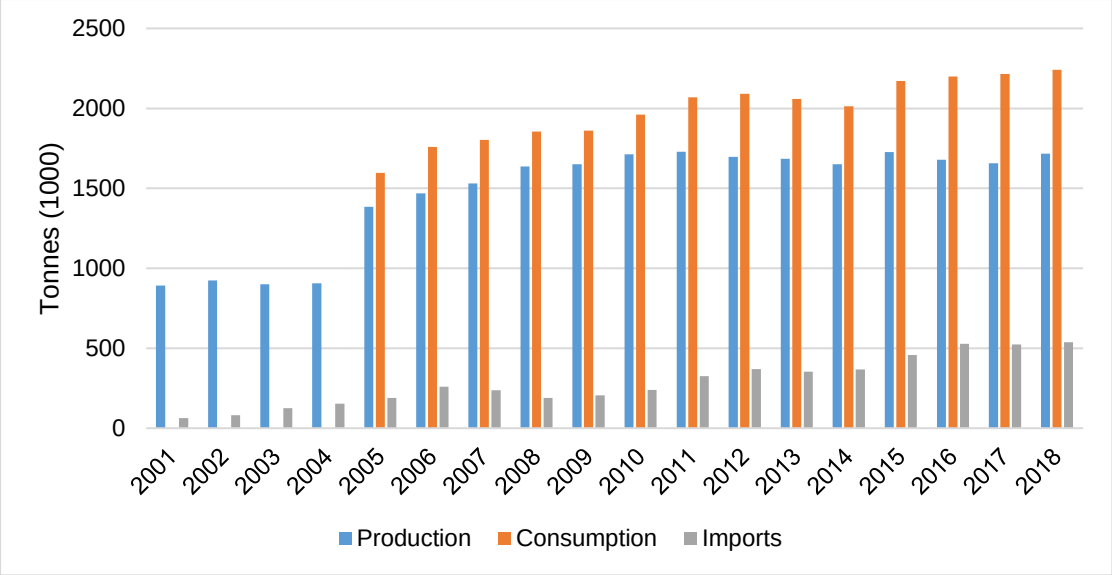
Figure 3: Brazil – Chicken production, exports & domestic consumption (1990-2017)



Source: USDA FAS

South Africa's poultry sector is much smaller, with 1.7 million tons of poultry produced in 2018. Consumption of poultry meat has increased significantly since 2005, on the back of increased income levels and lower prices of chicken as a source of protein. However, production has not been able to meet that demand. While consumption continued to increase between 2011 and 2018, production has stagnated (Figure 4). This excess demand has been met by increased imports from major producing countries in South America and European Union.

Figure 4: SA – Chicken production, imports and consumption (2001-2018)



Source: DAFF, SAPA, FAOSTAT, Trademap.

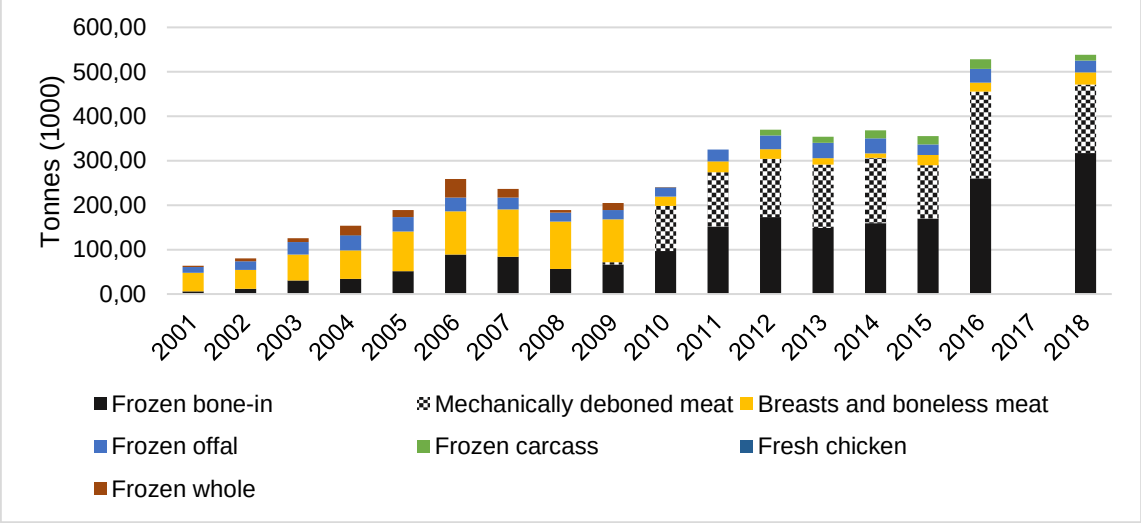
[24] The Agricultural Census of 2006 revealed that 84% of all farms were family farms.

[25] http://www.brazil.gov.br/about-brazil/news/2018/06/brazilian-family-farmers-are-the-worlds-8th-largest-food-producer

Note: Production data prior 2005 comes from FAOSTAT, while beyond 2005 production data comes from DAFF and SAPA. There is no consumption data prior 2005

The poultry industry in South Africa has raised concerns about the high levels of import penetration in the local market. The local poultry market prefers bone-in products, unlike the US and European markets where boneless products such breasts are preferred (Astral, 2015; SAPA, 2016). Imported products compete largely with the bone-in chicken products (Figure 5). While mechanically deboned meat (MDM) constitutes the second largest component of total imports, MDM imports are not in competition with local production: MDM is made from the left-overs after extracting boneless meat (preferred in many international markets), but because the local market prefers bone-in chicken pieces over fillets/ boneless breasts, there is insufficient excess with which to produce MDM. As a result, the local industry has deliberately not invested in mechanically-deboning technology. The implication is that the actual amount of imports that exert pressure on the local industry is reduced to around 17% of demand if MDM is excluded.

Figure 5: SA Imports of chicken products (2001-2018)



Source: Trademap. Data does not go beyond 2001

Most of the imports in 2018 originated from South America, with Brazil leading, followed by the United States. Imports from the US are relatively high as a result of 65,000 tonnes tariff-free quota on imports from that country under the African Growth and Opportunity Act (AGOA) agreement, which came into effect in 2016. Up until 2016 most imports came from the European Union, but imports from the EU largely disappeared in 2017 due to the ban imposed by South Africa on EU chicken products as a result of the highly pathogenic avian influenza (HPAI) outbreaks. Thus, imports switched from EU to South America. South Africa's exports of poultry products are low, with products only destined for Africa. There is a ban on local chicken products in other international markets as a result of phytosanitary issues.[26]

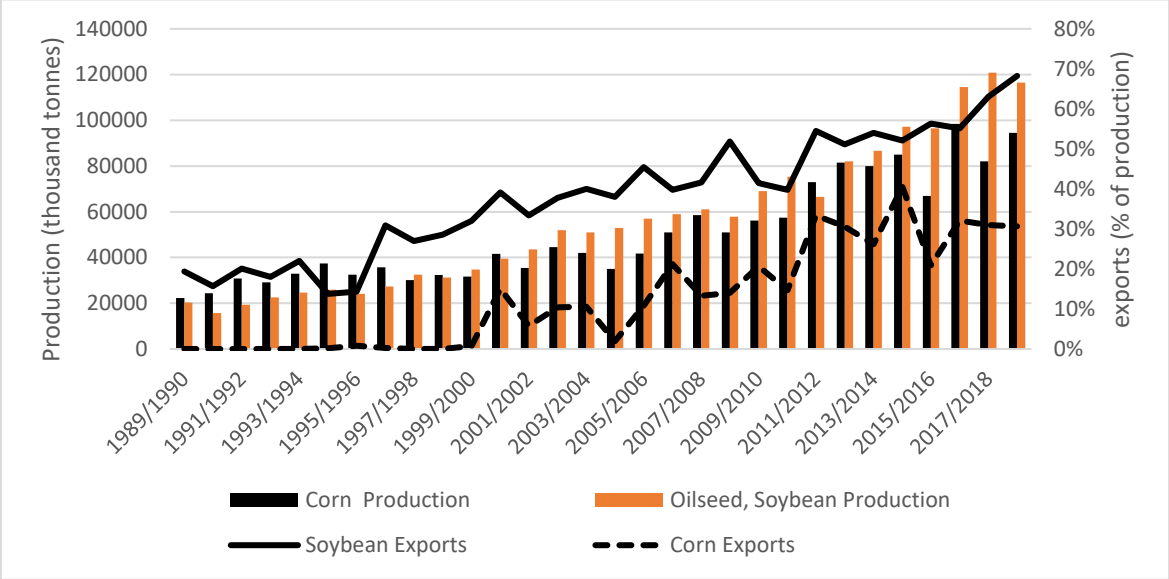
Production of agricultural input for feed in Brazil and SA

Since feed constitutes the majority of poultry production costs, the availability of soybean and maize is critical. Brazil's crop industry has undergone a significant and very important transformation as a result of research and technology investment in the sector. It resulted in

[26] Interview with SAPA, 24 January 2019

an expansion of maize and soybean production into Brazil's Center-West region (cerrado) and has resulted in enormous export-oriented industries.[27] The significant increase in soybean and maize production has benefitted a number of agro industries in Brazil, including the poultry industry.[28]

Figure 6: Soybean and maize – production & exports in Brazil (1990-2017)



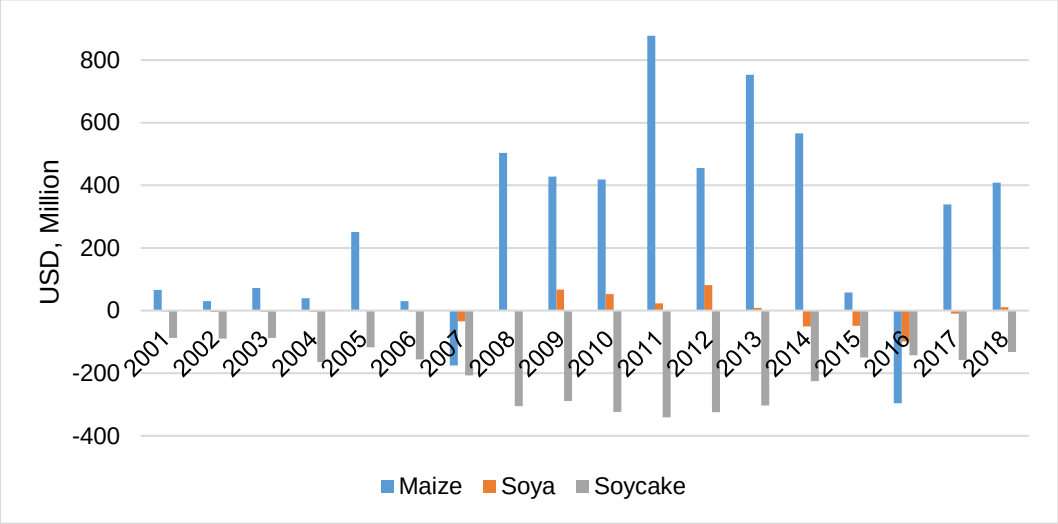
Source: Source: USDA FAS

In contrast to Brazil, South Africa does not produce sufficient inputs for feed production, in particular soybean (generally) and maize during periods of droughts. Figure 7 shows that the country is generally a net exporter of maize, except during periods of severe droughts as was the case in 2016.

[27] In the 10 years between 2008/09 and 2017/18, on average, about 51% of soybean was exported while 26% of maize was exported.

[28] Of interest is the size of farms producing soybeans in Brazil from the perspective of inclusion in the value chain. There are around 216,000 soybean producing farms in Brazil. Most farms are relatively small – there are 195,000 located in the South Region, with an average size of 34.92 hectares, while there are 13,000 farms in the Midwest Region, with an average size of 501.05 hectares (Cattelan and Dall'Agnol; 2018).

Figure 7: South Africa's maize and soya trade balance (2001-2018)



Source: Trademap. Data does not go beyond 2001

In 2016 South Africa recorded a trade deficit in maize which resulted in high prices of maize that impacted the poultry industry negatively. Apart from periods of droughts, maize prices are normally at export parity prices as a result of trade surplus position.

On the other hand, though South Africa has been a net exporter of soybean in a number of years, the local poultry industry consumes significant amounts of imported soycake as demonstrated by substantial trade deficit in figure 7 above, that is, the actual demand for soya is understated. While local soybean production has increased significantly in the past five years or so due to increased area of plantation, this has not been sufficient to meet demand. Furthermore, it is unlikely that South African soybean producers will be in a position to meet such demand in the longer term, given unfavorable climate conditions and limited planting area for soybean (which competes with that of yellow maize).

Soybean production is expected to be impacted by climate change in South Africa.[29] The implications of future climate projections is that while expansion of climatically suitable areas for soybean production might occur, there is also a likelihood that the area of actual production may become more concentrated.[30] Soybean is likely to experience no change or an increase in average annual crop yields as precipitation increases offset higher evaporation rates in regions where these crops are grown.[31] Increasing drought events, as projected, have and will continue to impact on soybean production. [32]

[29] Temperatures are expected to increase drastically under low mitigation, and it is likely that the larger South African region will experience generally drier conditions. Dry spells, flood events, heatwaves and high fire danger days are expected to increase compared to a base period of 1971-2000 – https://www.environment.gov.za/sites/default/files/reports/nationalclimate_changeadaptation_strategyforcomment_nccas.pdf

[30] https://www.environment.gov.za/sites/default/files/docs/implications_climatechange_foragriculture.pdf

[31] https://www.wider.unu.edu/publication/climate-change-effects-irrigation-demand-and-crop-yields-south-africa

[32] See for instance *https://www.theguardian.com/global-development/2015/nov/17/farmers-bear-brunt-of-south-africas-severe-drought-all-we-can-do-is-pray* and *https://www.fin24.com/Economy/drought-hurts-sa-maize-soy-plantings-grain-sa-says-20181229*.

3.3. Competitiveness of the value chains

Broiler Production Efficiency

Technical efficiency is critical for the overall competitiveness of the poultry industry. The feed conversion ratio (kg of feed used to produce a kg of meat) is a good indicator of production efficiency of any producer. Lower values of the feed conversion ratio indicate high production efficiency in that smaller amounts of feed are required to produce a kilogram of meat. Feed conversion ratios have improved steadily in Brazil over time (Table 2 below). Furthermore, while live weights have been increasing, slaughter age has been decreasing, indicating greater efficiencies, that is, a shorter production cycle to grow bigger chickens. Mortality rates have also been decreasing over time.

Table 2: Brazil technical efficiency and production cycle (1990-2018)

			Aurora[33]				
	1990	**2000**	***2010***	***2012***	***2014***	***2016***	***2018***
Feed conversion ratio (FCR)(quantity of feed to produce 1kg of meat)	2.00	1.88	*1.78*	*1.77*	*1.77*	*1.74*	*1.72*
Average liveweight	1.94	2.25	*2.70*	*2.67*	*2.80*	*2.88*	*2.95*
Average slaughter age (days)	47	43	*45.59*	*45.75*	*46.71*	*46.56*	*44.99*
Mortality rate%			*3.78*	*3.81*	*4.16*	*3.32*	*3.40*

Source: Waker and Naas (2018); Data for 2010 to 2018 is from Aurora, the third largest producer

In South Africa, the feed conversion ratio worsened between 2011 and 2015 from 1.68 in 2011 to 1.7 in 2015 (Table 3), and then improved significantly from 1.7 in 2015 to 1.5 in 2018. There were improvements in in the length of the production cycle as indicated by declining slaughter age in the period. The improvement in the feed conversion ratio is in line with the improvement in the length of the production cycle.

Table 3: South Africa technical efficiency and production cycle (2011-2018)

	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
FCR	1.68	1.69	1.70	1.70	1.70	1.60	1.60	1.50
Slaughter age (days)	34.63	34.78	34.3	33.61	33.89	33.68	32.59	33.27
Live weights	1.80	1.81	1.80	1.78	1.79	1.83	1.80	1.85

Source: Astral annual reports; BFAP (2017); own calculations

International comparisons of feed conversion ratios must account for slaughter weights, as feed conversion declines when birds get older, and hence a longer growing period would be accompanied by a higher feed conversion ratio. Put differently, the efficiency of feed conversion declines as the length of the production cycle increases (Van Horne, 2013). While South Africa appears to be an efficient producer, the FCR values in table 3 above are not directly comparable to Brazil since South Africa produces relatively smaller-sized chickens as demonstrated by the live weights. Nevertheless, South Africa's FCR has improved, indicative of efficiency gains. While some studies suggest that South Africa is an efficient producer

[33] Based on interview at Aurora (22/02/2019).

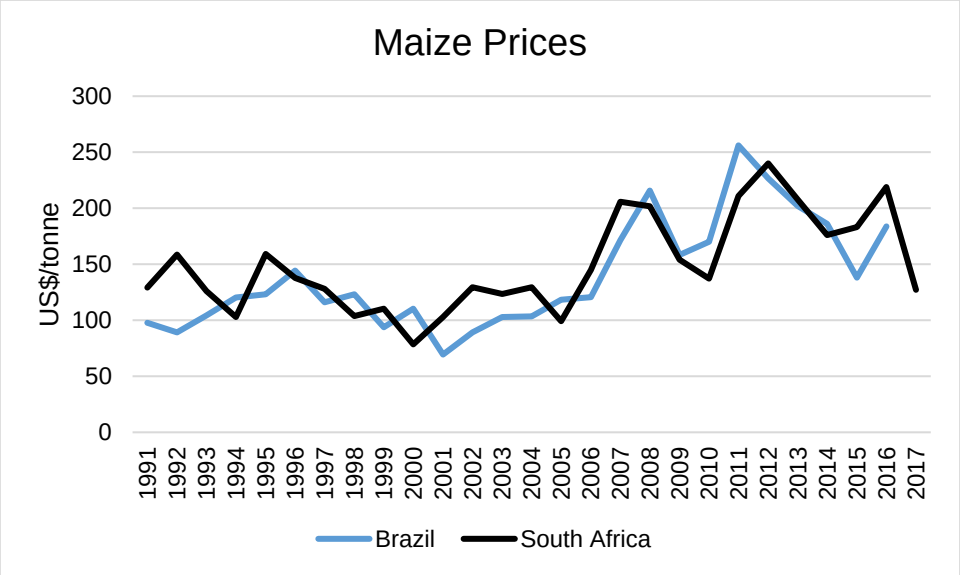
(Davids and Meyer, 2017; BFAP, 2017), Zengeni (2017) standardizes feed conversion ratios to 1.8kg of bird using 2012/2013 data, and finds that South Africa is less efficient than Brazil.

Maize and soybean prices, and the cost of feed

Since feed is the major input cost for production of broilers, the price of feed (composed mainly of maize and soya) drives the cost of producing broilers. Since South Africa is a net exporter of maize, except during years (i.e. 2015/16), the price of maize is at export parity and comparable to prices in Brazil (Figure 8). However droughts are likely to be more frequent in future given the changing climate conditions.

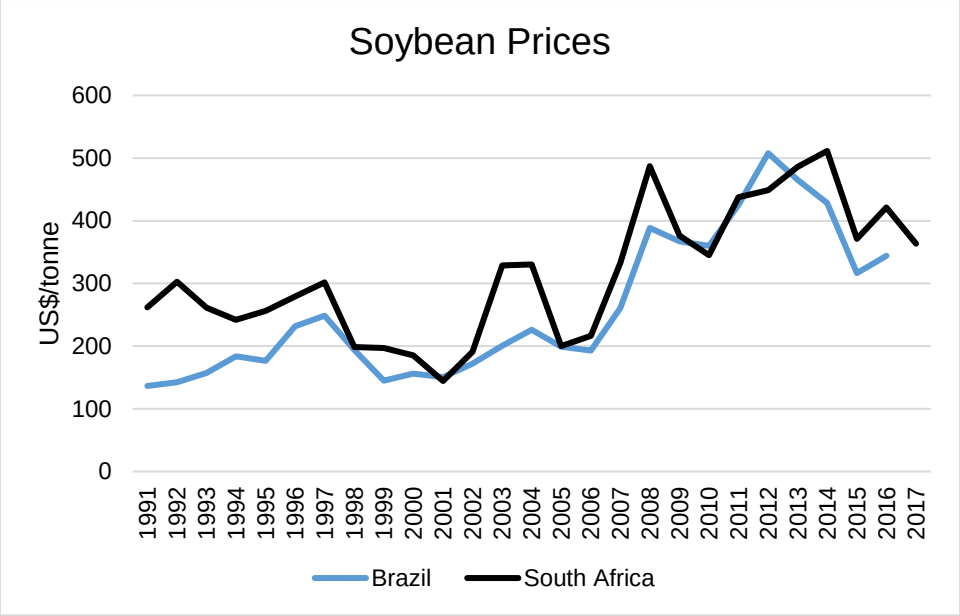
On the other hand the country is a significant net importer of soy products due to limited local production. There is also a tariff for soybeans 8% of the fob price, though EU and SADC countries are exempt from this.[34] The prices of soybean are generally higher at import parity and more in line with international benchmarks. The South African futures market determines domestic prices on a daily basis. The domestic price (SAFEX) normally follows the import-derived price (based on soymeal and oil).

Figure 8: Producer prices of maize & soybean in Brazil and South Africa, US$/tonne



Source: FAOSTAT
Notes: Prices are farmgate producer prices

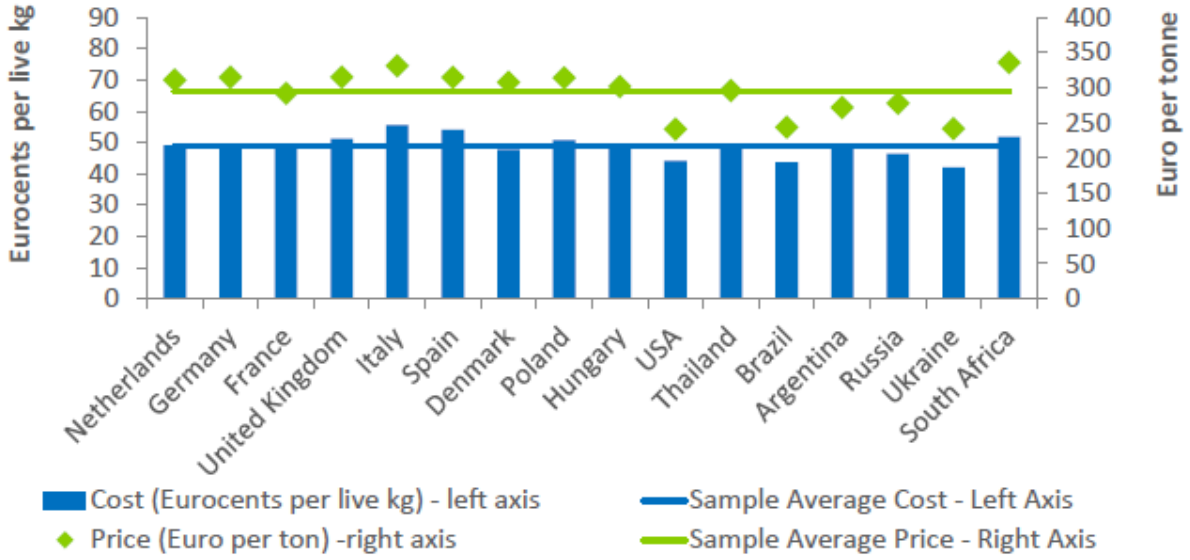
[34] http://www.sagis.org.za/import_tariffs.html



Source: FAOSTAT
Notes: Prices are farmgate producer prices

As a result of the fact that the energy source for meal (yellow maize) is competitively priced, but the protein source (soy) is more expensive than in countries like Brazil, Argentina and the US (which are net exporters of soy), South Africa's cost per tonne of feed is generally less competitive than countries who are exporters of both maize and soybean (Figure 9). In 2017, South Africa's cost per tonne of feed (Euros 330/tonne) was around 32% higher than Brazil's (Euros 250/tonne). This is in a year in which maize prices in South Africa were relatively low.

Figure 9: Feed costs in South Africa relative to leading producers, 2017



Source: BFAP (2019)

When looking at feed costs per live kg, South Africa performs abit better. South Africa's feed cost per live kg (51 Eurocents per live kg) were 19% higher than Brazil's (43 Eurocents per

live kg). Thus, when accounting for the production process in calculating the cost of feed, South Africa performs a bit better than when using the simple cost per tonne indicator. This implies that South Africa is a relatively efficient producer, but is hampered by the cost of feed. South Africa does however produce smaller birds than comparator countries, thus requiring less feed, and this may also partly explain these results. Nevertheless, it is clear that the cost of feed is a significant challenge for producers in South Africa.

The total broiler production costs (not shown here) in South Africa in 2017 were typically lower than most EU producers but higher than leading exporters like Brazil and the USA, mainly due to the cost of feed (BFAP, 2019).

4. Power and the role of the state in the poultry value chain in SA and Brazil

4.1. Main sources of power along the value chain in SA and Brazil

In this section, the *main* sources of power in the value chain are discussed as per the typology developed by Dallas et al (2018) and discussed in section 2.

South Africa: There are three main centres of power in the poultry value chain in South Africa. These are grain producers, poultry producers and retailers, while producers additionally exert power through their industry body.

One of the most important sources of power in the poultry value chain are grain producers (*bargaining power*). Given that 50-70% of broiler production costs are attributed to feed, of which 70–80% comes from maize and soya costs, grain producers are important players in the value chain. South Africa has pursued a soybean strategy of supporting local soybean producers; it has imposed a tariff of 8% on the fob price of soybean and invested in soybean crushing capacity. Production of soybean has increased substantially in the past few years but imports of soy products are substantial as demand outweighs supply. Imports are mainly in the form of soycake, despite excess crushing capacity; poultry producers prefer imported soycake over locally crushed soya due to perceptions of quality differences. About a third of the existing crushing capacity is being utilized.

The tariff on soybeans increases the return to soybean farmers but makes poultry producers less competitive. This is despite the fact that soybean farmers are not expected to shift to being net exporters as South Africa does not have favorable climate conditions and soil quality to grow sufficient soybean (Ncube et al., 2016). Given that feed costs account for the majority of poultry production costs, policies to support soybean farmers impacts on the competitiveness of the value chain. Moreover, from 1 March 2019, producers will be charged a statutory Breeding and Technology levy of R65 for every tonne of soybean sold.[35] This levy will be transferred to seed breeding companies and research institutions based on their seed sales market share,[36] in order to stimulate investment in developing advanced seed technology.[37] These costs may be passed on to consumers of soybeans as well.

Downstream in the value chain, poultry producers exert *bargaining power*: through their vertical integration at almost every stage up to processing, poultry producers dictate the manner in which the chickens are grown, what feed they eat and at what stage they get

[35] The levy is effective from 1 March 2019 to 29 February 2020. Thereafter the levy will increase to R80 per tonne until 28 February 2021.
[36] https://www.bfap.co.za/wp-content/uploads/2018/10/BFAP-End-Point-Royalties.pdf
[37] https://www.bizcommunity.com/Article/196/742/187884.html

slaughtered. Economies of scale mean that there are relatively few producers due to significant capital investment requirements.

The producers are organized through an industry body – South African Poultry Association (SAPA).[38] The association exerts *institutional power* (direct power exerted by collectives). The Association has been instrumental in lobbying for its members, including getting import tariffs approved; passing the Livestock Improvement Act; influencing bilateral Trade Agreements; and dealing with legal challenges through the courts (SAPA, 2016). As a result of lobbying by the industry, a number of protection measures have been implemented in the past 6 years.[39]

Nevertheless, the power of producers in the value chain was not sufficient to prevent the USA from gaining duty free access to the local market through the 65,000 tons quota under AGOA. SAPA launched a court challenge in 2016 on the basis that Salmonella testing standards were lowered to suit the US poultry imports under AGOA (Astral, 2016). In August 2018, the Association launched another court challenge attempting to set aside the quota altogether.[40] Given that the potential retaliation by the USA – and consequences to other sectors – it is unlikely that attempts by the Association to set aside the quota will be successful.

Vertical integration and the continued consolidation in the industry have contributed to the relative *bargaining power* of poultry producers.[41] The oligopolistic nature of industry makes it susceptible to collusion. The Competition Commission of South Africa has in the past investigated a case of price-fixing against major poultry producers, namely Rainbow, Astral, CBH and Afgri (presently known as Daybreak). The Commission received a leniency application from Pioneer with respect to cartel behaviour in the market for fresh chicken products in the Western and Eastern Cape. This matter formed part of the Commission's landmark R960m ($117.07m) settlement with Pioneer in November 2010. Astral subsequently admitted to collusive conduct in that market and has settled with the Commission.

Access to breeding stock is another lever used by producers to exert power on the value chain. Only three major producers have licenses with multinationals (with intellectual property rights to breeds) to supply the local market with quality breeds, and other producers have to access these breeds through these three major producers. This is in contrast to Brazil where the multinationals provide them directly to the Brazilian market, making access by small producers relatively easier than in South Africa. South African producers have used access to breeding stock to control the market, to the detriment of the poultry sector. In the early 2000s, the breeding stock market was effectively a duopoly, with Astral having a market share of 69% of

[38] SAPA is funded by producers through a statutory levy. It is involved in a continuous process of identifying issues affecting the industry, and serves as the industry's collective voice to the public and to government (SAPA, 2016).

[39] On 30 September 2013 ITAC introduced a General Rate of Duty on imported poultry products (ITAC, 2017). In 2015, ITAC further implemented anti-dumping duties ranging from approximately 22% to 73% against poultry imports from the UK, Netherlands and Germany (Astral, 2015). Furthermore, the European Partnership Agreement (EPA) safeguard for poultry imports from the EU was imposed on 28 September 2018 (Astral, 2018), with the safeguard duty on EU frozen bone-in portions as follows: 35.3% from 28 September 2018 up to and including 11 March 2019; 30% from 12 March 2019 up to and including 11 March 2020; 25% from 12 March 2020 up to and including 11 March 2021; and 15% from 12 March 2021 up to and including 11 March 2022.

[40] https://agoa.info/news/article/15510-south-african-poultry-group-targets-us-import-quota.html

[41] There has been consolidation in the poultry industry with the liquidation sales of distressed assets of small-sized producers, some of which Astral purchased (Astral, 2014). There was also a recently failed attempt by CBH to acquire Sovereign Foods, which was ultimately by acquired by a private equity firm (Capital Works) at a much higher premium than what CBH had offered (Astral, 2017).

breeding stock sold through its Ross brand, while its main competitor, Cobb, had a market share of 26% of the great grandparent market (Ncube et al, 2016). Since 1992, the third most significant producer CBH was locked into a supply agreement that compelled it to buy 90% of its breeding stock from Astral. CBH took the case to the Competition Commission, who intervened on the basis of exclusionary conduct. CBH subsequently introduced the Arbor Acres breed into the market, which led to increased rivalry at breeding stock level and filtered through to strengthen competition at the broiler level (Grimbeek and Lekezwa, 2013).

Retailers hold significant buyer power in the value chain. The main route to market for poultry products is retail (about 50% of all produce), followed by the Quick Service Restaurants (QSR), with a small proportion of sales through informal channels (Ncube et al, 2016).[42] The wide distribution networks and market reach of retailers have enabled them to accumulate significant buyer power to practically dictate terms of business with suppliers, and hence influence the trajectory of the value chain. Both retailers and QSRs impose requirements on poultry producers, including rearing conditions of chickens, various packaging denominations; whether the chickens are individually quick frozen (IQF) or fresh. There are also requirements with respect to weight and/or size of chicken and types of cuts. Thus, retailers have exerted significant pressure on chicken suppliers through product specification and several other listing requirements. Chicken is however a must-have product for retailers given the high consumer demand.

The poultry value chain is also influenced by consumer tastes and standards (*constitutive power*). Although customers are not organised into clear or formal common membership, their conventions regarding how to define 'quality' as well as their demand for certain types of cuts is instrumental in terms of driving key investments by leading producers in the industry. For instance brining regulations have been significantly influenced by the media, with new brining regulations[43] for individually quick frozen (IQF) portions from the 22 October 2016, despite SAPA launching a court action against the regulations (Astral, 2016). The outbreak of listeriosis has also induced significant backlash towards poultry producers by civil organisations (*constitutive power*).

The balance of power in the poultry value chain lies with industry and grain producers, evidenced by the industry's successful lobbying for protection as well as import tariffs on soybeans.

Brazil: There are four main sources of power in the Brazilian value chain: government, producers, farmers and consumers.

Government has been an integral player in the poultry value chain in Brazil, impacting significantly on outcomes. This ranges from transforming the agricultural system in Brazil through technology and research in order to produce soybean on a phenomenal scale, to supporting farmers and producers with subsidized credit, to funding research and providing extension services. In sum, government coordination and support along the poultry value

[42] Most of the chicken produce is sold through retailers is in the form of individually quick frozen (IQF) pieces or fresh. However there has been significant shifts towards the QSR market in the past couple of years in order to reduce exposure to competition with imports. For example, RCL reduced the production of IQF from 62% in 2012 to half the total production in 2016 (ITAC, 2017; and RCL, 2016), while Astral reduced its production of IQF from 54% in 2014 to 49% in 2018 (Astral, 2014 & 2018).

[43] The legislation was promulgated by the Department of Agriculture, Forestry and Fisheries (DAFF). The total brine injection allowed for individual portions is now limited to a maximum of 15%, versus the previous uncapped and unregulated industry brining practices.

chain has resulted in a competitive and export-oriented poultry industry. We return to a deeper discussion of the impact of government policies on capability development in the Brazilian poultry value chain in section 5.2 below (*institutional power)*.

As in South Africa, producers in Brazil wield significant power in the value chain, and through the system of contract-growers impact on poultry farmers, dictating chicken growth and slaughter, feed, and use of breedstock (*bargaining power*). In Brazil, two main producers dominate the market. More generally, Brazilian producers have been a driving force in the industry, playing a significant role in opening up markets.[44] Importantly though, in Brazil, smaller processors are represented in the Brazilian value chain through cooperatives.

All significant producers are represented at the industry association ABPA (Brazilian Association of Animal Protein) (*institutional power*). They are very well organized through the industry association as well as state and local organizations (which are also represented at ABPA). The industry uses this forum to identify specific issues to be dealt with, and to negotiate with government as far as support and challenges are concerned, including support for export promotion activities.

In the relationship between producers and farmers, producers wield substantial power. Industrial conglomerates have huge bargaining power to impose contracts, and fulfilling these contracts often requires substantial investment from farmers (Repórter Brasil, 2016; EPAGRI Interview)[45]. Costs related to international trends are also passed down to farmers. For instance, European countries are concerned about the "welfare of the bird", and processors expect farmers to bear the costs related to these concerns.

The weight of chickens and amount of feed consumed are the main criteria used in the formula to calculate producers' payments by poultry processors. However, payment criteria are complex and many farmers struggle to understand them (Repórter Brasil, 2016). As a result of dissatisfaction among contract growers, Brazil is looking at an "integration bill" to regulate the relationship between farmers and producers by establishing a legal framework and pushing for greater transparency (Repórter Brasil, 2016).

While farmers wield substantially less power in the value chain than processors, the interests of farmers, and smaller farmers in particular (or family farmers), are given a significant amount of importance when contrasted with the South African case. Family farming is significant in Brazil, accounting for an estimated 90% of poultry farmers.[46] Over time, significant support has been given to crop and poultry farmers through rural and family farming support policies, with significant subsidized credit and working capital made available. In addition, smaller farmers are given extension support through institutions like EMBRAPA, and have been kept at the frontier through public investments in R&D in the sector which has been widely disseminated.

Consumers are also a source of power in the value chain. Though the majority of poultry in Brazil is consumed locally, Brazil is also the largest exporter of poultry meat in the world. There are requirements on the poultry industry from both local and international consumers (*constitutive power*). Ethical and environmental requirements are governed and shaped by

[44] International exports to Saudi Arabia were opened up by two large companies (Sadia and Pedigao) who went to the Middle East in order to set up contacts there and open the market. This then opened the market to other players as well (Interview at Aurora (22/02/2019).
[45] Interview at EPAGRI (22/02/2019).
[46] Interview at EPAGRI (22/02/2019). There are currently concerns around succession, since the average age of farmers is around 50 years (Interview at EPAGRI (22/02/2019).

mechanisms of broad-based collective action or social movements as well as conventions by consumers and retailers. This illustrates an exercise of *constitutive power* of customers and industry quality standards (Dallas et al., 2018). Considerations include the cuts, weight/size, packaging and quality of meat. Saudi Arabia demands 1kg frozen birds, Japan demands deboned legs, and European countries demand breast portions.[47] International pressures also impact on the rearing of birds, with concerns raised from consumers on issues like the use of antibiotics and the welfare of birds.[48] These requirements bind the activities of poultry producers, as well as farmers, but requirements with regard to rearing conditions are generally passed on to farmers, imposing additional costs on them.[49] At present, processors expect farmers to build dark houses for chickens, costing around R$1million.[50]

4.2. Reflecting on the impact of state support and coordination in SA and Brazil

The state in Brazil has played quite a different role to the state in South Africa with regard to building capabilities in the poultry industry. While the poultry value chain is well-coordinated and supported in Brazil, it is not in South Africa. There is no strategy in place that brings together critical aspects of the value chain such as access to cheap animal feed, access to development finance for new entrants, access to breeding stock, and research and development. In Brazil the policy framework has addressed the value chain, most clearly illustrated in the links between soya and poultry production. In South Africa, there has not been an effective value chain approach and the focus has been at the downstream level on protection for poultry without addressing the key issues on the input side, namely access to competitively priced soya for poultry production. The analysis below focuses on coordination of the value chain in Brazil, and the lack thereof in South Africa.

Soybean as a critical input to poultry production

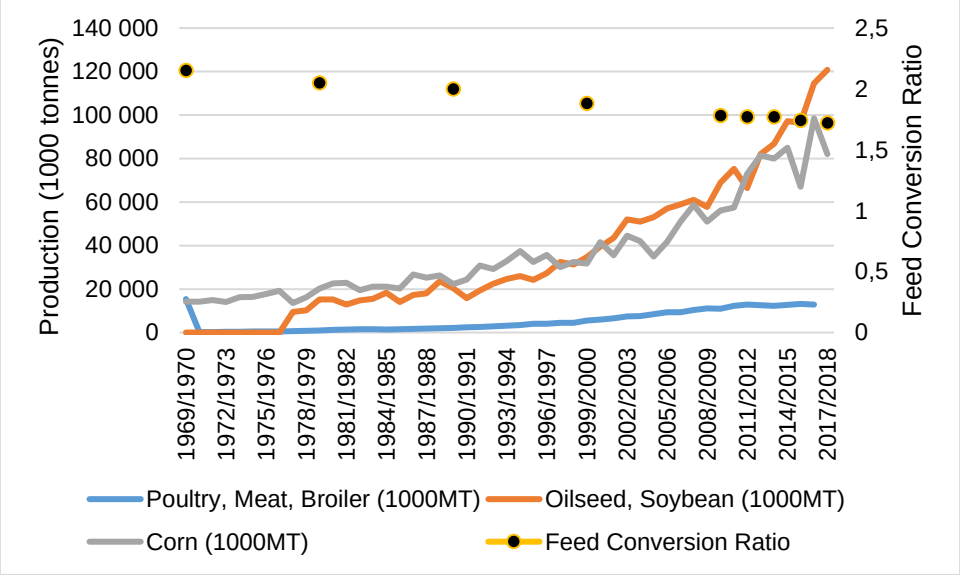
Since crop production accounts for the majority of the costs of poultry production, sourcing competitively priced maize and soybean is critical to being competitive. The foundation for Brazil as an export powerhouse in poultry was laid in the 1970s with a set of state policies that played a crucial role in constructing comparative advantage in the agriculture sector. Efforts to transform and modernize crop production through research and development laid the basis for a successful poultry industry in Brazil. This was backed by subsidized credit and agricultural extension services in order to facilitate the diffusion of new technologies. The outcome of these policies and subsequent support for the poultry has been enormous increases in crop production, together with significant growth in the poultry production and increasing efficiency (Figure 10).

The advances in crop production have been phenomenal. In particular, efforts centred around improving soybean production yielded enormous success, leading to the creation of an enormous soybean industry, and the basis for other agro industries like poultry. In fact, some have argued that the Brazilian case illustrates the remarkable capacity of state investments in R&D and related policies to yield unanticipated dividends. Between 1970 and 2010, Brazilian agricultural production more than tripled (Contini and Martha, 2010). At the centre of these efforts was the creation of EMBRAPA in 1973, the Brazilian Agricultural and Livestock Research Company (Empresa Brasileira de Pesquisa Agropecuária) to provide technological support for the development of Brazilian agriculture and livestock. EMBRAPA brought in a

[47] Interview at Aurora (22/02/2019)
[48] Interview at Aurora and interview at EPAGRI (22/02/2019)
[49] Interview at EPAGRI (22/02/2019)
[50] Interview at EPAGRI (22/02/2019).

model that set up several national centers for specific activities, including EMBRAPA Swine and Poultry. EMBRAPA was tasked with constructing a large research infrastructure of laboratory and other facilities, and was supported by substantial investments in research and development and advanced training and capacity-building.[51] It also coordinated nationwide agricultural research through the Brazilian Agricultural Research System, encompassing state agricultural research organisations, universities and its own research operations (Martha et al. 2013).

Figure 10: Poultry & Maize/Soya Production; Efficiency of Production (Brazil)



Source: USDA FAS for production; Waker and Naas and Aurora for Feed Conversion Ratios

EMBRAPA's main work was to adapt agricultural systems to the distinctive ecosystems of Brazil. Substantial investments were made in the development of novel, science-based technologies for tropical environments, specifically in three main areas: i) soil correction and management[52]; ii) plant genetics and new seed varieties[53]; iii) improved agricultural practices, including soil recuperation, 'no-till' agriculture and integrated systems of crop production and cattle grazing.[54] It was also discovered that inoculating soybean seeds with nitrogen-fixing bacterias almost eliminated the need for nitrogen fertilisers, leading to savings estimated at R$7.5 billion/year (Correa and Schmidt, 2014). This is now applied throughout the soybean

[51] By the late 1970s, EMBRAPA had nearly 1,000 researchers, including agronomists and veterinary personnel specialising in plant production, genetic improvement, soil science and phytopathology, and biotechnology (Wilkinson and Sorj, 1992).

[52] To reduce the soil's toxicity, EMBRAPA deployed a technique called agricultural liming, applying massive quantities of lime to the soil to lower acidity and neutralise its pH levels, along with phosphorus to improve fertility.

[53] Soy cultivars suited to the climate as well as cultivars with greater resistance to pests and diseases, and varieties that grow more quickly.

[54] The increase in soy production was possible as a result of moving maize production later in the season in the cerrado. Early soybean varieties are sown in early spring with harvesting in early summer, followed by maize, which takes advantage of the last rains of the seasons. This is feasible provided both crops are produced using a no-till system to avoid delays in sowing and loss of moisture. This strategy liberated extensive areas for soybean that were previously cultivated with maize. From 1991 to 2016, the area of first crop maize (spring/summer season) was reduced by 57% while the area of second crop maize (summer/autumn season) increased almost fifteenfold.

crop, with a saving of over 5 million tonnes of nitrogen fertilizer annually and some 80% of fertilizer costs.

Government intervention, supported by technical assistance from Japan, was instrumental in the process of transforming the savannah into the agricultural heartland of the country (Ohno, 2014). The sector changed from traditional to science-based. Soybean production increased from 1 million tons in 1970 to 114 million tons in 2017. Thus, state-led innovation was central to the increase in productivity and to the territorial expansion of agriculture, which lowered the overall costs and increased the yields of Brazilian agriculture (Rada and Valdes, 2012).

In contrast, South Africa's soybean strategy has not resulted in cheaper soya for the poultry industry. The soya strategy in 2012 focused primarily on increasing the country' soybean crushing capacity, in response to large amounts of imports of soymeal. As a result, 1.75 million tonnes of dedicated soybean crushing capacity was established in South Africa, which represents a total capital investment of approximately R2 billion (BFAP, 2018). At the same time, soybean imports are subjected to a tariff. While soybean production has increased substantially in the past couple of years, it is unclear how much production can expand given the shortage of planting land, as well as unfavorable climate conditions. Currently soybean production competes with maize production for planting land[55]; soybean is suitable for crop rotation with maize (Dlamini et al, 2014). Expansion in soybean production could come at the expense of yellow maize area, as both crops are grown in the eastern part of the country.

The results are continued imports of significant amounts of soycake[56], excess crushing capacity[57], and soybean prices at import parity.There is subdued demand for locally produced soybean cake because some chicken producers in SA still prefer imported soybean cake above the locally produced cake (BFAP, 2018).

Subsidized credit for farming and poultry production

Brazil's policies for the poultry value chain have included subsidized credit for farmers as well as poultry producers. The National Rural Credit System (SNCR) was established in 1965 with the purpose of providing rural credit at low interest rates to help producers finance agricultural outputs and machinery, as well as operating costs and product marketing. Three key objectives of the rural credit policy created in 1965 remain in effect today (Lopez and Lowery, 2015): i) access to credit at below-market interest rates; ii) the legal requirement that banks devote a portion of their checking deposits to rural credit lines; and iii) small and family farmers benefit from even lower interest rates by targeted credit lines.

PRONAF and support for Family Farms: In the late 1980s and 90s, Brazil instituted a set of social and sectoral policies, one of which was a support programme for the rural poor involved in family farming, launched in 1996 (PRONAF – National Programme to Strengthen Family Farming) (Buainain et al., 2014). PRONAF supported family farmers by providing a credit line for financing production and for operating and investment expenses. It was intensified in 2003 under President Lula as part of the *Zero Hunger* programme to combat rural poverty and improve the quality of life for the rural poor (Buainain et al., 2014).[58]

[55] See commentary by Agribiz's agricultural economist Wandile Sihlobo, available at: https://wandilesihlobo.com/2018/09/11/south-africas-soybean-success-story/

[56] Around 450 thousand tonnes of soybean cake is imported.

[57] Excess crushing capacity is despite closing down of a crushing plant on the Reef following explosion/fire damage, which reduced available crushing capacity by 150,000 tonnes (BFAP, 2018).

[58] PRONAF operations are coordinated by the Minister of Agrarian Development (MDA) in collaboration with the Ministry of Treasury, the Bank of Brazil and other banks. The main sources of PRONAF funding

The principal financial agent for PRONAF is the Bank of Brazil (Banco do Brazil), which has an extensive network of branches throughout the country and a long tradition of working with rural credit. When PRONAF was launched, its nominal interest rate ranged from 16 to 12%, but interest rates have gradually been lowered, and in 2015, costing and investment lines started at a rate of 2.5% to 5.5% per annum. Interest rates are much more attractive than commercial rates and have been a strong stimulus for family farming.

In the early years, PRONAF's activities were concentrated in Brazil's South region. During the expansion of soybean production, the bridge loans provided by PRONAF helped farmers to keep producing and stay on the land, averting migration to the towns. It also played an important role in helping producers gain access to and apply the new productive systems that were being developed by EMBRAPA, and enabled large producers from the Southern states (Rio Grande do Sul, Parana and São Paulo) that had constituted the traditional centre of commercial agriculture in Brazil to expand their operations into the cerrado.

During the 2002/03 harvest year, a total of R$2.4 billion was executed, and this increased tenfold in 10 years to $24 billion by 2014/15. In 2013, activities supported included cultivation of soybeans (8.7%) and corn (8.3%). Bridge loans[59] accounted for over 80% of the credit extended by PRONAF (reference).

Subsidized credit for investment: In agriculture value chains, BNDES provides cheap loans on second-tier investments, which are basically larger operations with agro-industry and cooperatives. BNDES was very important as far as movement of crop production in the cerrados was concerned, financing machine equipment, farm vehicles etc.[60] Furthermore, from the 1960s through to the end of the 80s, when poultry started becoming more industrialised, there was significant subsidized credit available to poultry processors through BNDES[61], including for setting up contract-grower operations. Brazilian chicken meat exports began in 1975, when 3,500 tons were exported to the Middle East.

In the 1980s, Brazilian commercial poultry production, with the help of subsidized finance, established itself as competitive, organized, and integrated (>75%), and was annually exporting more than 200,000 tons of chicken meat, and competing with the United States and European countries. The greatest innovation in the 1980s was the introduction of the cut-up line in the processing plants, i.e., transforming the whole chicken in to parts, bone-in or deboned.

In the 1990s, there were deep changes in the poultry industry, with increasing internationalization and merging of the large companies in the South of Brazil, particularly the five largest. From 2007 to 2013 Brazil implemented the National Champions Policy, with the aim of strengthening Brazilian multinationals in order to make them globally competitive. BNDES helped to consolidate the JBS and BRF groups as absolute leaders in Brazilian poultry production.[62]

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are the Workers Support Fund (FAT), Constitutional Financing Funds, rural savings accounts, banking demandables and the National Budget.

[59] Bridge loans help farmers cover running costs between harvests (inputs, electricity, and so forth).

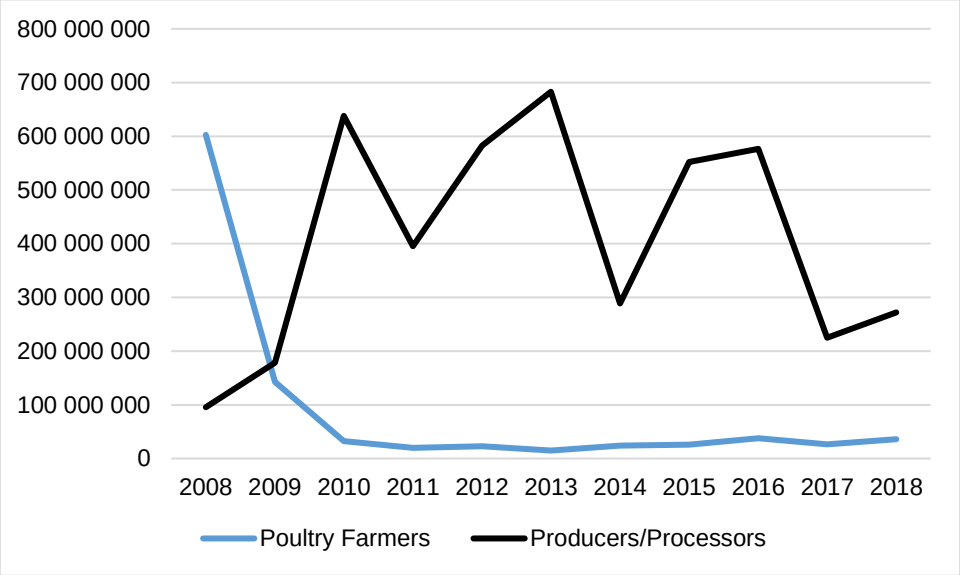
[60] Interview at Federal Rural University of Rio de Janeiro.

[61] The Agri-Industrial Reconversion Fund (FUNAR) was set up in 1965 to administer funds arising out of the Land Statute Act which had been entrusted to BNDES. FUNAR funded livestock and industrial projects in agriculture. The funding provided by government was a stimulus for those choosing to stay in the countryside (UBABEF, 2011).

[62] In 2009, Sadia –the largest poultry processor in Brazil – faced difficulties and announced its merger with main historical rival Perdigão. This gave rise to BRF in a transaction sponsored by pension funds from state enterprises and BNDES (which acquired the new company's shares). JBS also received equity investments and major loans from BNDES. In 2016, it held 24% of JBS shares (Monitor, 2016).

Loans for the sector currently come through *Plano Safra*, which allocates money to the agriculture sector annually, a portion of which goes to BNDES and is used across agriculture to fund capital investments. BNDES has disbursed R$ 5,471 million to the sector between 2008 and 2018, with the majority (82%) going to poultry producers (Figure 11).

Figure 11: BNDES Disbursements for Poultry Value Chain (R$) (2008 to 2018)



Source: BNDES

In sum, subsidized credit for farming and production/processing has been integral to the growth of the poultry value chain in Brazil, and has allowed farmers and producers to adapt to an evolving sector that has advanced technologically. Critically, it has also allowed smaller farmers and producers to make the necessary investments in order to keep up with advancements. BNDES has calculated that from 2007 to 2014, it was responsible for 83% of total sector growth.[63]

In contrast, in South Africa, there have been isolated cases of investment support by the government. A case in point is the support for the entry of Grain Fields Chicken (GFC), which saw a total investment of R350 million, with the abattoir alone costing R200 million to construct. VKB (the parent company) borrowed approximately R88 million from the IDC which the IDC sourced from the Department of Labour's Unemployment Insurance Fund (UIF) as well as from the Agro Processing Competitiveness Scheme (IDC, 2014). The role of development finance from the IDC was important, although the general lack of patient finance in South Africa limits wide scale entry. For instance, GFC had four successive years of significant losses before making a profit in its fifth year of operation. The diverse operations of its parent company, VKB, assisted in sustaining the business owners during this time.

Government has also provided grants to the poultry industry in the past. For example, Astral received a grant of R30 million from the DTI in 2013 through the Manufacturing Investment Programme Grant (Astral, 2013). The grant was part of a R200 million investment to build a feed plant in Standerton.

Government has also provided financial assistance to small scale and previously disadvantaged farmers. This is important given the increasing trend of contract farming in the poultry sector, which presents opportunities for previously disadvantaged individuals to

[63] Interview at BNDES.

participate in the value chain. DAFF plays a leading role in that regard[64], notably through Operation Phakisa (SAPA, 2016).[65] We do not know what level of assistance from various initiatives have gone to the poultry sector in particular. Nevertheless, there has not been a coordinated investment strategy which involves development finance in order to shape the trajectory of the industry and ensure entry of small players. Investments in the sector have largely been driven by the industry itself. The notable expansion by local producers into the SADC region shows how the industry has managed to spot and grab regional opportunities, without much assistance from government. These investments have largely been through acquisitions notably by Astral, Rainbow and CBH.[66]

Support in linking agriculture activities to manufacturing

In Brazil, a range of institutions have played a role in supporting poultry farmers, including companies, industry associations and government. Support revolves around pre-slaughter and environmental management, poultry transportation, biosecurity on farms, and animal welfare (UBABEF, 2011). EMBRAPA Swine and Poultry, set up in 1975, in particular, has played a key role. For the past 40 years, they have assisted with control of diseases; improvement of animal feed; improvement of genetic quality of animals; preservation of the environment and development of equipment for swine and poultry.[67] In the 20 years to 2012, EMBRAPA has contributed nearly 30% of the technological progress in poultry (UBABEF, 2012). Alongside government, the industry and farmers, EMBRAPA has worked to help meet export requirements, and make Brazilian chicken international. Both research and dissemination of research are crucial activities that have helped advance the sector.[68] Some of EMBRAPA's work in the poultry sector is reflected on below.

Biosecurity and production handling processes: One of the main areas of work of EMBRAPA has been around sanitary and production handling practices (UBABEF, 2011). Biosecurity is considered crucial, since protecting birds from avian influenza and other illnesses is integral

[64] Interview with DAFF, 5 Mach 2019

[65] Financial support from DAFF has largely been in the form of grant incentives, such as the AgriBEE fund and Comprehensive Agricultural Support Programme (CASP). The maximum grant that each farmer can apply for under the AgriBEE fund is capped at R5 million.
Beyond grant funding, DAFF had soft loan funding in the form of MAFISA, introduced in 2004. MAFISA's focus is on providing short to medium term production loans to historically disadvantaged smallholder farmers and small agribusinesses, with the maximum loan amount capped at R500 000. The absence of on-site technical assistance and mentorship has been a challenge (Mthombeni et al, 2019).
The other key provider of finance to farmers is the Land Bank, although it's selection criteria is quite strict given the need for it to be financially sustainable. Since 2008, the Land Bank has provided about R249 billion to commercial farmers, and R18 billion to emerging farmers (Mthombeni et al, 2019). Of the R18 billion to emerging farmers, R3.5 billion was provided at concessional rates capped at 4% (Mthombeni et al, 2019).

[66] For example, RCL acquired 49.0% interest in Zam Chick in Zambia and a 33.5% stake in HMH Rainbow Limited (HMH) which is a poultry producer operating a feed mill, broiler farms and processing plant in Uganda (RCL, 2013 and 2015). RCL has made further infrastructure investments in Uganda by constructing more chicken houses which will provide additional capacity (RCL, 2018). Astral has three hatcheries situated in Mozambique, Swaziland and Zambia, and breeder farms and animal feed plants in Zambia with and Mozambique. Astral had further registered a company in Ethiopia in anticipation of developing a greenfields integrated poultry business in that country (Astral, 2015).

[67] Interview at EMBRAPA Swine and Poultry (21/02/2019).

[68] EMBRAPA's Annual Master Plan is based on consultations with representatives of all segments of the poultry chain, and sets out the work's unit in conjunction with market needs and programmes. It develops projects to solve challenges, and is constantly looking at trends and new development of sustainable approaches to improve poultry productivity.

in order to export. EMBRAPA has helped farmers build control measures for avian influenza, and helped develop a range of diagnostic methods for avian diseases. It also developed vaccines, and inputs for vaccines and antigens in the past (UBABEF, 2012), and has developed ways to detect and measure selmonella.

EMBRAPA's contribution as far as on-farm practices is concerned has been very important, since improvements in on-farm production practices (e.g. floor space, feeder space per bird) constitute significant cost-reducing drivers in per-broiler feed, labor, and housing requirements (Dos Santos et. al. 1998). EMBRAPA developed prototypes for bird houses in Brazil's Midwest in the 1980s, when poultry raising was taking root in that region, thus allowing for better technical performance. Ventilation technology developed by EMBRAPA has been a crucial contribution to bird health and industry productivity. When exposed to heat stress, birds present decreased feed intake and consequently, a reduction in weight gain (MacDonald, 2014). In 2008, EMBRAPA was involved in developing protocols for best practices in chicken production. The protocol is comprehensive, reflecting on procedures along the chain from housing to the delivery of birds at slaughterhouses, including construction and maintenance of grower sheds; bird density per square meter, ventilation, and temperature control in sheds; lighting and water; and biosecurity (UBABEF, 2011).

Nutrition: Nutrition is important since animal feed constitutes the majority of cost as far as poultry farming is concerned. The aim is to optimize feed for health and reduction of costs. This includes both the composition of feed as well as feed requirements for animal health. EMBRAPA played a significant role in improvement of animal feed historically, but plays less of a role now.[69] It produced a table of the composition of feed for poultry, which was widely used. Working with both poultry producers and solutions providers (machinery companies, companies providing feed additives, etc), it provides the best feed solutions to the industry. Interaction with companies is through technical seminars, trade shows and demonstration workshops. More recently, big companies have developed significant in-house expertise as far as nutrition is concerned. For instance, Aurora employs two full-time nutritionists. However, smaller companies still rely on EMBRAPA and other research institutions.

Other: In the environmental field, EMBRAPA has developed a set of methods for treating and using poultry residues, ranging from composting to the production of biogas, as well as the production of biofertilizers that can be used in poultry farming. It is currently looking at technologies to destinate dead animals given the challenge this poses to farmers. It also undertakes specific projects with other institutions as necessary. For instance, it helped create a spreadsheet to determine drawbacks (tax exemptions on inputs for exporters) as well as a poultry production matrix.[70] One of the areas in which it now contributes is "democratization of the digital revolution" – it has developed a number of apps for measuring feed granulometry, feed energy, salmonella warning and calculating production costs.

Making technology and research available: Over time, as research and technology has resulted in improved production practices, EMBRAPA has been very active in spreading knowledge in order to boost production and keep farmers and producers at the technology frontier. It has placed a big emphasis on making technology and research available to farmers/producers, through publications, field days, courses, demonstration units, events, and

[69] Interview at EMBRAPA Swine and Poultry (21/02/2019).
[70] Interview at EMBRAPA Swine and Poultry (21/02/2019).

other initiatives. Its contribution to the industry has however been changing, with bigger companies now conducting their own research.[71]

In contrast to the Brazilian case, research and development in the poultry industry in South Africa has largely been driven by the industry. SAPA is involved in a process of researching issues affecting the industry and putting in place measures to prevent outbreaks of poultry diseases such as the highly pathogenic avian influenza (HPAI). This is on the back of the absence of a strong national veterinary service (SAPA, 2016). Furthermore, SAPA has sponsored a research Chair in Poultry Health and Production at the University of Pretoria (UP), which was formally established in August 2012 (SAPA, 2016).

Government does provide some support in terms of research-related activities. For example DAFF runs an HPAI surveillance system in order monitor and manage outbreaks of avian influenza. The Agricultural Research Council (ARC) through its Animal Sciences programme, conducts research to improve the productivity, competitiveness and sustainability of livestock-based agriculture, and to enhance the efficiency and competitiveness of the agricultural sector in South Africa. Nevertheless it is not clear what, if any, programmes have been undertaken specifically for the poultry industry.

State spending on R&D in the agriculture sector in SA (not poultry specifically) has been significantly less than in Brazil. For example in 2013, South Africa spent about 15% of Brazil's spending on agriculture R&D.[72]

Support to market

In Brazil, the poultry sector is well-supported as far as accessing export markets are concerned. Poultry producers' relationship with government has been built through the industry association, and this is the forum through which engagement with government occurs.[73]

ABPA works in two main areas: (i) market access (finding new markets and dealing with trade barriers) and technical issues (inspection; regulatory issues, etc). It has thematic working groups made up of companies that sit together regularly in order to deal with issues, for example, around sustainability, markets, logistics, etc. ABPA is considered to be well-organized and representative of the industry, giving it legitimacy as far as engagements with government are concerned.

ABPA works closely with government's export promotion agency APEX-Brasil (Brazilian Trade and Investment Promotion Agency) in promoting chicken as an export product. APEX has since 2006 been promoting the chicken industry abroad. It undertakes a number of activities, including commercial and prospective missions, business rounds, supporting Brazilian businesses in major business fairs, promotions and fairs, and visits of foreign buyers and

[71] Aurora, employs two nutritionists for feed mixing; and six technical people that give technical assistance to the farmers on ventilation; litter; etc. Interview at Aurora (22/02/2019).
[72] Calculated using data from *https://www.asti.cgiar.org*
[73] The Brazilian Poultry Union (UBA), founded in 1963, represented the domestic industry, while the Brazilian Association of Chicken Producers and Exporters (ABEF) came into being in 1976 with the goal of fostering access to new exporting markets for chicken meat, and monitoring tariffs and non-tariff barriers erected by importing countries. ABEF, supported by the government through various ministries, worked to open up new markets (UBABEF, 2011). In 2009, UBA and ABEF joined forces and gave rise to the Brazilian Poultry Association (UBABEF). Recently, UBABEF and ABIPECS (the Brazilian Meat Producers and Exporters Association) merged to form ABPA.

opinion-formers to assess Brazilian production.[74] Annually, ABPA and APEX negotiate an export promotion plan for the industry, which is then monetarily supported by both institutions. APEX has expertise in trade issues, and provides direction for international trade challenges.

One of the most important sources of support for the meat sector is the laboratory testing done by the National Network of Animal and Plant Laboratories of the Ministry of Agriculture, Livestock and Food Supply (MAPA). Different laboratory services are required at every phase of the animal and plant production chain, from the farm to the consumer (including transportation and different types of processing). The government maintained network to assure quality is coordinated by six National Animal and Plant Laboratories (Lanagros), located in the states of Pará, Rio Grande do Sul, Pernambuco, Goiás, Minas Gerais and São Paulo. These units carry out between 30 and 40% of officially requested tests, many of them exclusively (UBABEF, 2011).

Finally, poultry producers receive assistance in the form of tax exemptions (the drawback policy), and programmes that provide cash advances for export sales. The drawbacks policy has been important for stimulating exports. It consists of the suspension or elimination of taxes levied on inputs used in exported products, thus acting as an incentive for exports by reducing the cost of producing exportable products (and making these products more competitive in the international market) (UBABEF, 2012).

In contrast to the case in Brazil, where the industry tends to work together with government in developing capabilities in the industry, the association in South Africa has resorted to lobbying for protection through tariff and safe-guard measures against dumping. In the past six years alone, government has approved a number of tariff increases and anti-dumping duties. For example in September 2013 ITAC increased the general rate of customs duty to support the poultry industry to recapture the domestic market, retain and create jobs (ITAC, 2017). Prior to that, anti-dumping duties on bone-in chicken against USA were imposed in 2000 and maintained through sunset reviews in 2006 and 2012 (ITAC, 2017). Following the 2013 tariff increase, further anti-dumping duties were also imposed against Germany, the United Kingdom and the Netherlands in February 2015 (ITAC, 2017). Further safeguard duties against the EU were implemented during December 2016 although they expired in July 2017 (Astral, 2017). In 2018, the European Partnership Agreement (EPA) safeguard duty was also imposed on poultry imports into South Africa (Astral, 2018).

The DTI's poultry task team has not managed to coordinate the activities of the industry, including unlocking further investment opportunities. The task team passively interacts with the industry in response to concerns raised by the industry, largely with respect to imports.[75] DAFF has attempted to organize the industry through establishment of the poultry round table, which would bring the different stakeholders together.[76] The expectation from DAFF was that the round table will be led by the industry itself, however the industry has not shown much enthusiasm. The poultry round table has failed to take off.

The discussion above shows the fragmented nature of government's interventions in the poultry sector in South Africa, together with the industry using its power to lobby for protection. This is despite the adoption of the Agricultural Policy Action Plan (APAP) by parliament in 2015, which clearly identifies the poultry value chain for support (APAP, 2014). The plan aims at establishing a national Poultry Support Programme which would be developed and implemented in partnership with SAPA (SAPA, 2016), though this has not materialized.

[74] ABPA website.
[75] Interview with DTI member of the poultry task team, 29 January 2019
[76] Interview with DAFF, 5 March 2019

5. Implications for the SA value chain

Based on the discussion above, this section reflects on the implications for capability development in the South African value chain.

Our ability to compete in international markets is dependent on producing poultry cheaply. Production costs are higher than leading producers like Brazil and the United States (who are surplus producers of soybean), with the differences being attributed mainly to feed costs. Given the centrality of feed to poultry production, bringing the costs of feed down is critical. With the challenges in expanding soybean production in South Africa, the value chain needs to take soybean production capabilities in the greater region into account (discussed in 1. below). There is also a need for greater coordination as far as capabilities development in the sector is concerned, in order to make South Africa more competitive (discussed in 2. below).

1. Considerations for a regional feed strategy

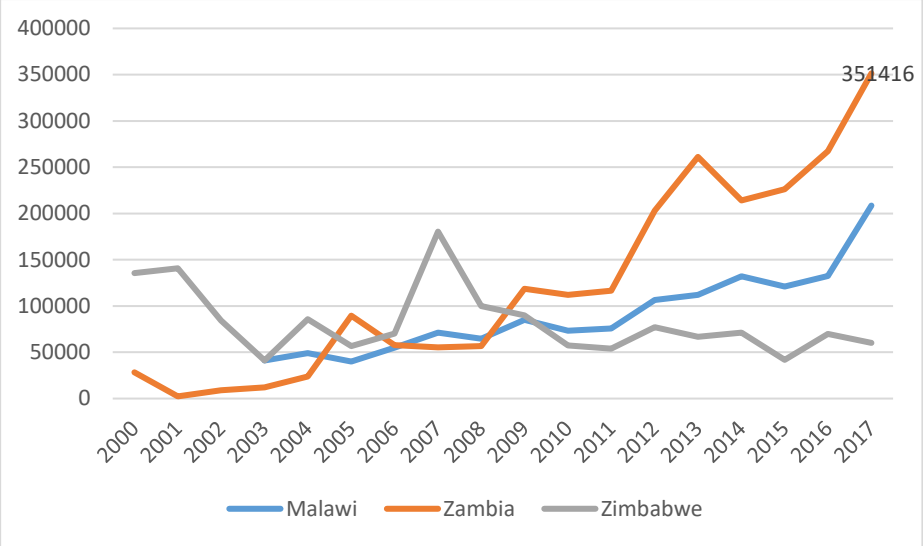
Poultry has been in high demand as the main source of animal protein in southern African countries.[77] However, the regional poultry value chain is characterised by high costs of animal feed inputs, and the region is a net importer of inputs to animal feed (Appendix 4). South Africa's soybean requirements are around 2 million tonnes/year. As a result of insufficient production, South Africa relies on imports for around half its requirements, mainly from South America. While soybean production has increased in South Africa, production at the level required to meet demand is unlikely. Soya prices will thus remain at import parity levels. A key finding from previous research is that developing a competitive poultry industry in Southern Africa requires a regional strategy for the production of low-cost animal feed inputs (maize and soya bean).[78]

Appendix 4 shows that Zambia, Malawi and Tanzania are net exporters of prepared animal feed which exhibits local production capabilities, while Malawi and Zambia are net exporters of soybean. An important development in the region has been the growth in soybean production in Zambia, particularly from 2001 to 2017 (Figure 12), which indicates potential for exports into the region. Production has however increased by increasing planting area rather than yields. Production in Zambia is expected to increase, particularly if smaller farmers are incorporated into the value chain. Importantly too, the price of soybean from Zambia is now at levels that are comparable to prices in Brazil (Figure 13 below).

Figure 12: Soybean production in Malawi, Zambia and Zimbabwe (2000-2017)

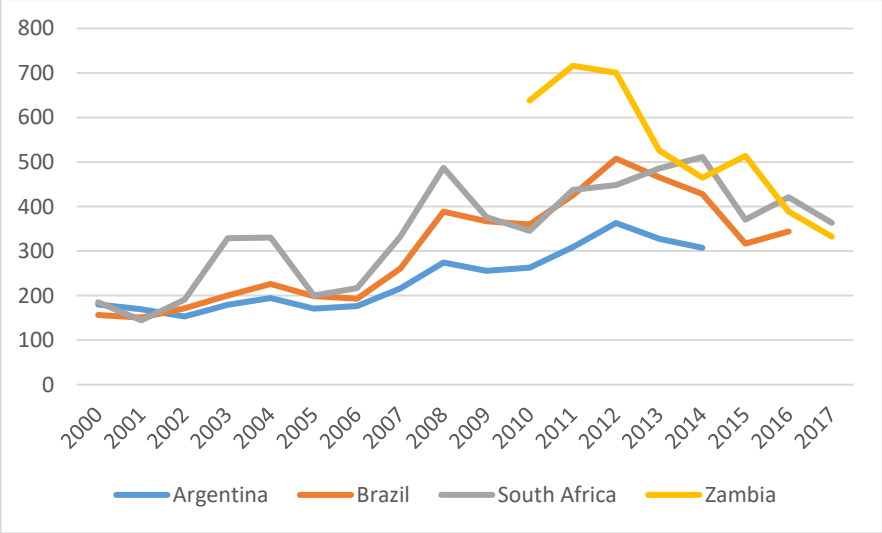
[77] Steinfield, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M. and Haan, C. (2006). Livestock's long shadow: environmental issues and options. Food and Agriculture Organization of the United Nations (FAO).

[78] Ncube, P., Roberts, S. and Zengeni, T. (2016). Development of the animal feed to poultry value chain across Botswana, South Africa, and Zimbabwe. UNU Wider Working Paper 2016/2. Available: https://www.wider.unu.edu/sites/default/files/wp2016-2.pdf (Accessed: 30 Jan 2017).



Source: Food and Agricultural Organisation of the United Nations, 2017

Figure 13: Soybean producer prices for select countries (2000-2017)



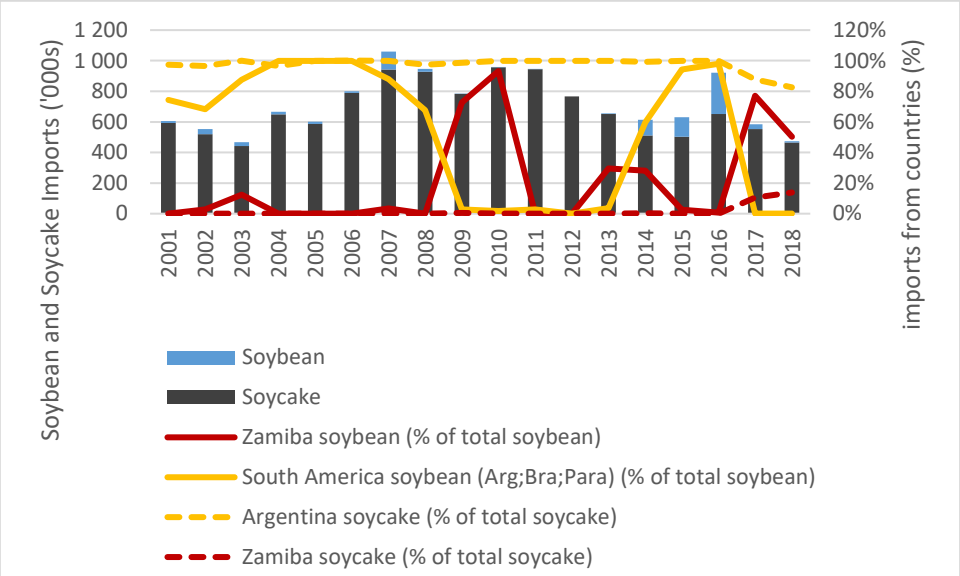
Source: Food and Agricultural Organisation of the United Nations, 2017 [check source for Zambian prices]

As far as soy imports into South Africa are concerned, overall there has been a reduction from 2010 as a result of increased local production (Figure 14).[79] Together with this, imports of both soybean and soycake from Zambia to South Africa have already begun to increase, though to a limited extent. Of the total soybean imported in 2017 and 2018, Zambia accounted for 77%

[79] The development of the new crushing plants has resulted in progressive replacement of imports by local production, yet a significant amount of soybean cake is still imported. Domestic crushing plants compete with imported oilcake produced mostly in mega plants in Argentina, putting significant pressure on domestic crushers to improve efficiencies, capacity utilisation, and to beat the quality of imported oilcake. There has generally been a preference by some chicken producers for imported rather than locally produced soybean cake (https://agribook.co.za/agronomy/soybeans/)

and 50%, while it accounted for 11 and 14% of soycake imported in 2017 and 2018, eating into Argentina's dominance in the soycake market.

Figure 14: South Africa soybean and soycake imports (2007-2018)



Source:

Production of soybean does however need to increase considerably in Zambia in order to satisfy South African demand. In theory, there is no cap on production in Zambia, as there is significant arable land (33m HA available for additional production). However, increasing production of soya in Zambia requires interventions on a number of fronts.

Production and agronomic practices

Production in Zambia is dominated by commercial farmers (85%), but there is considerable room for increases in production by smallholder farmers[80], and a growing share of production is being produced by small-scale farmers. This is partly attributed to deliberate efforts from organizations such as ZNFU and USAID funded programs (Chisanga and Sitko, 2013) (Meyer et al., 2018). Soybean is however not an attractive crop for smallholders as they lack inputs, expertise and a market.

For commercial farmers, the use and availability of basic inputs such as lime, fertilizer, herbicide, inoculant and seeds are sufficient, even though farmers face high input and fixed costs compared to neighbouring countries like South Africa (most inputs are imported). However, for smallholder farmers, usage of inputs is very low due to high costs, lack of availability and insufficient awareness of benefits (see appendix 6). There is a significant gap in the yield produced by commercial and smallholder farmers.[81] In order to increase yield, increased input use, site-specific fertilizer recommendations, and extension services provision is required (Samboko et al., 2017). Furthermore, since smallholder farmers are spread out

[80] In the 2012/2013 season, there were about 372,905 smallholder (i.e. small and medium scale) farmers who produced soya beans (ZNFU, 2013). About 72% of these smallholder farmers were classified as small scale farmers who planted, on average, 0.45 hectares per household and produced, on average, 0.4t/ha. Medium scale farmers (28% of the total number of smallholder farmers) planted, on average, 0.61 hectares per household and had a slightly higher yield of 0.66t/ha per hectare (Imakando, 2017).

[81] There is an average yield of 1.8t/ha in Zambia; commercial farmers are far more productive, with an average yield of 2.6t/ha compared to smallholder farmers' yield of 0.9t/ha (Technoserve, 2011).

across rural areas making transportation and communication expensive, incorporating them into the soya bean value chain requires coordination (for example, organising farmers into cooperatives) to facilitate communication and sharing of resources.

Policies

Input subsidy programme: One of the challenges for farmers, particularly smaller scale farmers, has been around the high costs of inputs. To deal with this, the government in Zambia introduced the Electronic Voucher Initiative during the 2015/2016 farming season to distribute subsidized seed and fertilizer, among other inputs, to smallholder farmers as part of the Farmer Input Support Program (FISP) implemented by the Ministry of Agriculture. The initiative was previously restricted to maize, but has now been expanded to include all other agricultural inputs. The expansion of the electronic voucher to all inputs could have profound impacts on diversity of crop production among smallholder farmers (Samboko et al., 2017).

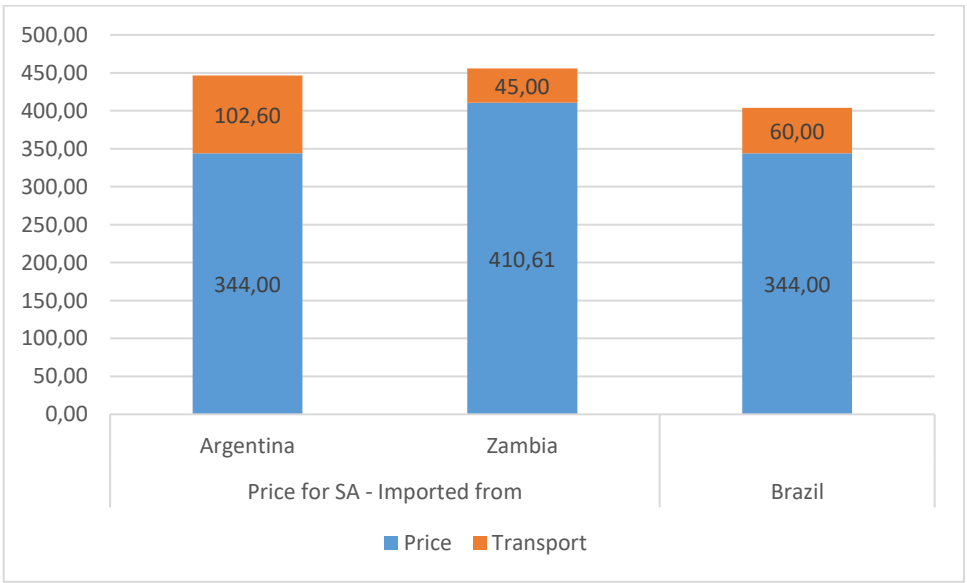
FRA: The Food Reserve Agency (FRA) is meant to stabilize the supply and prices of designated crops like maize, and is a major purchaser or smallholder maize. The FRA sets a fixed pan-territorial price for maize, generally significantly above market prices. It indirectly limits planted land for soya because the FRA's purchasing guarantee makes maize a preferential crop by encouraging maize production over other crops (Technoserve, 2011). However, government's announcement in 2016 that the FRA's role was going to be limited to managing strategic reserves and the maize market was going to be deregulated may have implications for soya production.

Transport costs

One of the big challenges for a regionalisation strategy is the cost of transport. Even though the production of soybeans in Zambia has increased and the price of soybeans is competitive, the cost of transporting Zambian soybean to South Africa has historically been so high, that it renders soybean imports from Zambia uncompetitive with Argentinian imports. The cost of transport has however come down from 2017 (CCRED, 2017).

Figure 15 below shows the price of soybean, including transport costs from Zambia and Argentina.

Figure 15: Soybean prices for South Africa and Brazil, January 2019



Source:
(i) Argentinian soy prices and transport costs from SAGIS (import parity prices of oil seeds as on 2019/01/15);
(ii) Zambian soy prices from ZAMACE (http://zamace.co.zm/trading/) (based on price of 4900KW/t using an exchange rate of 11.934 KW/USD (https://www.exchange-rates.org/history/ZMW/USD/T); Transport costs from Zambia to South Africa based on data from CCRED (2017)
(iii) Brazilian soy prices are from CEPEA; Brazil transport costs based on data collected from Grainnet

In January 2019, the price of Argentinian soya, including transport, insurance and financing costs, landed in Gauteng (Randfontein) at around $446/t (SAGIS). At this time, Zambian soya prices per tonne were around $410/t (ZAMACE), though there is significant variability in prices[82]. The cost of overland transport from Zambia to Gauteng at around $45/t, means that soybean from Zambia can be delivered in Gauteng at a competitive price of $455/t.[83]

In comparison, Brazil, soybean prices were around $343/t in January 2019 (CEPEA). Since soybean is mainly produced in the cerrado region and mainly in Matto Grosso (Appendix 5), soybean has to be transported to poultry and other industries as well as for export purposes. Freight costs from North Eastern Matto Grosso to Paranaguá – a distance of around 1,700km with poor road infrastructure – was at around $60/t. The cost of soybean in Brazil (transported over a similar distance as from Zambia to Gauteng) was thus $404, significantly cheaper than the $455/t for soybean from Zambia to Gauteng. If soybean production is supported in Zambia and the cost of soybeans is reduced, feed prices for the South African poultry industry will become competitive.

In sum, given the demand for soybean in the region and the prevalence of arable land in Zambia, there is a significant opportunity for improvement of soybean production through better incorporation of smallholder farmers into commercial production. This will require improvements in agronomic practices, financial support for upgrading, and a set of complementary policies that support soybean production. Importantly, the cost of transporting soybean from Zambia to South Africa – a distance equal to transporting soybean from Matto Gross in Brazil to the southern states – needs to remain at competitive levels.

2. Coordination and capabilities development in the sector

Brazil has implemented effective national strategies to develop an integrated value chain from the main feed inputs of maize and soya to penetrating export markets. In contrast, there has been a lack of coordinated approach to capabilities development in the poultry value chain in South Africa, with interventions being piecemeal.

Coordination between the feed and poultry sectors in Brazil has been critical. Brazil's long-term strategy to grow its soybean industry has been phenomenal, and has been the base of which industries like poultry could develop. In contrast, South Africa's strategy for procuring competitively priced feed has been poor. The tariff on soybean imports raises the costs of soybeans to poultry producers, and have thus worked against development of the value chain.

[82] The price per tonne of soybean in Zambia differs considerably between provinces. Looking at the weekly report on the Zambian National Farmers Union (ZNFU) site, prices for soya beans in Zambia range from a low of K2,800/t to a high of K5 200/t. The highest prices are obtained in Lusaka and in Central Provinces while soya beans fetch the lowest price in Southern province (https://www.africanfarming.com/farmers-question-much-bag-soya/)
[83] Transport costs were at around $110/t in 2016. These costs were reduced to around $45/t in 2017 as increased SA exports to Zambia meant cheaper backhauls were available (CCRED, 2017).

This is despite the fact that with increasing climate change (as well as other factors), it is unlikely that South Africa can become self-sufficient in soybean production.

While maize and soya in the southern African region will increasingly be impacted on by climate change, projected climate change is expected to differ in different regions in southern Africa.[84] Increasing rainfall in some regions in southern Africa signals potential opportunities for growth of feed for poultry in these regions (regional value chains). Regional value chains leverage the variability in weather conditions across countries and make the most sustainable use of endowments and capabilities in different countries. They provide a long-term strategy for improved competitiveness of local industries through increased regional production of low-cost agricultural inputs and closer integration of production and markets.[85] There are opportunities for development of a regional value chain in poultry production, given climate conditions and the availability of arable land in Zambia for production of soybean. Exports of soybean from Zambia to South Africa have already begun to increase on the back of increased production and reduced transport costs, but more needs to be done to support the sector and the development of regional value chains.

In the chicken farming and processing segments of the value chain, one of the key interventions in Brazil has been subsidized credit. Brazil's family farming policies through PRONAF as well as its development finance institution (BNDES) have played a crucial role. This has not been the case in South Africa. While the IDC has indeed funded some producers in the industry, those investments have been isolated and passive, and the overall impact has been insignificant. It is unclear what contribution other initiatives and institutions have had on the poultry sector in particular.

In addition, Brazil has placed significant emphasis on undertaking research and development in the sector, as well as disseminating research and technology, and providing support to smaller farmers and producers. In sum, subsidized credit as well as R&D and technology dissemination support has allowed Brazilian farmers and producers to make the necessary investments and adjustments in order to propel the industry forward. In contrast, capabilities development, including research and development, has largely been left with the poultry producers in South Africa. Although government established the Agricultural Research Council (ARC) in 1990, it does not seem that there is a clear linkage and collaboration with the industry. Moreover, the ARC has not done much work in the poultry sector in particular, although some work has been done for other agricultural industries.

The differences between Brazil and South Africa are stark. The Brazilian case shows that it is possible for smaller producers to be competitive within the value chain but that this requires clear policies to support them. While capabilities development by smaller players has been enabled in Brazil, the South African picture is different. In South Africa the processing sector remains dominated by large producers and has been marked by lobbying and protection, despite the fact that imports (excluding MDM imports) account for only around 17% of demand and processors have been found to engage in uncompetitive practices, including at the breeding level, to the detriment of the industry. Despite protection though, the local industry has not managed to increase production substantially, while earning significant profits in some years.[86] In addition, consumers suffer as a result of tariffs, with one study finding that every

[84] The Department of Environmental Affairs (DEA) and South African National Biodiversity Institute (SANBI). Climate change adaptation: Perspectives for the Southern African Development Community (SADC). Available here.

[85] See Farole, T. (2016) and Kaplinsky, R. and Morris, M. (2015).

[86] https://www.iol.co.za/business-report/economy/sa-emerging-chicken-importers-say-hiking-poultry-tariffs-would-hurt-consumers-21478990

10% increase in duties equals a 4.7% increase in the price of chicken on the shelf. If the import tariff increase to 82% is granted, duties on bone-in chicken would increase by 45%, which means consumers would pay 21.15% more for bone-in chicken.[87]

South Africa needs to institute policies that coordinate the development of the value chain, so that we can be more competitive. It also needs to put in place clear policies to support smaller players in the value chain. Measures could include a more considered strategy for competitively priced feed inputs (which would include a removal of tariffs and promulgation of a regional strategy), subsidized finance and support to smaller players in the industry, and significant investments in R&D and dissemination of research and technology.

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Appendix 1: List of Interviews

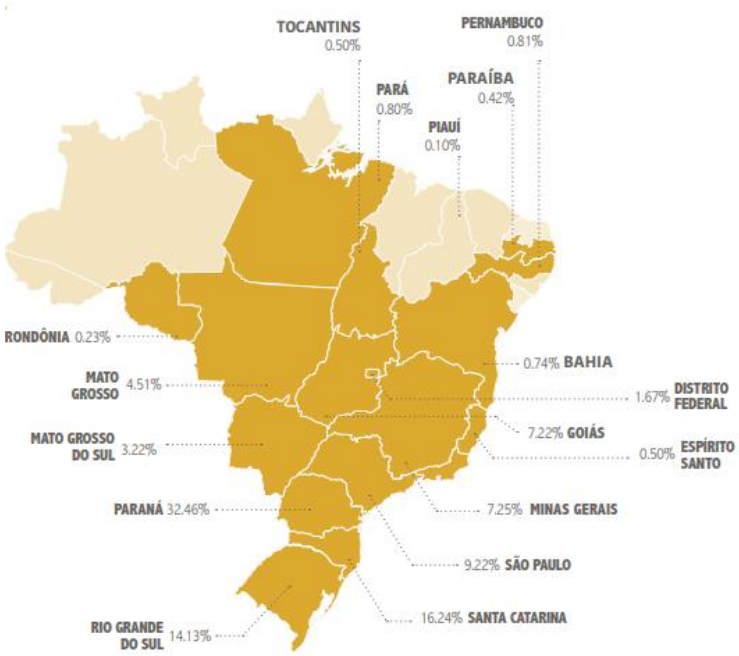
South Africa interviews		
Organization	**Person interviewed**	**Date**
SAPA	Izaak Breitenbach – General Manager: Broiler Organisation	24/01/2019
DTI	Solly Molepo	24/10/2018
DTI	Imameleng Mothebe – Director: Agro-processing	29/01/2019
DAFF	Judith Mabuso – Senior Agricultural Economist: Livestock Marketing	05/03/2019
Astral	Wimpie Kruger – Financial Manager	04/04/2019
Brazil Interviews		
Organization	**Person interviewed**	**Date**
BNDES	1. Artur Yabe Milanez – Manager Agribusiness and Fuels Department	18/02/2019
Federal Rural University of Rio de Janeiro	2. Professor John Wilkinson	19/02/2019
EMBRAPA Swine and Poultry	3. Airton Kunz – Deputy Head of Research and Development 4. Dirceu J.D. Talamini – Researcher Rural Economy 5. Elsio A.P. de Figueiredo – Investigator in Animal Breeding and Production Systems 6. Everton Krabbe – Poultry Nutrition and Production	21/02/2019
Cooperativa Central Aurora Alimentos	7. Luis Carlos Farias – Poultry Manager	22/02/2019
EPAGRI	8. Clovis Dorigon – Researcher	22/02/2019
ABPA	9. Jose Luiz Pimenta Junior – Manager of Intelligence and Market Access 10. Bruna Yumi Kassama – Coordinator of Intelligence and Market Access	25/02/2019

Appendix 2: A Typology of Power in Global Value Chains

	Direct	Diffuse
Dyadic	*Bargaining Power* • Operates in firm to firm relations • Exhibits different degrees in hierarchy, captive, relational, modular, and market linkages • Is shaped by the relationship between lead firm/platform owner requirements and supplier competencies	*Demonstrative Power* • Operates through informal 'transmission' mechanisms along value chains and/or competitive mimicry among suppliers and would-be platform owners • Is shaped by quality conventions implicitly accepted by the parties of a dyadic transaction
Collective	*Institutional Power* • Operates through government regulation and/or multi-stakeholder initiatives or other institutionalized forms • Can be leveraged through industrial standards and codified 'best practices' • Helps to build platforms and stimulates their network effects, extending to platform ecosystems	*Constitutive Power* • Is based on broadly accepted norms, conventions, expectations and best practices, e.g. financialization, 'platform ideologies' • Can be leveraged by social and consumer movements • Arises from user-induced platform adjustments, extensions, and fully open platforms that stretch them beyond established ecosystems and opens up space for new platform owners

Source: Dallas, Ponte and Sturgeon, 2017

Appendix 3: Chicken Slaughtering by State in Brazil in 2015



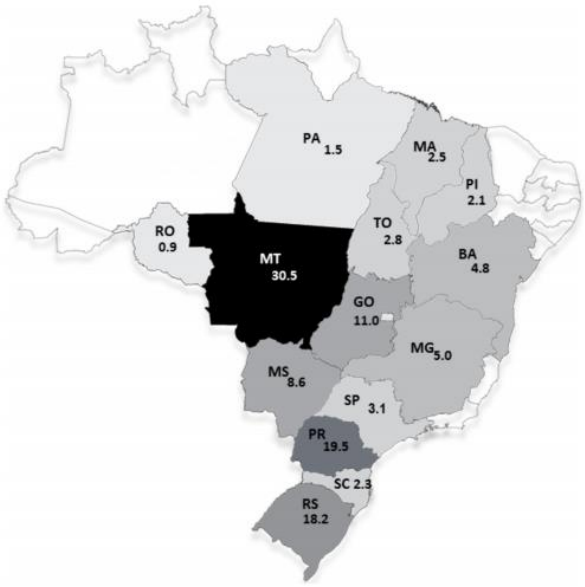
Source: ABPA Annual Report, 2015

Appendix 4: Trade balances of poultry and animal feed inputs (000 US$)

	2011	2012	2013	2014	2015	2016
Animal feed Hs Code 23						
SADC region	-532 400	-371 453	-499 482	-281 376	73 136	-157 125
South Africa	-419 710	-428 928	-373 842	-301 631	-127 157	-200 672
Malawi	-3 086	2 264	8 593	19 502	40 811	9 617
Tanzania	20 926	69 244	40 399	103 743	285 230	191 996
Zambia	2 571	109 675	63 310	58 648	14 897	8 198
Soya beans HS Code 1201						
SADC region	23 567	81 419	15 512	-32 417	-67 904	-106 493
South Africa	22 844	81 682	8 251	-50 442	-68 116	-98 563
Malawi	2 812	148	7 817	13 773	5 418	4 673
Tanzania	66	-301	1 761	-790	-529	-3 061
Zambia	-32	1 124	935	13 310	5 493	3 287
Maize HS Code 1005						
SADC region	875 101	459 892	534 766	431 696	-114 513	-744 316
South Africa	878 259	455 652	753 007	565 834	66 451	-295 808
Malawi	84 113	-160	-18 407	-9 276	-30 482	550
Tanzania	-13 242	-923	-29 507	87 518	-18 760	8 480
Zambia	185 054	412 056	148 531	60 697	198 126	111 687

Source: ITC TradeMap

Appendix 5: Soybean production by state (Mt) in 2016/2017 season



Source: Cattelan and Dall'Agnol (2018)

Appendix 6: Input use among Commercial and Smallholder Farmers in Zambia

	Current Situation	Current Capacity	Key Players
Seed	• **Commercial**: ~70% use recycled or uncertified seed • **Smallholder**: 80% use recycled or uncertified seed • Seed companies typically err on side of under-production • It is easy for seed companies to increase production from year to year	• Not uncommon for seed companies to run out (e.g., MRI & Pannar this year) • However, neither farmers nor experts say seed availability is a problem • High costs and local availability are hurdles for smallholders	• Seed Co (~60% share) • MRI (~30% share) • ZamSeed • Pannar • Kamono
Fertilizer	• **Commercial**: lack of fertilizer use is not an issue • **Smallholders**: usage is very low	• Availability is non-issue, but it is very expensive (imported from RSA)	• Greenbelt • Omnia • Nitrogen Chemical Zambia • Nyiombo
Inoculant	• **Commercial:** current usage of ~60% is adequate • **Smallholders:** only 10-20% use inoculant	• **Commercial:** Inoculant is widely available • **Smallholders:** have to go to major market (e.g., Lusaka)	• Soya Grow (imported from RSA) • ZARI produces

Lime	• **Commercial:** farmers test soil and adjust where necessary • **Smallholders:** Very little soil testing or lime usage	• Significant domestic reserves of lime • Agro-dealers don't distribute widely • Soil testing locations are very limited in the country	• Ndola Lime • Uniturtle Zambia
Herbicide / Chemicals	• **Commercial:** farmers use herbicides and chemicals fully • **Smallholders**: ~10% use herbicide; hand weeding is predominant method	• Herbicide is widely available to both commercial farmers and smallholders	• AgraChem • Crop Serve • Farmer's Barn
Mechanization	• **Commercial:** fully mechanized • **Smallholders:** Very little mechanization (some tractor plowing)	• Biggest hurdles are financing and cost • High costs as most equipment is imported	• Farmer's Barn • SARO
Irrigation	• **Commercial:** 60-70% of commercial soy is irrigated • **Smallholders:** Virtually no irrigation	• Biggest hurdle are financing and cost	