Modelling poultry markets in Eastern and Southern Africa

A Technical Report

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Report Authors:

Tracy Davids (BFAP)

Fred Dzanku (ISSER)

Lilian Kirimi (Tegemeo)

Zena Mpenda (AB-Consult)

Peter van Horne (WUR)

Daniel Ayalew Mekonnen (WUR)

Thom Achterbosch (WUR)

Contact Information

tracy@bfap.co.za

admin@bfap.co.za

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Executive Summary

At a global level, poultry consumption has grown faster than any other meat type over the past decade. Much of this growth was attributed to developing countries, where its affordability makes it a common choice when diets start to diversify to include more protein from animal source food. However, in Sub Saharan Africa, despite a few exceptions, average per capita consumption levels remain very low.

As income levels continue to grow and urbanization accelerates, poultry consumption in SSA is also expected to expand, but in order to understand the extent of possible growth in consumption, demand preferences, as well as the cost structure in the region must be considered. In countries such as South Africa, where poultry consumption is high, the sector has intensified to the extent that poultry provides the most affordable source of protein to lower income consumers. But this is not the case across the entire region. In several countries, where the prevalence of extensive production systems with indigenous breed types is higher, poultry is in fact more expensive than beef - a reality that is also reflected in consumption patterns.

Apart from affordability, consumption trends also reflect consumer preferences, which differ widely across the region. A review of literature related to consumer preferences suggested that, in general, most consumers show a preference for locally produced chicken as opposed to imported products. Furthermore, with a few exceptions, indigenous chicken breeds are preferred to broilers, particularly in more rural areas. Locally produced products are generally perceived to have better quality and food safety attributes, but imported products tend to be cheaper and are sometimes available in more convenient forms. The relative affordability of imported products is a key factor that has driven rapid growth in imports over the past decade – particularly in South Africa and Ghana.

As poultry consumption continues to grow in the region, as is projected in literature, as well as the initial baseline simulations presented in this study, the extent to which domestic production expands to benefit from rising demand will depend on how competitively the relevant countries can produce the various types of chicken meat demanded by consumers. Production costs in the region are influenced by multiple factors, but two of the most important are the nature of the production system and the cost of feed. In many countries, intensification remains slow – partly due to the preference amongst consumers for indigenous breeds, and partly due to the high cost of feed, which increases the cost of production in intensive systems. While the differences in production systems and the products demanded by consumers is acknowledged, the evaluation of competitiveness focused on broiler meat, which is a comparable product that competes with imported chicken meat and does not attain a premium due to consumer preferences.

In a country like South Africa, the feed industry is well developed, and in most years, surplus production of maize implies that feed is fairly competitively priced. Costs are still driven up by the need to import protein meal (mostly soybean meal), but with the exception of leading exporters such as Brazil and the USA, South Africa has been shown to be able to produce a chicken carcass at cost levels comparable to most global producers. However, differences in demand structure and consequently marketing strategies compared to more developed

economies make it difficult to compete with specific cuts that are imported at highly competitive prices. Conversely, countries such as Kenya and Ghana are net importers of most raw materials used to produce feed, and with high transportation costs this implies that feed is very expensive. The analysis of relative competitiveness showed that even in Tanzania, which is mostly self-sufficient and, in many years a net exporter of maize, feed costs remain exceptionally high, making domestic production costs uncompetitive compared to imported products.

This report details the model structure and specification for a partial equilibrium model of the chicken meat sectors in South Africa, Ghana, Tanzania and Kenya. These models have been integrated into the ReNAPRI modelling system and are used to generate a baseline projection for production, consumption, trade and prices of chicken. It suggests that, under baseline assumptions, imports will likely continue to play an important role in supplying domestic demand growth in future. Tanzania is presented as an indicative example of countries where the poultry sector is less mature and intensive. An alternative scenario of lower feed costs and improved efficiency is presented in terms of competitiveness and the outlook, providing a holistic view of possible impacts. While the levels of improvement achieved in this scenario are sufficient to reduce offer prices to the levels of EU exporters in Tanzania, Brazil and the USA can still offer products at a lower price than Tanzanian producers. This is also reflected in the outlook, where production growth is accelerated substantially, but is insufficient to replace all import growth over the 10 year projection period. An alternative scenario of accelerated production in South Africa is also presented to illustrate the interlinkages with feed materials.

This study report provides a detailed description of the structure and competitiveness of selected poultry value chains in the region and presents a new extension of the ReNAPRI partial equilibrium modelling framework that can be utilised to assess alternative future scenarios and evaluate the impact of possible policy interventions in a forward looking context. A baseline outlook over a 10 year horizon, together with indicative scenarios in South Africa and Tanzania, illustrates the applicability of the modelling framework. The modelling framework is based on the assumption that chicken meat is a homogeneous good, with no differentiation in demand preferences for indigenous breeds over broilers. Future work could consider further disaggregation, both in terms of the demand structure, to account for differences in consumer preferences, as well as varying rates of technological advancement across different production systems. A broader representation of the animal feed sector will also be beneficial, as the extent of its inclusion and integration within the chicken model varies broadly across the countries included in this report. While such disaggregations would broaden the possibilities for analysis, even in its current, more aggregated form, opportunities remain to utilise the modelling system for further scenario analysis in future, which could consider factors such as an accelerated dietary transition and various combinations of interventions to improve competitiveness and accelerate domestic supply responses, tapping into consumer preferences and commercialization potential for domestic chicken meat production.

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Introduction

Globally, growth in poultry consumption has exceeded all other meat types over the past decade. Poultry consumption growth, which amounted to an annual average of 2.5% over the past decade, was supported by its relative affordability within the meat basket. In addition to its affordability, it is perceived as a healthy meat type, which carries no negative cultural or religious connotations. Consequently, poultry is expected to account for approximately 50% of the additional meat consumed globally over the next 10 years (OECD-FAO, 2020). Much of this growth is attributed to developing countries.

Like the rest of the developing world, the demand for animal source protein in Africa is expected to grow, due to rapid population growth, increased urbanization, and rising incomes. The growth in expenditure on animal source foods is expected to be higher among urban than rural consumers. In West Africa, for example, expenditure on meat is projected to grow four times faster in urban than rural areas, between 2010–2040 (Zhou and Staatz, 2016). Among meat categories, poultry meat consumption in Sub-Saharan Africa increased from an annual average of 1.5 kg to 2.1 kg per capita between 2000 and 2017 (OECD-FAO, 2017). Projections for future demand for major meat products in Africa between 2010 and 2050 show that poultry meat is expected to grow by 813%, making it the fastest growing product followed by pork, beef, and mutton & goat, which are projected to grow by 573%, 261%, and 162%, respectively (FAO, 2017).

Growth in the demand for poultry products is also expected to drive production growth, but productivity remains low and in large parts of the continent, intensification has been slow. If productivity in the region is not enhanced, production deficits are likely to remain (FAO, 2017). In theory, such deficits can be supplied through international trade. However, rising concern over food sovereignty[1,2] and the need to create jobs for the growing youth population in Africa have the potential to bias policy towards poultry sector development.[3] The effectiveness of such policy would of course depend on consumers' demand preferences for domestically produced poultry, among others.

This study seeks to improve the understanding of poultry consumption and production in Sub Saharan Africa by providing a comprehensive overview of market dynamics in South Africa, Kenya, Tanzania and Ghana. Furthermore, it considers the possible evolution of these markets in future by providing an outlook for the coming decade, based on an expansion of the partial equilibrium modelling framework that has been developed in the region by the Regional Network of Agricultural Policy Research Institutes (ReNAPRI). This will also enable an improved linkage between livestock markets and feed products such as maize and soybean, which are already included in the modelling system maintained by ReNAPRI (Meyer et al., 2018).

[1] According to Ashley (2016), the term food sovereignty encompasses the political economy of where and how the food is produced, and how equitably this is done. Two contrasting definitions of food sovereignty are: '(1) "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems." (2) "the right of peoples and sovereign states to democratically determine their own agricultural and food policies."

[2] For example, a network of different civil society actors, The Alliance for Food Sovereignty in Africa (AFSA), was established in 2011 to influence policies and to promote African solutions for food sovereignty. https://afsafrica.org/ [Accessed on Oct 01, 2020]

[3] A recent report indicates that in Africa about 80% of both poultry meat and eggs are produced in ten countries, with South Africa taking the lead, producing 25% of all poultry meat on the continent while Nigeria produces most eggs (Vernooij, et al 2018).

The report starts with some context on the evolution of poultry markets in Sub Saharan Africa (SSA), before providing an in depth review of literature related to consumer preferences for poultry in the region. This is followed by an evaluation of the structure and competitiveness of poultry production systems in the region, considering growth over time, as well as production cost structures. Having provided the background to the sectors in each country, it then details the development of a partial equilibrium modelling framework, which is integrated into the bigger ReNAPRI modelling system, to enable consistent forward looking analysis. This system is then utilised to provide a baseline outlook for the sector, as well as alternative future scenarios with respect to production growth in South Africa and Tanzania.

Evolution of poultry markets in Sub Saharan Africa

Since 2005, poultry consumption in Sub Saharan Africa has increased at an annual average of 5.4%. Over the same period, poultry production increased by 4.2% per annum, resulting in a rising deficit that needs to be imported (Figure 1). On average, over the past three years, South Africa, Angola and Ghana contributed almost half of the total imports into SSA. In South Africa and Ghana, imports have also increased very rapidly, by 8% and 9% per annum respectively since 2005. In many smaller markets, such as Tanzania, imports have also grown rapidly (Figure 2), but from a small base, and they often still constitute a small share of domestic consumption.

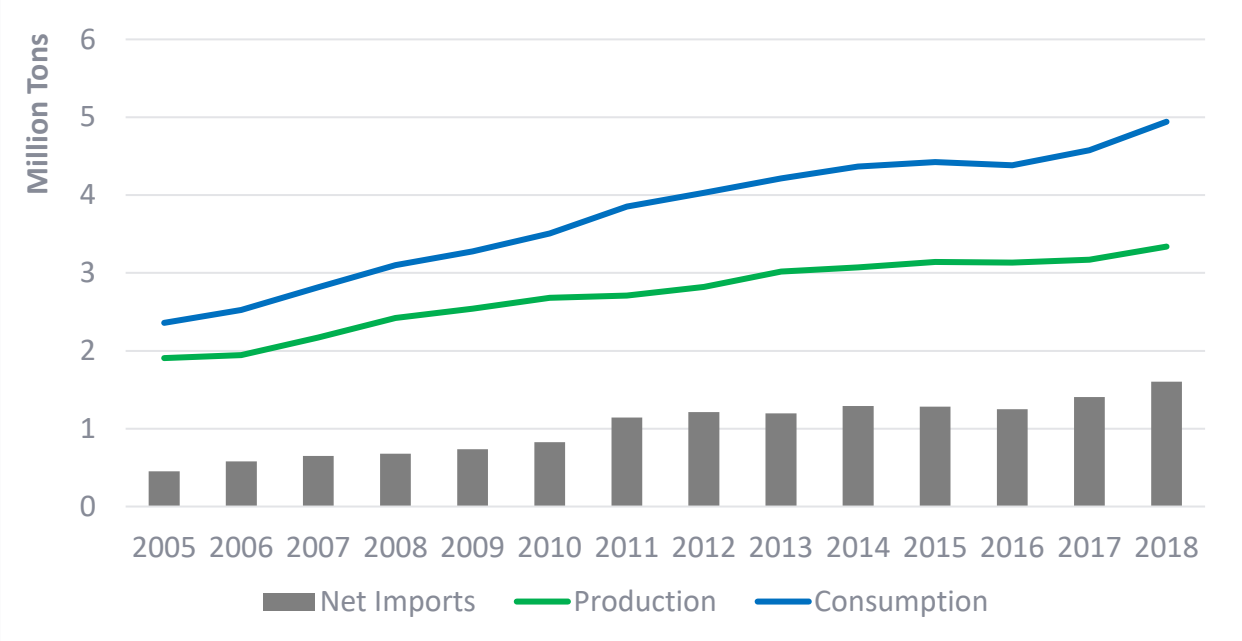

Figure 1: Poultry production, consumption and net imports in Sub Saharan Africa
Source: FAOSTAT, 2020; ITC Trademap, 2020

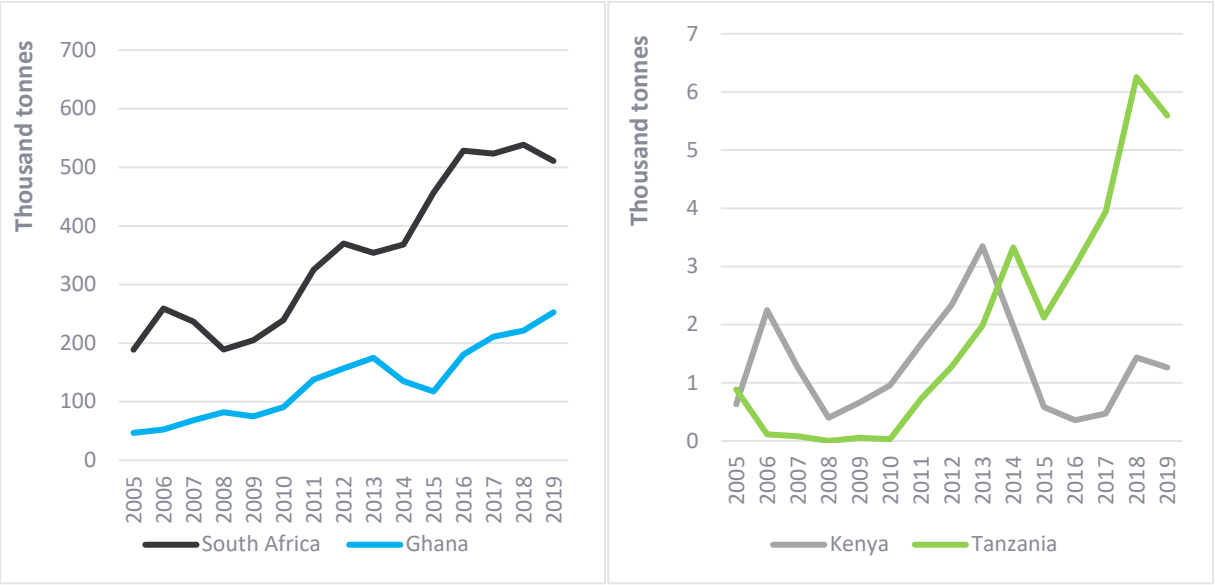

Figure 2: Poultry imports into South Africa, Ghana, Kenya and Tanzania
Source: ITC Trademap, 2020

Despite the rapid growth in consumption, Figure 3 suggests that, with few exceptions, per capita consumption levels remain very low. By overlaying income levels, in purchasing power parity terms, with consumption it also sheds some light on some of the factors underpinning low consumption levels.

Measured in real PPP terms, per capita GDP in SSA, on average, only amounts to 26% of the level recorded in Brazil and only 6% of the level observed in the USA (IMF, 2020). Figure 3 reflects a clear trend of increasing poultry consumption as income levels rise, but also offers distinct differences in consumption between countries of similar income level, such as Kenya and Ghana. This would suggest that other factors, such as relative prices and consumer preferences, cannot be discounted.

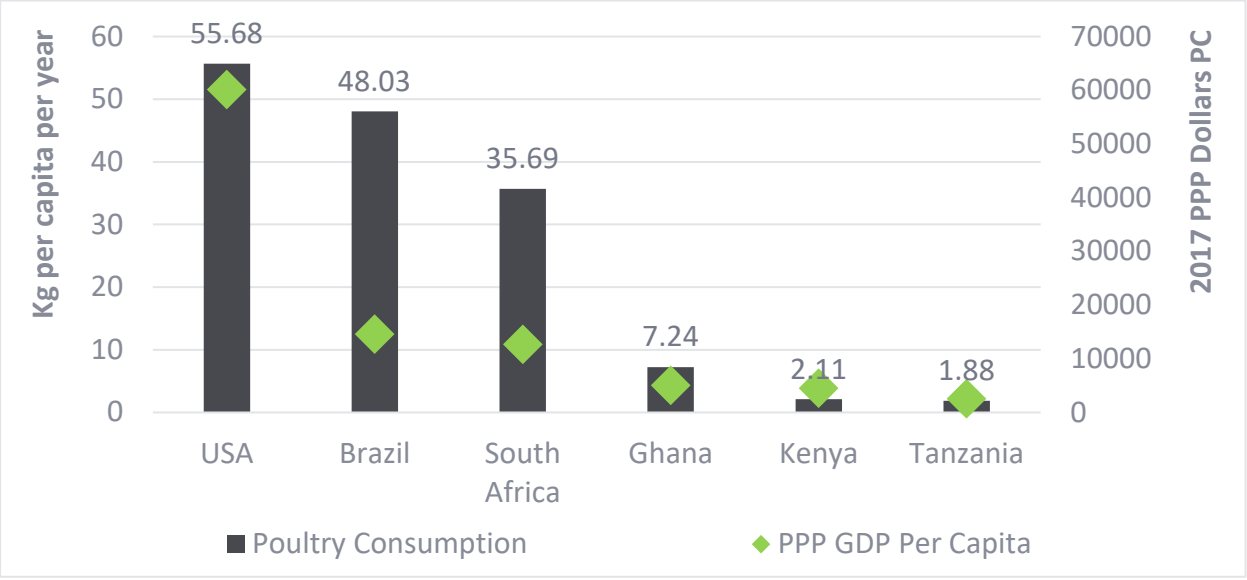

Figure 3: Poultry consumption per capita in the region relative to the USA and Brazil
Source: FAOSTAT, 2020; IMF, 2020

The low absolute levels of consumption in SSA, combined with expectations for income and population growth, suggest that substantial growth is possible in future. This provides a significant opportunity not only for dietary diversification, but also to grow production of poultry as well as feed-related products, and to support employment opportunities for the growing population. In order to quantify the extent of this opportunity, one must first understand consumption preferences, as well as the relative competitiveness of the various countries in producing poultry. An important factor influencing the extent to which imports supplement domestic production, is the extent to which consumers are willing to buy intensively produced broiler meat, as opposed to domestically produced, indigenous breed types, which are produced more extensively. Similarly, the relative competitiveness of the various systems and the price at which they can deliver poultry are important to consider. Accordingly, a more detailed analysis of consumer preferences, as well as the production environment and competitiveness of the four countries included in this study follows in sections 3 and 4.

Consumer Preferences with respect to poultry in the region

Section 2 indicated that in some countries, such as South Africa and Ghana, imports have been an important contributor to supplying rapid growth in consumption. On the other hand, in a country like Kenya (as well as many others on the continent), absolute consumption levels remain very low, and imported products limited.

Low absolute consumption levels can partly be attributed to low per capita incomes (Figure 3), which constrain the inclusion of animal protein in diets. However income levels are not the only factor to consider, as Figure 4 indicates that chicken is not always the most favoured source of animal protein in the region. In Ghana, chicken is the second most consumed source of animal protein, after fish. In Tanzania chicken is third after beef and fish, whereas in Kenya, it is eclipsed by beef, fish and ovine (sheep and goat) meat. This is in stark contrast to South Africa, where chicken accounts for more than half of the animal sourced protein consumption, as well as the global average, where chicken is one of the leading sources of animal protein along with pork and fish.

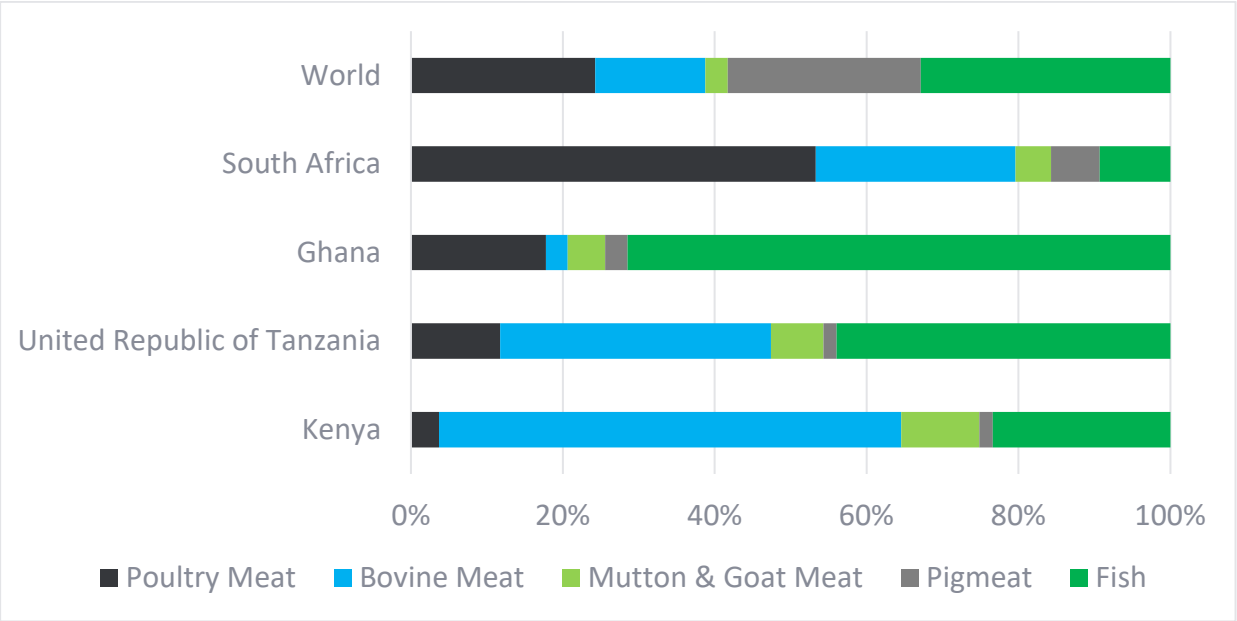

Figure 4: Composition of animal protein consumption in the region
Source: FAOSTAT, 2020

Low relative levels of chicken consumption could be due to factors such as relative affordability, as well as consumer preferences, which can in turn be influenced by perceptions related to factors such as quality or health (Vermeulen *et al.*, 2015; Grunert *et al.*, 2004). Figure 5 indicates that affordability is an important consideration. It indicates that in Kenya and Tanzania, where chicken consumption is low, prices are not only significantly higher than in the USA, South Africa and Ghana, but also higher than beef.

High prices are a result of a myriad of factors. Feed prices in both countries remain high and intensification of chicken production has been slow. In both countries, indigenous chicken, produced in a fairly extensive system, is widely produced. Despite its higher production cost and consequently also higher price, indications are that consumers prefer indigenous breeds and are willing to pay a premium for it. By contrast, in Ghana and South Africa, where consumption is higher, chicken is much cheaper than beef. The bulk of production is from highly intensive broiler production systems, which yields a much cheaper product that competes head on with imported products from the most competitive producers in the world. The fact that in South Africa and Ghana imported products are more comparable to what is produced and consumed domestically is an important factor when considering the extent to which imports have contributed to meeting consumption growth.

What is clear is that distinct differences are evident when considering chicken consumption in different parts of SSA. While relative affordability is undoubtedly an important driver of such differences, consumer preferences also matter. Given the range of factors that influence such preferences, they have to be considered on a more regional basis. The rest of this section provides an overview of literature related to consumer preferences related to chicken across the region.

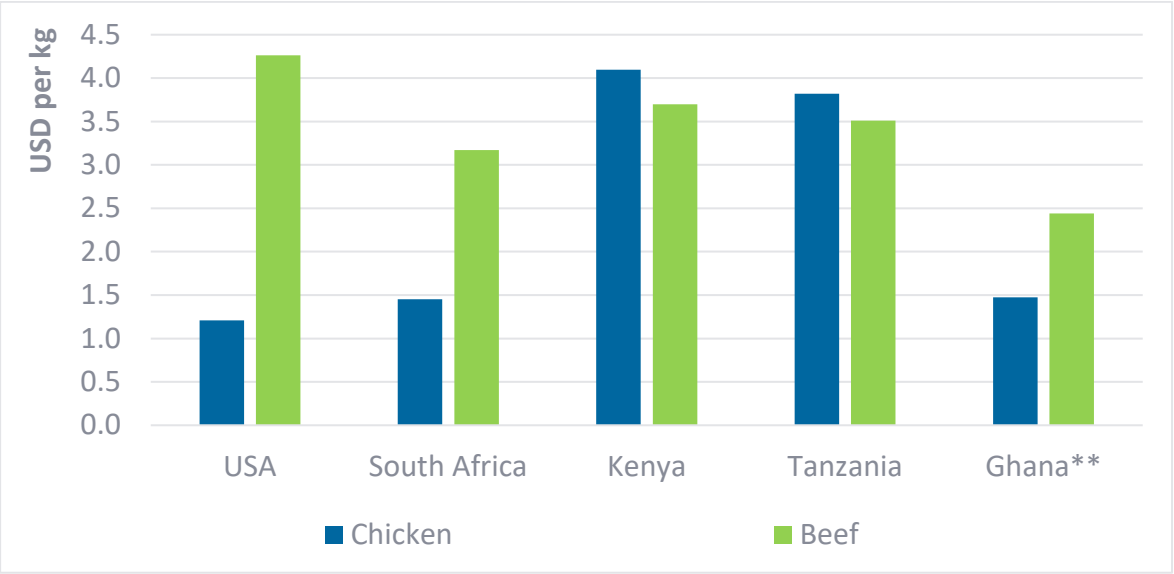

Figure 5: Prices of chicken and beef in the USA, South Africa, Kenya and Tanzania: 2016-2018
Source: Compiled from OECD-FAO, 2020; ReNAPRI, 2020; ITC, 2020

** In Ghana, prices reflect the Unit Value of imports, rather than domestic prices in country, as is the case with the other countries.

Stated and revealed preferences of consumers in Ghana

Poultry meat consumption in Ghana has increased from an annual average of 1.26 kilograms per capita in 1995-1999 to 6.66 kilograms per capita in 2011-2015 (Andam et al., 2017). The bulk of this consumption was from imports, which made Ghana the third largest importer of chicken meat in Sub-Saharan Africa (Andam et al., 2017). During the same period, local broiler production has declined or stagnated (Amanor-Boadu, et al., 2016). To assess the potential of local poultry production in Ghana in the face of competitive imports, Asante-Addo and Weible (2019) studied consumers' preferences for chicken meat of domestic and imported origins. A discrete choice experiment set in Accra and Kumasi was used to assess consumers' willingness to pay for product attributes, including country of origin (foreign, domestic), product form (whole-dressed, cuts/parts), storage form (frozen, fresh), and production claim (antibiotic/hormone-free, no claim). Price attributes were determined based on market prices for chicken reflecting low-end, two middles, and high-end prices for chicken. Based on random parameter logit estimation, the study found heterogeneous preferences for chicken meat attributes; for example, preferences for domestic to imported chicken and willingness to pay a premium for domestic chicken; preferences for antibiotic/hormone-free, fresh, and cuts with antibiotic/hormone-free having a larger impact on choices; and, found that consumers' preferences differ across segments (Table 1). In a follow-up study, Asante-Addo and Weible (2020) found that concerns about food safety, price, and the lack of convenience reduce consumption of domestically produced chicken, while perceived quality and ethnocentrism increase consumption. On the other hand, the study found cheaper price, convenience, and availability influence frequent consumption of imported chicken.

Earlier studies in Ghana documented a preference for locally produced over imported chicken among urban consumers on the basis of non-price attributes such as freshness and perceived better taste and nutrition (Andam et al., 2019), as well as freshness, taste, and safety certifications for antibiotic residue-free (Ragasa et al., 2019). While heterogeneities exist among consumers' preferences and willingness to pay, findings of the aforementioned studies suggested that the price competitiveness of imported chicken may win over perceived quality advantages of locally produced chicken for most consumers. Consistent growth in imports over the past decade would seem to confirm this.

Perspectives on East and Southern Africa

Elsewhere in Sub-Saharan Africa, the literature on consumer preferences for poultry meat seems rather limited and much of available studies rely on small sample sizes and little rigor.[4] The few exceptions include Bett *et al.* (2013) which used both qualitative and quantitative methods, including a contingent valuation experiment in Kenya, as described toward end of this section. Nonetheless, among available studies, Makanyeza and du Toit (2016), Mantsho and Hlongwane (2018), Otieno and Keubo (2016), Kyarisiima et al (2011) and Queenan et al. (2016) reported both price and non-price factors as key influencers of consumers' preferences for chicken meat.

Based on data collected from 305 poultry consumers in the two largest cities in Zimbabwe, Makanyeza and du Toit (2016) found price to be the single most important factor that explains consumers' choice of imported over local chicken. Health and safety issues, accessibility, appearance, taste, tenderness, GM food status, product labelling, country of origin, packaging, production methods and branding were also found important factors for consumers' purchase decisions (Makanyeza and du Toit, 2016).

In Limpopo Province, South Africa, health, mood, convenience, sensory appeal, natural content, price, familiarity and ethical concern were important for consumers' choice between broiler and indigenous chicken meat, where a slightly higher share of respondents had preference for broiler meat (Mantsho and Hlongwane, 2018).

In Kampala city, Uganda, Kyarisiima et al (2011) found that most consumers preferred local chicken meat to exotic ones (such as spent hens and broiler chickens) on account of quality and safety attributes, including perceived taste, toughness and freedom from chemical contaminants. Similarly, based on a qualitative study conducted in selected villages in Tanzania and Zambia, Queenan et al. (2016) reported that most consumers in both countries preferred indigenous chickens to broilers and spent hens, and urban consumers paid significantly higher prices for indigenous chickens. Indigenous chickens were sold as live birds and consumers preferred them for taste and texture of the meat, and perceived cleanliness and freedom from

[4] The review covers literature in English. A quick scan was done on French literature by using the phrase keywords "poulet bicyclette" in Google Scholar. We found no rigorous consumer studies.

disease and drugs. However, Queenan et al. (2016) noted that consumers in Zambia were more open to purchasing commercial chickens because of their availability and lower prices.

Findings related to preference for domestic poultry meat

It is expected that consumers' preferences would be heterogenous. However, how much of preference heterogeneities reported across studies were actually true and how much of them were a result of differences in study design is not clear. For example, based on a qualitative study among 200 chicken consumers in peri-urban areas of Nairobi, Kenya, Otieno and Keubo (2016) found that most consumers (56%) preferred broilers to local chicken, and preferred fresh slaughtered chicken to other forms such as live or cooked; more than half of the consumers preferred naturally reared chicken without growth hormones/stimulants; and over two-thirds of consumers considered cleanliness of place of sale, price and accuracy of the quantity when making purchase decisions. By contrast, based on data collected from 930 urban and rural consumers from three regions in Kenya and using a contingent valuation experiment, Bett *et al* (2013) found that 98% of consumers preferred indigenous chicken to commercial exotic ones, and the premium that consumers were willing to pay was 23.26% per kg more for indigenous chicken meat. According to Bett *et al*. (2013), specific qualities that consumers sought in poultry meat included fat content (80%), colour (52%), and flavour (82%).

Table 1: Average willingness to pay for poultry meat products, evidence from selected studies

Study; method	**Location; number of study participants**	**Product attribute**	**Premium price**	
Asante-Addo and Weible (2019); discrete choice experiment (stated preference)	Accra and Kumasi, Ghana; 500 consumers	Foreign vs domestic	- GH¢ 30.0/kg, (negative WTP) [-44.8, -15.2]	
		Cut	GH¢ 15.8/kg [9.88, 21.6]	
		Fresh	GH¢ 45.1/kg [31.3, 58.9]	
		antibiotic/hormone-free	GH¢ 46.9/kg [28.55, 65.2]	
Andam et al. (2019); Discrete choice experiment (DCE) (stated preference); experimental auctions (EA) (revealed preference)	Accra, Ghana; 403 consumers	DCE WTP local versus imported (%)	12.00 %	
		EA WTP local versus imported (%)	10.99 %	
			Auction bids in GH¢/kg (mean)	Actual prices in GH¢ (mean)
		Local fresh	17.19	16.00
		Imported from Brazil	15.13	12.00
		Imported from Netherlands	15.13	9.8
		Imported from USA	15.42	9.5
		Local processed	16.6	10.00
Ragasa et al. (2019); choice experiment	Accra, Ghana; 403 consumers	Ghana-produced	14.07 % (Local product lovers) [7.87, 20.27]	
			9.85% (Food safety conscious) [7.41, 12.29]	
			4.42% (Imported chicken lovers) [2.69, 6.15]	
			0.34% (Price conscious) [0.3, 0.38]	
		Hazard Analysis and Critical Control Point-certified	3.31% (Local product lovers) [2.19, 4.42]	
			10.66% (Food safety conscious) 8.12, 13.21]	
			0.08% (Imported chicken lovers)	

			0.78, 0.93]
			0.14% (Price conscious) [0.1, 0.18]
		Certified antibiotic residue free	7.03 % (Local product lovers) [4.63, 9.43]
			15.67% (Food safety conscious) [12.33, 19.01]
			0.15% (Imported chicken lovers) [-1.24, 0.94]
			0.46% (Price conscious) [0.42, 0.48]
		Fresh	5.97 % (Local product lovers) [3.67, 8.27]
			3.00% (Food safety conscious) [2.26, 3.74]
			1.46% (Imported chicken lovers) [0.86, 2.06]
			0.2% (Price conscious) [0.18, 0.22]
Bett et al. (2013); contingent valuation survey (stated preference)	Six counties from Three regions including Western, North and South Rift Valley; 930 consumers	Indigenous chicken	KES 209.54 /kg

Note: Figures in brackets are the 95% confidence interval estimates.

Conclusions regarding poultry demand preferences

What appears to be evident from this review is that many consumers in Africa state a preference for locally produced chicken to imported ones, and indigenous chicken to broiler chicken, though results are not homogeneous and exceptions still occur. This has important implications for the commercialization potential of poultry meat production in Sub-Saharan Africa. Perceived better quality and safety of the locally produced poultry product including taste, freshness, toughness, and freedom from antibiotic/hormone residues are some of the main attributes that consumers are after.

On the other hand, imported poultry products are reported to be cheaper and are available in more convenient forms (e.g. whole dressed, cuts/parts, frozen, packaging, labeling). Thus, in order to take advantage of perceived quality and safety attributes and fully exploit the potential demand for locally produced chicken, domestic producers should find ways that would help them supply their products at more competitive prices, as product price was reported to be the single most important factor for purchase decisions for most consumers in Africa. In this regard, increasing use of improved genetics such as the Kuroiler and the SASSO[5] provide an interesting alternative with improved productivity, but still in a predominantly extensive system. In addition, local producers should design marketing strategies tailored to consumer segments with "artisanal" attributes (Table 1). These may include increased value addition on product form, packaging and labelling, and promotional activities that emphasize the quality and safety aspects of domestically produced chicken.

[5] Kuroiler and SASSO are improved dual purpose breeds that are suited to scavenging systems with some supplementary feeding and while productivity is improved from most pure indigenous breeds, they retain similar characteristics from a consumer perspective.

Last, poultry is reported to be a relatively inexpensive source of animal protein that can help meet shortfalls in essential nutrients, especially of low income people; and it is of high quality and low in saturated fats (Farrell, 2013). Also, poultry production is reported to have a more efficient feed conversion ratio relative to other meats (Tolkamp et al. 2010) and has less detrimental impact on the environment than other livestock (Farrell, 2013). Hence, in the face of rising demand for animal source protein, especially for poultry, and rising concern over food sovereignty and related issues in Africa, supporting poultry sector development relative to other livestock sectors might be a better strategy. Further, findings of recent studies on Eastern Africa (Vernooij, et al., 2018) and southern Africa (Ncube et al., 2016) show that a regional approach and coordinated investment on the animal-feed-to-poultry value chain may help increase the competitiveness potential of the poultry sector in Africa. This is because, for example, one of the main costs of poultry sector is animal feed, which highlights the importance of linking countries with strong agricultural potential (Ncube et al., 2016).

Structure and Competitiveness of poultry production in the region

As an affordable source of protein, poultry clearly has the ability to contribute to improved dietary diversity on the continent. Unfortunately, in many instances, domestically produced products in the region still come with a significant premium over imported products. Hence, for countries in the region to benefit from growing demand in future by expanding domestically produced products, they will not only have to pay attention to the quality and safety attributes that consumers find important, but they will also have to produce at competitive prices, to improve affordability.

Production costs in the region are influenced by multiple factors, but two of the most important in terms of driving up costs is the nature of the production system and the cost of feed. In terms of production systems, intensification remains slow in many countries that still rely heavily on indigenous breeds. This is partly due to the preference, but also partly due to the high cost of feed. In order to evaluate the extent of intensification, as well as the evolution of chicken production in the various countries, and to illustrate the differences across the region, this section provides and overview of the poultry sector of each individual country included in the study, followed by an evaluation of the cost competitiveness of production in these countries relative to other leading producers globally.

Poultry sector overview: South Africa

South Africa has one of the largest and most mature poultry sectors in SSA. In addition to providing the most consumed and affordable animal protein to South African consumers, it makes a substantial contribution to agricultural value added. Chicken production is the largest subsector within South African agriculture (Davids & Meyer, 2017), contributing a gross value of

R46.5 billion (R3.52 billion USD) in 2018 (DALRRD, 2020). The industry is also the largest consumer of animal feed. The South African Poultry Association (SAPA) estimates that the industry employs 111 822 people through the value chain, before accounting for industries such as feed material production.

Industry structure

In terms of structure, chicken production in South Africa is dualistic in nature. The bulk of production is attributed to the formal sector (SAPA, 2017), where the structure of the value chain is comparable to leading producers in the world (Davids & Meyer, 2017). Production is typically concentrated due to the combination of scale benefits and the sheer magnitude of investment required in highly specific assets to produce at optimum efficiency levels. Thus large, integrated firms encompass the entire value chain, from feed production through to-day old chick production, broiler grow out and processing (Figure 6). Within this integrated chain, many prefer to leave the broiler grow-out stage to specialised, contracted producers, whilst others also produce broilers on the company's own farms.

At the opposite end of the spectrum is a large number of smaller, independent producers and while these producers are estimated to contribute less than 10% of total chicken meat production in South Africa (BFAP, 2017), a large number of them earn a living in the sector. The majority market live birds directly to the consumer (Figure 10). Figure 7 shows the incidence of households farming with poultry, as reflected in Statistics South Africa's Community Survey in 2016. It illustrates the share of total households in the survey that reported being active in poultry production. This incidence was the highest in KwaZulu-Natal and the Eastern Cape (20%), followed by North West, Limpopo and Mpumalanga (10%). Nationally, more than 1.1 million households reported being active in poultry production.

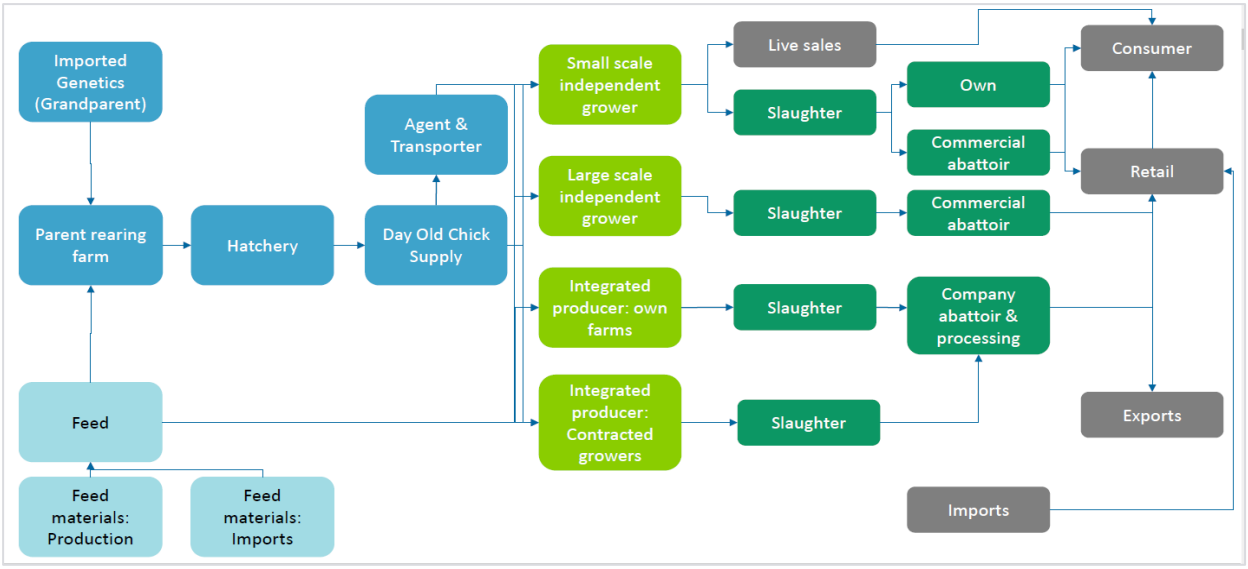

Figure 6: Diagrammatic representation of the South African chicken value chain

Source: BFAP, 2018

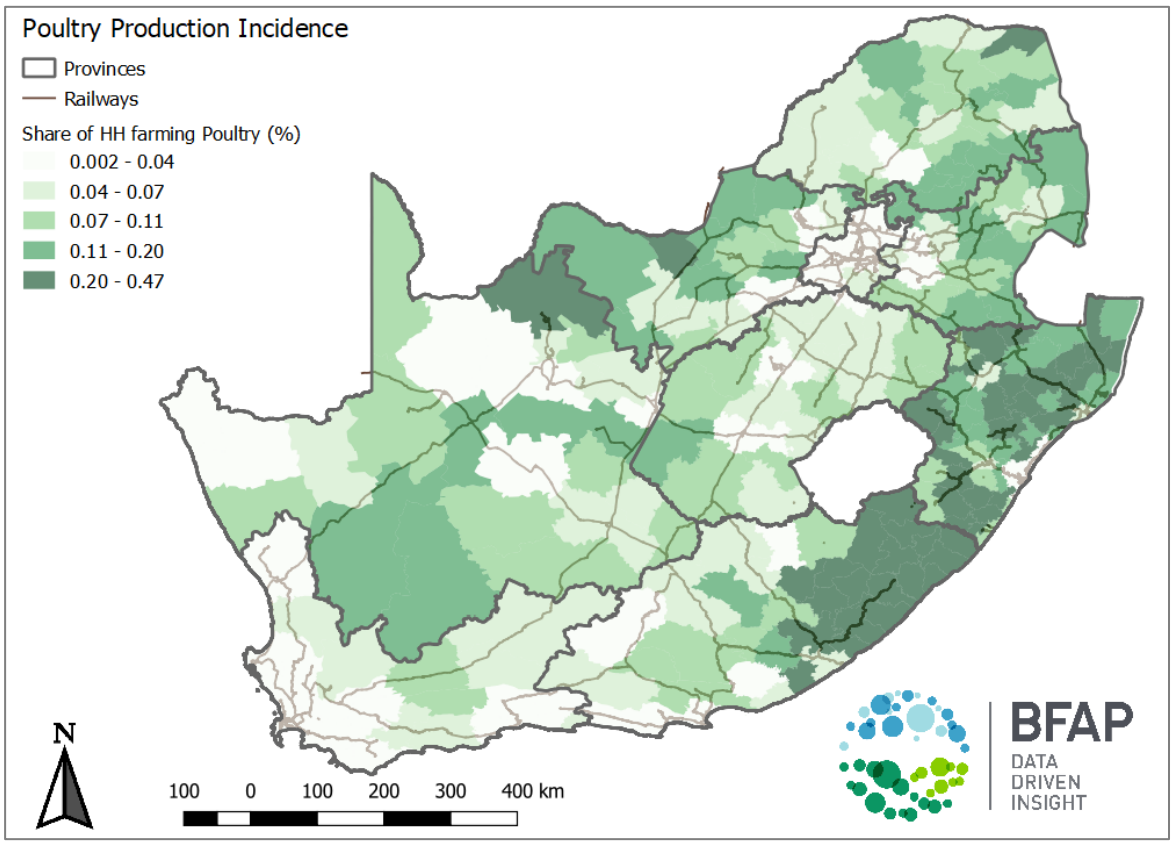

Figure 7: Incidence of households partaking in poultry production in South Africa
Source: Stats SA, 2018

Market trends over time

While the sector's contribution to both agricultural production and food security is clear, growth has come under pressure in recent years. Amidst rising feed costs, an ever increasing influx of competitively priced chicken imports resulted in limited price gains, squeezing margins and constraining further investment. Figure 8 indicates that, in the period from 2000 to 2010, chicken consumption in South Africa increased by 678 023 tonnes. Of this growth, 86% was supplied through expansion of domestic production. By contrast, from 2010 to 2019, domestic producers only supplied 43% of the 497 670 tonnes of additional poultry consumption, with the balance being imported. This trend raised significant concern, leading many to question the sector's ability to compete with leading global producers and in 2013, the industry was declared an industry in distress by the South African Department of Trade and Industry (DTI).

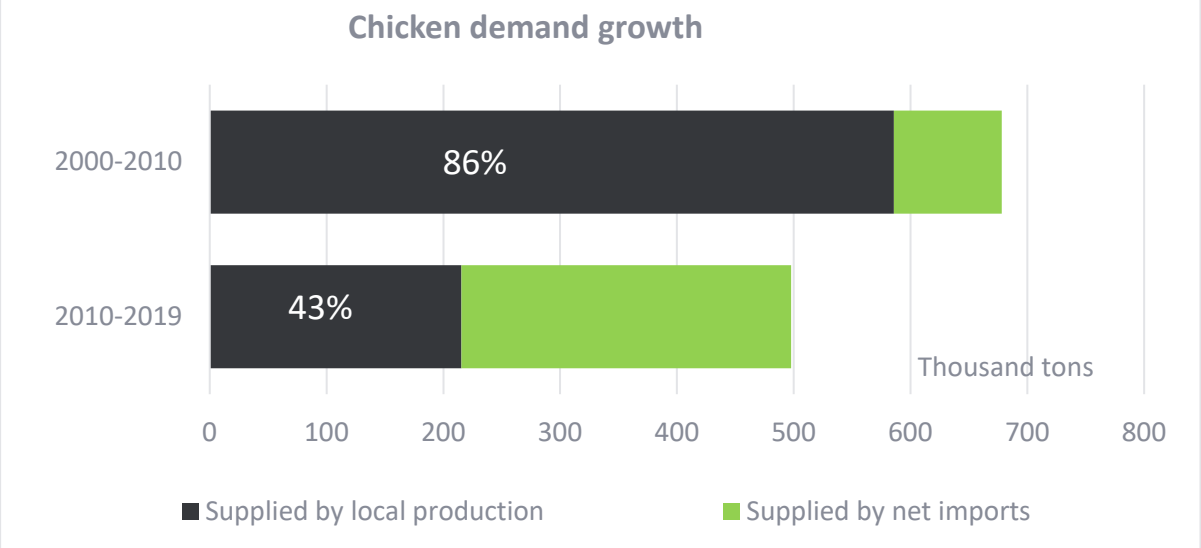

Figure 8: Growth in chicken consumption in South Africa across various periods

Source: Compiled from SAPA, 2020 & SARS, 2020

Figure 9 presents the industries' growth path since 2001, with several distinct periods. From 2001 to 2008, the combination of firm economic growth and the introduction of social grant payments improved spending power amongst South African consumers, leading to rapid growth in chicken consumption. Poultry production also expanded, responding to a highly favourable chicken to maize price ratio. With maize accounting for the largest share of most poultry feed rations, the chicken to maize price ratio provides a high level indicator of profitability.

When the maize price spiked in 2006, firstly as a result of a sharp reduction in area planted in 2006 and then in response to the spike in global prices from 2007 onwards, the chicken to maize price ratio plummeted and from 2008 to 2010, production largely stagnated. This new norm in terms of global feed grain prices, which was underpinned by the introduction of policies mandating the use of biofuels in the USA and rapid demand growth in China, coincided with a slowdown in economic performance, as the global financial crisis hit. The recovery was slow and despite rising consumption since 2010, production has fluctuated around a modestly upward trend, with rising imports making a more significant contribution to growth in demand for chicken products.

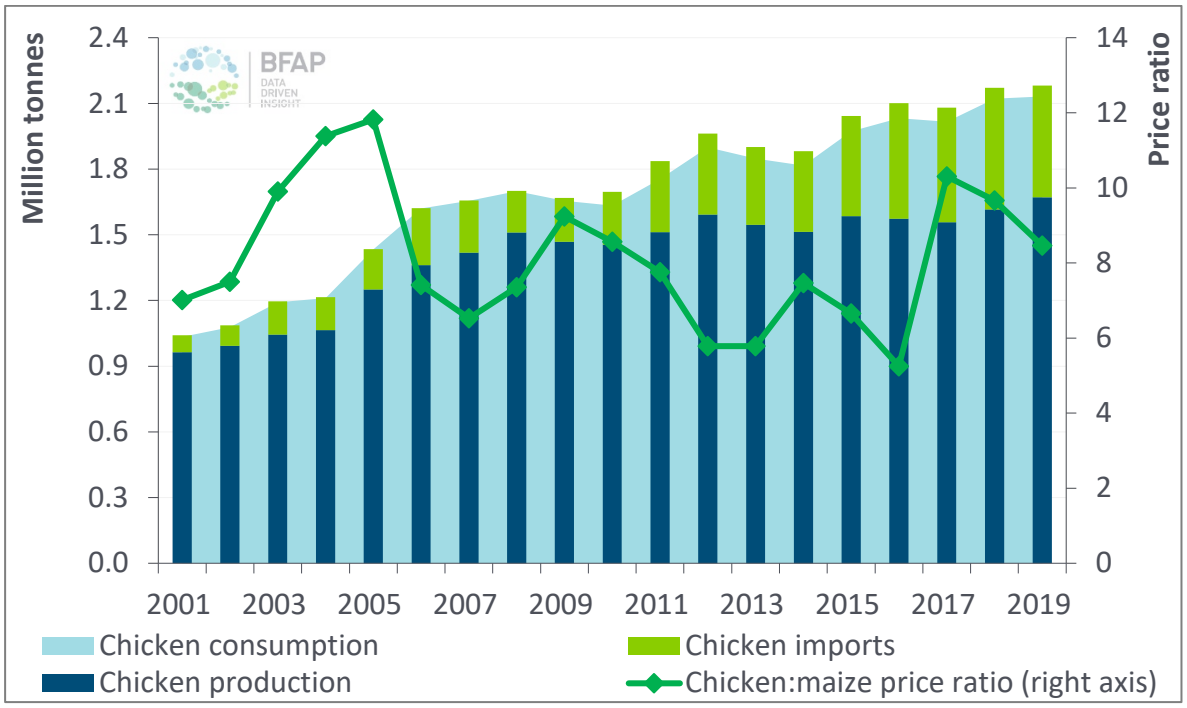

Figure 9: Growth in chicken production, consumption and imports: 2001-2019
Source: Compiled from SAPA, SARS & BFAP, 2020

Despite some volatility, the chicken to maize price ratio has mostly remained well below the levels observed from 2003 to 2005. Further to international dynamics, domestic weather conditions have been exceptionally volatile in recent years, leading to maize prices fluctuating between import parity and export parity levels. Maize prices reached an all-time high in 2016, when South Africa faced the worst drought in 100 years (BFAP, 2016), pushing the chicken to maize price ratio to an all-time low. With imported products effectively providing a ceiling, chicken price increases were limited and when yellow maize prices increased by 26% year on year in 2016, chicken prices increased by less than 1%. A correction came in 2017, when an all-time record maize crop again initiated a 41% year on year decline in maize prices, while higher chicken prices globally supported a 15% gain in domestic chicken prices. This improvement initiated some expansion in production for the first time in three years in 2018.

While high and volatile feed prices were clearly an important factor influencing the profitability of chicken production in recent years, industry role players have maintained that growth is possible, but that unfair trade practices by exporting countries had not allowed prices to increase. This led to several applications for increases in the general duty applied to chicken imports, as well as anti-dumping tariffs and safeguard duties, which were granted after an investigation by the International Trade Administration Commission of South Africa. More detail on the tariffs applied by South Africa is provided in Section 4.1.3.

A detailed evaluation of chicken imports into South Africa (Figure 10) suggests that, rather than a blanket increase, the bulk of the growth in imports since 2010 can be attributed to a single tariff line, namely bone-in portions. This product competes most directly with the individually quick frozen (IQF) portions that constitute the bulk of South Africa's domestic market (Figure

11). This would suggest that imports have not increased due to an inherent lack of competitiveness in the production of whole chicken (Davids & Meyer, 2017), but instead emanates from differences in marketing strategy. In many developed markets, producers are able to obtain a premium for breast fillets, which are perceived as lean and healthy by consumers, allowing producers to sell bone-in portions, for which they have a limited market, into countries where bone-in portions are frequently consumed. In South Africa, this strategy is more limited, as the consumer base that is willing and able to pay such premiums is small. Figure 11 suggests however that, given the constant competition from bone-in portions, South African producers have started to shift away from IQF portions, towards specific cuts in fresh and frozen form. From 2016 to 2019, the share of IQF portions in the domestic production mix has declined from 61% to 43%, whereas fresh and frozen cuts have increased from 11% to 26% and value added products have increased from 1% to 5%.

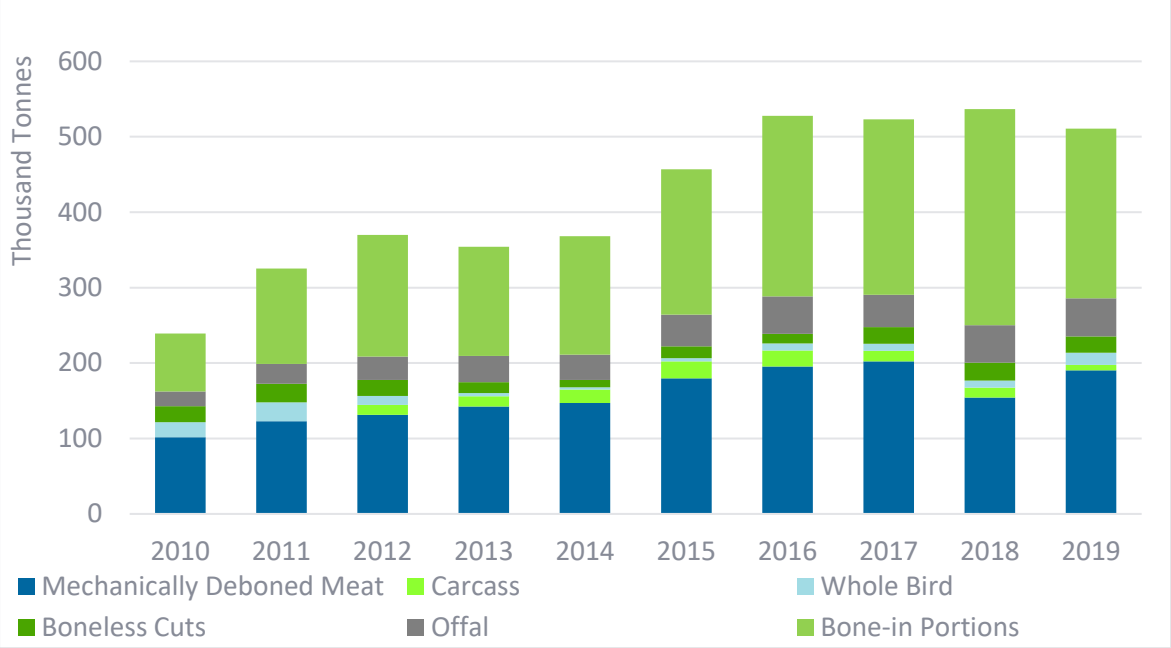

Figure 10: Composition of chicken imports into South Africa: 2010 - 2019

Source: Compiled from SARS, 2020

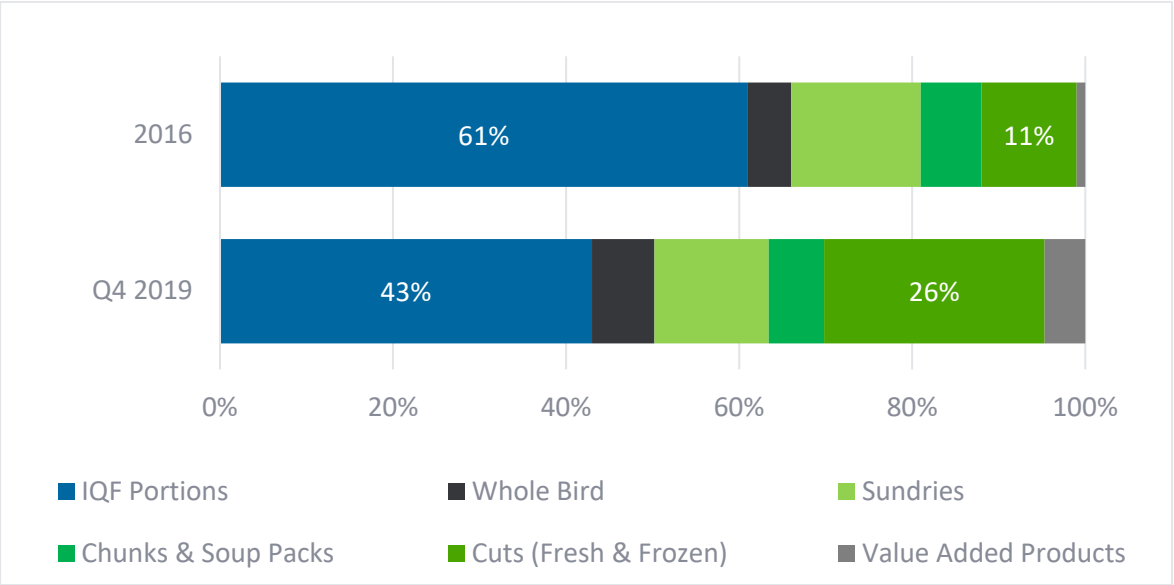

Figure 11: Composition of South Africa's chicken production mix

Source: Compiled from SAPA, 2019 & SAPA, 2016

Figure 12 presents an alternative view of South African imports – depicting the country of origin, on average between 2017 and 2019. It indicates that developed markets such as the USA and the EU are important suppliers, again highlighting the benefit attained from the premium breast meat market. Prior to 2017, the EU was a more important supplier and in fact accounted for the bulk of import growth into South Africa. Under the Trade Development and Cooperation Agreement with the EU, which was later replaced by the Economic Partnership Agreement (EPA), chicken originating from the EU was able to enter South Africa free of the general duty faced by alternative suppliers. The outbreak of Highly Pathogenic Avian Influenza (HPAI) in 2017 however halted imports from multiple EU countries. A safeguard duty was also introduced on imports of EU origin in 2018.

Brazil is also an important supplier, almost solely responsible for supplying South Africa's Mechanically Deboned Meat imports, in addition to bone-in portions, particularly in recent years when imports from the EU declined. Brazil is one of the largest and most competitive exporters of poultry meat in the world and while its own market for high value breast meat is not as strong as developed countries, it exports at a premium into developed markets such as the EU, thus enabling it to follow the same marketing strategy. Given that South Africa has preferential access into the EU under the EPA, it would seem reasonable for it to do the same, but currently it does not have the required structures in place to enable certification of compliance to EU food safety standards and therefore is unable to export to the EU under current conditions. Under the recently developed Poultry Masterplan, this is a key factor that has been identified and must be addressed. Figure 13 indicates that currently, the bulk of chicken exports are destined for the Southern African region, where the product mix is similar to South Africa. Consequently, while this is undoubtedly a growing market, it does not enable an improvement in carcass valuation strategy by providing a premium for high value cuts.

Figure 12: Origin of South Africa's chicken imports: Avg 2017-2019

Source: Compiled from ITC Trademap

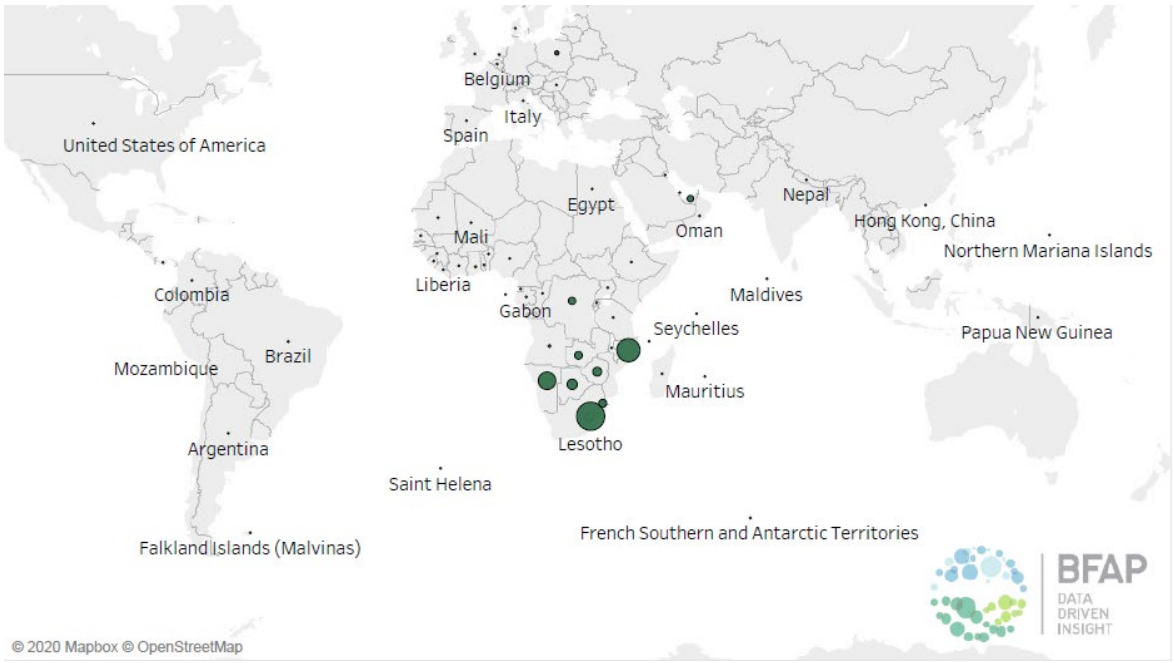

Figure 13: Destination of South Africa's chicken exports

Source: Compiled from ITC Trademap

Policy environment

Other than the food safety and animal disease policies that relate to livestock markets, policies related specifically to South Africa's poultry industry have mostly centred around tariff support, aimed at levelling the playing field against imported products. After initially declaring the industry as "in distress" in 2013, general duties on imported chicken were increased substantially

in October 2013. However, Davids, Meyer & Louw (2015) note the effect of this increase was limited, due to the large share of duty free imports that from the European Union. In 2020, the general duty on bone in portions was again increased from 37% to 62%, while the general duty on boneless cuts was increased from 12% to 42%. A detailed breakdown of the duties applied to specific cuts of chicken is provided in Table 2.

Table 2: Import tariffs for selected chicken cuts into South Africa

Tariff Heading	Product Description	Rate of Duty				
		General (MFN)	EU	EFTA	SADC	MERCOSUR
0207.1: Meat of poultry species "Gallus Domesticus" – Fresh, Chilled or Frozen						
0207.11	Not cut in pieces, fresh or chilled	0%	0%	0%	0%	0%
0207.13	Cuts and offal, fresh or chilled	0%	0%	0%	0%	0%
0207.12: Not cut in pieces, frozen						
0207.12.10	Mechanically Deboned Meat	0%	0%	0%	0%	0%
0207.12.20	Carcass with all cuts removed	31%	0%	31%	0%	31%
0207.12.90	Other	82%	0%	82%	0%	82%
0207.14.1: Boneless Cuts						
0207.14.11	Breasts	42%	0%	42%	0%	42%
0207.14.13	Thighs	42%	0%	42%	0%	42%
0207.14.15	Other	42%	0%	42%	0%	42%
0207.14.2: Offal						
0207.14.21	Frozen Cuts & Offal: Livers	30%	0%	30%	0%	30%
0207.14.23	Frozen Cuts & Offal: Feet	30%	0%	30%	0%	30%
0207.14.25	Frozen Cuts & Offal: Heads	30%	0%	30%	0%	30%
0207.14.29	Frozen Cuts & Offal: Other	30%	0%	30%	0%	30%
0207.14.9: Bone In Portions						
0207.14.91	Frozen Cuts & Offal: Whole bird cut in half	62%	0%	62%	0%	62%
0207.14.93	Frozen Cuts & Offal: Leg quarters	62%	0%	62%	0%	62%
0207.14.95	Frozen Cuts & Offal: Wings	62%	0%	62%	0%	62%
0207.14.96	Frozen Cuts & Offal: Breasts	62%	0%	62%	0%	62%
0207.14.97	Frozen Cuts & Offal: Thighs	62%	0%	62%	0%	62%
0207.14.98	Frozen Cuts & Offal: Drumsticks	62%	0%	62%	0%	62%
0207.14.99	Frozen Cuts & Offal: Other	62%	0%	62%	0%	62%

Source: SARS, 2020

In addition to the general duty, South Africa applies anti-dumping duties of R9.40 per kilogram on bone-in chicken pieces originating from the United States. In June 2015, it was announced that this anti-dumping duty would be removed for a quota of 65 thousand tonnes of bone-in portions. On bone-in portions originating from the EU, South Africa applies a safeguard duty, which was introduced in 2018 at 35.3%. The safeguard will decline annually and be phased out completely by March 2022.

Recognizing the importance of the poultry sector and following a number of years of limited growth, industry stakeholders convened under the guidance of the Department of Trade and Industry in order to develop the Poultry Industry. The Masterplan was signed in November 2019 and is the culmination of input from all stakeholder across the value chain, including producers, processors, importers, exporters, organized labour and government. It provides a framework for a determined effort to grow the output (and jobs) in the industry through measures that will be implemented over a number of years. Significantly, it sets out a new,

joint vision across the value chain and identifies five pillars that underpin the vision and creates a Poultry Sector Master Plan Council to monitor and drive implementation of the pillars.

The five pillars are:

1. Expanding and improving production by 2023
2. Driving domestic demand and promoting affordability
3. Driving exports
4. Enhancing the regulatory framework and ensuring compliance
5. Trade measures to support the local industry

Poultry sector overview: Kenya

Kenya's poultry industry is becoming an important livestock enterprise, particularly in the rural areas where more than 70 percent of the population derives its livelihood from agriculture. The poultry industry, which comprises mainly chicken, contributes about 55 percent to the livestock sector, 30 percent of the agricultural GDP, and 7.8 percent of the total GDP (MOLD, 2019). Poultry production is widespread in both rural and peri-urban areas. The sector has been identified as one with employment and entrepreneurship opportunities, which may be particularly attractive for youth and women due to the relatively small capital investment and land ownership needs.

Apart from its direct contribution as an important source of food, income and employment, the poultry industry has multiple linkages with other sectors of the economy (Figure 14). The industry has fairly well developed inputs and services provision along the value chain. However, importation of raw eggs, underdeveloped markets and unstructured marketing systems impact negatively on the industry leading to its underperformance (Draft National Livestock Policy, 2019).

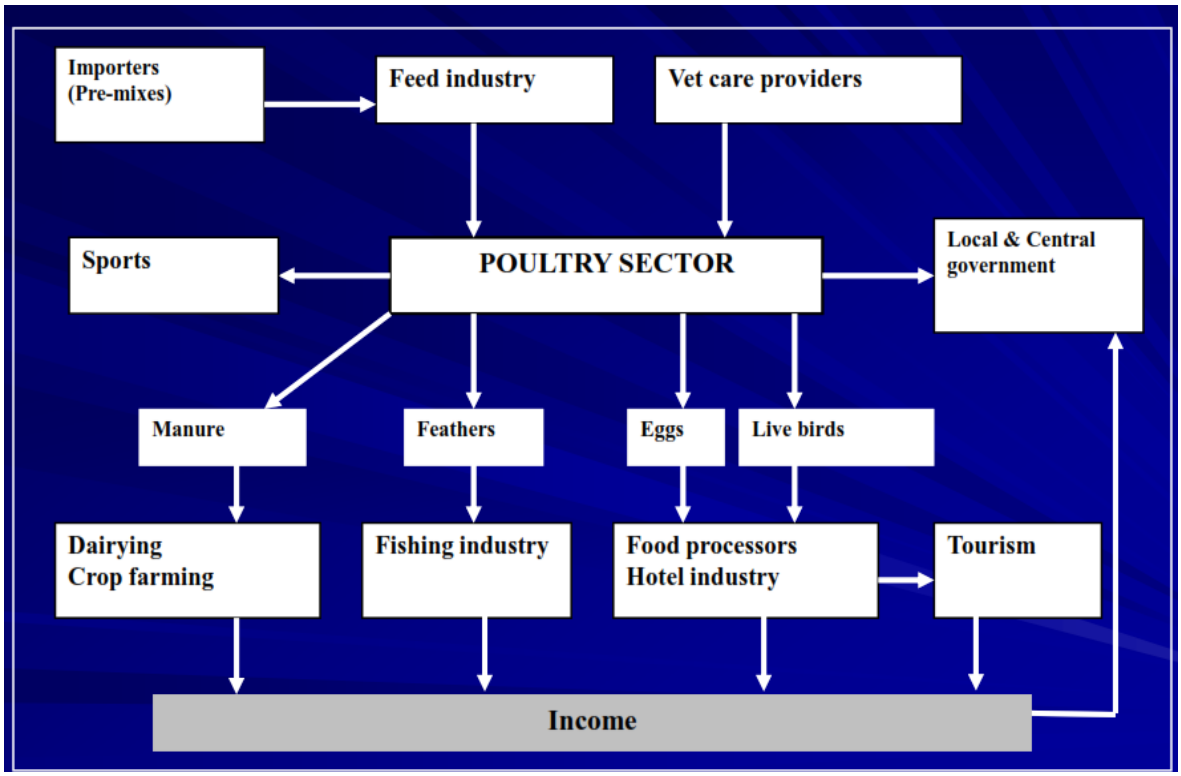

Figure 14: Poultry sector linkages in Kenya

Source: John Omiti **(https://assets.publishing.service.gov.uk/media/57a08bd240f0b64974000dbe/PRE080708_J-Omiti.pdf)**

Industry structure

The poultry industry comprises of small- and large-scale poultry producers, operating under two main production systems: indigenous poultry production and commercial hybrid poultry production systems (Okello et al, 2010), with the former dominating. Birds are raised in a free range system where they scavenge for food during the day and occasionally receive commercial feed supplements. The commercial hybrid production system consists of layer and broiler subsystems and relies on imported exotic parent and grandparent stock and is exclusively market oriented (Okello et al, 2010).

Table 3 indicates that, in 2008, Kenya had an estimated poultry population of 29.2 million birds. While this is the latest official statistics that provide a breakdown of the national flock by type and by region, the data is old and more recent estimates point to a national flock of around 42 million birds[6]. Of this, 82% are thought to be indigenous chicken, 9% commercial layers and 7.4% broilers. While broilers constitute a small share of the national flock at any given time, they are substantially more productive and multiple cycles per year suggest that their contribution to chicken production would be much higher.

[6] https://kilimonews.co.ke/science-and-technology/karlo-develops-high-laying-indigenous-chicken/

Table 3: Distribution of poultry production in Kenya by province and type of poultry

Province	Indigenous	Broilers	Layers	Others	Total
Nyanza	5652740	95570	230920	46840	6057070
Rift Valley	5622500	257790	437140	128090	6445520
Eastern	3864760	112640	164950	22860	4165210
Western	2644150	17770	113110	236430	3011460
Central	1967180	1437270	1084950	49070	4538470
Coast	1947060	637320	230000	94240	2908620
N/Eastern	165000	200	300		165500
Nairobi	141400	1607800	188100	10000	1947300
Total	**22034790**	**4167360**	**2449470**	**587530**	**29239150**

Source: MOLD, 2008

Indigenous chicken production systems

Indigenous chicken offers a flexible production system, adaptable to many agro-ecological zones, and are often ranked highly as an existing resource whose productivity can be increased with minimal inputs. Hence, they are highly suitable for vulnerable households and are often owned and managed by women and children. Products from the chicken can improve nutrition security by providing high-quality animal protein (eggs and meat) at the household level. Although their output in terms of weight gain and number of eggs per hen per year is low, it is obtained with minimal labour and other inputs. This factor of low input and, consequently, low risk is one of the major advantages of extensive indigenous chicken production systems. Significant returns can be achieved from indigenous chicken without the need for expensive housing, complex technology and funding just by utilizing locally available resources. Kenya utilizes three different indigenous chicken production systems namely, traditional free-range, improved semi-free-range and small-scale confined system. This classification is based on key management practices employed across the systems.

Commercialization and growth of the indigenous chicken sector can be achieved by tackling the bottlenecks facing it, which include high feed prices, unstructured markets for chicken and chicken products, lack of value addition, long maturity duration of indigenous breeds, poor access to improved breeding stock, frequent disease outbreaks, and inadequate management skills, knowledge and information. As a result of these challenges, the sector registers poor productivity and is not able to fully exploit existing market opportunities.

The Kenya Agricultural and Livestock Research Organization (KALRO) is addressing the challenge of poor access to improved breeds. It has developed an improved indigenous chicken often referred to as the 'improved KALRO indigenous chicken'. Kenchic also markets the Kenbro for the same purpose. These breeds are expected to produce between 220 to 280 eggs per year, substantially boosting egg production since the common indigenous chickens lay 80 to 100 eggs annually. Improved chickens start laying eggs only five months after being hatched and they produce an average meat weight of 1.5kg. At five months, a cock weighs about 2 kg, almost the

weight of a three-year old local indigenous cockerel, which weighs between 2.5-2.8kg. This breed requires no special care and can be fed just like other indigenous chickens, and hence the cost of production is low. The chicken has the capacity to withstand most climatic conditions and is resistant to common chicken diseases like Newcastle. While its performance is much improved from traditional indigenous breeds, it would require producers to purchase day old chicks for every cycle, as opposed to traditional systems where the flock is replenished from fertilized eggs.

A representative indigenous poultry value chain map is as shown in Figure 15[7]. A number of actors are involved in the marketing of poultry and poultry products between the farm and the final consumer. These include small traders/primary brokers, local market traders, secondary brokers, assemblers, hotels and consumers. The node marked "roadside traders" is not found in all producing areas. Other actors comprise of suppliers of breeding stock and agro-vets. The production and marketing systems of the indigenous chicken enterprise are highly informal and unorganized hence it is difficult to know the number of birds sold at each stage of the value chain.

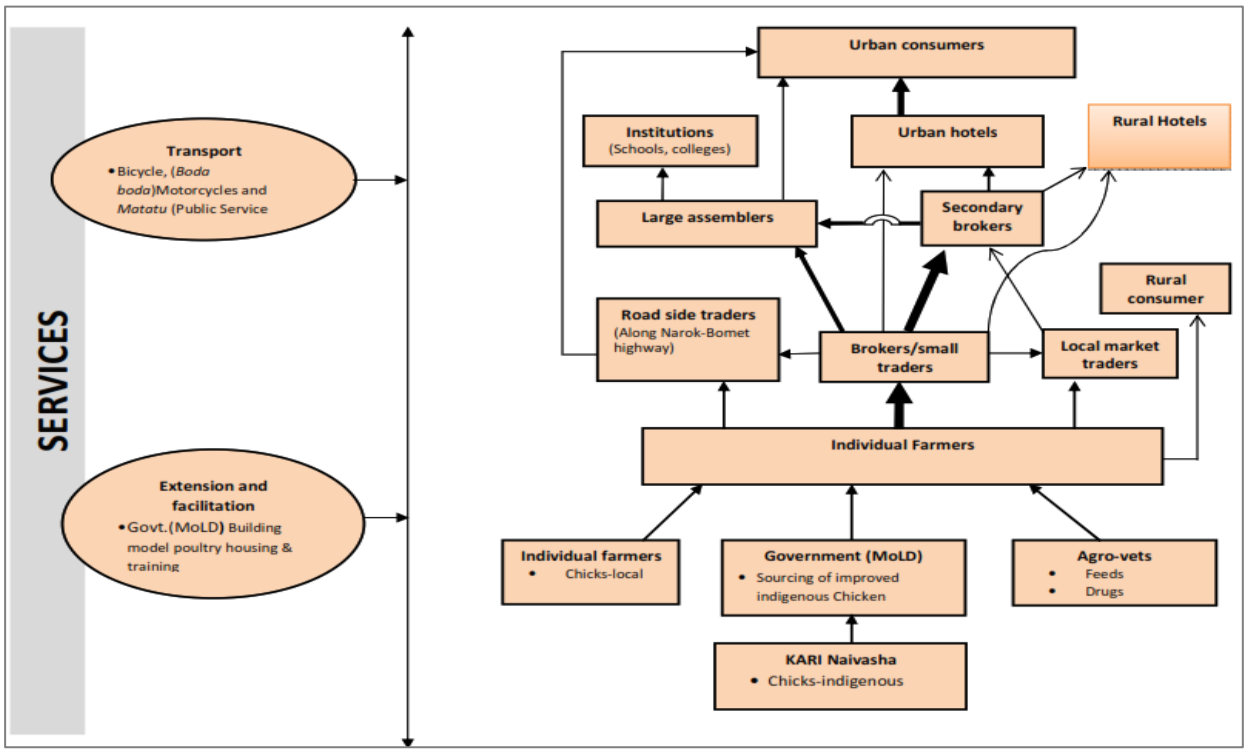

Figure 15: Value chain map for indigenous chicken in Bomet District
Source: Kirimi et al., 2013

[7] This map was drawn with stakeholders from Bomet County, which is one of the major production areas for indigenous chicken in Kenya (Kirimi et al, 2013).

Broiler production systems

Contrary to indigenous breed systems, which are often for subsistence purposes, broiler production in Kenya is fully commercial and market orientated. A study by Carron *et al*. (2017) indicated that there are significant structural differences between different broiler chains within Nairobi, with clear inequalities in product quality and market access across the chains. The study focused on large-scale and medium scale integrated broiler firms as well as small-scale producers. There were key differences in broiler production types, chain structure and product marketing. The chain maps were different in terms of length and complexity across the different production systems. For instance, short, simple chains were found among small-scale producers in one area, while in another area, the chains among a different group of small-scale producers involved more intermediaries such as brokers. Small farm chains in the two study sites presented great variability and diversity in their retailing channels.

The study found that the profiles for the large integrated broiler companies and medium-size integrated companies were similar, with the key components as shown in Figure 16. The flowchart indicates sources and flows of chicken/chicken meat in a nearly fully integrated production system (feed mill, grandparent stock, parent stock farms, hatchery and broiler abattoir are company-owned; broiler grower farms are contracted out). Carcasses (spring/capon) are exported to Tanzania, Uganda, Democratic Republic of Congo, Rwanda and Ethiopia.

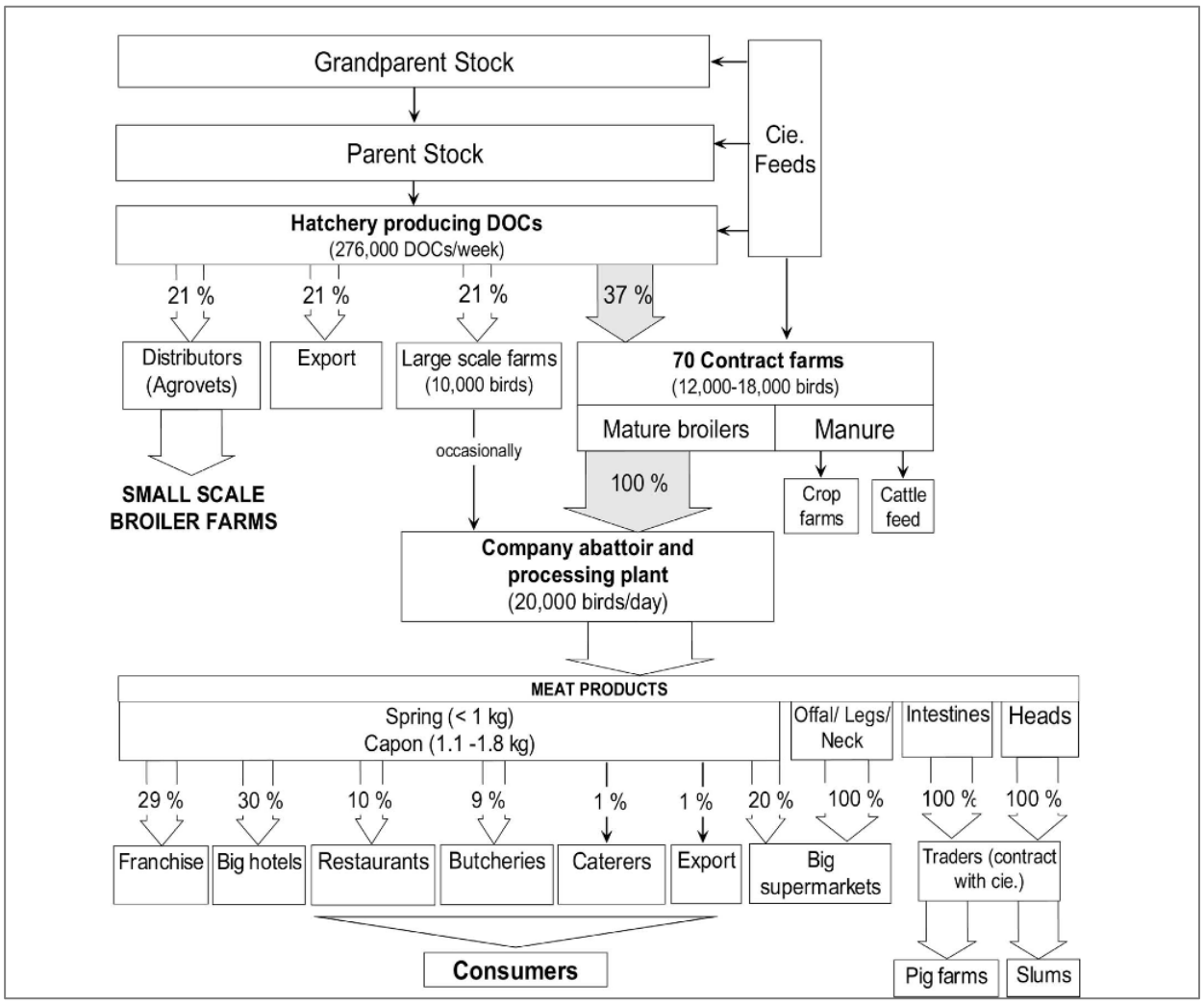

Figure 16: Large integrated broiler company (Cie.) profile
Source: Carron et al (2017).

The flow maps for the small scale producers were different from that for the large- and medium-size integrated firms. In addition, there were variations in the maps among small-scale farmers depending on flock size as shown in Figure 17 and Figure 18. One of the main differences is that although farmers represented in Figure 17 flow map used on-farm slaughter and sold their birds/meat products to brokers for further resale to retailers, those represented in Figure 18, which were typically much smaller, mainly sold live chicken directly to a retailer. While in the first case, chicken manure was used on the farmer's crops or sold as feed, in the second case, it was mainly disposed-off.

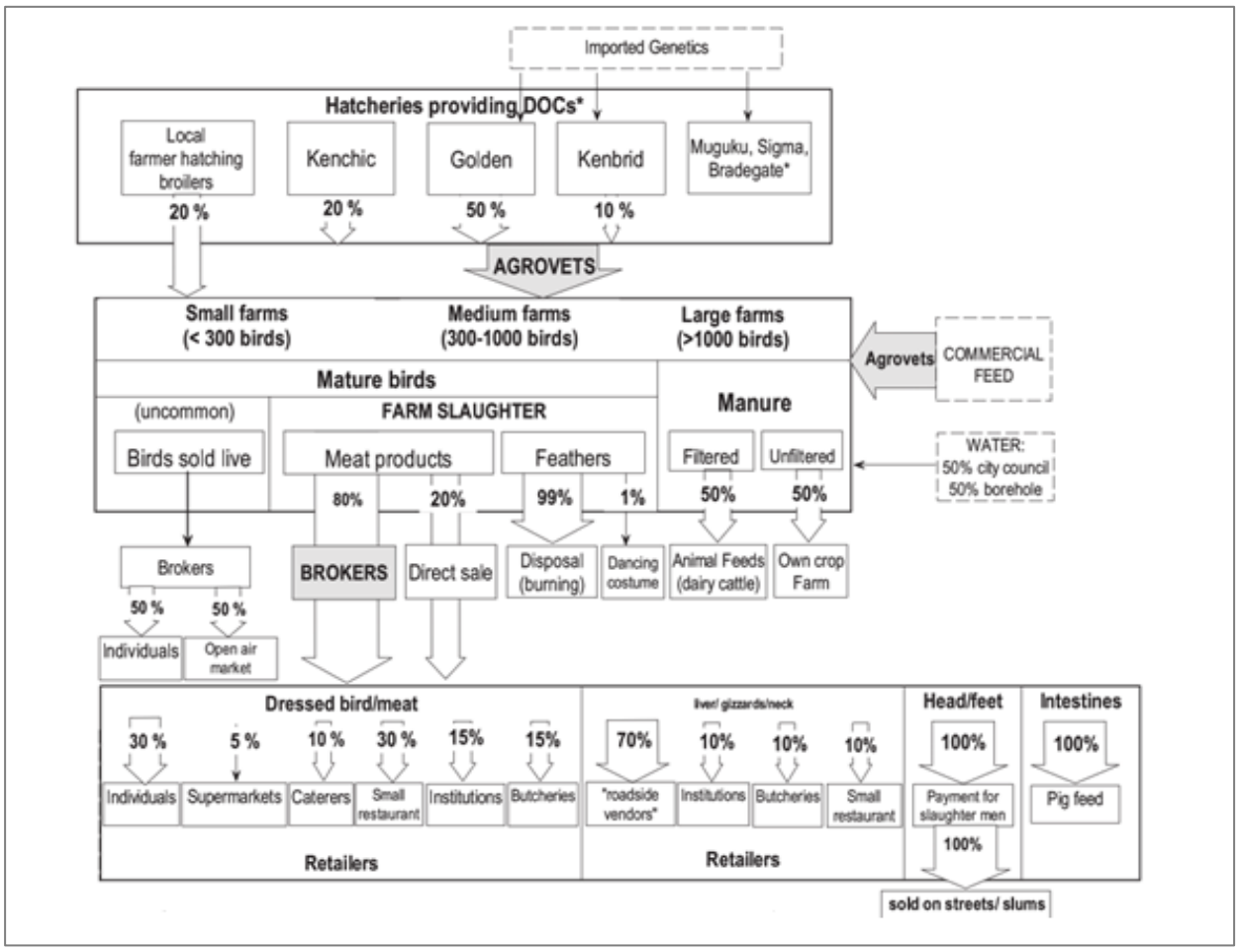

Figure 17: Flow map for small-scale broiler farmers in Dagoretti
Source: Carron et al (2017).

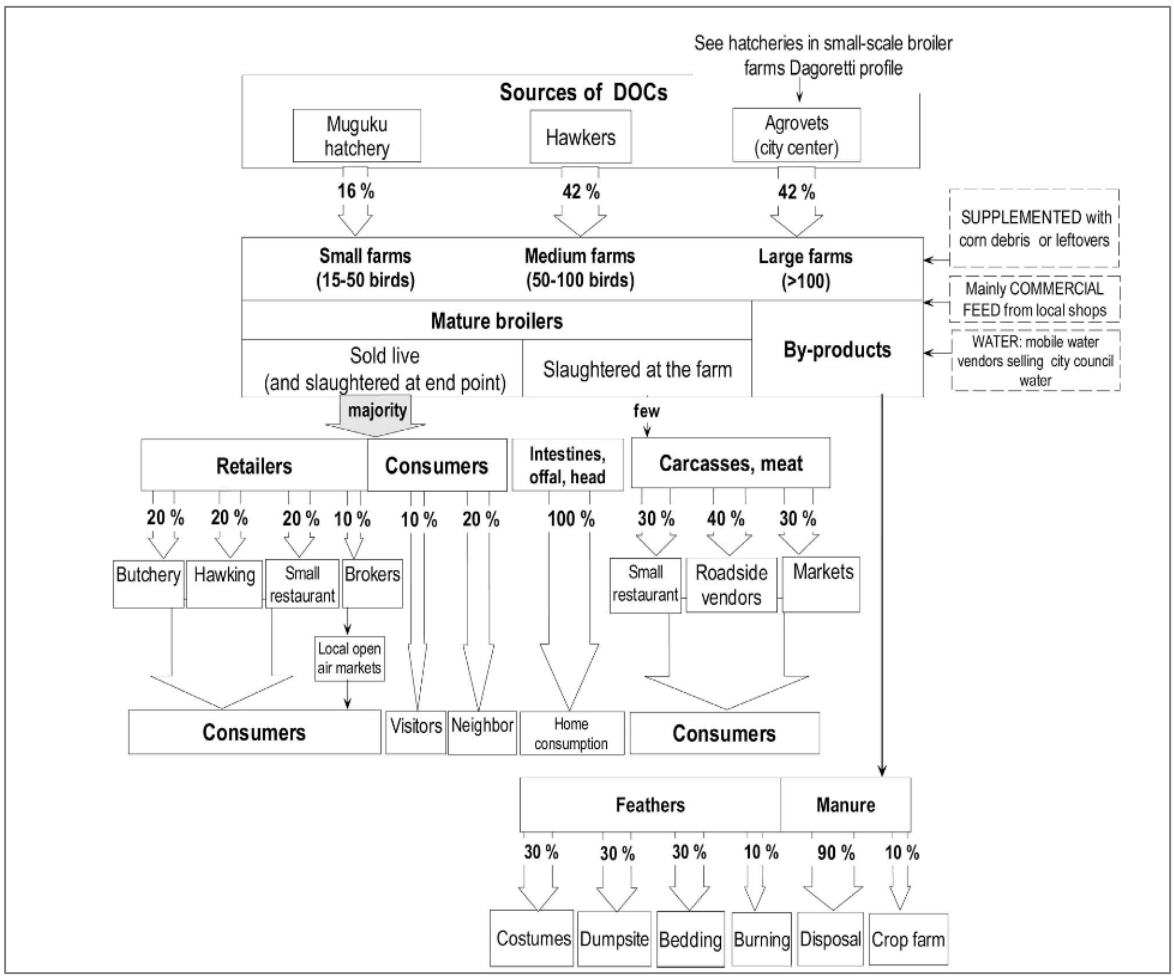

Figure 18: Flow map for small-scale broiler farmers in Kibera
Source: Carron et al (2017).

Market trends over time

Kenyan chicken production has increased rapidly in recent years. From 2001, production increased by an annual average of 8.1%, but most of this growth was attained from 2016 onwards. Between 2001 and 2015, production growth amounted to only 1.3% per annum, but since then, it increased from 33 thousand tonnes in 2015 to 131 thousand tonnes in 2018, before declining once more to 89 thousand tonnes in 2019 (KNBS, 2020).

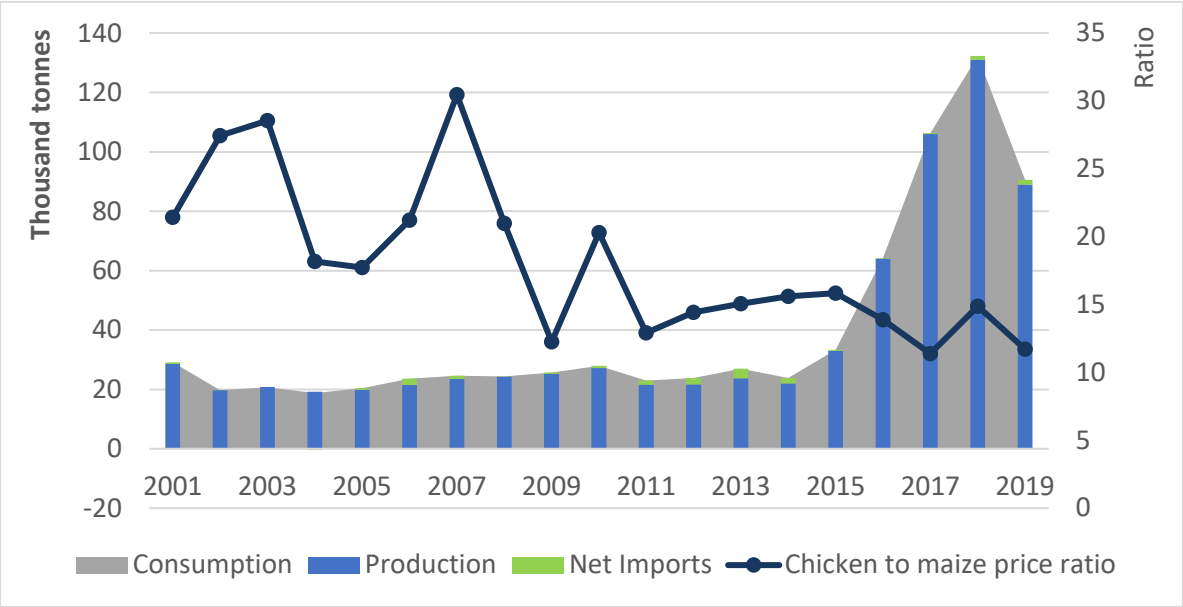

Figure 19: Kenyan chicken production, consumption, net imports and profitability: 2001-2019

Source: Compiled from KNBS, 2020 & ITC, 2020

While traditional and improved indigenous breeds remain important contributors to chicken production, they are challenged by day old chick availability, particularly for improved breeds, high costs of supplementary feeds and poor disease management. Consequently, supply is often inconsistent. This presents a challenge to supermarket and fast food chains which require consistent supply of uniform products – preferably in bulk. Given that such supermarkets and particularly fast food chains such as KFC have been strong drivers of expansion in urban demand, much of the growth since 2015 has been driven by integrated commercial producers such as Kenchic, which produce broilers in intensive production systems and are able to supply more consistently. Broilers are produced on company farms, as well as by a network of contract growers. In 2016, Kenchic invested in an additional breeder facility, which was stocked for the first time in 2017. In 2017, the company also invested in four additional poultry centres (Kenchic, 2020).

An ever increasing contribution from intensive production systems also implies that production would become more sensitive to an indicator such as the chicken to maize price ratio, which expresses output relative to the most important feed ingredient. Consequently, in 2019, the locust invasions which damaged crops, causing a sharp increase of more than 30% year on year in Kenya's maize prices (FAO GIEWS, 2020) was an important contributing factor to the decline in production. Producers also indicate that rising imports, often of an informal, cross border nature, present a significant challenge. Neighbouring countries such as Uganda, where feed is cheaper and production therefore more competitive, are able to supply at substantially lower prices (Poultry World, 2020). Disregarding possible informal trade, formally recorded imports from Uganda increased more than five-fold in 2018, albeit from a small base. Uganda and Brazil are the most prominent exporters into Kenya (Figure 20), while frozen whole birds constitute the bulk of imported products (Figure 21). Overall however, imports remain only 1% of production, on average, between 2017 and 2019.

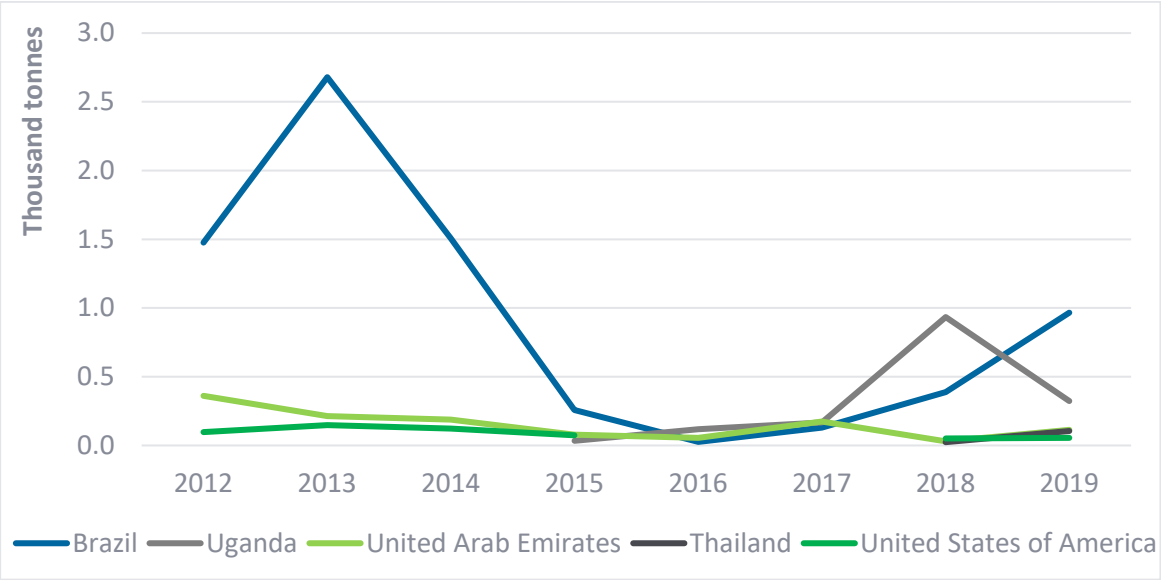

Figure 20: Kenyan chicken imports, disaggregated by country of origin
Source: ITC, 2020 (Mirror data)

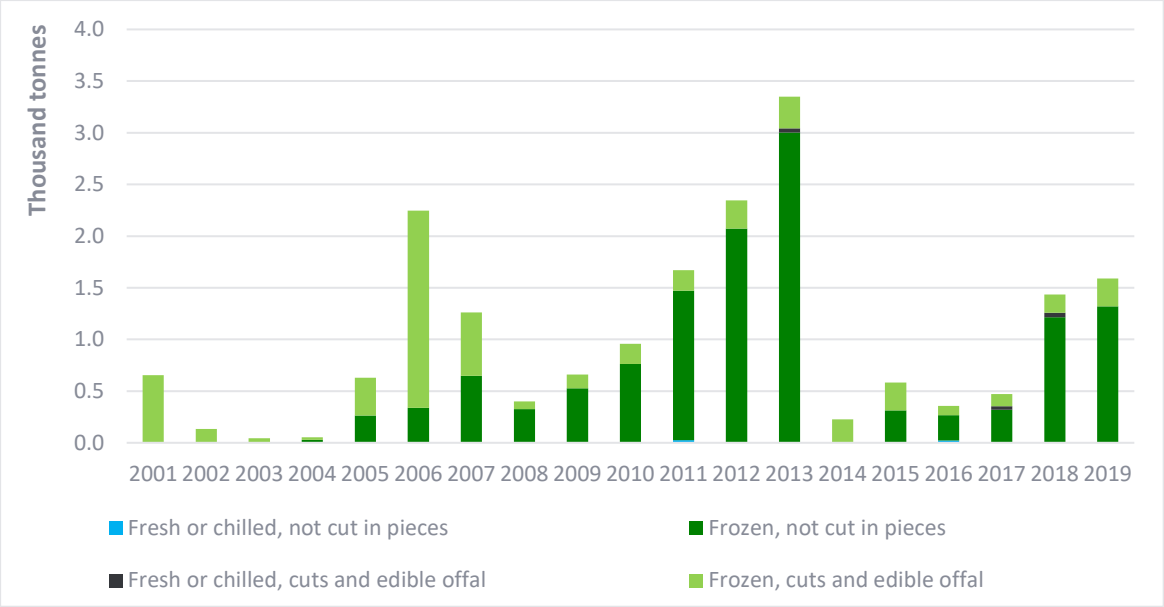

Figure 21: Kenyan chicken imports, disaggregated by product
Source: ITC, 2020 (Mirror data)

Policy environment

The overarching policy document governing the poultry sector in Kenya is the Draft National Livestock Policy of 2019. The policy covers key issues on farm animal genetic resources, livestock feeds and nutrition, inputs, animal diseases and pests, livestock marketing, research and extension, and food security. In addition, the Directorate of Livestock Production has drafted a Livestock Bill which intends to regulate the livestock sector, including livestock marketing, vaccine production, tsetse and trypanosomiasis eradication, animal genetics

resources and training. On the veterinary side, the Directorate of Veterinary Services has consolidated the veterinary laws into two draft bills, the Animal Health Bill and Veterinary Public Health Bill. The bills are in line with international agreements, guidelines and standards that Kenya has ratified or adopted including OIE guidelines, Codex Alimentarius Commission standards, WTO Agreements on Sanitary and Phytosanitary measures, East African Community treaties, Intergovernmental Authority on Development in East Africa policies and UN Sustainable Development Goals.

The livestock sector is also highlighted in the Presidential Big Four Agenda under the pillar on Food and Nutrition Security. This implies significant policy priority to the sector. One area of focus is improvement of smallholder productivity and the Agenda has identified the establishment of commercialized feed systems for livestock, fish, poultry and piggery as key in revolutionizing feed regime and traceability of animals.

The State Department for Livestock (SDL) has been assigned functions on production, management, value addition and marketing as per the Executive Order number 1 of 2018. The Order assigned functions on promotion and development of the livestock industry, value addition and marketing, which have also been assigned to county governments in the Fourth Schedule of the Constitution. Within the SDL, the functions that touch on the poultry subsector include livestock policy and Veterinary services and disease control through the Kenya Veterinary Board (KVB), the Kenya Veterinary Vaccine Production Institute (KEVEVAPI) and the Animal Technicians Council.

With respect to trade, Table 4 presents the current tariffs applied by Kenya to different primary chicken products in 2020. It presents a fairly simple classification structure, in line with global norms at HS 6 level, with no further disaggregation to HS 8 level. Tariffs are the same across the various HS classifications, with a general duty of 25%. This is not applied to members of the East African Community (EAC), which can enter Kenya's market duty free, along with members of the free trade area within COMESA. COMESA countries that are not signatories of the Free Trade Agreement face a tariff of 2.5%.

Table 4: Tariffs applies by Kenya to poultry imports

HS Code	Description	Duty applied			
		MFN	EAC	COMESA (FTA Members)	COMESA (non-FTA members)
0207.1: Meat of poultry species "Gallus Domesticus" – Fresh, Chilled or Frozen					
0207.11	Fresh or chilled, not cut in pieces	25%	0%	0%	2.5%
0207.12	Frozen, not cut in pieces	25%	0%	0%	2.5%
0207.13	Fresh or chilled, Cuts & edible offal	25%	0%	0%	2.5%
0207.14	Frozen, Cuts & edible offal	25%	0%	0%	2.5%

Source: Market Access Map, 2020

Poultry sector overview: Tanzania

Livestock production is among the major economic activities in Tanzania's rural areas providing livelihoods to about 37 percent of agriculturally active households (URT, 2016). This sector

contributes some 7.4 percent of the GDP of the country (MLF, 2017a). The Bank of Tanzania (2019) highlighted that the sector maintained a growth of 4.9 percent in 2017 and in 2018 and now accounts for 7.6 percent of GDP growth for the country. Within the livestock subsector, poultry is still one of the smaller sectors, contributing an estimated 1.8% to agricultural GDP in 2016, compared to 12% from cattle and 8% from dairy.

Industry Structure

Tanzania's poultry industry utilizes a diverse range of breeds within various production systems. According to the Ministry of Livestock and Fisheries (MLF) (2020), the national flock comprises 83 million birds, of which 38.7 million (47%) are indigenous breeds, 33.4 million (40%) broilers and 11.1 million (13%) layers. This represents a significant expansion from the 69.4 million reported in the Tanzania Livestock Masterplan of 2017. While flock numbers of broilers and indigenous breeds are fairly similar, improved productivity from broilers enables them to contribute a much larger share of production. Estimates suggest that up to 85% of chicken meat consumed in Tanzania comprises exotic breeds (broilers and spent layer hens), while higher costs and inconsistent supply result in indigenous breeds only constituting 15%, despite being preferred by rural consumers.

Statistics on the regional distribution of broilers and layers are scant and somewhat contradictory to the national aggregate data. Summing up the region data from the annual agricultural sample survey by the Tanzania National Bureau of Statistics (NBS) the national poultry production in 2017 was 42 million, substantially less than the national statistics of 69.4million. Similarly, in 2019 the ARDS (2020) region distribution data sum up to a total of 35.10 million, substantially less than the national figure provided by the MLF (2020) of 79.40 million. This underestimation in regional surveys may be due to the number of cycles obtained by broilers in any single calendar year, whereas surveys are stationary and present a single point in time. Nevertheless, in order to provide some context on where poultry production occurs, Figure 22 presents the latest figures from the ARDS (2020).

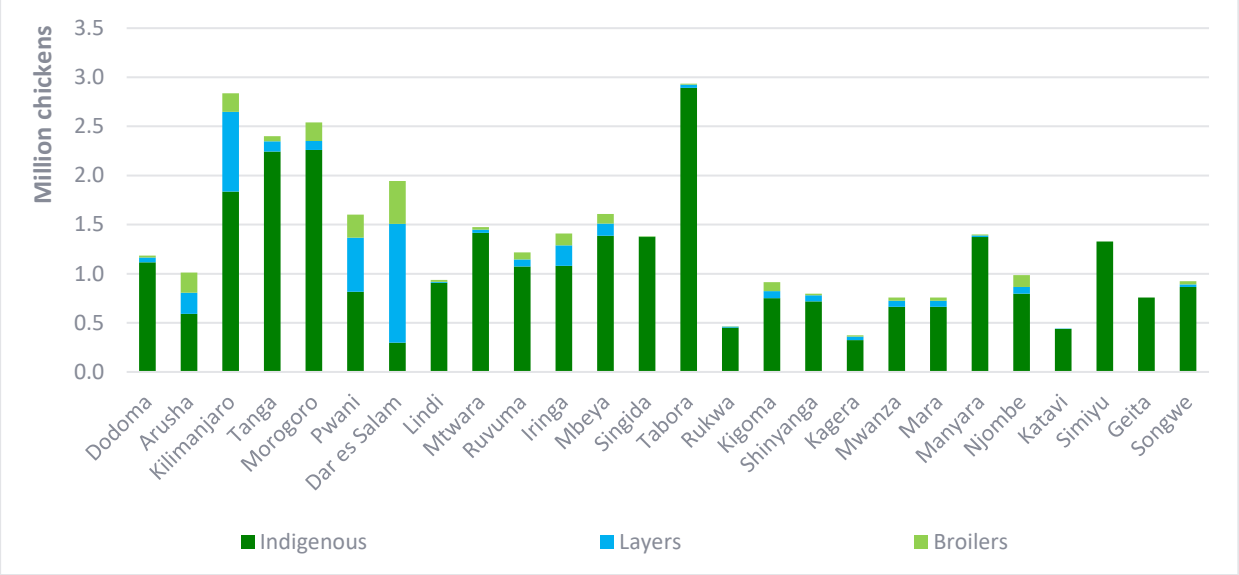

Figure 22: National flock by regions in Tanzania in 2019

Source: Compiled from Agriculture Routine Data System (ARDS) data of 2020

Figure 23 presents a high level overview of Tanzania's poultry value chain. From a marketing perspective it indicates that the bulk of poultry products are still traded through informal channels, which account for roughly 80% of total production. The poultry products typically procured through informal markets include live birds, dressed whole birds and eggs. Products such as chicken portions, sausages and chicken fillets are mostly traded through the formal market which constitutes roughly 20% of the total volume traded. Producers tend to prefer informal markets, where immediate payment improves cashflow and enables efficient restocking, as opposed to typical credit policies of large companies or institutional buyers, where payment can take 30 to 90 days.

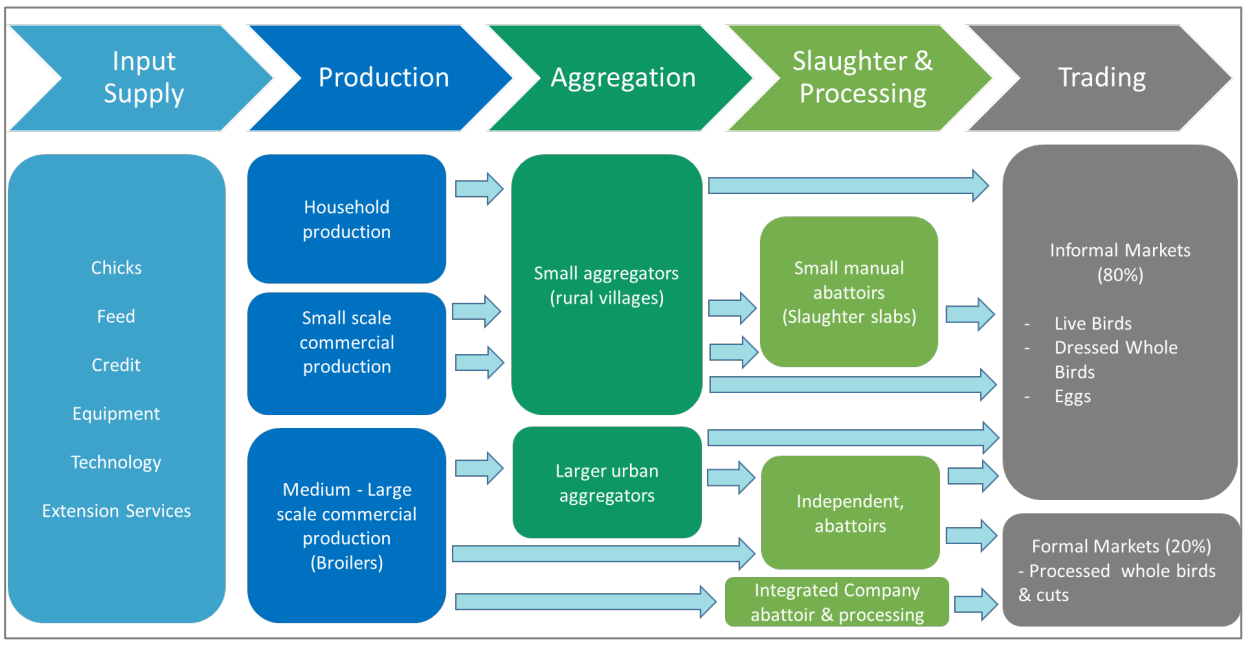

Figure 23: Value chain map of Tanzania's poultry value chain structure.

Source: BFAP & Sokoine University of Agriculture, 2018

Across the spectrum of formal and informal markets, there are various categories of buyers, with different preferences. High profile hotels normally prefer exotic breeds, as their supply is more reliable and less costly. Local hotels and restaurants in peri-urban or rural areas, including bars and pubs, buy exotic and local chicken, depending on their clients. However, unreliable supply and high costs of local chicken makes them prefer exotic breeds. Institutional buyers prefer exotic breeds.

Households in the rural areas tend to prefer local chicken due to perceptions related to quality and food safety, while those in urban areas are more accepting of exotic breeds due to their availability and relatively low cost. Exotic breeds are also normally well dressed, packaged, and sold in urban supermarkets. Local chicken meat is not common in supermarkets due to inconsistent supply, which challenges supermarket supply chains. In addition to their own production, vertically integrated growers are key buyers of chicken for their slaughtering or processing facilities.

The broad range of marketing channels illustrated in Figure 23 is essentially supplied by three categories of producers. The first is traditional production systems, which dominates in rural areas and is mostly aimed at household consumption, utilizing indigenous breeds. The second is a semi-commercial system, where production is for both household consumption and for the market. Finally, the third group is fully commercial, producing solely for commercial purposes.

Traditional production systems for household consumption

Traditional production systems are still frequently found in rural areas and rely almost solely on indigenous, dual purpose breeds. Flock sizes range from around 5 to 50 chickens, mostly relying on scavenging in a free range system. Some supplemental feeding would consist of maize, wheat or rice bran. A very small share of products reaches the market, with in excess of 90% of production consumed within the household.

Indigenous chickens are characterized by very poor productivity. Typically, they produce only around 36 eggs per annum, across three laying cycles. At the end of the year, they reach a weight of 1 to 1.5kg. Some eggs are retained for hatching, in order to regenerate the flock, but hatchability is poor at around 60-65%, with mortality rates of 45-70%.

In an effort to improve productivity, improved breeds such as the Kuroiler or SASSO have been introduced as an alternative to indigenous breeds, but in a similar system. These are also dual purpose breeds able to scavenge, with some supplementary feeding, but they are able to reach a weight of 1 to 1.5kg much quicker, typically in around six months. Male birds have to be sold to market or used for own household consumption before 6 months since breeding will then start and own household reproduction is not desirable due to the risk of cross-breeding with traditional chickens. Female birds are retained in a laying cycle, yielding around 75 eggs per annum, before being sold or consumed at the end of the cycle.

While productivity improves greatly when utilizing these breeds, thereby improving earning potential, as well as supply for household consumption, the system is riskier, as producers have to restock with commercial chicks for every cycle, as opposed to utilising their own flock for reproduction. Consequently their uptake has been limited amongst producers with limited commercial intent.

Semi-commercial production systems

Within the semi commercial systems, which produce greater output and supply a higher proportion of production to the market, improved indigenous type breeds have become increasingly popular. These are still dual purpose breeds, utilized for egg and meat production. With a typical flock size of 200 to 300 birds, a purely scavenging system is not feasible due to a lack of space. While some free roaming and scavenging still occurs, the extent of supplementary feeding is much more than in traditional household systems. These more intensive feeding operations also tend to rely more on pre-mixed rations, as opposed to pure maize or wheat bran.

Within this system, producers typically sell live birds and eggs to aggregators, who collect from numerous small producers before selling at informal markets. While some household consumption still occurs, the bulk of product tends to be market orientated.

Fully commercial production systems

Within this commercially orientated group is a range of different sized enterprises. The Meat Industry Act (Government Notice no 677 published on 13/9/2019) classifies large scale, medium and small scale commercial producers to be those firms producing more than 10,000, 1000 to 9999 and 400 to 999 birds per year respectively. Medium and large-scale commercial producers are normally based in town or close to urban areas given the fact that commercial production is capital intensive.

While some of the smaller operations still utilise improved dual purpose breeds such as the Kuroiler or SASSO, medium to large scale operations typically produce broilers. These are highly productive and typically produced in a cycle of 4 weeks. Producers revealed that beyond 4 weeks, margins reduce due to a weaker feed conversion ratio and high feed cost. Within this space, many of the larger producers are vertically integrated, engaging in the full chain from feed production to meat processing. In addition to company farms, these integrated companies also utilise contract producers for the crucial broiler grow-out stage. An example is Interchick Co. Ltd, who procures 90% of its meat supplies through a network of contract growers, to which it provides day old chicks and feed.

Within these contractual arrangements, the companies typically supply contract growers with inputs at a reduced cost, sometimes on credit. The contract producer then sells the birds to the company at an agreed price, based on carcass weight obtained. In some cases, the contract grower does not incur the full input costs up front, but instead pays a deposit of around 75%, with the balance subtracted from the sales price when the birds are delivered.

Integrated companies typically have their own breeder operations for day old chick supply, with genetics imported from Europe. They also have modern slaughter and processing facilities. Integrated companies always avail their products in the formal markets (formal retail, hospitality, supermarkets, restaurants and catering, institutional) as a whole bird dressed.

Market trends over time

Tanzanian poultry production has grown steadily over most of the past decade, by an annual average of 2.5% since 2010. Recent survey data from the ARDS (2020) and the NBS (2017) also suggests that it is commercializing rapidly. This is flagged by the proportionate growth of exotic bird population over the past three years (39% from 32 million to 44.51 million), which is ten times greater than that of indigenous birds (3.6% from 37.4 million to 38.77 million). At regional level, flock data does not correlate well with these national statistics and while the suggested growth is impressive, the same extent of growth is not reflected in chicken production statistics from international sources such as the FAO.

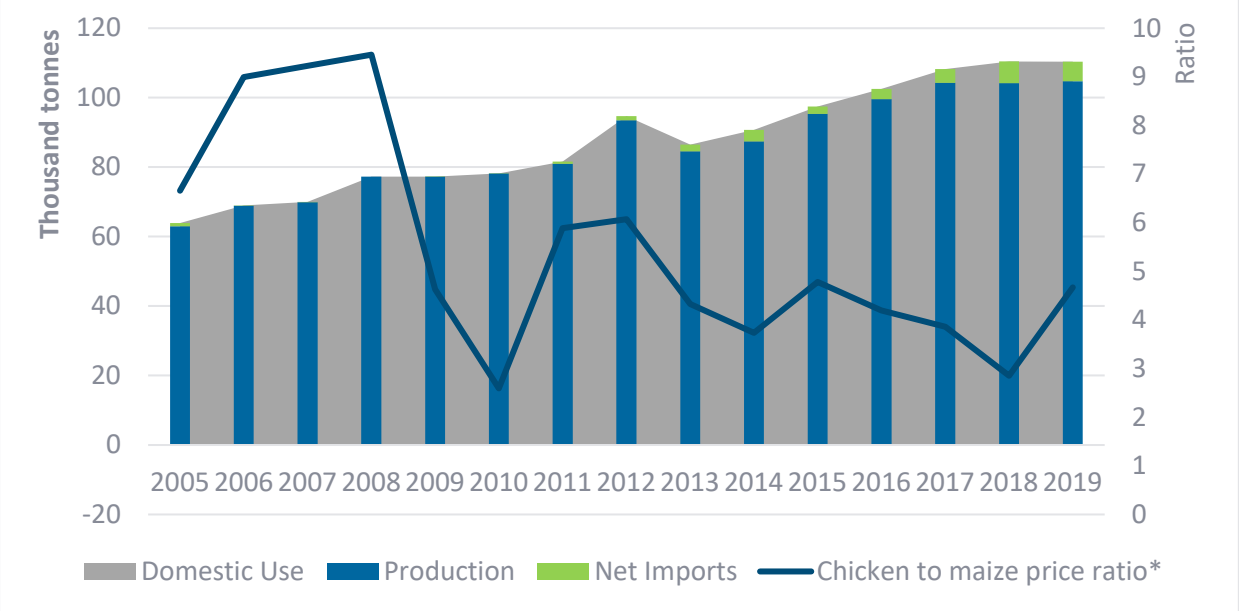

Figure 24: Chicken production, consumption, net imports and profitability in Tanzania
Source: Compiled from TNBS, FAOSTAT, FAO Food Outlook & ITC, 2020

Evaluation of day old chick production also points to substantial growth and commercialization over the past decade. SAPA (2015) suggests that Tanzania produced 61 and 63 million day old chicks per annum respectively in 2013 and 2017, whereas recent estimates from the MLF (2020) put the figure for 2019/20 at 80.3 million. This comprises 85% broiler chicks, 3% layer chicks and 11% improved dual purpose breeds such as Kuroiler and SASSO. The MLF (2020) also notes an increase of 35% in imports of parent stock over the past 2 years, mainly from France, Netherlands, Zambia and India.

The expansion in day old chick production is also evident in the expansion of the number of hatcheries, as well as the capacity of existing hatcheries. In 2010, the MLF reported that medium

and large scale producers relied solely on 12 hatcheries across 5 regions (Dar es Salaam, Coast, Arusha, Kilimanjaro and Iringa). Between them, these hatcheries had a capacity of 1.5 million chicks every 3 weeks. By 2020, this had expanded to 25 hatcheries, with a combined capacity of 5.6 million chicks every 3 weeks (MLF, 2020). The changes in capacity of selected firms over the past 10 years are presented in Table 5. Further to those presented in the Table, Ringo and Mwenda (2018) reported a production capacity of about 10,000 DOC per week at Silverlands in Iringa alone. Currently, the Ministry of Livestock and Fisheries (MLF 2020 has highlighted the capacity of Silverlands to be about 300,000 DOC per week.

Table 5: Day old chick production capacity of selected poultry firms in Tanzania: 2010 and 2020.

No	Region	Hatchery	Capacity in 2010/3 weeks	Capacity on 2020/3 weeks	% increase
1	Dar es Salaam	Interchick	260 000	915000	252
2		Twiga Hatcheries	120 000	360000	200
3		Ideal chicks	120 000	360000	200
8	Pwani	Ruvu JKT	30 000	90000	200
9		Kiluvya Poultry Products	30 000	90000	200
10	Arusha	Tanzania Poultry Farms	180 000	540000	200
11	Kilimanjaro	Kilacha	30 000	90000	200
12		Kibo Hatcheries	60 000	180000	200

Source: (MLF 2010 and MLF 2020)

Despite the rapid growth in production, the industry remains challenged by comparatively high feed costs. Feed costs in turn are influenced by high and volatile prices of key raw materials such as maize and soybean meal. This volatility is evident in the chicken to maize price ratio in Figure 24. The figure also indicates that, despite strong growth, the deficit in the domestic market continues to increase. While net imports only constituted an average of 5% of domestic consumption between 2017 and 2019, net imports have increased by an annual average of 27% since 2015. The bulk of these imports are classified as frozen cuts (Figure 25), with the USA representing the most prominent supplier (Figure 26).

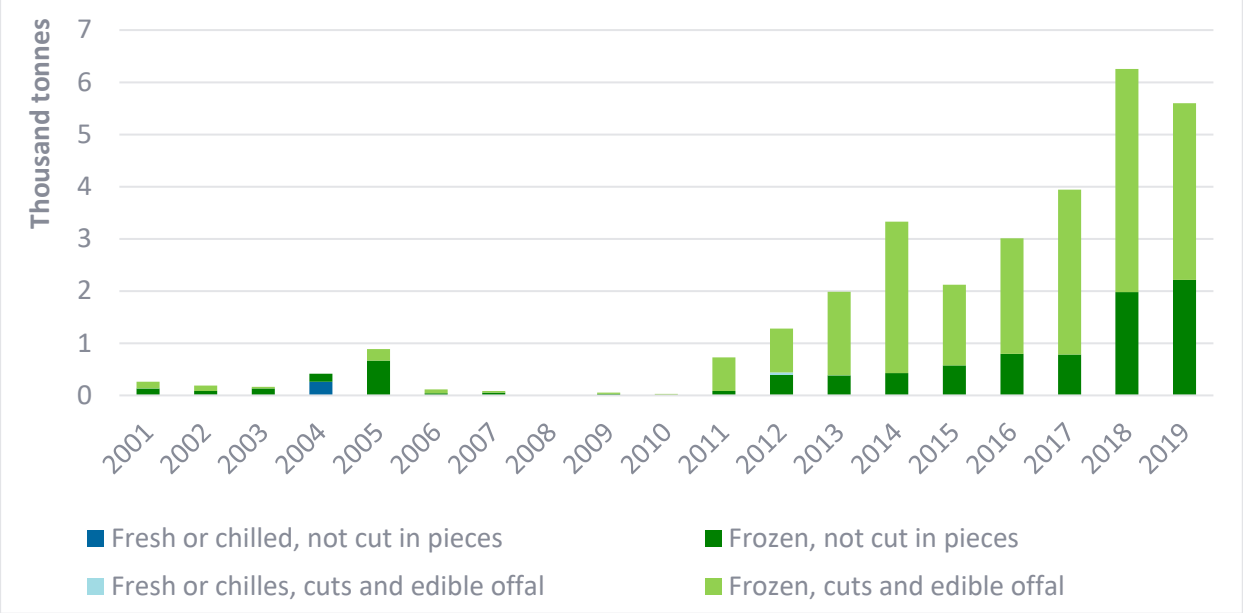

Figure 25: Poultry imports into Tanzania disaggregated by product type

Source: ITC, 2020

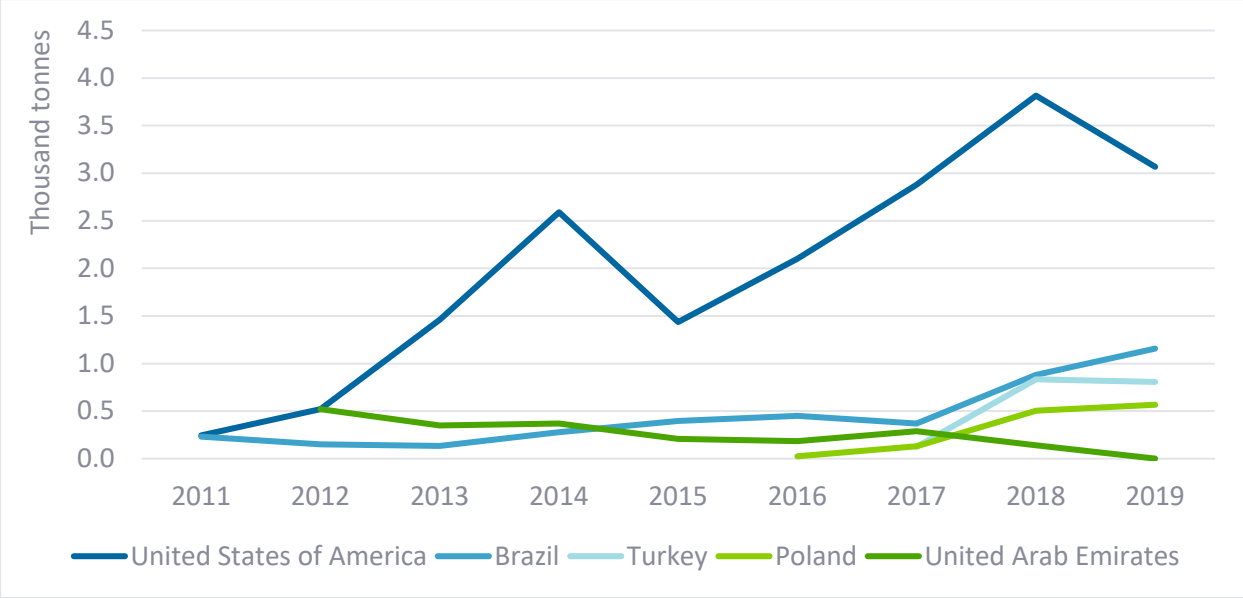

Figure 26: Poultry imports into Tanzania from selected suppliers

Source: ITC, 2020

Policy environment

Currently, there is no specific policy for the poultry subsector in Tanzania. The National Livestock Policy of 2006 guides the development of the livestock sector as a whole. The instruments for the implementation of this policy are covered by the Livestock Sector Development Strategy of 2010 and the Livestock Sector Development Program of 2011 (Ringo and Mwenda, 2018). A detailed review of the policies that affect the sector is included in Table 6. It covers *veterinary services, feeds, breeding flocks and hatcheries*, meat/eggs and live

chicks/chicken movement, registration and traceability. Many of these policies are currently under review by the Government of Tanzania.

Table 6: Major regulations and their respective insertion in poultry industry in Tanzania

Item	Act, Law or Regulation	Effect
Veterinary services, Drugs and Vaccine	*The Veterinary Act of 2003*	Establishment of Veterinary Council of Tanzania and gave the mandate to regulate the veterinary profession in the country, register Veterinarians and Paraprofessionals and regulate the general principles of veterinary practices.
	Animal Diseases Act of 2003	Gave Director of Veterinary Services (DVS) the overall mandate of regulating livestock activities for the purpose of controlling animal diseases in the country. It has set procedures and requirements for inspecting, registering, testing, identifying, licensing and regulating movements of animals and animal products.
	Industrial and Consumer Chemicals (Management and Control) Act, 2003	Under this mandate, the Chief Government Chemist Laboratory Authority (CGCLA) inspects to certify imported veterinary drugs at the point of entry before they are allowed to enter the market.
	Tanzania Food, Drugs and Cosmetics Act 2003	Gave the mandate to TFDA (Tanzania Food and Drugs Authority) to handle registration of premises, issuing of wholesale and license, issuing import permit.
	The amendment of the Tanzania Food, Drugs and Cosmetics Act Cap 219 through the Finance Act of 2019	The Tanzania Food, Drugs and Cosmetics Act, Cap 219 was amended to redesignate the activities that were done by the Tanzania Foods and Drugs Authority (TFDA) relating to food, drugs, medical devices, cosmetics to only medicines, medical devices. Consequently, TFDA has been changed to become the Tanzania Medicines and Medical Devices Authority (TMDA).
	The Animal Diseases (Vaccines and Vaccination) Regulations, 2020 GN. Na. 180	It regulates and control the quality of animal vaccine and vaccination, making sure efficiency vaccination (coverage and completeness is achieved). It also regulates prices of vaccine and vaccination i.e the price for Newcastle Vaccine is 50 Tshs per dosage and Vaccination is 50 Tshs per chicken.

Feeds	*The Grazing Land and Animal Feed Resources Act of 2010*	Management and control of grazing lands, animal feed resources and trade and other matters related to animal feeding. It regulates feed manufacturers, importers and distributers. It also sets standards for different feed resources and ensures no substandard feeds are sold in the market.
Breeding flocks and hatcheries	*The animal diseases act 2003*	This Act was established to control activities in all livestock sectors. Although well intended to control the spread of all animal disease it was later clear that there were a need for a regulation to control poultry diseases specifically after the global outbreak of the H5N1 avian influenza virus.
	The Animal Diseases (Hatcheries and Breeding Flocks) Regulations of 2010.	Require hatcheries to be inspected and registered formally and hatchery owners to have formally written Standard Operating Procedures (SOPs). They also regulate production and sale of eggs and chicks through registration and inspection of hatcheries and agents that distribute eggs and chicks.
Meat/eggs and live chicks/chicken movements	*The Tanzania Meat Industry Act of 2006.*	Mandates the Tanzania Meat Board to regulate all stakeholders involved in the business of producing and trading poultry birds and their products including breeding farms and hatcheries.
	Meat Industry (Registration of Meat Industry Stakeholders) (Amendment), 2019 GN.No.677;	Requires meat industry stakeholders to register a farm or establishment with a tin number and a known valid address recognized by the local authorities. Paying the registration fee according to the scale of operation classified as large scale commercial producer (raising above 10,000 poultry per year), medium scale commercial producers (1,000 to 9,999 poultry per year) and small scale commercial producer (400 to 999 poultry per year).
	The amendment of the Tanzania Food, Drugs and Cosmetics Act Cap 219 through the Finance Act of 2019	The regulation of Food and Cosmetics has been shifted from the then Tanzania Food and Drugs Authority (TFDA) to Tanzania Bureau of Standards (TBS). All activities that were conducted by TFDA relating to quality assurance and safety of food and cosmetics products, have now been transferred to TBS

Registration and traceability	The Animal Welfare Act of 2008	The law requires the owner or operator of a vehicle, vessel, aircraft or premise to maintain minimum established standards for transporting or keeping an animal. It also involves checking and certifying how animals are transported. It is very relevant to poultry as it defines how chickens should be housed, raised, transported and slaughtered.
	The Livestock Identification, Registration and Traceability Act.	Establishment of National livestock Identification, registration and traceability system and livestock recording system.

From a trade perspective, Tanzania applies import tariffs as specified in Table 7. As is the case with Kenya, Tanzania is a member of the EAC and in line with global norms at HS 6 level, with no further disaggregation to HS 8 level. Tariffs are the same across the various HS classifications, with a general duty of 35%. Other members of the EAC are exempt from this tariff, as is South Africa and members of the Southern African Development Community.

Table 7: Tariffs applies by Tanzania to poultry imports

HS Code	Description	Duty applied			
		MFN	EAC	SADC	South Africa
0207.1: Meat of poultry species "Gallus Domesticus" – Fresh, Chilled or Frozen					
0207.11	Fresh or chilled, not cut in pieces	35%	0%	0%	0%
0207.12	Frozen, not cut in pieces	35%	0%	0%	0%
0207.13	Fresh or chilled, Cuts & edible offal	35%	0%	0%	0%
0207.14	Frozen, Cuts & edible offal	35%	0%	0%	0%

Source: Market Access Map, 2020

Poultry sector overview: Ghana

Agriculture remains one of the most important sectors in the Ghanaian economy. In terms of contribution to GDP, agriculture was overtaken by the services and industry sectors over the last decade. In terms of employment, agriculture's[8] share of the total labour force of persons aged 15 years and older is about 38%, representing the second largest sector after services (GSS, 2019). In terms of the active labour force in general, agriculture contributes about 45 percent. Most of those employed in agriculture are in traditional farming systems dominated by smallholders with farm holdings less than two hectares, which are cultivated using rudimentary technology.

Large scale or commercial agriculture in both the crop and animal subsectors is minimal with a few large rubber, oil palm and coconut plantations. Between the two subsectors, livestock production has received the least attention over the years. The major livestock species produced

[8] Including fisheries and forestry.

in Ghana are cattle, sheep, goats, pigs and poultry. Within the livestock subsector, poultry has been attracting significant attention over the last decade due to the high volumes of imports and a dwindling and struggling domestic poultry subsector. The importance of poultry in Ghana transcends economic and livelihood gains and includes social, religious and spiritual benefits.

Within the poultry sector in Ghana, chicken is by far the most commonly produced species followed by guinea fowls, ducks and turkey. Other less prominent poultry species such as geese and ostriches are also produced in the country but may not feature in surveys due to the small scale of production. The report of the 7th round of the Ghana Living Standards Survey (GLSS7) shows that over one million households are involved in chicken production, producing nearly seventeen million birds. Across ecological zones, over 40 percent of chicken and turkey production takes place in the rural forest zone. For each of them, the second-largest proportion of production takes place in the rural savannah zone. This spatial distribution of poultry production was noted by Ekin et. al. (2010) who indicate that rural location is one of the main determinants of poultry production in Ghana.

Table 8: Poultry raised by households, number, value, sales and purchases in the last 12 months preceding GLSS7 survey

Type	Estimated number of households raising	Number of Poultry	Total value of livestock (Million GH¢)	Sales of livestock in the last 12 months (Million GH¢)	Livestock purchased in the last 12 months (Million GH¢)
Chicken	1,115,757	16,866,545	442.57	39.04	10.52
Guinea fowl	163,440	1,802,838	43.41	11.52	0.79
Duck	49,622	457,629	21.04	1.67	0.43
Turkey	8,448	58,019	10.75	0.75	0.03

Source: GLSS7 report (GSS, 2019)

Industry structure

In Ghana, livestock and poultry are raised under three production systems, namely the extensive, semi-intensive and intensive. The extensive system dominates production, practiced by smallholder producers, especially in rural areas. This is distinct from commercial production, which is defined by a primary intent to produce and sell for profit. In Ghana, farms with over 10,000 birds are classified as large scale; 5,000 to 10,000 bird-farms are considered medium-scale and 50 to 5,000 birds constitute small-scale farms (MoFA, 2016). The commercial poultry industry has two major segments, layer production for eggs and broiler production for meat, both in highly intensive systems. The production of layers for eggs is preferred to broiler production due to less competition from imports, which allows farmers to get better prices for eggs in the local market. Medium and large-scale farms for both layers and broilers are found mainly in the peri-urban and urban areas of the country.

Of the livestock produced in Ghana, an estimated 90% is attributed to rural small and medium scale farmers with only about 10 percent of the stock going through formal marketing outlets (MoFA, 2019b). Nevertheless, The Ghana Livestock Development Policy and Strategy document recognizes the importance of developing both traditional and modern systems of livestock production. Whilst the local breeds are typically reared in rural areas in backyard farms for subsistence, the exotic breeds are found mainly in the urban and peri-urban areas and are reared for commercial purposes. The local breeds of chicken are distributed throughout the country and include the frizzle, barred and naked neck which are far outnumbered by exotic breeds, namely Hisex Brown, ISA Brown, Lohmann Brown, Lohmann White, Bovan Brown. These exotic breeds are kept for commercial purposes, mostly in the urban areas, and are either imported or hatched locally from established parent stock, but usually from imported eggs (Table 9). The available data shows the dominance of chicken imports over turkey[9], and layer imports are consistently higher than the rest, except in 2014. The high layer imports are explained by producer preference for egg production, which is precipitated by less competition from imports than broiler production. For one thing, it is more challenging importing eggs due to problems associated with transportation and handling. Similar challenges are associated with live bird imports.

Table 9. Number of Day-Old Chicks and Parent Stock Imported (2009-2018)

Year	Broiler	Layer	Turkey	Parent Stock
2009	454,640	1,036,872	6,972	58,822
2010	379,643	1,422,199	21,290	95,016
2011	547,205	2,461,140	9,180	9,180
2012	651,112	3,227,844	16,966	114,344
2013	1,088,865	4,481,602	9,286	126,288
2014	3,161,144	602,209	6,840	18,080
2015	246,948	2,573,326	19,497	111,692
2016	784,917	3,963,705	13,412	158,386
2017	724,580	5,476,815	14,945	86,099
2018	511,960	7,130,999	41,189	101,871

Source: Veterinary Services Directorate, MoFA

The poultry value chain comprises institutions such as the Ghana National Association of Poultry Farmers (GNAPF) and its regional branches and the Ghana Feed millers Association, with the Ministry of Food and Agriculture, the donor, bilateral and multilateral communities playing the role of supporting of farmers, feed producers, traders, processors, wholesalers, retailers, and consumers to undertake poultry production activities. The value chain appears fragmented, with different actors specializing in single or multiple production activities and products. They operate in both the domestic and international markets to trade in poultry inputs such as day-old chicks, hatching eggs, vaccines, drugs and feed, and in products, predominantly chicken in the form of live birds, meat and eggs, importing predominantly. These production ventures in

[9] Exotic California White breed imported for festive seasons. The local indigenous turkey breeds are white, bronze and buff varieties which can be found nationwide but concentrated in the Upper-East, Ashanti and Eastern regions (MoFA, 2016).

the poultry value chain are sustained by imports. The volumes of imports are high and are not only limited to poultry products but production inputs as well. For example, importation of day-old chicks, hatching eggs, vaccines, drugs and feed are reported to be high even though Sumberg et al. (2013) note that the available data provides only a partial picture due to underreporting. Inputs such as hatcheries, feed mills, processing plants, cold storage and transportation facilities for live birds and frozen chicken are inadequate. These factors mainly contribute to the industry's inability to meet the nation's consumption requirements.

Andam et al. (2017) provide evidence on a reduction in the number of commercial feed mills in the country, reducing from 15 to 6 within the decade leading to the study. They also reported the emergence of vertically integrated poultry farms with their own feed mills, representing a shift from stand-alone or specialized commercial milling. Whilst the feed mill subsector has generally been neglected in policy discourse, Andam et al. (2017) adduce evidence that the vertically integrated feed mills and stand-alone commercial mills are subject to more regulation because of their (large) size compared to the predominantly smaller service mills which are the preferred feed source for most smallholder poultry farmers, with adverse effects on feed quality for smallholder production. Feed quality differences between the small service feed mills on one hand and vertically integrated feed mills and stand-alone commercial mills on the other emanate from the use of more advanced production technology by the latter, which is to be expected from our understanding of production in the agricultural sector in general where commercial and large-scale production tends to do better in terms of technology use and quality and quantity of products. It is this limited commercialization in feed and poultry production that constrains the development and competitiveness of the poultry sector in Ghana. Attempts to interact with the Ghana Feed Millers Association and Ghana Poultry Farmers Association to substantiate these observations have not been successful yet.

Poultry product markets trade in live birds, meat, and eggs. In this industry, only egg producers encounter limited foreign competition in the form of imports from Côte D'Ivoire (Sumberg *et al.*, 2013). Traders scavenge for live birds due to the low production, going to farms and village markets to purchase/aggregate broilers, spent layers and local poultry breeds, which they retail themselves or supply to table top sellers in urban markets. Retail trade of live bird takes place in the central markets of the regions, districts, and towns across the country. The live bird market is not well structured; it is subject to the availability of products which tends to boom during festive public occasions and is open to all who desire to do wholesale or retail trade, including farmers. The main actors in the wholesale meat trade, which comes in the form of dressed and cut up portions, are importers, processors and butchers who supply various retail outlets.

Darko Farms and Asamoah and Yamoah Farms are the two large scale chicken processors with a combined processing capacity of 15,000 birds per day (MoFA, 2016). Both are located in the Ashanti region. Meat processing on these farms essentially involves cutting and packaging fresh poultry meat and sausage production. Processing factories are mainly constrained by the limited supply of birds, high cost of inputs and maintenance, equipment breakdowns and skilled labour constraints. These difficulties in processing chicken meat locally mean that policy interventions

such as the removal of customs duties on input imports need enforcement alongside the provision and competitive production inputs for local production.

Market trends over time

Over the past two decades the poultry industry in Ghana has been on a decline in sharp contrast to the post-colonial era, particularly the 1960s when the industry begun to show signs of vibrant growth. Several African countries, including Ghana, experimented with large-scale farms, under the state farms paradigm. In the livestock sector in Ghana, a large, modern, state-owned poultry project established near Accra was believed to be as efficient as those in the US (Miracle & Seidman, 1968). This was meant to increase domestic protein consumption with the goal of sustainably producing 10 million chickens yearly for breeding, egg production, and for sale as broilers. This was lauded as promising at the time but there is no data on costs and returns of this project to assess its success and impact on the industry.

Recent data from international sources and projections show that domestic poultry production has been on the increase (MoFA, 2019b). Domestic chicken meat supply increased from almost 5 thousand tonnes in 1961 to 47.6 thousand tonnes 2013 (Amanor-Boadu, Nti and Ross, 2016). This increase was estimated to have occurred at an average rate of about 3.6% per annum. From 2013 to 2018, production increased by a further 4% per annum, to reach 65 thousand tonnes (Figure 27). This expansion is based on data reported by the FAO. In country, the Statistics, Research and Information Directorate of MoFA only reports projections, which also reflect a consistent increase at an annual average rate of about 3% per year between 2014 and 2018. Regardless of the exact rate between 3 and 4 percent per annum, the expansion has been insufficient to supply domestic demand, with net imports increasing continually by an annual average of 8.6% per annum since 2013.

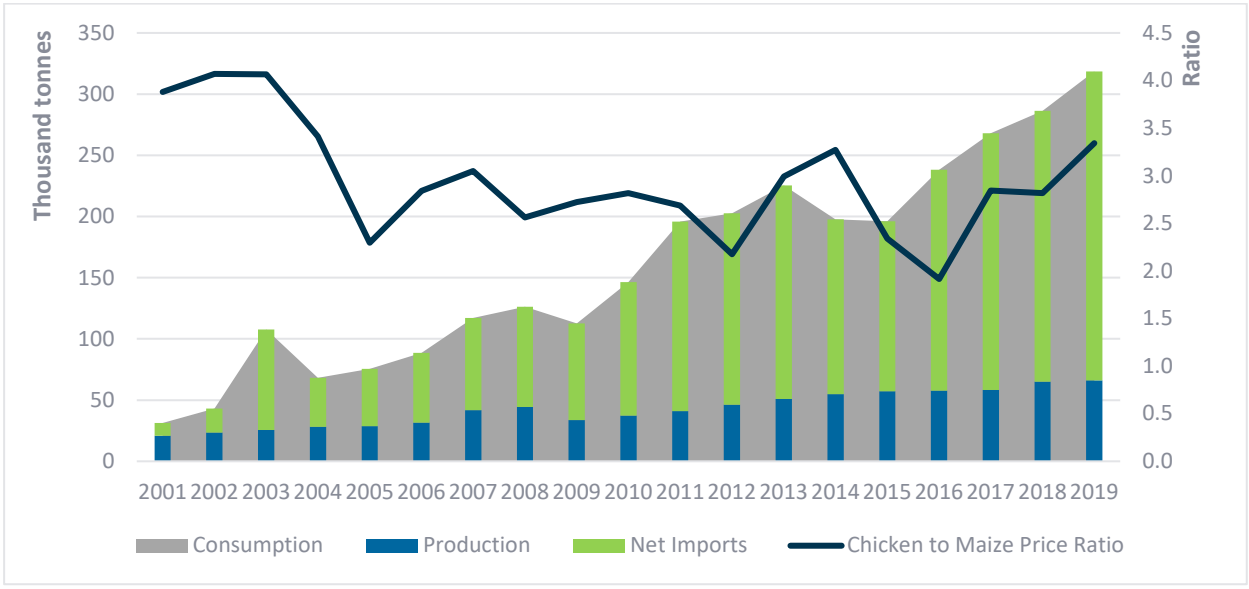

Figure 27: Chicken production, consumption, net imports and profitability in Ghana: 2001-2019

Source: Compiled from FAOSTAT & ITC, 2020

The enormity of the domestic supply-demand gap is further highlighted by the import penetration ratio (IPR), the total imports divided by total domestic production. In 1991, the IPR was 100 percent, implying that Ghana imported as much as it produced to meet its local demand, and by 2013 the IPR increased to approximately 439 percent, meaning that for every metric ton of chicken produced about 4.4 metric tons is imported (Amanor-Boadu, Nti & Ross, 2015).

The dependence on imports for poultry meat is considered by poultry value chain actors and policymakers as the most challenging issue facing the poultry industry (Andam et al., 2017). For frozen meat, for example, chicken alone accounts for over 97 percent of poultry imports, followed by turkey (2.9 percent) and ducks, geese and guinea fowls (0.03 percent). From 2014 to 2018, the annual average poultry meat imports value was roughly US$114 million (MoFA, 2019a).

The available data from the Ghana Statistical Service, as well as mirror data from trade partners and Sumberg *et al.* (2013) indicate that chicken meat imports have been on the rise over the last decade. For instance, an estimated 108 thousand tons of fresh and frozen chicken meat was imported in 2010. This increased to more than 250 thousand tonnes by 2019. Figure 28 and Figure 29 suggests that frozen bone-in portions constitute the bulk of import volumes and that, while a large number of countries contribute, the USA is the largest supplier. This growth in imports has certainly not escaped academic and policy attention. For example, a recent government of Ghana policy known as Rearing for Food and Jobs (RFJ) aims to reduce Ghana's meat deficit by increasing local poultry meat production from chicken and guinea fowl by 400 percent.

Figure 28: Chicken imports into Ghana: 2001-2019

Source: Compiled from ITC, 2020

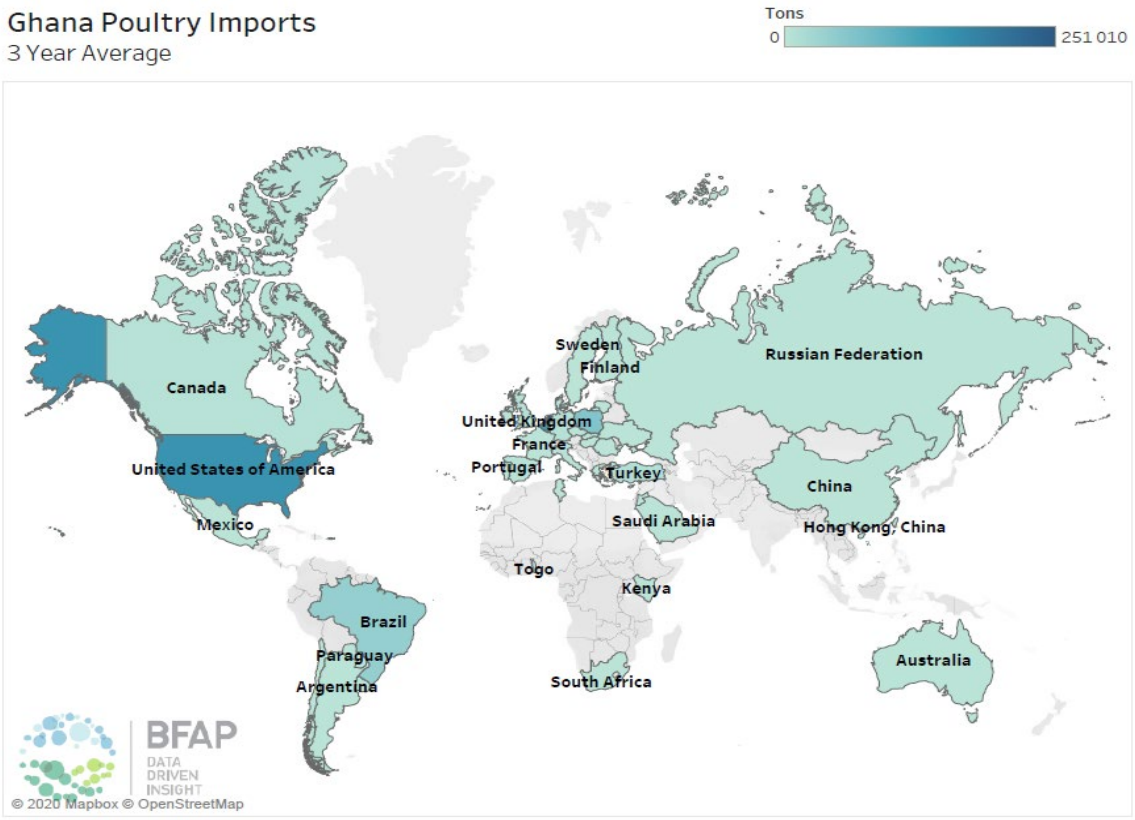

Figure 29: Imports of poultry into Ghana, disaggregated by country of origin
Source: Compiled from ITC, 2020

Policy environment

Relative to the crops sector, policy attention towards the livestock and poultry sector has been modest, at best. Most of the policy initiatives over the last two decades such as the Food and Agriculture Sector Development Policy (FASDEP I & II), Medium Term Agriculture Sector Investment Plan (METASIP), Comprehensive Africa Agriculture Development Program (CAADP) and the Ghana Shared Growth and Development Agenda (GSGDA I & II) often to not cover the livestock and poultry subsectors in any detail. MoFA (2016) admitted that livestock is often given less attention than needed in policy initiatives. The few exceptions include the Livestock Development Project (LDP) and the National Livestock Services Project (NLSP). The most recent initiative by government, the Rearing for Food and Jobs (RFJ) policy, acknowledges some positive outcomes from such projects, but these were not sustained. Thus, the agricultural policy environment relating to livestock and poultry production needs coordination from various national institutions responsible for the sector. Various aspects of the policy environment as related to the poultry sector are summarized below.

Institutional and legal setting

MoFA through its Animal Production Directorate (APD) and the Veterinary Services Directorate (VSD) has oversight responsibility of the poultry and the livestock sector as a whole. The APD is mandated to oversee production and control of feed quality, both from local and imported sources. The VSD is also mandated to manage poultry health, is responsible for the control and eradication of diseases, largely through vaccination and quarantine. The Statistics, Research and Information Directorate (SRID) has the mandate to carry out statistical functions for the ministry. These and other directorates of the ministry are established by the Civil Service Law 1993, PNDC L 327.

Project interventions

Highlighting some recent and ongoing projects for poultry production is important in contextualizing the broad policy framework of the industry. The five-year Ghana Poultry Program (GPP), funded by the United States Department of Agriculture (USDA) and implemented by ACDI/VOCA and TechnoServe, was initiated to increase the competitiveness of domestic production and processing of poultry meat and eggs. The project had two objectives: increase agriculture productivity in the poultry value chain through capacity building, improving input markets, and promoting strategic investments and private-public partnerships; and increase the trade of poultry products by improving product quality, increasing production efficiency, and improving market linkages. Its interventions included capacity building for poultry associations and other stakeholders, training on the adoption of best management practices in areas such as animal husbandry and vaccinations, provision of financial services, input markets and services, and increasing market access.

The Ministry of Food and Agriculture launched the Ghana Broiler Revitalization Project (GHABROP) on the 15th of July 2014. This is a ten-year collaboration between the government of Ghana and the Ghana National Association of Poultry Farmers (GNAPF) with the aim to stimulate local broiler production. The project seeks to develop the poultry industry along the poultry value chain and will ensure that farms, input suppliers, hatcheries, feed mills, veterinary service providers, processors, marketers, cold store operators and consumers all play their roles efficiently to ensure Ghana's self-sufficiency in poultry meat production. Prior to this (in 2013), the Government of Ghana removed customs duties on poultry feed, additives, drugs and vaccines to address constraints in access to inputs.

A new poultry and livestock import policy was included as part of the GHABROP to reduce the country's imports of chicken meat to a maximum of 60 percent. This was to force importers of poultry meat to source 40 percent of their produce from the domestic market. Lower chicken meat import volumes from 2014 to 2016 could be associated with this intervention, although the impact seems weak overall, perhaps due to implementation relapse. The Rearing for Food and Jobs initiative contains an ambitious target to invest in poultry as a major step to stop the importation of chicken. Ghana also continues to apply a general duty of 35% on imported chicken meat (Table 10). Members of ECOWAS are exempt from this duty.

Table 10: Tariffs applies by Ghana to poultry imports

HS Code	Description	Duty applied	
		MFN	ECOWAS
0207.1: Meat of poultry species "Gallus Domesticus" – Fresh, Chilled or Frozen			
0207.11	Fresh or chilled, not cut in pieces	35%	0%
0207.12	Frozen, not cut in pieces	35%	0%
0207.13	Fresh or chilled, Cuts & edible offal	35%	0%
0207.14	Frozen, Cuts & edible offal	35%	0%

Source: Market Access Map, 2020

Policy framework

One of the fifteen policy objectives of the National Medium-Term Development Policy Framework (NMTDPF) of the Ministry of Food and Agriculture for 2018-2021 is to promote livestock and poultry development for food security and income generation (MoFA, 2018). The target outcome for this policy is to increase the production of poultry (including guinea fowls) from 73,885 in 2016 as the base year to 114,278 in 2021. The Rearing for Food and Jobs initiative targets increasing production further by the end of 2023. Poultry production is projected to increase steadily over the policy implementation period, from 89,773 in 2018 to 114,278 in 2021. In 2016 and 2017, the ministry supported 1,500 people below the extreme poverty line to engage in cockerel production; this project is planned to run until 2023.

The Ghana Livestock Development Policy and Strategy (GLDPS) is meant to provide a roadmap for the effective implementation of livestock policies and strategies. The first GLDPS (2004-2015) had several gaps and was largely ineffective as a result of inadequate implementation of various components, as well as lack of an effective monitoring and evaluation mechanism (MoFA, 2016). The current GLDPS (2016-2025) was developed to address the shortcomings of the first version, with an overall objective to develop a competitive and more efficient livestock industry that increases domestic production, reduces imports of meat and livestock products and contributes to the improvement of the livelihoods of livestock value chain actors and the national economy while protecting the environment, preserving livestock biodiversity and ensuring bio-security. The challenges in the livestock sector are interdependent, and for the interventions to be effective the implementation of the GLDPS aims to address them holistically. The GLDPS has a three-stage implementation plan; short term (1 to 3 years), medium-term (4 to 7 years) and long term (8 to 10 years).

The current policy interventions are NMTDPF, The Rearing for Food and Jobs initiative, and GLDPS. These active interventions are scheduled to be completed in 2021, 2023 and 2025, respectively. They all seek to increase domestic poultry production using similar approaches as a route to achieving several socioeconomic gains, particularly reducing importation of poultry meat. The objective of the Rearing for Food and Jobs initiative was adopted from the NMTDPF objective, signifying some form of convergence. As a new, standalone and the most comprehensive of the three, the Rearing for Food and Jobs initiative may offer different insights and potential to the poultry industry.

Currently, the leading and most comprehensive policy on livestock is the Rearing for Food and Jobs[10] (RFJ). The RFJ is a five-year (2019-2023) policy intervention that focuses on developing ruminant and poultry value chains to increase productivity to meet the country's meat requirements while creating jobs. It seeks to develop a competitive and more efficient livestock industry that increases domestic production, reduces importation of livestock products and contributes to employment generation and to the improvement of livelihoods of livestock value chain actors and the national economy. By the end of the program in 2023, over 1.5 million jobs are expected to be created. Of this total, poultry is expected to contribute a total of 908,068 jobs comprising 129,724 direct jobs and 778,344 indirect jobs. With these projections, the poultry industry alone will account for about 59 percent of the jobs to be created under the initiative.

Relative competitiveness of poultry production in the region

Rising imports of poultry products into the region raises questions on the relative competitiveness of specific countries compared to leading producers globally. Drawing on a calculation tool developed by Wageningen Economic Research (Van Horne, 2018), this section presents a relative comparison of production costs. The competitiveness analysis is focused on South Africa, where, despite mature and well developed poultry and feed sectors, rising imports remain a challenge. As an illustrative example of the relative competitiveness of the smaller, still less intensive sectors in the other three countries, it also compares the cost of production in Tanzania to South Africa and other leading producers such as Brazil, the USA and selected European countries.

Relative production costs at farm level

Table 11 presents basic data for the selected countries and indicates that feed and day old chick prices were lowest in Brazil and the USA – both net exporters of key raw materials utilized for feed production. Prices of both feed and day old chicks were higher in the EU. South African feed rations were marginally more expensive than in the EU, while day old chick prices were slightly less on a per chick basis. In Tanzania however, feed prices were almost 50% more expensive than the sample average and 33% more expensive than in South Africa. In general, live sales weight in South Africa and Tanzania was substantially lower than in the other sampled countries, which also supports good feed conversion ratios, particularly in South Africa – which is the lowest in the sample. Feed conversion increases towards the end of the growing cycle and so must be considered in combination with sales weight.

[10] A detailed description of the RFJ program can be provided as an annexure.

Table 11: Basic data for broiler production in 2018[11]

	NL	DE	PL	USA	BRA	SAF	TZA
Feed price (euro /100 kg)	31.7	32.3	32.6	22.8	25.2	33.3	44.3
Day old chick (eurocent)	31.0	31.5	31.5	27.0	22.4	28.4	75.8
Live weight (g)	2400	2400	2300	2700	2600	1840	1800
Feed conversion	1.59	1.61	1.61	1.81	1.79	1.49	1.67

Figure 30 presents the total production costs at farm level, on a cost per kilogram produced basis (live weight) – thus accounting for differences in feed conversion and sales weight. In line with feed costs, the USA and Brazil have the lowest production costs by some margin. The cost of producing a broiler in South Africa is lower than in the EU, whereas Tanzanian production costs were more than 50% above the average of all countries included in the sample. In Tanzania, costs are driven up by feed and day old chick costs in particular. Tanzania does have a small advantage on lower labour costs, but these are a small share of total production costs.

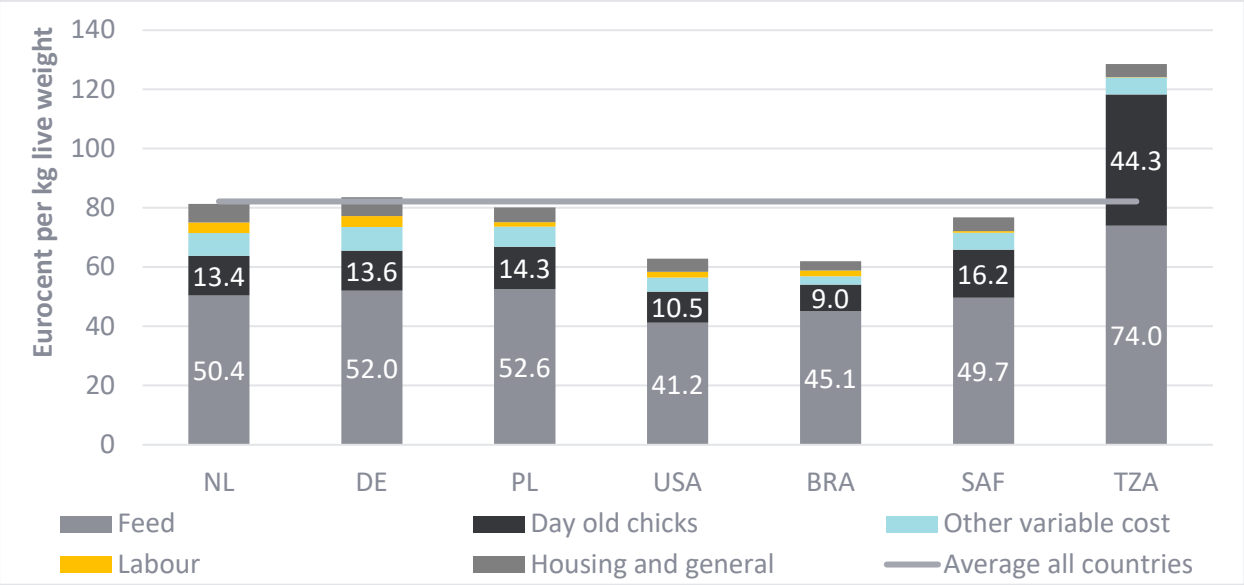

Figure 30: Relative comparison of primary production costs in selected countries in 2018

[11] NL is Netherlands, DE is Germany, PL is Poland, USA is the United States of America, BRA is Brazil, SAF is South Africa and TZA is Tanzania

Relative production costs including slaughter

Figure 31 presents a combination of primary production costs at farm level and the cost of slaughter. For all countries, the basic situation is indicative of a medium to large scale slaughterhouse with modern equipment and a high level of automation. Differences between slaughter costs are mainly a result of differences in labour costs, resulting in comparatively low slaughter costs in Tanzania, South Africa and Brazil.

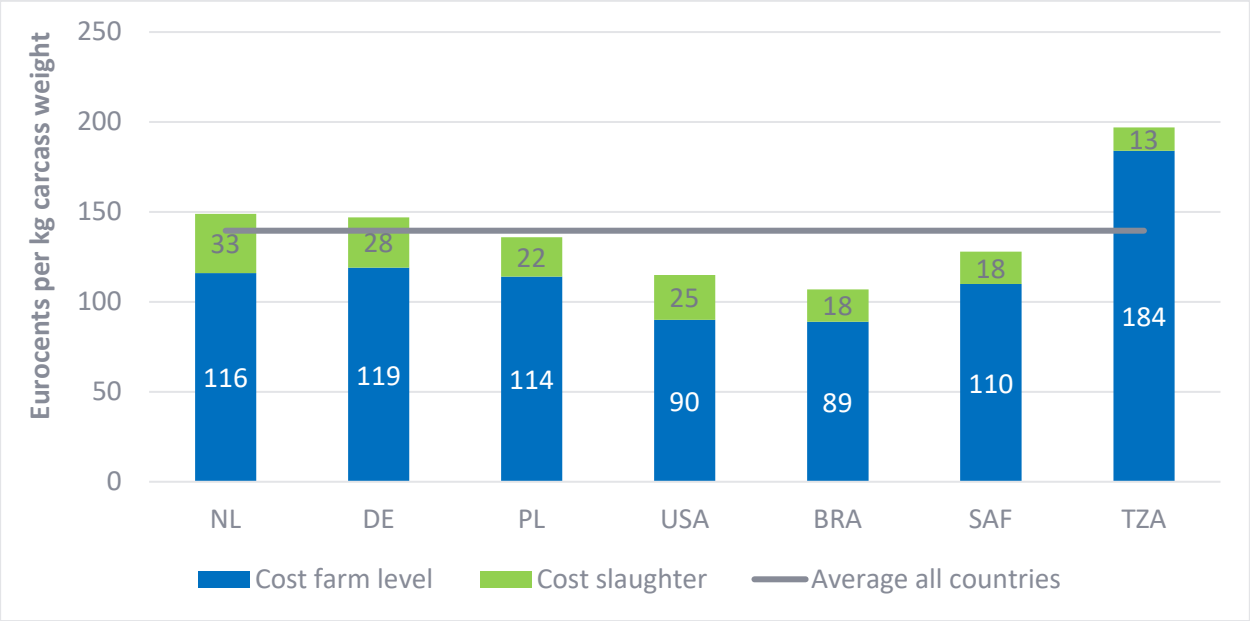

Figure 31: Relative comparison of primary production and slaughter costs in selected countries in 2018

Offer price of whole carcass

Despite a reasonably competitive production cost structure, imports into South Africa have increased consistently over the past decade (Figure 2). To complete the evaluation of relative competitiveness, Figure 32 presents an offer price for whole birds in South Africa. This offer price is indicative, based on costs, of the level at which various countries could offer whole chickens in South Africa (Johannesburg), accounting for production costs, as well as transportation and handling. It indicates that most countries would struggle to deliver whole carcasses competitively in South Africa's market, owing to high costs of transportation. This is also supported by the small share of whole chickens in South Africa's total chicken import mix (Figure 10).

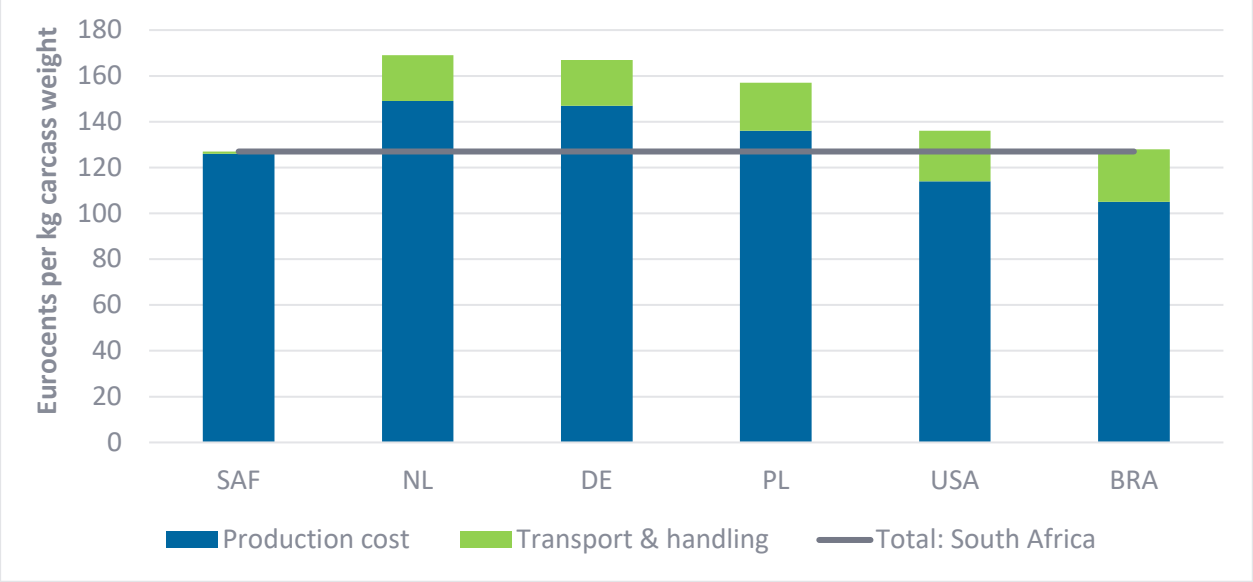

Figure 32: Offer price of whole birds from South Africa (horizontal line) and selected exporting countries in 2018 (in eurocents per kg carcass weight).

Offer price of selected cuts

Considering the composition of imports into South Africa (Figure 10), as well as the composition of the domestic market (Figure 11), a comparison of offer prices for specific cuts would be more relevant. In South Africa, individually quick frozen (IQF) portions comprise the bulk of domestic consumption. These portions also compete directly with bone-in portion imports, which is where the bulk of rising imports have occurred. The offer price of leg meat is influenced by the cost of production, as well as the extent of revenue generated from the rest of the carcass. Post slaughter, carcasses are divided into parts such as breast cap, leg quarters, wings etc. The breast cap is deboned and breast meat is sold at a premium on the domestic market in the EU or USA. In the case of Brazil, the breast meat is exported to the EU. In order to compare offer prices of bone-in portions, total carcass revenues from the rest of the carcass were calculated and subtracted from the cost of production – yielding the net cost of producing the leg meat. The premium attainable for breast meat, either domestically or in export markets, reduces the offer price of bone-in portions substantially.

Figure 33 presents a comparison of the offer price of IQF mixed portions in South Africa, relative to bone-in leg meat offered from abroad. It indicates that the offer price of leg meat from the EU, the USA and Brazil are all below that of mixed portions in South Africa. For South Africa to reduce the offer price of bone in portions, it would need to attain a similar premium for breast meat, either in the domestic market – where the consumer base that is willing and able to pay such a premium is smaller, or alternatively in the export market, where it would need to comply with neccesary SPS measure and compete effectively against Brazil.

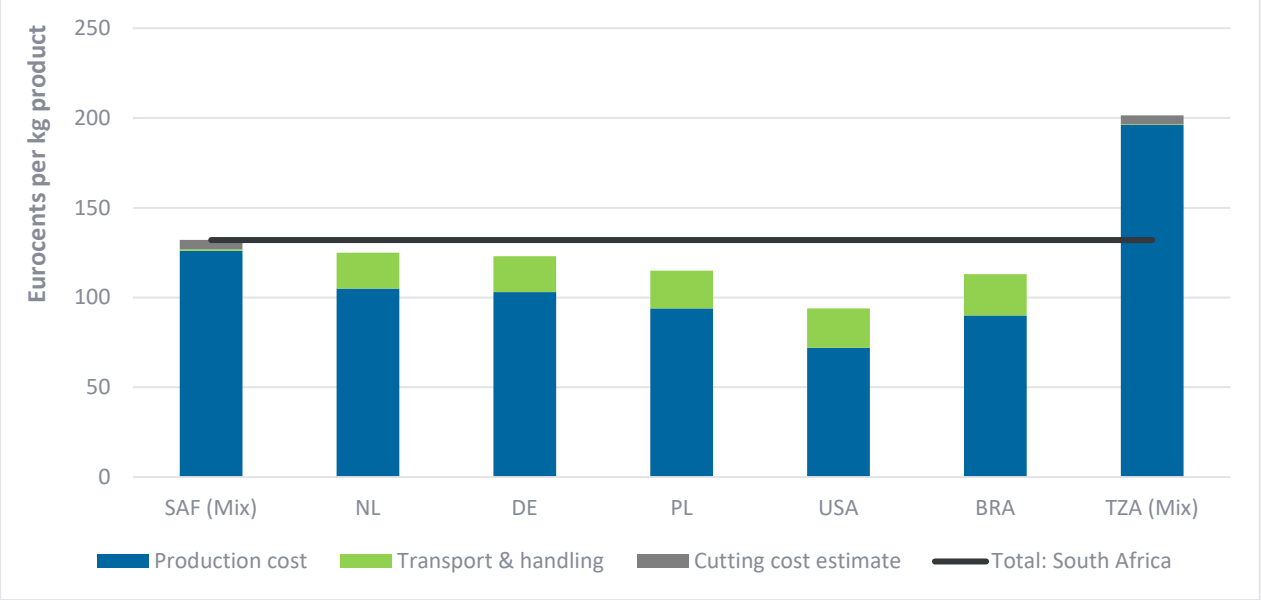

Figure 33: Offer price of mixed portions in South Africa and Tanzania relative to bone-in portions from other selected countries

Chicken imports into Tanzania are limited, due to a ban on imports of chicken products into mainland Tanzania. The imports that do occur are destined for Zanzibar, from which some are thought to make their way to the mainland (Naggujja et. al., 2020). The imports that do occur are predominantly frozen cuts, implying that a comparison to bone-in leg meat imports would be most relevant. In this respect, Figure 33 suggests that Tanzania's challenge is even greater than South Africa's, with the calculated offer price more than 50% above that of South Africa and more than double that of the USA.

The high offer price in Tanzania is a result of high production costs relative to the rest of the sample and is also reflected in the prices presented in Figure 5. Multiple strategies could be considered to reduce this cost, including improvements in feed conversion, reduced feed prices and cheaper day old chicks.

- **Feed Conversion:** Average feed conversion ratios in Tanzania were estimated at 1.67, for a 1.8kg bird. Top end producers do achieve lower feed conversion rates. For a similar weight bird, South African producers achieve an average feed conversion of 1.49 and in Europe, the adjusted feed conversion for a 1,8kg bird amounts to 1.45, which would suggest that some scope exists for improvement in Tanzania.
- **Feed Price:** Feed price in Tanzania is 30 to 40% higher compared to South Africa and some EU countries. Reductions could be achieved through investment in the feed milling industry, or a reduction in raw material costs, which remain high. Maize provides the primary source of energy in poultry feed rations, but competes with demand for human consumption. Tanzania has the potential to produce surplus maize, which would reduce prices. Tanzania also remains a net importer of other key ingredients such as soybean

products, utilised as protein in feed rations, increasing the cost. High transportation rates also raise the cost of imported mineral premixes.

- **Day old chicks:** Day old chicks present the second most important input at primary level and here Tanzanian prices are more than double that of other countries in the sample. Feed, along with imported breeding stock, is an important contributor to the cost of day old chicks, but efficiency in many smaller hatcheries in Tanzania could also be improved.

Alternative scenarios

In order to evaluate options for improved competitiveness relative to imported products, this section considers various alternative scenarios and the impact thereof on offer prices. A range of scenarios is presented for South Africa and Tanzania.

South Africa

In South Africa, the scenarios illustrate the impact that various tariff levels and exchange rate volatility can have on competitiveness.

- **Scenario 1:** An import levy of 35% - which is the level at which the safeguard duty was imposed on bone-in products of European origin in September 2018. This duty will be phased out over a 3 year period.
- **Scenario 2:** A fixed import duty of R9.30 per kg, in line with the anti-dumping duty applied to bone-in portions originating from the USA
- **Scenario 3:** A 10% depreciation in the Rand exchange rate relative to other currencies

The results of the different scenarios are presented in Figure 34, Figure 35 and Figure 36. While these results provide a reasonable indication of competitiveness, it must be acknowledged that the model relies on a range of assumptions, as well as expert inputs where data is not available from public sources. While production costs were obtained through samples and case studies within the ReNAPRI network, costs such as transportation and handling are estimated.

The offer price of leg meat is calculated considering the total production cost minus the revenues for breast meat in a specific country. The result of the calculation is very sensitive for the market price of breast meat. While best estimates were utilised in this calculation for market prices in the EU countries, Brazil and USA, none of these prices are published by official sources.

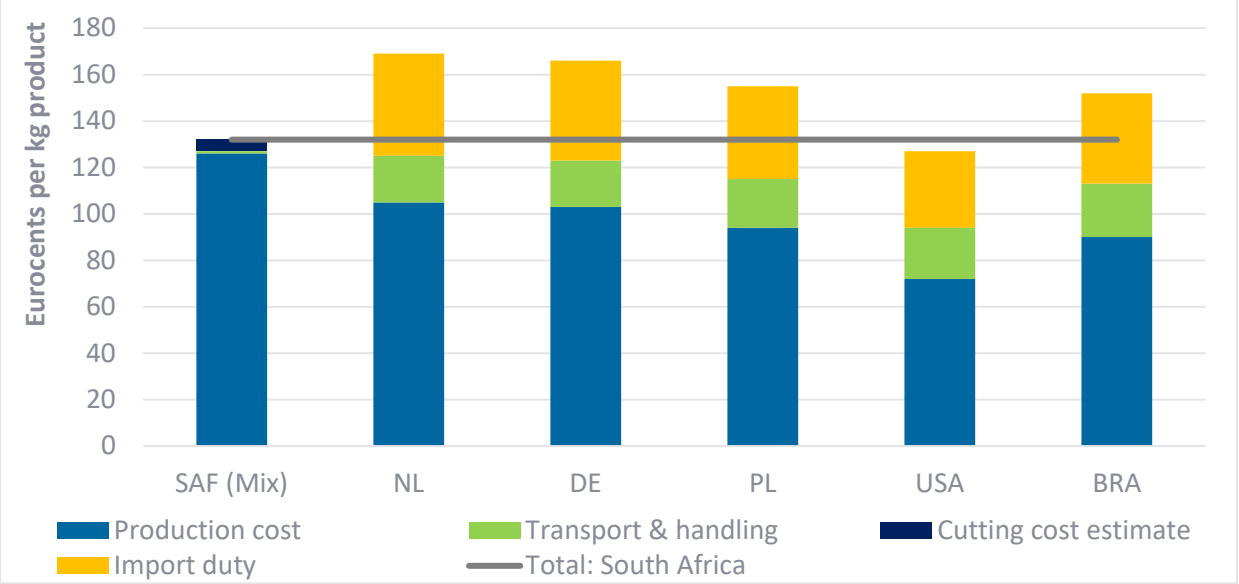

Figure 34: Offer price of leg meat by exporters to South Africa in Scenario 1 (import levy of 35%)

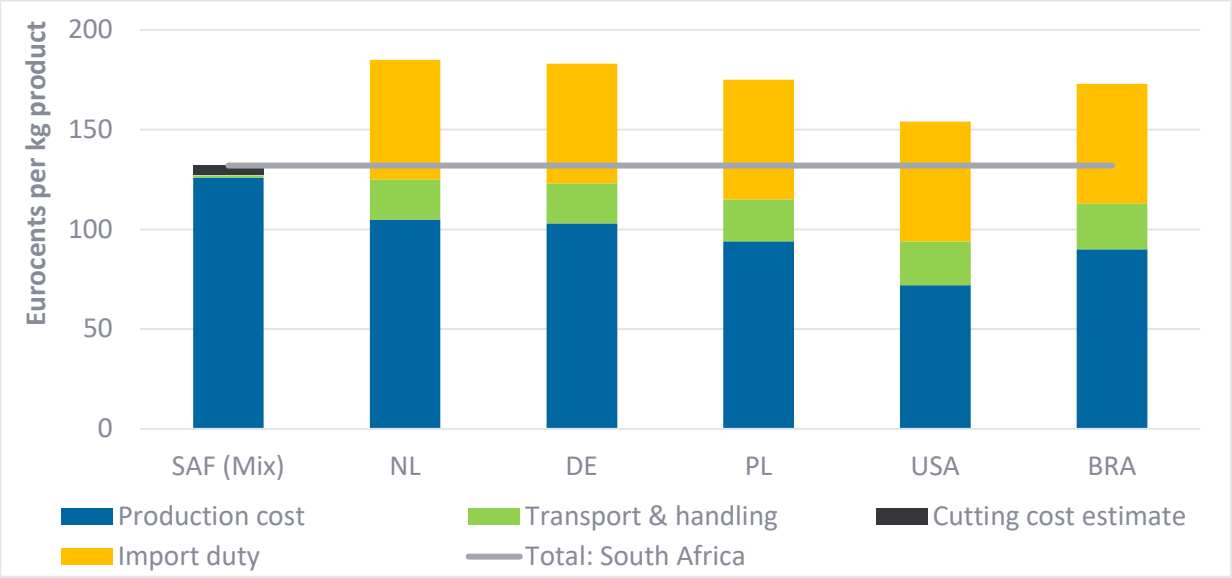

Figure 35: Offer price of leg meat by exporters to South Africa in Scenario 2 (import levy of R9.30)

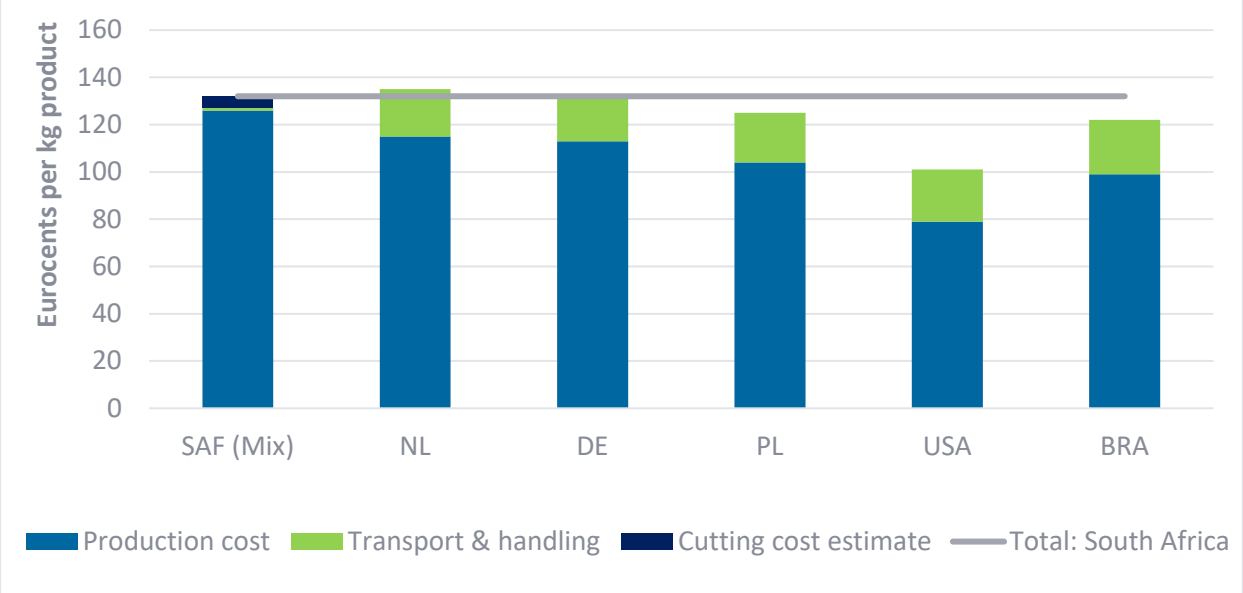

Figure 36: Offer price of leg meat by exporters to South Africa in Scenario 3 (10% weaker exchange rate of the South Africa Rand)

Tanzania

In the case of Tanzania, the key factor reducing competitiveness is the high cost of production at primary level. To illustrate the impact of possible improvements in this regard, Figure 37 compares the current offer price of Tanzanian chicken meat, presented as mixed portions, to a combined improved scenario. The scenario entails the following:

- A reduction of the feed conversion to 1.49 – the level attained in South Africa for a similar size bird
- A 25% reduction in the price of feed, which would bring it in line with the levels observed in South Africa
- An import levy on poultry meat of 35%

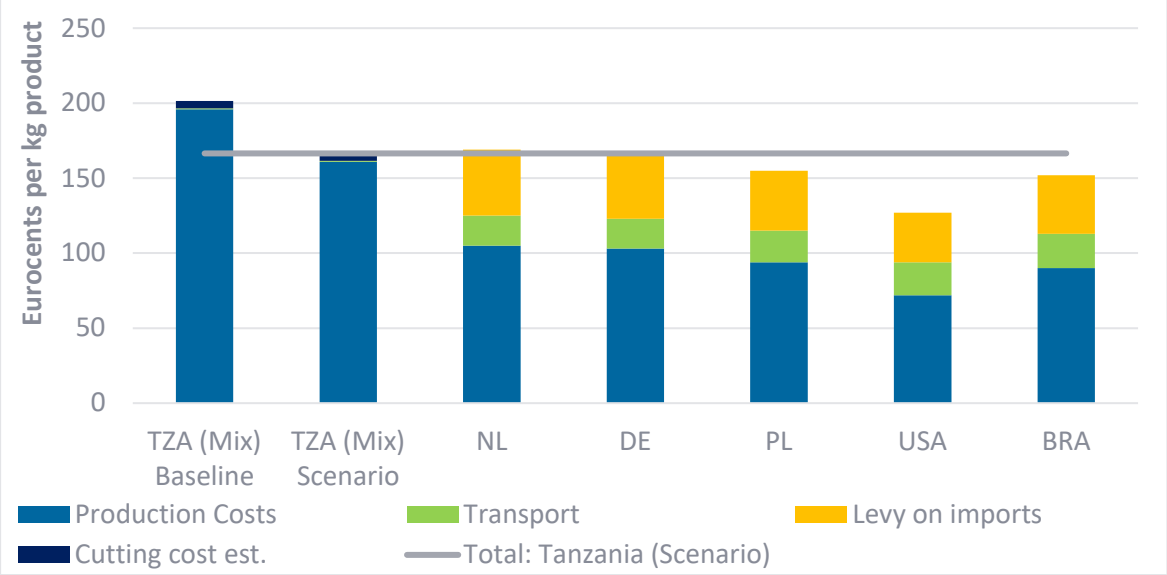

Figure 37: Offer price of Tanzanian chicken relative to selected countries under the baseline and a combined scenario of efficiency gains, lower feed costs and import duties

With a lower feed conversion ratio and lower feed prices, the production costs of Tanzanian chickens are reduced from 196 to 161 eurocent per kg product. This is a reduction of 18%. Compared to imports, the offer price of Tanzania is much improved, but still too high. When an import levy of 35% is imposed, the offer price of the Netherlands and Germany become equal to the Tanzania offer price, while the offer prices from the USA, Poland and Brazil are still below the Tanzania offer price.

While the evaluation of competitiveness was focussed on South Africa as the largest producer in the region and Tanzania as an emerging sector, the relative cost drivers in Ghana and Kenya are similar. Being net importers of key raw materials utilised for chicken feed production, both countries are also challenged by high feed costs, which spill over into day old chick costs. In light of the high share of feed and day old chick costs in total production costs within an intensive production system, total production costs in both countries would be high in the global context – a factor also evident in high prices (Figure 5). As diets in the region diversify and the demand for chicken products increase in future, relative improvements in the cost of production would be required to compete efficiently with imported products.

Outlook for poultry markets in Eastern and Southern Africa

Structure of the modelling framework

The ReNAPRI regional modelling system comprises a set of country level, partial equilibrium models of the agricultural sector. The models are all similar, in that they are based on a system of equations representing individual components of supply and demand in each sector, designed to incorporate the major economic, biological and policy relationships within these markets. The individual models are a combination of econometric estimation and calibration based on literature and analyst judgement. The level of detail varies by country, with the scope and calibration possibilities dependant on data availability.

The partial equilibrium structure implies that the models take macro-economic projections, world market prices and policy assumptions as exogenous. Macro-economic views are based on those published in the latest World Economic Outlook from the International Monetary Fund, complimented by in-country information. World prices are sourced from global modelling systems, such as the Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri, or the Organisation for Economic Co-operation and Development (OECD) and Food and Agriculture Organization of the United Nations (FAO). Policy assumptions are based on information from in-country analysts.

The modelling system was initially developed for the maize sector – the core food staple in the region. Over time, various expansions resulted in the inclusion of additional crops such as wheat, rice, sugar and soybeans. Recognising the potential growth in meat consumption as diets diversify, this section presents the methodological framework for the inclusion of chicken. This will also strengthen the linkages with the animal feed sector as a driver of demand for products such as maize and soybean oilcake.

Section 4 indicates that the poultry sectors in South Africa, Ghana, Kenya and Tanzania are very different in structure and composition, as well as level of maturity. Consequently, the structure of the modelling framework, and the extent of linkage with the feed sector also differs. As part of this interim report, the structure of South Africa and Kenya's models will be presented for illustrative purposes, with Tanzania and Ghana to be added in the final report.

As with the differences in structure, the availability and quality of data also differs across countries. This influences the ability to rely on econometrically estimated parameters, resulting in a set of parameters utilised across countries that are a combination of estimation, calibration based on economic theory and literature, as well as analyst judgement with the input of in-country and industry experts.

South Africa model

South Africa's chicken industry is by far the largest and arguably the most mature of the four countries included in this study. Figure 38 presents a basic flow diagram of the structure of South Africa's chicken model. It reflects broadly the cross sectoral linkages captured in the model, such as the link to feed products. Circles reflect variables that are exogenous assumptions in the

South African context, whereas the rectangles reflect endogenous variables and the hexagon the market clearing identity.

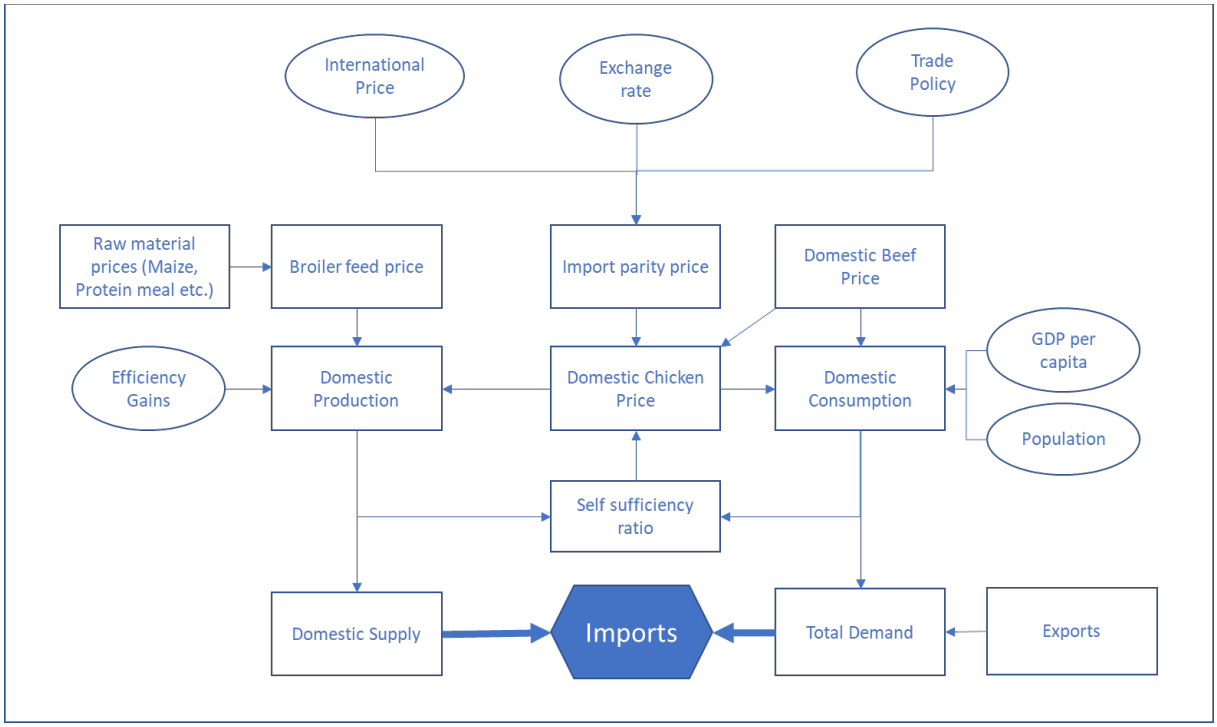

Figure 38: Structure of South Africa's chicken model

The structure of the various supply and demand components is based on a fairly conventional specification. Various elasticities of supply and demand have been estimated over the past decade, which provide a solid base for the model's parameters.

Supply block

The intensive nature of chicken production in South Africa implies that input costs, and particularly feed costs, which constitute approximately 70% of variable production costs (Davids & Meyer, 2017) are an important determinant of chicken production. The cost of a typical feed ration is calculated in the model, based on the inclusion rates defined by De Beer (2009), which were verified with industry and included in Davids (2013). The inclusion rates are combined with modelled prices for key ingredients to create a weighted average feed price. In the construction of an input cost index, feed carries a weight of 70%, with the remaining 30% linked to a general inflation indicator – in this case the GDP deflator.

Table 12: Broiler feed inclusion rates in South Africa

Feed Ingredient	**Inclusion rate**
Maize	0.65
Sunflower Cake	0.03
Soybean Cake	0.18

Full fat Soya	0.05
Fishmeal	0.03
Vegetable Oil	0.02
Vitamin & Mineral Pack	0.04

Source: Davids, 2013 & Stakeholder interviews, 2020

The capital intensive nature of broiler production, which requires a substantial investment in highly specific assets, implies that lagged production is an important consideration that influences current production. In order to capture the improvements in such technology over time, lagged production is multiplied by a trend variable influenced by the number of production cycles per year. The theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 13.

$$CPSA = \alpha + \beta_1 RCPPSA + \beta_2 RCICISA + \beta_3 LN(CPSA(-1) * TRND) + \mu$$

Table 13: Elasticities of the chicken production equation in South Africa

Explanatory Variable	**Variable Description**	**Average Elasticity**
CPSA	Chicken production in SA	
RCPPSA	Real chicken producer price in SA	0.19
RCICISA	Real chicken input cost index in SA	-0.05
Ln(CPSA(-1)*TRND)	Natural log of chicken production lagged by 1 year, multiplied by a trend encapsulating technological advancement	0.62

Source: De Beer, 2009 & Davids, 2013

Demand block

Domestic consumption is modelled in per capita terms, before being multiplied by the population estimate to yield total domestic consumption. In line with literature and economic theory, per capita chicken consumption is modelled as a function of per capita income, proxied by per capita GDP, as well as the real price of chicken and the real price of substitute meats.

The theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 14. MBFP is a ratio of the real carcass price to the respective annual production levels for mutton, beef and pork. The real GDP per capita is include in natural logarithmic form to ensure that the elasticity decreases as incomes rise.

$$PCCCSA = \alpha + \beta_1 RCPPSA + \beta_2 MBFP + \beta_3 LN(RGDPPCSA) + \mu$$

Table 14: Elasticities of the chicken consumption equation in South Africa

Explanatory Variable	Variable Description	Average Elasticity
PCCCSA	Per capita chicken consumption in SA	
RCPPSA	Real chicken producer price in SA	-0.37
MBFP	Index capturing the sum of cross commodity effects	0.14
Ln(RGDPPCSA)	Natural log of real per capita GDP	0.3

Source: De Beer, 2009 & Davids, 2013

The second component of the total demand block is exports, which constitute a very small share of total production and is primarily destined for neighbouring countries. Exports are estimated based on a ratio of domestic prices and world prices, expressed in domestic currency. The theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 15.

$$CEXSA = \alpha + \beta_1 \frac{\text{RCPPSA}}{\text{RCWPSA}} + \mu$$

Table 15: Elasticities of the chicken export equation in South Africa

Explanatory Variable	Variable Description	Average Elasticity
CEXSA	Chicken exports from South Africa	
RCPPSA / RCWPSA	Real Chicken producer price in SA / Real Chicken World Price in SA Currency	-1.1

Pricing and market clearance

The role of imports in supplementing domestic production in South Africa implies that the price of imported products is an important consideration with respect to price formation. In empirical estimation of the factors that influence chicken prices in South Africa, Davids & Meyer (2017) indicated that the price of imported products, expressed in domestic currency and accounting for import tariffs, was the single largest contributing factor to domestic chicken prices, followed by South African beef prices and the price of feed. The world price in this instance represents a weighted average FOB price for the various chicken products that South Africa imports, as per Figure 11, with the applicable tariff applied to the relevant HS classification. Products of EU origin remain duty free. Once this import parity price has been calculated, the theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 16. In addition to the variables presented by Davids & Meyer (2017), this model also includes a ratio of domestic production to domestic consumption, in order to capture some domestic supply and demand effects on prices.

$$RCPPSA = \alpha + \beta_1 RCFPSA + \beta_2 RFOBT + \beta_3 RBPSA + \beta_3 CDUSA/CPSA + \mu$$

Table 16: Elasticities of the chicken price equation in South Africa

Explanatory Variable	Variable Description	Average Elasticity
RCPPSA	Real Chicken producer price in SA	
RCFPSA	Real Chicken feed price in SA	0.194
RFOBT	Real FOB Price + Tariff	0.575
RBPSA	Real Beef price in SA	0.27
CDUSA / CPSA	Chicken domestic use in SA / Chicken production in SA	0.15

Source: Davids & Meyer, 2017

Finally, as illustrated in Figure 38, market clearance is achieved through an identity to calculate imports. In the case of chicken, the market clearing identity is simple, with imports calculated by subtracting domestic production from the sum of domestic consumption and exports. The model is then simulated as a closed system, with the solution yielding the equilibrium level of domestic supply, demand and trade.

Kenya model

Kenya's chicken industry is much smaller than that of South Africa and also less intensive. Imports play a smaller role, with the country operating close to self-sufficiency historically. Figure 39 presents a basic flow diagram of the structure of Kenya's chicken model. It reflects broadly the cross sectoral linkages captured in the model, such as the link to feed products. Circles reflect variables that are exogenous assumptions in the Kenya context, whereas the rectangles reflect endogenous variables and the hexagon the market clearing identity.

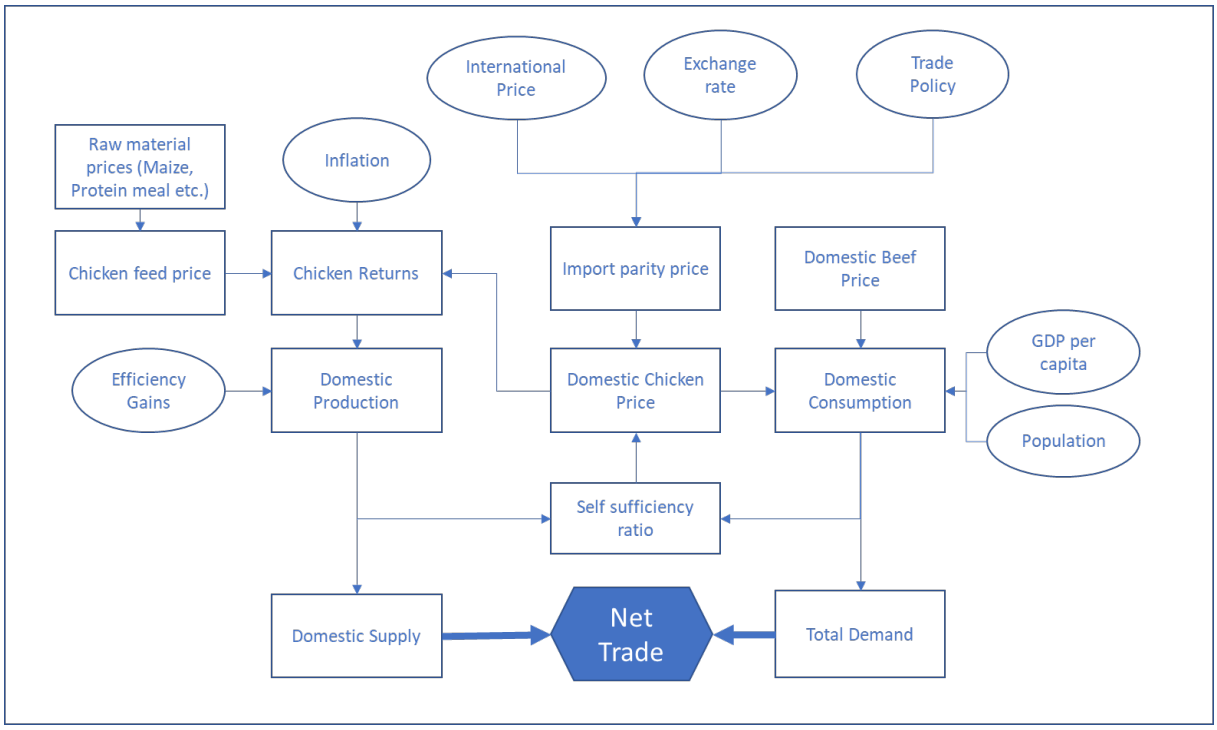

Figure 39: Structure of Kenya's chicken model

The structure of the various supply and demand components is based on a fairly conventional specification, though simpler at times than South Africa's model, where information is more abundant. The dynamism evident over the past 5 years complicate economic estimation and therefore the model is calibrated off elasticity assumptions that are a combination of theory, econometric estimation and analyst judgement.

Supply block

Given that production systems are less intensive, the share of feed in total input costs is assumed to be lower than South Africa. The cost of a typical feed ration is calculated in the model, based on the inclusion rates in Table 17. The inclusion rates are combined with modelled prices for key ingredients, to create a weighted average feed price, with the "other" component linked to general inflation, due to all components not yet being included in the model. In the construction of an input cost index, feed carries a weight of 50%, with 10% linked to labour and the remaining 40% linked to a general inflation indicator – in this case the GDP deflator.

Table 17: Chicken feed inclusion rates in Kenya

Feed Ingredient	Inclusion rate
Maize	0.6
Soybean Cake	0.2
Fishmeal	0.02
Other	0.18

Chicken production is modelled directly, as a function of lagged production, a returns variable and a trend to encapsulate productivity gains. Returns reflect a ratio of chicken prices to the chicken input cost index. The theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 18.

$$CPKE = \alpha + \beta_1 CPKE(-1) + \beta_2 KECHRET + \beta_3 TRND + \mu$$

Table 18: Elasticities of the chicken production equation in Kenya

Explanatory Variable	Variable Description	Average Elasticity
CPKE	Chicken production in Kenya	
CPKE (-1)	Chicken production in Kenya lagged by 1 year	0.4
KECHRET	Chicken Returns in Kenya = Kenya chicken Producer price / Kenya chicken input cost index	0.45

Demand block

Domestic consumption is modelled in per capita terms, before being multiplied by the population estimate to yield total domestic consumption. In line with literature and economic theory, per capita chicken consumption is modelled as a function of per capita income, proxied by per capita GDP, as well as the real price of chicken and the real price of beef as a substitute.

The theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 19.

$$PCCCKE = \alpha + \beta_1 RCPPKE + \beta_2 RBEPPKE + \beta_3 RGDPPCKE + \mu$$

Table 19: Elasticities of the chicken consumption equation in Kenya

Explanatory Variable	Variable Description	Average Elasticity
PCCCKE	Per capita chicken consumption in Kenya	
RCHPPKE	Real chicken producer price in Kenya	-1.63
RBEPPKE	Real beef producer price in Kenya	0.42
RGDPPCKE	Real per capita GDP in Kenya	1.21

Pricing and market clearance

Contrary to South Africa, where import prices are the primary driver of domestic prices, Kenya has historically been close to self-sufficiency, implying that domestic supply and demand factors are important in determining price levels. The role of imported products is still considered, given

that trade is possible and in history has contributed as much as 10% of domestic consumption in some years. Its elasticity is lower however than the self-sufficiency ratio, which in this instance is very elastic. The world price in this instance represents a weighted average FOB price for the various chicken products that Kenya imports, as per Figure 21, with the tariff added to this price. Once this import parity price has been calculated, the theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 20.

$$RCPPKE = \alpha + \beta_1 RFOBT + \beta_2 CDUKE/CPKE + \mu$$

Table 20: Elasticities of the chicken price equation in Kenya

Explanatory Variable	Variable Description	Average Elasticity
RCPPKE	Real Chicken producer price in Kenya	
RFOBT	Real FOB Price + Tariff	0.37
CDUKE / CPKE	Chicken domestic use in Kenya / Chicken production in Kenya	3.5

Finally, as illustrated in Figure 39, market clearance is achieved through an identity to calculate net trade. In the case of chicken, the market clearing identity is simple, with net exports simply calculated by subtracting domestic consumption from domestic production. The model is then simulated as a closed system, with the solution yielding the equilibrium level of domestic supply, demand and net trade.

Tanzania model

In terms of structure, Tanzania's poultry sector is far more comparable to that of Kenya than that of South Africa. Imports typically only constitute a small share of total consumption, peaking at 9% in 2017. This would suggest that imported products are not insignificant in terms of price influence, but that domestic supply and demand dynamics would be more important. In most years, Tanzania operates close to self-sufficiency, with the bulk of imports going into Zanzibar. Figure 40 presents a basic flow diagram of the structure of Tanzania's chicken model. It reflects broadly the cross sectoral linkages captured in the model, such as the link to feed products. Circles reflect variables that are exogenous assumptions in the Tanzanian context, whereas the rectangles reflect endogenous variables and the hexagon the market clearing identity.

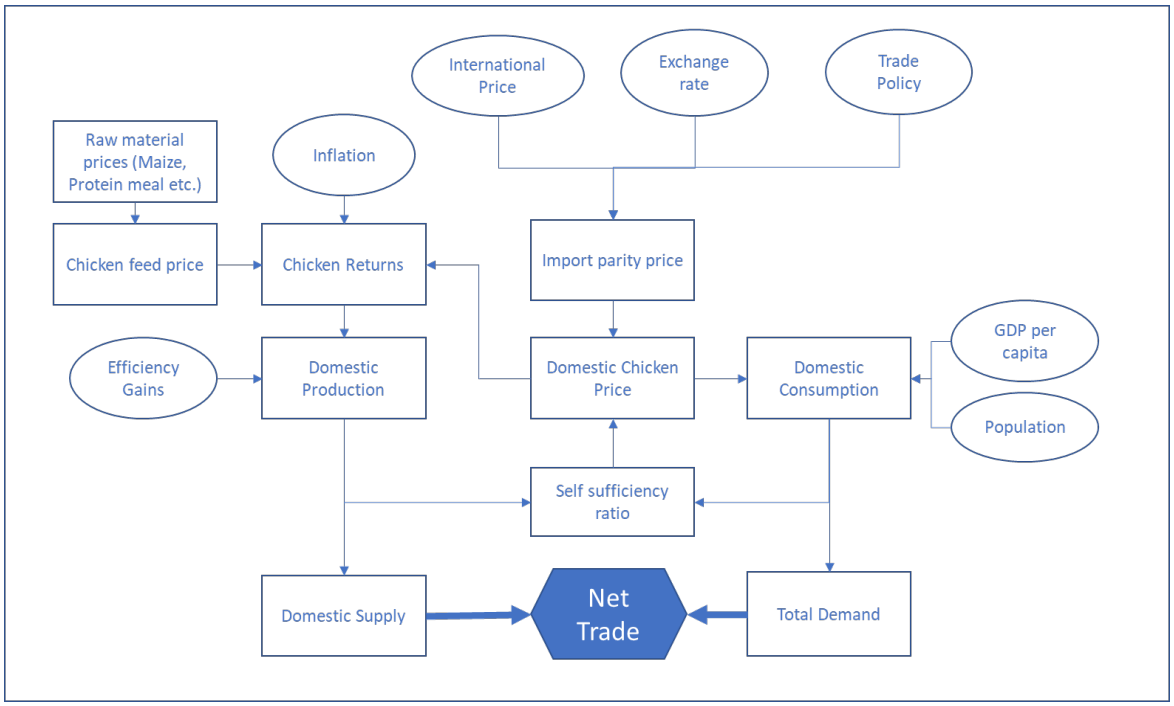

Figure 40: Structure of Tanzania's chicken model

The structure of the various supply and demand components is based on a conventional specification and are inherently simple by design, due to limited data availability. Data quality, particularly limitations with respect to price data, combined with the exceptional volatility evident in the sector over the past 5 years complicate economic estimation and therefore the model is calibrated off elasticity assumptions that are a combination of theory, econometric estimation and analyst judgement.

Supply block

The structure of chicken production in Tanzania, which still reflects a high prevalence of indigenous breeds produced in extensive systems, combined with a growing contribution from intensive broiler production, underpins the assumption that feed constitutes a lower share of total cost than South Africa. This is confirmed by the production costs presented in Section 4.5, where feed comprised 57% of total variable production costs in 2018. The cost of a typical feed ration is calculated in the model, based on the inclusion rates in Table 21. The inclusion rates are combined with modelled prices for key ingredients to create a weighted average feed price, with the "other" component linked to general inflation, due to all components not yet being included in the model. In the construction of an input cost index, feed carries a weight of 50%, with the remaining 50% linked to a general inflation indicator – in this case the GDP deflator.

Table 21: Chicken feed inclusion rates in Tanzania

Feed Ingredient	Inclusion rate
Maize	0.6
Soybean Cake	0.2
Fishmeal	0.02
Other	0.18

Chicken production is modelled directly as a function of lagged production, and a returns variable. Returns reflect a ratio of chicken prices to the chicken input cost index, accounting for changes in feed conversion over time. The theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 22.

$$CPTZA = \alpha + \beta_1 CPTZA(-1) + \beta_2 TZACHRET + \beta_3 TZACHRET(-2) + \mu$$

Table 22: Elasticities of the chicken production equation in Tanzania

Explanatory Variable	Variable Description	Average Elasticity
CPTZA	Chicken production in Tanzania	
CPTZA (-1)	Chicken production in Tanzania lagged by 1 year	0.6
TZACHRET	Chicken Returns in Tanzania = Tanzania chicken Producer price / Tanzania chicken input cost index	0.3
TZACHRET (-2)	Chicken Returns in Tanzania = Tanzania chicken Producer price / Tanzania chicken input cost index	0.6

Demand block

Domestic consumption is modelled in per capita terms, before being multiplied by the population estimate to yield total domestic consumption. In line with literature and economic theory, per capita chicken consumption is modelled as a function of per capita income, proxied by per capita GDP, as well as the real price of chicken.

The theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 23.

$$PCCCTZA = \alpha + \beta_1 RCPPTZA + \beta_2 RGDPPCTZA + \mu$$

Table 23: Elasticities of the chicken consumption equation in Tanzania

Explanatory Variable	Variable Description	Average Elasticity
PCCCTZA	Per capita chicken consumption in Tanzania	
RCHPPTZA	Real chicken producer price in Tanzania	-0.7
RGDPPCTZA	Real per capita GDP in Tanzania	0.7

Pricing and market clearance

Tanzania typically produces the bulk of domestic consumption in country, implying that domestic supply and demand factors are important in determining price levels. The role of imported products is still considered, given that trade is possible and in history has contributed as much as 9% of domestic consumption in some years. Its elasticity is lower however than the self-sufficiency ratio. The world price in this instance represents a weighted average FOB price for the various chicken products that Tanzania imports, as per Figure 25, with the tariff added to this price. Once this import parity price has been calculated, the theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 24.

$$RCPPTZA = \alpha + \beta_1 RFOBT + \beta_2 CPTZA/CDUTZA + \mu$$

Table 24: Elasticities of the chicken price equation in Tanzania

Explanatory Variable	Variable Description	Average Elasticity
RCPPTZA	Real Chicken producer price in Tanzania	
RFOBT	Real FOB Price + Tariff	0.46
CPTZA / CDUTZA	Chicken production in Tanzania / Chicken domestic use in Tanzania	-0.85

Finally, as illustrated in Figure 40, market clearance is achieved through an identity to calculate net trade. In the case of chicken, the market clearing identity is simple, with net exports simply calculated by subtracting domestic consumption from domestic production. The model is then simulated as a closed system, with the solution yielding the equilibrium level of domestic supply, demand and net trade.

Ghana model

Ghana's chicken industry is the smallest of the four countries included in this study and is also the market most dominated by imports. In recent years, imports accounted for almost 80% of domestic consumption. Figure 41 presents a basic flow diagram of the structure of Ghana's chicken model. It reflects broadly the cross sectoral linkages captured in the model, such as the link to feed products. Circles reflect variables that are exogenous assumptions in the Ghanaian context, whereas the rectangles reflect endogenous variables and the hexagon the market clearing identity.

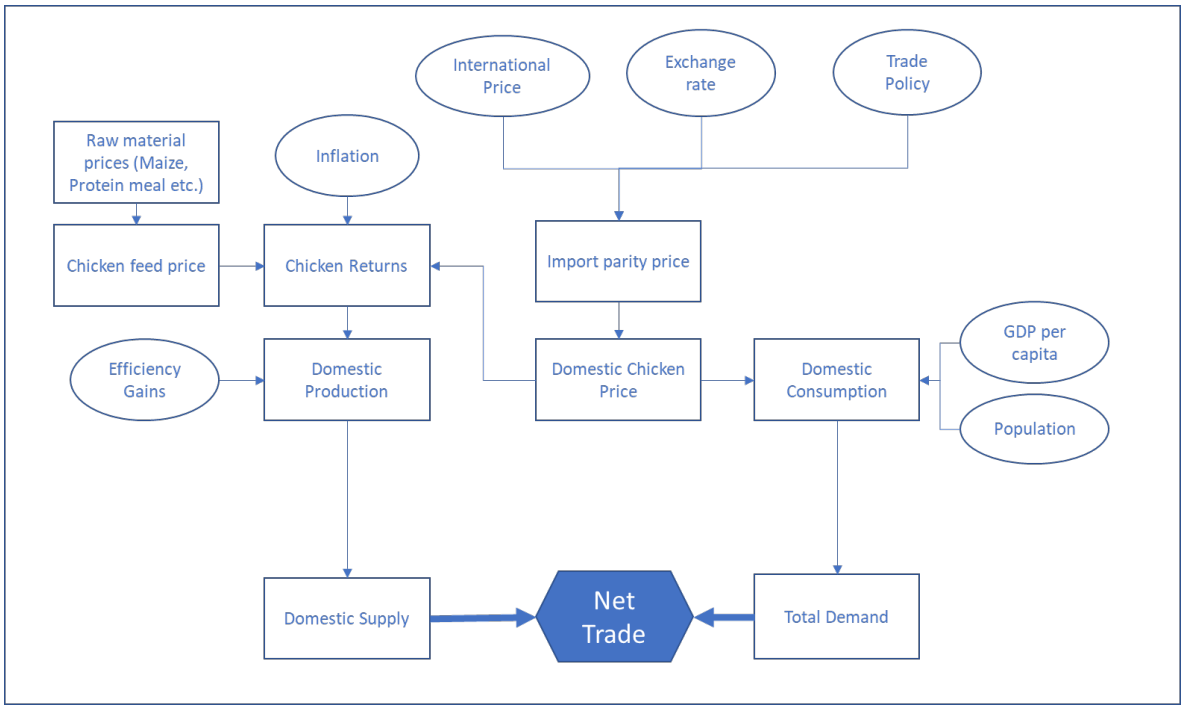

Figure 41: Structure of Ghana's chicken model

The structure of the various supply and demand components is based on a fairly conventional specification, though simpler at times than South Africa's model, where information is more abundant. The model is calibrated off elasticity assumptions that are a combination of econometric estimation, economic theory and analyst judgement.

Supply block

Given the high prevalence of domestic breeds in extensive systems, as described in Section 4.4, the share of feed in total input costs is assumed to be similar to that of Kenya. The cost of a typical feed ration is calculated in the model, based on the inclusion rates in Table 25. The inclusion rates are combined with modelled prices for key ingredients to create a weighted average feed price, which is adjusted for feed conversion ratios and combined with the "other" component linked to general inflation, due to all components not yet being included in the model. In the construction of an input cost index, feed carries a weight of 50%, with 50% linked to a general inflation indicator – in this case the GDP deflator.

Table 25: Chicken feed inclusion rates in Ghana

Feed Ingredient	Inclusion rate
Maize	0.6
Soybean Cake	0.2
Fishmeal	0.02
Other	0.18

Chicken production is modelled directly, as a function of lagged production and a returns variable. Returns reflect a ratio of chicken prices to the chicken input cost index. The theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 26.

$$CPGH = \alpha + \beta_1 CPGH(-1) + \beta_2 GHCHRET + \mu$$

Table 26: Elasticities of the chicken production equation in Ghana

Explanatory Variable	Variable Description	Average Elasticity
CPGH	Chicken production in Ghana	
CPGH (-1)	Chicken production in Ghana lagged by 1 year	0.4
GHCHRET	Chicken Returns in Ghana = Ghana chicken Producer price / Ghana chicken input cost index	0.45

Demand block

Domestic consumption is modelled in per capita terms, before being multiplied by the population estimate to yield total domestic consumption. In line with literature and economic theory, per capita chicken consumption is modelled as a function of per capita income, proxied by per capita GDP, as well as the real price of chicken, which is the nominal price of chicken, deflated by the Consumer Price Index.

The theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 27.

$$PCCCGH = \alpha + \beta_1 RCPPGH + \beta_2 RGDPPCGH + \mu$$

Table 27: Elasticities of the chicken consumption equation in Ghana

Explanatory Variable	Variable Description	Average Elasticity
PCCCGH	Per capita chicken consumption in Ghana	
RCHPPGH	Real chicken producer price in Ghana	-0.40
RGDPPCGH	Real per capita GDP in Ghana	1.92

Pricing and market clearance

The high share of imported products within total chicken consumption in Ghana suggests that import prices are the primary driver of domestic prices. The world price in this instance represents the FOB price for Brazilian exports. The tariff applied by Ghana (Table 10), is added

to this price. Once this import parity price has been calculated, the theoretical equation is presented below, with the variable descriptions and the elasticity assumptions in Table 28.

$$RCPPGH = \alpha + \beta_1 RFOBT + \mu$$

Table 28: Elasticities of the chicken price equation in Ghana

Explanatory Variable	Variable Description	Average Elasticity
RCPPKE	Real Chicken producer price in Ghana	
RFOBT	Real FOB Price + Tariff	0.81

Finally, as illustrated in Figure 41, market clearance is achieved through an identity to calculate net trade. In the case of chicken, the market clearing identity is simple, with net exports simply calculated by subtracting domestic consumption from domestic production. The model is then simulated as a closed system, with the solution yielding the equilibrium level of domestic supply, demand and net trade.

Exogenous assumptions related to economic performance and world markets

Macro-economic performance

Assumptions regarding macro-economic performance are based on the latest World Economic Outlook from the International Monetary Fund (IMF), released in October 2020. The assumptions regarding economic growth, population growth, exchange rate and inflation are presented in Table 29. In all countries, the impact of the restrictions related to the COVID-19 pandemic is clear in 2020, but South Africa is by far the worst affected. In light of the challenges faced prior to the lockdown restrictions, the recovery is expected to be slow.

Table 29: Macro-economic assumptions

Variable	Unit	2019	2020	2021	2022	2023	2024	2025 – 2029 avg
South Africa								
GDP Constant Prices	% change yoy	0.153	-8.00	3.00	1.54	1.52	2.14	2.34
Population	Millions	58.78	59.67	60.58	61.51	62.44	63.40	66.35

Exchange Rate	LCU / USD	14.45	17.10	15.74	16.20	16.80	17.06	17.24
GDP Deflator	% change yoy	4.02	3.44	3.88	4.30	4.50	4.50	4.50
Ghana								
GDP Constant Prices	% change yoy	6.48	0.93	4.20	4.14	7.35	4.58	4.45
Population	Millions	30.17	30.78	31.28	32.08	32.90	33.74	36.42
Exchange Rate	LCU / USD	5.22	5.77	6.15	6.43	6.76	7.08	7.96
GDP Deflator	% change yoy	9.19	10.13	9.33	7.22	6.43	6.21	5.85
Kenya								
GDP Constant Prices	% change yoy	5.37	1.05	4.67	6.04	5.80	5.76	5.78
Population	Millions	47.60	48.69	49.80	50.92	52.06	53.22	56.82
Exchange Rate	LCU / USD	102.09	105.36	110.33	114.18	118.29	122.43	135.53
GDP Deflator	% change yoy	3.96	8.17	4.63	5.08	5.17	5.09	5.01
Tanzania								
GDP Constant Prices	% change yoy	6.97	1.90	3.60	6.12	6.46	6.59	6.67
Population	Millions	56.32	58.00	59.73	61.51	63.34	65.23	71.30
Exchange Rate	LCU / USD	2301	2313	2367	2424	2485	2546	2738
GDP Deflator	% change yoy	1.37	4.06	4.16	4.39	4.64	4.74	4.74

Source: IMF, 2020

Global market developments

World prices are exogenous in the ReNAPRI modeling framework, but global market developments remain an important consideration that influences markets in the region. This is true both in terms of poultry, which is the focus of this study, and feed related commodities.

The assumptions regarding world price developments are based on the latest edition of the OECD-FAO Agricultural Outlook, published midway through 2020. As such, it does not fully account for the impact of COVID-19 on global agricultural commodity markets, nor recent production and stock estimates. Hence in some instances, short term price projections for 2021 & 2022 were adjusted to align with the latest information.

In 2020, global poultry prices come under pressure due to constraints in consumer spending power. Some recovery is projected over the next 2 years, based on the assumption that the global economy rebounds following the restrictions of 2020 – as is projected by the IMF. Poultry is an affordable, heathy source of animal protein and demand will likely recover earlier than more expensive meat types. In the case of maize, after initially declining in the early part of 2020 due to sharp declines in industrial demand, prices have spiked in the latter part of the year on the back of mounting concerns over weather in South America and weaker than initially expected crops in North America following storm damage. Once supply normalizes, prices are expected to correct downwards, before returning to a marginally upward trend in nominal terms over the second half of the coming decade (Figure 42).

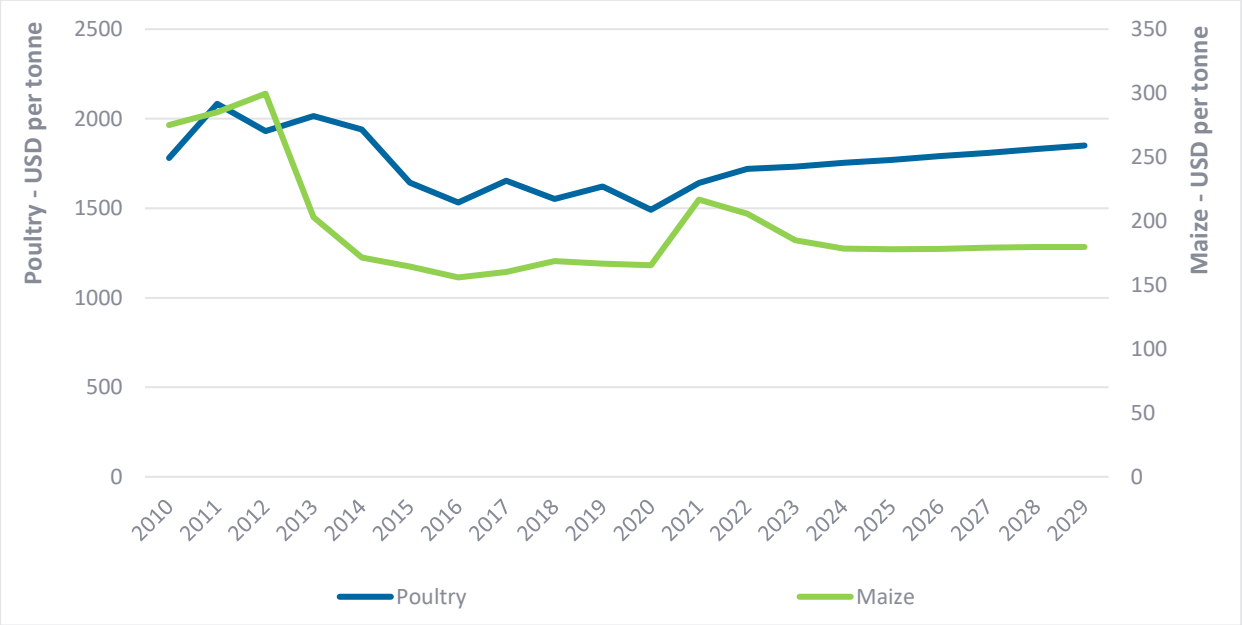

Figure 42: Assumptions for poultry and maize price developments towards 2029

Baseline Outlook

In light of the assumptions presented in Section 5.2, the baseline outlook presents a single possible outcome of the future development of poultry markets in the region. Rather than a forecast, it should be interpreted as an equilibrium in poultry markets given the specified assumptions and a benchmark against which further analysis can be measured and understood.

South Africa

South Africa's poultry sector already faced immense volatility over the past decade and 2020 was no different. The impact of the COVID-19 pandemic and the measures imposed to curb its spread had a significant impact on most meat markets in South Africa. Following the announcement of the initial lockdown, demand spiked briefly on the back of panic buying, but

plummeted thereafter as the reality of consumer spending power constraints set in. In the case of chicken, where 20% of total demand is attributed to the food service sector, the effect was particularly severe. After forced closure through the first 5 weeks of lockdown, restaurants were able to open for delivery under level 4, with take away options only opening under level 3 of lockdown – 2 months after the initial imposition of restrictions.

With imports having reached approximately 20% of domestic poultry consumption in South Africa, the price effect of this weaker demand was limited. Weaker international prices were offset by depreciation in South Africa's exchange rate and domestic chicken prices remained fairly stable, whereas beef and pork prices declined. Furthermore, after a recovery in the chicken to maize price ratio since 2017, and following an upward adjustment in the general import duty, chicken producers were already in an expansionary cycle. While South Africa produced the second largest maize crop on record, the weak exchange rate also supported maize export prices and so maize prices did not decline to the same extent as might have been expected given the large crop. Consequently, profitability in the poultry industry did come under pressure in 2020, as reflected in the reduced chicken to maize price ratio (Figure 43). Over the next 2 years, this is expected to improve, stabilizing at a level well above the lows of 2012 to 2016, but below the peaks of 2017.

These improvements in profitability, combined with commitments made under the chicken Masterplan that was signed in November 2019, are projected to support expansion in production over the next 3 years. While this growth slows over the second half of the outlook period, it remains positive and on average, over the next 10 years, production is projected to expand by 1% per annum, reaching 1.9 million tonnes by 2029. Combined with the weaker exchange rate, which increases the cost of imported products, this is expected to result in reduced imports in the short term. With the safeguard duties on bone-in portions of EU origin set to be phased out by 2022, imports are projected to rise again over the second half of the outlook period. Recent tariff increases and further trade related commitments in the poultry masterplan, such as the review of regulations regarding labelling and traceability requirements, are all expected to contribute to reducing the share of imports in total consumption to 22% by 2029, from an average of 29% in the 2017-2019 base period.

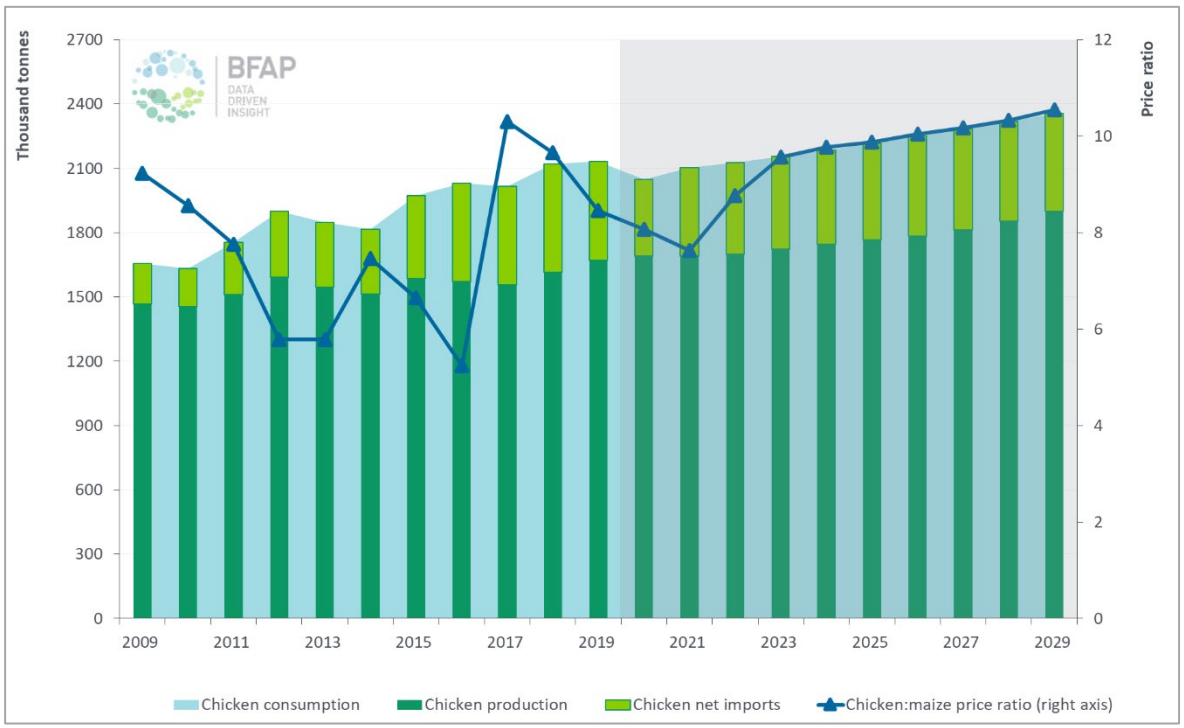

Figure 43: Chicken production, consumption, net imports and profitability in South Africa: 2009 – 2029

Consumption growth in the coming decade is also expected to slow relative to the past. The fundamental factors that underpin meat consumption are income levels and the resultant changes in spending power, population growth and urbanisation. South Africa's economy already faced a number of challenges prior to the shock imposed by lockdown restrictions in 2020. Consequently, the recovery is expected to be prolonged, with unemployment remaining a significant challenge. As a result, income growth is slow, which is the largest contributing factor to the slowdown in chicken consumption growth.

Poultry remains the cheapest source of animal protein, but for many lower income consumers, it has few alternatives and when disposable income declines, it becomes unaffordable, leading to reductions in meat consumption and a switch back to a more starch rich diet. Conversely, its relative affordability within the total meat basket implies that mid-income consumers who had been able to afford a more diverse meat basket, may end up consuming more poultry. After an initial sharp decline in 2020, consumption levels are projected to recover steadily over the 10 year period, but the total projected consumption growth of 13% by 2029 relative to the 2017-2019 base period pales in comparison to the 25% achieved over the past decade (Figure 43).

Kenya

Chicken production in Kenya has increased very rapidly over the past 4 years, responding to growing urban demand. Part of this production growth is also attributed to rapid intensification and growing inclusion of improved indigenous type breeds, as well as broilers, to supply this demand. In 2019, some correction was evident when feed prices increased drastically, which has a significant impact on these intensive operations. At the same time, chicken prices came under

pressure from regional imports. High feed costs remain a challenge in Kenya, which is still a net importer of maize, but some normalization is expected over the baseline once the locust plagues that have challenged the sector improves. There still remains substantial opportunity for further intensification, which is an important driver of production growth in excess of 5% per annum over the 10 year projection period (Figure 44). Section 4.2 indicates that substantial investments have been made in the sector and growth will benefit from this going forward. Over the outlook, the chicken to maize price ratio reaches an equilibrium at a level comparable to that which induced growth in the sector in 2014 and 2015.

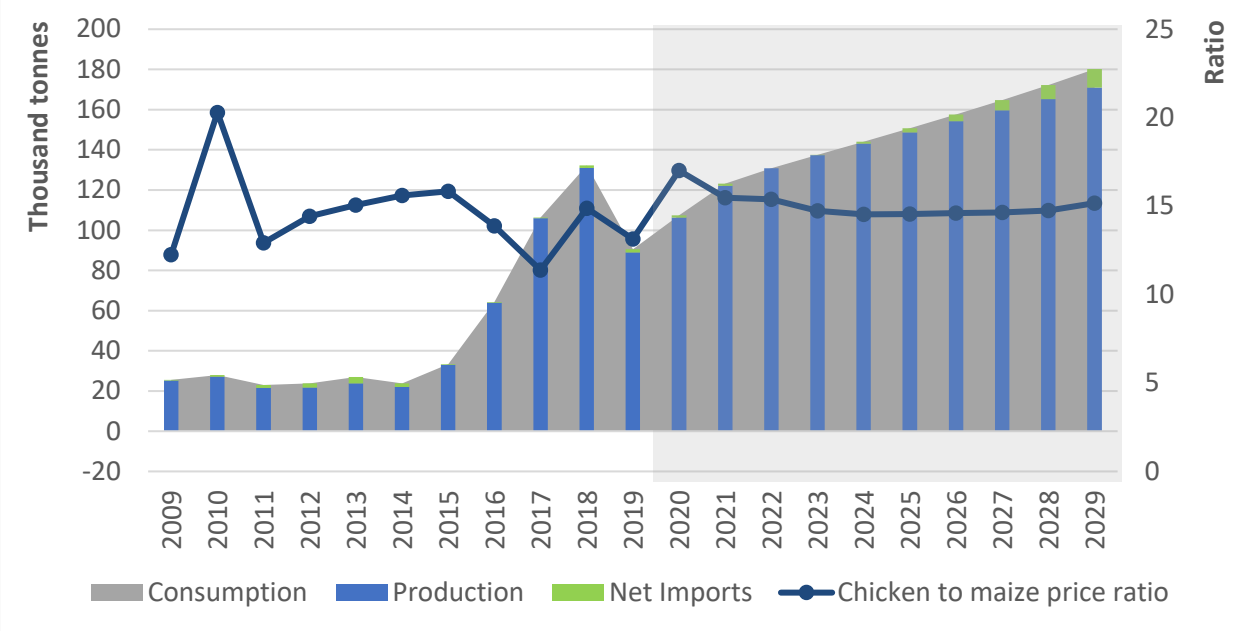

Figure 44: Chicken production, consumption, net imports and profitability in Kenya: 2009 – 2029

Chicken consumption in Kenya remains low on a per capita basis, which also implies that there are ample opportunities for consumption to grow, particularly in the event that greater intensification in production reduces real prices relative to beef. The recovery in consumption takes a few years, given the economic impact of COVID-19, which reduces GDP growth to merely 1% in 2020, but by IMF projections is not projected to induce a recession, as was the case in South Africa. As income growth recovers, chicken consumption is projected to expand by an annual average of 6%, albeit from a small base, which brings total consumption to just over 180 thousand tonnes by 2029.

Tanzania

Despite consistent growth in production over the past decade, the profitability of Tanzanian chicken production has been under pressure in recent years, as maize supply across East Africa was constrained by locust plagues, resulting in sharp price increases. While expansion is projected to slow as a result, the investments already made to increase day old chick production capacity, combined with continued intensification to both broiler and improved indigenous breeds is still expected to support positive production growth of almost 2% per annum over the

coming decade (Figure 45). Over the course of the outlook, the chicken to maize price ratio reaches an equilibrium at levels similar to 2017, which is well below the average of the past decade.

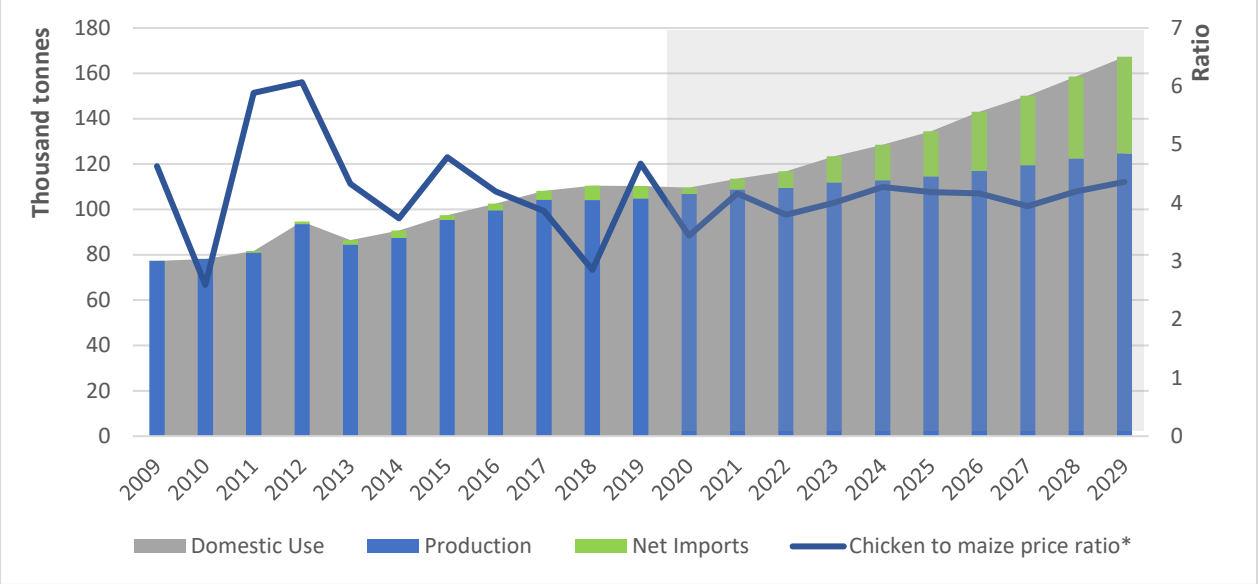

Figure 45: Chicken production, consumption, net imports and profitability in Tanzania: 2009 – 2029

In per capita terms, chicken consumption in Tanzania remains very low, suggesting that there is ample room for growth as income levels improve. If the recent rate of intensification can be retained, this will further support affordability. Over the course of the 10 year projection period, per capita consumption will increase by almost 2% per annum, albeit from a low base, to reach 2kg per capita by 2029. Tanzania imposed fewer economic and movement restrictions in response to COVID-19 than most countries in the region, but its reliance on sectors such as tourism, implies that GDP growth is still expected to slow to below 2% in 2020 and remains well below the levels of recent years in 2021. This implies that initial consumption growth is also slower, before accelerating over the second half of the outlook period. Combined with still strong population growth over the coming decade, this supports domestic consumption growth projections of 4.5% per annum over the outlook – bringing total consumption to 170 thousand tonnes.

The consumption growth projected for the outlook is higher than production owing to the continued challenges with high feed costs, as highlighted in Section 4.5. Despite the ban on imports imposed by Tanzania, volumes have increased in recent years. Much of these volumes come in through Zanzibar, but some of it is thought to move into mainland Tanzania informally. Consequently, the import ban is not imposed on the model in the Baseline, resulting in imports fulfilling a greater role in supplying domestic demand going forward. In the event that the ban is maintained and strictly enforced, prices will likely be higher and consumption growth slower.

Ghana

Ghana's poultry sector is small and despite growth of 6.5% per annum over the past decade, the share of imports in total consumption has increased consistently, to reach 80% by 2019. Over

the course of the baseline projection, which represents a "business as usual" scenario, this trend is expected to continue, with imports projected to account for 86% of total consumption by 2029 (Figure 46).

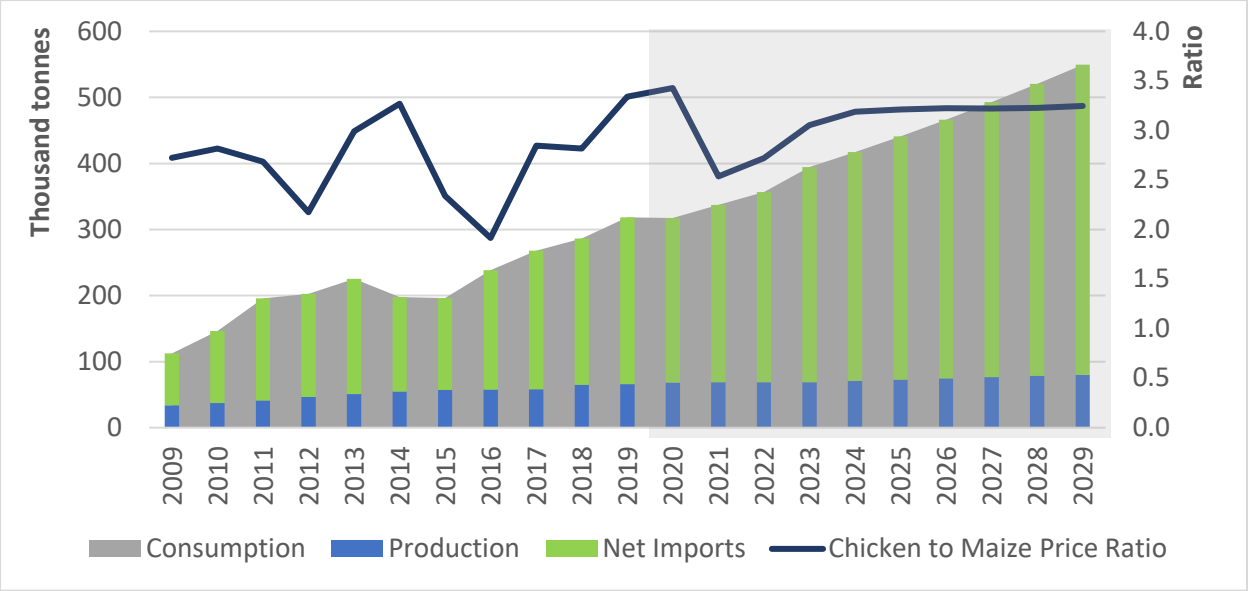

Figure 46: Chicken production, consumption, net imports and profitability Ghana: 2009 – 2029

Chicken consumption in Ghana has grown rapidly in the past, by an annual average of more than 8% since 2009. This growth rate is projected to slow over the outlook to just under 6%, but it remains substantial and by 2029, total consumption is projected to reach 550 thousand tonnes. This implies per capita consumption of 14 kg by 2029, still less than half of the consumption levels observed in South Africa.

Production remains challenged by high feed costs and highly competitive imports and hence it continues to trail consumption growth, both historically and over the baseline projection. Nevertheless, it is projected to remain positive, expanding by an annual average of 2% over the coming decade. Ghana remains a net importer of key feed ingredients and so both poultry and maize prices are largely driven by international market and exchange rate dynamics. On average, over the coming decade, the chicken to maize price ratio is expected to become marginally more favourable which is a factor supporting production growth, but domestic production costs in Ghana remain high in the global context. Consequently, imports continue to capture a larger share of consumption growth over the outlook than domestic production. Interventions that improve the relative competitiveness of domestic production will be critical to reverse this trend.

Alternative Scenarios

The baseline outlook combined with the competitiveness analysis shows that in the absence of interventions, poultry sectors in the region will likely remain challenged by rising imports, particularly of bone-in portions which are offered very competitively in these domestic markets by producers from the EU, the USA and Brazil.

Recognising the impact of the poultry sector within broader agriculture, most governments in the region have expressed a desire to improve competitiveness in order to support domestic production growth. Various policy changes have been proposed to achieve this. In South Africa, the import duties have increased numerous times over the past decade, yet imports continued to rise. More recently, industry stakeholders, convened by the Department of Trade and Industry, contributed jointly to the development of the Poultry Masterplan to set out a new vision for the sector. In Tanzania, imports have been banned outright, but some trade is still observed, particularly in mirror statistics from trade partners, and producers remain challenged by high production costs. In Ghana, the National Medium Term Development Policy Framework of the ministry of food and agriculture has prioritised livestock and poultry development and sets ambitious expansion targets.

The baseline presents a single plausible outcome and a point of departure for further analysis, but the real value of the modelling system lies in evaluation of alternative scenarios and quantifying impacts of specific interventions. In order to demonstrate the application of the modelling framework, two alternative future outcomes are evaluated. These relate to the commitments made under the Poultry Sector Masterplan in South Africa, which was signed in November 2019, and to possible improvements in productivity and feed costs in Tanzania, in line with the scenario presented in Section 4.5 regarding competitiveness.

South Africa's poultry masterplan

South Africa's Poultry Masterplan, which was described on page 27, was the culmination of inputs from various stakeholders across the value chain and sets out a new, joint vision across the value chain. It identifies five pillars that underpin the vision and creates a Poultry Sector Masterplan Council to monitor implementation. The Masterplan essentially represents a social compact between government, business, labour and civil society. Under each pillar, it sets out a number of commitments, in order to achieve the strategic objectives identified. The simulations presented here are focused on the commitments under pillar 1, which includes expansion of the contract grower network and commitments to increase production volumes by 1.7 million broilers per week over the next 3 years – an expansion of almost 10%. This includes a committed investment of R1.5 billion.

Rather than quantifying each of the commitments made under the Masterplan, which is beyond the scope of this study, the expansion commitments under this pillar are simulated directly in order to illustrate the broader impact on South Africa's agricultural sector, through its interlinked nature with the feed value chain. While the restrictions associated with COVID-19 have delayed implementation of many actions, some of the commitments made by government (such as a review in the general duty, which was increased in 2020) have been implemented already and are therefore included in the baseline. Many others, such as domestic procurement commitments, are still in the process of being implemented and are therefore not yet included in the baseline.

Figure 47 presents the baseline projection for chicken production growth in South Africa, relative to the scenario where production is increased by 10% over the period from 2022 to 2024. By 2029, this results in a 173 thousand ton increase in chicken production relative to the baseline – just over 9%. Figure 48 presents the associated impact on imports. It indicates that not all imports are replaced – this was not the ambition of the Masterplan, but the reduction of 35% relative to the baseline allows a substantial share of current bone-in portion imports to be produced domestically. The sustainability of this expansion hinges on a number of actions and commitments, including an enhanced regulatory framework, which enables compliance with EU food safety standards for export of breast meat, as well as a drive to expand exports into the Middle East.

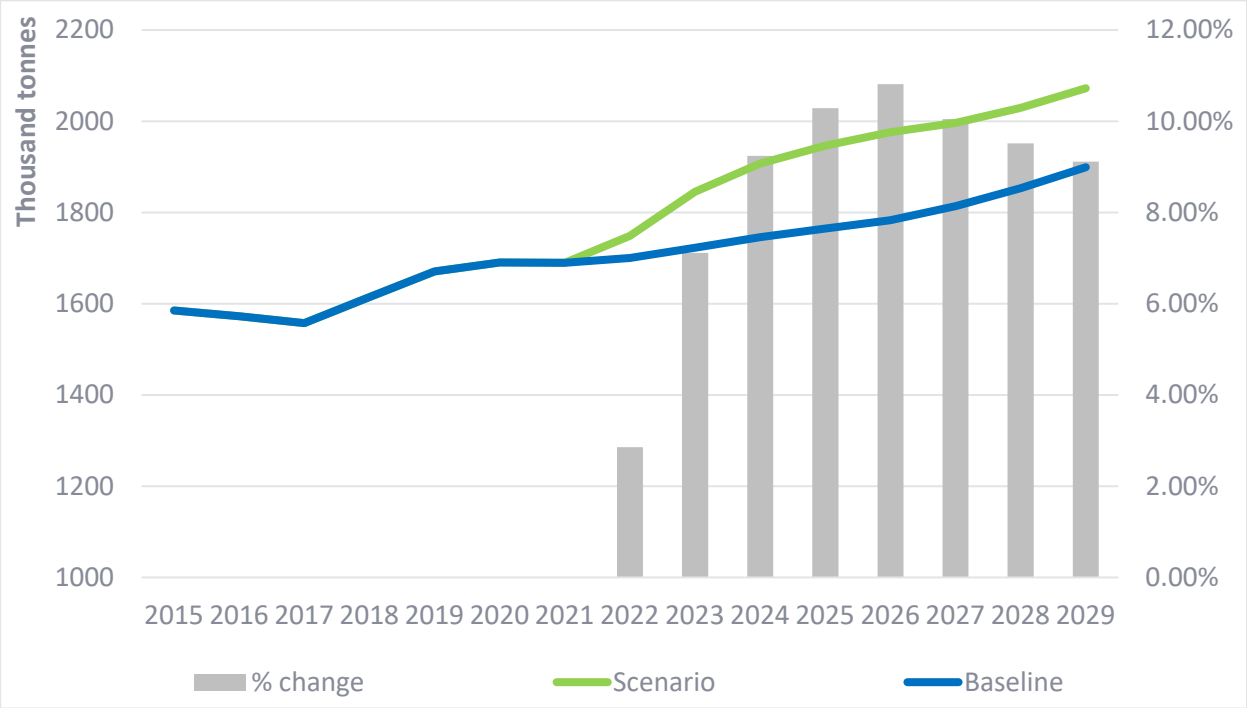

Figure 47: Impact on chicken production in South Africa resulting from expansion commitments in the Poultry Masterplan

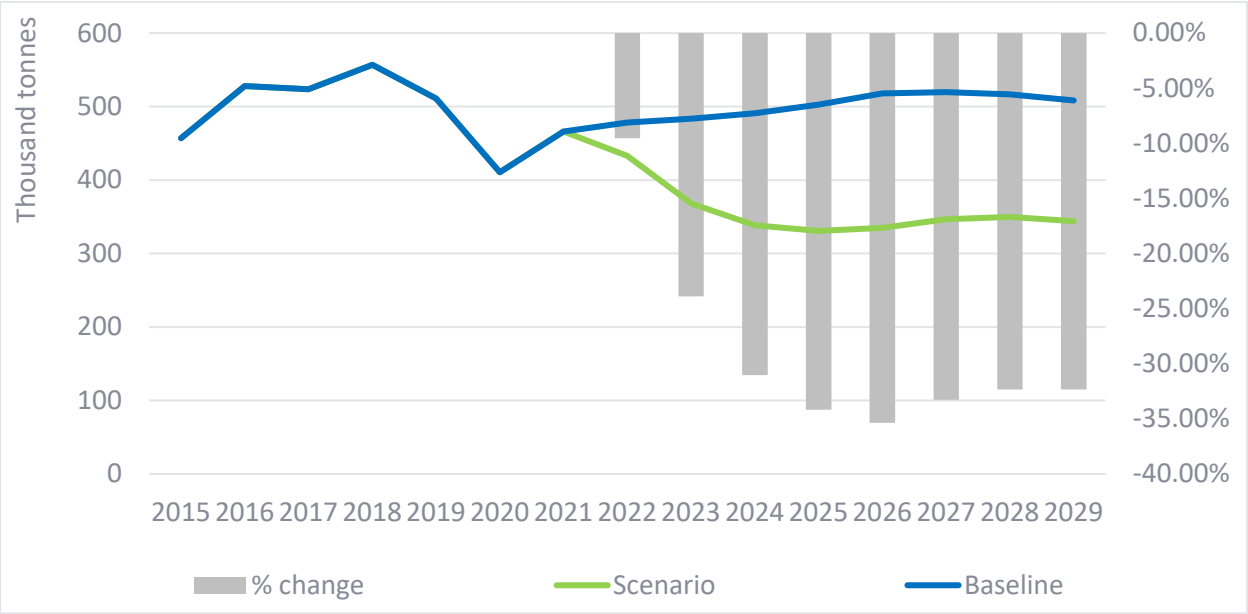

Figure 48: Impact on chicken imports in South Africa resulting from expansion commitments in the Poultry Masterplan

As a consequence of the expansion in chicken production, Figure 49 and Figure 50 indicate that the use of feed-related raw materials will also increase. Maize utilised for feed consumption increases by 317 thousand tonnes relative to the baseline by 2029, whereas soybean oilcake use increases by 57 thousand tonnes. This implies that maize exports will be reduced, with additional value being added domestically instead through processing into animal feed. Furthermore, after substantial investment in domestic soybean processing capacity over the past decade, growth in soybean oilcake consumption will enable additional processing of soybeans – further increasing the demand for soybeans and inducing area expansion.

This analysis only considers a few of the actions stipulated in the poultry masterplan, and therefore does not attempt to fully quantify its impact. Nevertheless, it illustrates clearly that, in addition to the direct value of the poultry sector, improvements in its competitiveness which induces expansion in production volumes has substantial effects across a number of agricultural sectors, such as raw material production and processing. Beyond its links to the feed sectors, it also contributes to sectors outside of agriculture, such as logistics and can therefore have a broad impact on economic activity and job creation.

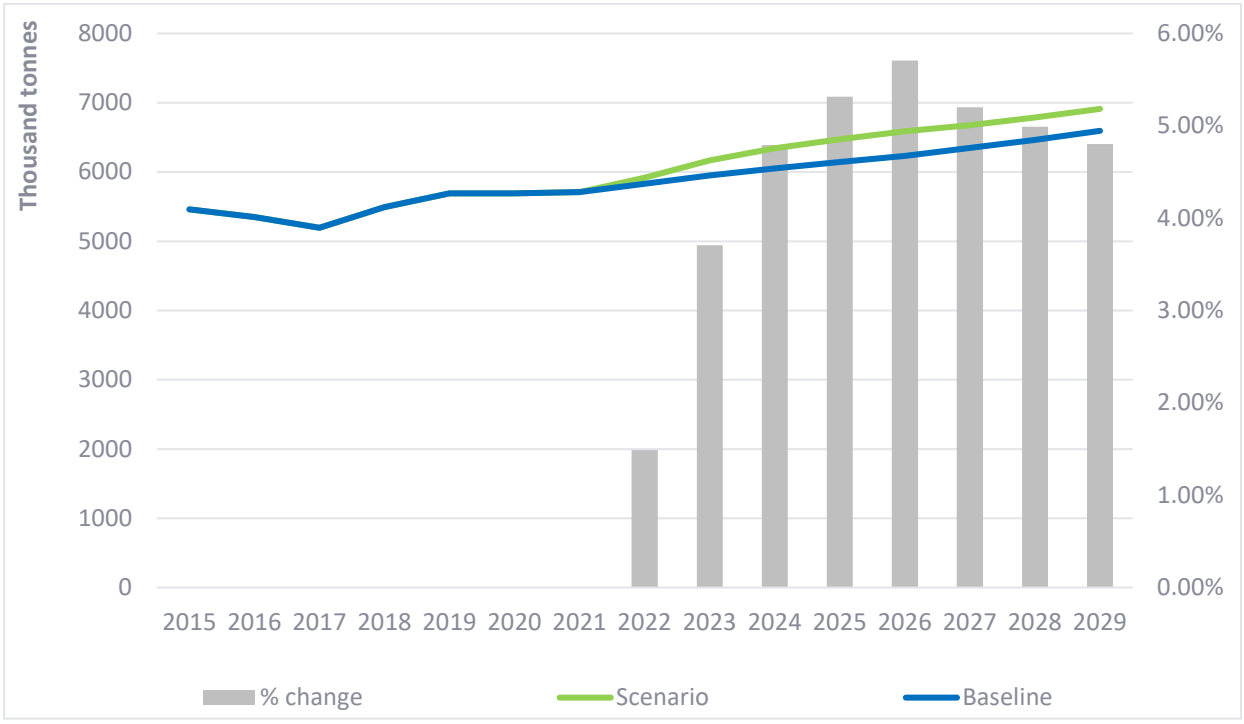

Figure 49: Impact on maize feed use in South Africa resulting from chicken production expansion commitments in the Poultry Masterplan

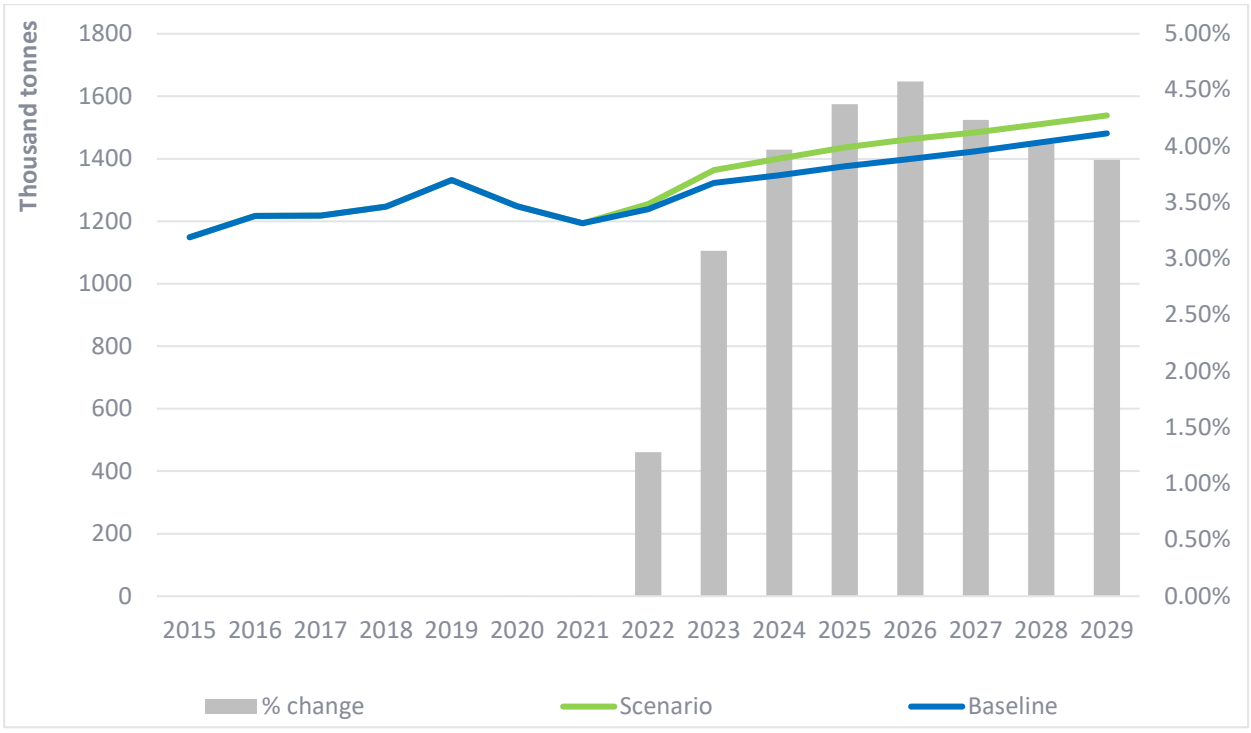

Figure 50: Impact on soybean oilcake use in South Africa resulting from chicken production expansion commitments in the Poultry Masterplan

Reduced feed costs in Tanzania

Section 4.5 illustrated the challenge faced by chicken producers in Tanzania due to its high cost structure. It identified a number of options to improve the competitiveness and then evaluated the impact of a combined scenario on relative competitiveness with imported products. The scenario encompassed the following:

- A reduction of the feed conversion to 1.49 – the level attained in south Africa for a similar size bird
- A 25% reduction in the price of feed, which would bring it in line with the levels observed in South Africa
- An import levy on poultry meat of 35%

Tanzania does in fact impose a tariff of 35% on poultry products originating from outside of the East African Community (Table 7) and so the impact of this is already accounted for under the baseline. To complete the analysis, Figure 35 presents the impact on production of an improvement in feed conversion, combined with a 25% reduction in feed costs. Both changes are introduced incrementally into the modelling framework over a 3 year period from 2022 to 2024. By 2029, this results in an increase of almost 25 thousand tonnes in chicken production relative to the baseline – the equivalent of 19%. As a result of faster growth in production, the import requirement is also reduced, with a reduction of 45% by 2029 relative to the baseline (Figure 52). While making a significant difference to profitability and therefore accelerating production growth, this is still insufficient to replace all imports, as consumption levels rise in response to lower prices. At the same time, Section 4.5 indicated that, while these improvements equate the offer price to that of bone in portions from the Netherlands and Germany, countries such as Poland, Brazil and the USA are still able to offer the product at lower prices than domestic producers. These competitive prices support the result that imports continue to increase over the coming decade, even under the improved scenario, but not to the same extent as under the baseline.

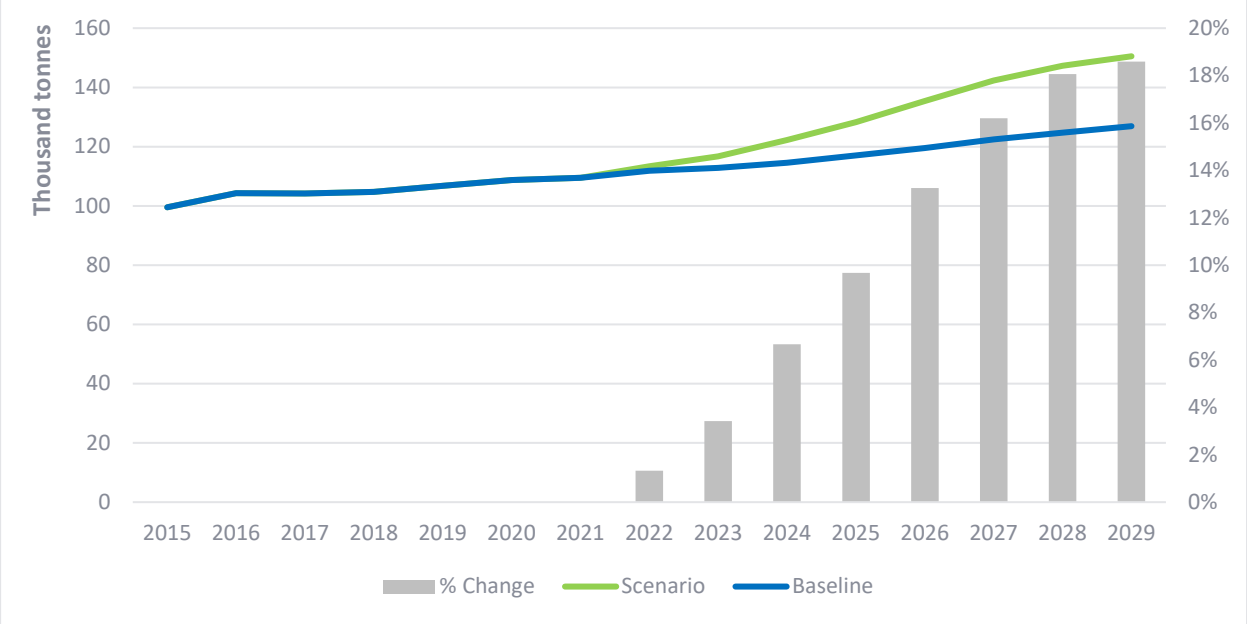

Figure 51: Impact on chicken production in Tanzania resulting from improved efficiency and reduced feed costs

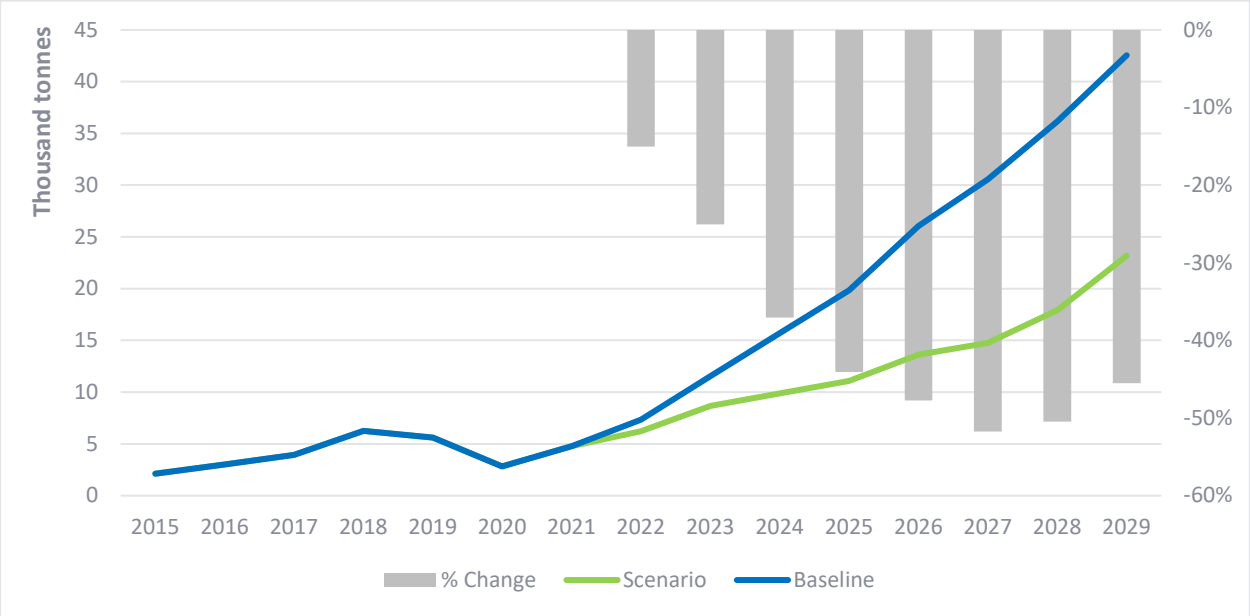

Figure 52: Impact on chicken imports into Tanzania resulting from improved efficiency and reduced feed costs

Concluding remarks

Poultry provides an affordable, healthy source of protein to consumers and consumption is projected to expand in the coming decade, particularly in the developing world (OECD-FAO, 2020). This also holds true in Sub Saharan Africa, where rapid population growth, urbanisation and rising incomes are expected to support rising demand for animal protein. As an affordable option, poultry could constitute a significant share of additional meat consumption, but current

levels of consumption per capita remain very low compared to the rest of the world. In many countries in the region, poultry production has not intensified to the same extent as leading global producers and in some countries poultry meat is actually more expensive than alternative meat types such as beef.

Poultry markets in the region are not homogeneous and the nature of production systems varies significantly across countries. Recognising this heterogeneity, this study provides a comprehensive overview of poultry markets in South Africa, Ghana, Kenya and Tanzania. It includes a holistic view of value chain structure, policy environment, competitiveness and challenges and opportunities to supply possible consumption gains.

From a consumption perspective, a review of existing literature suggested that, in most of SSA (excluding South Africa), consumers generally prefer locally produced chicken to imported chicken, and with some exceptions, indigenous breeds to broilers. While locally produced meat is perceived as higher quality, imported meat is generally cheaper and sometimes available in more convenient forms. This had led to rising imports into the region and suggests that domestic production will need to improve its price competitiveness in order to capture a larger share of domestic consumption growth in future.

The analysis of relative competitiveness focussed on two countries; South Africa as the largest and most mature market dominated by large scale intensive production, and Tanzania as a smaller market, where the contribution of intensive production systems to total output is less than South Africa, but increasing, and where the feed market is less mature. While the cost of producing broilers in Tanzania is very high owing to high feed and day old chick costs, South Africa can compete fairly well with EU producers in terms of production costs for a whole carcass, albeit not at the level of leading exporters such as the USA and Brazil. Despite this, South African poultry imports (mainly bone in portions) have increased consistently over the past decade. An evaluation of offer prices for bone-in portions from various leading producers suggested that exporting countries are able to offer bone-in leg quarters more competitively due to the premium obtained for breast meat. In South Africa, the premium market for breast meat is small and exports of breast meat into the EU are inhibited by stringent SPS requirements and food safety regulations. This suggests that, in order to capture a larger share of consumption growth in future, the industry will need an integrated strategy that is focused not only on levelling the playing field against imports, but also ensuring compliance with food safety regulations in order to enable exports into premium markets. These factors are acknowledged in South Africa's recently developed poultry industry Masterplan.

Utilising a partial equilibrium modelling framework, the report provided a baseline outlook for the four countries, which represents a business as usual scenario serving as a point of departure for further analysis. Under the baseline assumptions, imports will likely continue to play an important role in meeting additional demand growth. However, national policies in the countries considered favour domestic production, thereby supporting growth in the agricultural sector, not only directly from poultry, but also indirectly through feed related industries.

The high level of integration between the poultry and feed sectors suggests that interventions that enable growth in poultry can have a wide impact on broader agricultural performance – as was shown in the alternative scenarios presented for South Africa. Likewise, it also implies that for poultry producers to be truly competitive in the global context, the production of feed and raw materials for feed production must also be competitive. This was evident in Tanzania, where high feed and day old chick costs, which are also influenced by feed, were major contributing factors to the high cost of production and consequently prices for chicken. In this regard, productivity gains in poultry production as well as lower feed material costs would yield substantial improvements in competitiveness.

The focus of this report has been on a detailed understanding of the structure and competitiveness of selected poultry value chains in the region, as well as the development of a partial equilibrium modelling framework that can be integrated into the ReNAPRI modelling system and utilised to assess alternative future scenarios and evaluate the impact of possible policy interventions in a forward looking context. This was achieved. The modelling framework considers the heterogeneous nature of poultry sectors in different parts of the region and its applicability was illustrated with two alternative scenarios for South Africa and Tanzania. At the same time, it is also acknowledged that, from a modelling perspective, further possibilities for disaggregation and improvement exist, which would broaden the scope of possibilities for scenario analysis and impact assessment in future.

In the analysis of competitiveness, as well as the partial equilibrium simulation framework which lies at the core of this report, it is assumed that chicken meat is a homogenous good, with no differentiation in demand preferences for indigenous breeds over broilers. Possible disaggregations include the demand structure, to account for differences in consumer preferences, as well as the supply side to account for varying rates of technological advancement across different production systems. A further expansion of the modelling framework would also be beneficial, both in terms of a broader country coverage, as well as a broader representation of the animal feed sector, as the extent of its inclusion and integration within the chicken models presented in this report varies broadly across the countries included.

While such disaggregations would certainly broaden the possibilities for analysis, even in its current, more aggregated form, opportunities also remain to utilise the modelling system for further scenario analysis in future. This could include an accelerated dietary transition, particularly in countries where per capita consumption levels are still fairly low, as well as various combinations of interventions to improve competitiveness and accelerate domestic supply responses, tapping into consumer preferences and commercialization potential for domestic chicken meat production.

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