

# A Quantitative and Qualitative Analysis of the South African Broiler Industry

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A thesis submitted to meet the requirements for the degree

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BLOEMFONTEIN

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June 2017

## DECLARATION

I declare that the thesis is hereby submitted for the Doctor of Philosophy with specialisation in Agricultural Economics at the Department of Agricultural Economics, University of the Free State. I declare that this is my work and I have not previously submitted it for a qualification at another university or another faculty at this university. I also cede copyright of this work to the University of the Free State.



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Jan C. N. Joubert

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Christo Joubert

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## **SUMMARY**

A Quantitative and Qualitative analysis of the South African Broiler Industry

By JCN Joubert

**Degree:** Doctor of Philosophy (PhD) with specialisation in Agricultural Economics

**Department:** Agricultural Economics

**University:** University of the Free State

**Promoters:** Professor Johan Willemse & Dr Dirk Strydom

The South African broiler sector is the largest agricultural sub-sector. It contributed R37.2 billion or 16.5 % to the total agricultural sector in the 2014/15 season (DAFF, 2016:76). The industry produced  $\pm$  962 million broilers in 2014 and  $\pm$  1 003 million in 2015 (SAPA, 2016b). The Department of Agricultural Forestry and Fisheries (2015:69) reported per capita consumption of 16,11 kg in 1993/94 and 38,5 kg in 2013/14 season, which constitutes a growth of 140 % over the past 20 years. The Bureau for Food and Agricultural Policy (BFAP) estimated that consumption would increase by a further 38 % from 2014 to 2024 (BFAP, 2015:74). Chicken meat remains an affordable protein, as against pork and beef (Lovell, 2014a:12). The industry employs  $\pm$  10% of the total agricultural workforce (IDC, 2016:66).

From a supply and demand perspective, South Africa consumed 2 127 389 tonnes of broiler meat in 2015 (South African Poultry Association (SAPA), 2016a: 1). The local production by commercial and subsistence farmers, together with imports are as follows. Commercial farmers produced 1 720 155 tonnes in 2015. Importers, retailers, and wholesalers imported 457 374 tonnes. Subsistence producers produced 69 334 tonnes. Live sales from depleted stock comprised 71 885 tonnes, and exports formed 65 815 tonnes (SAPA, 2016a: 5). The trade in broiler meat of certain cuts and mechanically deboned meat (MDM) is a vibrant and active market. The value of imports increased by 139 % from R1,5 billion in 2010 to R3,6 billion in 2015 (SARS, 2016).

World broiler meat prices decreased between 30 % and 40 % from 2014 to 2016 (Unnerbary, 2016). The northern hemisphere prefers 'white' chicken meat (mostly breast meat). Because of this preference, research and development in the USA and EU poultry industries have resulted in larger chickens produced. This phenomenon results in surplus production in the specific markets of brown meat (drumsticks and thighs), which needs to be sold in other global markets.

Increased imports into the South African market were a result of this trend, while trade agreements with the EU and the USA aggravated the position in South Africa for the local producers (by allowing increased import volumes into the domestic market). The trading environment also changed for the USA when Russia closed its borders to imports from the USA. Brazil is the biggest trader of broiler meat in the world, with the USA as the biggest producer of chicken meat in the world. Both these countries have competitive supporting industries regarding maize and soybeans with much higher yields than South African.

The local poultry industry contributes significantly towards the agricultural sector and food security in South Africa. Government strives to utilise the broiler industry as a start-up business for small-scale farmers entering farming. However, producing broiler meat for international markets, and on a competitive basis, requires high managerial and technical skills. In the South African case, the producer also must need to manage relative volatile feed prices, compared with international competitors. The two major ingredients for feed in the South African poultry industry are maize and soybeans, and both the prices of these commodities are relatively more volatile in South Africa, compared with international competitors.

The movement of feed prices in the industry creates much uncertainty, which can be attributed to a few factors. South Africa experiences a very highly volatile maize market. The price of maize can swing from import parity (in a drought situation) to export parity, in one season. This swing can easily be more than R1 000/ton within one production season. A volatile South African exchange rate also adds to the total feed price volatility. South Africa does not produce enough soybeans or soybean meal and need to import the shortage. Local soybean production constitutes to about 30 to 40 % of total meal usage, although the local production varies, depending on weather patterns. This research did not focus on the production and the substitution effect of maize and soybeans. However, the comparative advantage of the broiler industry could improve if South Africa can produce enough soybean meal for its demand. It can also stabilise the feed price.

The goal of this study is to analyse the South African chicken meat market to determine if production can be justified regarding competitive and comparative advantage. It is important to note that the comparative advantage is measured regarding the total international market. The researcher used various methods to analyse the industry and to identify the constraining

and enhancing factors in the South African broiler value chain, amongst other things. The study also evaluates the advantage and benefit of protecting the sector against large and relatively cheap imports. The local constraining factors were identified to make the industry internationally competitive.

The researcher employed various methodologies to quantify and understand the relationships of the broilers industry in the wider South African economic context. The results of this research will assist policy makers to formulate a more balanced policy whilst considering both the consumer and the producers in finding an acceptable balance in the interest of the broader South African economy.

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## ACRONYMS

ADA	Anti-Dumping Agreement
AFMA	Animal Feed Manufacturing Association
AGOA	African Growth Opportunity Act
ARC	Agricultural Research Council
ARDC	Agricultural Rural Development Corporation
AMIE	Association of Meat Importers and Exporters
BFAP	Bureau for Food and Agricultural Policy
BOP	Balance of Payment
CBH	Country Bird Holdings
CEO	Chief Executive Officer
CGE	Computable General Equilibrium
DAFF	Department of Agriculture, Forestry and Fisheries
DoC	Day-Old-Chicken
DPME	Department of Planning, Monitoring and Evaluation
DRC	Domestic Resources Coefficient
DSU	Dispute Settlement Understanding
DTI	Department of Trade and Industry
ERS	Economic Research Service
ESCOM	Electricity Supply Commission
EU	European Union
FANRD	Food, Agriculture and Natural Resources Directorate
FAO	Food and Agriculture Organization of the United Nations
FOB	Free on Board
FTA	Free Trade Agreement
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
HS	Harmonised System
IERF	Inter-industry Research Foundation
IM	Inforum Model
IDC	Industrial Development Corporation
I/O	Input Output
Inforum	Interindustry Forecasting at the University of Maryland



LIFT	Long-term Interindustry Forecasting Tool
IQF	Individual Quick Frozen
ITIO	Inter regional input-output
ITAC	International Trade Administration Commission of South Africa
ITC	International Trade Centre
LTC	Livestock Technical Committee
LU	Livestock Unit
NDA	National Department of Agriculture
MDM	Mechanical Deboned Meat
MFN	Most Favourable Nation
NAMC	National Agricultural Marketing Council
NIE	New Institutional Economic
OECD	Organization for Economic Cooperation and Development
PPI	Producer Price Index
RCL	Rainbow Chicken Limited
PAM	Policy Analysis Matrix
PSE	Producer Support Estimate
RISDP	Regional Indicative Strategic Development Plan
ROW	Rest of the World
SA	South Africa
SADC	Southern African Development Community
SACU	Southern African Customs Union
SAGIS	South African Grain Information Services
SAFRIM	South African Inter-Industry Forecasting Model
SAPA	South African Poultry Association
SAPIA	South African Petroleum Industry Association
SARB	South African Reserve Bank
SCA	Sustainable Competitive Advantage
SAM	Social Accounting Matrix
SNA	System of National Accounts
SPS	Sanitary and Phytosanitary
StatsSA	Statistic South Africa
TAD	Trans-boundary Animal Diseases

TDCA	Trade Development and Cooperation Agreement
UK	United Kingdom
USA	United States of America
USDA	United States Department of Agriculture
USAID	United States Agency for Independent Development
WTO	World Trade Organization.
VAT	Value Added Tax
ZAR	South African Rand

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# **CHAPTER 1 :**

## **INTRODUCTION TO THE ANALYSIS OF THE SOUTH AFRICAN BROILER INDUSTRY**

### **1.1 Introduction**

The Department of Agriculture, Fisheries and Forestry (DAFF) published figures, indicating the broiler industry (fowls slaughtered) contributed more than R37 billion (16.5 %) to the total agricultural production in 2014/15 (DAFF 2016:76). The value chain of the broiler/chicken meat industry is complex and integrated into other value chains. The final products in the chain are categorised into live, fresh, frozen, individually quick frozen (IQF) chicken meat and offal. The only non-edible parts, namely blood and feathers, go to a rendering plant for further processing. Chicken meat comes from various production operations, namely subsistence farmers, commercial broiler producers, spent layers from the egg industry and spent broiler parent hens and cocks from the Day-old Chick (DoC) industry.

Commercial broiler production represents the bulk of the supply of chicken meat. Local production increased from 1 578 238 in 2014 to 1 650 821 tonnes in 2015, against the total consumption of 2 032 328 in 2014 and 2 127 389 tonnes in 2015. The difference between local production and consumption is imported, mainly from South America in the past and recently from the European Union (EU). The industry also finds it difficult to keep up with local demand against prices of certain imported cuts. Although the United States of America (USA) also produces a surplus brown meat (frozen bone in portion), limited imports have been experienced in the past due to anti-dumping measures against the USA of R9.40/kg.

The South African industry broiler was labelled as an industry in distress (Farmers Weekly: 2013) for the past few years. This raised the question whether the industry has any competitiveness in the market. Processors add value by differentiating the whole carcasses into several products. These products offered to the market can be grouped into fresh, frozen, individually quick frozen (IQF) and edible oval. Over 60% of chicken meat in South Africa is processed and classified as IQF (with brine).

Production needs to stay financially viable to enhance the sustainability of the sector and ensure self-sufficiency, or to a certain extent, for food security purposes. Broiler prices in South Africa

have been under pressure from cheaper imports, while feed prices increased sharply within a particularly volatile environment, resulting in uncertain profitability. Feed prices constitute to 60% to 80% of the production cost of broilers Louw *et al.*, (2011: 233) also argued that feed prices represent between 60% and 80% of input costs. The percentages are also confirmed by Davids (2013: 22).

As a net importer of chicken, the industry is integrated into international markets, and prices are expected to follow global trends. While feed costs increased by 157% from 2001 to 2012, the chicken price was capped by the increased flow of cheaper imports, resulting in an increase of only 61% over the same period. Thus, the only mechanism for remaining economically sustainable was through efficiency gains, mainly in the form of improved feed conversion rates. Because of the cost pressures, many smaller producers that did not have integrated feed manufacturers and economies of scale benefits have been unable to stay in production. This has increased concentration levels in a market where the two biggest producers already account for almost 50% of total production. High concentration levels, in turn, raise the concern of uncompetitive behaviour, as illustrated by numerous enquiries from the Competition Commission (Davids, 2013:4).

The local industry came under further pressure with the extension of the African Growth Opportunity Act (AGOA) in 2015 from the USA. AGOA is an agreement between the USA and certain African countries that comply with certain requirements set by the USA. AGOA provides duty-free access for export commodities from these countries into the USA (Williams, 2015: 2). The USA originally requested an import quota of leg quarters of 145 000 tonnes without any dumping measurements from South Africa. South Africa and the USA reached an agreement during June 2015 to import 65 000 tonnes of broiler meat per year to South Africa from 2016, without any anti-dumping measurement (City Press, 2015). The usual tariff measures for most favourite nations (MFN) still apply for this quota.

The above phenomena further emphasised the importance in analysing the industry in many ways and with different economic models. The Organization for Economic Cooperation and Development (OECD) (2006: 122), using the Producer Support Estimate (PSE) methodology, indicates that the poultry sector in South Africa receives no form of support from the government as of 2003. It implies that the total value chain is taxed. Considering the on-going



differences between the poultry producer organisation and the importers and exporters, a more comprehensive analysis of the value chain is needed.

The following issues remain critical:

- The South African broiler industry faces challenges regarding its sustainability due to high feed costs and a global over supply of meat.
- The industry experience volatility in production cost due to exogenous factors such as climate changes resulting in the recent drought and changes in the South African exchange rate. The latter makes it difficult for producers to do proper planning.
- The industry claims it needs protection against dumping or unfair competition because of world market failures.
- The Association of Meat Importers and Exporters (AMIE) argue they provide the South African consumer with a relatively cheap form of protein (SABC, 2013: np).
- With the size and challenges within the sector, it is important to understand the different economic impacts on the broiler industry, related industries, government and employment.

Several studies and models have been developed in the past to analyse certain parts of the South African broiler industry. For example:

- De Beer (2009: 6) developed a new baseline model for projections which from part of the BFAP Sector Model. This model is sector driven and is a partial equilibrium model. The new model shows less sensitivity to changes in the exogenous factors. The closure of the new model makes use of a price equilibrium approach where the net import identity is used (De Beer, 2009:100)
- Davids (2013: ii) has done research and addresses price forming mechanisms in the value, South Africa. The objective of the research was to determine a method to discover price within the South African broiler market and to formulate an equation. This price equation was further integrated into a simulation model which represents the industry more accurately. A New Institutional Economic (NIE) framework was used to analyse the structure of the South African broiler industry. The stakeholders and activities in the value chain were also evaluated.

- The National Agricultural Marketing Council (NAMC) have done a sub-sector study on chicken meat in 2007. The following was found (2007: 20):

*“The SA broiler industry can be seen to be competing in two different markets. The first is the domestic market, where broiler meat competes with other protein sources for market share. The second is the international broiler market.”*

The NAMC expected at the time that the industry will remain a dynamic and volatile environment. The study predicted the following on production:

- major market swings;
- major movements in ownership and management;
- and major threats, opportunities and exposure to occurrences in the international arena.

The above factors with economies of scale will result in a higher rate of automation and bigger production units.

Marketing will remain a challenge for the future.

- The Department of Agriculture, Forestry and Fisheries provides a profile of the South African Broiler Market Value Chain in 2015. The profile provides general data on the value chain and an illustration of the marketing channel (DAFF 2015:27)
- The research of Machethe (2016:4) focus on the smallholder broiler industry in the Mopani district and the determinants of market participation. The results of the study showed that there are 8 significant factors that affect market participation. These factors include household size, income received per month, experience of the farmers in broiler production, land size, access to market information, distance to the market, profitability and land ownership. The most constraining factors identified are theft of chickens, lack of water, high mortality rate, proper housing, lack of funds.

The above research is valuable and were used in the research as literature review. The research done in the past on the above mentioned critical aspects is partial of nature and only provides certain answers relevant to the specific issue.

The novelty of this research is that the aim is to provide a holistic view of all the different value chains combined. The focus is on different models addressing the competitiveness, the effect of policy and determines if the industry has a right to existence. This will provide the industry with information and knowledge to understand the impact on other sectors such as the public sector, employment and other industries in the economy. And finally, to understand the impact of exogenous and endogenous factors on the competitiveness of the broiler industry.

## **1.2 Research objectives**

### **1.2.1 Primary research objective**

The primary research objective is to determine the sustainability and competitiveness of the broiler industry from a holistic approach. This is important because factors such as financial feasibility, economic growth, employment creation and food security play an imperative role in every industry. This will be done via mapping and to quantify the value chain and using the data and information in various economic models. The result of these models will address the broad objective of the research. Several secondary objectives are also relevant and are listed below.

### **1.2.2 Secondary research objective**

- Mapping and quantifying the broiler value chain.

The mapping of a chain is normally the initial phase before proper research can be done on an industry (Mooney, 2014:np). It is important to map, unpack and quantify a value chain to get an understanding of how the products and activities function and the involvement of each stakeholder. Umberger (2014:16-21) also explains that a value chain analysis examines the interactions between different stakeholders.

Value chain analysis is important to understand the interconnectedness in the chain, to identify stakeholders and their activities and what value they add to the industry. Also, to identify what support systems are necessary and what enhancing and constraining factors exist in the chain.

A comprehensive value chain analysis provides important information for further analysis and modelling.

*Hypothesis: Historical value chain studies are outdated due to constant changes in the world.*

- The following secondary objective is to identify the exogenous and endogenous forces that determine the competitiveness of the broiler industry on a macro-, meso- and micro-level.

- This approach is qualitative in nature and can only be done after the preliminary mapping of the value chain is completed. The identification of the factors affecting the chain are done by means of interviews with role players and the theory application of the Porter model. After the forces have been identified a well-constructed questionnaire was sent out for research purposes. Porter's theory is known to determine the competitiveness of industries and nations. It provides an understanding of how the industry anticipates exogenous and endogenous factors on a macro-, meso- and micro-level.

*Hypothesis: The exogenous and endogenous factors are unknown in the industry. These factors need to be identified and mapped.*

- The third secondary objective is to determine the comparative advantage and the effect of policy on the industry.

- This study will provide insight into the broiler industry with a proper understanding of the factors that drive profitability, sustainability and comparative advantage in the industry. It will also help to determine the key success factors and constraints impacting on the comparativeness of the industry.

*Hypothesis: The South African broiler industry has a comparative advantage, and the current effect of policy is unknown to the industry.*

- The fourth secondary objective is to determine and quantify the economic and socio-economic impact of the industry on the general economy.

- The objective of socio-economic impact analysis is to understand and reduce unintended consequences and foreseen unpredicted in an economy or socio-economy (DPME, 2015). Therefore, it is important to understand the effect on the different endowments employed by industry. The aim of socio-economic impact studies is to get a clearer understanding of the economy on several levels and to identify unintended consequences. This part of the research applies two general equilibrium models towards the industry, namely: South Africa Industry

Forecasting Model (SAFRIM and the Computable General Equilibrium (CGE) model of the Global Trade Analysis Projects (GTAP).

*Hypothesis: The South African broiler industry has an important impact on the economic and socio-economic impact of the country.*

### **1.3 Framework of research**

The aim of this study is to determine the impact of the broilers industry on other related industries. It also aims to get a clear understanding of the linkage of the related industry and the economic and socio-economic effect of the industry.

Therefore, the objectives as mentioned above focus on:

- Value chain analysis;
- Endogenous and exogenous factors on a macro-, meso- and micro-level affecting the competitiveness;
- The effect of policy and comparativeness of the industry;
- The economic and social economic impact of the industry.

The next part of this section shortly explains the importance of each objective above and how they interact to obtain the results and conclusion for the research question as formulated earlier. The report is also structured in such a way that each model applied has a comprehensive literature review and a discussion of the results in each subsequent chapter.

#### **1.3.1 Mapping and Quantifying the South African Broiler Value Chain**

In the past, traditional sector analysis was static and only focused on parameters in the specific sector environment. It ignores the linkages and activities in the broader economy. Further investigation and analysis of the interlinkages between informal, formal and other sectors reveal a dynamic flow of the economy and unpack activities between sectors and producers in the different sectors and even on a universal scale (Kaplinsky and Morris, 2001:2). It is important to understand the relationship between sectors, producers, role players, activities and products in the chain from a supply side. On the other hand, or from a demand perspective, it is important to understand preferences and needs for the market from a food security perspective, as well as exporting to generate income for a country.

The focus of value chain analyst has reverted in the past years to focus on the optimisation of allocated resources. Commodities and goods are exported to earn foreign currencies, which in return can support the funding of other goods to import. A country's economy system has several consumers namely households, businesses in various manufacturing sectors and government. Households use products that are locally manufactured and imported. The business also uses it in the production processes of other intermediate or final products. Intermediate inputs contribute to further increase of output. Wealth is created by means of this phenomenon. Therefore households' ability to procure or use products or services determines economic welfare. A trade-off exists between imports, exports and production. It is challenging to solve the trade-off issue among industries, households and other consumers and the efficient allocation of resources (Hosoe, Gasawa and Hashimoto, 2010:1).

Value chain analysis can serve as a guide for producers to enter the global environment, which would provide economic growth for a country. Value chain analysis is an analytical tool in understanding the policy environment. The policy is supposed to enhance the efficient allocation of resources within an economy. Value chain analysis assists to understand how producers, manufacturer and countries participate in the global economy (Kaplinsky and Morris, 2001:6).

Holtzman (2002:6) listed areas of investigation and what information or data is necessary for subsector analysis. It is important to understand how agribusinesses react to forces such as price changes, market conditions, technology, and policy changes. He also mentioned that the structure, conduct and performance of a sector are important aspects in value chain analysis.

Holtzman (2002:9) listed ten important focus areas when an investigation of a sub-sector analysis is done. The focus areas are directly quoted as follow:

*“1) Commodity characteristic, 2) Consumption patterns, 3) Supply situation, 4) Price relationships and seasonality, 5) Food system participants and organization, 6) Subsector and food system operation or behaviour, 7) Marketing system infrastructure, 8) Government marketing institutions and policies, 9) International trade and commodity competitiveness, 10) Representativeness of the period under study”*

The above focus areas provide a framework to analyse a value chain. The initial phase before the Porter model diamond can be applied to do a proper value chain analysis (Porter, 1990:42). If a value chain does not represent the correct flow of activities or do not identify the correct role players, the result of the research can be misleading and meaningless. The quantification of certain parts of the value chains also plays an imperative role in the other models applied.

### **1.3.2 Determining the competitiveness with reference to the Porter model**

The methodology in determining the competitiveness of a value chain is a qualitative approach. The author employed the methodology in the past on several other value chain studies. This chapter also forms part of a project done for the Industrial Development Corporation by Burao for Food and Agricultural Policy FAP and the NAMC. The title of the project is: “Evaluating the competitiveness of the South African Broiler value chain. The project was finalised in December 2016. The author for the project conducted the research of this chapter.

The competitiveness and sustainability of a sector play an important role in the global economy. Van Berkum (2004:1) defines competitiveness as complicated and abstract. Competitiveness is the capability of a country to provide services and manufacture products in a sustainable way in a global market and to grow output.

Porter (1990) states that international success in an industry is determined by four broad mutually reinforcing factors creating an environment which enables firms, companies or businesses to compete against each other. The four factors include factor conditions, demand conditions, related and supporting industries, and firm structure, strategy and rivalry. These determinants are also influenced by the nation’s government and through chance events, as discussed by Porter’s (1990) competitiveness theory named the ‘diamond’ model.

According to Porter (1990), competitiveness at national level depends on:

- Product quality and features (determine prices),
- Efficiency with which products are produced,
- Capacity to compete in sophisticated industries,
- The upgrading of the competitive position,
- Move from competing on price and quality to higher margin levels,
- Productivity leads to high wages, low inflation,

The only meaningful concept of competitiveness for Porter (1990:67) at national level, is productivity. According to him, a country's goal is to be more productive. Countries cannot compete on comparative advantage factors only. That a country has good production factors, does not make it competitive anymore and this is mainly due to technology. Technology allows industries to operate in a more sophisticated way, and create new alternatives. Productivity is the basis for national per capita income, and in addition to that, provides the basis for the national standard of living. A high standard of living should be the goal of every nation (Joseph, 2014). Therefore, the standard of living depends on the productivity of the industries in a nation and its need for sustainable growth.

Porter (1990:71) explained the underlying basis of competitive advantage lies within four factors that will enhance or constrain competitive advantage. Individually, or together as a system, these determinants create the context in which companies or businesses in a country can compete. These factors or determinants are referred to as the "diamond," and country is most likely to succeed in industries or industry segments where the national "diamond" as a system is the most favourable. Figure 1.1 below is an illustration of the diamond. The effect of the one determinant depends on the state of the others, indicating that the "diamond" is a mutually reinforcing system (Porter, 1990:71).

The "diamond" model comprises of these four factors (Porter, 1990:121):

- “ ● **Factor conditions.** *Factor conditions are the input market. The ability of a nation to use the existing resources to compete. The resources can be referred to as labour, capital, intermediate goods or resources and physical and institutional infrastructure.*
- **Demand conditions.** *The demand conditions can be referred to as the local demand for the products or services produced and the nature of the environment.*
- **Related and supporting industries.** *The presence or absence to supply intermediate service or products in the system. For example maize, soybean meal and Day-old Chicks (DoC) must come from to produce a broiler. The competitive of the broiler industry is dependant on the competitiveness of these industries.*



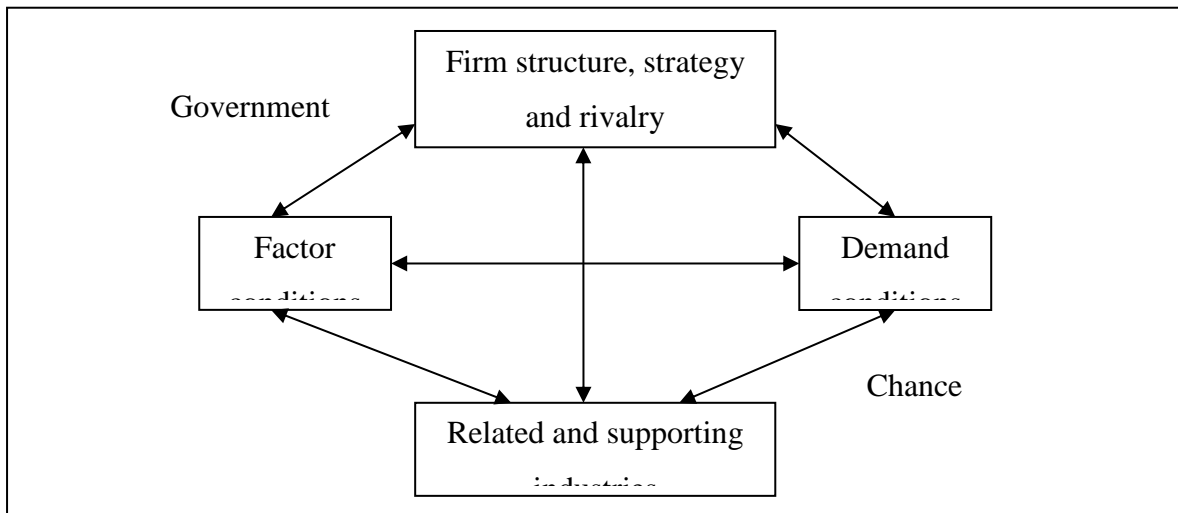
- **Firm strategy, structure, and rivalry.** Policies, laws, by-laws and institutional infrastructure, determine how a business operates, organise and compete in the market space.

Two important additional variables also influence a business environment  
These two variables are the effect and role of government.

- **Change.** A business or a country does not have control over change. Change is created by a need or demand in the market as the environment change. Change is normally created by an event outside the control of a country, such as breakthroughs in basic technologies, wars, external political developments, changes in climate and a shift in global demands (Porter 1990:124).

- **Government.** The role of government is underpinned by policies employed and acts to govern a country's system. The effect of policy determines how a business operates and has an influence on all four-primary determinants. The government need to understand the impact of policies. Policies implemented without consideration of how it will impact or influence the entire system of determinants are as likely to undermine national advantage as enhance it (Porter, 1990: 127).”

- 



**Figure 1.1: Determinants of national competitive advantage (Porter diamond)**

Source: Porter (1990:127)

Although the Porter diamond is a well-known model and provides a clear understanding of endogenous and exogenous factors affecting the value chain of industry, it does not indicate if

an industry has a comparative advantage or not. It also does not indicate what the impact is of a policy on an industry nor what the social and social-economic impact is. Therefore the Policy Analysis Matrix (PAM) of Monke and Pearson were used to determine the effect of policy and if the industry has a comparative advantage or not.

### **1.3.3 The effect of policy and comparative advantage**

Monke and Pearson have shown over several years that the Policy Analysis Matrix is applicable and reliable methodology to determine the impact of policy and to determine the comparative advantage of an industry.

The methodology of the PAM and the calculation of the DRC are well known and used in several other value chain studies conducted by the author while employed by the NAMC.

A PAM measures the effect of policy on an agricultural industry. It can be constructed for each selected agricultural system namely: farming, farm to processors marketing, processing, and processor-to-wholesaler marketing (Monke and Pearson 1989:16). This research only focused on the primary side of the broiler industry.

The DRC is an indication whether a country has a comparative advantage or not (Monke and Pearson 1989:16). Policies made by the government have a huge influence on how resources are allocated and how an economy grows or stagnates. The rationales for governmental intervention are based on:

- Government's belief that intervention can accelerate the rate of economic growth.
- The correction of market failures, representing the second rationale for government intervention in the agricultural sector.

The regulation of prices by ways of tariffs, taxes and subsidies can have an enhancing or constrain effect on the bottom-line of business (Monke and Pearson, 1989:7). Porter (1990:12) also mention that the policy can have an influence on the comparative advantage at factor cost levels if government change labour laws, export subsidies, depreciation allowances, devaluation strategies at sectors.

**Price stabilisation** is another reason for intervention in an agriculture system. Agricultural products are mostly associated with food security. Changes in weather conditions can have an influence on the production of these goods. This can cause market prices to fluctuate

substantially from one production cycle to the next. The potential income fluctuations for poor producers and high food prices, especially for poor consumers are often unacceptable to policy-makers. To mitigate the risk of volatility in the domestic markets, prices must stay stable, and many governments establish a set of policies, choosing among international trade controls, storage schemes, price-fixing and rationing. Market failure is also partially responsible for interventions (Monke & Pearson, 1989:7).

**Food security and self-reliance of staple food supplies** are commonly held objectives for policies in the agricultural environment as mentioned above. Countries with a negative trade balance on food use intervention to try and stimulate local production. This intervention pertains initiatives such as support prices systems on agricultural products produced, subsidies on input products, investment or subsidies on the purchase of machinery. Preferential tax schemes for producers. Marketing activities or quantitative restrictions on the production of alternative crops. The trade-offs between the non-efficiency and efficiency of these initiatives are sometimes very uncertain objectives (Monke & Pearson, 1989:12).

There are mainly three classifications of policies:

- **Commodity Policy**

Agricultural policy is associated with the set of commodity-specific actions that cause local prices of agricultural products to differ from world prices. A primary message of the PAM approach is that policy-makers could make more effective policies if they directly considered macroeconomic prices, exchange rates and factor prices (interest, wages, and land rental rates) in their agricultural decisions. Monke and Pearson (1989:15) mentioned that governments could use instruments to influence product prices. The tangible economic objectives for the agricultural sector of most governments, especially those of developing countries, are to:

- promote economic efficiency (and hence higher incomes);
- distribute incomes;
- provide food price stability;
- ensure the security of food supplies;
- create conditions of adequate nutritional status for all; and
- contribute to fiscal balance in the public sector.

Monke and Pearson (1989:39) write that the effects of commodity policies can be analysed by measurement of their influences on each of these objectives.

- **Factor policy**

Factor policies influence the prices of labour, capital, and land. The impact of a factor policy can be much higher than a commodity policy because it happens not to a single initiative but covers the spectrum of factors at once. It is also important to note that technology prices and factor endowments change all time. Therefore these policies have an influence on growth (Porter 1990:59)

- **Macroeconomic policy**

A country's wellbeing, wealth and sustainability hinges on macroeconomic policies which include monetary, fiscal policy that influences budgetary issues and has an impact on the agricultural system of a country. Governments typically extract a greater amount of tax revenue from agriculture than what they spend on agricultural subsidies or investments. This bias against agriculture in budgetary allocations is complemented with a pervasive tax on farmers, levied, sometimes unintentionally, through the exchange rate by skewed macroeconomic management (Porter 1990:74).

### **The role of Quantitative Policy Analysis**

Porter (1990:12) explained that the approach around the PAM is developed on a clear analytical framework. The method contains several empirical formulations, an assumption based on theory. The PAM is composed of two sets of identities. The one defining profitability and the other defining social values or economic values.

A PAM also allows a researcher to determine if an industry has a comparative advantage via means of a DRC A DRC smaller than 1 ( $\leq 1$ ) indicates that the economy saves foreign exchange from local production because the opportunity cost of its domestic resources is less than the net foreign exchange it gains. A DRC of 0.54 ( $\leq 1$ ) also indicates the international competitiveness (Tsakok, 1990:106) of the local industry. Jooste and Van Zyl (1999:31) argue that a DRC smaller than 1 ( $\leq 1$ ) and greater than 0 ( $0 >$ ) indicates a comparative advantage. Minimising the DRC is equivalent to maximising social profit (Monke & Pearson, 1989:18).

A lot can be learned from the PAM, but one of the shortcomings is that it does not explain other socio-economic impacts such as the effect of government budget, employment and the effect on other sectors. Therefore, two models have been applied in the research namely the SAFRIM model and the GTAP CGE model.

### **1.3.4 Determining the economic and socio-economic impact of the industry**

To determine the economic and socio-economic impact of the industry, two models were used, namely: Inter-Industry Forecasting Model and a single country CGE model in Global Trade Analysis Project database.

#### **1.3.4.1. Determining the socio-economic impact by developing an Inter-Industry Forecasting model**

The INFORM Model were used as part as research done for the Industrial Development Corporation namely “Evaluating the competitiveness of the South African Broiler value chain. The project was finalised in December 2016. The results and analysis were presented at 2<sup>nd</sup> Inforum World Conference in Washington in September 2014 by the author. The paper also formed part of the conference journal.

Most Inter-Industry-Macroeconomic (IM) models combine an input–output structure with econometric equations in a dynamic and detailed framework. Werling (2007:1) explains this as follows:

*“... that Inforum explores economic phenomena and principles in a nonpartisan fashion, according to generally accepted economic theory and econometric methods, regardless of the implications for public policy or private strategy. Inforum stands for the Interindustry Forecasting at the University of Maryland and is a registered trademark of Inter-Industry Research Foundation (IERF)”.*

In the Inforum Model (IM), inputs such as total capital investment, total imports and total profit are used. Income is not directly projected but is calculated from a weighted average sum of investment at the production level of imports of commodities and profits in the specific industry. This is a “bottom-up” approach. The approach provides several features for the

analysis of the economy. For example, it can measure industry-specific changes in the government and the institution environment, the impact of changes in related sectors, and the economy can be identified. At the same time, the impact of macroeconomic events, such as exchange rate fluctuations or fiscal policy, can be traced back to the sectoral level. The model provides results for income and production at the sectoral level and looks at the consumption and demand from the government, capital investment and profit, employment and wages, imports and exports (Werling, 2007:1).

The SAFRIM model explains what the impact is on the industry in terms of capital and operation expenditure as well as the effect on government and households. It also emphasises the effect on labour in the different sectors. The CGE GTAP model explains the impact on household demand, the demand of imports and the effect on other industries, which is not covered by the SAFRIM model.

#### **1.3.4.2. Determining the economic impact by developing a single-country model for South Africa and analyse in terms of the Global Trade Analysis Project (GTAP) and GEM Pack software.**

This research also formed part of a project finalised in December 2016 done for the Industrial Development Corporation (IDC) The research was done by the NAMC and BFAP. The name of the final report is: “Evaluating the competitiveness of the South African Broiler value chain. The author of the project conducted the research in this chapter.

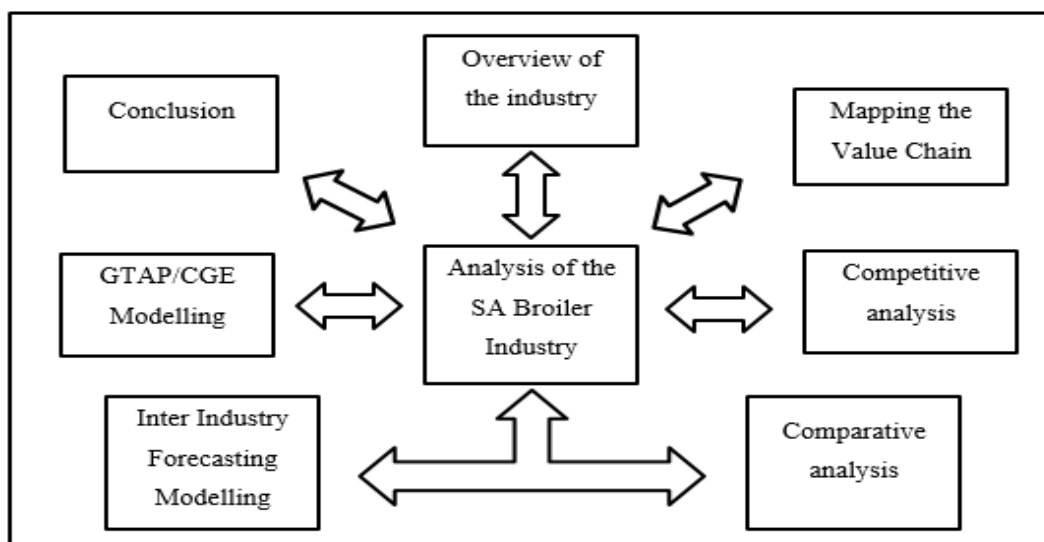
Computable General Equilibrium (CGE) models are widely used by governmental organisations and academic institutions to analyse economic events, such as climate change and tax policies, and to perform immigration CGE analysis. CGE models are comprehensive because they describe all parts of the economy simultaneously and how these parts interact with each other. The models describe the efficiency-maximising behaviour of firms and utility-maximising behaviour of consumers. Their decisions add up to the macroeconomic behaviour of an economy, such as changes in tax revenues for the government, the gross domestic product (GDP), and spending, aggregate savings and investment, and balance of trade. The GTAP CGE is an “economy-wide” model because it describes the motivations of all producers and consumers in an economy and the link among them. It depicts a business or a firm that respond to demand by purchasing inputs and hiring workers and capital equipment. The income

generated from sales of firms' output ultimately accrues to households, who spend it on goods and service, taxes and savings. Investment from the government comes from tax revenues. Firms meet the combined demand by private households, government and investors, thus completing the circular flow of income and spending. A CGE model also includes all sources of demand for all goods and services within the economy (Burfisher, 2011:3)

The result of the model described above provides a lot of answers in terms of the research objectives, which link up to the primary objective of the research. The following section aims to provide a simplistic framework of describing how the research and models fit into each other.

#### 1.4 Conceptual Research Framework of South African broiler industry study

The research framework is developed to underline the holistic approach set out in the primary and secondary objectives. Although some of the analysis can be seen as stand alone, it all forms part of the bigger holistic approach to understand the industry. It is therefore important to see every model application as a linkage towards the holistic research objective. The conceptual framework provides a simplistic and holistic illustration of the path followed to analyse the industry. Research can take a multi-dimensional approach to analyse a value chain. Figure 1.2 provides a conceptual framework of the approach and the analysis.



**Figure 1.2: Conceptual research framework**  
Own compilation (2016)

Comprehensive value chain analysis is necessary to capture the dynamics of drivers impacting on a value chain. It stays and is important to understand the relationship and drivers of

stakeholders in a value chain, who act on supply and demand functions in a marketing channel. The broad definitions, as asserted by (Spies, 2011:26), are as follow:

*“The supply chain originates at the enterprise and includes all the activities required to create store, and deliver a product from the raw materials to the end user (Booz et al., 2001:np). The value chain is the result of the interaction between the supply chain and the demand chain. It is the sequence of all the activities needed to envision, create, engineer, produce, distribute, market and sell an aggregated set of related products or services. The end-consumer experience the end results of the product or service, which is created or manufactured in portions or part from each step in the chain, although not all the steps create the same value or deliver the same profit potential. The goal of the value chain is to create a system that can accurately forecast and quickly satisfy consumer demand with the least inventory and the most efficient transportation modes possible so as to increase profitability and sustainability in an environment characterised by the delivery of information in a transparent, accurate and timely manner.”*

## **1.5 Data and information collection**

Data was collected from various sources:

- A literature review:
- The literature review was compiled primarily from the following data sources:
  - Internet
  - UFS Library and others
  - South African Poultry Association (SAPA)
  - National Agricultural Marketing Council
  - Financial institutions
  - Department of Trade and Industry
  - Department of Agricultural Fisheries and Forestry.
- A mapping of the value chain of the South African broiler chain from secondary data in the form of personal interviews.



- Stakeholder interviews.
  - Quantify the value chain of the South African broiler chain.
  - Trade and production data collected from SAPA.
  - Trade data from International Trade Commission (ITC).
  - Price data from Statistics South Africa (StatsSA).
  - Statistics and production data from DAFF.
  - Trade & price data from South African Revenue Services (SARS)
- Competitive analysis of the South African broiler industry
    - Stakeholder liaison and interviews.
    - Questionnaire through Survey Monkey.
  - Policy Analysis Matrix on the South African broiler industry.
    - Stakeholder liaison.
    - Producers.
  - Input-output analysis and SAFRIM model on the broiler chain.
    - Conningarth Consultants.
    - General Algebraic System.

## 1.6 Limitations

The limitations of the study are:

- Response rate of questionnaires

The industry is well organised. The questionnaire was distributed via electronic format, and was available via web base (Survey Monkey). Responses were also received via facsimile.

- Bias data

Producer and processor groups were used to obtain qualitative data. This could lead to instances of bias data as participants might see this as an opportunity to change their current scenarios. These participants may indicate challenges that are unreal. This was countered by the researcher by consultations with experts within the industry.

- Time constraints

The research faced time constraints due to a lack of interest from respondents. To manage this constraint, the researcher set up a timeline and maintained it. Some of the secondary data were sourced from processing companies and importers, through personal interviews.

### **1.7 Research ethics and confidentiality**

Written support for the research was obtained from the industry organisations. Participation was voluntary, the benefits and purpose of the study were explained in a formal letter. To protect the confidentiality and personal information of the participants, no direct information from the questionnaire, interview, and notes were made available. Completed questionnaires and interviews did not include any personal information that might be of harm to the respondent.

The researcher been part of several research teams in value chain analysis in the past. The research was done for institutions such as the Industrial Development Corporation (IDC), Department of Trade and Industry (DTI), Agricultural Research Council (ARC), South African Sugar Association (SASA) and the National Agricultural Marketing Council (NAMC) namely:

- Potato study: Competitive analysis of the Potato Industry in South Africa (2010)
- Soybean study: The South African Soybean Value Chain (2011).
- Lachenalia study: Impact Assessment report: towards commercialization of Lachenalia (2011)
- Sugar Study: Comparative analysis of the different regions of the South African sugarcane industry (2013)
- Tomato study: The South African Tomato Value Chain (2012).

To comply with plagiarism legislation, the information used these reports will referenced accordingly in this manuscript, although this is still the authors work.

### **1.8 Outline of the study**

**Chapter 1** outlines the research objective. **Chapter 2** provides an industry overview, while **Chapter 3** quantifies the value chain of the broiler industry. The chapter outlines information on previous value chain studies and describes the comprehensive value chains regarding industry role players and the institutional arrangement in the chain. The chapter calculates per

capita consumption from various angles and looks at price and production trends. **Chapter 4** provides the competitive analysis of the industry, using Porter model theory. The Porter Diamond was applied to determine the constraining and enhancing factors on the macro-, meso-, and micro-level. **Chapter 5** determines the effect of policy on the broiler industry regarding a PAM and addresses issues such as comparative advantage, net protection coefficients and subsidy ratios to producers. **Chapter 6** focuses on the Inter-Industry Forecasting model and a Macro Economic Impact if tariffs are removed. The chapter was presented at the INFORUM conference in 2014 in Washington and forms part of the conference publication. **Chapter 7** provides information on the single country CGE model. **Chapter 8** focuses on recommendations and concludes the research findings.

## **CHAPTER 2 :**

### **OVERVIEW OF THE INTERNATIONAL AND SOUTH AFRICAN BROILER INDUSTRY**

#### **2.1 Introduction**

It is important to provide a comprehensive overview of the industry to get an understanding of the magnitude of the industry and how it operates.

The value of production for fowl slaughters for the 2013/14 season was R32, 881 billion and for the 2014/15 season R37, 225 billion. It represents 15,8 % and 16,5 %, respectively of the total value of production for the South Africa agricultural sector (DAFF, 2016). The Department of Agriculture, Forestry, and Fisheries (DAFF) reported the value of the industry in 2001/02 at R9, 2 billion, which represents 13.5 % of the total value of production of the agricultural sector (DAFF, 2015:69). The above indicates the growth over the past 12 and 13 years.

The industry produced  $\pm$  962 million broilers in 2014 and  $\pm$  1003 million broilers in 2015 (SAPA, 2016). The consumption of broiler meat has two dimensions, one without brining and one with brining. Products can also be classified into fresh, frozen and IQF meat. South Africa consumed 42.55 kg per person per year of poultry meat (brining included) and 36.15 kg of poultry meat (brining excluded) (SAPA, 2013:47). The Department of Agricultural Forestry and Fisheries (2015:69) reported per capita consumption on 16,11 kg in the 1993/94 season and 38,5 kg in the 2013/14 season. This constitutes a growth of 140 % over the past 20 years. The Bureau for Food and Agricultural Policy has estimated consumption to increase by 38 % from 2014 to 2024 (BFAP, 2015:74). Lovell (2014:12) is also of the opinion that chicken meat remains an affordable protein, against pork and beef.

From a balance sheet approach regarding the supply and demand, South Africa consumed (demand) 2 127 389 tonnes in 2015 (SAPA, 2016a:1). The supply consists of local production by commercial and subsistence farmers and imports. In 2015, commercial farmers produced 1 720 155 tonnes, importers/retailers/wholesalers imported 457 374 tonnes, subsistence producers produced 69 334 tonnes, live sales from depleted stock comprised 71 885 tonnes,

and exports constituted 65 815 tonnes. (SAPA: 2016a:5). SAPA does not report any beginning or ending stock.

The trade in broiler meat, especially certain cuts and mechanically deboned meat (MDM), is a very vibrant and active market. Total imports in 2014 reported by SARS in 2015 constituted  $\pm$  368 000 tonnes, and exports were reported at 68 800 tonnes by the International Trade Commission (ITC: 2016), in 2014.

In 2011, the industry employed  $\pm$  14 500 employees at the primary agricultural level, 27 600 at the secondary level, and  $\pm$  60 000 at the distribution level (SAPA: 2015c).

Feed is one of the major cost components in the production of broilers across the world. Deselt (2009: 1274) indicates that yellow maize or corn comprises between 60 % to 70 % and soybean meal  $\pm$  25 % of feed, with other ingredients and nutrients making up the rest, depending on the feed ration. If white maize prices in South Africa trade below yellow maize prices, white maize is used as a substitute for yellow maize in the manufacturing process. The broiler industry is highly dependent on industries such as maize and soybeans and the price forming thereof. The broiler industry is also one of the biggest users of feed AFMA (2015a: 53).

South Africa is not self-sufficient in the production of soybean meal and needs to import the deficit for its poultry feed industry. Both these intermediate products are priced on the global market. This renders the industry vulnerable to negative changes in the exchange rate.

The other biggest component contributing towards the cost of production is the cost of day-old chicks. South Africa does not produce its own grand-grandparent material. The fact that the genetic material (grand-grandparent material) needs to be imported at a premium is a constraining factor for the industry, which increases the sensitivity towards exchange rate dynamics (Schutte: 2015).

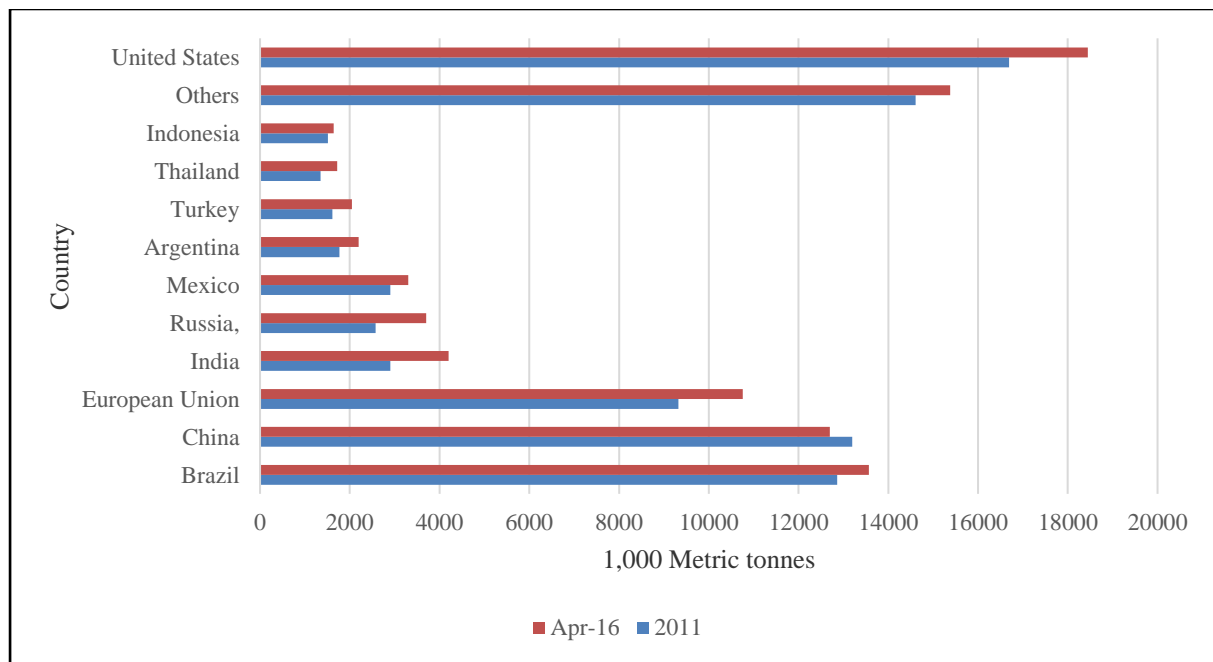
## **2.2 The International Broiler Market**

The poultry industry of the USA is the largest with regards to production. The USA is the second largest exporter of poultry meat in the world, according to the Economic Research Services (ERS) of the United States Department of Agriculture (USDA) (2016).

South Africa is a small player in the world market, contributing approximately 1.75 % to world production while accounting for only 2.1 % of global consumption in 2011 (USDA: 2014:22). It is essential to understand the functioning of the South African broiler market within the global context. As a net importer of chicken, changes in the international broiler market will influence the South African broiler industry (De Beer: 2009) and a brief review of the international broiler market is necessary for understanding the South African broiler market that follows.

### 2.2.1 International production

The USA, China, Brazil and the EU are the four largest producers in the world and produced  $\pm 60\%$  of the world’s broiler meat in 2013. Figure 2.1 below illustrates broiler production in tonnes (‘000) for 14 countries across the globe. These 14 countries represented more than 86 % of world production (see Figure 2.1 for illustration).



**Figure 2.1: World poultry meat production in 2013**

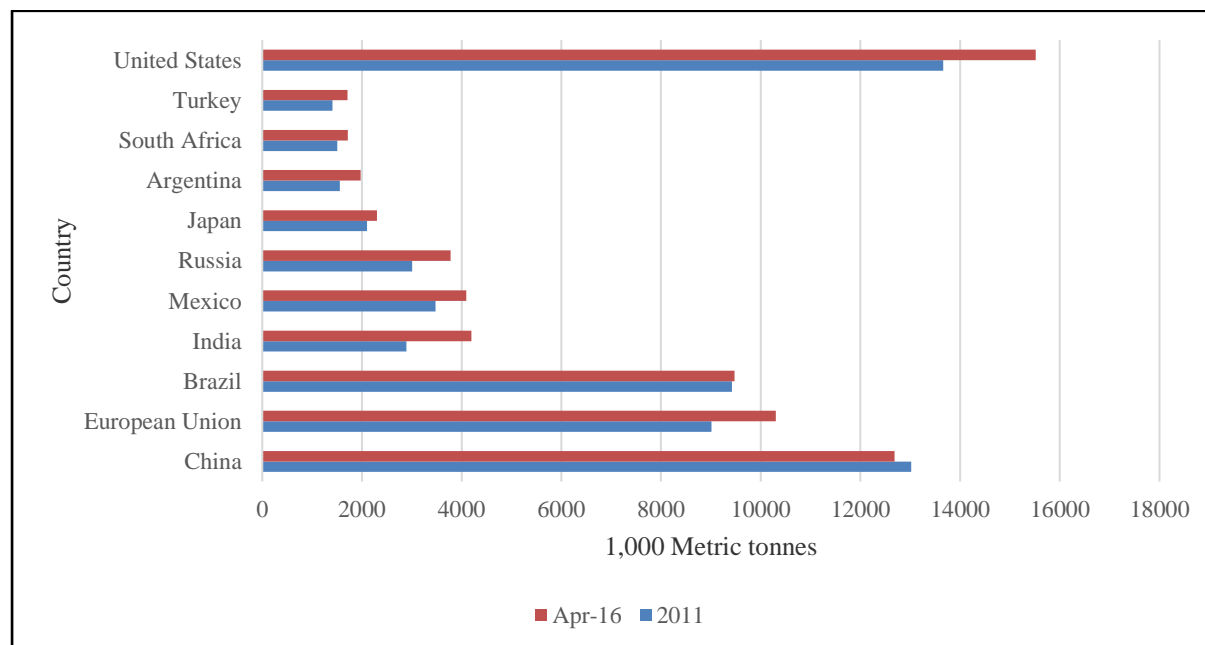
Source: USDA FAS (2016)

Total world production was reported by FAS (2016) at 89.655 million tonnes in 2016. This quantity increased from 81.313 million tonnes in 2011. The USA is the world’s biggest producer, with a 20.57 % share, followed by Brazil with 15.13 % and China with 14.17 % shares.

## 2.2.2 International Consumption

### 2.2.2.1. Total world consumption

Figure 2.2 below illustrates total consumption of poultry meat by country for the top 15 biggest consumers of poultry meat.



**Figure 2.2: World poultry meat consumption in 2013**

Source: USDA FAS (2016)

The USA is the biggest consumer of poultry meat with a 17.7 % share, followed by China with a 14.46 % share and the EU with an 11.75 % share. Brazil consumes 10.81 % of the total world production, while South Africa consumes 1.96 % of world production.

Brazil, the USA, and EU are the countries producing surpluses, whilst Mexico, South Africa and Russia experience shortages in their systems.

### 2.2.2.2. The World per capita consumption of various animal proteins

The OECD (2016) estimated the average per capita consumption of poultry meat for the world at 13.15 kg. North America uses the most poultry meat, at 42.96 kg per capita, with Brazil second at 39.30 kg per capita, followed by the EU at 21.31k g per capita, Latin America and the Caribbean at 30.1 kg per capita, while BRICS countries consume 10.32 kg per capita, Asia and Pacific 25.74 kg per capita, with Africa at 4.05 kg per capita. Table 2.1 below provides information regarding the per capita consumption regarding beef, sheep, pork and poultry.

**Table 2.1: Average per capita consumption/year for selected animal protein for 2012 to 2014**

Country	Beef	Sheep (kg)	Pork (kg)	Poultry (kg)	Total (kg)
North America	24,59	0,43	20,47	42,96	88,45
Brazil	26,31	0,41	11,60	39,30	77,62
European Union	10,50	1,87	31,02	21,31	64,70
Latin America and Caribbean	17,41	0,56	9,30	30,10	57,37
BRICS	4,42	1,65	16,11	10,33	32,50
Asia and Pacific	2,86	1,72	12,74	8,41	25,74
Africa	3,87	2,32	0,98	4,05	11,22
World	6,52	1,70	12,49	13,16	33,86

Source: OECD-FAO (2015) & own calculations.

### 2.2.2.3. Outlook on consumption

Table 2.2 below illustrates the OECD-FAO's (2015:np) outlook for the per capita consumption of animal proteins for selected regions. On estimation, North America will stay the highest consumer of animal protein. The EU will stay the highest consumer of pork, and Africa of Mutton.

**Table 2.2: Outlook – Average per capita consumption/year in kg for selected animal protein for 2024**

Country	Beef (kg)	Sheep (kg)	Pork (kg)	Poultry (kg)	Total (kg)
North America	23,11	0,36	20,37	47,80	91,64
Brazil	27,12	0,38	13,51	42,33	83,34
European Union	9,657	1,81	30,36	23,14	64,95
Latin America and Caribbean	17,56	0,55	10,66	32,77	61,54
BRICS	4,62	1,94	16,85	11,95	35,36
Asia and Pacific	3,28	2,01	13,21	10,06	28,56
Africa	3,69	2,30	1,17	4,57	11,73
World	6,54	1,88	12,49	14,60	35, 51

Source: OECD-FAO (2015) & own calculations.

Negative growth in beef consumption in kg can be expected from the EU and North America. Total world consumption of animal proteins is estimated at 35.5 kg per capita, which is an increase of 8.79 %, as illustrated in Table 2.3 below.



**Table 2.3: Calculated growth in percentage (%) on outlook and current consumption of selected animal protein sources in kg.**

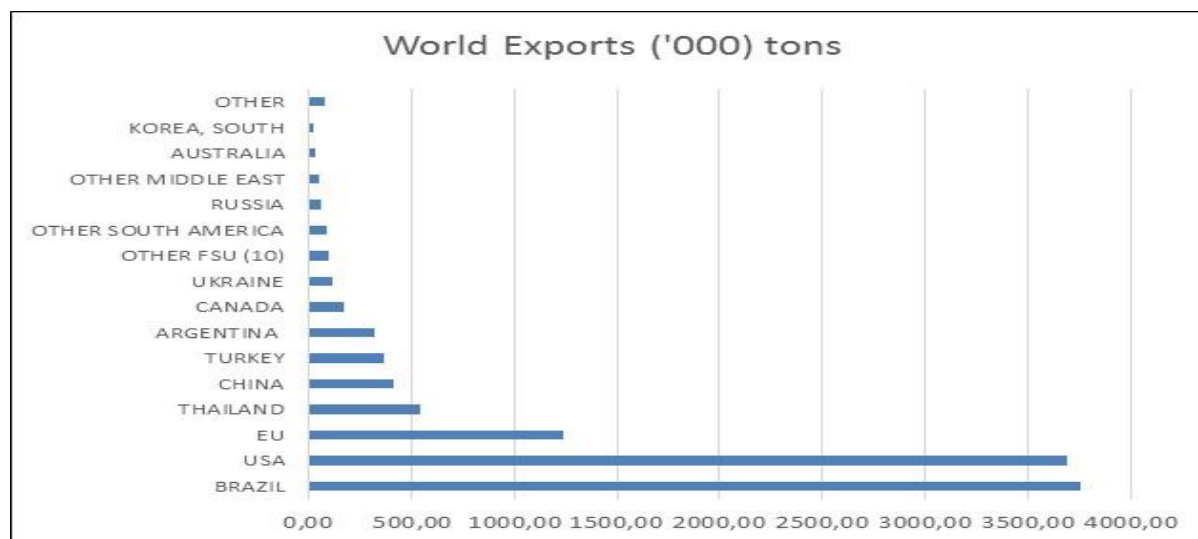
Growth	Beef (%)	Sheep (%)	Pork (%)	Poultry (%)	Total (%)
North America	-6,04	-14,65	-0,51	11,26	3,60
Brazil	3,08	-7,18	16,44	7,71	7,37
European Union	-8,15	-3,18	-2,12	8,58	0,40
Latin America and Caribbean	0,88	-1,66	14,55	8,89	7,27
BRICS	4,46	18,19	4,60	15,68	8,79
Asia and Pacific	14,84	16,48	3,64	19,58	10,96
Africa	-4,67	-0,79	19,46	12,62	4,48
World	0,33	10,22	0,02	10,99	4,85

Source: OECD-FAO (2015)

## 2.2.3 International trade

### 2.2.3.1. Exporting countries of poultry meat

World exports comprised 11 million tonnes in 2013. Figure 2.3 below illustrates exports per country in 2013.



**Figure 2.3: World Poultry exports per country in tonnes ('000) in 2013**

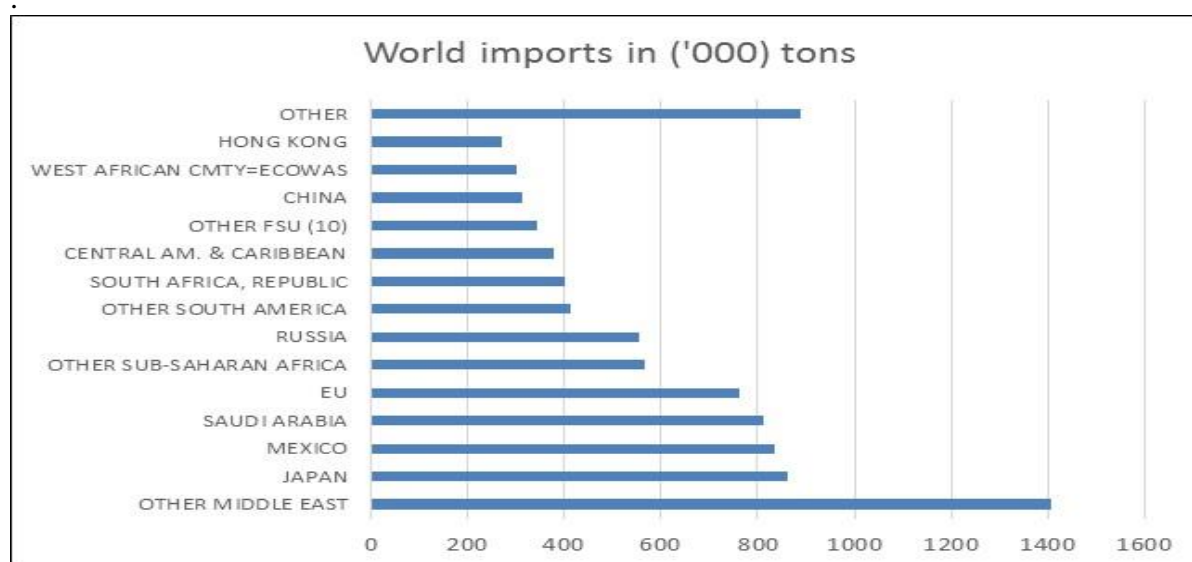
Source: USDA ERS (2016)

The world's biggest exporter of poultry meat is Brazil, at 3,756 million tonnes representing 34 % of the world's exports. The USA exported 3,692 million tonnes, or 33.37 %, of world exports. The EU exported 1,235 million tonnes, representing 11.16 % of world trade, while

Thailand exported 540 000 tonnes and China 416 000 tonnes. The 15 countries shown in Figure 2.3 represent 99.24 % of world exports.

### 2.2.3.2. Importing countries of poultry meat.

Total poultry meat imports across the world comprised of 11 million tonnes in 2013. Figure 2.4 below illustrates world imports in 2013.



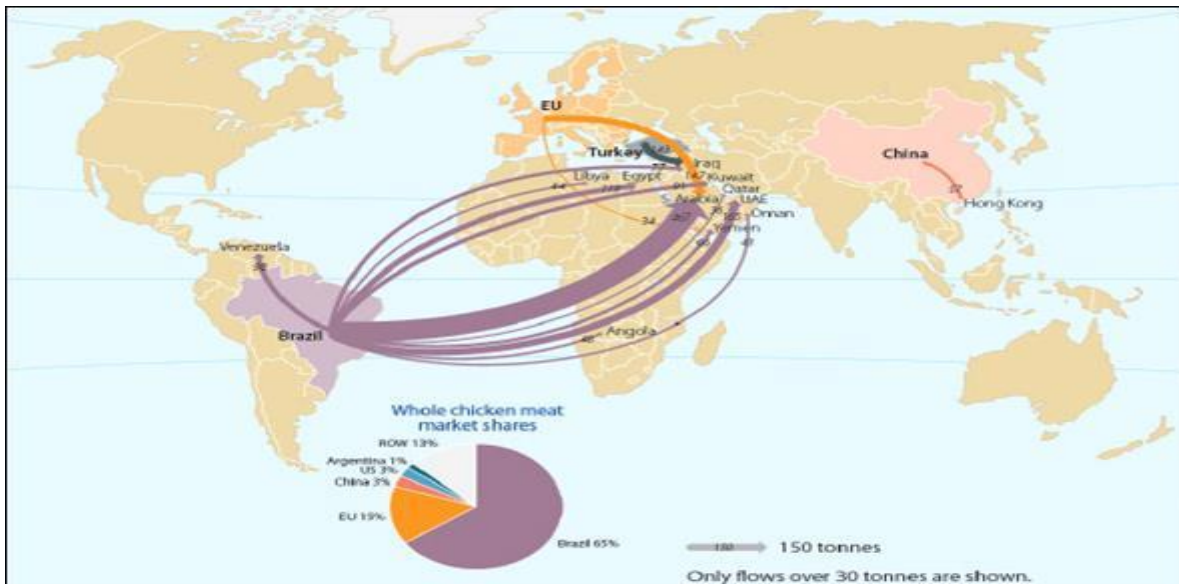
**Figure 2.4: World poultry imports meat production in 2013**

Source: USDA ERS (2016)

The world’s biggest importers are other Middle Eastern countries, Japan, Mexico and Saudi Arabia, with these four regions importing close to 4 million tonnes of poultry meat, or 43 %, of world imports. The EU also imports a considerable quantity of poultry meat, namely 760 000 tonnes, standing fifth, and representing 8.35 % of world imports.

### 2.2.4 Poultry meat trade in perspective

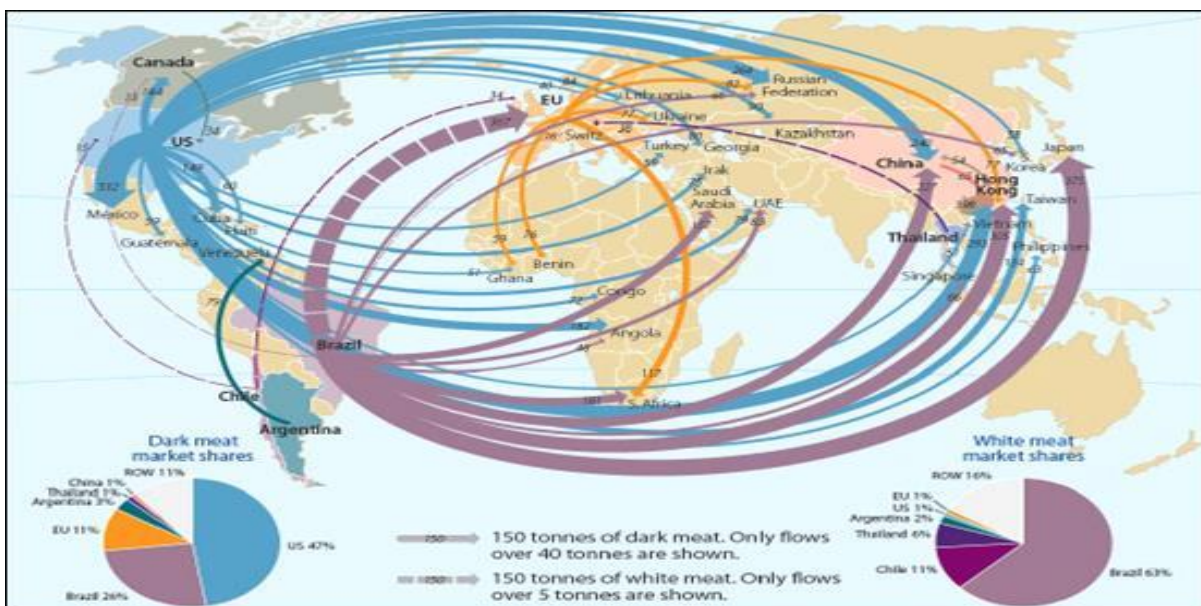
Rabobank (2014a) reports that the world chicken trade comprised USD \$17.9 billion in 2013. Rabobank also explains how this trade takes place in the world. It is interesting to note that Brazil is the most prominent international player in whole bird meat trade (65 %), with the EU (15 %), China (3 %) and both the USA and Argentina exporting ±1 % each. Figure 2.5 below indicates the trade of whole bird meat.



**Figure 2.5: International trade of whole chicken**

Source: Food and Agriculture Organization of the United Nations, local statistics, UN Comtrade (2014) cited in Rabobank (2014a).

World trade is divided into four main categories, namely whole bird (US\$3.6 billion), dark meat (US\$9 billion), white meat (US\$2.3 billion), and processed chicken (US\$3 billion). The Rabobank World Poultry Map (2014a) illustrates international trade of white and dark meat, as indicated in Figure 2.6 below.



**Figure 2.6: International trade of white and dark chicken meat**

Source: Food and Agriculture Organization of the United Nations, local statistics, UN Comtrade (2014) cited in Rabobank (2014a)

Rabobank (2014) is also of the opinion that all the categories operate under different dynamics: dark meat is often considered an excess supply with relatively low value, while processed chicken and white meat are mainly destined for high-value markets such as the EU and Japan. Table 2.4 below illustrates the market share of the trade of dark meat and white meat:

**Table 2.4: Market share of whole bird, dark and white meat trade in value (USD\$)**

Region/Country	Whole bird (%)	Dark meat (%)	White meat (%)
USA	3	47	1
Brazil	65	26	63
Chile	-	-	11
EU	15	11	1
Argentina	1	3	2
Thailand	-	1	6
China	3	1	-
ROW	13	11	16

Source: Food and Agriculture Organization of the United Nations, local statistics, UN Comtrade (2014) cited in Rabobank (2014).

Brazil has a market share of 65 % of whole bird trade, followed by the EU with a market share of 15 %. The USA is the biggest trader of dark meat, representing a market share of 47 %, followed by Brazil with 26 % and the EU with 11 %. Brazil has the biggest trade of white meat, representing 63 % of the world market.

### **2.3 Southern African Development Community (SADC) overview**

The Southern African Development Community (SADC) was formally established by the SADC treaty in 1992 with the objective of achieving economic growth, alleviating poverty and enhancing living standards and quality of life within the region. These objectives are to be achieved through increased regional integration, built on democratic principles and equitable, sustainable development. The SADC Secretariat is headquartered in Gaborone, Botswana (SADC, 2014), and member states include Angola, Botswana, the Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe, as illustrated in Figure 2.7 below.



**Figure 2.7: SADC Countries**

Source : SADC (2014)

SAPA (2013b) emphasises that SADC member states seek to improve the lives of their people by removing the serious obstacle of inadequate access to food, as a healthy, well-fed population will be better equipped to build for a better future. The SADC addresses agriculture and food security issues within the region by focusing on five key areas, three of which concern the poultry sector:

- Food security: Ensuring sustainable access to safe and adequate food
- Livestock production: improving work methods, capacity building, and disease control
- Agricultural information: data collection to monitor progress.

The Food, Agriculture and Natural Resources Directorate (FANRD) of the SADC Secretariat is tasked with the co-ordination and harmonisation of agricultural policies and programmes in the SADC region, in line with priorities in the Regional Indicative Strategic Development Plan (RISDP). The overall objective of the FANRD is to develop, promote, coordinate and facilitate harmonisation of specific policies and programmes that will increase agricultural and natural resources production and productivity while promoting trade and ensuring both food security and sustainable economic development within the SADC region (SADC, 2014).

Livestock production offers the SADC region an opportunity for accelerated economic growth. Factors like low productivity, lack of efficient and effective animal disease control, lack of marketing infrastructure, poor market access for livestock products and a lack of information

hinder the region's progress in achieving its goal of being self-sufficient in livestock production. The SADC addresses the challenges in this important sector through the Livestock Unit (LU) of the FANRD, which coordinates livestock development activities throughout the region. Livestock policies and strategies are formulated by the SADC Livestock Technical Committee (LTC), Livestock Unit (LU) (SAPA, 2013b).

The livestock population in the SADC region, is estimated at 64 million cattle, 39 million sheep, 38 million goats, 7 million pigs, 1 million horses and 380 million poultry. Traditionally, these farm animals are a source of food, skins, fertiliser, traction power, medicine and other raw materials for the population of the region. About 75 % of the above livestock population is kept under traditional smallholder farming systems (SADC, 2014).

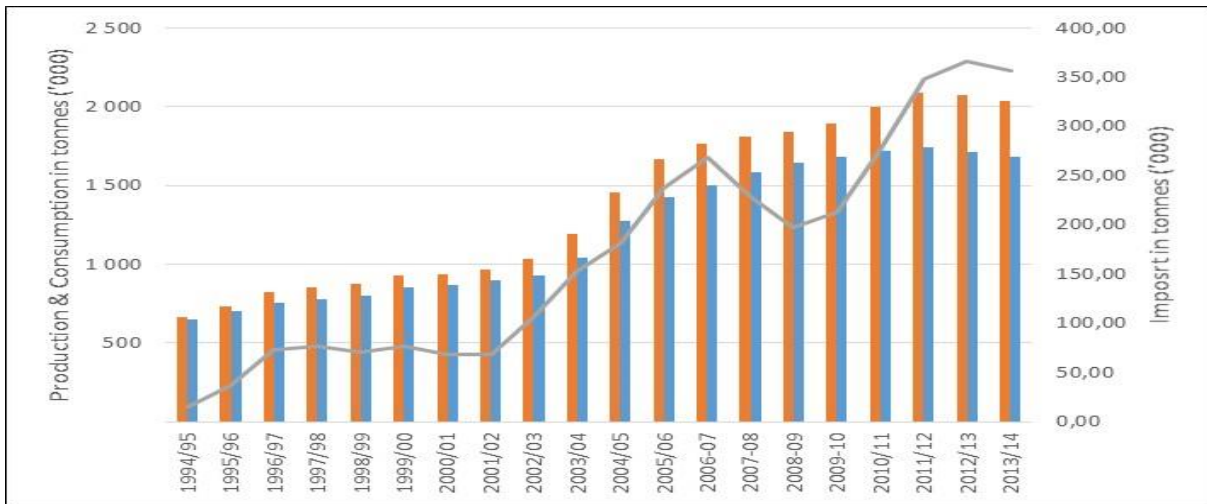
## **2.4 The South African Broiler Market**

The South African Poultry industry became organised in 1904 with a body for poultry hobbyists focusing on the needs of various poultry clubs by regulating the rules and appointment for popular poultry shows and egg laying test stages (SAPA, 2013a). Since 1904, the industry has changed as the need for a more formal enterprise emerged. In 1926, a Poultry Breeders Register was established, and ten years later, the government provided the assurance it would recognise SAPA as the official representative organisation of South Africa's poultry industry. The South African Broiler industry, regarding modern technology, is a sound business and in some instances, has some of the best businesses in the world. The association responds to meet the challenges of improved controls and comprehensive record keeping, and greater cooperation among members (SAPA, 2013).

### **2.4.1 Local market overview**

South Africa does not produce enough poultry meat for total demand. South Africa needs  $\pm$  370 000 tonnes of imports to meet its demand (SAPA, 2015c). Figure 2.8 below provides a snapshot of the South African poultry industry. Production grew by 160 % over the last 20 years. Total consumption for South Africa grew by 208 % over the same period, which constitutes a 10.4 % growth per year. Per capita consumption increased by 125 %, on average, with 6.2 % over the same period.





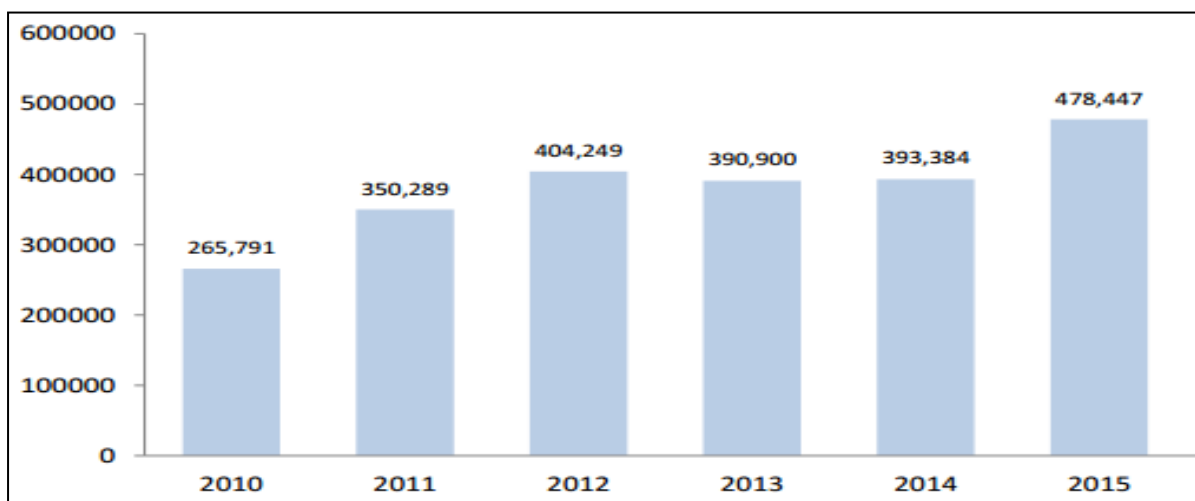
**Figure 2.8: Production, consumption & imports of broiler meat in South Africa: 1994–2014**

Source: DAFF (2015) & own compilation

It is important to note which types of products are imported into South Africa. The imports of Mechanical Deboned Meat (MDM) constituted 40 % of the total imports in 2014. It is a by-product, and South Africa does not produce MDM. MDM is used in the processed food market to make, for example, canned meat, sausages, and polonies.

### 2.4.2 South African poultry meat imports

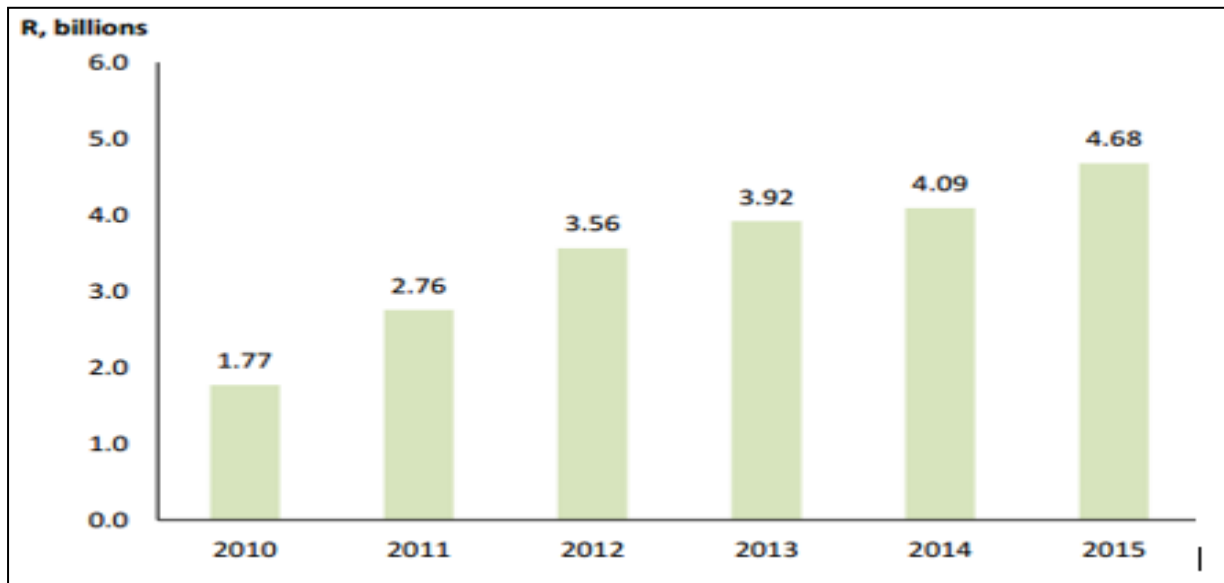
South Africa is a net importer of poultry meat. Import quantity is influenced by world supply, the exchange rate, and import duty. Import quantities increased by 81 %, (i.e. ± 265 000 tonnes, in 2010, and to 480 000 tonnes in 2015), as illustrated in Figure 2.9 below.



**Figure 2.9: Quantities imported from 2010 to 2015**

Source: SARS (2016) in SAPA (2016d)

The value of imports increased by 139 %, from R1.77 billion in 2010 to R4.6 billion in 2015, as illustrated in Figure 2.10 below. The primary reason for the the above increase can be seen as a result in higher local demand and local production that could not keep up with the pace of the demand. Further underlying factors also contributing to this phenomenon are the depreciation of the South African Exchange rate, increased global supply, and trade agreements with certain importing countries such as the EU countries.

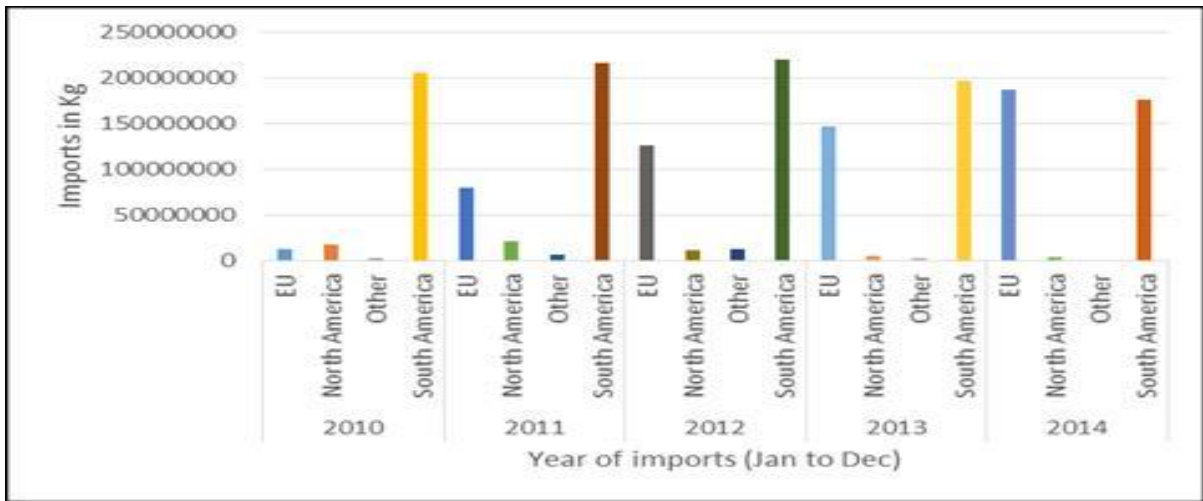


**Figure 2.10: Value of imports from 2010 to 2015**

Source: SARS (2016) in SAPA (2016d)

The import volume and quantity cannot be seen in isolation. It is also important to analyse the country of origin and which type of poultry product is imported from the different countries. Figure 2.11 below shows total imports in kg. Imports of poultry meat mainly originated from South America in 2010. This changed dramatically, and imports decreased from  $\pm 206\ 000$  tonnes in 2010 to  $\pm 165\ 000$  tonnes in 2014. The free trade agreement with the EU is the major result of the increase of imports from the EU. South Africa imported 12 800 tonnes of poultry meat in 2010, which increased by 1363 % to 188 041 tonnes in 2014. These imports are in addition to imports from Brazil.

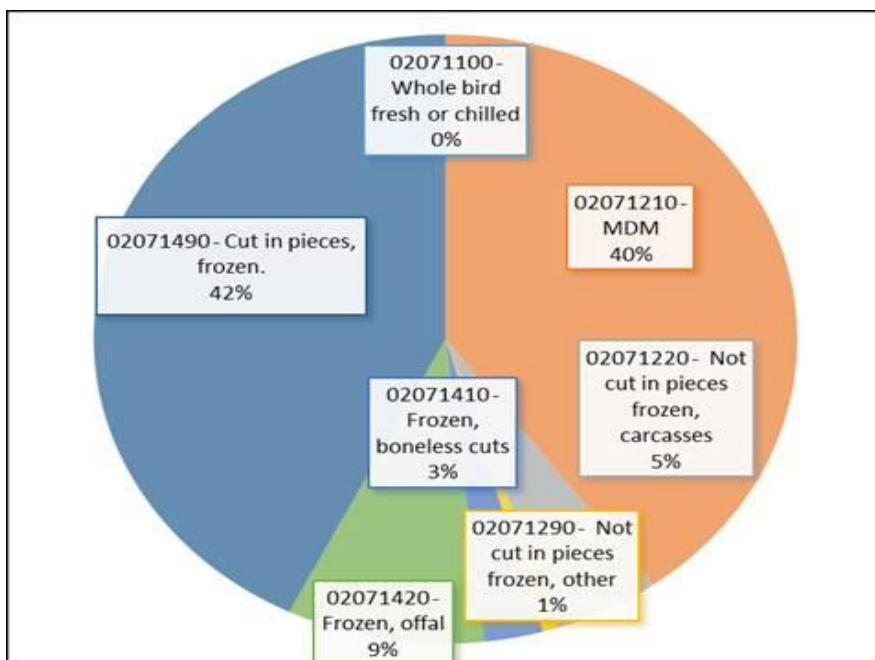




**Figure 2.11: Import growth from different countries from 2010 to 2014 (Dec to Jan)**

Source: SARS (2015) & own calculations

Figure 2.12 below illustrates the different products imported in 2014. The most imported product in 2014 was frozen pieces with HS Code 2071490. Frozen pieces made up 42.67 % of all the imports. The second highest quantity of imports was mechanically deboned meat (MDM – HS Code 2071210). MDM constituted 39.92 % of all the imports. The rest of the imports are frozen carcasses not cut in pieces (5%), offal (9%), frozen boneless cuts (3%), not cut in pieces frozen- other (1%). South Africa does not import fresh or chilled whole bird products.



**Figure 2.12: Percentage of different products imported in 2014 (Dec to Jan)**

Source: SARS (2015) & own calculations

The two major regions supplying poultry to South Africa are the EU and South America. Table 2.5 below illustrates that the two major products supplied by these regions are MDM (HS Code 02071210) and frozen pieces and frozen pieces (HS Code 02071490). Table 2.5 provides an illustration of imported quantities from South America and EU of the two major imported poultry products in tonnes.

**Table 2.5: Import quantity from SA major poultry trade partners in tonnes**

<b>South America</b>	<b>2010</b>	<b>2014</b>
02071210 – MDM	95 129	129 349
02071490 – Cut in pieces, frozen.	55 781	11 256
<b>European Union</b>	<b>2010</b>	<b>2014</b>
02071210 – MDM	5959	17387
02071490 – Cut in pieces, frozen.	4207	145491

Source: SARS (2016)

Total imports of MDM products increased by 36 %. There is no tariff on MDM products because South Africa does produce MDM. South America lost 80 % of their South African market for the export of frozen pieces. On the other side, the EU gained in imports, from 4207 tonnes in 2010 to 145 491 tonnes in 2014. Imports from the EU were duty free at the time of the research. The local industry presses hard for the imposition of safeguard and anti-dumping measures against the EU.

### 2.4.3 South Africa poultry meat exports

Although South Africa has a negative trade balance on poultry meat, some exports are realised, mostly to SADC countries as illustrated in Table 2.6 below.

**Table 2.6: Export quantities from South Africa in tonnes**

<b>Importers</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
World	65 256	88 404	66 226	55239	68 843
Lesotho	13 840	15 177	19 591	19 062	22 228
Mozambique	4 470	6 524	5 735	10 040	16 781
Namibia	29 204	32 174	26 705	12 933	12 573
Zimbabwe	10 893	3 300	3 098	3 996	6 598
Botswana	4 510	29 588	9 342	3 611	3 115
Other	2 337	1 641	1 752	5 594	7 551

Source: ITC (2016)

The biggest importers of meat from South Africa are its neighbours, Lesotho, Namibia and Zimbabwe.

Table 2.7 below provides the value of exports from South Africa to selected countries. The total value of exports constituted R1,1 billion in 2014.

**Table 2.7: Value of exports (R'000) from South Africa**

<b>Importers</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
World	946 375	904 344	819 816	803 377	1 100 410
Lesotho	224 295	237 778	273 038	286 089	366 858
Mozambique	110 049	99 827	88 518	169 145	343 342
Namibia	371 811	428 414	345 983	185 749	187 375
Botswana	64 353	72 050	63 164	62 227	53 494
Zimbabwe	140 279	40 368	20 226	32 314	51 838
Swaziland	11 697	10 944	14 018	24 295	25 930
Other	23 889	14 985	14 849	43 551	71 583

Source: ITC (2016)

#### **2.4.4 Trade regulation in the South African broiler market**

South Africa applies tariffs on certain poultry categories. It is known as the Harmonised System (HS) or eight-digit classification codes. The tariffs increased in 2013 after a successful application by industry in 2013 as illustrated in Table 2.8 below.

South Africa also uses anti-dumping tariffs for frozen bone-in portions (including leg quarters) originating from the USA to protect its industry. Anti-dumping tariffs for boneless cuts and frozen whole birds originating from Brazil were instituted provisionally for six months from February to August in 2012, while the investigation by the International Trade Administration Commission of South Africa (ITAC) was being completed (ITAC, 2012). Upon completion of the investigation by ITAC, the Department of Trade and Industry (DTI) in South Africa did not institute anti-dumping tariffs further. Import duty changes relatively over time for the different cuts. Table 2.8 below illustrates the ordinary customs duty according to the Harmonised System Code (HS).

**Table 2.8: Ordinary Customs duties for importing broiler meat to South Africa**

Heading/ subheading	CD	Article description	Rate of Duty				
			Unit	General	EU	EFTA	SADC
02.07		Meat and edible offal, of the poultry of heading 01.05, fresh, chilled or frozen:					
0207.1		Of fowls of the species GALLUS DOMESTICUS:					
0207.11	0	Not cut in pieces, fresh or chilled	kg	free	free	free	free
Heading/ subheading	CD	Article description	Rate of Duty				
			Unit	General	EU	EFTA	SADC
0207.12		Not cut in pieces, frozen:					
0207.12.10	4	Mechanically deboned meat	kg	free	free	free	free
0207.12.20	1	Carcases (excluding necks and offal) with all cuts (e.g. thighs, wings, legs, and breasts) removed	kg	31 %	free	31 %	free
0207.12.90	2	Other	kg	82 %	free	82 %	free
0207.13	3	Cuts and offal, fresh or chilled	kg	free	free	free	free
0207.14		Cuts and offal, frozen:					
0207.14.1		Boneless cuts					
0207.14.11	5	Breast	kg	12 %	free	12 %	free
0207.14.13	1	Thighs	kg	12 %	free	12 %	free
0207.14.15	8	Other	kg	12 %	free	12 %	free
0207.14.2		Offal					
0207.14.21	2	Liver	kg	30 %	free	30 %	free
0207.14.22	9	Feet	kg	30 %	free	30 %	free
0207.14.23	5	Heads	kg	30 %	free	30 %	free
0207.14.24	8	Other	kg	30 %	free	30 %	free
0207.14.9		Other					
0207.14.91	3	Whole bird cut in half	kg	37 %	free	37 %	free
0207.14.93	8	Leg quarters	kg	37 %	free	37 %	free
0207.14.95	6	Wings	kg	37 %	free	37 %	free
0207.14.96	4	Breast	kg	37 %	free	37 %	free
0207.14.97	2	Thighs	kg	37 %	free	37 %	free
0207.14.98	0	Drumsticks	kg	37 %	free	37 %	free
0207.14.99	9	Other	kg	37 %	free	37 %	free

Source: SARS (2016)

Several anti-dumping, countervailing and safeguard duties were also introduced on certain cuts of imported poultry meat. The anti-dumping duties against the United States are already for

several years in place. Recently introduced duties are applicable to certain countries in the European Union. The specific countries are Germany, Netherlands and the United Kingdom.

Table 2.9 below provides more detail regarding these duties.

**Table 2.9: Antidumping, countervailing and safeguard duties on imported broiler meat**

Item	Tariff heading	Code	Description	Imported from or originated in	Rate of Anti-dumping duty
201.02	0207.14.9	02.07	Frozen meat of fowls of the species Gallus Domesticus, cut in pieces with bone in, produced by Anhaltinische Geflügelspezialitäten GmbH, Donautal eflügelspezialitäten Zweiniederlassung der Lohman & Co, Nienburger Geflügelspezialitäten Zweiniederlassung der Oldenburger Geflügelspezialitäten GmbH, Oldenburger Geflügelspezialitäten GmbH and Wiesenhof International GmbH Co. KG.	Germany	31,70 %
201.02	0207.14.9	03.07	Frozen meat of fowls of the species Gallus Domesticus, cut in pieces with bone in, (excluding that produced by Anhaltinische Geflügelspezialitäten GmbH, Donautal Geflügelspezialitäten Zweiniederlassung der Lohman & Co, Nienburger Geflügelspezialitäten Zweiniederlassung der Oldenburger Geflügelspezialitäten GmbH, Oldenburger Geflügelspezialitäten GmbH and Wiesenhof International GmbH Co. KG.)	Germany	73,33 %
201.02	0207.14.9	04.07	Frozen meat of fowls of the species Gallus Domesticus, cut in pieces with bone in, produced by Plukon Dedemsvaart BV, Plukon Goor BV, and Plukon Blokker BV	Netherlands	3,86 %

**Table 2.10: Antidumping, countervailing and safeguard duties on imported broiler meat**

201.02	0207.14.9	05.07	Frozen meat of fowls of the species Gallus Domesticus, cut in pieces with bone in, (excluding that produced by Pluimveeslachterij C van Miert BV, Pluimveeslachterij Mieki Hunsel BV, Frisia Foods BV, Plukon Dedemsvaart BV, Plukon Goor BV and Plukon Blokker BV)	Netherlands	22,81 %
201.02	0207.14.9	06.07	Frozen meat of fowls of the species Gallus Domesticus, cut into pieces with bone in, produced by Moy Park Ltd	United Kingdom	12,07 %
201.02	0207.14.9	07.07	Frozen meat of fowls of the species Gallus Domesticus, cut into pieces with bone in, produced by 2 Sisters Food Group Ltd and Amber Foods Ltd	United Kingdom	12,07 %
201.02	0207.14.9	08.07	Frozen meat of fowls of the species Gallus Domesticus, cut in pieces with bone in, (excluding that produced by Moy Park Ltd, 2 Sisters Food Group Ltd and Amber Foods Ltd)	United Kingdom	30,99 %
201.02	0207.14.91	01.08	Whole bird cut in half	The USA	940c/kg
201.02	0207.14.93	01.08	Leg quarters	The USA	940c/kg
201.02	0207.14.95	01.08	Wings	The USA	940c/kg
201.02	0207.14.96	01.08	Breasts	The USA	940c/kg
201.02	0207.14.97	01.08	Thighs	The USA	940c/kg
201.02	0207.14.98	01.08	Drumsticks	The USA	940c/kg
201.02	0207.14.99	01.08	Other	The USA	940c/kg

Source: SARS (2016)

Domestic prices have increased considerably since the tariff increase in 2013; however, tariffs alone did not account for this increase, given the sharp depreciation of the Rand during the same period. The tariff increase does not apply to products originating from within the EU, while mechanically deboned meat used in processed food also remains duty-free. Given the composition of South African imports in 2012, the increased tariff affects only 30 % of total imports, while the small increase in tariff lines traditionally consumed by the poorest consumers, compared with significant increases in the more expensive tariff classifications,

reduces the cost to lower-income consumers, while simultaneously assisting domestic production. It remains to be seen, however, if the price increase in the absence of a weaker rand will be sufficient to encourage investment and increase domestic production.

#### **2.4.5 The USA and AGOA**

AGOA referred to an agreement or act approved by the US Congress and signed into law on 18 May 2000. The implementation date start in October 2000 and was supposed to be reviewed in 2008. President Bush extend the period in 2004 to 2015 (Tralac, 2016). The purpose of this act is to assist countries in Sub-Saharan Africa (SSA) in trading with the USA, thus improving economic relations between the US and the SSA region as well as to provide “*tangible incentives for African countries to continue their efforts to open their economies and build free markets*” (United States International Trade Administration (USITA), 2014).

It is also mentionable that the direct effect of the introduced quota on imports from the USA, as part of the revised AGOA agreement can results in a potential loss in production of R1, 3 billion in local production.

#### **2.4.6 The EU and the TDCA**

The Trade, Development and Co-operation Agreement (TDCA) is an agreement between South Africa and the European Community (EC). The agreement was signed in 1999 and makes provision for a Free Trade Environment with the EC. The agreement was to be implemented in 2012. The agreement includes initiatives such as, financial assistance and development cooperation, cooperation in trade issues and economic cooperation (Export Help, 2016). SAPA applies to ITAC for actions against certain countries (Germany, Netherlands and the United Kingdom) in the EC for alleged dumped imports of frozen bone in portion (ITAC, 2015). In the investigation, SAPA alleged that imports of frozen bone-in chicken portions originating in or imported from Germany, the Netherlands and the United Kingdom were being dumped on the South African Customs Union (SACU) market.

After the verification of the information submitted by SAPA, ITAC initiated an investigation in October 2013 and results indicated that that dumping took place. SARS introduced anti-dumping tariffs against some of these countries (excluding those produced by Frisia Foods

BV), effective until 02 January 2015 (ITAC, 2015). After the above period, ITAC recommend to the Minister of Trade and Industry that anti-dumping duties of between 31.30% and 73.33%; 3.86% and 22.81% (excluding those produced by Frisia Foods BV; Pluimveeslachterij C van Miert BV; Pluimveeslachterij Mieki Hunsel BV); and 12.07% and 30.99% be introduced (ITAC, 2015).

## **2.5 Chapter Summary**

Poultry producers, globally, have been under pressure for some time following significant increases in the prices of feed grain up to 2014, which accounts for approximately 70 % of broiler production costs.

The total world production was reported at 89.655 million tonnes by FAS in 2016. This quantity increased from 81.313 million tonnes in 2011. The USA is the world's biggest producer, at 20.57 %, followed by Brazil at 15.13 % and China at 14.17 %. The USA is the biggest consumer of poultry meat, at 17.7 %, followed by China at 14.46 % and the EU at 11.75 %. Brazil consumes 10.81 % of the total production. South Africa consumes 1.96 % of the world production. Brazil, the USA and the EU are the countries producing major surpluses, with Mexico, South Africa and Russia experiencing shortages in their systems.

The major exporting countries for poultry meat are the USA, Brazil, and the EU. The major importing countries are Japan, Mexico, Saudi Arabia, EU, South America, sub-Saharan countries and Russia. The poultry meat trade has been valued at close to US\$17.9 billion. Dark meat constituted 50 % of the value of trade, with a market share of 47 % for the USA and 26 % for Brazil. Brazil has a 65 % market share in the whole bird trade and 63 % in the white meat trade.

Although production has grown by 160 % from 1995 to 2014, South Africa needed to import close to 400 000 tonnes to meet demand between 2012 and 2014. This constitutes an average growth rate of 8 % per year. Total consumption for South Africa grew by 208 % over the same period. Per capita consumption grew by 125 % over the same period. The major imported products are MDM (40 %) and frozen portions cut in pieces (42 %) or better known as dark meat.



## CHAPTER 3 :

### THE VALUE CHAIN OF THE SOUTH AFRICAN BROILER INDUSTRY

#### 3.1 Introduction

The United State Agency for International Development (USAID, 2016) explains that to map a value chain is a flow of developing a visual picture of the underlying structure of a value chain. A value chain map illustrates the manufacturing of a product and how it flows, how stakeholders operate and what activities they are involve in. This happens from the raw material to the end markets and presents how the industry functions. It is a compressed visual diagram of the data collected at different stages of the value chain analysis and supports the narrative description of the chain. The purpose of a visual tool in the analysis process is to develop a shared understanding among value chain stakeholders of the industry. A value chain of an industry tells a story about the interrelationships, role players, activities and products between supply and demand.

The total value chain of the broiler industry is complex and sophisticated. The industry integrates intermediate products at several processes towards the final products. Therefore, several industries form part of the broiler value chain, such as the yellow maize and soybean industry. These products are the two primary ingredients for the manufacturing of feed. Feed and Day-old chicks (DoC) are the two major inputs in the production of broiler meat. The production of grains in South Africa shows high competitive and comparative advantages. South Africa produced enough maize for its consumption in the past and usually exports maize to several other countries in an average season.

South Africa exported 153 100 tonnes of soybeans in 09/10, 47 200 in 11/12, 152 616 tonnes in 12/13, 15 390 in 13/14 and 6 747 in the 16/17 marketing seasons. It is evident that export decreased over the last few years. This phenomenon is the result of an increase in the processing capacity of soybeans, and South Africa has been a net importer of beans over the past few years. This has led to a scenario where South Africa imports less soybean. An estimate of 250 000 tonnes will be needed for the 2016 to 2017 season (NAMC, 2016:5). The demand for soybeans will increase further, and this will probably lead to an equilibrium situation where less land will be utilised for maize and more for soybeans.

Porter (1985:45) explained that a value chain analysis provides a tool for understanding. Porter further explains that, to provide a proper understanding, a value chain can be divided into role

players, activities, products, linkages in the chain, scope of the chain and the structure of the chain. This chapter maps the South African broiler chain, focuses on the supply and demand for broiler meat, and discusses the role players and activities, and reports quantities and prices in the chain.

### **3.2 The South Africa poultry food system**

Various experts have mapped the broiler chain in the past. Porter (1990:42) explains that a company's value chain is only part of a larger stream of activities, which can be referred to as a value chain system. The system consists of suppliers who provide inputs (such as materials, components, machinery, and purchased services). Certain products in the chain are used as intermediate products of other chains. Linkages in the chain not only connect activities in the chain but also create interdependencies between a firm or business and its suppliers and channels.

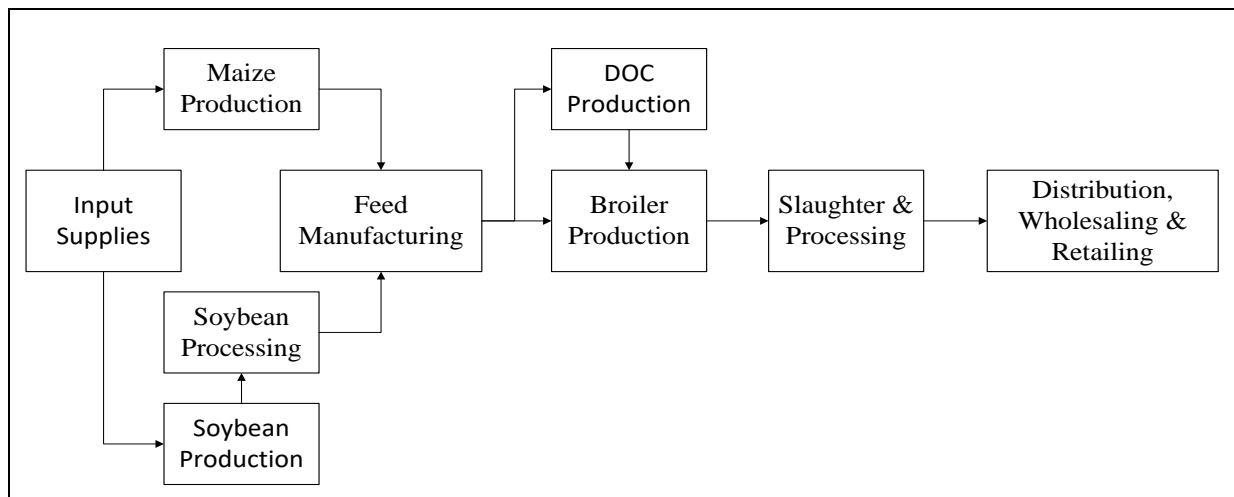
A two-phase process for developing a value chain map is recommended, as follows:

- Initial basic mapping, and
- Adjusted mapping.

Initial mapping is based on the information derived from desktop research and knowledge at the outset of the analysis. The second phase includes revisions based on interviews and feedback from companies and individuals brought into the analysis process. As value chain maps are representations of a complex system, the report must balance the need to generalise with the desire to charge the map with details (USAID, 2016).

The broiler value chain depends highly on the efficiency of other value chains, as illustrated in Figure 3.1, which represents the first phase of the mapping. The chain forms part of a global food system and is a complex, integrated structure of different value chains, interacting with each other.

Several value chains form part of the integrated broiler value system: a) Maize production system/chain, b) Soybean production system/chain, c) Poultry feed manufacturing system/chain, d) Day-old Chick production system/chain, e) other suppliers of equipment and machinery.



**Figure 3.1: The integrated broiler value system**

Source: Own compilation.

### 3.3 Industry bodies and role players in the chain

#### 3.3.1 Industry bodies in the broiler chain

A few industry bodies play important roles in the various chains – not only in the broiler chain but also in the whole poultry sector. The South African Poultry Association (SAPA) is the representative body for poultry producers. SAPA differentiates the organisation of the poultry industry into these areas:

- The Broiler Organization
- The Chick Producers Organization
- The Egg Organization
- The Developing Poultry Farmers' Organization
- The South African Ostrich Business Chamber.

Other representative bodies also involved in the broiler chain are:

- Association of Meat Importers and Exporters (AMIE)
- Grain South Africa (GrainSA)
- Grain Silo Industry (GSI)
- South Africa Cereal and Oil Seed Traders Association (SACOTA)
- South African Oil Processors Association
- Agricultural Business Chamber (Agbiz).

This section will provide a background of the South African Broiler Organization, the Chick Producers Organization and the Association of Meat Importers and exporters.

### **3.3.1.1. The South African Broiler Organization of SAPA**

SAPA (2013a:7) indicates that the Broiler Organization, with the Chick Producers Organization, was established as a national organisation with the objective to promote, develop and guide the industry as an independent subsidiary of SAPA. Further objectives entail:

- A sustainable and profitable industry.
- Protection of the industry and producers against unfavourable legislation and initiatives.
- Support and co-operate with related industries.
- Obtaining laws and regulations beneficial to the broiler and allied industries.
- Enhancement, support and the development of better production systems, testing methods, grading regulation, packaging, transportation, storage and marketing.
- Encouragement, enhancement and development of export market for broiler.
- Supporting education and training in poultry production.
- Assisting in investigational work of practical and scientific nature, and the organisation of seminars or courses.
- Looking after the publishing of literature, journals, pamphlets in regards of the industry.
- Acting as arbitrators in the settlement of any dispute in the interest of members, which may arise in any matter about the broiler and allied industries.
- Establishment of a suitable statistical database.

### **3.3.1.2. The Chick Producers' Organization**

The SA Chick Producers Organization is an independent body of the South African Poultry Association. The objective of the division is to improve and promote the welfare of those engaged in this part of industry. The organisation promotes and support all matters related to the breeding and chickens in South Africa by (SAPA, 2013a:8).

### **3.3.1.3. Association of Meat Importers and Exports**

The Association of Meat Importers and Exporters (AMIE) is a legal body representing the meat importers and exporters in South Africa. The association was founded in 1996 owing to a need by meat and poultry importers and exporters to have a representative to talk on behalf of the industry and to look after the interests of the members (AMIE, 2014). AMIE is recognised by:

- Department of Agriculture, Fisheries and Forestry.
- Department of Trade and Industry.
- International Trade Administration Commission (ITAC).
- South African Revenue Services (SARS).
- National Agricultural Marketing Council (NAMC).

AMIE is also recognised by several international institutions, namely:

- Meat and Livestock Australia (MLA).
- Associacao Brasileira de Industria Produtora e Exportadora de Carne Suina (ABIEPEC).
- German Export Chambers.
- Irish Meat Board.

AMIE is involved in many matters relating to:

- Tariff determination.
- Market access.
- Trade barriers.
- Import duties.
- Dumping duties.
- Moreover, other issues related to trade.

### **3.3.1.4. Agri Businesses in the South African broiler value chain**

The South African broiler industry is not only a complex supply chain, it also exhibits high levels of coordination and integration (Louw *et al.*, 2011:262). DAFF (2013) reported that for the period under review, the number of broiler producers in South Africa amounted to 404, of which 199 were producers integrated into large holding companies, and 205 were contract growers contracted to these integrated companies. This number increased to a total estimate of 471 in 2014 (SAPA, n.d.). Some of the major role players run integrated business operations

comprising soybean processing, feed manufacturing, importing of genetic material, breeder farms, hatcheries, broiler farms, abattoirs, processing plants, and distribution (Fox, 2014:20). Davids (2013:35) has reported on the market share, as illustrated in Table 3.1 below.

**Table 3.1: Market share of large-scale processors**

<b>Producer</b>	<b>Market Share (%)</b>
Rainbow Chicken Ltd	25,04
Astral Foods	22,45
Country Bird Holdings	7,99
Tydstroom Poultry (Pioneer Foods)	6,39
Afgri Poultry	5,97
Chubby Chicks	5,86
Sovereign Foods	4,53
Others	21,77

Source: SAPA (2012), Rainbow Chicken Ltd (2012), Astral Foods (2012), Pioneer Foods (2012) & Afgri (2012), cited in Davids (2013).

A recent development in the industry was that Quantum Foods agreed to supply up to 550 000 broilers per week to Astral Foods Limited (2014:1) from their Tydstroom Poultry Unit. This also meant that Tydstroom were to close their processing facilities in the Cape. Tydstroom Poultry became a broiler contract grower for Astral. It put Astral in the leading position regarding market share. Grain Field Chicken, a subsidiary of VKB Agriculture, has also increased capacity to process up to 850 000 million chickens per week. (Grain Field Chicken, 2015). Table 3.2 below illustrates the revised market share.

**Table 3.2: Revised market Share regarding large-scale processors**

<b>Group</b>	<b>Market share (%)</b>
Astral + Tydstroom	29
CBH	8
Daybreak Poultry (Afgri Poultry)	5
Rainbow	25
Chubby Chicks	6
Sovereign	5
Grain Field Chicken	4
Other	22

Source: SAPA (2016), Rainbow Chicken Ltd (2012), Astral Foods (2016), in Davids 2013 & Grain Field Chicken (2015) & own calculation (2016)

Rainbow and Astral account for over 50 % of total production of broilers in South Africa, while five medium-sized processors produced 24 % of the country’s broiler meat, and the rest by smaller processors. The supply of live sales and imports are not included in the above calculation. Fox (2014:30) elaborates comprehensively on some activities of the major role players, as shown in Table 3.3 below.

**Table 3.3: Activities of role players**

<b>Role player</b>	<b>Operations</b>
Daybreak Poultry (AFGRI Poultry)	Daybreak Poultry (AFGRI Poultry) processes over a million birds per week. Their main brand is Daybreak Superior. They supply fresh, value-added and products for the quick service restaurant (QSR) sectors. Broilers are processed through two modern abattoirs, certified as Halaal.
Astral Poultry	Astral Poultry produces frozen, fresh and value-added chicken products to both the retail and food services sectors under these brands: Goldi (frozen products), County Fair (bone in fresh and frozen chicken portions, IQF), Festive (fresh regional products) and Mountain Valley (fresh free-range products). Astral food has operations in Standerton, Olifantsfontein, Camperdown, Epping and Hocroft.
RCL food or Rainbow Chicken	RCL dominates the quick service restaurant (QSR) sector with tailored chicken solutions for leading customers that include KFC, Nando’s, Chicken Licken, and Steers. The Rainbow Food Solutions division also packages for several retailers, wholesalers, caterers and various state institutions under their brands. The head office is in Hammarsdale, outside Durban. Rainbow operates nationwide in the retail, wholesale and foodservice channels with three brands: Rainbow (fresh, frozen and processed products), Farmer Brown (fresh chicken) and Rainbow Food Solutions.

Role player	Operations
Sovereign Foods'	Sovereign Foods' chicken farming operation is in the Rocklands Valley near Uitenhage. They service the Eastern Cape's catering markets with two brands: Cater Chicken Chicken'tizers (value added products including coated wings, drums, thighs, strips, pops, livers and burger patties) and Cater Chicken Chef's Selection (fresh pieces).
Country Bird Holding (CBH) Supreme Poultry.	Chubby Chick (Fouries Poultry Farm) supply Woolworths. They also sell countrywide and are the country's largest poultry exporter. Supreme is South Africa's third-largest poultry producer and is the second-largest supplier to the QSR and food service markets. Their head office is in Bloemfontein. Their operations are in the Free State and North West, with hatcheries in Bloemfontein and Mafikeng, and abattoirs in Bloemfontein, Mafikeng, and Tigane near Klerksdorp. They operate two breeder-rearing farms, two breeder-laying farms, two hatcheries, nine broiler farms, three free-range farms, a processing plant and a rendering plant.
Elgin Free Range Chickens (EFRC),	Elgin operates across the Elgin Valley and the Overberg. Elgin supplies many free-range chicken products to Western Cape retailers like Checkers, Pick 'n Pay and Spar, as well as selected delis and restaurants. EFRC slaughters 70 000 birds per week at their abattoir in Grabouw.
Lazena Free Range Poultry	Lazena Free Range Poultry is at the foot of the Hottentots Holland Mountains in Gordon's Bay. They have three additional contract growers in the Hemel en Aarde Valley, Hermanus, and Grabouw. The company prepacks free-range chicken products for distribution to Western Cape outlets of Checkers and Shoprite, Pick 'n Pay, Spar and Fresh Food Lover's Market, and delivers chicken products to Primi Piatti,

Source: Fox (2014) & Astral (2014)



### **3.4 Institutional arrangement**

The institutional arrangement provided by the South African Poultry Industry is important for the future viability and sustainability of the broiler industry. The South African Poultry Association (SAPA) coordinates the relationships between the different associations related to the production of chicken meat. Other related industries, such as the Agricultural Meat Importers and Exporters, Animal Feed Manufacturers Association and other related industries, are not members of SAPA, although in certain instances they do support the Industry.

The support structures provided by the poultry industry are institutional services focusing on research; coordination of training, management information systems; and industry affairs. The support structures are made possible with previous funding obtained through a levy system from within the industry and membership fees. It is imperative that the industry should maintain its coordinating role. Broiler industry strategies and conduct, as well as legislative processes, should take cognisance of the strategic role of industry associations to ensure that future strategies, conduct, and legislation will not impact negatively on the support structures and fragment the existing environment, and should rather enhance well-needed cohesion.

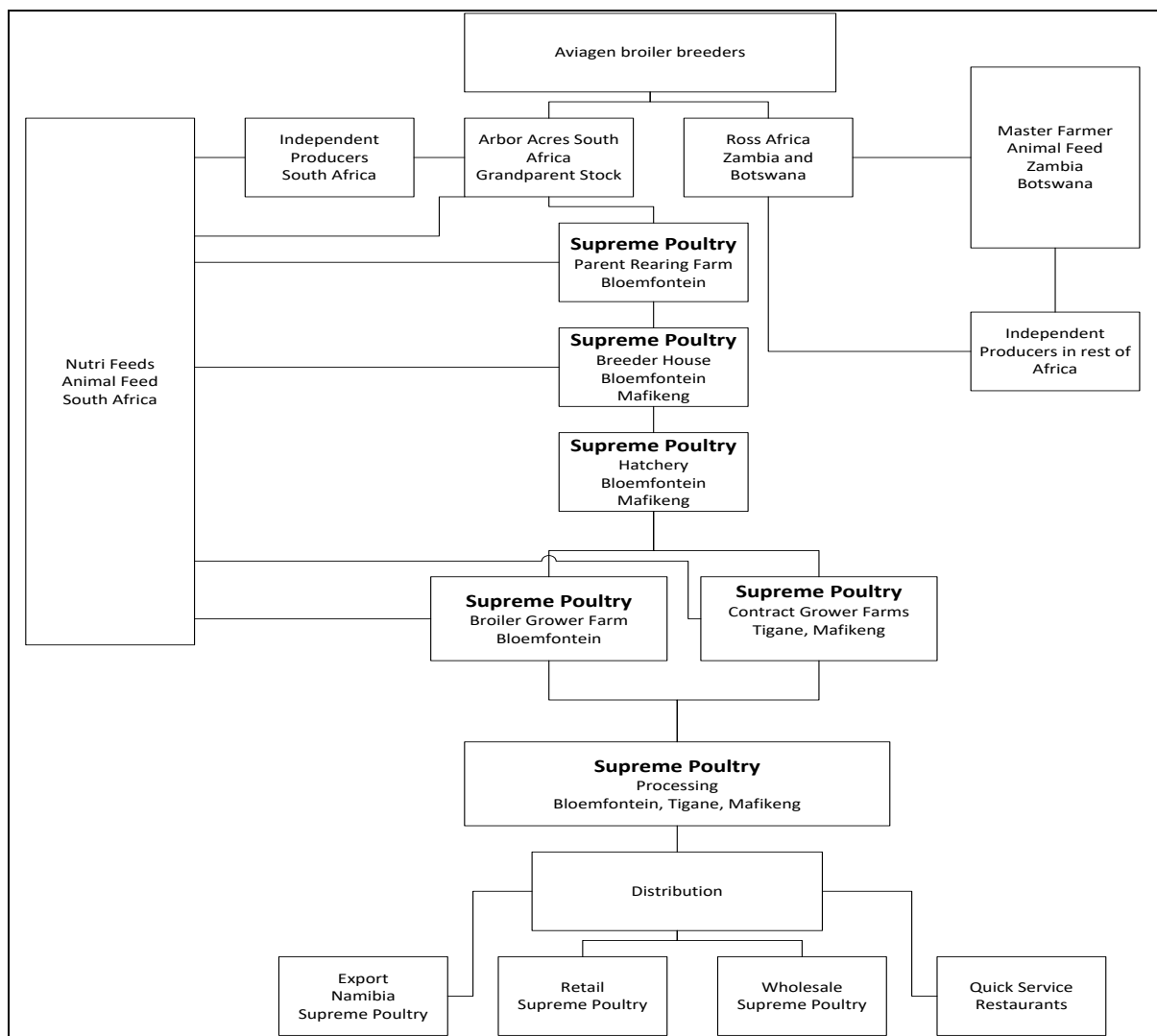
The relationships in the industry are of utmost importance and need development and enhancement. A cooperative, mutually beneficial and interdependent relationship exists amongst the broiler producers' industry, the chick producers' industry, the maize industry, and industries involved in soybean and soybean processing, feed manufacturing, broiler production, broiler processing, and wholesale and retail operations. Because of their strategic positioning, feed manufacturing plants and soybean processing plants are situated near the broiler producers. The viability of high throughput processing plants and the supply of feed and DoC to producers are equally dependent on the constant provision of these inputs and uptake of their final product. The slowing down or halting of a feed manufacturing plant or of the supply of DoC has an immediate impact on producers regarding additional costs required to transport feed and DoC from alternative sources and to transport birds to abattoirs (usually making broiler production uneconomical if it is located too far from an abattoir).

At the institutional level, processors and producers depend heavily on SAPA, in which they are equal partners, to negotiate tariff agreements and orchestrate various initiatives. In its important

coordinating role, SAPA maintains several programmes and support structures which are indispensable for the efficient functioning of the industry.

### 3.5 The Value Chain of the South African broiler industry

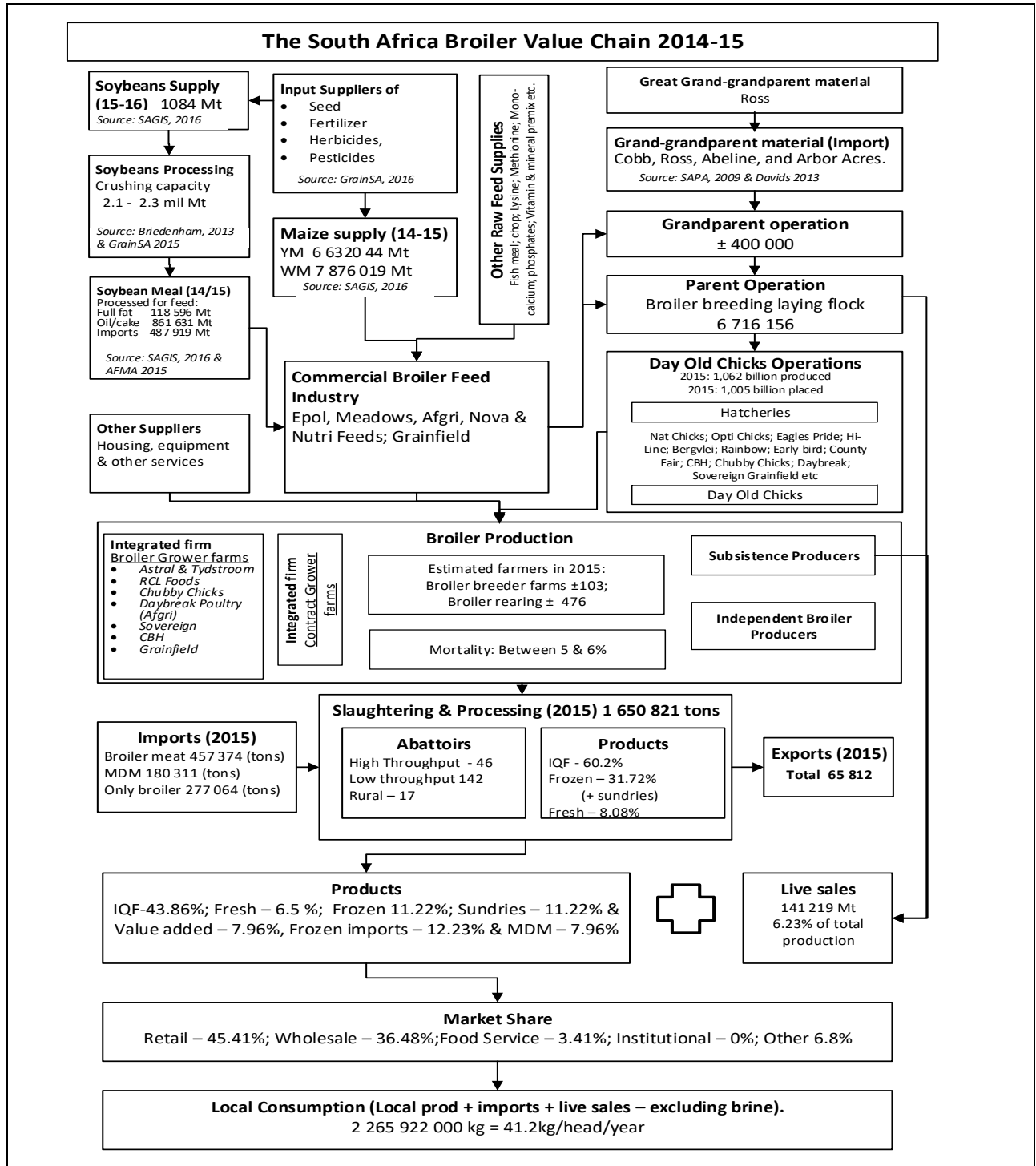
The South African broiler value chain is concentrated and complex. The value chain comprises several role players interacting with each other through the system. The business models of each role player are different. An illustration of the broiler value chain is provided by Davids (2013), as shown in Figure 3.2.



**Figure 3.2: Broiler value chain**

Source: Davids (2013).

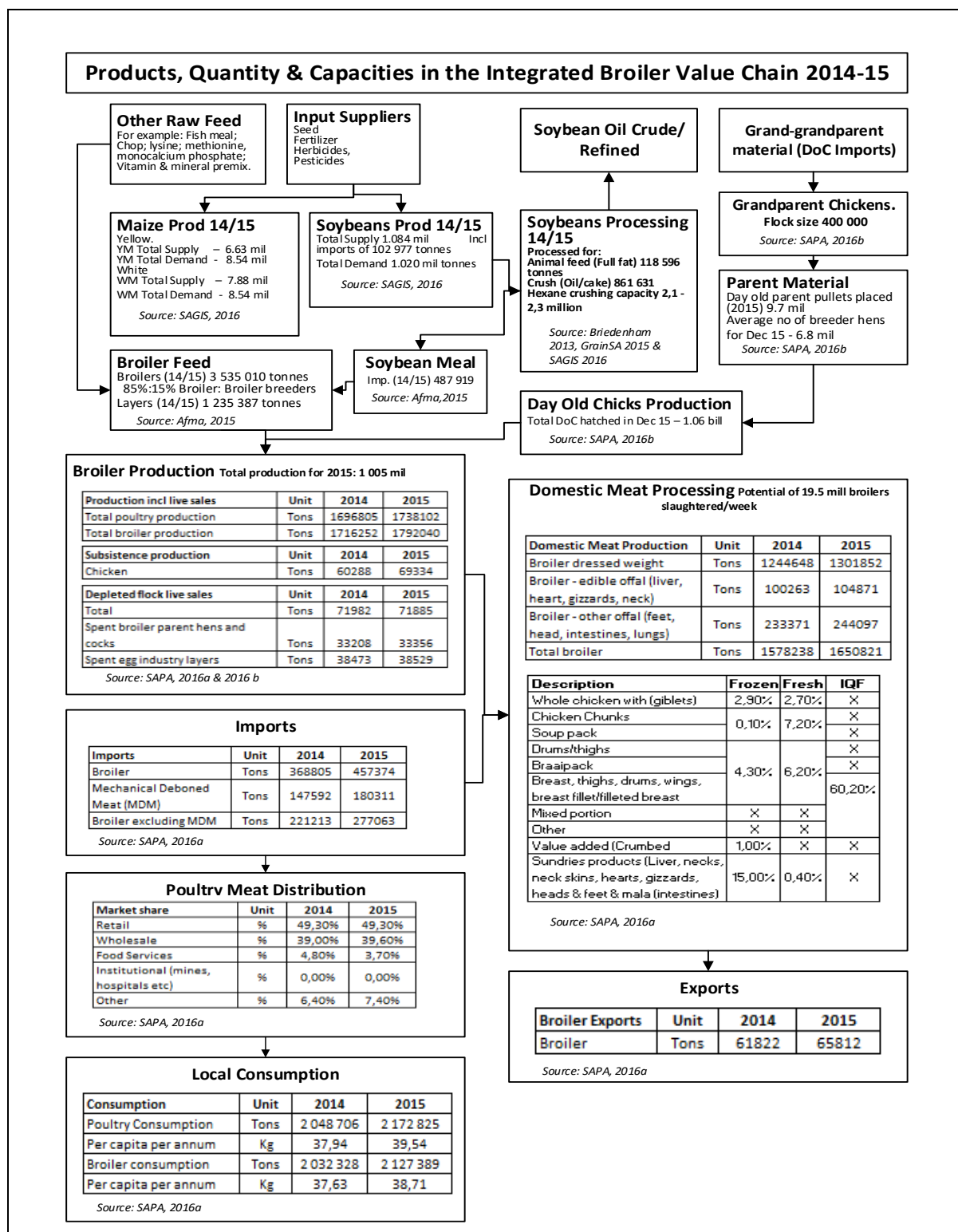
Figure 3.3 illustrates the activities and role players in broiler value chain in more detail and underlines more detailed activities in the chain, for example, the production process of the major inputs.



**Figure 3.3: Detailed representation of the South Africa Broiler Value Chain**

Source: Briedenham (2013), Davids (2013), GrainSA (2015), SAPA (2016a), NDA, & own compilation.

A further description of the products, quantities and capacities is illustrated in Figure 3.4 below.



**Figure 3.4: Products, quantities and capacities in the value chain.**

Source: Briedenham (2013), Davids (2013), GrainSA (2015), SAPA (2016), NDA, & own compilation.

### 3.6 Discussion of the South African Integrated broiler chain

#### 3.6.1 Broiler feed manufacturing process

The two major ingredients for broiler feed are yellow or white maize and soybean meal. South Africa produces enough maize in normal years for the total local demand, and South Africa is a net exporter of white maize in normal years.

Soya bean production in South Africa shows an upward trend the past few years, increasing from 186 000 tonnes in 1999/2000 to 1 042 149 tonnes in 2015/2016 (South African Grain Information Services (SAGIS, 2016)). Full-fat soymeal for animal feed increased from 92 500 tonnes in 1999/2000 to 121 763 in 2015/2016. Soybean processing for oilcake and oil increased from 94 900 to 988 024. Table 3.4 below shows the crushing capacity as for 2014 (Briedenham, 2013)

**Table 3.4: Crushing capacity for 2014**

<b>Company</b>	<b>Capacity</b>
Noble	620 000
Nedan	326 000
Russel Stone	310 000
Wilmar Continental	192 000
VKB	186 000
Willowton	156 000
Majesty	156 000
Gauteng	108 000
Drak	48 000
Total	2 102 000

Source: Briedenham (2013)

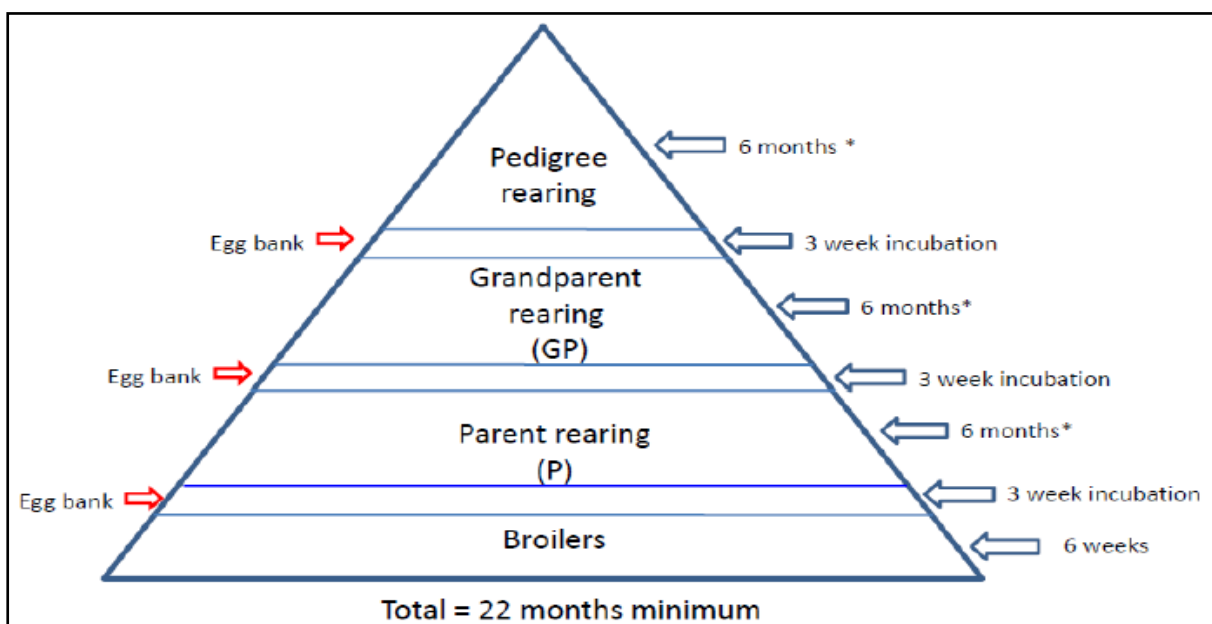
South Africa had 30 feed mill companies registered in 2013 for manufacturing feed for poultry. These companies have 47 feed mills, of which 41 are registered to produce feed for broilers. Two companies are situated outside the borders of South Africa, namely Mauritius and Botswana. Afgri Animal Feeds is not registered with AFMA. They have seven mills recorded for broilers (AFMA, 2011a). Therefore, it is estimated there are at least 52 feed mill operations in South Africa (AFMA, 2012b & 2012c).

### 3.6.2 Broiler production process

SAPA (2013a:22) explains that the production cycle from pedigree rearing to producing a bird, ready for slaughter, can take from 18 to 22 months. The process represents the time frame from the breeding material being imported, to the first commercial product slaughtered. It adopts a full laying cycle of approximately 40 weeks to transfer al Grandparent (GP) to Parent flock, to the new breeding material. At six months, hens are moved to laying houses, and it can take another few weeks before hatching eggs are set, depending on the breed, therefore lengthening the production chain. Bogapi *et al.*, (2014:6) also clarify the point that the grandparent stock produces chicks called ‘parent stock’. These parent stock birds produce approximately 150 eggs per hen during an estimated 48-week period. These eggs are sent to a hatchery for incubation for about 21 days in the production of day-old broilers. The day-old broilers are reared for a period of 32 and 42 days to a specified weight of between 1.6 kg to  $\pm$  2.2 kg, at which time they are slaughtered and processed. The processes are grouped into 4 phases, namely:

- Pedigree rearing
- Grandparent material
- Parent rearing
- Broiler production

The final phase of broiler production can be improved if commercial growers produce mature birds from day-old chicks in a cycle of 35 days. Figure 3.5 below illustrates the process.



**Figure 3.5: Broiler production process**

Source: SAPA (2013a:22)

### **3.6.3 Primary breeder flock**

South Africa only has seven main breeds, namely: Cobb, Ross, Elite, Hybro, Hubbard, Abeline, and Arbor Acres (SAPA, 2009:22). South Africa does not produce its primary breeding material (Schutte, 2015). The first stage is the development of a primary line. White Plymouth Rock males mate (cross-bird) with females of the Indian Game breed to obtain a male line. The female line is developed by mating females of the White Plymouth Rock with males of the Indian Game breed. Nowadays, these lines are called breeds and bear the names of their companies: Ross, Cobb, Arbor Acres, Hubbard, etc. The lines developed by the breeding companies are most valuable and are therefore maintained under very strict conditions of biosecurity and remains the property of a company. (SAPA, 2013c).

Companies do not share parent stock and broiler chick hatcheries because of biosecurity concerns. Biosecurity plays a vital role. Contamination can easily occur through vectors like people, equipment, and vehicles such as feed trucks for the delivery of feed or vehicles and equipment used in the depopulation process. The parent stock hatchery can become contaminated, which will cause the contamination of the breeding farm, and which can result in a collapse of the supply chain. (SAPA, 2012a).

Dauids (2013:27) also explains that the first stage of the DoC supply chain is represented by the primary breeder flock. According to SAPA, cited in Dauids (2013:27), broiler breeders are imported into South Africa at the great-grandparent or grandparent level, as no commercial-level, day-old chicks or fertile eggs may be imported. These birds are imported as day-old chicks before being raised on breeder farms around South Africa. Biosecurity is of vital importance and many integrated producers raise grandparent stock in different areas to those for parent stock. Broilers are bred for fast growth and performance. Breeders are raised according to set standards for each breed to ensure optimum performance upon entering production. The National Department of Agriculture reported (2002:2) stated that the commercial broiler genetics depends on the following exotic strains, namely Ross from the UK, Cobb from the USA, Hybro from the Netherlands, Hubbard from the USA, and Arbor Acres from the USA.

Davids (2013: 39) indicates that independent producers in the South African industry choose genetics from various lines or breeds, including Cobb 500, Ross 308, Ross 788, Arbor Acres and CobbAvian 48. The above was noted by SAPA (2011:47) in 2011.

Astral Foods is the sole distributor and supplier of Ross 308 and Ross 708 parent stock to the South African broiler industry (Astral, 2015). Rainbow Farms are the distributor of the Cobb 500 breed (CobbSA, 2011). Abeline Poultry introduced the Abeline breed in the late 1980s (Abeline Poultry, 2011). The South African poultry producer, Tydstroom, introduced the CobbAvian48 broiler breed into South Africa in 2010. (WattAgNet, 2010). The South African grandparent and great-grandparent stock was estimated at 400 000 in 2014 (SAPA, 2015e: np).

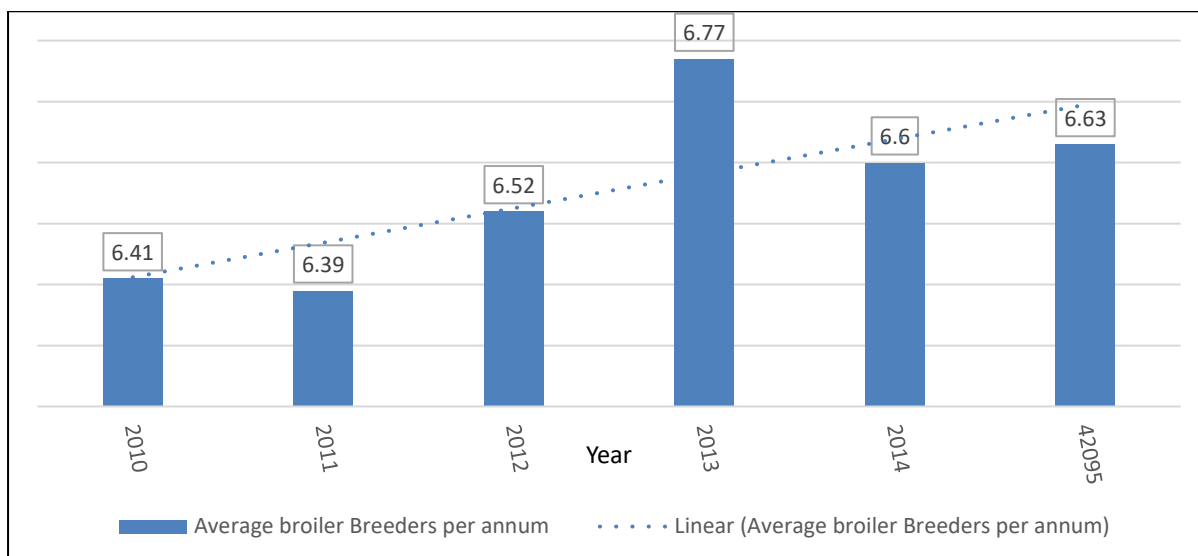
#### **3.6.4 Broiler breeder (Parent Stock)**

Parent stock farming is specialised. SAPA (2009:22) reported there were 34 multipliers in 2009. The parent hens produce fertile eggs for the supply of DoC. Davids (2013:28) explains that a constant supply of high-quality pullets is crucial to the success of the broiler industry because they are bred for a better feed conversion ratio (FCR) and rapid growth. The first step in this phase is that breeders of primary stock supply day-old birds to be raised on a pullet farm. Placement of these pullets happens from week 15 in breeding houses. The birds reach sexual maturity at  $\pm 21$  weeks. (Arbor Acres, 2013:29). The production periods of these hens are  $\pm 40$  weeks. The mating ratio is between 7 to 10 males per 100 females (Hy-Line, 2016).

The average number of parent females in rearing during 2014 was 3.5 million per week, with a total parent flock of 6.63 million as at April 2015 (SAPA, 2015:2)

Figure 3.6 below shows average broiler breeders per annum from 2010 to 2015.





**Figure 3.6: Average broiler breeders placed per annum**

Source: SAPA (2015:2)

Although there was an average increase of 4.69 % over the depicted period, a decrease from 2013 is evident due to higher feed prices from 2012. SAPA (2015:1) explained this result as the demise of smaller non-integrated poultry businesses and others being taken over by bigger, fully integrated businesses. In the broiler industry, this led to day-old chick suppliers losing volumes to the bigger integrators, and losing volumes due to smaller growers going out of business (SAPA, 2015:1)

### 3.6.5 Broiler production and performance

Three types of growers can be identified, namely contract growers, independent growers and direct growers (Louw *et al.*, 2011:226). Contract growers grow birds on their farms and deliver to a specific company, while direct growers grow for a holding company on a farm owned by the company. Independent growers have no obligation to deliver to anybody and can source their own feed from various suppliers, but they have no guarantees in selling the product. This is the only stage of the broiler supply chain not fully integrated into the holding companies in the market (Davids, 2013). SAPA (2016d: 1) also provides statistics regarding subsistence production and live sales from depleted flocks from the broiler parent process and spent hens from the egg industry. It is part of the informal sector.

Joubert (2007:29) explains that the performance of the production unit is measured by a productive efficiency factor (PEF). The PEF contains the following four factors namely:

- Percentage survivors (%S)
- Average live mass (ALM)
- Feed Conversion ratio (FCR)
- And the age at slaughter in days (Age)

The formula to calculate the PEF is as follow:

$$PEF = \frac{\%S \times ALM}{FCR \times Age} \times 100$$

Where:

- The percentage of survivors (%S) is calculated as the total quantity of broilers slaughtered divided by the total number of DoC placed.
- The average live mass (ALM) is calculated as the physical weight of a broiler at slaughter stage.
- The Feed Conversion Ratio (FCR) is calculated as the total feed used in kilograms divided by the total quantity of broilers placed.
- The age in days is the physical days of a broiler cycle.

South African broiler farmers are becoming more and more productive. Better breeding material, more constant environment control in the houses, optimal feed consumption, medicine and vaccine management, and a total better management of cycles by commercial and other broiler producers are results of higher and better productive efficiency.

The South African production efficiencies have been improving, over the past years and can compare with the best in the world. The last Production Efficiency Factor (PEF) published by SAPA was 263 in 2012. International PEFs are represented between 270 and 300 (SAPA, 2013:49).

### **3.6.6 Census and provincial distribution of chicken farms**

Spent chickens from the layer industry end up in the meat market and it is instructive to take note of quantities from the egg industry. SAPA (2014:1) has reported an estimate of 140 million live chickens at any given time in South Africa. Table 3.5 below provides more detail on the census of chickens in 2014.

**Table 3.5: Estimated census of chickens in South Africa from Jan to Jun 2014**

Estimated Census of Chickens in South Africa	Quantity
Broiler GGP's & GP's	400 000*
Broiler parents in rearing	3 155 300
Broiler parents in lay	6 605 000
Broiler rearing	98 743 000**
Total broiler industry	108 503 300
Commercial layers	300 000
Layer replacement pullets	7 724 400
Commercial layers	23 285 700
Total egg industry	31 310 100
Total industry	139 813 400

\*Estimate as 30 Jun 2014

\*\*Based on actual broiler chicks placed, slaughtered at 35 days of age

Source: SAPA, 2014.

Table 3.6 shows the provincial distributions of broilers and layers.

**Table 3.6: Provincial distribution of broilers and layers in South Africa**

Province	Broiler Industry		Layer Birds		Grand Total	
	Broiler Birds	Total birds (%)	Layer Birds	Total birds (%)	Total Birds	Total birds (%)
Eastern Cape	7 038 453	6,4	928 385	4,0	7 966 838	6,0
Free State	6 067 200	5,5	3 567 327	15,4	9 634 527	7,3
Gauteng	7 979 772	7,3	6 036 520	26,1	14 016 292	10,6
KZN	14 599 240	13,4	3 391 447	14,6	17 990 687	13,6
Limpopo	2 486 300	2,3	1 713 603	7,4	4 199 903	3,2
Mpumalanga	21 429 738	19,6	1 063 432	4,6	22 493 170	17,0
North West	26 366 010	24,1	2 418 496	10,4	28 784 506	21,7
Western Cape	23 205 600	21,2	3 978 561	17,2	27 184 161	20,5
North. Cape	157 000	0,1	53 274	0,2	210 274	0,2
Total	109 329 313		23 151 045		132 480 358	

Source: SAPA (2014)

The North-West Province produced the largest number of chickens in the country, followed by the Western Cape and then Mpumalanga. The Northern Cape has the smallest number of chickens in the country.

Table 3.7 below provides an indication of the number of chicken farms in South Africa. The estimates are based on a recalculation on a National Avian Influenza survey done in 2014 (SAPA, 2014:3).

**Table 3.7: Estimated number of farms.**

<b>Broiler industry</b>	<b>Number of farms</b>	<b>Estimated number of farms</b>
Broiler breeder farms	103	104
Broiler rearing farms	471	476
Total	574	580*
<b>Egg Industry</b>		
Type of layer farms		
Layer breeder farms	16	22**
Layer rearing farms	35	47
Layer farms (Egg producing)	178	241
Total	229	309
<b>Total (Broiler and egg industry)</b>	<b>803</b>	<b>889</b>

\* Based on a National Avian Influenza (NAI survey at 99 % representation)

\*\* Based on a National Avian Influenza (NAI survey at 74 % representation)

Source: SAPA (2014)

### **3.6.7 Processing**

The slaughtering of chickens and the processing of chicken meat is normally done at the same premises. The abattoirs/processing plants operate on low margins and therefore require large throughput volumes to recoup capital investment. An abattoir producing frozen poultry will require a greater scale as it has additional costs such as spiral freezers. Bogapi *et al.*, (2014:11) further mentioned that a South African producer estimated that unless an abattoir can slaughter at least 500 000 birds a week, it would not be economically viable. Abattoirs not linked to large producers often struggle to get sufficient volumes to make their operations efficient. Production requires sophisticated logistics, as freezer capacities can only hold production for a limited number of days. The newly established Grain Field abattoir, built in South Africa with the capacity of 800 000 broilers a week, cost around R130 m (\$15.85 m) to build. Other South African producers have estimated a cost around R85 m (\$10.37) for an abattoir with the capacity of slaughtering and processing 100 000 to 120 000 broilers a week (Bogapi *et al.*, 2014:11).

### 3.6.7.1. Processing facilities in South Africa

The Meat Safety Act, 2000 (Act 40 of 2000) regulates the slaughtering and processing of animals in South Africa. The purpose of the Act is to provide measures to increase and maintain meat safety and the safety of animal products. A further objection is to establish and maintain national standards regarding abattoirs; to regulate the importation and exportation of meat; to establish meat safety schemes; and to provide for matters connected therewith (Acts Online, 2013).

The poultry industry has made significant advances in its use and application of innovative technology to enhance its operational capacities. The equipment used at high throughput facilities has become highly automated and has impacted favourably on increases in line speed and production capacities. The structure, design, layout and the remarkable increases in line speeds have made it impossible to comply with all the regulations. This is to ensure that the products delivered to the consumers are disease and pathogen free (NDA, 2012:29).

The Meat Safety Act, 2000 (Act 40 of 2000) classifies an abattoir according to the number of slaughter units it can be slaughter per day. The classification for poultry abattoirs are indicated in Table 3.8 below.

**Table 3.8: Classification of poultry abattoirs**

<b>Description</b>	<b>Poultry</b>
High throughput	2001
Low throughput	51 – 2000
Rural	1 – 50
1 Slaughter unit	1 Fowl, 1 Duck, 1 Guinea Fowl, ½ Goose, ¼ Turkey

Source: NDA, 2012

SAPA (cited in Davids, 2013:34) explains that processors consist mainly of subsidiaries or divisions of holding companies. The mature broilers are either supplied within the company structure or by independent growers contracted to the holding companies. Slaughtering and processing are then handled by these companies. Chicken meat is sold fresh, frozen or in a further processed form. Individual, quick-frozen pieces make up the bulk of the market, comprising 65.13 % of the domestic market in 2010.

South Africa had 209 registered abattoirs in 2012 (NDA, 2012:10) and Table 3.9 below illustrates the distribution of poultry abattoirs.

**Table 3.9: Total number of poultry abattoirs in the country**

<b>Province</b>	<b>High throughput</b>	<b>Low throughput</b>	<b>Rural</b>
Eastern Cape	2	11	6
North West	10	20	0
Mpumalanga	5	13	2
Gauteng	7	23	1
Limpopo	3	6	0
KZN (North)	0	1	3
KZN (South)	7	14	2
Free State	4	33	0
Western Cape	8	9	3
Northern Cape	0	12	0
<b>Total</b>	<b>46</b>	<b>142</b>	<b>17</b>

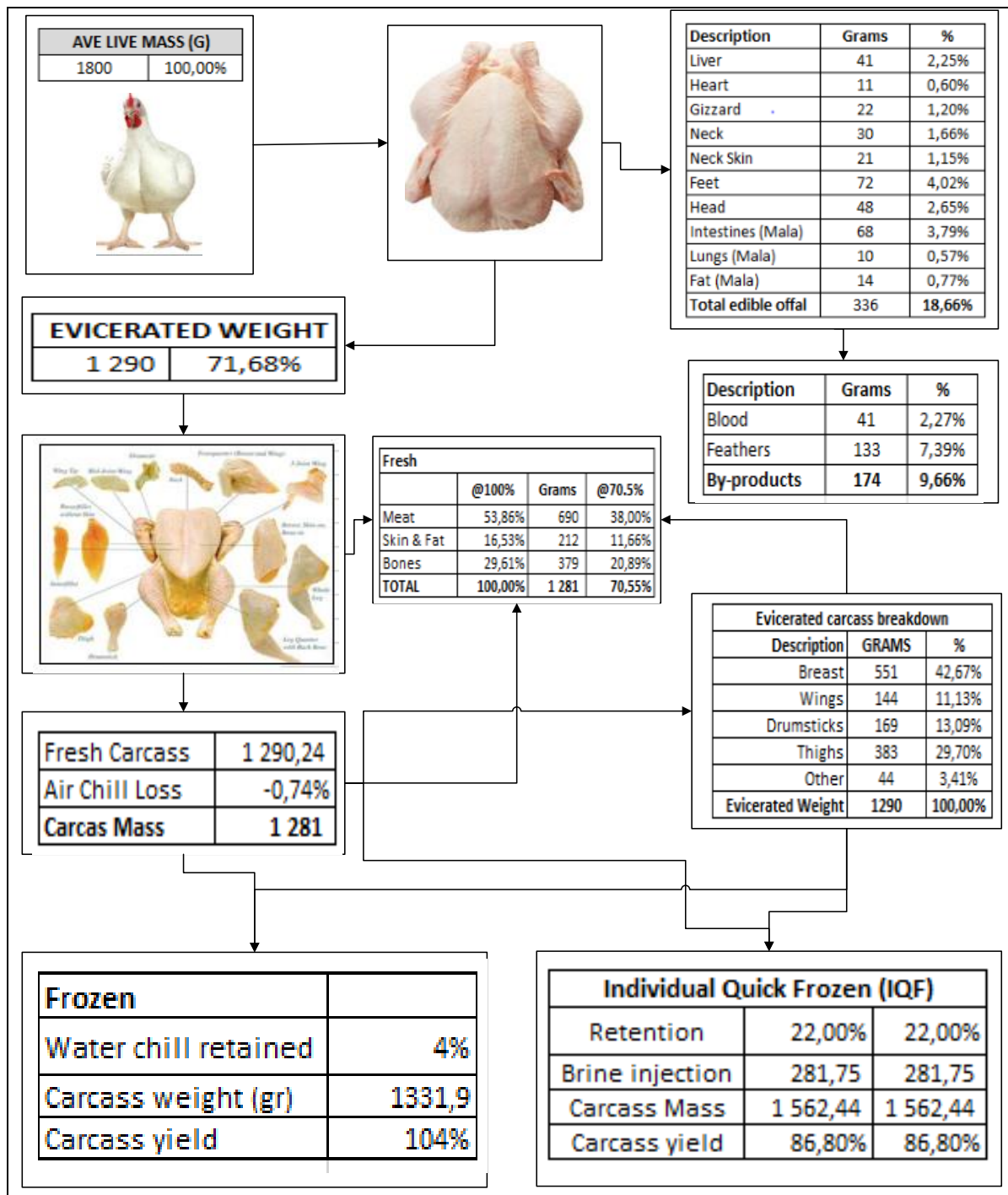
Source: NDA (2012)

SAPA (2016a: 9) reports that chicken meat is sold either fresh, frozen or IQF. Producers differentiate chicken meat into various products, namely:

- Fresh and frozen chicken:  
Whole chicken, braai packs, breast, thighs, drums, wings, drums/thighs, fillet, chicken chunks and soup packs.
- IQF  
Mixed portions, thighs, breast, drumsticks, wings, fillet breast, and other.
- Sundry products
- Value added (crumbed) products.

### **3.6.7.2. Products from a broiler carcass breakdown**

The processing of broiler carcass into different products is illustrated in Figure 3.7 below.



**Figure 3.7: The processing of broiler carcasses in South Africa**

Source: Lovell (2015a).

### 3.6.7.3. Brining of chicken meat

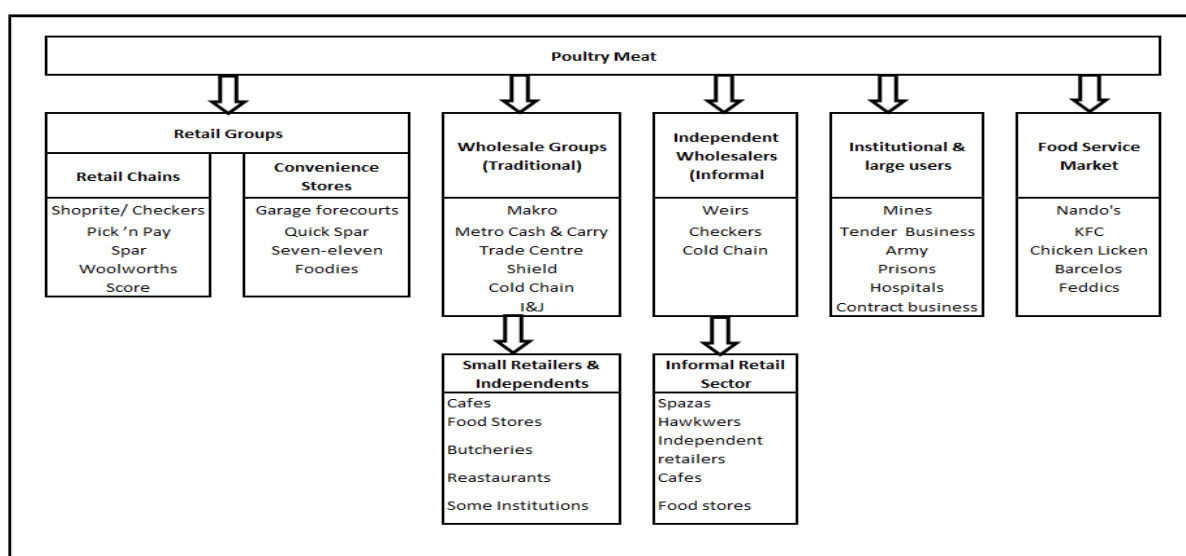
Brining is a process where the meat is injected with a salt-water mixture. The average brining for IQF is 22 % (Lovell, 2016). This technique lowers prices at the retail level and makes broiler meat affordable for the consumer. Regulations on brining were gazetted on 22 April 2016 to the effect that frozen meat may not exceed a level 10 % of brine injected, and individual quick

frozen (IQF) is set at a maximum level of 15 % (Section 15 of the Agricultural Product Standards Act, 1990 (Act No. 119 of 1990) from 22 October 2016. Lovell in the *Sunday Times* (2016) argued that the new regulation would make chicken meat unaffordable for many of the poor.

### 3.6.8 Distribution, Consumption & Pricing of broiler meat

#### 3.6.8.1. Distribution

The Agricultural and Rural Development Corporation (2002:8) provides a clear distribution structure of slaughter and processed poultry meat for the formal sector in Limpopo province, as illustrated in Figure 3.8 below. Although the reference is old, it is still usable.



**Figure 3.8: Distribution structure for broiler and processed chicken products**

Source: Agricultural and the Rural Development Corporation (2002:10)

Retailers play an important role in the distribution of poultry. The South African retail food sector is concentrated. It is dominated by four main retail chains. The retailers have the following market share (Kirsten, 2009:10), as illustrated in Table 3.10 below:

**Table 3.10: Market share of retailers**

Retailer	Market share 2009 (%)
Pick 'n Pay Retail group	35
SPAR Group	20
Shoprite/Checkers	42
Woolworths	9

Source: Kirsten (2009:10)



### 3.6.8.2. Consumption

Broiler meat is used in various ways. DAFF (2016:69) has stated that the white meat consumption portion of broiler meat constituted a total of 2 138 000 tonnes in the 2014/15 season, with a per capita consumption of 39.60 kg per person per year. SAPA (2016b: 1 & 2) provides detailed figures concerning the total consumption, recalculated from figures provided by SAPA, please see appendix 1. Please see Table 3.11 for recalculation.

**Table 3.11: Consumption & production of chicken meat in SA**

	<b>Human population</b>	<b>Unit</b>	<b>2014</b>	<b>2015</b>
1	Population	People	54 002 000	54 956 900
	<b>Consumption</b>	<b>Unit</b>	<b>2014</b>	<b>2015</b>
2	Poultry Consumption	Tonnes	2 048 706	2 172 825
3	Per capita per annum (Poultry)	Kg	38,13	39,22
4	Broiler consumption	Tonnes	2 032 328	2 127 389
5	Per capita per annum (Broilers)	Kg	37,63	38,71

	<b>Production including live sales</b>	<b>Unit</b>	<b>2014</b>	<b>2015</b>
6	Total poultry production	Tonnes	1 696 805	1 738 102
7	Total broiler production	Tonnes	1 716 252	1 792 040

	<b>Local commercial production</b>	<b>Unit</b>	<b>2014</b>	<b>2015</b>
8	Broiler dressed weight	Tonnes	1 244 648	1 301 852
9	Broiler - edible offal (liver, heart, gizzards, neck)	Tonnes	100 263	104 871
10	Broiler - other offal (feet, head, intestines, lungs)	Tonnes	233 371	244 097
11	Total broiler	Tonnes	1 578 238	1 650 821
12	Turkey	Tonnes	0	0
13	Duck	Tonnes	929	1 336

	<b>Subsistence production</b>	<b>Unit</b>	<b>2014</b>	<b>2015</b>
14	Chicken	Tonnes	60 288	69 334

15	<b>Depleted flock live sales</b>	<b>Unit</b>	<b>2014</b>	<b>2015</b>
	<b>Total</b>	<b>Tonnes</b>	<b>71 982</b>	<b>71 885</b>
16	Spent broiler parent hens and cocks	Tonnes	33 208	33 356
17	Spent egg industry layers	Tonnes	38 473	38 529

	<b>Poultry imports</b>	<b>Unit</b>	<b>2014</b>	<b>2015</b>
18	Total imports	Tonnes	393 302	478 447
19	Broiler including MDM	Tonnes	368 805	457 374
20	Broiler excluding MDM	Tonnes	221 213	277 063
21	Turkey	Tonnes	24 299	20 724
22	Ducks, geese and guinea fowl	Tonnes	198	349
23	Imports as % of consumption	%	19	22

	<b>Poultry exports</b>	<b>Unit</b>	<b>2014</b>	<b>2015</b>
24	Total exports	Tonnes	66 355	72 444
25	Broiler	Tonnes	61 822	65 812
26	Turkey	Tonnes	2 253	2 084
27	Ducks, geese and guinea fowl	Tonnes	2 280	4 545

	<b>Broiler flock's stats</b>	<b>Unit</b>	<b>2014</b>	<b>2015</b>
28	Broiler breeder laying flock	hens	6 600 817	6 716 156
29	Day-old broiler chicks hatched	chicks	1 022 019 466	1 061 946 418
30	Broiler slaughtered	birds	960 376 152	1 004 515 404

	<b>Price (Net Sales Value) *</b>	<b>Unit</b>	<b>2014</b>	<b>2015</b>
31	Total realisation	R/Kg	17,1	18,43
32	Frozen	R/kg	16,13	17,72
33	Fresh	R/kg	25,48	26,38
34	IQF mixed portions	R/kg	15,25	16,97
35	Sundry	R/kg	8,37	8,13

\* Net sales value: net price after all discounts

*Source: SAPA, 2016*

	<b>Feed Price Indicator</b>	<b>Unit</b>	<b>2014</b>	<b>2015</b>
36	Broiler breeders	R/Ton	4169,03	4286,18
37	Broilers	R/Ton	4829,63	4934,22

The feed price includes distribution but excludes medication, additives and VAT

	<b>Gross Value (source DAFF)</b>	<b>Unit</b>	<b>2014</b>	<b>2015</b>
38	Poultry meat	R'000	R 34 216 286	R 38 807 151
39	Eggs	R'000	R 9 200 230	R 9 832 850
40	Total animal production	R'000	R 102 445 524	R 113 684 641
	Total agricultural products	R'000	R 220 982 565	R 233 237 242

Source: DAFF 2016 in SAPA (2016b)

Table 3.12 provides information the processed meat supply.

**Table 3.12: Summary of processed meat supply**

	<b>Processed meat supply</b>	<b>Unit</b>	<b>2014 (tonnes)</b>	<b>2015 (tonnes)</b>
42	Broiler - edible offal (liver, heart, gizzards, neck)	Tons	100 263	104 871
43	Broiler - other offal (feet, head, intestines, lungs)	Tons	233 371	244 097
44	<b>Total sundries</b>	<b>Tons</b>	<b>333 634</b>	<b>348 968</b>
45	Total processed meat supplied by local producers	Tons	1 578 282	1 864 102
46	Exports	Tons	61 822	65 812
47	Imports (broiler meat)	Tons	147 592	180 311
48	Imports (MDM)	Tons	221 213	277 063
49	<b>Total processed meat supply</b>	<b>Tons</b>	<b>2 008 909</b>	<b>2 387 288</b>

Source: SAPA (2016b) and own calculations

Table 3.13 provides information on poultry meat supply from subsistence production and spent hens.

**Table 3.13: Summary of consumption on subsistence and spent chickens**

	<b>Dressed weight of live sales plus edible offal</b>		<b>Slaughtered sales</b>	
		<b>Year</b>	<b>2014</b>	<b>2015</b>
50	Subsistence production	Tonnes	99 294	114 193
51	Spent broiler parent hens and cocks	Tonnes	54 694	54 937
52	Spent egg industry layers	Tonnes	63 365	63 457
53	<b>Slaughtered weight (Live minus feather, blood - 8.5%)</b>	<b>Tonnes</b>	<b>217 353</b>	<b>232 588</b>

Source: SAPA (2016b) and own calculations

Further calculations on exactly how much chicken meat in different forms is consumed are illustrated in Table 3.14 below.

**Table 3.14: Calculations on poultry consumption in South Africa**

	<b>Per capita consumption calculation (kg/yr.)</b>	<b>2014</b>	<b>2015</b>
54	Per capita consumption (Commercially local produced, brine excluded - slaughtered) (Colum 8 / Colum 1*1000)	23,05	23,69
55	Per capita consumption (Sundries - slaughtered) (Colum 9 + 10 / Colum 1*1000)	6,18	6,35
56	Per capita consumption: Foreign poultry (Imports (Broiler meat and MDM minus exports) (Colum 19 / Colum 1)	5,68	7,12

	<b>Per capita consumption calculation (kg/yr.)</b>	<b>2014</b>	<b>2015</b>
57	Per capita consumption (Commercially local + all imports - exports) (Colum 54 + Colum 55 + Colum 56)	34,91	37,16
58	Per capita consumption (Commercially local + all imports - exports + brine & chilled water) Colum 49/ Colum 1	37,20	43,44
59	Per capita consumption (Slaughtered: spent chickens parent stock) Colum 51/ Colum 1	1,84	2,08
60	Per capita consumption (Slaughtered: spent chickens layers stock) Colum 52/ Colum 1	1,01	1,00
61	Per capita consumption (Slaughtered live weight: subsistence farmers) Colum 53/ Colum 1	1,17	1,15
62	Total per capita consumption (Commercially local + all imports - exports + brine & chilled water + slaughtered (live sales) weight) Sum of Colum 58 to Colum 61	41,23	47,67

Source: SAPA (2016b) and own calculations

With the recalculation of consumption, the average South African citizen consumes close to 48 kg of chicken meat per year in 2015.

### 3.6.9 Value at retail level, distribution, rebates and VAT

Certain part of chicken meat is used as an anchor product in retail store, especially for the lower income group who mostly purchased IQF. Calculations have been done on two scenarios of margins for a retail store namely 3% and 12%. It is unclear how much is distribution cost and rebates. Please see Table 3.15.

**Table 3.15: Value at retail level, distribution, rebates and VAT**

		<b>VAT</b>	<b>Retail Margin, distribution cost &amp; rebate</b>	
<b>Percentage</b>		<b>14%</b>	<b>3%</b>	<b>12%</b>
<b>Fresh</b>	<b>R/kg</b>	<b>Quantity (Tonnes)</b>	<b>Value for 2015 (R)</b>	
Price at factory door	26,38	138 495	3 653 284 034	3 653 284 034
Margin for retailer, distribution cost & rebate			109 598 521	438 394 084
VAT		138 495	526 803 558	572 834 937
<b>Total for 2015</b>		<b>138 495</b>	<b>4 289 686 113</b>	<b>4 664 513 055</b>

<b>Frozen</b>	<b>R/kg</b>	<b>Quantity (Tonnes)</b>	<b>Value for 2015 (R)</b>	
Price before VAT	17,72	246 459	4 366 160 779	4 366 160 779
Imports (broiler meat)	17,72	147 592	2 614 672 085	2 614 672 085
Margin for retailer, distribution cost & rebate			78 440 163	313 760 650
VAT			R 377 035 715	409 980 583
<b>Average price for 2015</b>		<b>394 051</b>	<b>7 436 308 741</b>	<b>7 704 574 097</b>

<b>Frozen Imports MDM</b>	<b>R/kg</b>	<b>Quantity (Tonnes)</b>	<b>Value for 2015 (R)</b>	
Imports (MDM)	7,00	221 213	1 548 491 000	1 548 491 000
Margin for retailer, distribution cost & rebate			46 454 730	185 818 920
VAT		221 213	223 292 402	242 803 389
<b>Average price for 2015</b>		<b>221 213</b>	<b>1 818 238 132</b>	<b>1 977 113 309</b>

<b>IQF</b>	<b>R/kg</b>	<b>Quantity (Tonnes)</b>	<b>Value for 2015 (R)</b>	
Price before VAT	16,97	1 130 180	19 173 508 985	19 173 508 985
Margin for retailer			575 205 270	2 300 821 078
VAT (14%)		1 130 180	2 764 819 996	3 006 406 209
<b>Average price for 2015</b>		<b>1 130 180</b>	<b>22 513 534 250</b>	<b>24 480 736 272</b>

<b>Sundries</b>	<b>R/kg</b>	<b>Quantity (Tonnes)</b>	<b>Value for 2015 (R)</b>	
Price before VAT	8,13	348 968	2 837 385 978	2 837 385 978
Margin for retailer			85 121 579	340 486 317
VAT (14%)		348 968	409 151 058	444 902 121
<b>Average price for 2015</b>	<b>8,13</b>	<b>348 968</b>	<b>3 331 658 616</b>	<b>3 622 774 417</b>

			<b>R25,00/kg</b>	<b>R45,00/kg</b>
<b>Life market (Informal) (R)</b>		<b>232 588</b>	<b>5 814 692 325</b>	<b>10 466 446 185</b>

<b>Total value at retail level (R)</b>			<b>45 204 118 176</b>	<b>52 916 157 334</b>
<b>Total for retailers, distribution and rebate (R)</b>			<b>4 226 478 878</b>	<b>7 202 055 467</b>
<b>Total governmental income (VAT) (R)</b>			<b>4 301 102 728</b>	<b>4 676 927 238</b>

Source: SAPA 2016b & own calculations.

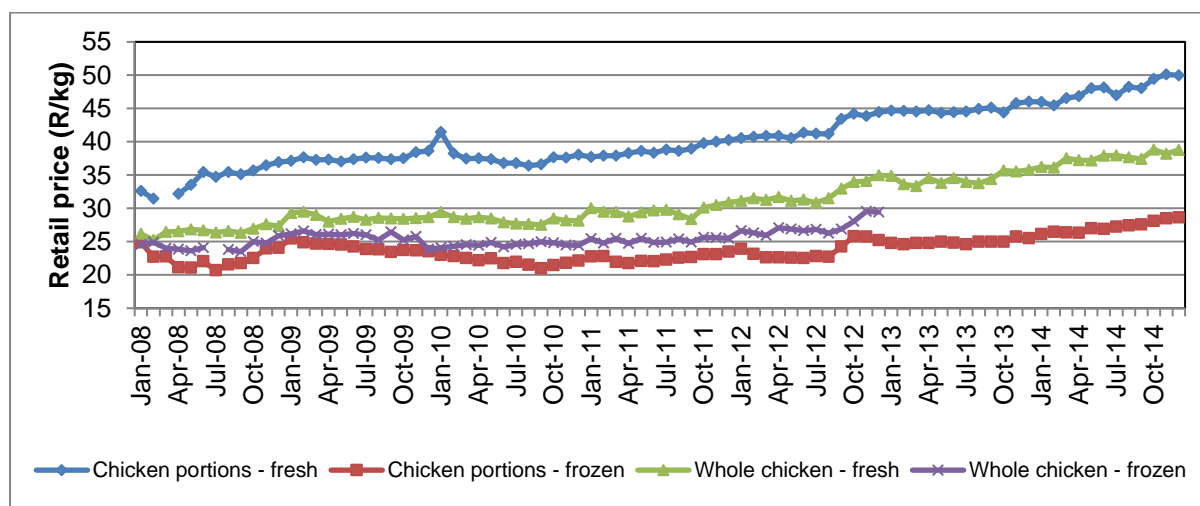
It can be assumed that the value of the industry at consumption level is between R45 and R53 billion. The industry also contributes significantly towards governmental income, between R4, 3 and R4, 7 billion rand.

### 3.6.10 Pricing & price trends

#### 3.6.10.1. Prices at retail level

The retail prices for selected poultry products are shown in Figure 3.9 below. The retail price of frozen chicken portions increased by 9.1 % between 2013 and 2014, while the retail price of fresh whole chickens and fresh chicken portions increased by 9.0 % and 6.6 %, respectively, between 2013 and 2014 (NAMC, 2015:49).

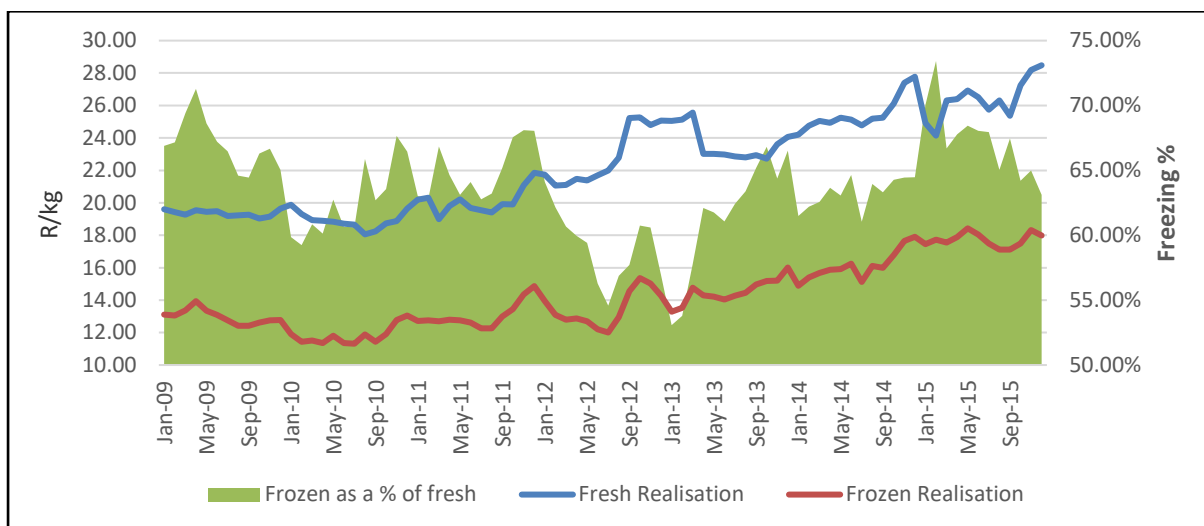
The NAMC (2015:50) indicates, as illustrated in Figure 3.9 below, that retail prices in real terms showed a sideways trend for poultry meat, except for frozen chicken portions, which displayed a decreasing trend. In real terms, the annual retail price for frozen chicken portions increased by 2.8 % between 2013 and 2014, while the price of fresh whole chickens and fresh chicken portions increased by 1.7 % and 0.5 %, respectively, between 2013 and 2014.



**Figure 3.9: Poultry retail price trends**  
Source: Stats SA (2015, cited in NAMC, 2015)

#### 3.6.10.2. Price at factory (producers) level, freezing percentage and volumes

Prices at the producer level are, in this part of the chapter, referred to as prices at factory level (SAPA 2016). Figure 3.10 below illustrates the net realisation of fresh and frozen prices at factory level (left axis) and the percentage of frozen realisation versus fresh realisation (right axis). These prices do not include volume discounts, settlement discounts, and rebates (including advertising expenditure, secondary distribution and VAT) (SAPA, 2016a).

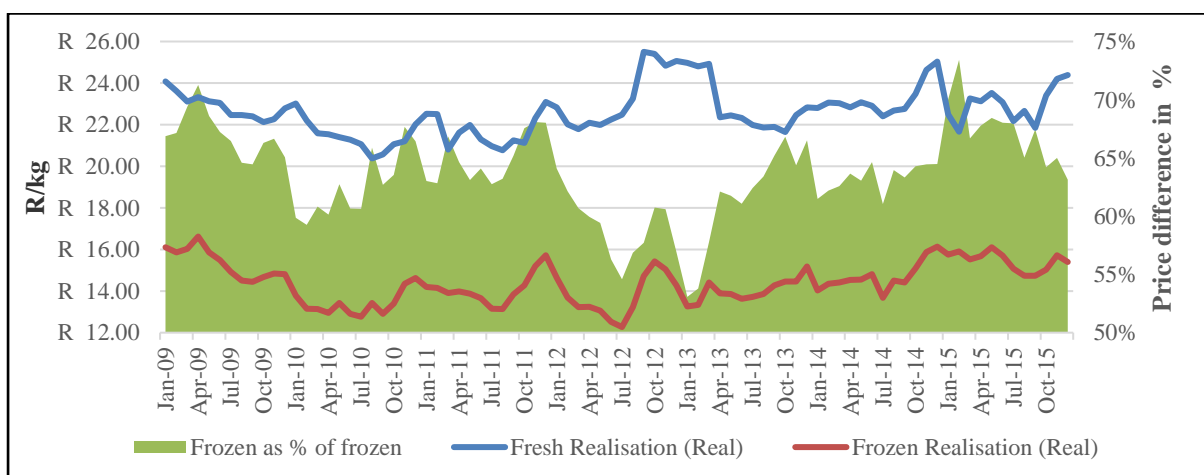


**Figure 3.10: Net realisation of fresh and frozen prices at factory level**

Source: SAPA (2016c)

The ratio of frozen meat vs fresh meat declines as the price of fresh meat increases. It also seems that the price of frozen meat follows the price of fresh meat, but with lower volatility. When fresh meat prices decrease, processors tend to freeze more, as depicted in Figure 3.10 above.

Figure 3.10 cannot be seen in isolation. Price movement is also a function of supply. Figure 3.11 below illustrates prices versus supply. The net realisation of fresh and frozen prices was deflated by the Producer Price Index (PPI). Please see Figure 3.11. The right vertical axis represents supply in tonnes.



**Figure 3.11: Deflated price realisation of fresh and frozen chicken and supply in tonnes at the factory level.**

Sources : SAPA (2016c), StatsSA (2016) & own calculation.

The net real realisation of fresh chicken meat has moved within a band of R20,38 and R25,40 per kilogram over the past six years. The net real realisation of frozen chicken meat moved within a band of R12,27 and R16,62 per kilogram over the past six years.

### **3.7 Chapter Summary**

The integrated broiler chain links with several industries. Numerous factors have a direct and indirect effect on these sectors. The value chain also indicates a well-organised system, with several bodies representing the different organisations participating in the chain.

Astral and Rainbow represent over 50 % of the total production of the industry. Companies operating in the chain are very active in endeavours to increase market share and position themselves strategically throughout the chain. Location of production facilities also plays an imperative role. The biggest production and processing facilities are in the main grain producing areas in South Africa, except for the Free State. The North West produces 24.1 %, Mpumalanga, 19.6 % and KwaZulu-Natal 13.4 %, of broilers in South Africa. This also accounts for feed manufacturing and soybean processing. The Western Cape produces 21.2 % of the country's broilers. This can be attributed to cheap imports of raw materials from Argentina. The total production of broilers is produced by an estimated 580 farms.

South African industry role players slaughter chickens at  $\pm 1,8$  kg average live mass (ALM). Blood and feathers (9 % to 10 %) are by-products, which are not consumed by our population. Blood and feathers go to a rendering plant, and the product is used in the processing for feed. The market mix consists of  $\pm 8$  % to 10 % fresh,  $\pm 60$  to 62 % IQF, and the rest is edible offal and frozen products. The total consumption by the average South African citizen of all chicken meat (broilers, spent hens, etc.), with brining, adds up to close to 48 kg per year. This figure is different from, and controversial regarding, figures published by DAFF and SAPA.

It can be assumed that the value of the industry at consumption level is between R45 and R53 billion. The industry also contributes significantly towards governmental income, between R4,3 and R4,7 billion rand. The net realisation of broiler prices increases over time. The mix between fresh and frozen is very volatile. The price transmission effect and the relationship



between price, percentage frozen and percentage fresh, needs to be investigated in further studies.

## **CHAPTER 4 :**

### **FACTORS AFFECTING THE COMPETITIVENESS OF THE SOUTH AFRICAN BROILER INDUSTRY – A PORTER MODEL**

#### **4.1 Introduction**

The competitiveness of the broiler industry is dependent on various micro-, meso- and macro-factors; therefore, understanding the key influencing factors on competitiveness is crucial, to:

- Enhance, create and provide transparent information systems in the sector.
- Enable stakeholders to position themselves optimally or to become more informed of the constraining and enhancing factors of the market at a specific time.
- Providing a basis to measure change over time and the impact of it.
- Provide information for further modelling and “what if” scenarios
- Provide information to policy makers provide them with the ability to re-align policy or change policy for the benefit of all stakeholders and the country as whole.

The methodology of the determining the competitiveness of a value chain is a quantitative approach. The author used this methodology in the past on several other value chain studies. This chapter also forms part of a project done for the Industrial Development Corporation by BFAP and the NAMC. The title of the project is: “Evaluating the competitiveness of the South African Broiler value chain.” The project was finalised in December 2016. The research of this chapter was conducted by the author for the project.

#### **4.2 Literature review**

Competitiveness of an industry or business of a country or nation is much broader than the optimal use capital, labour and land. Entrepreneurship and comparative advantage also play an important role for business to be competitive.

Worley (1996) in Van Rooyen, Esterhuizen and Doyer, (1999:4) explain comparative advantage as how a country can benefit from production and trade via the most optimal and efficient use of the resource. Trade needs to be fair and free with no restrictions and support. Competitive advantage describes the trends in trade and production. Non-tariff barriers to do business in a global environment, the effects of policy on trade and production, the differences in the quality of products, the difference in service and attributes such as marketing skills are

do not form part comparative advantage principal (Worley 1996 in Van Rooyen *et al.*, 1999). Competitive advantage reflects how businesses optimise opportunities in a environment to create and maintain a sustainable business, which results in a sustainable industry. Hough *et al.*, (2008:5) believe that a company can achieve sustainable competitive advantage when its products and services are preferred above the competition.

Van Berkum (2004:3) mentioned a few characteristics in the agricultural environment why an industry couldn't compete successfully, namely:

*“On-farm technical efficiency might be low because of Low-quality inputs (e.g. breeding livestock, seeds, land in areas with major climatic or physical disadvantages), unexploited economies of scale, low managerial efficiency (because of lack of experience, training, education) and a lack of investment.*

*Marketing efficiency might be low because of a lack of experience in marketing, unexploited economies of scale, lack of investment in on-farm storage and grading facilities, inadequate information about market prices and consumers' preferences and supply levels.*

*Market efficiency might be low because of little competition that exists at certain stages of the marketing system leading to exploitation of market power which raises prices of farm inputs and lowers prices of agricultural outputs. Inadequate competition gives rise to inflexible organisations unresponsive to market requirements price signals in the market are suppressed, farmers are not paid according to the quality of their products and do not produce what the consumers want. No commonly accepted grading systems exist which allow producers and buyers to sell/buy by description and to interpret market information regarding prices and supplies.*

*Macro-economic conditions, sometimes the result of government policies, may put suppliers in unfavourable position vis-à-vis international competitors. Notable examples include overvalued*

*exchange rates (which make domestic produce too expensive on world markets) and interest rate policies (which limit availability of investment credits);*

- *The industry might suffer none of the above particular disadvantages but is uncompetitive because of a different price structure (e.g. for labour) and/or inferior natural resources compared with those in competing countries.”*

The government can contribute and have a responsibility to enhance some of these attributes and create an enabling environment to grow. It is impossible for any government to be accountable for every sector to be competitive, especially when conditions change in a market. Policies to protect certain industries may result that certain industries can expand or contract Van Berkum (2004). Food security, self-sufficiency, job creation plays a major role in policy creation by government.

After all, Porter (1990: 7) emphasize that no country can be competitive in everything, and he also states that a nation's source of skilled and unskilled labour and other resources is not a bottomless pit. Somewhere, at a time, it gets exhausted.

Porter (1990:69) mentioned that the competition and foundation of competitive advantage vary widely among industries and business. Companies operate across the border and are not home based; they invest in other countries when the environment exists to be competitive. Companies create and gain local and global competitive advantage through better services, production processes and products through continuous upgrading, improvements and innovation. A company needs to be aggressive and adopt new technologies and create new demands. An industry or business is competitive if the industry can deliver product and service in time (Freebairn, 1987:61).

Competitiveness, on the other hand, is a dynamic concept that is strongly influenced by the macroeconomic and regulatory environment, producers and processors place on an ongoing "treadmill" in the market (OECD, 2004). Per Turok (2005), competitiveness is classified into three categories, namely the performance of cities and businesses in foreign markets (trade),

the productivity of local resources, and the extent to which resources (especially labour and land) is used.

The theory of the “Porter diamond” was adopted in identifying the drivers effecting the competitiveness in the South African broiler industry. The drivers or determinates was further divided into micro-, meso- and macro level. What is Micro, Meso and Macro?

According to Porter (1990), a few broad features affect the competitive advantage of an industry, namely:

- (i) Related industries in the chain that can provide services or products on a competitive basis to the specific business or sector. For example: a broiler industry cannot be competitive if the inputs supplied, by related industries is not competitive provided, like feed and DoC's. A feed industry cannot compete if the primary products in feed cannot be supplied at a competitive price. If transport, storage facilities, communication systems are not developed well enough it counts as a constraining factor in the system.
- (ii) The condition in terms of a country or sector to transform its raw products, its capital, its work force, its entrepreneurial skills and spirits into products and services creates competitiveness in a system. The production of intermediate products and the availability of inputs such as resources, skilled and unskilled workforce or labour, physical and institutional infrastructure is necessary to be competitive in a sector and in the world. Many countries across the globe have ample mineral resources and workforce but do not have the ability or managerial and entrepreneurial skills to manufacture or produce products and create a business environment to develop wealth at the through the value chain.
- (iii) The competition in the market, the market forces in the industry, the business environment and structure on how a sector is organised and how companies are established, have an important effect on the future and sustainability of a sector.
- (iv) The attitude and spirit of government and the policies plays a vital role in the competitiveness of a country. Policy can influence the above determinants in a positive or negative way.
- (v) The demand for locally produced products and services are important to maintain competitiveness.

- (vi) The existence or the ability to recognise a need in the market or a gap is referred to as the role of change. The ability of this occurrences is sometimes beyond normal straightforward business. It lies within the spirit amber of intra entrepreneurial skills of a business or sector.

#### **4.2.1 Structural Analysis of Industries**

The understanding of how an industry operates plays a vital role when analysing an industry. The crafting of a competitive strategy is based on how such chain function and will change in the future. Porter explain (1990:34) that there are five basic competitive forces, namely:

- The possibility of new entrants.
- The availability of generic services and products.
- The power and size of suppliers.
- The power and size of buyers.
- Competition amongst existing role players.

These five competitive forces develop an industry, for example, South Africa experiences a retail sector that is very well designed in size, that is very concentrated and compete for the best price and service in the food system. It's hard to enter the market on processing and retail level due to small margins in the system. Therefore, the power of size on the supply side and the buying side plays an important role.

#### **4.2.2 Positioning within industries**

Businesses or companies need to position themselves strategically in a environment. Strategic positioning is also essential for the sustainability of a business (Porter, 1990: 37). A good example of how businesses are positioning themselves in an industry can be found in the South African Soybean industry. South Africa exported vast amounts of soybeans especially from 2009 to 2013 (SAGIS: 2015). Throughout this period, South Africa imported the processed product, namely soybean meal or oil cake. Soybean meal is used in feed manufacturing process for poultry. Investment led to the building of soybean processing plants. These plants were built in the main production area of soybeans and broilers production.

Porter differentiates (1990: 38) between lower competitive cost advantage and differentiation of products. He is also of the opinion that competitive strategy can be a combination of different

strategies between lower cost and differentiation and a combination of it. This all depends on the target market.

#### **4.2.3 Sources of competitive advantage**

Porter (1990:40) explains that advantage to compete, develops from the methods a business organises and operates. The manoeuvres of any business can be differentiated and divided into various activities, such as marketing, sales, maintenance and repairs, research and development, designing of products or processes and financial management. Business can add value to products from the demand of intermediate and final consumers by performing these activities. The value proposition of a company or industry is determined by the quantity buyers are prepared to pay more for its products or services than the competition.

A company needs to increase the customer value proposition to maintain a competitive edge above its competitors. This can be done by performing operations that are more efficient than its competitors at a lower cost. The activities to compete in the value chain can be differentiated into primary and support activities. Activities such as logistics, manufacturing operations, marketing and sales are primary activities. Administrative and financial planning, human resources management, technology development and procurement are typical support activities (Porter, 1990:41).

#### **4.2.4 The Porter Diamond or Determinants of National Competitive Advantage**

The main reason why a sector in a country achieves success is the result of mainly four attributes which are also referred to as the Porter Diamond, namely:

##### Factor conditions:

Inputs are necessary to produce a product or provide a service to client or customer. Inputs and the environment from which it is supplied from is referred to as factors of production or input market. These inputs are labour, natural resources, capital, and infrastructure. The theory of a successful business or industry is based on the efficient application of inputs. According to the theory, countries, industries and companies have a supply with different levels of inputs. Certain countries have more resources/inputs or better climatic conditions than other countries

do. The role of factors and the application thereof is different and much more complex than as often understood. (Porter, 1990:74).

#### Demand conditions:

The need for the products or services produced must exist. The nature of demand for the industry's goods or services will determine the future sustainability of such an industry or business. The demand for products and services vary much from country to country and between different types of consumers. The demand for broilers in South Africa has increased, as discussed in the first part of the chapter, and is different from regions and countries like the EU and the USA. Porter explained that the most important influence of demand on competitive demand is the mix of the buyers' needs. Ackgun (2013) explains that buying power of the consumer is the impact that purchasers have in the industry. Buyers for poultry meat can be differentiated into the following classifications (SAPA, 2013):

- Retail (52 %).
- Wholesale (35 %).
- Quick service restaurant (7 %).
- Other domestic buyers and institutional organisations (6 %).

Kirsten (2009:2) believes supermarkets in South Africa have created dominance through their buying power, and therefore can determine the terms of trade. This can have an impact on food security and the rural landscape in South Africa. The demand for the different products of chicken meat also differs a lot. Raw chicken meat trade is classified into two major categories, namely white and dark meat (Rabobank, 2014:3). Customers have the bargaining power when they can buy in bulk and when they can switch to different suppliers (Ackgun, 2013).

#### Related and supporting industries:

Porter (1990:76) explains that the existence of interrelated industries also has an important role on the competitiveness a country. For example, the ability and cost for a sector or business to supply intermediate products can enhance or constrain its capacity to compete internationally. These industries or businesses also need to have a competitive edge on an international level. In South Africa, the broiler industry is a good example of this. Approximately 70 % of the total cost to produce a chicken consists of feed and day-old- chicks (DoC). Although the grand-grandparent materials for DoC reside abroad, South Africa is relatively competitive against the



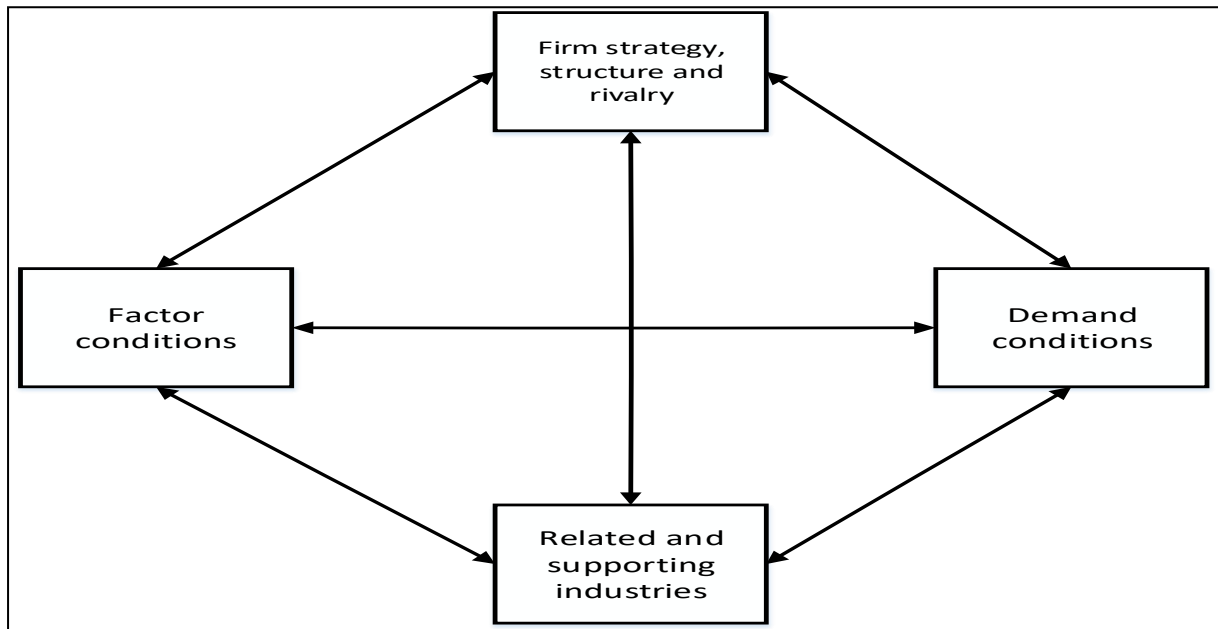
rest of the world regarding the cost and quality of DoC. The two biggest ingredients in the feed are maize and soybean meal. South African has been a net exporter over the past few years of maize and therefore, is competitive enough to support the industry. South Africa is a net importer of soybean meal. Processing capability has increased much over the past few years. If this trend continues until a certain point where South Africa produce enough soybean meal and stay competitive, it will further enhance the competitiveness of the broiler industry. Louw *et al.*, (2011) also explain that these markets are exposed to various risks including price volatility on the input and output side, high capital requirements, the inherent business and climatic risks of different sub-sectors, and various other challenges. These factors have a significant impact on decision making. They must cope with price cost squeezes from a buyer's and a seller's points of view. The NAMC (2012:10) also refer to supporting and relating sectors as sectors providing information, development programmes, training, programmes, research and development research, technology development and much needed in South Africa skills transfers and development for small-scale farmers. Government and government related sectors like ARC, BFAP, DTI, IDC and NAMC plays an important role in several ways to support industries on a direct level.

#### Business strategy, structure, and the competition.

The condition and requirements on how companies or sectors are created, governed, organised and managed have an impact on the competitive advantage of the company or industry. Government policy places an important role to create an environment to enhance competitiveness as well as initiatives to improve competitiveness on an international level. The straightforward example is in foreign exchange control and foreign direct investment (Porter, 1990:109). The broiler industry in the South African context is built on concentration; this is in fact economies of scale. This is due to very low margins and high competition. South African processors also brine certain parts of poultry meat. This is a very controversial topic in South Africa. Processors argue that they add value to the meat and the meat is tastier. It also allows processors to sell meat cheaper per kilogram. Regulations regarding brining are currently under review (Business Day Live, 2015).

Figure 4.1 below illustrates the Porter diamond in the diagram. The determinants are the pillars of the Porter diamond and create the context in which businesses in a country can be competitive. A company gains a competitive advantage when the home base allows:

- Support and rapid accumulation of specialised assets and skills, and sometimes due solely to greater commitment;
- Better information and insight into products and processes; and
- When the goals of owners, managers and employees support intense commitments and sustained investment (Porter,1990:71)



**Figure 4.1: The Porter Diamond**

Source: Porter (1990:72)

Porter (1990:120) believes that a further two attributes are necessary for a country or sector to be successful in business namely:

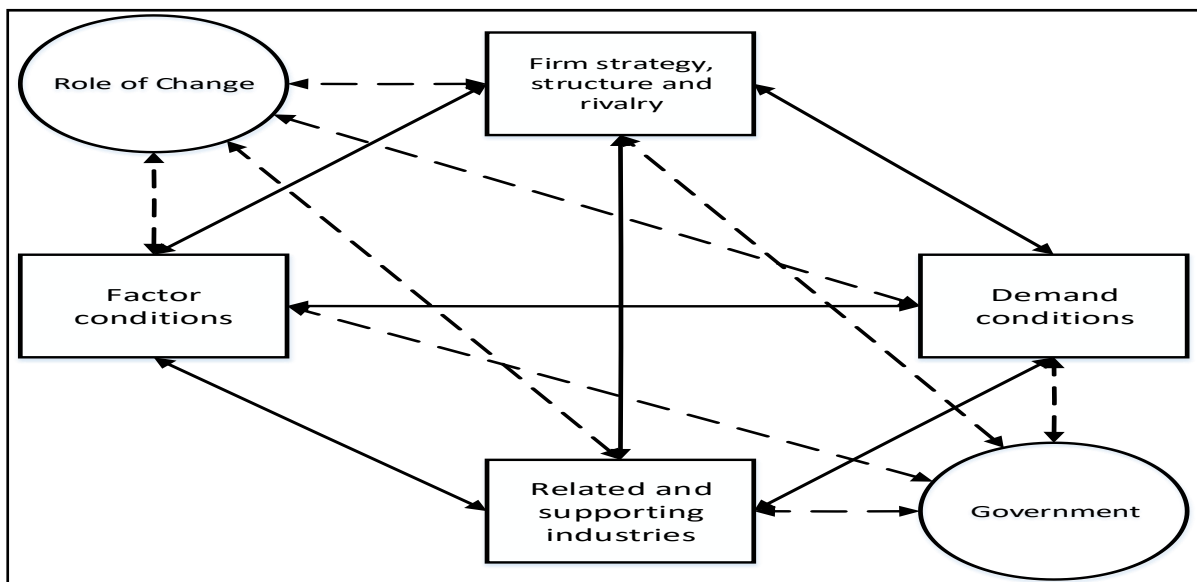
Invention, entrepreneurship, and change

Creativity or invention and entrepreneurship are also referred to as the role of change at the heart of competitive advantage. Some people are convinced that these acts are mostly random; a visionary or an inventor might be in any nation, which means that the birth of a world-class industry can take place anywhere. Porter (1990:126) further elaborates the point that research shows that neither entrepreneurship nor invention is a random assigning a role to chance does not mean that industry success is wholly unpredictable. Not every person in the world is the same. Not everyone has entrepreneurship and the ability to start and create new things, therefore not every company, business or nation are the same.

### The role of government

The government plays a significant role in international competitiveness. Many see it as a vital, if not the most important, influence on modern international competition. The role of the government in national competitive advantage is to changing the four determinants. This is schematically illustrated in Figure 4.2 below. The government can affect each of the four determinants. Factor conditions are affected by subsidies, policy towards the capital markets, policies towards education. The government also shape local demand conditions. Government bodies establish local product standards and regulations that mandate or influence buyers' needs. The government also buy and use many products from the private sector.

The government can enhance and shape the environment of industries supplying inputs in many ways, such as control incentives schemes, marketing restriction, supporting and regulation of supporting services. Policy from government can also influence business strategy, structure, and competitiveness, through initiatives such as capital market regulations, tax policies, and anti-trust laws. The positive and negative roles of government in the process of creating competitive advantage or are highlighted and clarified by seeing government as part of the Porter Diamond If the government is the only influence in competitive advantage, then the policy will fail at the end. The government needs to reinforce the underlying factors to enhance competitive advantage by applying a policy that contributes to competitive advantage. (Porter, 1990:128) as illustrated in Figure 4.2.



**Figure 4.2: The extended Porter Diamond.**

Source: Porter (1990:127)

Producers and businesses are responsible for the production and marketing of their products and services, for the efficiency and cost-effectiveness of their operations, while the government is responsible for creating the right environment, institutional & physical infrastructure, laws & regulation in which these ventures can operate effectively. The government, therefore, will increase competitiveness by ensuring the proper environment that work for an economy.

Ortmann (2005:1) has stated that the South African Government needs to focus on optimising its scarce resources by providing physical and legal infrastructure. The improvement of transport and communication is essential. Property rights need to be secured and the enforcement of contract if necessary. Risk and transaction cost in the market place will decrease. The relaxation of restrictive labour laws is necessary to increase employment. The reduction of uncertainty regarding land claim is a constraining factor for companies to invest.

#### **4.2.5 The Diamond in perspective**

The determinants in the diamond and the interactions amongst them create the forces that shape an industry and create wealth. The availability and interpretation of information are central to the process of establishing and maintain a competitive edge or advantage. The competitive edge of an industry grows out of conditions in an environment that signal, channel, or steer its businesses to optimise opportunities for improvement and innovation and move early and in the proper direction to capitalise on the opportunities (Porter, 1990:173).

The diamond can also be used to predict future industry evolution. The industry has the prospects for competitive advantage if the underlying fundamentals are favourable or have the potential to develop them. (Porter, 1990:173).

#### **4.3 Data collection, questionnaire, methodology, and respondents**

Competitiveness in this context is defined as: *'The ability of your business to maintain or increase market share in a profitable manner, and in a sustainable way in the long run'* (Stroebe et al., 2009).

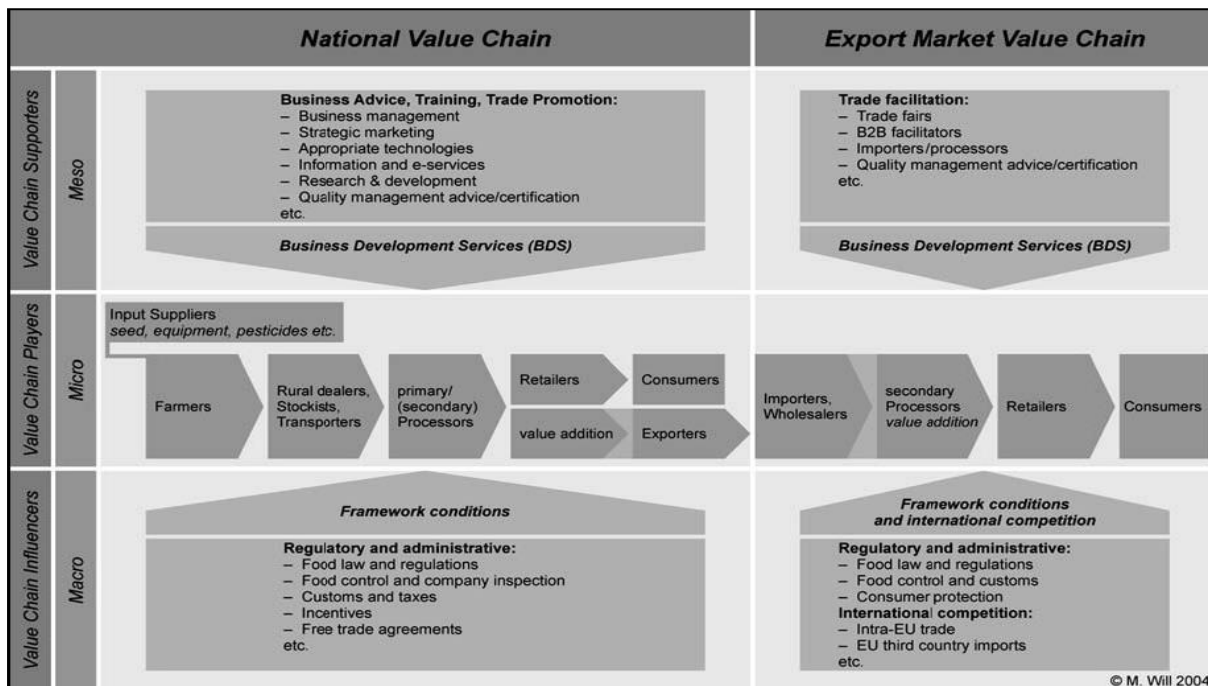
The first step of the study was to map the chain and determine the drivers that influence the factors of competitiveness. This was done using interviews with industry specialists and a literature review. The different types of stakeholders were identified. The stakeholders were classified in the following groups:

- Producers
  - Commercial broiler producer (not on contract basis)
  - Broiler producer (on contract basis)
  - Small-scale broiler producer (less than 10 000 capacities per cycle)
  - Indigenous broiler producer
- Input Supplier
  - Supplier of feed
  - Supplier of equipment and machinery
  - Supplier of fixed equipment (housing, silos, conveyors, etc.)
  - Suppliers of veterinary services
  - Supplier of transport services
  - Supplier of other services (e.g. catching)
  - Supplier of other goods and services
- Information & consultation
  - Suppliers of data, reports and information
  - Suppliers of financing, advices and consultation
  - Institution doing research and development
- Processors
- Importers and Exporters
- Wholesale, Retail and Fast Food Chicken meat wholesalers

A comprehensive questionnaire was developed and distributed, using Survey Monkey, to the different stakeholders. The response rate was 14 %.

#### **4.4 Construction of the questionnaire**

Roduner (2005) has distinguished between the various participants in an industry, grouping them at either micro-, macro- or meso level (see Figure 4.3 below). The questionnaire is reproduced in Appendix 2.



**Figure 4.3: Industry players, supporters and influencers**

Source: Will (2004), as cited in Roduner (2005)

**Level 1 (micro level)** consists of ‘industry players’ – those directly involved with the primary product. The factors impacting on the micro level relate to issues that can be managed by each role player in the industry’s direct business environment. This level also refers to the coordination of the value chain and the level of competition amongst role players.

**Level 2 (macro level)** consists of ‘industry influencers’ – those responsible for regulatory and administrative conditions, as well as global and local economic and trade specifications and trends, together with change factors such as the exchange rate and the political environment.

**Level 3 (meso level)** consists of related industries providing intermediate products and services, such as feed manufacturers, DoC’s chemicals, transport, electricity, coal for heating, information, training and other support functions.

For this study, a generic questionnaire was designed for each group and distributed to role players via electronic media, and the data received in response were then processed and analysed. The questions were constructed in such a manner as to assign a weight to understand if the factors are a high constrainer or enhancer. In each instance, level 7 signifies an enhancing

factor, and level 1 signifies that the factor is a constraining factor. Table 4.1 below depicts the factors identified as having a possible influence on the industry.

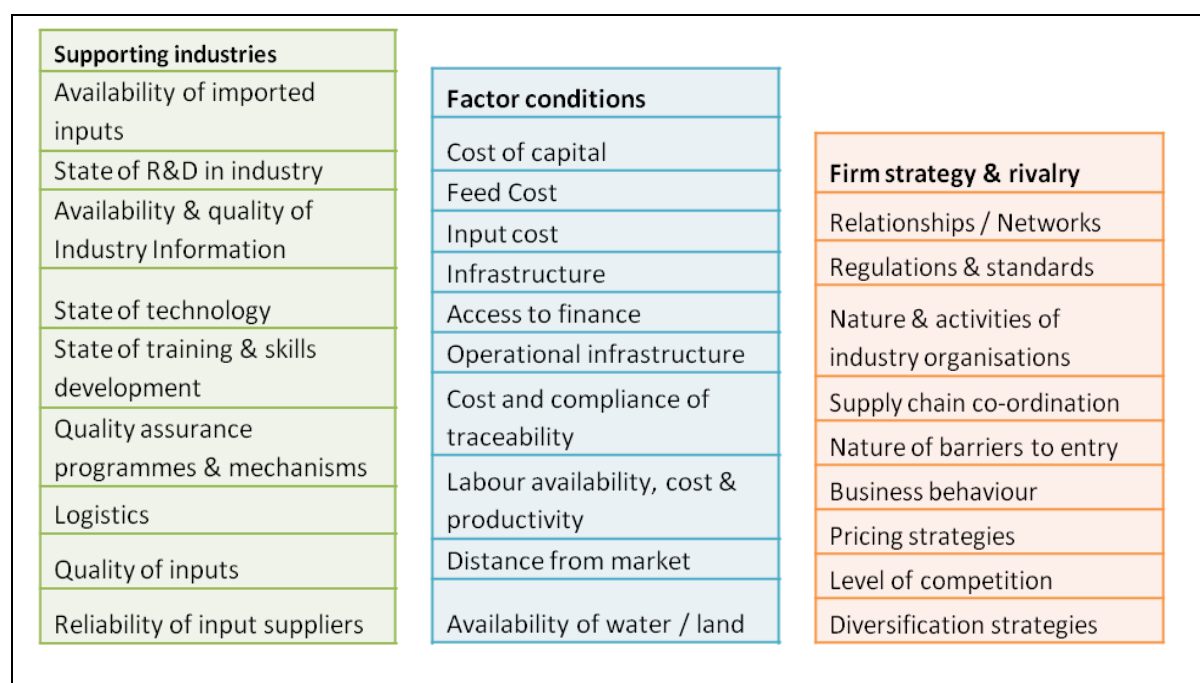
**Table 4.1: Factors affecting the competitiveness of the poultry broiler industry**

<b>Macro factors</b>	<b>Meso factors</b>	<b>Micro factors</b>
Change in input cost	Access to government support & PPP	Pricing strategy of role players
Changes in administered prices	Price of input products produced in SA	Cost of feed
Import/export environment	Availability and quality of imported inputs	Cost of energy
Labour laws	Relationships/networks chain	Cost of labour
State of infrastructure	Industry information	Labour productivity
State of political climate	Capacity and ability of input suppliers	Business behaviour: upstream & downstream
Cost of crime	The current quality assurance programmes and mechanisms	Distance from the market
Municipal by-laws	State of technology	Level of competition
Purchasing power of consumers	Quality and standards of chicken meat	Barriers of entry
Administration procedure & cost	Industry organisations	Availability of water
Environment laws & regulation	Training and skills development	Availability of land
Change in input cost	Access to government support & PPP	Pricing strategy of role players
Changes in administered prices	Price of input products produced in SA	Cost of feed
Import/export environment	Availability and quality of imported inputs	Cost of energy
Labour laws	Relationships/networks chain	Cost of labour
State of infrastructure	Industry information	Labour productivity
State of political climate	Capacity and ability of input suppliers	Business behaviour: upstream & downstream
Cost of crime	The current quality assurance programmes and mechanisms	Distance from the market
Municipal by-laws	State of technology	Level of competition
Purchasing power of consumers	Quality and standards of chicken meat	Barriers of entry
Administration procedure & cost	Industry organisations	Availability of water
Environment laws & regulation	Training and skills development	Availability of land

<b>Macro factors</b>	<b>Meso factors</b>	<b>Micro factors</b>
HIV / Aids	Research and development in the industry	Cost of DOC
Land & water reform	Quality and availability of locally produced inputs.	Quality of water
Exchange rate	Available quality of veterinary services	Infrastructure in your business
Cost of capital	Biosecurity management	Access to finance
Competition regulation		Cost of traceability
AgriBee		Supply chain activities
Current local market		Quality of DOC
Consumers act		Labour availability
Size of export market – world		Logistics
Size of export market – SADC		Availability of DOC
Consumer tastes & preferences		Diversification of your business
		Quality of feed
		Availability of feed

Source: Own compilation (2014)

The regrouping of the relevant factors is a necessary step to incorporate the Porter Diamond model, as illustrated in Figure 4.4 below.





<b>Government</b>		
Labour laws & regulations		
Municipal by-laws		
Land & water reform	<b>Demand cond.</b>	<b>Role of chance</b>
Import/export environment	Purchasing power	Exchange rate
Food safety& consumer laws	Growth of informal market	Political environment
State of bio-security management	Size & growth of market	Cost of crime
	Changing consumer trends	HIV / Aids

**Figure 4.4: Industry players, supporters, and influencers in the value poultry value chain**  
Source: Own compilation (2014)

See Appendix 2 for the questionnaire.

#### 4.5 Response rate

Questionnaires were submitted to 122 stakeholders in South Africa. Some members did not want to participate owing to fear of breaking competition laws. The study was also registered with the competition authorities. A total of 17 participants responded to the questionnaire. Although the response was not satisfactory, some significant conclusions could be made.

#### 4.6 Results and discussion

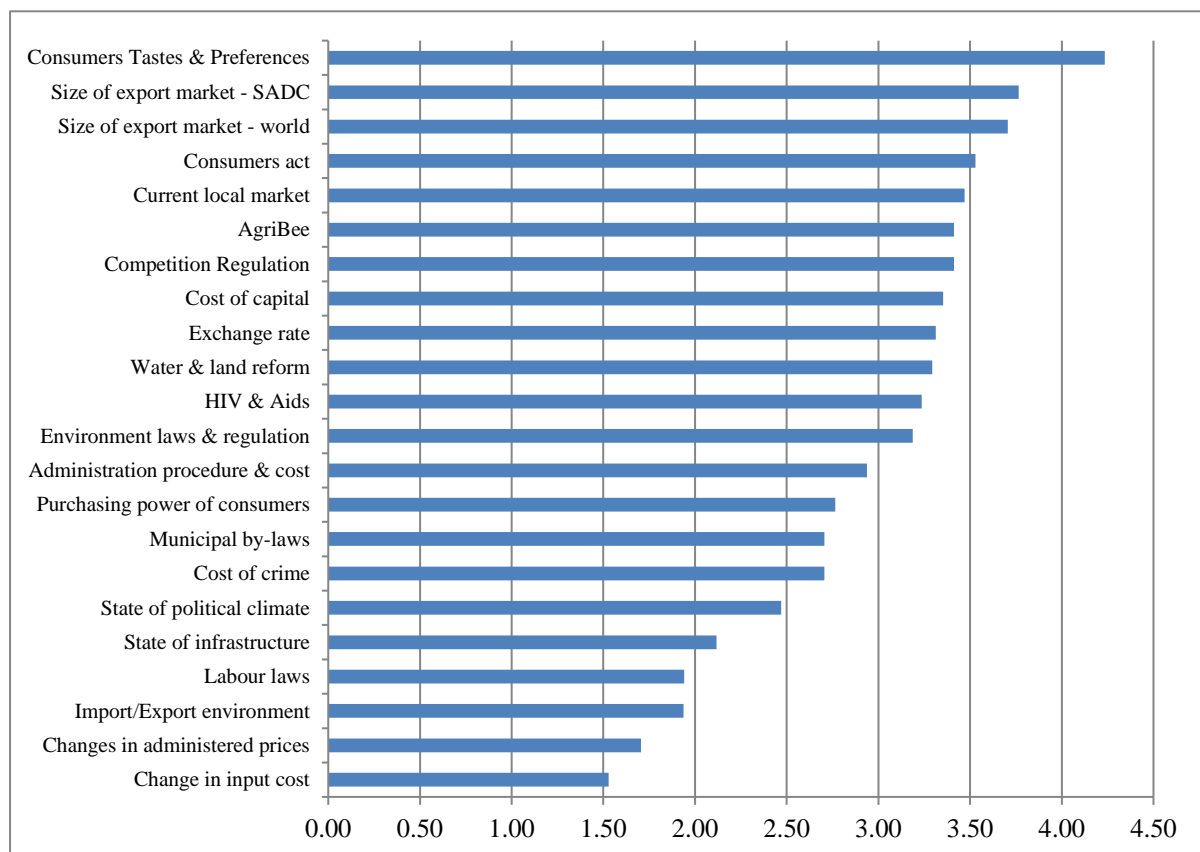
##### 4.6.1 Macro-environmental factors constraining and enhancing the poultry broiler industry

The respondents indicated their perceptions and experiences as per a scale. The scale has indicators from 1 to 7. A very high constraining factor received a score of 1. A score of 2 and 3 is not as severe as a 1 but is constraining factor. A score of 4 indicates a neutral status. Indicates a less serious effect. Indicator. A score of five (5), (6) or (7) was allocated if a factor was perceived to make a significant contribution towards enhancing the competitiveness of the business.

Figure 4.5 below depicts the most enhancing and the most constraining macro-environmental factors affecting the poultry broiler industry, ranked on the industry average rating per the responses from the survey.

The sector did not provide a score that indicates convincing enhancing factors. Most enhancing factors, include consumers’ tastes and preferences, the potential of the South African Development Community (SADC), the size of the global export market, the consumer’s act and current conditions in the domestic market.

Infrastructures, labour laws, import and export environment, the state of infrastructure, the import and export environment, changes in and input cost are constraining factors in the broiler industry. It is also important to take note of the other constraining factors such as local laws by the local authority to do business and cost of crime.



**Figure 4.5: Macro-environmental factors enhancing/constraining the competitiveness of the poultry broiler industry in South Africa**

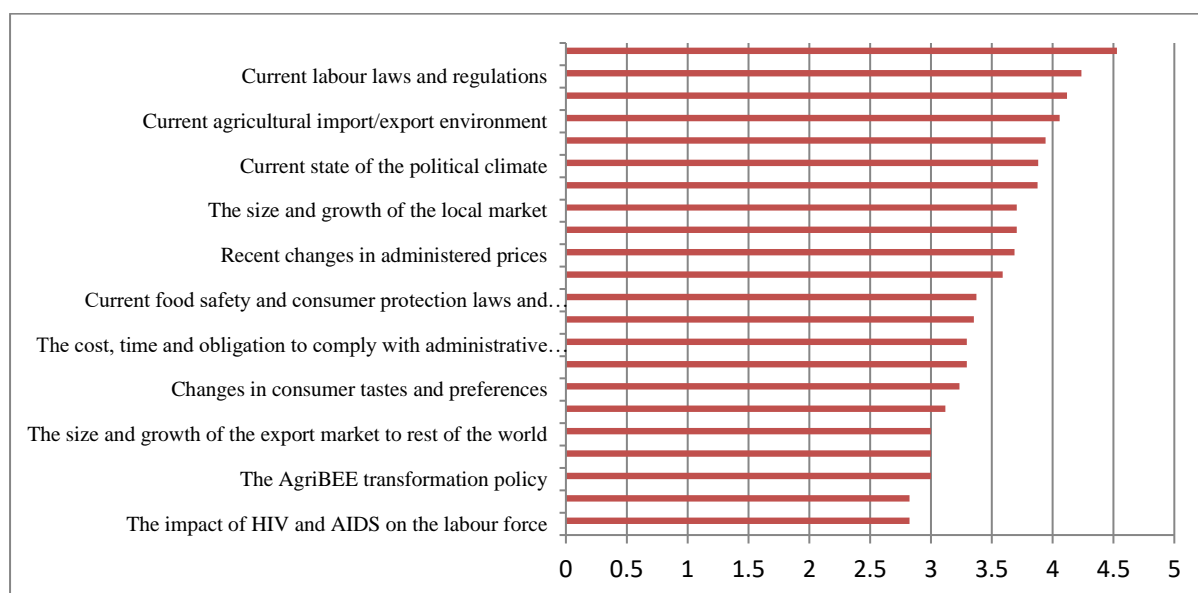
(1 = most constraining, 7 = most enhancing)

Source: Own calculation (2014)

#### 4.6.2 Weighing of the macro-environmental factors

Figure 4.6 below shows that input costs, labour laws, the purchasing power of the consumer, the import and export environment, infrastructure, and political climate are the factors of highest importance. The national authority needs to look to improve infrastructure, change the way our labour legislation works, and increase the efficiency of local authority

The enhancing factors in the broiler industry also needs attention due the score improve, there are a few factors highlighted that constrain the industry. The impact of HIV/AIDS, the Competition Act, the AgriBEE Transformation Policy, the export market, and the environmental by-laws needs urgent attention.

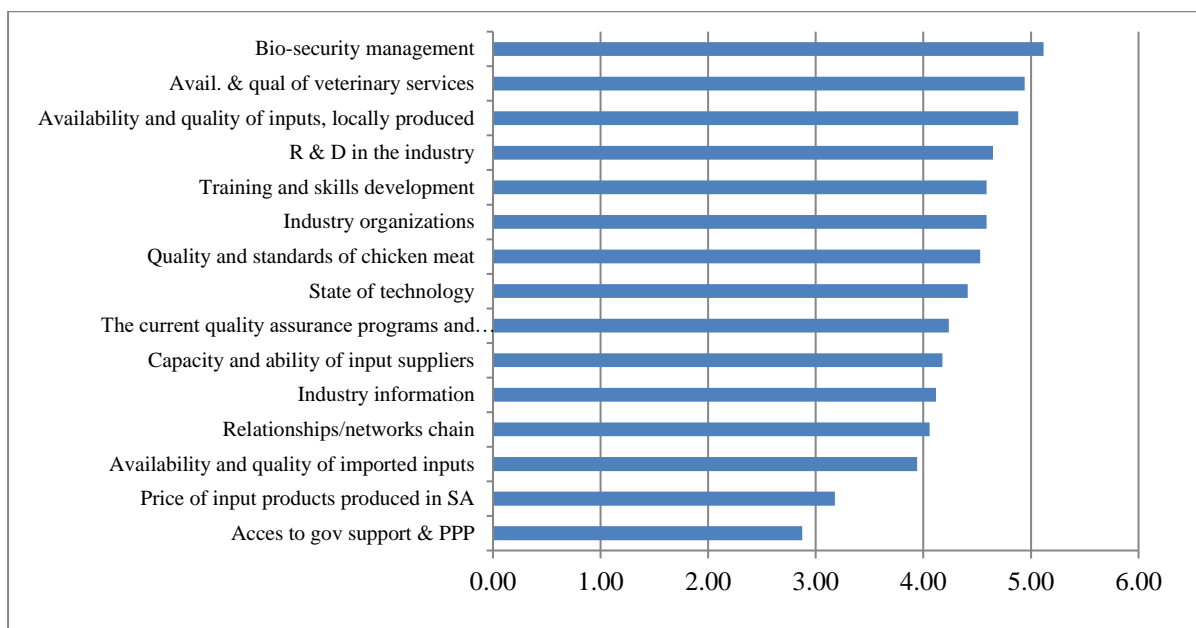


**Figure 4.6: Weighing of the macro-environmental factors ((5 = highest weight, 5 = lowest weight)**

Source: Own calculation (2014)

#### 4.6.3 Meso-environmental factors constraining and enhancing the poultry broiler industry

The combined impact of biosecurity management, veterinarian and R&D services within the broiler industry were found to be the most enhancing, as illustrated in Figure 4.7 below.

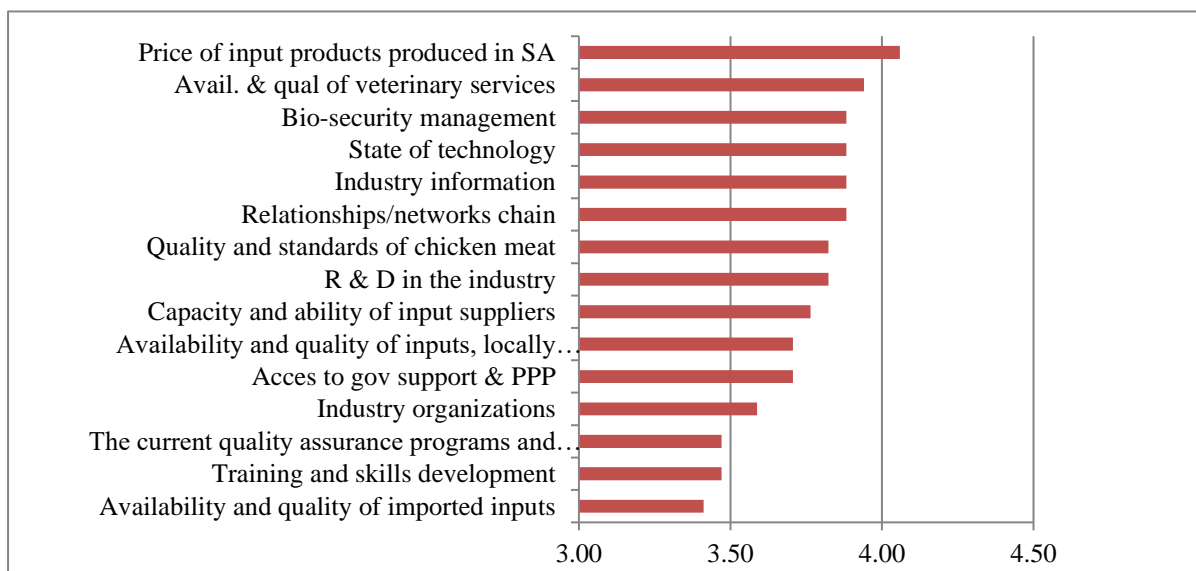


**Figure 4.7: Meso-environmental factors affecting the competitiveness of the South African broiler industry. (1 = most constraining, 7 = most enhancing)**

Source: Own calculation (2014)

#### 4.6.4 Weighing of the meso-environmental factors

Figure 4.8 below shows that input costs, veterinary services, and biosecurity management are the meso-environmental factors of high importance. Availability and quality of imported inputs and current quality assurance are some of the factors with lower importance.

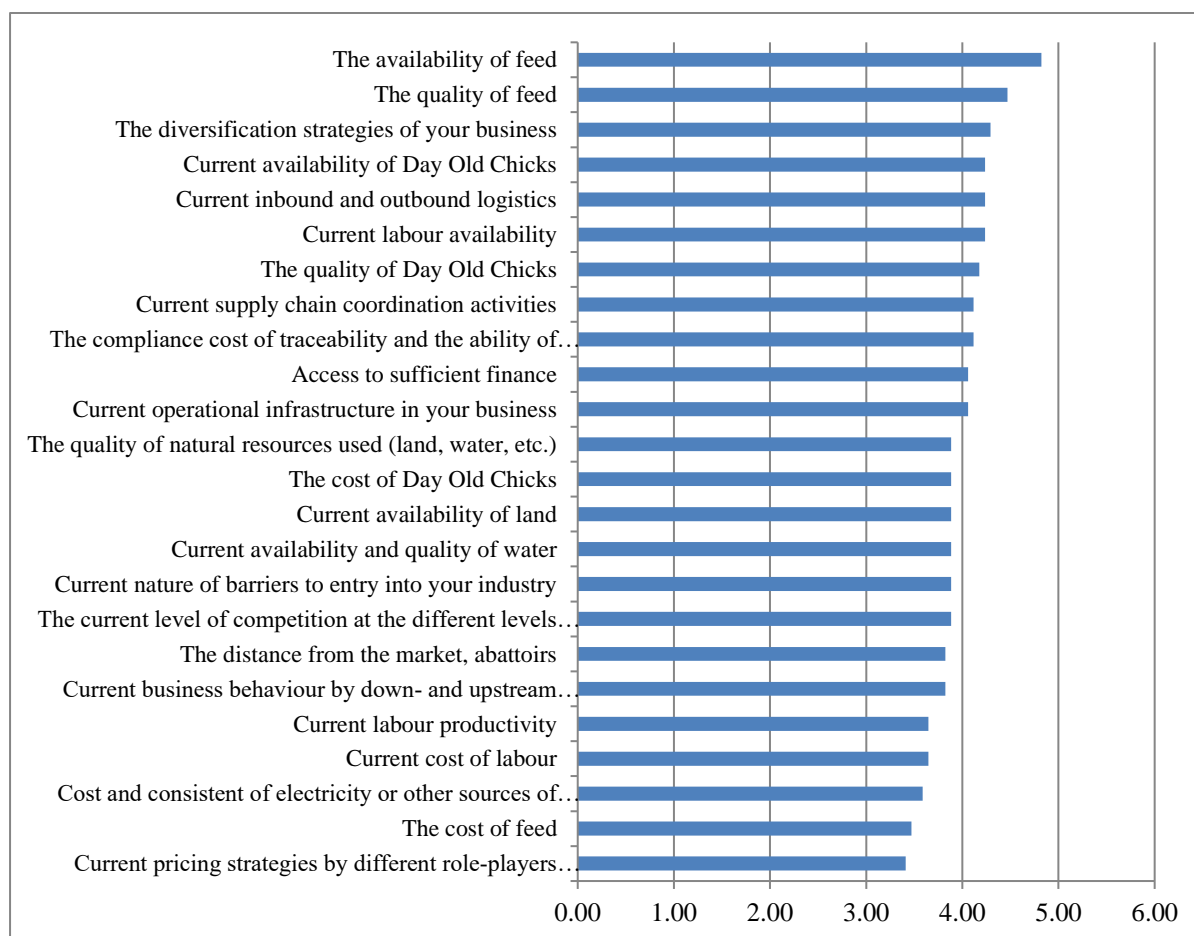


**Figure 4.8: Weighing of the meso-environmental factors (5 = highest weight, 5 = lowest weight)**

Source: Own calculation (2014)

#### 4.6.5 Micro-environmental factors constraining and enhancing the poultry broiler industry

The micro-environment (industry players) was found to have an above-average impact on the industry. The availability and quality of feed, diversification strategies, and the availability of day-old chicks enhance the industry at the micro-level. Pricing strategies of different stakeholders, feed costs, and the cost of labour and productivity were found to be the most constraining factors, as illustrated in Figure 4.9.

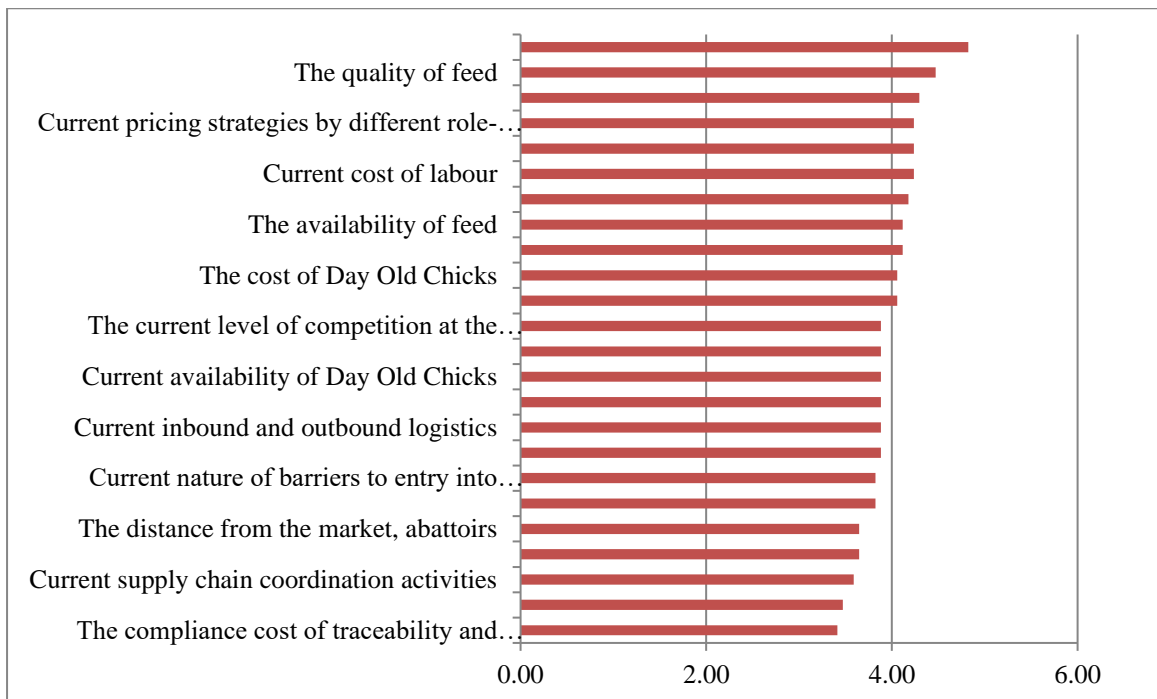


**Figure 4.9: Micro-environmental factors affecting the competitiveness of the South African broiler industry. (1 = most constraining, 7 = most enhancing)**

Source: Own calculation (2014)

#### 4.6.6 Weighing of the micro-environmental factors

Figure 4.10 below shows the importance of factors on a micro level. The cost of feed and quality is very important. Administered prices also play an imperative role.



**Figure 4.10: Weighing of the micro-environmental factors. (1 = most constraining, 7 = most enhancing)**

Source: Own calculation (2014)

The cost and quality of feed, electricity, and pricing strategies are the factors of high importance. The cost and the productivity of labour play an important role, as do the quality and cost of DoC. These factors are very important for securing the sustainability of every business. The compliance costs and traceability and diversification strategies are some of the factors with lower importance which play a role, but are not seen as very important for increasing the competitiveness of the industry.

#### 4.7 Chapter Summary

This report serves to illustrate qualitative aspects on the macro-, meso- and micro environment of the South African broiler industry. High levels of integration and concentration are evident in the South African broiler value chain. This concentrated market structure is arguably a result of extreme cost pressures and narrow margins that have forced smaller producers out of the market, while large, integrated holding companies have survived because of economies of scale benefits, as well as cost reductions resulting from vertical integration. These companies have been able to stay competitive by diversifying production, adding value and improving efficiency on a continuous basis.

The poultry broiler industry has potential to grow and increase the contribution towards several factors like employment, GDP and towards the welfare of the country. This can be achieved by an effort from the public and private sectors.

The findings of this chapter serve as indicators to guide the industry to manage the various factors to improve the competitiveness of the industry. Several policy shifts can enhance the competitive of the industry. Industry role players indicate clearly what the most importing factors to increase competitiveness are:

- Input cost/production cost: The current cost of production is also seen as a vital factor in the competitiveness of the industry. A question to be asked is what can be done to decrease cost and increase productivity. Several factors affecting input costs contribute to these phenomena, namely:
  - The cost of feed: The major cost components of feed are the world price of soybeans and maize, and local stock levels and production. South Africa needs to move into a situation where it is self-sufficient in the production of all the ingredients of feed, and therefore become a net exporter of maize and soybeans. In normal years, South Africa produces enough maize and is a net exporter. This keeps feed at export parity levels, which contributes to lower feed costs. South Africa needs to increase production of soybeans and processing capacity. Although processing capacity of soybeans has increased over the past few years, South Africa remains a net importer of soybean meal. Several factors contribute to the increase of the processing capacity of soybeans.
    - Role players in the industry identify a need in the market for better effectiveness, to decrease feed cost and to utilise locally produced resources more optimally. This have a further potential of higher and better profits in the market.
    - The DTI also introduced incentive schemes on the processing side of soybeans.
    - Tariff protection also exists for the soybean industry. It indicates that government is serious about the whole value chain and understands the importance regarding food security and sufficiency.

- The volatility of the exchange rate: Grain and oilseed prices are derived from world prices. A volatile exchange rate makes it difficult to plan accordingly and contributes to uncertainty. A more stable political environment can enhance this factor.
- The cost of administered prices. The costs of administered prices have increased over the past few years, for example, levies on fuel, electricity costs, toll fees, and taxes on property and companies.
- Day-old Chicks: The cost and quality of DoC play a very important role. South Africa does not produce its own grand-grandparent material. What can the industry do or what research is necessary to move to a level for South African production to happen?
- The quality of feed: Feed plays a vital role in the industry. Although regulations exist on the quality of feed, the question remains whether the enforcement of the regulations is up to standard.
- Electricity supply: The consistency and consistently increasing price of electricity supply comprise probably one of the most controversial topics in South Africa. The government needs to increase the supply of electricity and to maintain a constant supply of electricity at a reasonable cost.
- Price formation: The pricing strategy of different role players is also seen as an important factor. The question to be asked is how transparent these strategies are and what can be done to increase transparency. Does the industry need a new price-forming mechanism? The industry is also known as a concentrated industry, especially on the processing level. Does this enhance or constrain the competitiveness of the industry? It is recommended that further studies need to analyse this in the industry.
- Water supply: The quality and the availability of water plays an important role. How do local authorities comply with this requirement and can they be held accountable for the neglecting of South Africa's water resources? The quality and availability of water are important to the industry.
- Infrastructure: Some parts of the processing and feed manufacturing infrastructure are old and need to be replaced. Financial constraints prohibit this, which is a constraining factor in improving the competitiveness of the industry.
- Import and export environment: Free trade agreements pose a huge threat and leave South Africa open for dumping. Official programmes on the development of export



markets also need attention. South Africa only exports to Lesotho and Swaziland, with limited quantities being exported to other neighbours. Certain chicken cuts are in significant demand by other countries and receive special premiums. This market needs to be exploited and developed.

- Labour law: The current labour law system is not seen as an enhancing factor in the industry. This area needs a revisit.
- Relationship and networking in the industry: Cohesiveness and institutional arrangement plays a very important role. The industry needs to work together on a macro level promoting the growth of the local industry and develop an export market.
- Pricing strategies: The different pricing strategies of the different companies are a constraining factor.
- Labour productivity: The cost of labour and the productivity return is also seen as a constraining factor.

## **CHAPTER 5 :**

### **THE EFFECT OF POLICY AND ANALYSIS OF THE COMPARATIVE ADVANTAGE OF THE SOUTH AFRICAN BROILER INDUSTRY**

#### **5.1 Introduction**

The broiler industry receives significant attention and publicity due to its magnitude and importance regarding food security, labour component and the ability to be a start-up industry for small-scale and emerging farmers. The way policy is structured usually influences the competitiveness of business, and the way resources are allocated throughout an economic system. Government use agricultural policies to establish certain development objectives. With the above, the importance of efficiency is left behind although it is necessary to improve the economic opportunities available to the majority of the population on a sustainable basis. In the long run, the only survivor is efficiency and optimal allocation of resources (Tsakok, 1990:48). Thus, the question and concern regarding the broiler industry is if it has a right to existence and what the impact is of policy on the industry?

This chapter, therefore, attempts:

- to analyse the effect of policy on the South Africa broiler industry; and
- to determine if the broiler industry has a comparative advantage.

The Policy Analysis Matrix (PAM) methodology was used because it provides answers on the specific research objectives at a specific time. The results can be compared with previous results and other industries. It also provides a foundation for future comparison and attempt to provide a better understanding of the factors that influence profitability, sustainability and comparative economic advantage. The Domestic Resource Cost (DRC) analysis, calculated from Policy Analysis Matrix (PAM) is a useful methodology to understand the optimisation resources in a region or country. The PAM define; profitability, comparative advantage and policy distortions (Hassan and Faki, 1993:9).

The methodology of the PAM and calculation of the DRC is well known and is used in several other value chain studies conducted by the author. This chapter also forms part of a project done for the Industrial Development Corporation by the NAMC in conjunction with BFAP. The title of the project is: “Evaluating the competitiveness of the South African Broiler value

chains. The project was finalised in December 2016. The research in this chapter was conducted by the author for the project. The project was finalised in December 2016.

## **5.2 Literature review**

The first section of the literature review will provide an overview of the difference between competitive and comparative advantage, the second section provides an overview of the PAM. The third section discusses how the economic values were calculated and the fourth section provides empirical research where the PAM was used in the past. It also addresses the lessons that can be learned and indicates why the PAM was used in this research. The fifth and final section looks at some of the limitations of using the PAM.

### **5.2.1 Competitive advantage versus comparative advantage**

Gupta (2009:1) argues that competitive advantage is an advantage over competitors gained by offering consumers greater value, either by using lower prices or by providing greater benefits and services that justify the higher prices. He also mentioned the following (Gupta, 2009:9):

*“Porter (1985:9) emphasised competitiveness, at the level of a firm, in terms of competitive strategies, such as low cost and product differentiation. However, his description of competitiveness did not entail a formal conceptual definition. As noted by Cho (1998), ‘Despite all discussions on competitiveness, however, no clear definition or model has yet been developed. There is even ongoing debate about the “entity” of competitiveness.’ Hoffman (2000) developed a definition of sustainable competitive advantage (SCA) based on Barney (1991), together with dictionary meanings of each term as ‘An SCA is a prolonged benefit of implementing some unique value-creating strategy, not simultaneously implemented by any current or potential competitors, along with the inability to duplicate the benefits of this strategy. Obviously, this definition emphasises competitive advantage of a firm based on firm-specific factors and thus ignores macro aspects of comparative advantage.”*

A clear difference exists between competitive advantage and comparative advantage or also known as comparative economic advantage (CEA). Many economists believe when they

compare two different regions or products, and the one product or region perform better than the other, it has a comparative advantage. Comparative advantage is unique to a specific region. A region has a comparative advantage above another when the net margin of its business system is higher due to factors such as cheaper labour, better climatic and soil conditions, and distance to markets. Comparative economic advantage (CEA), or analysis, determine the economic efficiency of alternative productive uses of scarce land, labour, capital and water resources within a country or region (Jooste and Van Zyl, 1999:2). Hassan and Faki (1993:6) state that for any product to attract different resources, such as research and capital, it must show a comparative advantage over alternative products that are available. Consequently, principles of CEA ought to guide economic policy reforms to direct resources to their most productive use (Jooste and van Zyl, 1999:xi). A detailed explanation of the methodology of the CEA analysis can be found in Monke and Pearson (1989).

## 5.2.2 The PAM and Comparative Economic Advantage

The PAM measures the impact of policy on competitiveness at farm-level. It also measures the impact of investment policy on economic efficiency and takes look at comparative advantage (Monke and Pearson (1989:17). It is important to understand how the PAM is constructed and how to determine each item in the PAM, before any analysis can be made. This part of the literature review provides a brief overview of the PAM.

### 5.2.2.1. Policy Analysis Matrix (PAM).

Akthur, Sharif and Akmal (2007:144) stated that the PAM was developed and designed by Monke and Pearson in 1989. The PAM consists of a system that represents an enterprise budget for the specific commodity, which can be referred to as market income and expenditure. Table 5.1 provides a breakdown to compile PAM.

**Table 5.1: Policy Analysis Matrix**

	<b>Revenues</b>	<b>Tradable inputs</b>	<b>Domestic factors</b>	<b>Profits</b>
<b>Market/private prices</b>	A	B	C	D <sup>1</sup>
<b>Economic/Social prices</b>	E	F	G	H <sup>2</sup>
<b>Effect of divergences &amp; policy</b>	I <sup>3</sup>	J <sup>4</sup>	K <sup>5</sup>	L <sup>6</sup>

Source: Monke and Pearson (1989:15)

The budget is also known as private prices or market prices. The second budget consists of income and expenditure where all distortions are removed. This budget represents the shadow, social or market prices. This budget captures the real profitability in the system. The indicators that appear in the first row of the table shows the competitiveness of a system. The indicators in the second row are a degree of economic efficiency or can be better defined as the comparative advantage of a system.

Where:

<sup>1</sup>Private profits,  $D = A - B - C$

<sup>2</sup>Social profits,  $H, = E - F - G$

### **Policy transfer and the effect of divergences**

Transfers due to any policies can be measured by the difference between the income and the different expenditure items of the market/private or economic/social prices.

<sup>3</sup>Output transfers,  $I = A - E$ .

<sup>4</sup>Input transfers,  $J, = B - F$ .

<sup>5</sup>Factors transfers,  $K, = C - G$ .

<sup>6</sup>Net transfers,  $I = D - H$  or  $I - J - K$ .

The dissemination of the results of the PAM is normally done in the domestic currency. A foreign exchange rate is used to convert world prices into domestic equivalents. The social exchange rate may differ from observed exchange rates. Monke & Pearson (1989:24) explain the following:

*“Undervalued exchange rates reflect an excess supply of foreign exchange that is accumulating as excessive reserves and reducing potential income. Overvalued exchange rates correspond to conditions of excess demand; this demand results in extra foreign borrowing, excessive drawing down of exchange reserves, or rationing of foreign exchange among domestic users. An overvalued exchange rate is an implicit tax on producers of tradable products because too little domestic currency is earned by exports or paid out for imports. In the absence of commodity policy, the world price of a tradable good determines its domestic price. When the exchange rate*

*is overvalued, the domestic price is lower than its efficiency level and domestic producers are effectively taxed. Undervalued exchange rates exert the opposite effects. Correction for this distortion in the PAM is done by conversion of world prices (E and F in the matrix) at the social exchange rate rather than at the official rate. Because exchange rates affect both product prices and factor prices, exchange-rate adjustments are limited to special circumstances-the appearance of multiple exchange-rate regimes or the government's failure to adjust the exchange rate enough to offset the effects of domestic inflation”.*

The economic values of domestic factors (land, labour and capital) (G) reflect the underlying supply and demand the specific market of factors. The values of domestic items are influenced by the macroeconomic and commodity price policies. The government can influence the value of expenditure with policies. For example, it can introduce a tax or a subsidy, more applicable to the South African scenario, is that transport is taxed using toll fees, tyre levies and different levies fuel. Policies such as the minimum wage excessive cost of electricity can add further to the decrease in the competitiveness of a specific industry.

The net transfer caused by policy and market failures (L in the matrix) is the sum of the separate effects from the product and factor markets,  $L = (I - J - K)$ . (Positive entries in the two cost categories, J and K, represent negative transfers because the transfers reduce private profits, whereas negative entries in J and K represent positive transfers; hence, J and K are subtracted from I, a positive transfer, in the calculation of the net transfer, L.) The net transfer from distorting policy is the sum of all factors, commodities, and exchange-rate policies (apart from efficient policies that offset market failures) (Monke and Pearson (1989:25).

The net transfer can also be found by a comparison of private and social profits. These measures of the net transfer must, by definition, be identical in the double-entry accounting matrix,  $L = (I - J - K) - (D - H)$ . Disaggregation of the total net transfer shows whether each distorting policy provides positive or negative transfers to the system. The PAM thus permits comparison of the effects of market failures and distorting policies for the entire set of commodities and

macro price (factor and exchange-rate) policies. This comparison can be made for the complete agricultural system and each of its outputs and inputs (Monke and Pearson (1989:25)).

**Ratio indicators for comparison:**

- Private cost ratio (PCR):  $C / (A-B)$ .
- Domestic resource cost ratio E. (DRC):  $G/(E-F)$ .
- Nominal protection coefficient (NPC).
  - On tradable outputs (NPCO):  $A/E$ .
  - On tradable inputs (NPCI):  $B/F$ .
- Effective protection coefficient (EPC):  $(A-B)/(E-F)$ .
- Profitability coefficient (PC):  $(A-B-C)/E-F-G$  or  $D/H$ .
- Subsidy ratio to producers (SRP):  $L/E$  or  $(D-H)/E$ .

All these agents will be discussed in the following part of the literature review.

**5.2.2.2. Market/private profitability**

**5.2.2.2.1. Profitability**

Monke and Pearson (1989:16) explain that the market or private profitability indicates the quantitative competitiveness of an agricultural system. This is with current technologies, output values, input cost, and policy transfers. Profitability results are residuals and might have come from systems using various levels of inputs to produce outputs with widely varying prices. Two factors determining the profitability are represented in the first horizontal line of the PAM. The construction of the line begins by completing a detailed budget of the industry. If profits are positive, the expansion of an industry can be expected. If private profits are negative, contraction and slowdown of an industry can be expected and producers will exit the industry. If profit is equals to zero, producers will also exit the industry, unless something change in the system (Monke and Pearson, 1989:20).

Market/private profit is calculated as follows:

Market/Private Profit = Income – Tradable expenditure – Expenditure

#### **5.2.2.2. Private Cost Ratio (PCR)**

The PCR is an equation to determine how much value is added in a distorted market - if no value is added, then the production of a commodity has no reason for existence. The PCR (Monke and Pearson, 1989:21) is calculated as follow:

Market Non-Tradable Expenditure / (Market Income – Market Tradable Expenditure).

The value adds the difference between the value of output minus the costs of tradable inputs. This also indicates how much a system can afford to pay for domestic factors (including a normal return on capital) and remain competitive – that is, break even after earning normal profits, where (Market Income – Market Tradable Expenditure – Market Non-Tradable Cost) = Market Profit = 0. A typical entrepreneur in the system attempt to earn as much profit as possible. Entrepreneurs try to minimise the private cost ratio by holding down non-tradable and tradable expenditure, to maximise excess profits (Monke and Pearson, 1989:26).

#### **5.2.2.3. Economic/social profitability**

##### **5.2.2.3.1. Profitability**

The second row of the PAM utilises social or economic prices. This row takes all the distortion out of the system and therefore measures whether a system has a comparative advantage. Most optimal and efficient outcomes are achieved when an economy's resources are used in activities that create the highest levels of output and income. It can also be referred to as the highest value a system received for its inputs. Economic/social profits, H, measures efficiency because outputs, E, and inputs, F + G, are valued at prices that reflect scarcity values or social opportunity costs. Social profits, like the private analogue, are the difference between revenues and costs, all measured in social prices:  $H = (E - F - G)$ .

Smith (1985: 1) states that the "social profitability" of a system is calculated similarly as in the private sector. Regarding the cost or expenditure, a shadow price needs to be calculated. This represents the social value of goods or economic value of goods. In a perfectly competitive economy, market prices and shadow prices will be the same, if we ignore complications introduced by issues of income distribution. Market distortions, however, will cause shadow prices and market prices to differ. This makes cost-benefit analysis difficult, since "shadow prices" or "social values" cannot be directly observed.



### 5.2.2.3.2. Domestic Resource Cost ratio (DRC)

When outputs differ from different systems, then these systems can be compared with the DRC. The DRC has measured by determining how much value your domestic resources, without any distortion, can give to a system. For example, if wages increase due to a shortage in supply, the DRC will also increase, which entails a less comparative advantage for that specific region. The DRC is defined as  $G / (E - F)$  and serves as a proxy measure for social profits. No new information beyond social revenues and costs is required to calculate a DRC. The DRC plays the same substitute role for social profits as does the PCR for private profits. In both instances, the ratio equals one if its similar profitability measure equals 0. Minimising the DRC is thus equivalent to maximising social profits. In cross-commodity comparisons, DRC ratios replace social profit measures as indicators of relative degrees of efficiency (Monke & Pearson, 1989:21).

Jooste (2002:4) indicates the basic formula to generate DRC ratios as follow:

$$C_i = ( \sum_r N_r X_{ri} ) / ( P_i Q_i - \sum_j R_j Q_{ji} )$$

Where:

- $C_i$  measures the value of domestic resources used in saving or generating a unit value added in activity  $i$ .
- $N_r$  is the opportunity cost of a unit of non-tradable primary factor  $r$ .
- $X_{ri}$  is the quantity of factor  $r$  used in the activity  $i$ .
- $P_i$  and  $Q_i$  are the import or export parity price and quantity of tradable product  $i$ .
- $R_j$  and  $Q_{ji}$  are the import or export parity price and quantity of tradable input  $j$  used in activity  $i$ .

### 5.2.2.4. Policy Transfer

The second ability of the PAM is to look at the differences between private and social values. For each figure in the matrix measured vertically any difference between the observed market/private (actual market) price and the estimated economic/social (efficiency) price must be explained by the effects of a policy or by the existence of market failures. This relationship follows directly from the definition of social prices. Social prices correct for the effects of distorting policies and policies that lead to an inefficient use of resources. These policies are often introduced because decision-makers are willing to accept some inefficiencies (and thus lower total income) to further non-efficiency objectives, such as the redistribution of income

or the improvement of domestic food security. In this circumstance, assessing the trade-offs between efficiency and non-efficiency objectives becomes a central part of policy analysis (Monke and Pearson, 1989:22).

Output transfer is defined as the difference between the actual market price of a commodity produced by an agricultural system, and the efficiency valuation for the product. Policy distortion can be measured with the Nominal Protection Coefficient (NPCo) and the Effective Protection Coefficient (EPC). These two indicators measure the magnitude of policy distortions. The NPCo (Market Income/Economic Income) indicates the extent of the impact of policies that cause a divergence between the market price and the social price of a commodity, i.e. it indicates the degree of output transfer (Monke and Pearson, 1989:22).

The following indicators are used to analyse the extent of divergences, policy failures or incentives. The DRC is used to determine if a system has a comparative advantage or not (Monke and Pearson, 1989:16).

#### **5.2.2.4.1. Nominal Protection Coefficient for outputs (NPCo)**

A NPCo greater than one ( $>1$ ) shows that policies have increased the market price to levels higher than the economic price. Thus, if the domestic price is constantly higher than the economic or shadow price (international price), it indicates that policies on the domestic market because prices being paid by domestic consumers to be higher than they would have paid in the absence of such policies. Hence, a NPCo greater than one ( $>1$ ) indicates that consumers are indirectly taxed. This shows that policies increase output prices by 34 % because world prices do not set domestic prices (Monke and Pearson, 1989:22).

#### **5.2.2.4.2. Nominal Protection Coefficient for inputs (NPCi)**

The NPC on tradable inputs (NPCi), defined as Market Tradable Inputs/Economic Tradable Inputs, shows the degree of tradable-input transfer. A NPC on inputs of greater than 1 ( $>1$ ) shows that policies are increasing input costs more than the world prices (Monke and Pearson, 1989:23).

#### **5.2.2.4.3. Effective Protection Coefficient (EPC)**

The EPC  $((\text{Market Income} - \text{Tradable Market Expenditure}) / (\text{Economic Income} - \text{Tradable Economic Expenditure}))$  measures the value-added in market prices, about the value-added in economic prices, i.e. it measures the degree of policy transfer from product market-output and tradable-input policies. If the EPC is higher than one ( $>1$ ), it indicates that the market profit is higher than it would have been if no commodity policies had been in place. Thus, it indicates that policies are in place that increases profits artificially (Monke and Pearson, 1989:24).

#### **5.2.2.4.4. Profitability coefficient (PC=D/H)**

The profitability coefficient (PC) is calculated by private profitability being divided by social profitability. The profitability coefficient is a measure of the degree to which net transfers have caused private profit exceeds social profit. Therefore, a PC greater than one ( $>1$ ) indicates that private profit exceeds social profit. The PC measures the total or aggregated incentive of all policies and serves as an estimation of the net policy transfer (Monke and Pearson, 1989:19). The PC is a more comprehensive explanation of EPC because it explains the total effect of incentives (Monke and Pearson, 1989:234).

#### **5.2.2.4.5. Subsidy ratio to producers (SRP=L/E)**

The subsidy ratio to producers (SRP) is an aggregated measure for the total effects of all transfers. The SRP indicates the total net transfer across an economic system. It measures how big or small the net transfer from divergences are in comparison with the market or social revenues of a system (Monke and Pearson, 1989:234). The SRP ratio shows the equivalent of the net transfer of the value of the total output regarding world prices, or  $\text{SRP} = L/E$ . The SRP shows market failure and also the net effect of distorting policies through the system. The SRP indicates the part of net profits in economic and social prices, which is required when a single unit of support or tax is received for all the commodities and macroeconomic policy (Ellis, 1992:59). The SRP also indicates how much a weighted average protection rate is necessary to maintain existing private profits (Monke and Pearson, 1989:236).

### 5.2.3 Calculation of economic or social (shadow) prices for tradable and non-tradable expenditure

Without shadow or economic prices, it will be difficult to make the necessary comparisons and to analyse if a system is efficient or not (Monke and Pearson, 1989:87). Gittinger (1984:21) explains that to do economic analysis some market prices need to change so that they reflect economic or social values, these prices are called accounting or shadow prices.

*“a shadow price is any price that is not a market price”* Gittinger (1984:21)

#### 5.2.3.1. Shadow pricing of tradables: fertilisers, pesticides and commodities

The tariff protection method is used to calculate the economic price or shadow price of tradables. The main reason why this approach was used is that South Africa is a net importer of these commodities. Ward and Deren (1991:77) explained that value of products that’s been imported must be determined with the cost-insurance-and-freight methodology. The following equation is approach is denoted by the following equation:

$$CIFW_{ij} = (IntP_{ij} + TransC_{ij} + Ins_{ij}) \times ExhR_{ij}$$

Where;

$CIFW_{ij}$  = cost-insurance-freight-value of imports in domestic prices;

$IntP_{ij}$  = International market price in US\$;

$TransC_{ij}$  = Transport cost;

$Ins_{ij}$  = Insurance;

$ExhR_{ij}$  = Exchange rate in Rand/US\$;

$i$  = Product identification;

$j$  = Year.

Bradfield (1987) indicates that the tariff protection rate is an indication of the percentage deviation of domestic prices from international prices. The shadow price calculation, using the tariff protection method, is denoted by the following equation (Bradfield, 1987):

$$W_p = D_p / (1 + T_{pr})$$

Where:

$W_p$  = World price;

$D_p$  = Domestic price; and

$T_{pr}$  = Tariff protection rate expressed as a percentage.

### 5.2.3.2. Shadow price of fuel

The shadow price for fuel was calculated by looking at the value without any distortions. See Table 5.2.

**Table 5.2: Shadow value of fuel**

<b>Description</b>	<b>2013 (C/litre)</b>
Contribution to basic fuel price	835.41
Government duties and levies	297.66
Zone differential	28.9
Industry margin	61.2
Service differential	31.8
Pump price	1254.97
Shadow price	835.41
Conversation factor	0.67

Source: SAPIA 2014:42 and own calculation

### 5.2.3.3. Shadow pricing of non-tradables

#### 5.2.3.3.1. Electricity

For the purposes of this study, labour, land, water and electricity were regarded as non-tradable. It can be argued that electricity should be regarded as a tradable input since electricity is supplied from South Africa to neighbouring countries. According to Jooste and van Zyl (1999:35), the scale of distribution is very small and in some cases, certain areas in South Africa does not have access to this luxury. Hence, over the short-term electricity can be regarded as non-tradable.

#### 5.2.3.3.2. Labour

Bradfield (1987:np) in Joubert, Phahlane, Jooste, Dempers and Kotze (2010:6) mentioned that three types of labour can be distinguish namely, skilled labour, semi-skilled labour and unskilled labour. The conventional approach is however, to distinguish only between skilled and unskilled labour. Certain policies can distort the prices in the labour market and with that influence the supply and demand. Harberger (1972:158) emphasized that if an economy shows signs of unemployment, a shadow price for labour needs to be calculated to properly reflect the opportunity cost of labour.

#### **5.2.3.3.2.1. Unskilled labour**

South Africa has unemployment and a minimum wage policy. Mullins *et al.*, (2007:68) explained that the shadow wage of rural labour in slack seasons might be taken as roughly the equivalent of three kilograms of grain per day. Using this methodology, they calculated the shadow price adjustment factor for unskilled labourers in the agricultural sector to be 0.60. Hence, due to the lack of more precise information, the shadow wage adjustment factor for unskilled labourers used in this study was taken as 0.60, as suggested by Mullins *et al.*, (2007:68).

#### **5.2.3.3.2.2. Skilled labour**

Skilled labour in the agricultural sector is classified as those workers who can operate machinery. It is also believed that no unemployment exists in this market. This entails that the market wage rate for skilled labour closely approximates the economic rate. The adjustment rate to change skilled labour from market to economic is therefore zero.

#### **5.2.3.3.3. Electricity**

Mullins *et al.*, (2007:75) calculated the shadow-selling price of electricity in South Africa. The shadow conversion factor calculated by them suggests that electricity is subsidized in South Africa. The opportunity cost for electricity is 58c/kWh in world terms. After the current increase, the average cost for electricity is 41c/kWh. The shadow conversion factor used for electricity was calculated at 1.40.

#### **5.2.3.3.4. Land**

Gittinger (1984) defined the opportunity cost of land as the net value of production when the use of the land is changed. In this study, the rental values for land were calculated as four per cent of the market value of land in different regions. This is consistent with the findings of van Schalkwyk and van Zyl (1996).

#### **5.2.3.3.5. Shadow price of the Rand (exchange rate)**

The South African exchange rate is very volatile. There are many reasons for this, amongst others, monetary controls, perceptions of investors, investment grading of South Africa. The purchasing power parity (PPP) approach was used to calculate the economic value of the ZAR.

This methodology entails that a change in real prices of goods and services are mirrored by the change in the exchange rate. This also indicates that relative price changes between different countries can be used to calculate the shadow exchange rate. Since it is common practice in South Africa to value the South African Rand against the United States Dollar, the producer price index of the US was used to calculate the shadow exchange rate of the Rand in Joubert *et al.*, (2010:8). The calculation of the shadow exchange rate is denoted by the following equation (Bradfield, 1987):

:

$$SE = (PI_{SA}/PI_{FC}) / E_{bj}$$

Where:

$SE$  = Shadow exchange rate;

$E_{bj}$  = Base year exchange rate;

$PI_{SA}$  = Producer price index for South Africa;

$PI_{FC}$  = Producer price index for the USA.

Bradfield (1987) in Joubert, *et al.*, (2010:7) states that a practical problem in the calculation of the shadow exchange rate is the choice of a realistic base year. According to Bradfield (1987), the base year must adhere to the following practical requirements:

- The economic growth rate must be stable or near to the long-term growth rate of the economy.
- The balance of payments must be near equilibrium.
- There should not have been any major economic or political crisis in the world.
- There must be domestic political stability.
- International economics must be relative stable.
- The rate of unemployment must not be excessively high.
- The inflation rate must not deviate too much from the long-term trend in inflation rate.

According to Bradfield (1987) in Joubert, *et al.*, (2010:7) the only year which conforms to a large extent to these requirements in South Africa is 1975, and hence it was used in this study. The shadow exchange rate for South Africa was calculated to be R7.95 in 2013.

### 5.2.3.3.6. The tradable/non-tradable composition of the value of inputs and products

Table 5.3 illustrates the non-tradable part of tradable inputs. The costs of tradable inputs often include substantial amounts of inputs that are not available on international markets, such as transportation, electricity and labour. Therefore, after all market and economic input cost categories were standardised and allocated to domestic factor (non-tradable) and tradable input components. The non-tradable components were then added to the cost of the domestic factors (Monke and Pearson, 1989). Due to lack of input-output matrixes of national accounts, the decompositions are based on the work of Jooste and van Zyl (1997:39) and Mahlanze, Mandes and Vink (2003). See Table 5.3.

**Table 5.3: Components of the economic value of inputs.**

Description	Tradable (%)	Non-tradable (%)
Fertilizer & pesticides	80.00	20.00
Other purchased inputs	90.00	10.00
Fixed cost of machinery	95.00	5.00
Variable cost of machinery	50.00	50.00
Electricity	85.00	15.00
Contract services	95.00	5.00
Transport	60.00	40.00
Admin & Insurance & other overheads	40.00	60.00

Source: Mahlanze, Mandes and Vink, 2003.

## 5.2.4 Empirical research

### 5.2.4.1. Application of the Policy Analysis Matrix in Indonesian Agriculture.

Pearson, Gotch and Bahri (2003:2) used the PAM in an outreach programme to analyse the agricultural sector of Indonesia. The research and publication thereof, were very useful for policy analysts and makers. The PAM methodology was used in several sectors of the Indonesian agricultural sectors. The primary objective of the publication was to make the results easily accessible for several uses and proof that the PAM can be successfully applied to several projects and policy issues in rural Indonesia. Part one of the publication is an integrated discussion of the theoretical framework and empirical procedures. Part two is a collection of the case studies and part three provides an overview of the lessons learned. In total twenty case studies is cited in the publication namely:



*The Impact of Government Policy on Clove Production in Minahasa Regency.*

*The Impact of Tariff Policy and Inter-Island Transport Cost on the Profitability of Soybean Production in Ngada Regency, NTT.*

*Traditional Versus Intensive Coconut Production in North Sulawesi.*

*Profitability and Efficiency of the Broiler Industry in Tasikmalaya.*

*Analysis of Efficiency and Competition of Soybeans Farming System in Jember.*

*The Efficiency and Competitiveness of NaOogst Tobacco and Rice Production in Jember Regency.*

*Competitiveness and Comparative Advantage of Beef Cattle Fattening in Bandung Regency.*

*The Profitability of Rice Farming in Polmas District, South Sulawesi, Indonesia.*

*The Competitiveness of Soybean Production in Blitar, East Java.*

*The Competitiveness of Red Onion Production in Brebes, Central Java.*

*The Impact of Agricultural Policy on Soybean Production in West Nusa Tenggara Province.*

*The Effect of the Rice Tariff Policy in Minahasa Regency.*

*Is Cultured Shrimp Production in West Nusa Tenggara Still Profitable?*

*The Competitiveness and Efficiency of Potato Farming in Pangalengan.*

*The Impact of Liberalization on the Competitiveness and Efficiency of the Cashew Systems in Nusa Tenggara Barat Province, Indonesia.*

*The Competitiveness and Efficiency of Rice Farming systems in North Bengkulu District, Bengkulu Province.*

*The Impact of Technology Improvement on the Profitability of SoE Keprok Citrus Farming in Timor Tengah*

*Efficiency and Competitiveness of Rice Production in Riau.*

*The Impact of Irrigation Development on Rice Production in Lampung Province.*

*Pricing of Palm Oil Fresh Fruit Bunches for Smallholders in South Sumatra.*

#### **5.2.4.2. Profitability and efficiency of the broiler industry in Tasikmalaya,**

Unang (2003:3) make use of the PAM to evaluate the efficiency of the broiler industry in Indonesia. The Indonesian government wants to expand the industry as the industry is seen as a very important source of animal protein. In 1997 the industry produced  $\pm$  816 million broilers. The result of the research stated that Indonesia is efficient industry and can exist without any protection. The sustainability of the industry is influenced by feed prices and the prices of DoC. There are several reasons high DOC price. One is the possible monopolistic practises by large entrepreneurs as reported by Yusja and Psandaran (1999) in Unang (2003:11).

The sustainability of the industry can be increased by the following initiatives:

- Reduction in inefficiencies in the input market especially on DoC,
- Further investments are necessary to build local hatcheries by local farmers. Mortality need to be decrease, the recommendation is to provide better extension services, and better access to credit.

#### **5.2.4.3. The comparative advantage of selected long-term crops in Lesotho.**

Makosholo and Jooste (2006:173) use the CEA methodology to determine the different irrigated long-term crops in the four agro-ecological zones of Lesotho. The analysis makes use of a net present value approach (NPV). The study reveals that farmers receive benefits from policy intervention and receive subsidies. The exchange rate is an exogenous factor that has an uncontrollable impact. Other economical and political changes within South Africa also have a direct influhhnce because Lesotho forms part of the Common Monetary Area. The study also reveals that issues of land and water have a significant impact on certain commodities that can assist to decrease poverty and increase wealth in the rural areas.

#### **5.2.4.4. Comparative advantage of organic wheat production in the Western Cape**

Mahlanza, Mendes, and Vink (2003:144), used the PAM to determine if organic wheat production would have a comparative advantage against wheat production under conventional practices. The result indicates that if the social cost benefit (CSB) is considered, organic wheat production has a comparative advantage above conventional practices. The primary reason for the above is that the organic methodology applies economic or social factors more optimal than the conventional method. It is applicable More applicable at this stage from the study is that in

2003, the indication is that the wheat market is distorted. The study shows that the wheat market has been distorted from 2003.

The PAM is a static model Mahlanza *et al.* (2003:158) and makes use of historical data. The PAM is not a forecasting model and does not capture future dynamics and driving of supply and demand, price, yield, changes in consumer trends and world trade. Although not addressed in this research the methodology, the PAM can be used to simulate certain scenarios to determine the effect of policy changes in a *ceteris paribus* environment. It is unknown if the PAM methodology was ever applied for this type of analysis.

#### **5.2.4.5. The Comparative advantage of Dryland Soybean Production in Brits, North-West Province**

Grönum, Van Schalkwyk and Du Plessis (2000:235) also used the PAM to determine the comparative advantage of dryland soybean production in the Brits-area in the North-West province. They mentioned in 2000 that the industry has very limited protection and that the processing industry is highly inefficient. This lead to low farm gate prices and to a relocation of resources to crops that result in higher profits.

#### **5.2.4.6. The effect of policy on the South African Valencia Industry**

Joubert and Van Schalkwyk (2000:82) applied the PAM to define the impact of policy the Valencia industry. The Valencia industry represented 43% of total exports of citrus at that stage. Joubert and Van Schalkwyk (2000:83) used a weighted average approach for the different provinces and for the age distribution of valencia's at that stage. Monke and Pearson (1989) in Joubert and Van Schalkwyk (2000:83) stated that if a weighted approach is not used, cost and revenue can be overestimated. Taxation on inputs is one of the factors that can be controlled. The industry earns foreign exchange and contributes to South Africa's balance of payments. The industry is a leading export industry and therefore assist in wealth creation.

#### **5.2.4.7. Policy incentives and the comparative economic advantage in Malawian agriculture.**

Nakhuma, Hassan, Kirsten and Ng`ong`ola, (1999:356) used the PAM framework to determine the impact of policy distortion and determine the comparative economic advantage in the

agricultural sector of Malawi. The results of the study reveal that Malawi has a relative strong comparative advantage in the production of tobacco, paprika, macadamia nuts, cotton, tea, Phaseolus beans and hybrid maize. The study also shows that to produce open pollinated maize and soybeans resources is not optimal. Both are using low-input technology. It is interesting to note that the low input technology favours the production of paprika and tobacco more in Malawi (Nakhuma *et al.*, 1999:356). Controlled price over the commodity market further resulted in a huge gap between private and social profits. The input market is higher than it is supposed to be and therefore the system is taxed. Poor road infrastructure increases transportation cost unnecessary and sales tax on inputs contribute to lower private profits. The elimination of policy distortion, access to credit and research should contribute to higher competitiveness, especially among smallholders.

#### **5.2.4.8. Searching for Comparative advantage in Commercial Sugarcane Production in South Africa: A PAM analysis**

Krabbe and Vink (2000:161) also used the PAM to measure the sugarcane industry. The results of the research showed that the industry has no comparative advantage under the current world market conditions. Globally, countries protect their sugar cane sectors, and therefore it is difficult for South Africa to compete. Krabbe and Vink (2000:171) suggest that more emphasis should be placed on the potential of a trade bloc formation where South Africa is a dominant player within SADC. South Africa is not seen as the most favourable sugarcane producer in the region due to less favourable climatically conditions than our neighbours. Cross-border trade and regional investment can increase the CEA of the region (Krabbe and Vink, 2000:171).

#### **5.2.4.9. Comparative analysis of the South African sugarcane industry.**

If the world production of sugarcane was undistorted, South Africa would show a very strong comparative advantage (NAMC, 2011:3). The analysis also indicates that the South African industry needs protection and will not survive in a distorted world market. The NAMC (2011:3) determined the CEA of the four agro-ecological areas of sugarcane namely: Coastal region, Northern irrigated region, KwaZulu-Natal and the Midlands of KZN. The NAMC found that the current policy environment does not provide enough protection for the industry to expand. The situation are worsened by certain taxations on inputs namely taxation on land and the regulation on certain prices on inputs such as electricity

### **5.2.5 Limitations of the PAM**

The PAM makes use of historical data and do not take current changes into account. Cross sectional data is used to construct a PAM. The ideal would be to construct a PAMs over a time to trace the evolution of policy effects. This goal is difficult due to data limitations (Monke & Pearson, 1989:154)

The calculated Domestic Resource Coefficient (DRC) calculated in the PAM also isolates to the costs of domestic factors and can understate the social profitability of activities that make intensive use of domestic resources (Mahlanza *et al.*,2003:151).

The main limitation of the effective protection coefficient (EPC) is that it does not incorporate any effects of policies that influence factor prices. This omission means that EPC results should be interpreted as measures of the incentive.

The calculation of shadow prices can be complex and difficult. It is an essential part to do the correct calculation. Mullins *et al.*, (2007: 65-79) provides a detailed discussion for determining shadow and surrogate prices for South Africa.

### **5.3 Data collection and formulation of the PAM**

The first step in the construction phase of the PAM is to compile a well-presented enterprise budget for farm-gate prices, which are also referred to as market prices. Interviews were scheduled with different stakeholders and budgets were compiled. In the construction of a budget for broilers some technical assumptions were necessary. The technical assumption was tested and is in line with industry norms. Please see table 5.4 for technical assumptions. The enterprise budget is divided into income, goods (tradable expenditure) and services (non-tradable expenditure). It is further necessary to calculate the economic price (also known as shadow prices or social prices) for income, goods and services. Hence, market prices are those prices that prevail in a market, where market failure and government intervention influence prices. To calculate different economic prices, commercial enterprise budgets, obtained from various sources, were used as a basis (Monke and Pearson, 1989:29).

### 5.3.1 Market/private values

#### 5.3.1.1. Market/private income

Market/private income was calculated as an average income per tonne per year. This represents the average income for 2013 for seven cycles per year. The income was derived from several enterprise budgets compiled in South Africa. Table 5.4 sets out the technical assumptions for the compilation of the enterprise budget. (See Appendix 3 for enterprise budget).

The average Market/private income per tonne is R1 695.

**Table 5.4: Technical assumptions**

Number of houses		8
Size of houses	Square meter	2 200
Total size	Square meter	17 600
Cost of DOC		R4,30
Number of chickens per house per cycle		48 500
Number of chickens placed per cycle		388 000
Number of cycles per year	*	7,00
Days per cycle		35
Mortality	*	4,00 %
Number of chickens sold per cycle	96,00 %	372480
Average weight when rounding of	kg	1,8
Total weight sold	kg	670 464
Average selling price	R/kg	R11,50
Feed conversion rate (FCR)		1,6
Feed used per broiler sold	kg	2 880
Interest rate		9,50 %
Management Fees	Rand/year	R240 000
Value of loose equipment	Rand	R5 072 000
Provision for capital replacement		10,00 %
Live tonnage delivered		670 464
Dressing percentage		66,00 %
Slaughtered weight per cycle	kg	442506
Average feed price	R/kg	R4,18

**Source:** Industry stakeholders and own calculations, 2013 & 2014

### 5.3.1.2. Market/private tradable expenditure.

As mentioned, a detailed enterprise budget is necessary to determine the market/private tradable expenditure. The total Market/private tradable expenditure is R12 769 to produce 1 tonne of poultry meat, as illustrated in Table 5.5.

**Table 5.5: Market/private values for tradable expenditure to produce 1 tonne of broiler meat.**

<b>Tradeable Components (Rand)</b>	<b>12 769,10</b>
Feed	8 784,82
DoC	3 393,31
Medicine & vaccine	90,46
Heating	159,04
Transport	45,36
Bedding	85,42
Cleaning chemicals	58,63
Repair and maintenance	82,50
Insurance	69,56

**Source:** Industry stakeholders and own calculations, 2013 & 2014

### 5.3.1.3. Market/private value of non-tradable part of tradable expenditure

Domestic factors or non-tradable factors can be described as the services provided by production, labour, capital, and land (Monke & Pearson, 1989:17). Table 5.6 illustrates a summary of the non-tradable/ domestic part of tradable expenditure.

**Table 5.6: Summary of non-tradable of tradable expenditure to produce 1 tonne of broiler meat**

<b>Non-tradable component of tradables:(Rand)</b>	<b>1 496,15</b>
Feed	976,09
Day Old Chicks	377,03
Medicine & Vaccine	10,05
Heating	28,07
Transport	30,24
Bedding	9,49
Cleaning chemicals	6,51
Repair and Maintenance	55,00
Insurance	3,66

**Source:** Industry stakeholders and own calculations, 2013 & 2014

The market/private non-tradable expenditure is typically derived from expenditure that cannot be traded across borders. Every tradable item also has a non-tradable or domestic factor

#### 5.3.1.4. Market/private value of Non-Tradable expenditure

The market/private non-tradable expenditure is typically derived from expenditure that cannot be traded across borders namely: capital, land and labour. Table 5.7 illustrates the Market/private value of non-tradable expenditure.

**Table 5.7: Market/private value of non-tradable expenditure.**

<b>Non-tradable expenditure/Domestic factors (Rand</b>	<b>939,34</b>
Labour	57,55
Cleaning labour	48,86
Interest on working capital	135,99
Electricity	123,25
Catching	78,45
Land cost	392,56
Transport	25,20
Management Fees	77,48

**Source:** Industry stakeholders and own calculations, 2013 & 2014

### 5.3.2 Economic Values

World prices and technologies are the backbones of social valuation and efficiency analysis of agricultural systems. These world prices are also referred to as economic or social values.

#### 5.3.2.1 Economic income

South Africa is a net importer of broiler meat. South Africa mainly imports frozen chicken meat and mechanically deboned meat (MDM). There is no tariff protection on MDM with the Harmonised Standard (HS) classification 02071210 (Fowls, not cut in pieces, frozen: mechanically deboned meat). MDM is used for processing market. South Africa does not produce MDM. Antidumping and other tariffs have been introduced into the 020714 HS classification, as illustrated in Table 5.8.



**Table 5.8: Summary of tariffs introduced in the broiler sector.**

HS Classification Code	Description	General Tariff	EU Tariff	SADC Tariff
2071100	Fowls, not cut in pieces, fresh or chilled	0 %	0 %	0 %
2071210	Fowls, not cut in pieces, frozen, mechanically deboned	0 %	0 %	0 %
2071220	Fowls, not cut in pieces, frozen, carcass with cuts removed	27 %	0 %	0 %
2071290	Fowls, not cut in pieces, frozen, other	27 %	0 %	0 %
2071290	Fowls, not cut in pieces, frozen, other	Provisional anti-dumping payments: Products produced in and imported from Brazil: 62.93 % (Only applied from February to August 2012)		
2071300	Fowls, cuts and offal, fresh or chilled	0 %	0 %	0 %
2071410	Fowls, cuts and offal, frozen, boneless cuts	5 %	0 %	0 %
2071410	Fowls, cuts and offal, frozen, boneless cuts produced and exported by Aurora Alimentos Brazil	Provisional anti-dumping tariff on products produced by and exported by Aurora Alimentos in Brazil: 6.26 % (Only applied from February to August 2012)		
2071420	Fowls, cuts and offal, frozen, offal	27 %	0 %	0 %
2071490	Fowls, cuts and offal, frozen, other	220c/kg	0 %	0 %
2071490	Fowls, cuts and offal, frozen, other originating and imported from the USA	Anti-dumping tariffs on products originating from the USA: 940c/kg		

Source: SARS (2013:8, cited in Davids, 2013:25).

### 5.3.2.1.1 Calculation of the Average Protection Rate

The tariff protection rate is an indication of the percentage deviation of domestic prices from international prices. The shadow price calculation, using the tariff protection method, is denoted by the following equation from Bradfield (1987) in Joubert, *et al.*, (2010:10):

$$W_p = D_p / (1 + T_{pr})$$

where:

$W_p$  = World price,

$D_p$  = Domestic price, and

$T_{pr}$  = Tariff protection rate expressed as a percentage.

To calculate the average protection rate, an estimate CIF value was calculated with Gauteng as a reference point. Table 5.7 below provides an indication of the imports for 2013 of broiler meat.

**Table 5.9: Imports for 2013**

HS Code	Quantity (ton)	Import value (R)	Unit Value (R/Ton)
2071100	0	0	0
20712	159 973	831 992 611	5 201
2071210	141 804	709 703 578	5 005
2071220	13 905	63 960 558	0
2071290	4 264	58 328 475	0
2071300	28	260 640	0
20714	194424	2 598 830 573	13 367
2071410	14606	332 790 740	22 784
2071420	37927	225 406 224	6 454
2071490	144890	2 040 633 609	14 083

Source: SARS (2015) & own calculations

Table 5.10 below provides and calculation of Cost Insurance, and Freight cost to deliver poultry in Gauteng.

**Table 5.10: Calculation of CIF values in Gauteng**

Description	FOB Value/ton (R)	Sea Freight/tonne (R)	Insurance (R)	Off Loading (R)	Transport Gauteng (R)	CIF Value Gauteng (R)
Average value: Fowls, cuts and offal	13 367	1 309	1334	408	327	15 544
Frozen boneless portion	22 784	1 309	228	408	327	25 056
Frozen fowl Offal	6 454	1 309	65	408	327	8 562
Poultry (bone- in portion) mainly leg quarters	14 083	1 309	141	408	327	16 267

Source: Industry role players & own calculations

Table 5.11 illustrates the calculation of the average protection rate for 2013.

**Table 5.11: Calculation of the average protection rate**

Description	Tariff (% & R)	Cost + tariff (R)	Total value of imports (plus tariff)
Frozen boneless portion (R)	5,00	26 308	384 259 341
Frozen fowl Offal (R)	27,00	10 873	412 397 230
Poultry (bone- in portion) mainly leg quarters (R)	2 200	18 467	2 675 752 237
Total value of imports (plus tariff) (R)			3 472 408 809
Average protection rate (%) *			33,6%

\*Calculation: Total value of imports – Import value without any tariff, cost & insurance/Import value without any tariff, cost & insurance

Source: SARS (2015) & own calculations

An average protection rate of 33.6 % was calculated and used in the modelling.

To calculate the economic value of income, all distortions need to be removed from the market.

This was done by applying the average protection rate of 33, 6 %.

$$\text{Economic value of broilers (ton)} = \frac{\text{Market/private value to producers (R16 956)}}{\text{Average protection rate (33.6\%)}}$$

The economic value for broilers for the 2013 season was R12 690/ton.

### 5.3.2.1. Economic value of tradable expenditure

Economic value is an undistorted value or price of a commodity. The value is not higher due to taxes or tariffs, or lower due subsidies in a marketplace. Tariffs and taxes are one of the main reasons for distortions. The economic values of tradable expenditure for the broiler industry are illustrated in Table 5.12 below.

**Table 5.12: Economic value of tradable expenditure (R)**

<b>Tradable Components</b>	<b>10 450,41</b>
Feed	7 394,47
Day old chicks	2 976,59
Medicine & Vaccine	79,35
Heating	139,51
Transport	39,79
Bedding	74,93
Cleaning chemicals	51,43
Repair and Maintenance	72,37
Insurance	61,02

**Source:** Industry stakeholders and own calculations, 2013 & 2014

### **5.3.2.2. Economic/social value of non-tradable/domestic part of tradable expenditure**

The services provided by domestic factors of production, labour, capital, and land do not have world prices because the markets for these services are domestic. The social value of each factor service is found by estimation of the net income forgone because the factor is not employed in its best alternative use. This approach requires the commodity systems under analysis to be excluded from social factor price determination. For example, if wheat is cultivated on land, the land cannot be used to grow barley during the same period. The social opportunity cost of the land for the wheat is therefore the net income lost because the land cannot produce barley, even if barley yields higher returns. Similarly, capital and labour used to produce wheat cannot simultaneously provide services elsewhere in other sectors of the economy. Their social opportunity costs are measured by the net income given up because alternative activities are deprived of the labour and capital services applied to wheat production (Monke and Pearson, 1989:69).

As previously mentioned, every tradable item has a domestic factor or non-tradable part. Table 5.13 below sets out a summary of the economic value of the non-tradable parts of tradable items.

**Table 5.13: Non-tradable of tradable expenditure (R)**

<b>Non-tradable component of tradables:</b>	<b>1 277,80</b>
Feed	821,61
DoC	330,73
Medicine & Vaccine	8,82
Heating	24,62
Transport	26,53
Bedding	8,33
Cleaning chemicals	5,71
Repair and Maintenance	48,25
Insurance	3,21

**Source:** Industry stakeholders and own calculations, 2013 & 2014

Table 5.14 below provides a summary of domestic/non-tradable factors at the economic level.

**Table 5.14: Economic value of non-tradable expenditure (R)**

<b>Non-tradable expenditure/Domestic factors</b>	<b>737,39</b>
Labour	35,63
Cleaning labour	30,24
Interest on working capital	42,94
Electricity	87,51
Catching	51,02
Land & Capital cost	392,56
Transport domestic Factors	20,00
Management Fees	77,48

**Source:** Industry stakeholders and own calculations, 2013 & 2014

#### **5.4 Results and discussion**

The PAM was used to recalculate revenue, cost and profits items during the initial phase at the farm level. In the undistorted market, the efficient valuations of outputs and inputs are meant to lead to the highest possible levels of national income. The difference between social or economic revenues and costs equals social profits. This measures economic efficiency. New

investments that reduce social costs also increase social profits and improve the effectiveness. An understanding of the array of economic/social profitability's of agricultural systems is important to measure economic efficiency (Monke & Pearson, 1989:8)

#### 5.4.1 Results

The PAM for 2013 for the South African broiler industry is illustrated in Table 5.15 below.

**Table 5.15: Policy Analysis Matrix (PAM)**

	Revenue (R)	Cost (R)		Profit (R)
		Tradable Inputs (R)	Non-Tradable Inputs (R)	
Market/private prices	16 956	12 769	2 435	1 752
Economic prices	12 690	10 450	2 015	225
Effect of divergences and efficient policy	4 266	2 319	420	1 527

**Source:** Own calculation, 2014

Table 5.16 below provides indicators for comparison. The indicators will be discussed in section 5.4.2 to 5.4.4.

**Table 5.16: Ratio indicators for comparison**

Private Cost Ratio (PCR = $C/(A-B)$ )	0,58
Domestic Resource Cost Ratio (DRC = $G/(E-F)$ )	0,90
Nominal Protection Coefficient (NPCO) on Tradable Outputs ( $A/E$ )	1,34
Nominal Protection Coefficient (NPCI) on Tradable Inputs ( $B/F$ )	1,22
Effective Protection Coefficient ( $(A-B)/(E-F)$ )	1,87
Profitability Coefficient ( $D/H$ )	7,79
Subsidy Ratio to Producers ( $L/E$ )	0,12

**Source:** Own calculation, 2014

## **5.4.2 Market/private profitability**

### **5.4.2.1. Profitability**

The market/private profit for the broiler system in South Africa is R1752 per tonne. Private profitability was calculated as follow: R16 956 minus R12 769 minus R2 435 = R1752 in 2013. The industry shows profitability with protection.

### **5.4.2.2. Private Cost Ratio (PCR)**

The PCR with figures from 2013 were 0.58. The ratio is smaller than the one ( $>1$ ), which indicates that the industry adds value with the necessary protection.

## **5.4.3 Economic/social profitability**

### **5.4.3.1. Profitability**

The economic profit for the broiler system in South Africa is R225 per tonne. This indicates very low margins. The primary reason for this is that output prices of final products did not keep up with the cost to produce the final product.

### **5.4.3.2. Domestic Resource Cost ratio (DRC)**

The DRC for the South African broiler industry is 0.9, which indicates that its comparative advantage is very low. The industry can be seen as a very fragile industry, which can easily go into a situation where it does have any economic reason for existence.

## **5.4.4 Policy Transfer**

### **5.4.4.1. Nominal Protection Coefficient for outputs (NPCo)**

The NPCo is 1.34. This shows that policies increase output prices by 34 % because world prices do not set domestic prices.

#### **5.4.4.2. Nominal Protection Coefficient for inputs (NPCi)**

An NPCi on inputs of 1.22 shows that policies are increasing input costs, the average market prices for these inputs are 22 % more than the world prices.

#### **5.4.4.3. Effective Protection Coefficient (EPC)**

The industry measures an EPC of 1.87. An EPC greater than one (>1) indicates that profits are higher than it would be without commodity policy. Further interpretation is that the net impact of government policy influence product markets using prices on outputs and price of inputs.

#### **5.4.4.4. Profitability coefficient (PC=D/H)**

A profitability coefficient of 7.79 indicates that existing policy implications contribute as an incentive to produce broiler meat.

#### **5.4.4.5. Subsidy ratio to producers (SRP=L/E)**

The SRP indicates the extent to which a system's margins have been increase or decrease. The SRP in this case is 0.12, indicates increase the gross revenue with 12%. The SRP is an indication that support is received by the producers. The SRP of 12% also indicates that a weighted average protection rate of 12% on primary level is necessary to maintain private profit.

### **5.5 Chapter Summary**

South Africa has a competitive and comparative advantage in the production of broilers. The poultry producing industry believes that South Africa is being used to receive dumped chicken meat. It is a very controversial topic. The current global situation shows that South Africa needs protection to secure the sustainability of the broiler industry.

The profitability of broilers is dependent on the efficient allocation of inputs, as shown in the results of this study, and inputs are taxed relatively highly in comparison to the economic prices thereof. The current policy is exerting pressure on the comparative advantage of broiler production.



The following imperatives need to be addressed:

- Efforts to decrease the costs of ingredients for feed need to continue. For example, the stimulation of investment in the soybean processing industry.
- Information in the market can be enhanced, e.g. official supply and demand figures of poultry meat and substitutes.
- A case needs to be made whether dumping occurs in the market or not – proper research needs to be done.
- The comparative advantage study reveals that the current tariff formulation protects the industry sufficiently.
- The channel to convey the message to policy makers needs to be well researched, and be clear and specific.
- The industry needs to continue research, which needs to be funded by either industry or government.

## **CHAPTER 6 :**

### **INTER-INDUSTRY FORECASTING OF THE SOUTH AFRICAN BROILER INDUSTRY (SAFRIM)**

#### **6.1 Introduction**

The Interindustry Economic Research Foundation (IERF) founded a research program forty-five year back, namely INFORUM (Werling, 2007:1). Inforum stands for the Inter-Industry Forecasting Modelling. The model is linked with several international research partners across the globe. The initiative is housed at the University of Maryland and is a registered trademark of IERF. Werling (2007:2) describe the analysis as an Interindustry-Macroeconomic (IM) modelling that combines input-output structure with the econometric formulation in a dynamic framework.

Conningarth Economists developed the South African Inter-Industry Forecasting Model (SAFRIM) in conjunction with Department of Economics of the University of Maryland. (Conningarth, 2015). The model has not been used or tested in the past on a single agricultural sector in South Africa. Therefore a disaggregated model was developed by the Conningarth and the NAMC to understand the Macro Economic Impact of the South African broiler industry if the tariffs are relaxed on several aspects of the economy. The novelty and the value of the results of the model indicates the effect on capital expenditure, the investment side, governmental and the effect on consumers of the South Africa and the effect on employment on these sectors

The Inter- Industry Forecasting Model was also used as part of research done for the Industrial Development Corporation. The title of the project title is: “Evaluating the competitiveness of the South African Broiler value chain. The project was finalised in December 2016. The result and analysis were presented at 2<sup>nd</sup> Inforum World Conference in Washington in September 2014 by the author. The paper also forms part of the conference journal.

#### **6.2 Literature review**

Almon (1996: 1) defines the INFORUM as follow:

*“The system is multi-sectoral and includes an Input–Output (I–O) Table, which shows the magnitude and diversity of moderate consumption*

*within the context of the current economic structure. It allows the system to integrate intermediate input prices with sectoral price formation which ultimately determines overall price levels in the economy. It is done using behavioural equations for the final demand that depends on prices and an output, and functions for income that depends on production, employment and other variables. Long-term, multi-sectoral modelling requires the calculation of consumer expenditures in some detail by product.”*

Inforum’s operations are housed at the University of Maryland in the Economics Department. It was founded there by Dr Clopper Almon in 1967, now Professor Emeritus of the University. Clopper supervised over 40 PhD dissertations, many of which have contributed to the infrastructure of Inforum.

Werling (2007: 2) stated that Inforum could be used to improve business planning, assist the government with policy decisions and the analysis to understand the economic environment.

This is done by:

- Developing and using economic models from the USA and other economies. Inforum engineered a dynamic, inter-industry, macroeconomic model.
- Collaborating with government and private sector to analyse and investigate a variety of issues. Economic projections and analysis using Inforum econometric models are distinguished by detail at the industrial and product level.
- Liaise and maintain a world-wide network of research associates, of which the Inforum software and platform is used.

## **6.2.1 Empirical research on Inforum model**

### **6.2.1.1 Trade flows and trade protection: A multi-country and multi-sectoral investigation**

Wang (2000:109) stated that many large scale multi-sectoral models for many countries had been developed by INFORUM and partners. The development of import demand function and the determinants or estimation of price elasticities is an important part to develop Inter-Industry Forecasting Model. The price elasticities and demand function for many different countries forming part of INFORUM and commodities were already developed. Wang (2000

:7) uses this platform and developed a Multi-country and Multi-sectoral model. The primary objective was to determine the impact of a global trade liberalisation on trade flows of each country/region involved in a multi-sectoral and multi-regional framework. The results of removing existing tariffs place all competitors on a level playground. Certain countries, which have bilateral preferential treatment on the baseline scenario may lose market shares to new competitors. The effects are not positive for all the EU countries, whom before trade liberalisation, received preferential treatment from the member countries. The effects were strongly negative for Austria and Belgium in the EU because since more than 50 % of the exports took place within the EU in 1995. China, South Korea, and Mexico are the major gainers of removing discriminations. The effects for the US and Japan are somewhat more positive. This shows that their exports are diversified on a geographically way, and therefore the elimination of bilateral discrimination is marginal. The same argument also applies to the insignificant share effects for the two regions, the Rest of the World and the Rest of OECD Wang (2000:81).

#### **6.2.1.2. Macro Modelling and Elaboration of the Macro-Econometric Model for the Latvian Economy.**

Ozilina and Pocs (2013:6) make use of the INFORUM platform to develop a Macroeconomic for the Latvian Economy. The structure of the Latvian macroeconomic model includes several macroeconomic indicators, certain industry aspects, economic policy relations and the energy sector. The model contains seven sections namely:

- GDP sources and uses.
- The supply of services and goods and the production factors.
- Prices and wages.
- Foreign trade and balance of payments.
- Employment and demographic indicators.
- The fiscal sector.
- The energy sector.

The Latvian models are used to do forecasting, value the effect of economic policy and to do scenario analysis (Ozilina and Pocs, 2013:154).

### **6.2.1.3. Generating up-to-date starting values for detailed forecasting models**

Sampattavanija (2008:1) has done intensive research to use more frequent data available to generate forecasts of annual data from reliable sources in an inter-industry forecasting model. The results were used as starting values to improve the model's forecasting performance over the short term. Data needs to be reliable and up to date in economic forecasting models. Data from the census is very reliable data. The censuses provide estimates with a lag between the base year and the date of publication. Other more frequently published data is sometimes less reliable but more frequently available. The more frequent data can be useful information to analyse certain activities in a year although incomplete. The research gap of Sampattavanija (2008:263) was to discover a solution to a challenge of "ragged end" of historical data for long-term modelling. The study develops processes to developed values between the last published data and up to two years into the future. Four types of data have been studied used in long-term modelling namely:

- Personal consumption expenditures.
- Gross output.
- Investment in equipment and software, and
- Investment in structures estimated in detailed industries or categories.

The process to estimate the data series are the same and involve the use of time series analysis data high-frequency data. Sampattavanija (2008:263) finds that the performance of the forecasts depends on the accuracy of the exogenous variables used. The estimated values are consistent with the macroeconomic data, used as regressors in the processes. Therefore, the results will be reliable if a reliable forecast of macroeconomic variables exists. Sampattavanija (2008:263) believes the research will help to improve the short-term accuracy of a long-term economic model, which is an important concern for many economists.

### **6.2.1.4. Forecasting of employment in Russian Inter-Industry Model**

Mironova (2008) forecasted employment figures of Russia with a Russian inter-industry model. The growth in investment activity in Russia resulted in an increase in the scale of production and an increase in production resources. The decline in population also resulted in a decline in the population of working age, this can prevent expansion of production potential. Mironova (2008) believes it can be resolved in two ways, namely:

- Increasing of the labour productivity, and
- Involving foreign and local labour force in the production process.

The following models were used:

- Quarter model (QUMMIR).
- Dynamic inter-industry model (RIM).
- Inter-industry model (CONTO).

The following datasets were used:

- The series of input-output tables in current and constant prices for 44 economic activities structure since 1980 to 2006.
- The series of investment in fixed capital in constant prices.
- The series of sector employment.
- The main explanatory variables.
- Production factors(endogenous).
- The industrial gross output in constant prices.
- The investment in fixed capital in constant prices.
- The relative industrial wages for employee.
- The relative industrial prices.

Demographic factors (exogenous)

- The population of working age.
- The economically active population (labour force).

The example of the equation (the oil-extracting industry):

$$emp2 = -2.06 + 0.03*poptrudT - 0.004*kv2$$

Where:

$emp2$  = the sector employment (mln.person),

$poptrudT$  = the population of working age(mln.person),

$kv2$  = the investment in fixed capital in constant prices (ths. rub.)

The results of the regression analysis can be found in Table 6.1

**Table 6.1: Results of regression analysis for oil extraction**

<b>SEE</b>	0.02					
<b>RSQ</b>	0.8568					
<b>RHO</b>	-0.30					
<b>Obser</b>	9 from 1998.000					
<b>SEE+1</b>	0.01					
<b>RBSQ</b>	0.8091					
<b>DW</b>	2.60					
<b>DoFree</b>	6 to 2006.000					
<b>MAPE</b>	3.83					
<b>Variable name</b>	<b>Reg-Coeff</b>	<b>Mexval</b>	<b>Elas</b>	<b>NorRes</b>	<b>Mean</b>	<b>Beta</b>
0 emp2					0.35	
1 intercept	-2.06270	80.6	-5.85	6.98	1.00	
2 poptrudT	0.02789	95.8	6.99	1.19	88.33	1.159
3 kv2	-0.00014	8.9	-0.14	1.00	358.31	-0.297

Source: Mironova, 2008

The example of the equation (food industry)

$$emp7 = 0.02 * poptrudT + 0.09 * out7\_p - 0.002 * time - 0.112 * dum7$$

Where:

*emp7* –the sector employment(mln.person),

*out7\_p* –the industrial gross output (ths.rub.),

*time* –the time variable,

*dum7* –the dummy variable, has 1 in 1998.

The results of the regression analysis can be found in Table 6.2

**Table 6.2: The results for the equation for the food industry**

<b>SEE</b>	0.03					
<b>RSQ</b>	0.9035					
<b>RHO</b>	0.07					
<b>Obser</b>	27 from 1980					
<b>SEE+1</b>	0.03					
<b>RBSQ</b>	0.8860					
<b>DW</b>	1.86					
<b>DoFree</b>	22 to2006.					
<b>MAPE</b>	1.11					
<b>Variable name</b>	<b>Reg-Coeff</b>	<b>Mexval</b>	<b>Elas</b>	<b>NorRes</b>	<b>Mean</b>	<b>Beta</b>
0 emp7					1.60	
1 poptrudT	0.01884	463.5	1.01	21.49	85.342	
2 outR7_p	0.09269	8.6	0.06	16.44	0.97	0.203
3 dum7	-0.1121	23.7	0.00	1.04	0.04	-0.24
4 time	-0.0020	2.0	1.00	1.00	13.00	-0.18

Source: Mironova, 2008

The main exogenous variable for the study is depicted in Table 6.3

**Table 6.3: Exogenous variables (average annual index, mln. Persons)**

	<b>2005-10</b>	<b>2010-15</b>	<b>2015-20</b>	<b>2020-25</b>	<b>2025-30</b>
<b>Total population</b>	142	141.1	140.34	139.36	137.61
<b>The pop of working age</b>	90	88.35	86.1	83.63	81.23
<b>The working pop. of under and over age</b>	2.78	3.19	2.99	2.87	2.80
<b>Foreign workers</b>	1.90	3.37	4.17	4.66	4.95
<b>Employment</b>	70.73	71.35	70.40	69.20	67.89
<b>Unemployment</b>	3.36	3.86	3.52	3.17	2.84

Source: Mironova, 2008

The result of the research is depicted in Table 6.4.

**Table 6.4 The growth rate of the sector employment in %**

	<b>2005-10</b>	<b>2010-15</b>	<b>2015-20</b>	<b>2020-25</b>	<b>2025-30</b>
<b>Production sector</b>	0.9	1.2	1.6	1.2	3.0
<b>Construction</b>	-3.8	0.8	1.2	1.3	1.2
<b>Agricultural</b>	-9.0	-0.2	0.9	1.1	1.1
<b>Service industry (including trade)</b>	4.0	-0.6	-1.3	-1.4	-2.4

Source: Mironova: 2008

The growth rate of the different sectors labour productivity is depicted in Table 6.5.

**Table 6.5: The growth rate of the sector labour productivity in %**

	<b>2005-10</b>	<b>2010-15</b>	<b>2015-20</b>	<b>2020-25</b>	<b>2025-30</b>
<b>Production sector</b>	3.4	6.0	7.1	11.3	10.3
<b>Construction</b>	13.9	10.3	8.5	6.0	3.6
<b>Agricultural</b>	10.9	4.0	2.9	2.7	2.6
<b>Service industry (including trade)</b>	6.7	7.6	7.5	7.4	8.9

Source: Mironova: 2008

## 6.2.2 Empirical research on SAFRIM model

The SAFRIM is a dynamic, macroeconomic, multi-sectoral system. It describes the behaviour of the economy in its completeness. The focus is on the operation and behaviour of all the markets in an inter-related way. It accommodates the dynamic existence of the economy. It focusses on gross domestic product in an aggregated way and lends itself to anticipate “what if” scenarios. It also looks at the demand categories that determine GDP, instantaneously and dynamically. Conningarth Economists (2006) used the SAFRIM model to predict the effect

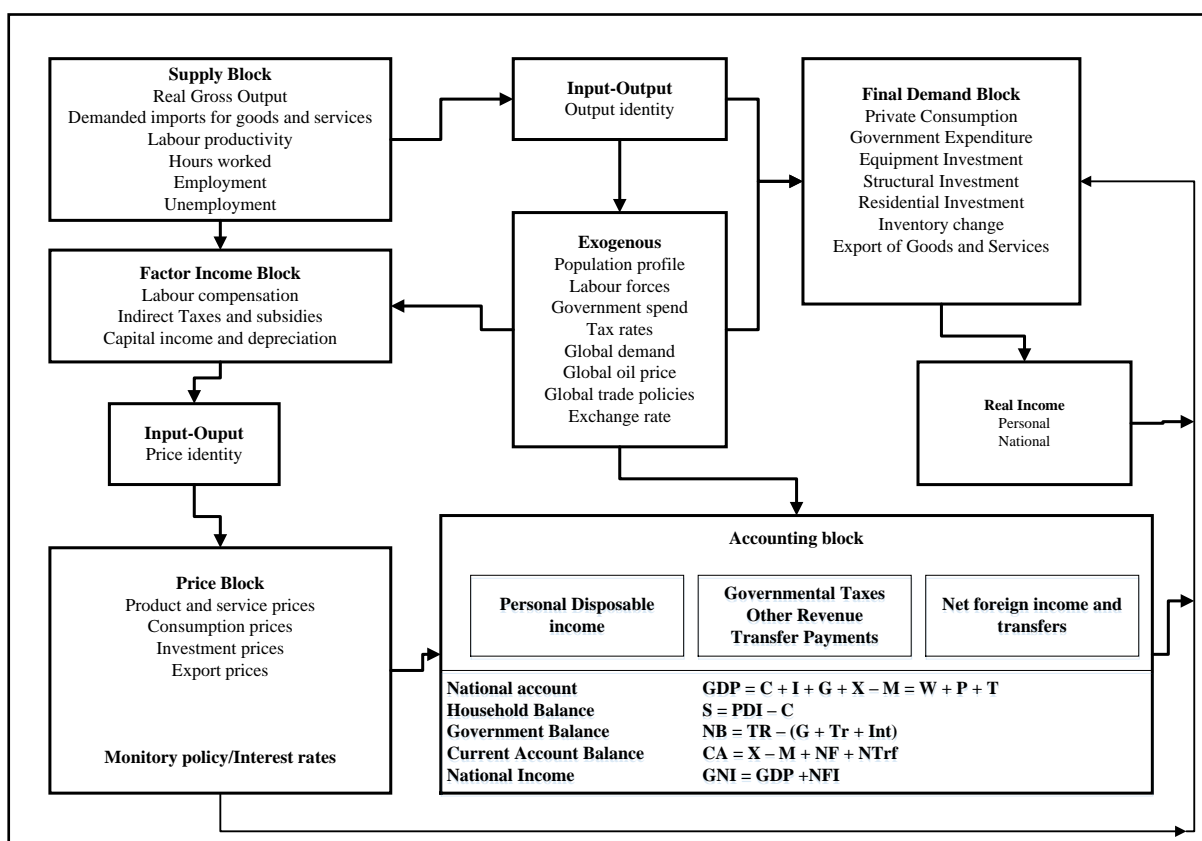


that various Water Resource Management Scenarios would have on South Africa’s Economic Development.

### 6.3 Methodology and Framework of the Model

The SAFRIM modelling system is dynamic from the outset and therefore allows for projections of the economy. Therefore, macroeconomic and dynamic multi-sectoral models are well suited for forecasting business-as-usual or reference cases. An important feature of this macroeconomic multi-sectoral model is its bottom-up approach. In this approach, the model mimics the actual workings of the economy in that the macroeconomic aggregates are built up from detailed levels at the industry or product level, rather than first being estimated at the macroeconomic level and then simply “distributed” amongst sectors (Conningarth, 2014).

Figure 6.2 below depicts the dynamic and inter-related workings of the Multi-sectoral modelling system. A description of each variable that must be estimated is shown.



**Figure 6.1: Detailed Inforum Structure**  
Source: Conningarth Economists, 2014

Conningarth explains (2014) explains that model “loop” begins on the production block side, where the expenditure components of GDP (supply side) are estimated at constant prices. Next, the personal savings propensity is applied to calculate what portion of total household real disposable income will be spent on consumption. From this total figure, the distribution of per-capita consumption expenditures per income group is calculated.

Exports are usually calculated outside the model (i.e. exogenously), given the dependence of exports on international economic conditions. However, for macroeconomic impact analysis, it is also defined endogenously. Exports are also defined as a function of the change in relative world prices. The investment equations model the substitution (or complementarily) of capital equipment with labour and energy.

Government consumption and investment expenditures are normally determined outside the model. At this point, after all, the final demand categories (except for imports and inventory change) have been estimated, and an input–output mathematical solution is applied to jointly and simultaneously determine output, imports and inventory change.

The model next turns to the important job of forecasting prices at various levels. To start off, all components of value added are calculated, of which the important one is the hourly labour compensation rate by industry, called the “wage rate”. By multiplying the wage rate by the total hours worked, total labour remuneration per industry is obtained.

Labour remuneration is the largest component of national income, usually about 60 %, and certainly has a major effect on prices. However, it is also important that the various components of capital remuneration are considered. Private enterprise gross profits are needed to be able to calculate some aggregates viz. company taxes, retained earnings and depreciation of capital assets which make up business savings, which together with personal savings impact heavily on the savings-investment equation in the economy. Furthermore, dividends, proprietors’ income, interest income and rental income generated in the private sector all ultimately contribute to personal income.

To calculate prices, value added by industry is summed to total value added and then passed through a product-industry bridge, to obtain value added per product. Once value added at the

product level has been obtained, commodity prices are calculated. The import content of intermediate consumption is considered here.

#### 6.4 Assumptions and Methodology for Activating the Model

The average protection rate for the various broiler meat cuts is about 33.61 % in 2013. The base for this analysis is that a 33.61 % protection rate will be phased out, with an impact on the current 2013 production of 11.3 %. The current production of broilers is 1, 667 million tonnes, which therefore means that local production will decrease by about 188 371 tonnes and that imports will increase by the same amount. It was further assumed that the relaxing of the import restriction would take place over a three-year period. Furthermore, it was also assumed that the future production would never be less than the 1, 667 million tonnes of 2013, and that the impact of the relaxing of the tariff, the current import restriction measure, would only have a bearing on future production. It was assumed that the broiler sales growth rate is 4 % per annum. A regression analysis was performed to calculate the production price elasticity of broilers. The 11.3 % change of the current 2013 production, due to the 33.6 % change in price, relates to the regression analysis. The dependent variable for the regression was the South African broiler production, and the independent variables are South African broiler prices per kilogramme and time. The regression is performed over the period 1970 to 2013. The results of the regression analysis are depicted in Figure 6.3 below.

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.99							
R Square	0.98							
Adjusted R Square	0.95							
Standard Error	139.74							
Observations	44.00							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	2.00	34 866 542.20	17 433 271.10	892.74	0.00			
Residual	42.00	820 166.00	19 527.76					
Total	44.00	35 686 708.20						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	-	-	-	-	-	-	-	-
Price	65.40	14.35	4.56	0.00	36.45	94.35	36.45	94.35
Time	15.79	4.13	3.82	0.00	7.45	24.13	7.45	24.13

Figure 6.2: Regression analysis results

Source: Own calculation

According to the regression results, the model has a good fit. It has an R Square of 0.98, which is very close to 1, representing a good fit. The t-stats of both variables are significant, with the price being 4.5 and time 3.8, both more than two, which is in line with the statistics theory indicating that the variables explain an acceptable relationship between the exogenous and endogenous variables. The positive sign of the price variable indicates that if the price of broilers goes up, production will also increase, which is in line with general economic theory. The positive sign of time indicates that the production of broilers in South Africa increases over time.

#### **6.4.1 Forecasting the Baseline Scenario**

It is important to note that the projection of the economy is done over a very long period, which stretches the limits of a standard dynamically orientated econometric forecasting model. The assumptions that are usually applied to modelling, such as monetary variables (i.e. interest rates and money supply) as well as short-term price fluctuations, which are normally imperative for short- and medium-term forecasting, are not that significant in this case. The long-term forecast is driven much more by expected structural developments in the South African economy, specifically regarding the potential of certain sectors to be able to export over the longer term, such as the long-term sustainable exports of iron ore, magnetite, chrome, and coal. It is also assumed that South Africa would play a much larger role in the African economy, and would be less dependent on its traditional trading partners, such as Europe and the United States of America. This will also change the structure of international trade, where South Africa will become more dependent on the exports of manufacturing goods and services, and less dependent on exports of primary and less processed commodities.

Specific information regarding Transnet's Capital Investment Programme over the medium to long term was also used to get an indication of the export potential of certain sectors (Transnet, 2012). However, this information emphasised the point that a substantial increase in harbour and railway capacities would serve as an essential prerequisite to unlock these resources. On the other hand, the diminishing role of gold and diamonds in the future development of the economy was also considered. Furthermore, fundamental economic imperatives/rules were built into the forecasting scenario, which includes the following aspects:

- There should be an acceptable measure (not exceeding  $\pm 4\%$  of the GDP) of balance on the current account of the balance of payments,
- No fundamental obstructions to obtaining foreign capital,
- Growth of the world economy, and
- South Africa's population growth, by considering the negative effects of HIV/Aids.

Broiler projections developed under this study are based on a targeted level of future economic growth, based on the “moderate growth rate” defined by National Treasury and published in the 2012 draft Integrated Energy Plan (Department of Environmental Affairs, 2013). The projection of moderate growth assumes that the economy will grow steadily, but with continued skills constraints and infrastructure bottlenecks in the short to medium term. The moderate growth scenario forecasts real growth in Gross Domestic Product (GDP growth) of 4.2 % per annum over the medium term (defined in the draft Integrated Energy Plan as 2015–2020) and 4.3 % per annum over the long term (2021–2050), according to the 2012 Medium Term Budget Policy Statement (National Treasury, 2012). This growth rate could currently be viewed as somewhat on the high side, if structural challenges in South Africa, such as the improvement of education, poverty alleviation, and enhancement of income distribution, are taken into account. It is also important to note that the South African economy has grown since the advent of full democracy only in the order of between 3 % and 3.5 %, which is well below the medium growth target of  $\pm 4\%$ . A summary of the assumptions for the medium growth scenario is based on depicted as follow:

- **South African population.** The population growth for 2002 – 2003 increase with 1.3% and is estimated at a rate of 1.34% for 2012 to 2013 StatsSA (2013:7a). An estimate of 1.5% were used as an assumption for the model.
- **South African CPI inflation.** The South African Reserve Bank (SARB) set the inflation target range between 3.0 % and 6.0 % (SARB 2013:22). A figure of 6% was used in the model
- **World prices/inflation** World price inflation indicator was estimated at 3% based on the World Bank data (World Bank, 2013)
- **Final consumption expenditure by government**  
Underpinned by the National Development Plan, 2030. The role of government in the South African economy should be in-line with economic growth.  
The estimates for the period under forecast:
  - 2013 to 2014 average

- 2015 to 2018 above average
  - 2021 to 2025 below average
  - all other years average
- **Exchange rate per annum** (depreciation of the real effective Rand exchange rate). A Manual for Cost-Benefit Analysis in South Africa with Specific Reference to Water Resource Development (TT305/07). This real 1.7 % is over and above the purchasing power parity theory which means that the Rand will depreciate against its trading partners with this real percentage plus the difference between South African inflation and the inflation of its main trading partners.
  - **World economic growth**
    - 2013 3.3%
    - 2014 4.0%
    - 2015 4.5%
    - 2015 – 2023 4.5%
    - 2024 – 2052: 4.0%
(OECD, 2012).
  - **The current account of the balance of payments as a percentage of GDP:** The assumption of 3.6% was used based on the 10-year average of SARB bulletin. As a rule of thumb, this ratio should be in the order of net domestic investment as a percentage of GDP (South African Reserve Bank, 2013).

A technical discussion of how the model was activated for the various linkages is as follows:

#### A. Construction phase (investment impact)

For the construction phase, the model was activated on the following final demand identity (constant prices).

$$fdc = pcec + invc + govc + exc - imc + fdrc + trcc + capex\_b \quad (1)$$

Where:

fdc = total final demand

pcec = private consumption expenditure

invc = investment (investment excluding investment in the mitigation measures)

govc = government  
 exc = exports  
 imc = imports  
 fdrc = residual  
 trcc = transfer costs  
 capex\_b = total net investment of the broiler industry

The investment related to the broiler industry was added in the variable capex\_b on an annual basis over the period 2013–2033. The investment was broken down into the various assets/commodities (e.g. construction, machinery and other equipment, and transport equipment) for the broiler industry.

### B. Government Impact

For the government income loss, the model was activated on the following final demand identity (constant prices).

$$fdc = pcec + invc + govc + exc - imc + fdrc + trcc + gov_b \quad (1)$$

where:

fdc = total final demand  
 pcec = private consumption expenditure  
 invc = investment (investment excluding investment in the mitigation measures)  
 govc = government  
 exc = exports  
 imc = imports  
 fdrc = residual  
 trcc = transfer costs  
 gov\_b = government income losses from the broiler industry

### C. Operational impact

The following production formula was used to activate the model for the operational impact (constant prices) on the broiler sector.

$$outc = (! (I-AMC) * fdc) + opex_b \quad (2)$$

where:

outc = total output (production)  
 ! (I-AMC) = inverse matrix

$fdc$  = total final demand  
 $oper\_imp$  = total net operational impact of the broiler industry

The total net operational impact of the broiler sector is added to the production function that is calculated by adding it to the function  $outc = (! (I-AMC) * fdc)$ . The operational impact is added on a detail sector basis per annum.

#### D. User Price/Cost Impact

The model depicts that both the intermediate users (food industry) and the private consumers will benefit from the lower price of imports.

Intermediate users:

In this instance, the intermediate user (food industry) will experience a cost reduction that will increase its domestic and international competitiveness. This effect is largely reflected in the prices of the goods and services produced by the food sector, which could influence the international competitiveness of the country. Depending on the price elasticity of the demand for local products, this, in turn, could influence local production and employment. The equation below was used to calculate the effect of the intermediate users.

$$fdc = pcec + invc + govc + exc - imc + fdrc + trcc + price\_b \quad (3)$$

where:

$fdc$  = total final demand  
 $pcec$  = private consumption expenditure  
 $invc$  = investment (investment excluding investment in the mitigation measures)  
 $govc$  = government  
 $exc$  = exports  
 $imc$  = imports  
 $fdrc$  = residual  
 $trcc$  = transfer costs  
 $price\_b$  = increase in consumer spending power from relaxing the tariffs.



## 6.5 Results

Considering the above assumptions, as well as making use of the regression analysis model, and based on the current production of broilers in South Africa, Table 6.6 below indicates the direct result if the average protection rate of 33.6 % on broiler imports is removed.

**Table 6.6: Model Inputs: Losses and gains in the industry (R Million, 2013 constant prices)**

	2014	2015	2016	2017		2032	2033
Investment in the broiler industry	-1 278	-1 329	-1 003	-	...	-	-
Government income	-1 139	-1 185	-1 232	-1 281	...	-2 308	-2 400
Production (operational cost and profits) in the broiler industry	-1 131	-2 307	-3 195	-3 195	...	-3 195	-3 195
Positive price/cost impact on the consumer	-1 628	-2 181	-2 612	-2 661	...	-3 688	-3 780

Note: The negative sign (positive price/cost impact on the consumer) of the impact indicates that the cost of broilers for the consumer will decrease. This decrease has a positive financial effect on the consumer.

The direct impacts emanating from the broiler industry as depicted in Table 6.6 above are:

- Less investment in the broiler industry,
  - Less government income, and
  - Less production (operational cost and profits) in the broiler industry.
- (See detailed calculations in the Appendix 4).

Impacts on the consumer are:

- Positive price/cost impact on the consumer

### A. Investment

The loss on investment was calculated by multiplying the lower broiler production by the direct capital/production ratio. A capital/output ratio of 1.13 was assumed, which means that for one Rand of output, R1.13 of future investment will be forfeited.

### B. Government

Government income will also be directly affected by the phasing out of the customs tariff. The amount is equal to the tariff of 32 %, multiplied by the total value of imports projected before the removal of the tariff which relates to the base case value of imports (See Appendix 7 for full calculations).

### C. Impact on the Consumer

The positive impact on the consumer is equal to the additional imported broilers that can be obtained at a lower price (import price). The local production price of broilers is R16 960 per tonne, while the imports price is R9 600 per tonne. This constitutes a saving for the consumer of R7 323 per tonne. The cost savings to the consumer per annum is depicted in Table 6.2 (See Appendix 6 for full calculations).

The results of a non-linear econometric model (which is the case here) differs when the components of the model are run separately (incremental). as compared with running the model components concurrently (dynamic). As already indicated, the impact on only two macroeconomic variables had been modelled. These are Gross Domestic Product (GDP) and the impact on employment.

A technical adjustment to the model is necessary to ensure that the economy as far as the international trade gap ( $x-m$ ) and the funding gap ( $s-i$ ) are in balance again. It is important to note that these two gaps are always the same. In terms of National Accounting Theory, a deficit on the current account of the balance of payments (exports fewer imports) must be equal to the deficit on the capital account (savings less investment). Everything else being equal, this implies that, given the limited pool of the domestic savings, investment in some of the other projects would have to be adjusted downwards to make provision for the required investment and life cycle costs implied by relaxing the tariffs on the imports of broilers. The model, simulating the workings of a market economy, will in a case or cases where domestic savings are insufficient to meet the investment needs, use an increase in the real interest rate to restore equilibrium in the capital markets. The effect of this will be a decrease of overall domestic demand (therefore increasing savings and decreasing other investment – excluding investment in mitigation options,).

For this technical restriction described above, the deficit on the current account of the balance of payments as a percentage of the country's overall economic activity (GDP) was taken as a controlling measure demonstrating the ability of the economy to financially carry the burden of relaxing the import restrictions. For instance, the deficit on the current account of the balance of payments amounts to 6 % of the GDP in the base case scenario, i.e. no changes to the existing policies on broiler imports, then for controlling purposes, the deficit in the current account of

the balance of payments must be constrained to 6 %. In this case, the adjustment was not done because the current account of the balance of payments was in line with the baseline scenario.

The results of the scenario that depicts relaxing of the import restrictions on broilers are shown in Table 6.7 below. The impact is given a per annum average over the total period from 2013 to 2033. Both the results of the Scenario as well as the Baseline are given in the table below. The impact is defined as the Scenario minus the Baseline.

**Table 6.7: Summary of Results for Economic Impact with Gross Value Added (GDP, R Million 2013 constant prices) and Employment in numbers (Impact over the period 2013-2033)**

	<b>Additional (Net) Investment Impact (Construction Impact) (See Appendix 4)</b>	<b>Additional (Net) Operational Cost (See appendix 5)</b>	<b>Government Income Loss (See Appendix 7)</b>	<b>Impact increase in personal disposable income (consumption expenditure) (See Appendix 6)</b>	<b>Total Incremental Impact</b>	<b>Total Dynamic Impact Before Balance of Payments Adjustment</b>
	1	2	3	4	5	6
GDP						
Scenario	2 531 787	2 530 871	2 530 522	2 535 453		2 532 214
Baseline	2 532 438	2 532 438	2 532 438	2 532 438		2 532 438
Difference	-652	-1 567	-1 917	3 014	-1 122	-224
Employment						
Scenario	16 220 323	16 203 884	16 206 975	16 246 665		16 205 540
Baseline	16 226 233	16 226 233	16 226 233	16 226 233		16 226 233
Difference	-5 910	-22 349	-19 258	20 432	-27 085	-20 693

Source: Own calculations

The following aspects are of importance:

- The net effect regarding GDP and employment is negative, which means that the economy will lose out regarding economic growth (GDP) and employment creation if the restrictions on the imports of broilers are relaxed. The GDP will decrease by R224 million and about 20 693 potential jobs could be lost (see column 6). It is important to note that the GDP as well as the potential jobs, is an average value/number over the period 2013-2033. This means, for example, the potential jobs will decrease by 20 693 on average for a specific year over the programming period, if the tariff is relaxed,

- The negative GDP figure is relatively small, but the impact on employment is significant. In South Africa, where employment is crucial, this aspect should be considered in any decision to relax the tariff,
- The negative impacts on the economy are created by the lowered investment (column 1, GDP = R-652 million and Employment = -5 910 jobs), reduction in the local production of broilers (column 2, GDP = R-1 567 million and Employment = -22 349 jobs) and the decrease in government income (column 3, GDP = R-1 917 million and Employment = -19 258 jobs), and
- The positive impact on the economy is attributable to the price reduction of broilers in South Africa and its positive effect on the intermediate consumers of broilers and the private consumers (column 4, GDP = R3 014 million and Employment = 20 432 jobs).

## 6.6 Chapter Summary

The objective of the analysis was to estimate the macroeconomic impact of the relaxing of import restrictions on the broiler industry for the period 2013 to 2033.

The industry is very important for South Africa. Chicken meat is one of the most favoured and most affordable protein sources for South Africans. The industry is highly integrated into other industries and accounts for the biggest contributor to agriculture GDP. The industry, therefore, contributes highly towards food security and food sustainability.

The economic impacts were calculated by making use of a general equilibrium modelling system which is of a dynamic and multi-sectoral nature, forecasting the economy in a bottom-up approach. Macroeconomic aggregates are built up from detailed levels at the industry or product level. The various impacts in this analysis are the loss in investment by the broiler industry, reduction in production (operational cost and profits) in the broiler industry, loss of government income from relaxing the import restrictions, and a positive effect on the buying power of the private consumer through a reduction in the price of broilers.

The results of the scenario show clearly that the positive effects that the consumers will receive due to lower broiler prices will be outweighed by the negative effects which will impact on the broiler industry. It seems that there is a net loss of R 224 million in GDP and a reduction of 20 693 jobs, on average, per annum over the programming period.

In conclusion, it can be said that the analysis clearly shows that the South African broiler industry should be safeguarded against unfair international competition, which have a significant negative effect on the South African broiler industry. It is important to note that the broiler industry in South Africa is also an industry that is a suitable start-up sector for upcoming small-scale farmers, and that the destruction of the industry could have a detrimental effect regarding poverty alleviation.

# **CHAPTER 7 :**

## **GLOBAL TRADE ANALYSIS (GTAP) COMPUTABLE GENERAL EQUILIBRIUM (CGE) MODEL OF THE SOUTH AFRICA BROILER INDUSTRY**

### **7.1 Introduction**

The Inter-American Development Bank (2017: 1) classified the CGE methodology as one of the most rigorous, quantitative and cutting-edge methods to evaluate the impact of the economy, policy shocks and policy reform. There is an increasing demand to do quantitative analysis on trade policy issues on a global basis. The Global Trade Analysis Project (GTAP) was developed to decrease the cost for computable general equilibrium (CGE) (Ianchovichina and Walmsley, 2012:3).

CGE models are used to analyse the effect of changes in factors affecting the economy. The impact of changes in sectors is sometimes so small in the total countries or world economy that it isn't even noticeable, but it changes trends that affect behaviour. It is important for economists, researchers, academia, policy makers to understand in which direction an economy will flow or what is the impact if certain events happen. Changes in a sector of the economy can significantly influence other industries. There are four approaches (White and Patriquin, 2016:1) used to determine general equilibrium impacts in an economy namely:

- Partial Equilibrium models,
- Input–output (I/O) models,
- Social Accounting Matrix (SAM) models, and
- Computable general equilibrium (CGE) models.

White and Patriquin (2016:1) explains the following:

*“Every model has its place in analysing economic changes. At times, these models were seen as competitors, but each is unique in its way. The models can even be compliments to each other. For example, I/O and SAM are building blocks in the development of a CGE model. I/O is the most commonly used of these models and is the least expensive, but suffers from the constraints of fixed prices, a short-run time frame and unidirectional sectoral impacts, among others. The SAM shares much of the same*

*framework as an IO model but allows for the measurement of distributional impacts. The CGE model allows for many of the constraints of an IO model to be relaxed and allows for multidirectional sectoral impacts, but has greater data requirements and is costly to implement. The CGE model has only recently been extended to regional impact analysis.”*

The research gap is based on the fact that no general equilibrium model was built in the past for the broiler industry. The CGE models are comprehensive because they describe all parts of the economy simultaneously and how these parts interact with each other. The models describe the efficiency-maximising behaviour of a company and utility-maximising behaviour of consumers. CGE models explain the macroeconomic behaviour of an economy. It focusses on changes, such as GDP, tax revenues, spending, investment and savings and balance of trade. This is also the primary reason why this model was included in the research. It is a well-recognised general equilibrium model.

This research also formed part of a project done for the Industrial Development Corporation by the NAMC in conjunction with BFAP. The title of the project is: “Evaluating the competitiveness of the South African Broiler value chain. *“The project was finalised in December 2016. The research in this chapter was conducted by the author for the project. The project was finalised in December 2016.”*

## **7.2 Primary objective**

The primary objective is to define the economic impact of the broiler industry, if protection is relaxed.

## **7.3 Secondary objective**

The secondary objective is to develop a single-country model for the broiler industry from the GTAP database to determine the impact on the broiler sector if all protection were to be removed and to determine the impact on other sectors of the economy if the protection were to be removed from the broiler industry.

## **7.4 Literature review on the CGE/GTAP model**

The start and development of the GTAP project in 1992 received momentum after the Uruguay Round negotiations of the General Agreement on Tariffs and Trade (GATT). The development further got momentum after the North American Free Trade Agreement (NAFTA) and the WTO Doha development. Thomas Hertel documented a publication namely: *Global Trade Analysis: Modelling and Application*, explaining the model structure, data and software towards trade policy (Ianchovichina and Walmsley, 2012:3).

Burfisher (2011:3) explains that a CGE model is an “economy-wide” model and is a macroeconomic model. It explains how industries in different countries will react to certain events. It explains businesses will respond to demand by employing inputs such as capital, labour, machinery equipment and intermediate products. The income generated from the sales of goods and services in the production process accrue to households. Households use the money to purchase goods and services, paying tax and save a certain portion of its income. The tax received by government and the saving received by institutions result in further spending and investment. The aggregated demand by households, government, and investors is met by firms who, to complete the circular flow of income and spending. A CGE model includes all sources of demand and supply for goods and services in the economy.

### **7.4.1 Empirical research on the GTAP/CGE structure**

The empirical research aims to provide information where CGE modelling was used in the past and also provides more detail on the specific research.

#### **7.4.1.1. Computable General Equilibrium Modelling and the Evaluation of Agricultural Policy**

Blake (1998:3) modelled and researched the effect of the Uruguay Round on the Agricultural system of the EU. He makes use of a CGE model and uses the 1998 version of the GTAP database. To understand the effect on agriculture it was necessary to look at the total economy. Therefore attention was also given to manufacturing and services industries. In the manuscript of Blake (1998:342), he explains that there are three primary type of reform namely: market access, export subsidies and domestic support commitments. Blake (1998:342) is also of the opinion that “dirty tariffs” and other exemptions will probably phase out over time. The inclusion of the agriculture sector into GATT/WTO disciplines is a big step in the right



direction. Blake (1998:342) also states that the export subsidies and support programmes would not have a huge impact as originally expected because the support was at a very high level when the negotiations were started. The main results of the simulations showed that the global welfare gain (0.39%) and regional gains to the USA would be 0.41%, the EU 0.42%, and Japan 0.84%. The textile and clothing, agriculture sector and market access for industrial goods would gain  $\pm 33\%$  of the global gains. The reform of agricultural import tariffs is much more important for the total global economy as subsidy reform. Export subsidies reform were the most important aspect for the EU at the Uruguay Round.

In Blake's (1998:345) conclusion he suggested that models need to be developed that incorporate forms of imperfect competition that have greater relevancy for the agricultural sectors. Monopsonistic, monopolistic competition or anti-competitive behaviour at multi-product retail level could also be investigated in a CGE framework. He also suggests that market concentration in the trading sector also need investigation for inclusion in a CGE model.

#### **7.4.1.2. The Effect of Tariff Reduction in Agricultural Sector on Macroeconomic Variables: Using Global Trade Analysis Project (GTAP)**

Heidari, Davoudi and Zanousi (2016:308) have determined the effect if Iran joins the World Trade Organization (WTO). One of the requisites of the members of the WTO is a reduction in tariffs. The research investigates the effect on the agricultural sector if tariffs are reduced. This study also analysis effect on the trading partners using the Global Trade Analysis Project (GTAP), based on a CGE model version 8, which covers 113 regions and 57 commodities. The model of Heidari *et al.*, 2016:308., used three regions namely: Iran, CIS and ECO countries as commercial partners of Iran, and the rest of the world (R.O.W). The model makes use of five (5) production factors: capital, skilled and unskilled labour and natural resources and three production sectors: agriculture, services, and industry. The first scenario simulated a reduction of 50 % reduction and a zero-import tax target rate on intermediate good for agricultural production. The second scenario was set on a zero-target rate for all imports. According to the Social Accounting Matrix for Iran, the average tariff rate on imports of agricultural products from selected commercial partners is 27.67 % and 7.82 % from Iran to these countries. The results reveal that a 50 % reduction in tariffs will increase the social welfare. If tariffs are illuminated, it will lead to a loss in the Iranian welfare. The analysis shows that the efficient allocation of resources increases with the first scenario and decrease with the second scenario.

On both scenarios, the trade balance of Iran decreases. Despite the above, the agricultural sector had a positive share in the trade balance, but a negative effect on the industrial sector. The latter have a much bigger impact on the trade balance. The first scenario increased agricultural production with a slight reduction in the industry sector. According to the results of Heidari *et al.*, (2006:318), a 50 % tariff reduction on agricultural productions imports policy among Iran and their trade partners, it will be to the benefit of all the parties.

#### **7.4.1.3. Modelling Effects of Tariff Liberalisation on India's Key Export Sectors: Analysis of the EU–India Free Trade Agreement**

Khorona and Badri (2017:np) modelled the effect of trade liberalisation on the India Free Trade Agreement with the EU. These negotiations started in 2007. Their study focusses on the aspect from a global CGE perspective. They make use of the GTAP framework. Two scenarios were modelled. The first scenario focused on the total decrease of tariffs of all goods traded. The second scenario focussed on selective tariff decreases on wearing apparel and leather goods and textile products. Khorona and Badri (2017:np) stated that India has a comparative advantage in these products. Both scenarios indicate that India show positive welfare effects, but under the first scenario there are loses due to a negative terms of trade (ToT) effect. The second scenario indicates a positive output effect due to change in demand for factors of production. The results also indicate that the FTA can lead to a relocation of labour-intensive production to India.

#### **7.4.1.4. Modelling multi-product industries in computable general equilibrium (CGE) models**

Punt (2013:4) developed a CGE model for South Africa in which the assumption of a fixed output structure can be relaxed to enhance the quality of CGE model results. To achieve the main objective the specifications of the output transformation function need to be improved. The second sub-objective was to develop a Social Accounting Matrix (SAM) for SA. The SAM will include agricultural, labour and household detail on the provincial level. This can be used to calibrate the adjusted CGE model for use in policy analysis. The CGE model of Punt (2013:266) can be explained regarding a SAM framework, following the sub-matrixes of a SAM. The second sub-objective of Punt's dissertation was to develop a SAM for South Africa for 2007. The detailed version of the SAM comprises of 543 accounts. The version she used contains only 137 accounts. The objective of this was to focus on the agricultural sector. The

household, factor and agricultural accounts include data on the provincial level. The above allow the analyst to trace and understand income from industries to factors to household on the provincial level.

Punt (2013:270) summarised the contribution of her research as follows:

- “● *A SAM for South Africa for 2007, with agricultural, household and factor detail at provincial level, is available for calibration of the adjusted CGE model;*
- *A description of the development of the SAM for South Africa and the data sources that were used, is available;*
- *The model and calibration code about the model changes is available to allow for other researchers to incorporate these changes into their models;*
- *Results from a case study in South Africa, using the revised version of the model and calibrated with the newly developed SAM, have been reported as a contribution to the policy debate;*
- *A comparison of results of the two alternative transformation specifications and sensitivity analysis of different parameter values for the selected transformation function has been reported for the benefit of conducting future case studies;*
- *Results on a wide range of general sensitivity analysis for four different scenarios have been reported to inform the selection of elasticity values and model closures for future studies.”*

#### **7.4.2 Global Trade Analysis: Modelling and application**

Hertel (1998:4) explains that the motivation for the development of the GTAP model was based on the growing demand for quantitative analysis of policy issues on a global basis. An example of this is the General Agreement on Tariffs and Trade (GATT), especially after the Uruguay Round, when the need for analysis increased to understand the effect of the agreement on individual countries, the world-wide effect and international trade. The effect on each sector is important and is a valuable input into these processes. The GATT influences all sectors and therefore a database, which includes all the commodities and countries, is necessary. The analyst also faces challenges to understand the impact of climate change the effect of economic

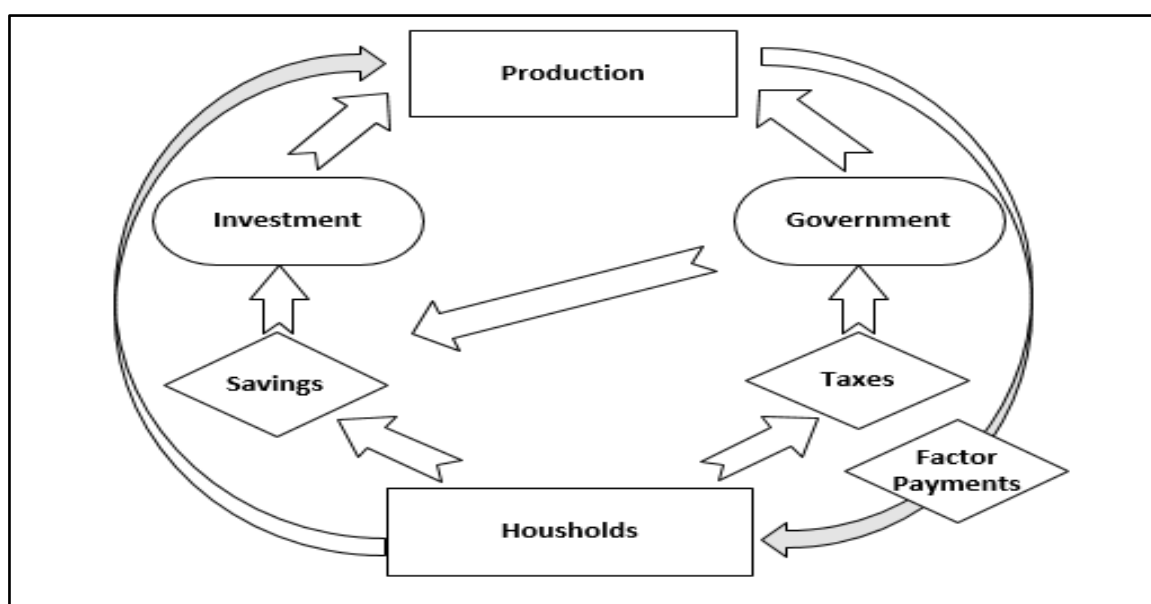
growth and other related issues. The objective of GTAP is to facilitate multi-country and economy wide analysis.

Hertel (1998:3) explain the Global Trade Analysis Project as a project consists of:

- *A fully documented, publicly available, global database.*
- *A standard modelling framework.*
- *Software for manipulating the data and implementing the standard model.*
- *A global network of researchers, linked through the Internet, with a common interest in multiregional analysis of trade and resource issues.*
- *A World Wide Web site for distributing software, data, and other project-related items of interest.*
- *A consortium of national and international agencies providing leadership and base level support.”*

#### 7.4.2.1. Overview of the model

One way to portray the relationship between the factors in the model is to explain them as a circular flow of income and spending in a national economy, as shown in Figure 7.1 below.



**Figure 7.1: The circular flow of income and spending in a national economy.**

Source: Burfisher (2011:6)

To meet the demand for broiler meat, broiler producers purchase inputs such as feed, chicks, medicine, and electricity. They also hire labour, use capital and pay rent, salaries and wages. The factor ‘payment’ accrues to private households as wages and capital rental income in the sector. Households spend their money on goods, such as broiler meat, and services. They pay income taxes and VAT. These taxes go to the government. They also save some of their funds at financial and other institutions. The government uses the tax as income to buy goods and services to run the country. Investors use savings to buy capital investment goods for the use of future production activities. The combined demand from households, government and investors constitute the final demand in the economy. Firms or businesses produce goods and services in response to this demand, which in return determines the demand for inputs, employment in the factor market, salaries and wages from households, and rental income and so forth in a circular flow. If trade is introduced (import and exports), exports can be added as an additional source of demand. Finally, policy is seen as taxes and subsidies, as “price wedges” that increase or lower the price of goods between buyers and sellers, or as a transfer that directly affects households’ levels of income, and therefore their levels of consumption, savings, and taxes. A general equilibrium model describes all these interrelationships in an economy at once. “Everything depends on everything else.” (Burfisher, 2011:6).

#### **7.4.2.2. Computable**

The term ‘computable’ in a CGE model explains the capability of this type of model to quantify the effect of change in an economy. Policy makers normally need to understand the magnitude of an impact. Is it big or is it small? CGE modellers have provided analysis on the advantages or benefits or costs of government policies, trade agreements and market shocks, for example, the effect of the increase in the price of fuel. (Burfisher, 2011:4).

#### **7.4.2.3. General**

The term ‘general’ refers to the fact that the model takes all economic activities simultaneously into account (Burfisher, 2011:4). The model includes every aspect of the economy namely: consumption, taxes, employment, savings and trade, and the linkages connection between the factors. A CGE model sees the economy as a whole/ circular flow as illustrated in Figure 7.1.

#### **7.4.2.4. Equilibrium**

An economy is in equilibrium when supplies and demands are in the balance at some set of prices, and there is no pressure for the values of these variables to change further. In a CGE model, equilibrium occurs at that set of prices at which all producers, consumers, workers, and investors are satisfied with the quantity of goods they consume, the number of hours they work, the amount of capital they save and invest, and so forth. Suppliers of goods or producers have a demand for chosen inputs and supply certain outputs that have maximised their efficiency, given the cost of inputs and technology constraints of their production processes. Consumers have maximised their utility, or satisfaction, by purchasing the most satisfying bundle of products, given their budget and the prices of consumer goods. The CGE model's equilibrium must also satisfy some important macroeconomic, market clearing constraints generally, these require that aggregate supply of goods and services equals aggregate demand, all workers and the capital stock are employed, and national and global savings equals investment (Burfisher, 2011:7).

#### **7.4.2.5. GEMPACK Software**

GEMPACK is a software package for general and partial equilibrium models. It can handle a wide range of economic behaviours and contains a versatile method for solving inter-temporal models. GEMPACK provides software for calculating solutions of an economic model. It starts from an algebraic representation of the equations of behaviour (SWMATH, 2016).

#### **7.4.2.6. Global Trade Analysis Project**

The GTAP Data Base consists of matrices that link individual country/regional economic databases. The regional databases are derived from individual country input–output tables, from varying years. In March 2012, the GTAP 8 Data Base was released, which included reference years for 2004 and 2007. Newly added data for Bahrain, Cote d'Ivoire, El Salvador, Ghana, Honduras, Israel, Kenya, Kuwait, Mongolia, Namibia, Nepal, Oman, Qatar, Saudi Arabia and the United Arab Emirates were added, as well as updated/improved data for Australia, Bolivia, Brazil, Cameroon, China, Ethiopia, India, Malaysia, Mexico, Norway, Philippines, Switzerland, Thailand, Uganda, Venezuela and Zimbabwe were included in this release (GTAP, 2016).

#### **7.4.2.7. Structure of the model**

Horridge (2014:2) explains that the CGE model as follow:

*“It has a theoretical structure which is typical of a statically applied general equilibrium (AGE) model. It consists of equations describing, for some period:*

- *producers’ demands for produced inputs and primary factors;*
- *producers’ supplies of commodities;*
- *demands for inputs to capital formation;*
- *household demands;*
- *export demands;*
- *government demands;*
- *the relationship of basic values to production costs and purchasers’ prices;*
- *market-clearing conditions for commodities and primary factors; and*
- *numerous macroeconomic variables and price indices.*

*Demand and supply equations for private-sector agents are derived from the solutions to the optimisation problems (cost minimisation, utility maximisation, etc.) which are assumed to underlie the behaviour of the agents in conventional neoclassical microeconomics. The agents are assumed to be price-takers, with producers operating in competitive markets which prevent the earning of pure profits”*

#### **7.4.2.8. Closure of the model**

Horridge (2001:58) explains that the choice of the closure of the model reflects two different types of consideration: First, the closure is associated with the idea of the simulation *timescale*, that is, the period which would be needed for economic variables to adjust to a new equilibrium. In a short-term simulation, capital stocks are normally fixed. The idea is that capital stocks take some time to install. It will normally take too long to show an effect in the short run, by the shocks. Short-run closures often also allow for rigidities in the labour market: in this case, by holding real wages fixed. The length of the ‘short’ run is not exact but is estimated to be between one and three years (Horridge, 2001:58).

Second, the choice of closure is affected by the needs of a simulation and by our view of the most appropriate assumption for those variables that the model does not explain. For example, the major expenditure-side aggregates are simply held fixed (Horridge, 2001:62).

## 7.5 Results & Discussion

The model was shocked by a decrease in tariffs of 33.6 %. This rate is seen as the average protection existed in 2013. Chapter 7.5.1. explain how the average protection rate was calculated. In theory, if the average protection rate is removed, the domestic price will decrease by the same percentage at the factory level. The main reason for this is that the imported product competes at the factory level. It is also important to note that although South Africa processors do brine and import products do not contain any brine, no calculations were considered due the complexity of such a system.

The calculation of the average protection rate of 33.6 % was used in the CGE modelling. See chapter 5.3 for calculation.

### 7.5.1 The quantity of endowments demanded by industries in a specific sector

Qfe explains an industry's behaviour regarding demand for individual inputs in the production process (Hertel and Tsigas, 1997:13). Primary production inputs are classified as land, labour (skilled and unskilled), capital and natural resources. Table 7.1 provides information on the changes that can be expected in different sectors if the protection of 33.6 % were to be removed.

The CGE model indicates that a result of relaxing protection will result in a decrease of 1.9 % in land, and 2.61 % in unskilled and skilled labour. Capital investment will also decrease by 2.61 %. It is also clear that a substitution effect of resources towards other industries will take place. The red meat/livestock sector will use 0.41 % more land, 0.05 % more skilled and unskilled labour, and 0.05 % more capital. Land used to produce cereals and grains will increase by 0.07 %, skilled, unskilled labour, and capital investment will decrease by 0.014 %. Land used for other grains will increase with 0.25 %, unskilled labour, skilled labour and capital will increase by 0.08 %.

**Table 7.1: Quantity demand of endowments by industry**

qfe[**SouthAfrica]	Land	UnSkLab	SkLab	Capital	NatRes
Poultry	-0,0194	-0,0261	-0,0261	-0,0261	-0,0001
MeatLstk	0,0041	0,0005	0,0005	0,0005	0



Cerealgrain	0,0007	-0,0014	-0,0014	-0,0014	0
Othergrains	0,0025	0,0008	0,0008	0,0008	0
ProcessFood	0,0048	-0,0007	-0,0007	-0,0007	0
Textile	0,0056	0,0003	0,0003	0,0003	0
Extraction	0,0018	0,0003	0,0003	0,0003	0
LightMnfc	0,0056	0,0004	0,0004	0,0004	0
HeavyMnfc	0,0057	0,0006	0,0005	0,0006	0
Otherserv	0,0057	0	0	0	0
CGDS	0,0047	-0,0003	-0,0003	-0,0003	0

Source: GTAP (2016)

The processed food sector will increase by 0.48 % and use less labour capital in the order of 0.07 %. The textile industry will also use more land in the order of 0.48 % and 0.03 % more labour and capital. The extrusion sector will use 0.18 % more land and 0.03 % less labour and capital. The light manufacturing sector will use 0.56 % more land and 0.04 % more capital and labour. The heavy manufacturing sector will use 0.57% more land and 0,05 % less capital, 0.06 % more unskilled labour and 0,05 % skilled labour. Other services will use 0.57 % more land. Capital Goods and services will use 0.47 % more land and 0.03 % less labour and capital. From the above, it is evident that the demand for land will decrease at the poultry industry and will be taken over to other industries. The same applies to labour and capital.

### 7.5.2 Quantity of output supplied by industry

Hertel and Tsigas (1997:13) explain that the manner in which a firm combines individual inputs to produce its output,  $QO(i,s)$ , depends largely on the assumptions that are made about *separability* in production. For example, assume that a company or business entity choose their optimal mix of primary factors *independently* of the prices of intermediate inputs. Since the level of output is also irrelevant to the assumption of constant returns to scale, this leaves only the relative prices of land, labour, and capital as arguments in a company' or sectors' conditional demand equations for components of value-added. By assuming this type of separability, the restriction imposes a point that the elasticity of substitution between any individual primary factor, on the one hand, and intermediate inputs, on the other, is equal. This is what permits the drawing of a production tree, for it is this common elasticity of substitution

that enters the fork in the inverted tree at which the intermediate and primary factors of production are joined. It also represents a significant reduction in the number of parameters that need to be provided to operationalise a GTAP model. The results are shown in Table 7.2.

**Table 7.2: Provides the results for quantity of output supplied by an industry**

qo[*SouthAfrica]	Ch/%Ch
Land, Capital, NatRes, UnSkLab & SkLab	0
Poultry	-0,5496
MeatLstk	0,0703
Cerealgrain	-0,014
Othergrains	0,0664
ProcessFood	-0,1816
Textile	0,0303
Extraction	0,0254
LightMnfc	0,1953
HeavyMnfc	0,4922
Otherserv	-0,0313
CGDS	-0,0938

Source: GTAP (2016)

Poultry cereals, grains and processed meat output will decrease by 54.9 %, 14 %, and 18 %, respectively. All the other industries indicate an increase in output.

### 7.5.3 Private demand for import goods

Import substitution elasticities comprise an important consideration for CGE modellers who study the impact of price changes, such as that of tariff reform on production and trade (Burfisher, 2011:93). Burfisher (2011:90) stated that the second stage of a consumer's decision-making determines the sourcing of each commodity. How much of the demand will be made by the domestic produce variety and how much will be imported? CGE models the allocation between domestic product and imported goods, and fix assumption that the two varieties are perfect substitutes (Burfisher, 2011:90). For example, South African consumers may feel that an imported product is different in certain characteristics and taste, and will then have certain preferences over the locally produced product. We can identify products such as chicken meat. Chicken meat imported from the USA is larger than locally produced meat, while locally frozen produced chicken meat has a high degree of brining, as against imports from the

EU and the USA. South Africans have higher preferences for brown meat, whereas countries in the northern hemisphere have a higher preference for white meat. Wheat imported from other countries does not have the same bread-baking attributes that the South Africa varieties have, but imported wheat is better to use when baking cookies. A further example is that Chinese apples are more suitable for baking in pies, while South African apples are best eaten raw. These preferences would explain why trade is necessary and why prices differ. Many CGE modellers describe these preferences using an Armington import aggregation function. This function describes how imported, and domestic products are combined to produce a composite commodity that is demanded by a country's consumers. The behaviour equation can be explained by disposal of total regional income according to a Cobb-Douglas per capita utility function, specified over three forms of final demand, namely private household expenditures, governmental expenditure, and saving. Table 7.3 shows the change in private demand for imported goods when tariffs are dropped on the poultry sector.

The demand at household level for poultry products increases by 64.6 %. It would be expected that it should be much higher. The explanation might be that the lower prices of goods imported are not transmitted to the consumers due to the dynamics of the supply chain. That is also why livestock or red meat prices do not decrease (0.8 %) so drastically with other grains (0.43 %) and processed food (1.26 %). Textiles decrease by 0.88 %, extraction products by 0.01 %, light manufacturing goods by 1.7 %, heavy manufacturing goods by 1.37 %, and other services by 1.5 %.

**Table 7.3: Private demand for imported goods**

<b>qpm[*SouthAfrica]</b>	<b>Ch/%Ch</b>
Poultry	0,6464
MeatLstk	-0,0116
Cerealgrain	-0,0008
Othergrains	-0,0043
ProcessFood	-0,0126
Textile	-0,0088
Extraction	-0,0001
LightMnfc	-0,0168
HeavyMnfc	-0,0137
Otherserv	-0,0146

Source: GTAP (2016)

#### 7.5.4 Private household demand for domestic goods

Burfisher (2011:81) explains that economic shocks in standard CGE models usually lead to larger changes in relative prices than in income, so it is worthwhile to examine carefully how demand for the said quantities are assumed to respond to price shocks in these models. A key determinant is the elasticity of substitution in consumption. The larger the elasticity of substitution is, the more willing the consumer is to shift from one substitute product to another as the relative price of the substitute product changes. Table 7.4 illustrates the rate of substitution after the price change attributable to the removal of tariffs.

The effect on private household demand for domestic goods is as follows:

- Poultry – negative by 0.4827 %
- Red meat & livestock – positive by 0.0205 %
- Cereals & grain – positive by 0.0009 %
- Other grains – positive by 0.0054 %
- Processed food – positive by 0.0068 %
- Textiles – positive by 0.0034 %
- Extraction – negative by 0.0013 %
- Light manufacturing – positive 0.001 %
- Heavy manufacturing – negative 0.001 %
- Other services – negative 0.0586 %

**Table 7.4: Private household demand for domestic goods**

qpd[*SouthAfrica]	Ch/% Ch
Poultry	-0,4827
MeatLstk	0,0205
Cerealgrain	0,0009
Othergrains	0,0054
ProcessFood	0,0068
Textile	0,0034
Extraction	-0,0013
LightMnfc	0,001
HeavyMnfc	-0,001
Otherserv	-0,0586

Source: GTAP (2016)

The effect on private household demand for domestic goods is as follows:

- Poultry – negative by 0.4827 %
- Red meat & livestock – positive by 0.0205 %
- Cereals & grain – positive by 0.0009 %
- Other grains – positive by 0.0054 %
- Processed food – positive by 0.0068 %
- Textiles – positive by 0.0034 %
- Extraction – negative by 0.0013 %
- Light manufacturing – positive 0.001 %
- Heavy manufacturing – negative 0.001 %
- Other services – negative 0.0586 %

### 7.5.5 Domestic sales

Domestic turnover or sales will also change over time regarding the dynamics of the consumers' market. Table 7.5 illustrates the change in domestic sales.

**Table 7.5: Domestic sales**

<b>qds[*SouthAfrica]</b>	<b>Ch/%Ch</b>
Poultry	-0,5544
MeatLstk	0,0396
Cerealgrain	-0,0175
Othergrains	-0,002
ProcessFood	-0,2285
Textile	0,0127
Extraction	0,0112
LightMnfc	0,0859
HeavyMnfc	0,1641
Otherserv	-0,0938

Source: GTAP (2016)

From the table above domestic sales will decrease by 0.5544 %. Livestock or red meat will increase by 0.039 %, which is an interesting phenomenon. This can be attributed to a drive and confidence for local products. Other cereal grains will also decline because they form part of

the broiler value chain as feed. The demand for locally processed food will change due to less poultry being processed.

### 7.5.6 Trade

The net effect of trade is measured regarding trade. This measure the import purchasing power of a country's exports. Any change in terms of trade therefore affect an economy's well-being, or welfare, by changing each of the consumption possibilities. Terms of trade are calculated as the ratio of the price of a country's export goods to the price of its imported goods, as imports are compared in fob prices, exclusive of trade margins. Otherwise, the change in shipping costs will appear to change the relative price of the two goods. Import tariffs are also excluded (Burfisher, 2011:155).

### 7.5.7 Change in trade balance of a region

Burfisher (2011:156) explains the point that countries usually export and import many types of goods with many trade partners, and that a global CGE model that tracks bilateral trade flows should include the Armington assumption that goods are differentiated by origin, as many bilateral export prices as the countries and commodities in the model. In this case, the country's terms of trade can be calculated as a price index that is defined for either an industry or for total imports and exports. Either index is calculated as a straight weighted sum of the home country's bilateral free-on-board (FOB) export prices about do a trade-weighted sum of the FOB prices of its import. The trade weights on the export side are the quantity share of each trading partner in the home country's export market. The weighs on the import side of the quantity shares of each source candidate in the home countries imports. Terms-of-trade changes can vary widely among countries, even though, globally, the terms-of-trade changes for all countries sum to zero. Table 7.6 indicates the change in the trade balance of domestic industries.

**Table 7.6: Change in trade balance**

<b>DTBALi[*SouthAfrica]</b>	<b>(Sim)</b>
Poultry	-0,7044
MeatLstk	0,0427
Cerealgrain	0,0027
Othergrains	0,0691
ProcessFood	0,0557

<b>DTBALi[*SouthAfrica]</b>	<b>(Sim)</b>
Textile	0,0259
Extraction	-0,0239
LightMnfc	0,14
HeavyMnfc	0,3589
Otherserv	0,0749
<b>Total</b>	<b>0,0416</b>

Source: GTAP (2016)

The poultry industry will be affected negatively by 70.44 %. Industries that will benefit from the relaxation of tariffs are the red meat industry (4.3 %), Cereals & Grains (0.27 %), other grains (6.9 %), processed food (5.57 %), textiles (2.59 %), light manufacturing (14 %), heavy manufacturing (36 %), and other services (7.49 %) The net effect is positive, at 4.16 %.

### 7.5.8 Aggregated imports at CIF level

Table 7.7 provides details regarding the change of imports at the cost insurance and freight level (CIF).

**Table 7.7: Aggregated imports at CIF level**

qiw[*SouthAfrica]	(Sim)
Poultry	0,7956
MeatLstk	-0,004
Cerealgrain	-0,0009
Othergrains	-0,0022
ProcessFood	-0,001
Textile	-0,0005
Extraction	0,0005
LightMnfc	-0,0003
HeavyMnfc	-0,0003
Otherserv	-0,0004

Source: Own calculation with GTAP (2016)

Imports of poultry will increase by 79.56 %, meat/livestock will decrease by 4 %, cereal & grains by 0.9 %, other grains by 2,2 %, and processed food by 0.1 %. Other industries such as

the textile industry have a decrease of 0.05%, the extraction industry have an increase of 0.05% with light manufacturing, heavy manufacturing and other services a decrease of 0.03.

### 7.5.9 Aggregated exports at FOB level

Table 7.8 indicates the impact of exports at the free on board (FOB) level.

**Table 7.8: Aggregated exports at CIF level**

qxw[*SouthAfrica]	(Sim)
Poultry	0,0036
MeatLstk	0,0096
Cerealgrain	0,0018
Othergrains	0,0029
ProcessFood	0,0014
Textile	0,0014
Extraction	0,0002
LightMnfc	0,0011
HeavyMnfc	0,0012
Otherserv	0,0008

Source: GTAP (2016)

All the sectors show positive export demand coefficients regarding exports, which entails that when tariffs are relaxed, exports will increase. The highest increase of exports is in the red meat livestock sector, at 0.96 %. Red meat exports are increasing to the rest of Africa and the Middle East. Poultry exports increase by 0.36 %. South Africa mostly exports chicken meat to its neighbouring countries, such as Lesotho and Swaziland. The lowest increase in exports is the extraction sector, at 0.02 %.

## 7.6 Chapter Summary

The average protection rate for the broiler industry is 33.16 %. In fact, broiler prices have increased by 33.16 % for consumers, due to tariffs. The South African business model for processing decreases the price of chicken meat due to the fact of brining. The previous calculation indicates an average of  $\pm 22$  % for IQF. This was not factored into the total equation.



The CGE model indicates that relaxing protection will result in the quantity demand for endowments experiencing a decrease of 1.9 % in land, and 2.61 % in unskilled and skilled labour. Capital investment will also decrease by 2.61 %. It is also clear that a substitution effect of resources towards other industries will take place. The red meat/livestock sector will use 0.41 % more land, 0.05 % more skilled and unskilled labour, and 0.05 % more capital. Land used to produce cereals and grains will increase by 0.07 %, and skilled, unskilled labour, and capital investment will decrease by 0.014 %. Land used for other grains will increase by 0.25 %, and unskilled labour, skilled labour and capital will increase by 0.08 %. The processed food sector will increase by 0.48 % and use less labour capital in the order of 0.07 %. The textile industry will also use more land in the order of 0.48 % and 0.03 % more labour and capital. The extrusion (production of parts) sector will use 0.18 % more land and 0.03 % less labour and capital. The light-manufacturing sector will use 0.56 % more land and 0.04 % more capital and labour. The heavy manufacturing sector will use 0.57 % more land and 0,05 % less capital, 0.06 % more unskilled labour and 0,05 % more skilled labour. Other services will use 0.57 % more land. Capital Goods and services will use 0.47 % more land and 0.03 % less labour and capital. From the above, it is evident that the demand for land will decrease at the poultry industry and will be taken over to other industries. The same applies with labour and capital.

On the outputs side, poultry, cereals and grains, and processed meat output will decrease by 54.9 %, 1.4 %, and 18.16 %, respectively. All the other industries indicate an increase in output.

The demand at household level for imported poultry products increases by 64.6 %. It would be expected that it should be much higher. The explanation might be that the lower prices of goods imported are not transmitted to the consumers due to the dynamics of the supply chain. That is also why livestock or red meat prices do not decrease (0.08 %) so drastically with other grains (0.43 %) and processed food (1.26 %). Textiles decrease by 0.88 %, extraction products by 1 %, light manufacturing goods by 107 %, heavy manufacturing goods by 1.37 % and other services by 1.5 %.

The effects on the demand for the household products in the following industries are as follows:

The effect on private household demand for domestic goods is as follows:

- Poultry – negative by 0.4827 %
- Red meat & livestock – positive by 0.0205 %
- Cereals & grain – positive by 0.0009 %

- Other grains – positive by 0.0054 %
- Processed food – positive by 0.0068 %
- Textiles – positive by 0.0034 %
- Extraction – negative by 0.0013 %
- Light manufacturing – positive 0.001 %
- Heavy manufacturing – negative 0.001 %
- Other services – negative 0.0586 %\

Total sales of domestic product at the retail level will decrease by 0.55 %. Livestock or red meat will increase by 0.0396 %, which is an interesting phenomenon. This can be attributed to a drive and confidence for local products. Other cereal grains will also decline because they form part of the broiler value chain as feed. The demand for locally processed food will change due to less poultry being processed.

The trade balance of poultry meat will be affected negatively by 70.44 %. Industries that will benefit from the relaxation of tariffs are the red meat industry (4.3 %), cereals & grains (0.27 %), other grains (6.9 %), processed food (5.57 %), textiles (2.59 %), light manufacturing (14 %), heavy manufacturing (35.89 %), and other services (7.49 %). The net effect is positive, at 4.16 %.

Imports for poultry will increase by 79.56 %, meat/livestock will decrease by 0.4 %, cereal & grains by 0.09 %, other grains by 2.2 %, and processed food by 0,001 %.

All the sectors show positive export demand coefficients in terms of exports, which indicates, that when tariffs are relaxed, exports will increase. The highest increase of exports is in the red meat livestock sector, at 0.96 %. Red meat exports are increasing to the rest of Africa and the Middle East. Poultry exports increase by 0.36 %. South Africa mostly exports chicken meat to its neighbouring countries such as Lesotho and Swaziland. The lowest increase in exports is the extraction sector, at 0.02 %.

## **CHAPTER 8 :**

### **CONCLUSION AND RECOMMENDATIONS**

#### **8.1 Introduction**

The broiler industry has increased production substantially over the past decade and it is now the agricultural industry with the highest value of production. On the demand-side, consumption has doubled in the last 15 years, which has further resulted in a higher demand for intermediate products such as DoC's, feed, and maize and soybean meal. South Africa has also experienced drastic increases in imports of broiler meat over the past decade. The local industry is experiencing severe competition from the EU because of the free trade agreement relating to imported poultry cuts. Imports from South America, and lately from the USA, have also increased substantially. South Africa, in general, has experienced the benefit in full of a growing demand across the value chain. In fact, the government also forfeits substantial income on taxes due to the increased import without tariffs. It is also mentionable that the direct effect of the introduced quota on imports from the USA, as part of the revised AGOA agreement, results in a potential loss in production of R1,3 billion in the first year for the South African broiler industry. The cost to produce broilers also came under pressure due to higher international feed prices and South African feed prices trading mostly at the upper import price level. The industry is highly concentrated, and it is difficult for individual growers to enter established marketing channels. The number of processors in the South African market is also highly concentrated and results in severe competition amongst them in the different outlet markets.

The research reported in this study was carried out to investigate the value chain of the industry and to measure the international competitiveness and comparativeness of the industry, using several models. The study provides an overview of the South African broiler industry and detailed information regarding the value chain through using an orthodox approach in calculating consumption. The study also refers to price trends and volumes produced. The research addresses the effect of policy and determines if the industry has a comparative advantage to produce poultry meat in South Africa. It also highlights the results of a disaggregated input-output analysis and further assesses the socio-economic impact, if tariffs were to be relaxed, via the SAFRIM model and looks at the economic consequences with a CGE single country model from the GTAP database.

## **8.2 Overview and the broiler value chain**

The global trade in poultry meat is complicated and comprises not only the trade of whole birds, but also of individually differentiated cuts, according to the different preferences and needs in several different countries. There are only a few countries in the world that have developed their value chains to such an extent that they be self-sufficient and supply the world with the cuts they do not consume. For a country to be self-sufficient, a few the other main dependent value chains also need to be competitive, and a comparative advantage in the specific products must exist. These are the production of maize, production and processing of soybeans, production of DoC's, and the manufacturing of feed. From here, the technical efficiency in the production of broilers plays an important role. Other transactional capabilities, such as transport and distribution through the total sector from the input side towards wholesale and retail, also need to be in place. South Africa can tick many of these boxes and is highly efficient in close to all of them. South Africa needs certain further enhancements in some industries to render the broiler industry more competitive and sustainable. With the above, it is also important to take cognisance of trade relations, trade agreements, and the preferences, needs and ability of the end consumers at different levels.

## **8.3 Overview of the international broiler market**

The outline of the chapter on the global market provides a summary of the background of trade in the world market. It is important to understand the relations between countries, trade agreements, and requirements to trade with these countries. The chapter presents a literature review and own calculation from various sources.

Total world broiler production was reported at 89.655 million tonnes by FAS in 2016. This figure increased from 81.313 million tonnes in 2011. The USA is the world's largest producer, with a share of 20.57 %, followed by Brazil at 15.13 % and China at 14.17 %. The USA is the largest consumer of poultry meat, with a total of 17.7 %, followed by China at 14.46 % and the EU at 11.75 %. Brazil consumes 10.81 % of the total production. South Africa consumes 1.96 % of the world broiler production. Brazil, the USA, and the EU are the countries producing major surpluses, while Mexico, South Africa and Russia are main importers in a world context.

Global trade can be split into four main categories, namely whole bird (US\$3.6 billion), dark meat (US\$9 billion), white meat (US\$2.3 billion) and processed chicken (US\$3 billion). The

major exporting countries for poultry meat are the USA, Brazil, and the EU. Total poultry meat trade constitutes ± US\$17.9 billion. The total trade of dark meat constitutes 50 % of poultry meat trade. The USA has a 47 % share of this market, and Brazil 26 %. Brazil has a 65 % market share of the international whole bird market and 63 % of the white meat market.

Although local production has grown by 160 % over the past 20 years in South Africa, the country is still importing ± 450 000 tonnes annually, and it continues to grow. This constitutes an average growth rate of 8 % per year. Total consumption has grown by an average of 10.4 % over the last 20 years. The two major products imported are MDM (40 %) and frozen portions, cut in pieces (42 %) or better known as dark meat.

Although the industry is protected by countervailing and safeguard duties and ordinary customs duties, imports have continued to increase over time. South Africa exported close to 70 000 tonnes in 2014 to neighbouring countries, mostly Lesotho and Swaziland. The South African broiler industry is institutionally well structured and organised. The industry strives to provide and maintain unique, comprehensive support structures for new black commercial farmers, as well as emerging small-scale and subsistence farmers. This lends itself to being a starter industry for these farmers and to assist with household food security in rural areas.

The industry also faces several challenges regarding imports of brown meat, a result of duty-free imports from certain exporting countries, under certain trade agreements. Of relevance in this regard, is the interplay between measures aimed at promoting consumer interests (and access to cheaper protein) and the efforts by government in seeking to sustain and promote job creation and food-security by establishing new emerging farmers in the broiler industry. Greater competition (and thus deregulation) is advocated in pursuit of lower prices and greater variety of choice for the consumer. Conversely, if liberalisation is pursued in the domestic market, without reciprocal measures being adopted by regional and international competitors, local industries are compromised at the expense of the country's labour force, local production and to some extent self-sufficiency.

#### **8.4 The broiler value chain and institutional arrangement in the chain**

This chapter analysed the complexity of the South African broiler value chain. Several interviews with stakeholders, literature reviews of previous studies, and calculations resulted

from this chapter. The integrated broiler chain links with several industries. Numerous factors have a direct and indirect effect on these sectors in the value chain. The value chain also indicates a well-organised system, with several bodies representing the different organisations participating in the chain.

Astral and Rainbow Chickens represent more than 50 % of the total broiler production of the South African industry. Companies operating in the chain are very active in endeavours to increase market share and position themselves strategically throughout the chain. Location of production facilities also plays an imperative role. It seems that production and processing facilities are in the main grain producing areas in South Africa except for the Free State. The North West produces 24.1 %, Mpumalanga, 19.6 % and KwaZulu-Natal 13.4 %, of broilers in South Africa. The Western Cape produces 21.2 % of the country's broilers. This can be attributed to lower-priced imports of raw material from Argentina, available at the coast near importing harbours – thus saving on transport costs. The total production of broilers in South Africa is produced by an estimated 580 farms. This emphasises the economies of scale achieved in the formal industry. The distribution of abattoirs also follows the same trend.

The South African industry role-players slaughter chickens at  $\pm 1,8$  kg live mass. Blood and feathers (9 % to 10 %) are the only by-products not consumed by our population. Blood and feathers are used in processing for feed. The market mix consists of  $\pm 8$  % to 10 % fresh,  $\pm 60$  to 62 % IQF, and the rest is edible offal and frozen products.

The total consumption by the average South African citizen of all chicken meat (broilers, spent hens, etc.), with brining, adds up to close to 48 kg per capita per year. This figure is different from, and controversial regarding, figures published by DAFF and SAPA because live sales from spent fowls and brine were included in the calculation.

The value of the industry at consumption level is between R45 billion- and R53 billion. The industry also contributes significantly towards governmental income, between R4,3 and R4,7 billion rand and further underline the importance of the industry.

The net realisation of broiler prices to the producers increased over time. The mix in selling fresh and frozen is very volatile. The price transmission effect and the relationship between price, percentage frozen and percentage fresh sold, need to be investigated in further studies.

The institutional arrangement provided by the South African Poultry Industry is important for the future viability and sustainability of the broiler industry. The South African Poultry Association (SAPA) coordinates the relationships between the different associations related to the production of chicken meat. Other related industries, such as the Agricultural Meat Importers and Exporters, Animal Feed Manufacturers Association and other related industries, are not members of SAPA, although in certain instances they do support the Industry.

The support structures provided by the poultry industry can be seen as institutional services focusing on research, coordination of training, management information systems, and industry affairs. The support structures are made possible with previous funding obtained through a levy system from within the industry and membership fees. It is imperative that the industry should maintain its coordinating role. Broiler industry strategies and conduct, as well as legislative processes, should take cognisance of the strategic role of industry associations to ensure that future strategies, conduct, and legislation will not impact negatively on the support structures and thereby fragment the existing environment, and should rather enhance well-needed cohesion.

The following strategic aspects have been identified and need further consideration and investigation regarding the institutional framework:

The relationships in the industry are of utmost importance and need development and enhancement. A cooperative, mutually beneficial and interdependent relationship exists amongst the broiler producers' industry, the chick producer's industry, the maize industry, and industries involved in soybean and soybean processing, feed manufacturing, broiler production, broiler processing, and wholesale and retail operations.

A result is the strategic positioning of feed manufacturing plants and soybean processing plants, located near the broiler producers. The viability of high throughput processing plants and the supply of feed and DoC to producers are equally dependent on the constant provision of these inputs and uptake of their final product. The slowing down or halting of a feed manufacturing

plant or of the supply of DoC has an immediate impact on producers regarding additional costs required to transport feed and Doc from alternative sources and to transport birds to abattoirs (in most cases, making broiler production uneconomical if it is located too far from a mill). Primary producers, processors, feed manufacturers and DoC suppliers are integrated into the value chain. This provides a competitive advantage for these specific organisations.

Multi-nationals have not yet entered the South African market, and the view is that it is a matter of time before this will happen. However, the low margins of the industry are a deterrent to new entrants. The impact of such entrance could influence the industry in several ways. New technology might be transferred into the South African market, and new markets might be developed.

At the institutional level, processors and producers are heavily dependent on SAPA, in which they are equal partners, to negotiate tariff agreements and orchestrate various initiatives. In its essential coordinating role, SAPA maintains several programmes and support structures which are indispensable for the efficient functioning of the industry, while the government is not fulfilling such a role.

The funding of the different associations in the industry takes place on a voluntary basis, as the statutory levy towards SAPA is no longer in effect.

Research and development can be enhanced and further developed, especially regarding market development and ways for South Africa to produce its own grand-grandparent material.

The brining of meat is also a controversial topic. A new regulation, promulgated in April 2016 to reduce the percentage of brining allowed, will have an adverse impact on the financial viability of the industry. The industry believes this will result in higher prices at the consumer level and reduce international competitiveness of the local industry.

The primary production side of the industry can be seen as dualistic. The commercial side contributes 95% of production and the small scale and emerging side the rest. The commercial part of the sector requires large capital investment and is well known for its highly technical sophistication (IDC, 2016:66). The characteristics of the small scale and emerging farmers are



less capital investment, higher margins and live marketing (IDC, 2016:66). Despite the support systems, it seems that the financial viability of black commercial farmers remains problematic and they struggle to compete in an environment, where imports are very competitively priced. This leads to insufficient profits and makes it difficult to invest in required expansion needed to increase the economies of scale and to make them more competitive in the industry. It is also mentioned in the IDC (2016:66) report that the competitiveness will remain a challenge for small-scale farmers and to integrate them into the commercial chain.

### **8.5 Factors affecting the competitiveness of the industry**

This is a summary of Chapter 4. The part is developed from Michael Porter's diamond, with emphasis on the qualitative aspects affecting the broiler industry on a macro-, meso- and micro level. Information was obtained via interviews with prominent stakeholders and the development and distribution of a questionnaire (please see Appendix 2). This study also carries the consent of the Competition Authorities of South Africa. Contact details were provided by the South African Poultry Industry. The questionnaire was distributed to stakeholders in the industry. Although the response rate is not at a satisfying level, the response represents feedback from stakeholders with more than 70 % of the market share.

High levels of integration and concentration are evident in the South African broiler value chain. This concentrated market structure is arguably a result of extreme cost pressures and narrow margins that have forced smaller producers out of the market, while large, integrated holding companies have survived because of economies of scale benefits, as well as cost reductions resulting from vertical integration. These companies have been able to stay relatively competitive by diversifying production, adding value and improving efficiency on a continuous basis.

The broiler industry has sound potential to grow in a financially feasible and sustainable manner, if a supportive environment were to exist. This can be achieved promptly by leveraging the tacit knowledge and capacity that exists in both the public and private sectors. It is also important to note that further investment is needed for the above initiative.

The impacts of macro-, meso- and micro-environmental factors, respectively, on the competitiveness of the broiler industry and on each group of role players within the industry

(and of different regions within specific groups of role players) were identified. These findings serve as indicators to guide the industry to manage the various constraining and enhancing factors to improve the competitiveness of the industry.

Several policy shifts can improve the competitive of the industry. Industry role players indicated clearly what the most important factors to increase competitiveness are:

- Input cost/production cost: The current cost of production is also seen as a vital factor in the competitiveness of the industry. A question to be asked is what can be done to decrease costs and increase productivity. Several factors affecting input costs contributes to these phenomena, namely:
  - The cost of feed: The major cost components of feed are the world price of soybeans and maize, and local stock levels and production. South Africa needs to move to a situation where it is self-sufficient in the production of all the ingredients of feed, and therefore become a net exporter of maize and soybeans. In normal years, South Africa produces enough maize and is seen as a net exporter. This keeps feed at export parity levels, which contributes to lower feed costs. South Africa needs to increase production of soybeans and processing capacity. Processing capacity has increased over the past few years.
  - The volatility of the exchange rate: Grain and oilseed prices are derived from world prices. A volatile exchange rate makes it difficult to plan accordingly and contributes to uncertainty. A more stable political environment can enhance this factor.
  - The cost of administered prices. The costs of administered prices have increased over the past few years, for example, levies on fuel, electricity costs, toll fees, and taxes on property and companies.
  - Day old Chicks: the cost and quality of day-old chicks play a very important role. South Africa does not produce its own grand-grandparent material. What can the industry do or what research is necessary to move to a level for South African production to occur?
- The quality of feed: Feed plays a vital role in the industry. Although regulations exist on the quality of feed, the question remains whether the enforcement of the regulations is up to standard.

- Electricity supply: The consistency and ever-increasing price of electricity supply comprise probably one of the most controversial topics in South Africa. The government needs to increase the supply of electricity and to maintain a constant supply of electricity at a reasonable cost.
- Price formation: The pricing strategy of different role players is also seen as an important factor. The question to be asked is how transparent these strategies are and what can be done to increase transparency. Does the industry need a new price forming mechanism? The industry is also known as a concentrated industry, especially on the processing level. Does this enhance or constrain the competitiveness of the industry? It is recommended that further studies need to analyse this in the industry.
- Water supply: The quality and the availability of water, plays an important role. How do local authorities comply with this requirement and can they be held accountable for the neglecting of South Africa's water resources? The quality and availability of water are important to the industry.
- Infrastructure: Some parts of the processing and feed manufacturing infrastructure are old and need to be replaced. Financial constraints prohibit this, which is a constraining factor.
- Import and export environment. Free trade agreements pose a huge threat and leave South Africa open for dumping. Official programmes on the development of export markets also need attention. South Africa only exports to Lesotho and Swaziland, with limited quantities being exported to other neighbours. Certain chicken cuts are in significant demand by other countries and receive premiums. This market needs to be exploited and developed.
- Labour law: The current labour law system is not seen as an enhancing factor in the industry. This area needs a revisited.
- Relationship and networking in the industry: Cohesiveness and institutional arrangement play a very important role.
- Pricing strategies: The different pricing strategies of the different companies are seen a constraining factor.
- Labour productivity: The cost of labour and the productivity return are also seen as a constraining factor.

The industry can increase sufficiency, productivity and sustainability by implementing these findings. Further research is also necessary. The industry role players can collectively address any similar and contrasting impact made by the various factors. Accordingly, organisations can be guided to design, negotiate and implement interventions to ultimately improve the industry's competitiveness, without doing so at the expense of role players within the broiler industry.

## **8.6 The effect of policy & comparative advantage of the industry**

South Africa has a comparative advantage in the production of broilers. The profitability of broilers is dependent on the efficient allocation of inputs, as shown in the results of this study, and inputs are taxed relatively high in comparison with the economic prices thereof. The current policy is exerting pressure on the comparative advantage of broiler production.

The following imperatives need to be addressed:

- Efforts to decrease the costs of ingredients for feed need to continue. For example, the stimulation of investment in the local soybean processing industry.
- Information in the market can be enhanced, e.g. official supply and demand figures of poultry meat and substitutes.
- A case needs to be made whether dumping occurs in the market or not – proper research needs to be done to inform policy decisions.
- The comparative advantage study reveals that the current tariff formulation protects the industry sufficiently, due to a positive profitability coefficient.
- The communication channel between industry and government bodies and decision makers needs to improve and to be put on a more permanent basis to convey industry information to policy makers.
- The industry needs to continue research, which needs to be funded by either industry or government.

## **8.7 Economic and social contribution**

### **8.7.1 SAFRIM Model**

The economic impacts were calculated by making use of a General Equilibrium modelling system which is a dynamic and multi-sectoral model, forecasting the economy in a bottom-up approach. Macroeconomic aggregates are built up from detailed levels at the industry or

product level. The various impacts in this analysis are the loss in investment by the broiler industry, reduction in production (operational cost and profits) in the broiler industry, loss of government income from relaxing the import restrictions, and a positive effect on the buying power of the private consumer through a reduction in the price of broilers.

The results of the analysis show that the positive effects of a possible lower price for the consumer, leaving more disposable income, are outweighed by the negative consequences, which will impact on the broiler industry and the wider economy. It seems that there is a net loss of R 224 million in GDP and a reduction of 20 693 jobs, on average, per annum over the programming period.

The broiler industry lends itself to being a start-up industry for small-scale and emerging farmers, owing to established grower support, existing broiler processing, and immediate access to markets provided by industry structures.

In conclusion, the analysis shows clearly that the South African broiler industry should be safeguarded against unfair international competition, which might have a significant negative effect on the South African broiler industry and the rural economy. It is important to note that the broiler industry in South Africa is also an industry that is a suitable start-up sector for new emerging small-scale farmers, and that the destruction of the industry could have a detrimental effect regarding poverty alleviation and the establishment of new small-scale farmers by the government.

Unfavourable changes in market regulations should be avoided as these will cause a strong decline in the domestic broiler price and have profound negative impacts on the following contributions to GDP and employment:

- Upstream and downstream contribution to economic development
- Contribution to food security
- Contribution to employment.

### **8.7.2 Computable general equilibrium (CGE) model of the South Africa broiler industry.**

The results of the CGE model indicate that if import protection is relaxed, quantity demand for endowments will have a decrease of 1.9 % in land, and 2.61 % in unskilled and skilled labour,

in the poultry sector. Capital investment will also decrease by 2.61 %. It is also clear that a substitution effect of resources towards other industries will take place. The red meat/livestock sector will use 0.41 % more land, 0.05 % more skilled and unskilled labour, and 0.05 % more capital. Land used to produce cereals and grains will increase by 0.07 %, and skilled, unskilled labour, and capital investment will decrease by 0.014 %. Land used for other grains will increase by 0.25 %, and unskilled labour, skilled labour and capital will increase by 0.08 %. The processed food sector will increase by 0.48 % and use less labour capital in the order of 0.07 %. The textile industry will also use more land in the order of 0.48 % and 0.03 % more labour and capital. The extrusion (production of parts) sector will use 0.18 % more land and 0.03 % less labour and capital. The light-manufacturing sector will use 0.56 % more land and 0.04 % more capital and labour. The heavy manufacturing sector will use 0.57 % more land and 0,05 % less capital, 0.06 % more unskilled labour and 0,05 % more skilled labour. Other services will use 0.57 % more land. Capital Goods and services will use 0.47 % more land and 0.03 % less labour and capital. From the above, it is evident that the demand for land will decrease at the poultry industry and will be taken over to other industries. The same applies to labour and capital.

On the output side, poultry, cereals and grains, and processed meat output will decrease by 54.9 %, 14 %, and 18 %, respectively. All the other industries indicate an increase in output.

The demand at household level for imported poultry products will increase by 64 %, in total. It would be expected that it should be much higher. The explanation might be that the lower prices of goods imported are not transmitted to the consumers due to the dynamics of the supply chain. That is also why livestock or red meat prices do not decrease (0.0008 %) so drastically with other grains (0.0043 %) and processed food (0.0126 %). Textiles decrease by 0.0088 %, extraction products by 0.0001 %, light manufacturing goods by 0.17 %, heavy manufacturing goods by 0.0137 % and other services by 0.015 %.

The effects on the demand for household products in the following industries are as follows:  
The relaxation of import tariffs, the effect on private household demand for domestic goods was to be determined as follows:

- Poultry – negative by 0.4827 %
- Red meat & livestock – positive by 0.0205 %

- Cereals & grain – positive by 0.0009 %
- Other grains – positive by 0.0054 %
- Processed food – positive by 0.0068 %
- Textiles – positive by 0.0034 %
- Extraction – negative by 0.0013 %
- Light manufacturing – positive 0.001 %
- Heavy manufacturing – negative 0.001 %
- Other services – negative 0.0586 %

Total domestic sales at the retail level will decrease by 0.55 %. Livestock or red meat will increase by 0.0396 %, which is an interesting phenomenon. This can be attributed to a drive and confidence for local products. Demand for oilseeds and grains will also decline because they form part of the broiler value chain as feed. The demand for locally processed food will change due to less poultry being processed.

The trade balance of poultry meat will be affected negatively by 70.44 %. Industries that will benefit from the relaxation of tariffs are the red meat industry (4.3 %), cereals & grains (0.27 %), other grains (6.9 %), processed food (5.57 %), textiles (2.59 %), light manufacturing (14 %), heavy manufacturing (35.89 %), and other services (7.49 %). The net effect is positive, at 4.16 %.

Imports for poultry will increase by 79.56 %, meat/livestock will decrease by 0.4 %, cereal & grains by 0.09 %, other grains by 2.2 % and processed food by 0,001 %.

All the sectors show positive export demand coefficients regarding exports, which entails that when tariffs are relaxed, exports will increase. The highest increase of exports is in the red meat livestock sector, at 0.96 %. Red meat exports are increasing to the rest of Africa and the Middle East. Poultry exports increase by 0.36 %. South Africa mostly exports chicken meat to its neighbouring countries such as Lesotho and Swaziland. The lowest increase in exports is the extraction sector, at 0.02 %.

This research, using various techniques, contributes to analysing and understanding the role of the broiler industry in the South African agricultural sector and industry. It also concluded that

the current import tariff regime in South Africa, as well as the different trade agreements, are to the detriment of the broiler industry and the economy – reducing job opportunities and adding to unemployment. The current policy framework, allowing relatively cheap imports into South Africa, is also detrimental to the establishment of new emerging farmers.

It was found that the local industry is relatively competitive based on efficiency, etc. –the biggest cost factor is the cost of feed in South Africa, which varies greatly from season to season, depending on the size of the local maize crop. This results in large price changes in maize (from export pricing to import pricing). The South African broiler industry will struggle to compete in feed cost efficiency, and in costs with competitors (in the Americas) with lower and more stable feed grain prices.

The local industry can also not compete against imports of leg quarters (drumsticks and thighs – brown meat), which is a product that does not have a market in Europe and the USA. These are sold in South Africa at only a part of the costs incurred in production. Striving to find a better balance in import protection against these unfair practices, it is a prerequisite to stabilise the local industry. The opposite is also true, government and the industry should make a concerted effort to access the international markets with white meat and other niche products, like wings. This will assist in becoming competitive and guarantee the sustainability of the industry.

It is recommended that the industry, government and other stakeholders initiate research to enhance the value chain in view of the different preferences of countries across the globe and in ways to access those markets. Negotiations and support from the national government are of utmost importance.



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## APPENDIX 1: SAPA Broiler Industry Summary for 2015

### SAPA Broiler Industry Summary on Two pages 2015



#### PRODUCTION AND CONSUMPTION

CONSUMPTION	UNIT	2014	2015	% GROWTH
Poultry consumption	tons	2 048 706	2 172 825	6.06
Per capita per annum	kg	38.13	39.22	2.86
Broiler consumption	tons	2 032 328	2 127 369	4.68
Per capita per annum	kg	37.63	38.71	2.86

PRODUCTION INCL LIVE SALES	UNIT	2014	2015	% GROWTH
Total poultry production	tons	1 696 805	1 738 102	2.43
Total broiler production	tons	1 716 252	1 792 040	4.42

LOCAL COMMERCIAL PRODUCTION	UNIT	2014	2015	% GROWTH
Broiler - dressed weight	tons	1 244 648	1 301 852	4.60
Broiler - edible offal (liver, heart, gizzard, neck)	tons	100 263	104 871	4.60
Broiler - other offal (feet, head, intestines, lungs)	tons	233 371	244 097	4.60
Total broiler	tons	1 578 283	1 650 821	4.60
Turkey	tons	0	0	0.00
Duck	tons	929	1 286	43.87

SUBSISTENCE PRODUCTION	UNIT	2014	2015	% GROWTH
Chicken	tons	66 288	69 334	4.60

DEPLETED FLOCK/LIVE SALES	UNIT	2014	2015	% GROWTH
Total	tons	71 682	71 885	0.28
Spent broiler parent hens and cocks	tons	33 208	33 356	0.44
Spent egg industry layers	tons	38 473	38 529	0.14

POULTRY IMPORTS (source: SARS)	UNIT	2014	2015	% GROWTH
Total imports	tons	393 302	478 447	21.65
Broiler	tons	368 805	457 374	24.02
Broiler excluding MDM	tons	221 218	277 063	25.24
Turkey	tons	24 299	20 724	-14.71
Ducks, geese and guinea fowl	tons	398	349	-12.31
Imports as % of consumption	%	19.20	22.02	14.70

POULTRY EXPORTS (source: SARS)	UNIT	2014	2015	% GROWTH
Total exports	tons	66 355	73 444	9.18
Broiler	tons	61 822	65 815	6.46
Turkey	tons	2 253	2 064	-7.50
Ducks, geese and guinea fowl	tons	2 280	4 565	99.37

BROILERS FLOCK STATS	UNIT	2014	2015	% GROWTH
Broiler breeder laying flock	hens	6 600 517	6 716 156	1.75

Day-old broiler chicks hatched	chicks	1 022 019 466	1 061 946 418	3.91
Broilers slaughtered	birds	960 376 152	1 004 515 404	4.60

MARKET SHARE	UNIT	2014	2015	% GROWTH
Retail	%	49.8	49.3	-0.86
Wholesale	%	39.0	39.6	1.46
Food Service	%	4.8	3.7	-23.97
Institutional (mines, hospitals etc.)	%	0.0	0.0	0.00
Other	%	6.4	7.4	16.04

PRICE (NET SALES VALUE)	UNIT	2014	2015	% GROWTH
Total realisation	R/kg	17.10	18.43	7.78
	Frozen R/kg	16.13	17.72	9.86
	Fresh R/kg	25.48	26.38	3.53
	IQF mixed portions R/kg	15.25	16.97	11.38
	Sundry R/kg	8.37	8.13	-2.87

Net sales value: net price, after all discounts

FEED PRICE INDICATOR	UNIT	2014	2015	% GROWTH
Broiler breeder	R/ton	4 169.03	4 286.18	2.81
Broiler	R/ton	4 829.63	4 934.22	2.17

The feed price includes distribution but excludes medication, additives and VAT

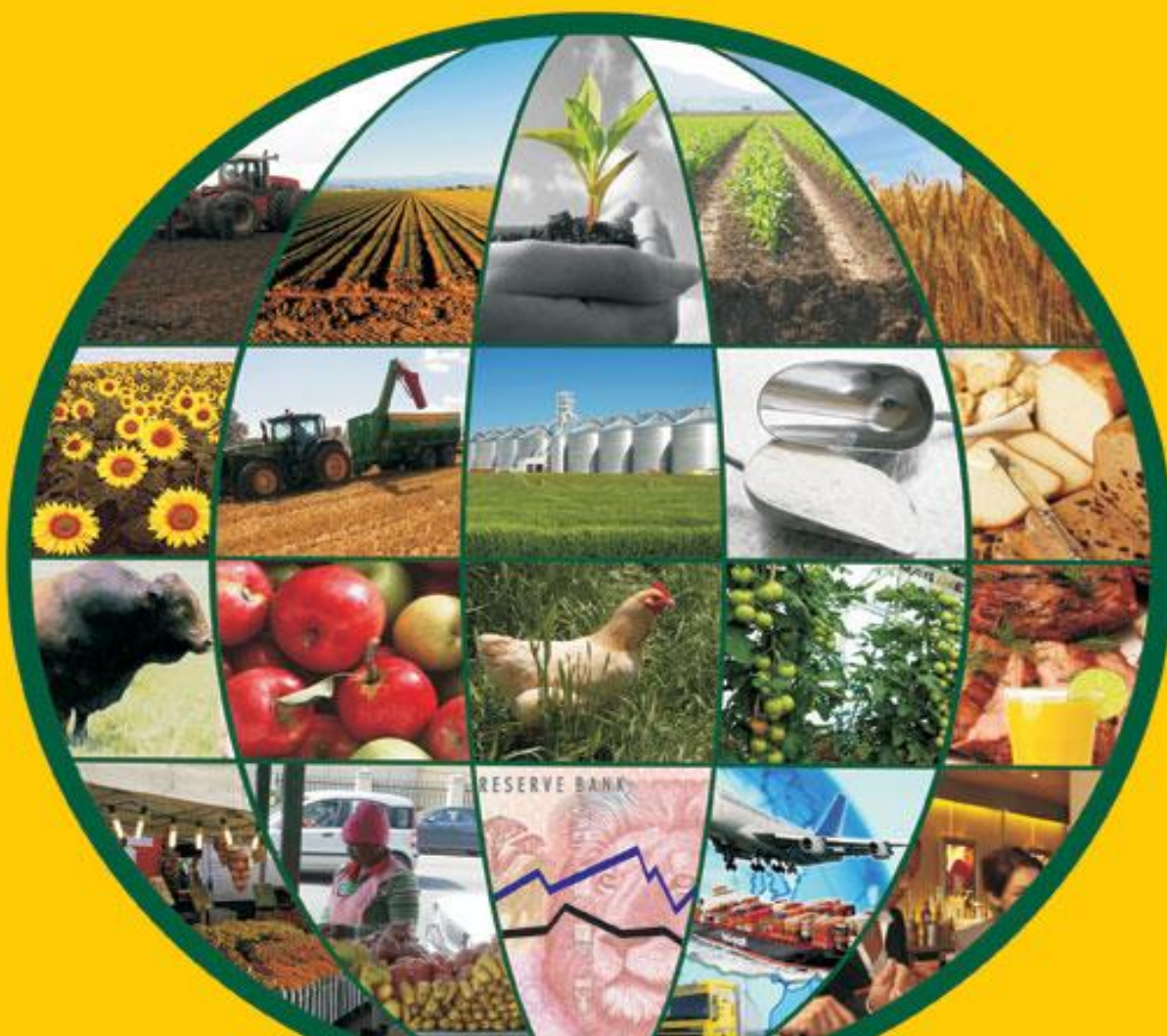
GROSS VALUE (source: DAFF)	UNIT	2014	2015	% GROWTH
Poultry meat	R'000	34 216 286	38 807 151	13.42
Eggs	R'000	9 200 230	9 832 850	6.88
Total animal products	R'000	102 445 524	113 684 641	10.97
Total agricultural products	R'000	220 982 565	233 237 242	5.55

POPULATION (source: STATS SA)	UNIT	2014	2015	% GROWTH
Human population	people	54 002 000	54 956 900	1.77

## APPENDIX 2: Questionnaire: Factors affecting the Competitiveness of the Broiler industry

### Questionnaire: Factors affecting the Competitiveness of the Broiler Industry

2013



Please complete the questionnaire and sent to [christo@namc.co.za](mailto:christo@namc.co.za)

or fax to 086 536 6032 before 10 July 2013

Purpose and background of the questionnaire:

The National Agricultural Market Council (NAMC) is currently engaged in an investigation to determine the factors that affect the competitiveness of the broiler value chain. Studies of a similar nature in other agricultural value chain have clearly demonstrated that information generated provides significant benefit to industry role players. These include, amongst others:

- (i) Empowering industry role players to make better decisions to position themselves appropriately,
- (ii) Empowering industry organisations to improve their service delivery by focusing on those issues which are of greatest importance to the broiler value chain,
- (iii) Establishing a framework to measure changes in the factors that affect competitiveness, and
- (iv) Inform policy makers of the factors that affect industry in its efforts to achieve the three pillars of the Strategic Plan for the Agricultural Sector (i.e. equitable access and participation, global competitiveness and profitability, sustainable resource management).

The questionnaire is structured to gain the relevant information for the **Macro-**, **Micro-** and **Meso-** environment, which the broiler value chain operates in. The **Macro-**environment refers to regulatory and administrative issues, global and local economic trends, together with chance factors, such as the exchange rate and the political environment. The **Micro-**environment relates to issues which can be managed by each role player in the industry's direct business environment. The **Meso-**environment refers to the supporting functions of and services in the value chain.

The purpose of this questionnaire is to solicit stakeholders' opinions on the factors that are most likely to influence the level of competitiveness of the broiler value chain. Respondents are also requested to weigh these factors in order importance in terms of their impact on competitiveness. The questionnaire is designed based on a random, though extensive, consultation process with industry stakeholders. Responses will be aggregated for each group of role players within the broiler value chain to enable the project team to identify the impact of the different factors on the competitiveness of the value chain as a whole, as well as for the different groups of role players within the chain.

In this context competitiveness is defined as:

The ability of your business to maintain, or increase market share in a profitable manner, and in a sustainable way in the long run.

All individual responses will be kept highly confidential.

Your participation in this regard is greatly valued and appreciated.

Please complete the questionnaire and sent to [christo@namc.co.za](mailto:christo@namc.co.za)  
or fax to 086 536 6032 before 10 July 2013

Example on how questions should be answered:

The first part of each question indicates a specific factor and the respondent must indicate whether this factor **constrains** or **enhances** the competitiveness of his/her business. This is measured on a **scale of 1 to 7** in the block below the question. Each value of the numbers on the scale represents the following:

- 1 = factor has a **serious** constraining effect on the competitiveness of the business/industry
- 2 = factor has a **significant** constraining effect on the competitiveness of the business/industry
- 3 = factor has a **slight** constraining effect on the competitiveness of the business/industry
- 4 = factor has a **neutral** effect on the competitiveness of the business/industry
- 5 = factor has a **slight** enhancing effect on the competitiveness of the business/industry
- 6 = factor has a **significant** enhancing effect on the competitiveness of the business/industry
- 7 = factor has an **extremely** enhancing effect on the competitiveness of the business/industry

Example Question:

Does the supply/availability of electricity:

Constrain the competitiveness of your business								Enhance the competitiveness of your business
	1	2	3	4	5	6	7	

Information about respondent:

Item	Information
Title: (e.g. Dr, Mr, Mrs, Ms)	
Name: (e.g. Kevin Stuart)	
Company name:	
Postal Address:	
Tel:	
Fax:	
Mobile:	
E-mail:	

Please tick one or more groups of role players, or functions, which describe your business and/or operations best:

Broiler producer (not on contract basis)	
Broiler producer (on contract basis)	
Chicken meat abattoir owner	
Chicken meat processor	
Chicken meat importer and exporter	
Chicken meat wholesaler	
Chicken meat retailer	
Fast food outlet of chicken products (Franchisee)	
Fast food outlet of chicken products (Franchisor)	

Macro environment

1 Does the current exchange rate:

Constrain the competitiveness of your business

Enhance the competitiveness of your business

1	2	3	4	5	6	7
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2 Does the current interest rate/cost of capital:

Constrain the competitiveness of your business

Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

3 Do the recent developments in purchasing power of consumers:

Constrain the competitiveness of your business                      Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

4        Do the recent changes in your input costs (e.g. raw materials):

Constrain the competitiveness of your business                      Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

5        Do the recent changes in administered prices (e.g. electricity, fuel, labour, water).

Constrain the competitiveness of your business                      Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

6        Does the current state of the political climate:

(e.g. the political climate has affects that range from creating certainty/uncertainty; affecting the efficiency of government institutions; creating specific conditions to enhance/constrain investment, etc. Your answer should reflect the impact of the aforementioned on the competitiveness of your business)

Constrain the competitiveness of your business                      Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

7        Does the current cost of crime:

(e.g. loss of equipment, disappearance of products/inputs, fraud, etc. that results in financial losses. Your answer should reflect whether the cost of crime affects your business more or less than in the past)

Constrain the competitiveness of your business                      Enhance the competitiveness of your business



business

business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

8 Does the current state of national infrastructure (e.g. roads, rail, ports, communication, electricity, water):

Constrain the competitiveness of your business

Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

9 Do the current labour laws and regulations (e.g. minimum wages, working hours, unions):

Constrain the competitiveness of your business

Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

10 Does the impact of HIV and AIDS on the labour force (e.g. the availability and productivity of labour):

Constrain the competitiveness of your business

Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

11 Do the current municipal by-laws and implementation thereof:

(e.g. different municipal by-laws, such as waste disposal, rates and taxes, building specifications, zoning, etc. Your answer should reflect whether these by-laws, as applicable to your business, constrain or enhance the competitiveness of your business)

Constrain the competitiveness of your business

Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

12 Does the enforcement of the Competition Act:

Constrain the competitiveness of your business

Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

13 Does the current land and water reform process indirectly and directly:

Constrain the competitiveness of your business

Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

14 Does the AgriBEE transformation policy

Constrain the competitiveness of your business

Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

15 Does the current agricultural import/export environment:

(e.g. import regulations and policy in South Africa may result in lower or higher imports. On the other hand, import regulations and policy in possible export markets may result in lower or higher exports. The procedures and actions to implement such regulations and policies will also affect imports or exports (e.g. administration required). In addition, the exchange rate, availability of product, efficiency of logistics, etc. will affect the import or export environment. Your answer should reflect the combination of all the different factors that impact on the import/export environment)

Constrain the competitiveness of your business

Enhance the competitiveness of your business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

16 Do the current food safety and consumer protection laws and regulations and implementation thereof:

(e.g. food safety and consumer protection laws and regulations (for instance chemical residue levels, Sanitary and Phyto-sanitary regulations, Act 36, etc.) could restrict or enhance market

access, depending on the ability of the business to comply. In addition, it could enhance or damage the consumer/client's perception of the business/product. Your answer should reflect the combined impact of these factors on the competitiveness of your business)

Constrain the competitiveness of your business				Enhance the competitiveness of your business		
1	2	3	4	5	6	7

17 Does the cost, time and obligation to comply with administrative procedures and regulations:

Constrain the competitiveness of your business				Enhance the competitiveness of your business		
1	2	3	4	5	6	7

18 Does the environmental laws and regulations:

Constrain the competitiveness of your business				Enhance the competitiveness of your business		
1	2	3	4	5	6	7

19 Does the availability and quality of imported inputs to manufacture/produce your product:

Constrain the competitiveness of your business				Enhance the competitiveness of your business		
1	2	3	4	5	6	7

20 Does the availability and quality of inputs, locally produced:

Constrain the competitiveness of your business				Enhance the competitiveness of your business		
1	2	3	4	5	6	7

21 Does the size and growth of the local market: (e.g. (i) the growth in the local market is possibly too slack to justify investment in new technology, or too rapid for investment to keep up, (ii) the size of the market constrains or enhances your ability to obtain economies of scale.

Your answer should reflect the combined impact of these on the competitiveness of your business.)

Constrain the competitiveness of your business				Enhance the competitiveness of your business		
1	2	3	4	5	6	7

22 Does the size and growth of the export market:  
(e.g. (i) the growth in the export market is possibly too slack to justify investment in new technology, or too rapid for investment to keep up, (ii) the size of the market constrains or enhances your ability to obtain economies of scale. Your answer should reflect the combined impact of these on the competitiveness of your business.)

Constrain the competitiveness of your business				Enhance the competitiveness of your business		
1	2	3	4	5	6	7

23 Does the price of input products produced in South Africa:

Constrain the competitiveness of your business				Enhance the competitiveness of your business		
1	2	3	4	5	6	7

24 Do changes in consumer tastes and preferences:  
(e.g. consumers at all levels are known to have become more sophisticated when it comes to their tastes and preferences. In other words, they demand better information about products, better quality, health consciousness and value for money. The speed at which an industry or business is able to respond to these changes will impact on its competitiveness. Your answer should reflect the combined impact of these factors on the competitiveness of your business)

Constrain the competitiveness of your business				Enhance the competitiveness of your business		
1	2	3	4	5	6	7

### Weighing the Macro factors

The table below includes all the items on which you have just answered questions, i.e. 22 different macro factors that could potentially affect the competitiveness of your business.

You are now kindly requested to weigh each of these items in terms of its importance to your business.

- 1 = No importance  
 2 = Low importance  
 3 = Moderate importance  
 4 = High importance  
 5 = Extreme importance

No.	Item	No	Low	Moderate	High	Extreme
1	Impact of the exchange rate	1	2	3	4	5
2	Impact of the interest rate/cost of capital	1	2	3	4	5
3	Impact of purchasing power of consumers	1	2	3	4	5
4	Impact of changes in input costs	1	2	3	4	5
5	Impact of administered prices	1	2	3	4	5
6	Impact of political climate	1	2	3	4	5
7	Impact of the cost of crime	1	2	3	4	5
8	Impact of the state of national infrastructure	1	2	3	4	5
9	Impact of labour laws and regulations	1	2	3	4	5
10	Impact of the state of HIV and AIDS	1	2	3	4	5
11	Impact of municipal bylaws and implementation	1	2	3	4	5
12	Impact of the Competition Act	1	2	3	4	5
13	Impact of the land and water reform process	1	2	3	4	5
14	Impact of AgriBEE	1	2	3	4	5
15	Impact of the agricultural export/import environment	1	2	3	4	5
16	Impact of food safety and consumer protection laws and regulations	1	2	3	4	5
17	Impact of cost, time and obligation to comply with administrative procedures and regulation	1	2	3	4	5
18	Impact of environmental laws and regulations	1	2	3	4	5
19	Impact of the availability and quality of imported inputs	1	2	3	4	5
20	Impact of the availability and quality of inputs locally, produced	1	2	3	4	5
21	Impact of the size and growth of the local market	1	2	3	4	5
22	Impact of the size and growth of the export market	1	2	3	4	5
23	Impact of price of input products produced in South Africa	1	2	3	4	5
24	Impact of changes in consumer tastes and preferences	1	2	3	4	5

Meso Environment

1 Does the current access to government support and/or public private partnerships:

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

2 The relationships/networks within the chicken value chain generally: (e.g. loyalty of suppliers/buyers, level of trust/mistrust between transacting parties, arms-length relationship and vice versa. Your answer should reflect the combined impact of these on the competitiveness of your business)

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

3 Does the current state of research and development in the chicken industry:

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

4 Does the quality and standards of chicken meat effect your business?

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

5 Does the current availability and quality of industry information:

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

6 Does the current state of technology (quality, efficiency, availability and cost of technology):

(e.g. machinery used, storage facilities, testing and lab equipment, processing and manufacturing equipment, efficiency of fertilisers and chemicals, new versus old cultivars, biotechnology)

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

7 Do the nature and activities of industry organisations  
(e.g. industry organisations provide a wide range of services to their respective constituencies. Your answer should reflect the combined impact of these services on the competitiveness of your business)

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

8 Does the current scope and nature of bio-security management in your industry:

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

9 Does the current state of training and skills development in the industry:  
(e.g. national and internal programmes to enhance skills and capacity of technical and management staff, the role of the SETA`s etc.):

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

10 Do the current quality assurance programmes and mechanisms:  
(e.g. grading and inspection of authorities and other intermediaries)

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
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## Weighing the Meso factors

The table below includes all the items on which you have just answered questions, i.e. 10 different meso factors that could potentially affect the competitiveness of your business.

You are now kindly requested to weigh each of these items in terms of its importance to your business.

- 1 = No importance
- 2 = Low importance
- 3 = Moderate importance
- 4 = High importance
- 5 = Extreme importance

### Importance

No.	Item	No	Low	Moderate	High	Extreme
1	Access to government support and/or PPP's	1	2	3	4	5
2	The relationships/networks within the poultry value chain	1	2	3	4	5
3	The state of research and development in the poultry industry:	1	2	3	4	5
4	Does the quality standard of chicken meat effect your business	1	2	3	4	5
5	Availability and quality of industry information and the transfer thereof	1	2	3	4	5
6	Technology in your industry	1	2	3	4	5
7	Nature and activities of industry organisations	1	2	3	4	5
8	Bio-security management	1	2	3	4	5
9	State of training and skills development	1	2	3	4	5
10	The current quality assurance programmes and mechanisms	1	2	3	4	5



Micro environment

1 Does your access to sufficient finance:

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

2 Does current operational infrastructure in your business:

(e.g. state of the art versus outdated machinery/equipment/buildings etc.):

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

3 Do current inbound and outbound logistics:

(e.g. availability of transport, administrative capacity, loading and offloading facilities, scale of logistical operations, etc.)

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

4 Does current supply chain coordination activities?

(e.g. consistency and continuity of quality and quantity produced, arrangement of deliveries, just in time systems, compliance with contracts):

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

5 Does the compliance cost of traceability and the ability of your business to comply:

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

6 Does current labour availability:

Constrain the competitiveness of your  
business

Enhance the competitiveness of your  
business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

7 Does current labour productivity:

Constrain the competitiveness of your  
business

Enhance the competitiveness of your  
business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

8 Does current cost of labour:

Constrain the competitiveness of your  
business

Enhance the competitiveness of your  
business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

9 Does the quality of natural resources used (land, water, etc.):

Constrain the competitiveness of your  
business

Enhance the competitiveness of your  
business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

10 Does the current availability of land and water:

Constrain the competitiveness of your  
business

Enhance the competitiveness of your  
business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

11 Does the quality of inputs used (chemicals, seed, etc.):

Constrain the competitiveness of your  
business

Enhance the competitiveness of your  
business

1	2	3	4	5	6	7
---	---	---	---	---	---	---

12 Does the cost and consistent supply of electricity:

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

13 Does the current nature of barriers to entry into your industry:

(e.g. cost of technology, food safety standards, economies of scale, start-up costs)

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

14 Does the distance from the market: (i.e. to buy inputs or sell products).

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

15 Does current business behaviour by down- and upstream role players: (e.g. procurement policies, monopolistic/oligopolistic behaviour enforced contractual obligations):

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

16 Do current pricing strategies by different role-players within the industry:

(e.g. the way those prices are set/negotiated/tendered by downstream or upstream role players)

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

17 Does the current level of competition at the different levels in the industry:

(e.g. whether there are enough competitors in the industry and whether this leads to healthy competition. Your answer should reflect your specific business environment):

Constrain the competitiveness of your business	Enhance the competitiveness of your business
--	--

1	2	3	4	5	6	7
---	---	---	---	---	---	---

18 Do the diversification strategies of your business:

(e.g. diversification in this context means whether you produce/manufacture and buy/sell different types of products):

Constrain the competitiveness of your business	Enhance the competitiveness of your business					
1	2	3	4	5	6	7

19 Does the capacity and ability of input suppliers:

Constrain the competitiveness of your business	Enhance the competitiveness of your business					
1	2	3	4	5	6	7

20 Does the quality of inputs/raw materials:

Constrain the competitiveness of your business	Enhance the competitiveness of your business					
1	2	3	4	5	6	7

## Weighing the Micro factors

The table below includes all the items on which you have just answered questions, i.e. 22 different micro factors that could potentially affect the competitiveness of your business.

You are now kindly requested to weigh each of these items in terms of its importance to your business.

- 1 = No importance
- 2 = Low importance
- 3 = Moderate importance
- 4 = High importance
- 5 = Extreme importance

### Importance

No.	Item	No	Low	Moderate	High	Extreme
1	Access to finance	1	2	3	4	5
2	State of operational infrastructure in your business	1	2	3	4	5
3	Inbound and outbound logistics	1	2	3	4	5
4	Supply chain coordination activities	1	2	3	4	5
5	Cost and ability to comply with traceability	1	2	3	4	5
6	Labour availability	1	2	3	4	5
7	Labour productivity	1	2	3	4	5
8	Cost of labour	1	2	3	4	5
9	Quality of natural resources used	1	2	3	4	5
10	Availability of land and water	1	2	3	4	5
11	Quality of inputs	1	2	3	4	5
12	Cost and consistency of electricity supply	1	2	3	4	5
13	Nature of barriers to entry into the business	1	2	3	4	5
14	Distance from the market	1	2	3	4	5
15	Business behaviour by down- and upstream role-players	1	2	3	4	5
16	Pricing strategies by different role players	1	2	3	4	5
17	Competition at different levels of industry	1	2	3	4	5
18	Diversification strategies	1	2	3	4	5
19	Capacity and ability of input suppliers	1	2	3	4	5
20	Quality of inputs/raw materials	1	2	3	4	5

Thank you for affording us your time.

Your valuable inputs are greatly appreciated.

Please complete the questionnaire and sent to [christo@namc.co.za](mailto:christo@namc.co.za) or  
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**APPENDIX 3: Private budget for 2013 for a typical South African  
broiler unit**

<b>ITEM</b>	<b>Per Cycle (R)</b>	<b>Per ton (R)</b>	<b>Per Year (R)</b>
Income	7 503 270	16 956	52 522 890
Sales	7 279 084	16 450	50 953 588
Manure sold	224 186	507	1 569 302
Cost	6 634 711	14 993	46 442 976
Feed	4 319 265	9 761	30 234 855
DOC	1 668 400	3 770	11 678 800
Medicine	44 478	101	311 346
Heating	82 796	187	579 572
Electricity	54 538	123	381 766
Transport	26 000	59	182 000
Cleaning	36 032	81	252 224
Bedding	42 000	95	294 000
Salaries	65 608	148	459 256
Labour	25 468	58	178 276
Repair and Maintenance	60 846	138	425 922
Insurance	32 400	73	226 800
Catching	34 715	78	243 005
Sub Total	6 492 546	14 672	45 447 822
Interest on working capital	35 422	80	247 954
Provision for capital replacement	72 457	164	507 200
Management Fees	34 286	77	240 000
Margin	868 559	1 963	6 079 914
Value of land + infrastructure (20 % capitalisation rate)	4 342 796	9 814	30 399 570

**APPENDIX 4: Calculation of the construction phase (investment) impact of relaxing of the import tariff**

Step 1: Reduction in Production										
Reduction in the base year production due to an 11.3 % change of the current 2013 production due to the 32 % change in prices.										
188 371 tonnes = 1 667 000 * 11.3 %										
Step 2: Production growth before relaxing of import restriction										
Years	2013	2014	2015	2016	2017	2018	...	2031	2032	2033
Production (tonnes) growing at 4 % per annum (p.a.)	1 667 000	1 733 680	1 803 027	1 875 148	1 950 154	2 028 160		3 377 036	3 512 118	3 652 602
Step 3: Distribution of reduction of production										
Distribution of reduction over 3 years assuming that production will not cause an absolute decrease in a specific year but will only have the effect that the industry will not										
Grow until the calculated reduction has been attained.										
Years	Total over the period	2014	2015	2016	2017	2018	...	2031	2032	2033
Marginal increase in production at a 4 % growth (p.a) (tonnes)	208 148	66 680	69 347	72 121	-	-	-	-	-	-



Reduced reduction to 188 371 tonnes by adjusting 2016	188 371	-66 680	-69 347	-52 344	-	-	-	-	-	-
Step 4: Changing tonnes to values by multiplying with a price per ton of R16 960										
Years		2014	2015	2016	2017	2018	...	2031	2032	2033
Production lost (Rand Millions)		-1 131	-1 176	-888	-	-	-	-	-	-
Step 5: Changing production to investment values by using a capital multiplier of 1.13										
Years		2014	2015	2016	2017	2018	...	2031	2032	2033
Lost investment (Rand Millions)		-1 278	-1 329	-1 003	-	-	-	-	-	-

## APPENDIX 5: Calculation of the operational impact of relaxing the import tariff

Step 1: Reduction in Production										
Reduction in production due to an 11.3 % change of the current 2013 production due to the 32 % change in prices.										
188 371 tonnes = 1 667 000* 11.3 %										
Step 2: Production growth before relaxing of import restriction										
Years	2013	2014	2015	2016	2017	2018		2031	2032	2033
Production (tonnes) growing at 4 % per annum (p.a)	1 667 000	1 733 680	1 803 027	1 875 148	1 950 154	2 028 160		3 377 036	3 512 118	3 652 602
Step 3: Production growth after relaxing import tariffs										
Production will only increase from the base tonnage of 2013 when the marginal increase at 4 % per annum has reached 188 371 tonnes. Benchmark therefore is equal										
To 1 855 371 = (1 667 000 + 188 371).										
Production growth is still at 4 % per annum but from a lower base 1 686 777 in 2016. The base is calculated by 1 875 148 – 188 371										
Years	2013	2014	2015	2016	2017	2018	...	2031	2032	2033
Production growth with lowered tariffs (tonnes)	1 667 000	1 667 000	1 667 000	1 686 777	1 761 783	1 839 789		3 188 665	3 323 747	3 464 231
Marginal impact on production (tonnes) – Step 3 minus Step 2	-	-66 680	-136 027	-188 371	-188 371	-188 371		-188 371	-188 371	-188 371
Step 4: Changing tonnes to values by multiplying volumes with a price per ton of R16 960										
Years		2014	2015	2016	2017	2018	...	2031	2032	2033

## APPENDIX 6: Calculation of the cost savings Impact to the consumer of relaxing the import tariff

Step 1: Current cost to the consumer											
Domestic production in Rand Millions (1 667 000 tonnes in 2013 multiplied by the current price of R16 960)											
		2 013	2 014	2 015	2 016	2 017	2 018	...	2 031	2 032	2 033
Production volume (tonnes)		1 667 000	1 733 680	1 803 027	1 875 148	1 950 154	2 028 160	...	3 377 036	3 512 118	3 652 602
Value (Rand Millions)	16 960	28 272	29 403	30 579	31 803	33 075	34 398	...	57 275	59 566	61 948
Imports in Rand Millions (355 165 tonnes in 2013 multiplied by the current price of R12 721. This price includes the 32 % tariff)											
Imports volume (tonnes)		355 165	369 372	384 146	399 512	415 493	432 113	...	719 499	748 279	778 210
Import value (Rand Millions)	12 721	4 518	4 699	4 887	5 082	5 286	5 497	...	9 153	9 519	9 900
Total cost to consumer (add production and import values)		32 791	34 102	35 466	36 885	38 360	39 895	...	66 428	69 085	71 848
Step 2: New cost to consumer after relaxing import duty											
Domestic production (tonnes) added to the marginal production and then converted to values											
		2 013	2 014	2 015	2 016	2 017	2 018	...	2 031	2 032	2 033
Current production volume tonnes		1 667 000	1 733 680	1 803 027	1 875 148	1 950 154	2 028 160	...	3 377 036	3 512 118	3 652 602
Production adjustment			-66 680	-136 027	-188 371	-188 371	-188 371	...	-188 371	-188 371	-188 371
New production		1 667 000	1 667 000	1 667 000	1 686 777	1 761 783	1 839 789	...	3 188 665	3 323 747	3 464 231
Production value (Rand Millions)	16 960	28 272	28 272	28 272	28 608	29 880	31 203	...	54 080	56 371	58 753
The reduction in production is added to the imports (tonnes) and then converted to values. The price of imports excludes the 32 % tariff.											
Imports		2 013	2 014	2 015	2 016	2 017	2 018	...	2 031	2 032	2 033
Current imports		355 165	369 372	384 146	399 512	415 493	432 113	...	719 499	748 279	778 210
Imports adjustment		-	66 680	136 027	188 371	188 371	188 371	...	188 371	188 371	188 371
New imports (tonnes)		355 165	436 052	520 174	587 883	603 864	620 484	...	907 870	936 650	966 581

New imports value (Rand Millions)	9 637	3 423	4 202	5 013	5 665	5 819	5 980	...	8 749	9 026	9 315
Total cost to consumer		31 695	32 475	33 285	34 273	35 699	37 182	...	62 829	65 397	68 068
Additional cost to consumer – Step 2 minus Step 1		-1 096	-1 628	-2 181	-2 612	-2 661	-2 712	...	-3 599	-3 688	-3 780

Note: Formula to calculate imports: ((Import volumes (tonnes) \* by the growth rate per annum) – change in imports due to relaxing of the import tariff) \* (adjusted price due to the change in import tariffs)

### APPENDIX 7: Calculation of the loss of government income of relaxing the import tariff

Step1: To calculate lost government income, take import sales including tariff of 32 % (Rand Millions, 2014 constant prices)										
Years	2013	2014	2015	2016	2017	2018	...	2031	2032	2033
Total Imports including tariff	4 518	4 699	4 887	5 082	5 285	5 497	...	9 153	9 519	9 899
Step2: Calculate imports value without tariff of 32 % (Rand Millions, 2014 constant prices)										
Years	2013	2014	2015	2016	2017	2018	...	2031	2032	2033
Total Imports excluding tariff	3 423	3 560	3 702	3 850	4 004	4 164	...	6 934	7 211	7 500
Step 3: Subtract Step 2 from Step 1 (Rand Millions, 2014 constant prices)										
Years	2013	2014	2015	2016	2017	2018	...	2031	2032	2033
Government lost income	-1 095	-1 139	-1 185	-1 232	-1 281	-1 333	...	-2 219	-2 308	-2 400