ANALYSIS AND QUANTIFICATION OF THE SOUTH AFRICAN RED MEAT VALUE CHAIN

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Declaration:

I declare that the thesis hereby submitted by me for the PhD degree in Agricultural Economics at the University of the Free State is my own independent work and has not previously been submitted by me at another university.

DC Spies_____ Date_____

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ABSTRACT

Given the natural resource base of South Africa, livestock production is one of the most important farming practices in the country. Of the approximately 80 % of the land surface being utilised for agriculture, almost 70 % is mainly suitable for raising livestock.

The South African red meat sector contributed 14.8 % to the total gross value of agricultural production during the 2008/2009 season with cattle being the main contributor at 10.1 % while sheep contributed 2.5 % during the same period (DAFF 2010). The long-term average contribution of the red meat industry to the total gross value of agriculture production (from 1996/1997 to 2008/2009) accounted for 13.2 % and that of beef 9.4 % and sheep 2.4 % during the same period (DAFF 2010).

The South African primary red meat sub-sector is unique due to the dualistic nature of the country's agricultural situation. There is a clear distinction between the commercial (formal) sector of the industry and the non-commercial (informal) sector.

Within the ambit of the above the South African red meat sector also has to compete at a global level. For the South African red meat industry to be on par and potentially become a leader (at least in the Southern African region) it is necessary to understand the red meat value chain in

detail in a holistic manner to (i) guide decision making in the public and private sector domains, (ii) identify challenges that the industry faces that impedes on its efficient functioning and (iii) create a foundation for the better understanding of the dynamic forces within the industry to allow stakeholders to internalise it in order for them to position themselves so that they can increase their performance at each segment of the industry to the benefit of the entire industry.

Merely providing a descriptive profile of a particular industry is not sufficient any more within a deregulated and liberalised environment. In order to make any normative judgments regarding the performance of an industry, an in depth value chain analysis is needed. This is what this study is set out to achieve for the large (cattle/beef) and small stock (sheep/mutton-lamb) sub-sectors.

The broader industry was investigated through interviews with different stakeholders in the red meat value chain. The analysis on the value chain in general shows that the South African cattle and sheep industries have been growing in nominal terms when considering their contribution towards the total gross value of agricultural production. However, the percentage contribution towards total gross value of agricultural production in South Africa of these two sectors has remained relatively constant during the short term (cattle at 10 % and sheep at 2 %). Critical variables that affect the performance in the feedlot industry are weaner and feed prices, as well as the price they receive in the market. The performance at primary processor level is directly linked to the price of offal, which is highly variable on a geographical level as well as seasonal. The performance of the retail sector is highly dependent on their ability to cater for specific consumers in specific geographical areas, while seasonal demand also determines purchasing and pricing patterns.

This variability in prices as well as the transmission thereof through the red meat value chain is a big concern in the industry. Price transmission was therefore investigated using time series data on primary producer- and derived retailer prices data from September 1999 to December 2008. The following methodological approaches were applied, namely the Engle and Granger cointegration test as well as threshold autoregressive models. The Granger causality test was applied to analyse causality. Asymmetry in price transmission (APT) was found in both the beef and lamb value chains, indicating inefficiencies within the chain. Causality in the case of beef ran both ways i.e. from producer level to retail level and *vice versa* depending on supply conditions while in the case of lamb a change in price at producer level “causes” changes at retail level. APT is not uncommon, especially in agricultural markets and a number of reasons

can cause APT in a value chain, however, in the case of the South African red meat industry a few contributors to APT was identified namely; asymmetry in information flow, menu cost and inventory cost.

The red meat value chain in the Free State province was investigated by using a value chain methodology that was derived from different approaches to value chain analysis. Primary data was captured by means of personal interviews. A total of 143 commercial producers were surveyed (i.e. 19 % of the total of 745 producers that made up the original producer database used). The analysis revealed the following important aspects, namely (i) 60 % of total income generated by commercial farmers is from livestock activities, (ii) productivity is high in the commercial sector with calving- and lambing percentages averaging 80 % and 93 % for the cattle and sheep sub-sectors respectively, while the smallholder sector only averaged 30 % and 13 % for cattle and sheep respectively, (iii) older animals within the commercial beef sub-sector are mainly marketed to primary processors while younger animals are marketed to the feedlot industry while the majority of animals in the sheep sub-sector are marketed to the primary processing industry, (iv) market access in the smallholder sector is still limited to regional auctions, the informal market and to lesser extent direct sales to abattoirs, and (v) the main constraining factors in the smallholder sector is the lack of proper infrastructure which makes managing practices difficult. One major concern within the industry is animal losses, i.e. 44 % of sheep losses in the FS was due to predation. The processor industry in the FS province is highly integrated, especially in terms of primary processors/abattoirs and butcheries. Abattoirs are an important marketing alternative, especially in the rural parts of the FS province. All the role-players in the FS cattle and sheep value chains identified the variability in live animal/meat prices as their main constraint.

Increasing the productivity of the producers in the smallholder sector should be a major industry objective. This objective should start with the improvement of infrastructure, education of extension officers and simplified and easier access to credit.

Given the methodology developed, and the results of the study, it is strongly suggested that the methodology be applied to the value chains of the remaining red meat producing regions in South Africa. This will provide a benchmarking platform for the red meat value chain in the country. This methodology should also be re-applied regularly (every 2 to 3 years) to keep the information up to date and to provide the means by which the industry can measure change in the industry. This will be critical from a private and public sector point of view.

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LIST OF ACRONYMS

ADF	Augmented Dickey Fuller
ADG	Average Daily Gain
AMIE	Association for Meat Importers and Exporters
AMT	Agrimark Trends
APT	Asymmetric Price Transmission
BIC	Bayesian Information Criterion
CCA	Commodity Chain Analysis
CFS	Central Free State
CPIX	Consumer Price Index
DAFF	Department of Agriculture, Forestry and Fisheries
DF	Dickey Fuller
ECM	Error Correction Model
ECT	Error Correction Terms
FCC	Food Chain Centre
FCR	Feed Conversion Ratio
FS	Free State
FSRPO	Free State Red Meat Producers Organisation
GAIN	Global Agriculture Information Network
GCA	Global Commodity Chain
GIRA	Gira Meat Club
GM	Gross Margin
GMTEU	Gauteng Meat Traders Employees Union
ha	Hectare
kg	Kilogram

HPC	Hans Posthumus Consulting
IMQAS	International Meat Quality Assurance Service
LSU	Large Stock Unit
LWCC	Livestock Welfare Coordinating Committee
MIT	Meat Industry Trust
MSMS	Meat Statuary Measure Service
M-TAR	Momentum Threshold Autoregressive
NDA	National Department of Agriculture
NEFS	North-East Free State
NERPO	National Emerging Red Meat Producer Organisation
NFMT	National Federation of Meat Traders
NM	Nett Margin
OLS	Ordinary Least Squires
PC	Production Cost
PP	Purchase Price
PR	Producer-Retail
PRINT	Promotion of Regional Integration
RMAA	Red Meat Abattoir Association
RMIF	Red Meat Industry Forum
RMLA	Red Meat Levy Administration
RMRDT	Red Meat Research and Development Trust
RPO	Red Meat Producer Organisation
SADC	South African Development Community
SAFA	South African Feedlot Association
SAMIC	South African Meat Industry Company

SAMPA	South African Meat Packers Association
SANCU	South African National Consumer Union
SAPPO	South African Pork Producers Organisation
SC	Schwarz Criterion
SCP	Structure Conduct Performance Analysis
SFS	Southern Free State
SHALC	Skins, Hides and Leather Council
SMS	Short Message Service
SP	Sales Price
SP/CWE	Sales Price/Carcass Weight Equivilent
SPT	Symmetric Price Transmission
SSA	Sub-Sector Analysis
STATS SA	Statistics South Africa
TAR	Threshold Auto Regressive
VAIMS	Value Added Information Management System
VCA	Value Chain Analysis
WFS	Western Free State
WP/CWE	Weaner Price/Carcass Weight Equivalent
WP/LWE	Weaner Price/Live Weight Equivalent

CHAPTER 1

Introduction

1.1 Introduction

Global red meat production and consumption is expected to increase during the next decade. Population growth estimates indicate that the demand for meat will double by 2050. This increase in the demand for meat will mainly be driven by increasing demand in developing countries (Korver 2010). Given this expected increases in demand for meat, the challenge will be to produce meat in a sustainable manner given the natural resource restrictions and changing market dynamics. South African red meat producers are also competing in this dynamic global market and to ensure the future success and profitability it is important for local producers to adapt to these changes. The first step is to properly understand the underlying dynamics of the industry.

1.2 Background and problem statement

Since the liberalization and deregulation of the South African agricultural markets during the early 90s, the South African red meat industry has been competing in a global market with countries that have ever changing and innovative consumer driven red meat industries constantly increasing their productivity at every level of the value chain. Better genetics has improved herd performance and productivity, while better pre- and post slaughter activities has improved the quality of the end product. New product development are aimed to satisfy consumer preferences, especially in terms of the non-economic factors such as palatability, tenderness, variety, traceability and ethical factors such as the humane treatment of animals. Overarching these developments is more efficient information flow systems to inform value chain role players.

Moreover, within the red meat industry, distribution patterns have changed, there have been immense investments in downstream activities with increases in vertical and horizontal integration within the value chain. More focus has been put on the consumer side of the value chain and this has led to increased value adding in the red meat sector, especially during the last 6 to 8 years.

For the South African red meat industry to be on par and potentially become a leader (at least in the Southern African region) it is necessary to understand the red meat value chain in a detailed and holistic manner to (i) guide decision making in the public and private sector domains, (ii) identify challenges that the industry faces that impedes on its efficient functioning and (iii) create a foundation for the better understanding of the dynamic forces within the industry to allow stakeholders to internalise it in order for them to position themselves so that they can increase their profitability and competitiveness at each segment of the industry to the benefit of the entire industry.

1.3 Motivation

Given the natural resource base of South Africa, livestock production is one of the most important farming practices in the country. Of the approximately 80 % of the land surface being utilised for agriculture, almost 70 % is suitable for raising livestock. The South African red meat sector contributed 14.8 % to the total gross value of agricultural production during the 2008/2009 season with cattle being the main contributor at 10.1 % while sheep contributed 2.5 % during the same period (DAFF 2010). The long-term average contribution of the red meat industry to the total gross value of agriculture production (from 1996/1997 to 2008/2009) accounts for 13.2 % and that of beef 9.4 % and sheep 2.4 % during the same period (DAFF 2010).

The South African primary red meat sub-sector is unique due to the dualistic nature of the country's agricultural situation. There is a clear distinction between the commercial (formal) sector of the industry and the smallholder (largely informal) sector. The informal sector can also further be divided into two sub-sectors namely: the small-scale subsistence producers and the emerging producers.

Typically small-scale subsistence producers will keep livestock, which is unique throughout the African continent, for status reasons or as a form of a “bank on hooves” and in some cases as draught power. Animals will mostly be sold in times where producers are cash strapped and are usually only slaughtered for religious or festive reasons. In this sub-sector there is little to no herd management practices in terms of the introduction of new genetic materials, calving seasons and health management practices amongst others. Subsistence farming with cattle was eloquently described by Behnke (1985) as follows: "Ranching is a predatory system in that it exploits animals by killing them, but does everything possible to insure their well-being up to the time of slaughter. Subsistence herders, on the other hand, live on their herds in that they rely on the harvesting of live-animals’ products and treat meat as a residual benefit to be realized only at the end of an animal’s productive career". It is therefore understandable that this sub-sector contributes very little towards the industry in terms of production (measured as calving rate). These animals also follow a unique value chain and seldom enter the formal red meat value chain.

The second non-commercial group, emerging red meat producers differ from the small-scale subsistence producers mainly because of the reason they keep animals. In the emerging sub-sector the producers keep animals for economic gain with the main objective being reproduction in order to sell surpluses into both the informal and the formal market. Management practices are more defined and sophisticated and the calving rate is therefore substantially higher than in the small-scale subsistence sub-sector (See Scholtz and Bester 2009 for different calving rates between commercial, emerging and communal red meat producers in South Africa). Emerging livestock producers’ market access is nevertheless limited by a number of factors throughout the livestock value chain. These factors include, amongst others, poor access to markets, poor quality coupled with rising animal feed prices that increase production costs and deplete margins, little knowledge regarding animal health and disease control as well as limited knowledge with regard to animal improvement in the form of scientific breeding processes, distorting government policies, the lack of proper information and the timeliness thereof, and high transaction costs (Coetzee *et al.* 2005*)*. A primary concern among many in the development community is the potential exclusion of the emerging

producers to growing markets because of the emergence of strict vertical coordination relationships and supermarket procurement systems as well as the increasing specifications in terms of health, hygiene, and product quality standards required (Rich *et al.* 2009).

Coetzee *et al.* (2005), identified five main marketing constraints faced by small scale farmers in South Africa; these includes the poor condition of the livestock, the lack of marketing information, the unwillingness and inability to adopt livestock identification practices, the lack of infrastructure and poor production and marketing management.

Apart from the aforementioned issues, the red meat industry in South Africa faces several other problems, similar to those experienced by various international meat producers. These include, amongst others, sub optimal growth in consumption figures, import threats, inappropriate policies and regulations, inconsistencies in quality and not adapting fast enough to consumer tastes and preferences.

With the growing importance of high-value agriculture in developing countries and its consequent complexity, efficient value chain management is crucial to deliver products in a safe and timely manner (Rich and Narrod 2005). These value chains require various coordination mechanisms used to manage the flow of products between intermediaries and ensure that quality specifications are met. Consequently, analytical tools and frameworks that provide guidance into the functioning of such chains are important means to understand whether such developments have positive or negative impacts on producers and to what extent the poor can benefit from these developments and to assist governments with policy reform towards effective agricultural systems, regional integration, etc.

Value chain approaches have been utilised by both researchers and development practitioners alike as a means to capture the dynamics of these fast-changing markets and to examine the inter-relationships between diverse actors that govern all stages of the marketing channel (see Rich *et al.* 2009 for a review, but relevant sources include Kaplinsky 2000; Dolan and Humphrey 2000; Fitter and Kaplinsky 2001; Ponte 2001; Schmitz and Knorringa 2000; Giulani *et al.* 2005; Humphrey and Napier 2005). Value

chain analyses alert stakeholders to inequities in power relationships based on the governance of the supply chain and have highlighted potential points of entry (and exclusion) for smallholders and identify the key relationships that need to be strengthened from a policy perspective, thus moving development thinking towards more of a systems approach (Rich *et al.* 2009).

In order to provide a proper foundation for the motivation it is necessary to provide clarity on the concepts of supply-, demand- and value chains. The broad definitions are as follows:

- 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 use.
- The demand chain is the reverse image of the supply chain. Demand originates when a business customer or individual consumer decides to order or buy a specific product and from this producers derive what to produce.
- The value chain is the end 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 a set of related products or services. The value perceived by the end-consumer of the product or service is derived in part from each step in the chain, although not all the steps create the same amount of 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 amount of inventory and the most efficient transportation modes possible to increase profitability and sustainability in an environment characterised by the delivery of information in a transparent, accurate and timely manner.

In short, the supply chain is much more production orientated, which is commonly accepted as being old fashioned in terms of business and industry development. The demand chain concept can also be interpreted as being consumer driven, which is commonly accepted as a more advanced business or industry orientation to more efficiently serve ever changing consumers needs and preferences. The danger of

basing business and policy decisions solely on one of these to business orientations is that important links in the chain can be neglected to the extent that it makes the whole chain inefficient and uncompetitive. Hence, the value chain approach towards the re-engineering and investigation of agro-food chains is preferred. In addition, the value chain approach constitutes a mechanism to design proper information systems. The challenge is therefore to properly map and quantity a value chain to identify value drivers and determining factors and key challenges that will significantly affect/improve competitiveness and sustainability. In addition to this, the way that prices are transmitted through the value chain has to be investigated as price transmission plays an important role in the effective performance of the value chain.

Taking the aforementioned into account it should be clear that merely providing a descriptive profile of a particular industry is not sufficient any more within a deregulated and liberalised environment. In order to make any normative judgments and through this process provide guidance on the re-engineering of a particular chain to be more competitive, an in depth value chain analysis is needed. This is exactly what this study is set out to achieve for the large (cattle/beef) and small stock (sheep/mutton-lamb) sub-sectors of South Africa.

The value derived from such an approach can be used at different levels, i.e. input to government policies to enhance the environment the industry operates in, input to industry role players to identify challenges and opportunities to strengthen business linkages and improve the profitability of the mentioned sub-sectors, identification of vulnerable areas in the industry that needs specific attention through policy and/or business intervention and the collective (through industry organisations) or individual action necessary to address specific inefficiencies in the mentioned sub-sectors.

1.4 Objectives

This study aims to map and quantify the large and small livestock agro-food chains in South Africa to firstly, uncover the inter-linkages and better understand the dynamic flow of economic and organisational activities at different stages of the industry, secondly to ultimately identify those factors that significantly affect the performance of these sub-

sectors and lastly to provide recommendations to leverage the same to improve the performance of the mentioned sub-sectors in the long run. In order to achieve this objective the following will be addressed:

- Investigate the structure, conduct and performance of the cattle and sheep value chains at a national and regional level;
- Analyse the price transmission mechanisms in the red meat value chain in order to determine the level of price symmetry or the lack thereof;
- Compile a value chain case study pertaining to the FS province based on structured questionnaires and stakeholder interviews. The methodology employed can be duplicated in other provinces to map geographic specific red meat value chains.

1.5 Outline of the study

Chapter 2 provides a literature review of different value chain methodologies, which was used to develop the methodological approach used to analyse the red meat value chain in the FS province. In **Chapter 3,** a structure, conduct and performance analysis of the South African red meat industry is provided. This chapter further provides an updated overview of the red meat industry in South Africa. **Chapter 4** analyses the price transmission mechanisms in the national beef and mutton value chains. **Chapter 5** provides a case study of the red meat value chain in the FS province. **Chapter 6** concludes the study and provides recommendations to the industry.

CHAPTER 2

Literature Review

2.1 Introduction

This chapter aims to review literature[1] on existing value chain analysis techniques that are relevant to large and small stock systems, commercial systems as well as the informal livestock systems, and are adaptable for analysis in other settings.

2.2 Methods to analyse value chains

According to Meyer-Stamer and Wältring (2007), it is firstly important to distinguish between supply chains and value chains. Supply chain literature has its roots in the industrial engineering faculties and business schools. It is aimed at creating a competitive advantage through unique and more efficient supply chain management. Value chain literature is rooted in development studies and sociology. It started from the observation that agricultural and industrial development processes in developing countries are increasingly based on the interaction with lead firms in industrialised countries mainly focused on the analysis of power structures in the world economy.

For the purpose of the study, the literature review will focus on value chain analysis as defined by Kaplinsky and Morris (2001), as the full range of activities required in bringing a product or service from conception through the different productions stages to the end consumer, and final disposal after that. Various methods all aimed at analysing value chains, both qualitatively and quantitatively, exist today. In this section, an overview of the evolution of value chain analysis is provided. Early literature from the 1960s includes Sub-Sector Analysis (SSA) as a tool used in sub-sector research and is similar to tools employed in other economic and business studies. According to Boomgard *et al.* (1986), SSA arose from the confluence of several closely-related

[1] This was part of the VAIMS study mentioned in Section 5.1 (SADC 2009). The author of this study compiled the literature review.

strands of applied research and draws on work done in the marketing literature, business schools and industrial organisation literature in the economics profession.

It was also during the 1960s that the French scholars used the French *filière* (also known as Commodity Chain Analysis or CCA) approach to analyse the vertical integration and contract manufacturing in French agriculture. This concept describes the flow of physical inputs and services in the production of a final product (Roduner 2004). Stamm (2004) argues that due to the static nature of this approach, i.e. non-changing actors and national boundaries, it is less functional in analysing the global world economy. According to Roduner (2005), analysts using the French *filière* approach borrowed from different theories and methodologies and this is why the approach is seen as a loosely-knit set of studies with the common characteristic that they are a *filière* (or thread) of activities and exchange as a tool and to delimit the scope of their analysis, compared to the global commodity chain approach, which is centered on contributions from a distinct school of thought.

The *filière* approach also tends to be more static, reflecting relations at a certain point in time (Kaplinsky and Morris 2000). Kaplinsky and Morris (2000) state that, although there is no conceptual reason for this, *filière* analysis has generally been applied to domestic value chains, which means that *filière* analysis generally stops at national boundaries.

Global Commodity Chain (GCC) analysis was introduced by Gereffi (1994) during the mid-1990s and primarily focuses on the analysis of the international trading system and the increasing economic integration of production and marketing chains (Roduner 2004). GCC analysis highlights the power relations that are embedded in value chain analysis and focuses on the governance of a chain. Gereffi (1994) showed that many chains are characterised by a dominant party that determines the overall character of the chain. Those dominant parties act as lead firms that become responsible for upgrading activities within individual links and coordinating interaction between the links. Gereffi (1994) identifies four dimensions of global commodity chains. Firstly, the input-output structure of the chain; secondly, the territory it covers; thirdly, its governance structure; and finally, the institutional framework that identifies how local, national and

international conditions and policies shape the globalisation process at each stage in the chain.

Porter (1985) described the value chain as the activities an organisation performs and links it to the organisation's competitive position. Therefore, the value chain evaluates which value each particular activity adds to the organisation's product or services. Value Chain Analysis (VCA) builds on the foundation of the SSA framework and can help an institution determine which type of competitive advantage to pursue, and how to pursue it. Porter (1985) identified five competitive forces interacting within a given industry: the intensity of rivalry among existing competitors; the barriers to entry for new competitors; the threat of substitute products and services; the bargaining power of suppliers; and the bargaining power of buyers.

Figure 2.1 illustrates how these four approaches overlap and build on each other. The following three sub-sections provide a more detailed review of the various approaches starting with SSA followed by CCA and GCC and finally VCA.

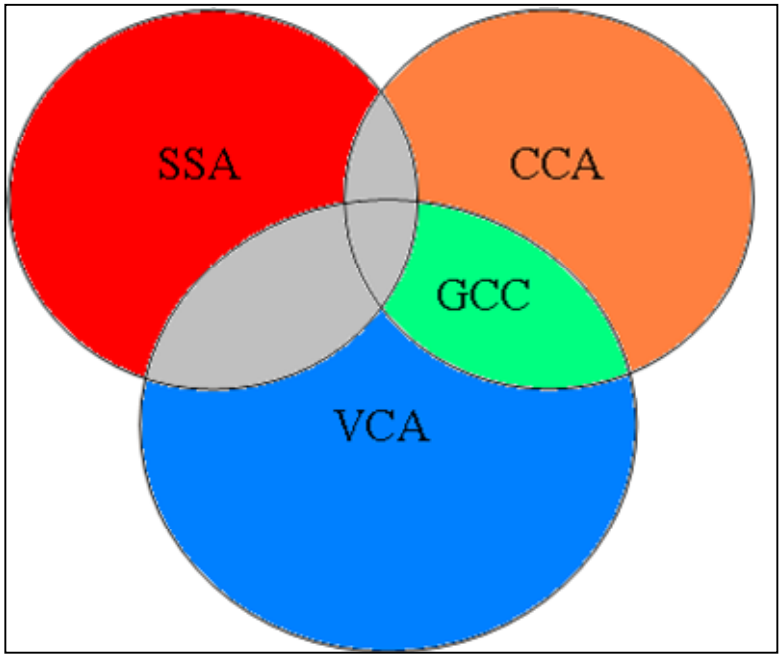

Figure 2.1: The evolution of chain analysis
Source: Own representation

2.2.1 Sub-sector analysis

Boomgard *et al.* (1986) state that, historically, virtually all SSA focused on agricultural commodities that described and evaluated the economic networks through which individual commodities are transformed and distributed to their ultimate consumers.

According to Boomgard *et al.* (1986), the term "sub-sector analysis" is somewhat misleading in the sense that a "sub-sector" does not refer to a sub-component of an individual sector of the economy, but rather to a set of economic activities that cuts across several sectors, i.e. the agricultural, industrial and commercial sectors. Holtzman (2002) defines a sub-sector as a vertically-linked chain of production, marketing and transformation activities that move an agricultural commodity from the field to final distribution to consumers. Further, sub-sector analysis uses the underlying framework from industrial organisation theory in economics; namely, how the commodity sub-sector is organised (structure), how the participants in the sub-sector behave or interact (conduct), and how the sub-sector performs in the aggregate (performance) (See Figure 2.2, Marion 1976).

In addition, Holtzman (2002) classifies SSA as a dynamic approach that examines how not only markets but also industries respond to changes in international supply and demand conditions for a commodity, changes in technology and changes in management techniques.

SSA provides a framework for the evaluation of enterprise performance on sub-sector level through the analysis of the functioning of each actor in the chain, including cross-linkages, competition and coordination. Bottlenecks and opportunities are identified and by applying the leverage principle, effective, cost-efficient interventions can be designed to impact on the chosen category of enterprises (HPC 2003).

Holtzman (2002) states that SSA differs from conventional producer/consumer surplus types of analysis in terms of the degree of competition in food industries and within sub-sectors; the degree of innovation and technological change and their impact on performance; the economic incentives to invest, innovate, and improve organisation and management at the firm level; how international supply and demand conditions affect

domestic production of agricultural commodities and domestic and international market opportunities; how well coordinated a sub-sector is across stages and the result in terms of product cost, quality, timeliness, and packaging.

Lusby and Panlibuton (2004) define a sub-sector as a range of activities required to bring a product or service to the final consumer and includes producers, processors, input suppliers, exporters and retailers as well as vertical and horizontal linkages between them. Lusby and Panlibuton (2004) highlight four elements of importance in SSA, namely the understanding of product markets and market trends; the relationships between participants; the identification of constraints and opportunities (technology, market access, organisation, policy, finance input supply, etc.); and sub-sector mapping in terms of the graphic presentation of inter-relationships within the sector.

Table 2.1 explains ten key areas of investigation in commodity SSA and provides a checklist in matrix form of important areas to take under consideration when an SSA is conducted. A potentially important contribution of a thorough sub-sector baseline study, used in impact assessment, is to pull together available information in a coherent and integrated package. If done well, such a baseline study can serve as a useful reference point for other analysts, policy-makers and their assistants, selected trade association representatives and private industry managers (Holtzman 2002).

According to Holtzman (2002), the first two areas of investigation in Table 2.1, namely commodity characteristics and consumption patterns, are of importance because of their specific relevance towards agricultural products and more specifically livestock and livestock products because of the perishability and post-harvest/slaughter care (maintaining quality and freshness of food products requires investments in storage facilities, pre-cooling, sorting, transport and handling equipment). Consumption patterns refer to the demand of the product or the pulling effect of the product through the system. Also included as areas of investigation are the domestic supply situation; commodity price relationships; international trade considerations; marketing system infrastructure; government institutions and policies; and finally, the timing of a sub-sector study.

Table 2.1: Key areas of investigation in commodity sub-sector studies

Areas of investigation	Contents	Method of inquiry	Reasons for investigating
1. Commodity characteristics	a) Different grades, end uses. b) Degree of bulkiness, perishability. c) Physical/handling requirements. d) Degree/type of processing. e) Types and magnitude of post-harvest losses. f) Packaging methods and materials for shipment and sale.	1) Review commodity manuals, studies. 2) Develop commodity calendars showing periods of production and transformation. 3) Observation of handling, processing, storage, any sorting or grading, and packaging. 4) Assess nature and degree of post-harvest losses in a rough way.	a) Commodity characteristics can influence operation of the sub-system, which functions are performed, how they are performed, and the relative cost at which they are performed. b) The nature of the production process influences the timing and magnitude of producer sales and market flows. c) Post-harvest losses are high in many countries. Identification of causes and means of reducing losses can expand food availability.
2. Consumption patterns	a) Seasonal and secular trends in domestic and export markets. b) Disaggregated consumption patterns by socioeconomic and ethnic groups. c) Future market prospects.	1) Review consumption studies, food balance sheets, and demand projections. 2) Construct food balance sheets if data are available. 3) Interview nutrition/consumption researchers, selected commodity importers, exporters, institutional buyers, and rural and urban consumers.	a) Demand drives (or pulls commodities through) sub-systems. b) The strength and seasonality of demand affect production and storage incentives, as well as the direction and magnitude of marketed flows. c) Longer run trends and opportunities affect investment decisions of participants in the sub-system.
3. Supply situation	a) Production by year and by region for recent years, noting trends and variability. b) Stocks for transformation and consumption by season and region. c) Flows from major supply areas to major	1) Review commodity studies. 2) Interview large wholesalers, parastatal managers, crop production researchers, importers, exporters, processors, cooperative and trade association officials. 3) Use map to show flows and	a) Supply and demand are basic elements of economic analysis. b) Production levels and variability affect prices (depending on elasticities), returns via the price mechanism, and risk perceptions of producers. c) The level of stocks during different

Areas of investigation	Contents	Method of inquiry	Reasons for investigating
	markets, including imports and exports.	apparent surplus and deficit areas. 4) Describe seasonal variation in stocks and flows.	periods affects seasonal variation in prices and commodity availability. d) Shifts in supply over time may indicate response to policies, technological change, the institutional environment, and alternative institutional arrangements.
4. Price relationships and seasonality	a) Secular trends in real prices at the farm gate, wholesale and retail levels. b) Seasonal and cyclical trends in prices. c) Changes over time in relative price relationships. d) Changes over time in input/output price and (product) value/(input) cost relationships.	1) Gather secondary price data for the commodity and close substitutes/complements for a ten or more year period. 2) Deflate prices or express prices in constant price terms. 3) Analyse secular, cyclical and seasonal price trends and changes in relative price relationships over time. 4) Estimate supply and demand relationships if data permit. 5) Calculate input-product price ratios, and/or value-cost ratios over several years.	a) Relative prices are a measure of the structure of incentives facing food system participants. b) Changing relative price relationships may indicate shifts in production and marketing incentives, especially if coupled with accurate production and marketing cost data. c) The domestic pricing structure relative to international prices provides insight into regional and national comparative advantage. d) Input-product price and value-cost ratios are proxies for the profitability of agricultural production.
5. Food system participants and organisation	a) Marketing channels and commodity sub-sector stages. b) Important assembly, redistribution and terminal markets. c) Types, numbers, and geographical distribution of firms at key sub-sector stages.	1) Review previous commodity studies. 2) Check if existing enumerations or sample frames in government agencies (e.g. licensing offices). 3) Interview knowledgeable observers of sub-sectors and selected	a) Food system organisation (or structure) influences the conduct of participants, which in turn affects performance. b) High levels of concentration of firms at particular stages of the food system may lead to higher production/marketing costs than under

Areas of investigation	Contents	Method of inquiry	Reasons for investigating
	d) Prevalence and importance of alternative institutional arrangements, such as contracts, vertical integration, direct marketing, cooperatives, and spot markets.	participants. 4) Draw a sub-sector map (flow chart) showing principal stages and marketing channels. 5) Use a geographic map to show important market places. 6) Identify firms using alternative coordination mechanisms and do case studies.	conditions of lower concentration. c) Prevalence of myriad small firms who fail to specialise at one or more levels of the food system may lead to scale diseconomies and high costs. d) Analysts need to examine the benefits and costs of alternative institutional arrangements as the food system evolves.
6. Sub-sector and food system and operation or behaviour	a) Practices and strategies of sub-system participants (individuals, firms, organisations for procuring inputs, processing, storage and marketing of outputs). b) Vertical coordination mechanisms: exchange arrangements, risk-reduction/sharing, information dissemination. c) Sources, uses and distribution (equity) of production and marketing information. d) Adaptability and responsiveness of sub-system to shifting supply/demand, exogenous shocks, policy changes and uncertainty. e) Evidence of market power.	1) Identify key stages and participants. 2) Develop informal interview guidelines. 3) Sample purposively based upon knowledge of the population of potential respondents from previous records or studies, or from the above characterisation of sub-system (#5). 4) Conduct selected in-depth informal interviews. 5) Cross check findings with other sub-system participants and knowledgeable observers.	a) Operation and behaviour in the aggregate affect food system performance. b) Information is costly to gather and process, and access is unequal. This affects the ability of different size firms to respond to changing market conditions. c) The adaptability and responsiveness of commodity sub-systems to changing conditions and uncertainty affect levels of output and performance, as well as the continued viability of the sub-system in a particular country. d) Better vertical coordination can improve the matching of supply and demand at successive stages of the food system and reduce risk. It is important to determine if this is associated with limited entry, unequal access to information, and unequal

Areas of investigation	Contents	Method of inquiry	Reasons for investigating
			sharing of risks and rewards.
7. Marketing system infrastructure	a) Physical infrastructure (transport, including roads, ports, airports and waterways; marketplaces; storage and processing facilities; communications; electricity; water supply). b) Infrastructure adequacy and bottlenecks. c) Evidence of excess or unutilised capacity.	1) Review studies of transportation and communication infrastructure, storage/processing capacity and utilisation, and marketplaces. 2) Inspect and assess the adequacy of a sample of the above. 3) Use a map to show key infrastructure. 4) Identify bottlenecks and constraints, uneconomic excess capacity (or inappropriate scale).	a) In some developing countries, infrastructural constraints constitute severe bottlenecks that slow food system development and penalise isolated areas and regions. b) Excess, underutilised capacity suggests uneconomic investments and resource misallocation.
8. Government marketing institutions and polices	a) Regulatory environment: rules; input and product regulations; laws affecting marketing and trading activities; property rights. b) Public marketing institutions (parastatals, cooperatives, joint ventures); the extent and nature of their participation in marketing; effect on the behaviour and performance of private participants in the food system. c) Macroeconomic policies: price policies; exchange, interest, wage rate policies; fiscal and monetary policies. d) Banking and credit policies.	1) Regulations: use informal interviews with sub-sector participants to identify vexing or constraining regulations. Do follow-up interviews with selected policy-makers. 2) Institutions: interview managers, determine the organisational mandate, outline its functions, estimate its market share, examine its pricing policies, assess the effectiveness of distribution and marketing services, and assess the impact of its participation on system performance. 3) Policies: review macroeconomic assessments of the World Bank, IMF or others. Assess the impact of policies on the organisation and	a) The regulatory environment generally and specific regulations in particular affect the behaviour and incentives of food system participants. b) Public marketing institutions dominate food systems in some countries, influence the organisation, operation and performance of food systems in many countries, and generally affect the behaviour of system participants. c) Macroeconomic policies condition and shape the environment in which system participants make decisions about investments and operations. d) All of the above contribute to food system stability and/or uncertainty, which greatly influence behaviour. e) Banking and credit policies determine

Areas of investigation	Contents	Method of inquiry	Reasons for investigating
		operation of the food system and the incentives of different system participants. 4) Interview bank and credit agency officers. Determine whether credit is subsidised, how it is rationed, who gains access, and the sectoral distribution of credit.	who gains access to formal credit, which is often subsidised.
9.International trade and commodity competitiveness	a) Commodity exports and world market situation. b) Imports of the commodity or substitutes and their impact on domestic production, markets and prices. c) Trends in exports and imports. d) Likely changes in exports and imports, and emerging market opportunities or dependencies. e) The competitiveness of exports in particular foreign markets.	1) Analyse trade quantity and price data available in statistical abstracts or outside assessments. 2) Review international commodity production, price and trade forecasts. 3) Compare prices of domestically-produced commodities with international prices. 4) Analyse the competitive position of a specific export commodity in key markets. Examine trends in export levels, market shares and prices, and ascertain reasons for changes. 5) Interview exporters and importers and major domestic buyers in the foreign markets. 6) Visit export-staging and import-receiving facilities. 7) Inspect exported produce in terminal markets and compare with that of competing suppliers.	a) Few, if any developing country food systems are autarkic. International trade in agricultural commodities affects production and marketing incentives, consumption patterns and preferences, and the behaviour and opportunities of system participants. b) International market conditions influence developing countries' comparative advantage in production and export (import) of agricultural commodities. c) In assessing export competitiveness, site visits to markets and buyers' premises and in-depth interviews with importers and end users in foreign markets provide a good picture of how a country's exports compare with those of other suppliers. Such visits to foreign markets often yield concrete input and insights into what needs to be done to meet international grades and standards generally and the requirements of particular buyers and end users.

Areas of investigation	Contents	Method of inquiry	Reasons for investigating
10. Representativeness of the period under study	a) Timing of the study relative to the annual commodity production and marketing cycle. b) Agricultural and economic characteristics of the year of the study relative to earlier years or climatic cycles.	1) Compare rainfall data and production estimates with earlier years. 2) Compare economic data: GDP, balance of payments, inflation rates, trade patterns, exchange rates. 3) Assess political factors: any change of government, policy changes, and movements towards (or away from) democracy.	a) The period of observation may be unusual with respect to climate, agricultural production, economic and political conditions, and the effects of recent changes. b) Food system development is an ongoing process. Historical perspective of long-run patterns of change in basic economic, institutional, political and environmental conditions is valuable in understanding food system development.

Source: Holtzman 2002

The three boxes in Figure 2.2 showing structure (S), conduct (C) and performance (P) or SCP attributes differentiate between industry and sub-sector-specific characteristics. The structure component at sub-sector level is concerned with the number of firms as well as their market power at the different stages of the chain and the different marketing channels present within the chain. Conduct within a sub-sector refers to the specific coordination activities or efforts of the participants of the sub-sector in terms of cooperation or conflict between the different stages and the flow of information across stages. Conduct also considers how a sub-sector as a whole responds to changes in terms of price movements, supply shifts, changes in the world market conditions and emerging competitors or threats. Finally, the analysis of performance at sub-sector level includes: matching of supply and demand between stages; the stability of output, prices and profits; technical and operational efficiency at each stage and linking stages; equity of returns relative to risks; the accuracy, adequacy and equity of information; the level and types of employment; and the adaptability and responsiveness of the sub-sector (Holtzman 2002).

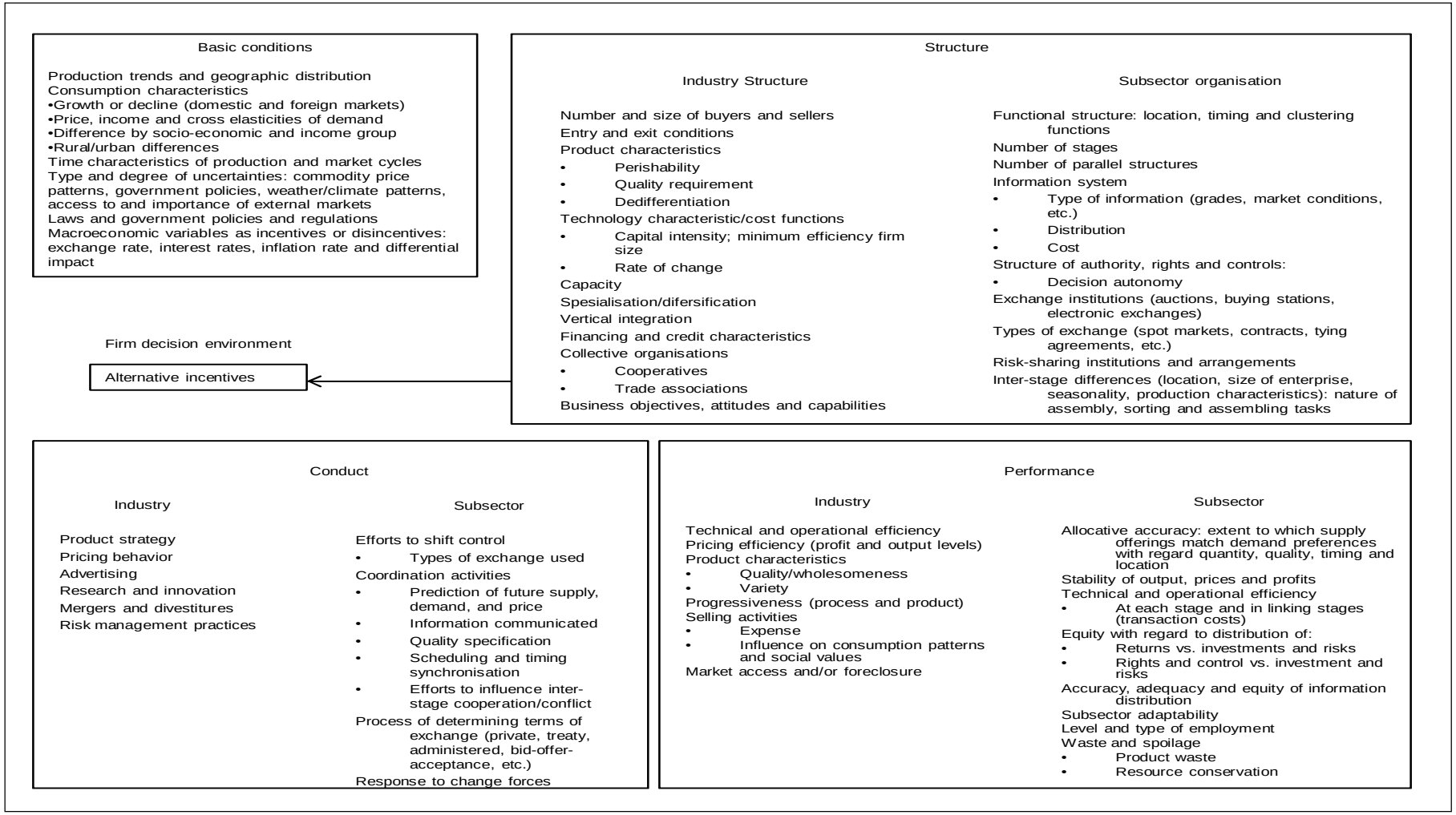

Figure 2.2: Structure, conduct, performance paradigm as applied to the commodity sub-sector approach
Source: Marion 1976

2.2.2 Commodity Chain Analysis (French *filière* concept)

According to Tallec and Bockel (2005b) the Commodity Chain Analysis (CCA) approach is part of a wider set of different approaches of chain analysis, including value chain and global commodity chain analysis. CCA is a neutral, value-free technique used to analyse existing marketing chains for agricultural commodities assessing how public policies, investments and institutions affect local production systems. CCA consists of quantitative analysis of inputs and outputs, prices as well as value added to a commodity chain through agent accounts.

Tallec and Bockel (2005a) highlight two important ways in which CCA can be used to analyse policies, namely: as a tool for setting out complete financial accounts of the various agents[2] along the length of the chain, and as an accounting framework allowing for the systematic recording of a large part of the information necessary for a proper economic analysis, thus extending financial accounting analysis.

As in the case of VCA, CCA starts with chain mapping as a first step of the analysis to obtain an overview of the chain, the product flows within the chain, the chain actors as well as the type of interaction between the agents. CCA can be used as a tool for economic analysis by either using the impact approach, using actual market prices as used by agents or by using the shadow price approach which uses computed (economic) prices instead of market prices to estimate the economic value of goods and services.

Tallec and Bockel (2005a) further identify a number of important aspects when constructing a commodity chain, which include the agents and institutional sectors that can consist of a physical person in the form of farmers, trader or consumers, or a legal entity in the form of a business, an authority or a development organisation; the classification of agents in terms of their primary activity which includes firms, financial institutions, households, the government and the rest of the world; the specification and operation of the commodity chain (likely elements and agents), including the input

[2] The term is used to describe an economic actor, i.e. a basic unit in the economy, who undertakes an activity and makes decisions autonomously (Tallec and Bockel, 2005a).

supply chain, agricultural and livestock rearing process, processing, wholesaling, transport and retail industries, packaging industries, industries handling processing, transport, trade and distribution, financial services, research and extension services, credit services and consumers; the identification of activities and the flows between them, starting from the primary agricultural production activity and following the product downstream through the various marketing and processing channels to the final market as well as upstream to identify the principal input providers; and the identification of agents - here Tallec and Bockel (2005c) suggest to grouping agents in homogeneous categories in separate functions for a technical analysis of the operation of the chain. Following this is a functional analysis of the agents and their interactions according to their principal function in the chain, the specific functions they carry out as well as the products concerned. The final aspects include the creation of a flow chart (map) for the specific commodity and quantifying the flow chart in terms of physical monetary flows, which allows for the assessment of the relative importance of the various segments in the chain.

According to Tallec and Bockel (2005c), CCA incorporates institutional analysis (identification of flows and agents, analysis of the locations for decisions and collaboration); comparative analysis (the relative competitiveness of chains and of the strategies of actors); functional analysis (identification of bottlenecks within the chain); as well as economic analysis (modelling and simulation). CCA can be used for descriptive studies and monographs, sectoral, sub-sectoral and branch analysis, project analysis, studies of comparative advantage and competitiveness and sectoral and macroeconomic policy analysis.

The CCA approach tends to be more static and reflects relations at a certain point in time (Kaplinsky and Morris 2000). Kaplinsky and Morris (2000) state that, although there is no conceptual reason for this, CCA analysis has generally been applied to domestic value chains which means that CCA analysis normally stops at national boundaries.

The concept of Global Commodity Chain (GCC) was introduced into the literature during the mid 1990s by Gereffi (1994). The major contribution of the global commodity chain

approach is its focus on the power relations which are embedded in value chain analysis. Global value chains or GCC, as described by Gereffi (1994), have four key dimensions, namely a specific physical input-output structure; its geography (the area it covers), inter-regional as well as international; governance structure; as well as an institutional framework. Amongst these dimensions, the governance structure has received the most attention since it is where the key notions of barriers to entry lie, where chain co-ordination appears in the analytical framework, and where the distinction between producer-driven and buyer-driven global commodity chain governance structures is introduced. The input-output structure of the chain and the territory of the global commodity chain covers have been used mainly descriptively to outline the configuration of specific chains.

GCC analysis emphasises the different ways in which activities along the chain are coordinated and defines chain governance as the process of specifying, communicating and enforcing compliance with key product and process parameters along the value chain (Humphrey and Schmitz 2004).

Humphrey and Schmitz (2004) explain that governance occurs when one firm follows parameters set and enforced by another. A distinction can be made between governance structure where the coordination is undertaken by buyers ('buyer-driven commodity chains") and structures where producers play the key role ("producer-driven commodity chains") (Gereffi 1994, Gereffi and Memedovic 2003).

2.2.3 Value Chain Analysis (VCA)

Porter (1985) describes VCA as the activities the organisation performs and links them to the organisation's competitive position. Therefore, VCA evaluates which value each particular activity adds to the organisation's product or services. Porter (1985) further distinguishes between primary and support activities (Figure 2.3), where primary activities are directly concerned with the creation or delivery of a product or service and can be separated into five main groups, namely: inbound logistics (receiving, warehousing and inventory control of input materials); operations (value-creating activities that transform the inputs into the final product); outbound logistics (activities

required to get the finished product to the consumer); marketing and sales (activities associated with getting consumers to purchase the product); and services (activities that maintain and enhance the product's value). These five primary activities are further linked to four support activities which help to improve their effectiveness or efficiency. These four support activities include: procurement (the function of purchasing the raw materials and other inputs used in the value-creating activities); technology (research and development aimed at supporting the value chain activities); human resource management (recruiting, developing and compensating employees); and infrastructure (finance, legal, quality management etc.). Thus, VCA addresses the nature and determinants of competitiveness and raises the sights from the individual enterprise to a group of interconnecting enterprises.

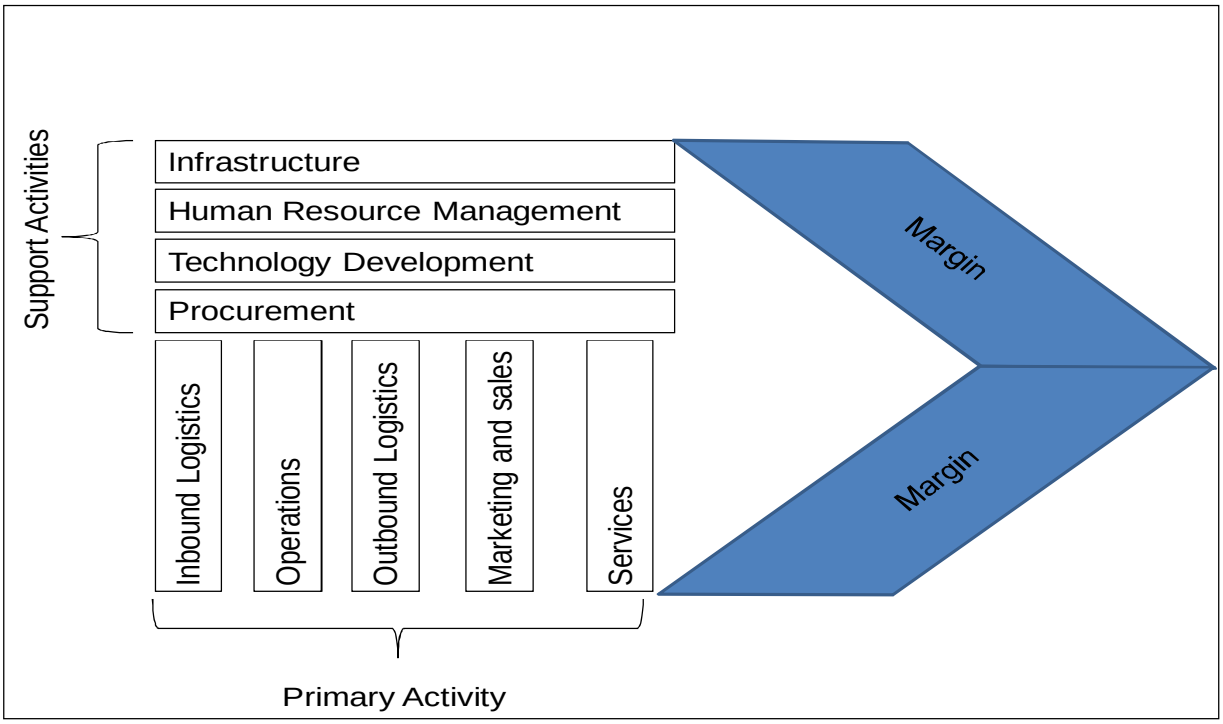

Figure 2.3: The basic model of Porter's value chain
Source: Porter 1985

Kaplinsky and Morris (2000) state that not only do value chains differ both within and between sectors, but also within their national and social content. This implies that there is not just one way of applying value chain research because each chain will have particular characteristics, whose distinctiveness and wider relevance can only be

effectively captured and analysed through an understanding of the broader issues that are involved throughout the chain.

Kula *et al.* (2006) see VCA as a continuation of the work begun under SSA and give four key points that differentiate VCA from SSA. These four key points include: inter-firm cooperation as the key to competitiveness in the late twentieth and twenty-first centuries; power relationships in the sense that supplier and buyer relationships can increase collective efficiencies, external economies of scale, and improved competitiveness; distribution of benefits (the ability to control information increases the share of benefits); and learning and innovation as essentials for creating and sustaining competitiveness.

Three key elements of VCA are identified by Kaplinsky and Morris (2000) which link strongly to the GCC approach, namely barriers to entry and rent; governance and the different types of value chains – buyer driven or producer driven (see Gereffi and Memedovic 2003). Lusby and Panlibuton (2004) link VCA and the GCC approach to SSA in the sense that they are complementary to SSA and provide additional analytical elements that can improve on, and build on the foundation of an SSA framework. These elements include the geographic coverage (national, regional and global); global benchmarking; inter-firm cooperation and governance. Schmitz (2005) also sees VCA as an increasingly useful method to gain a comprehensive view of the inter-locking activities involved when taking a good or service from the raw material to the producer and all the way to the final consumer.

Simmons *et al.* (2003) define VCA as a tool for analysing the nature and the source of value within a supply chain and the potential of reducing waste therein, focusing on the determinants of value within a manufacturing process rather than a simple measurement of process output.

Kula *et al.* (2006) define a value chain as a supply chain made up of a series of actors, from input suppliers to producers and processors to exporters and buyers, engaged in the full range of activities required to bring a product from its conception to its end use. According to the authors, value chain activities can be contained in a single

geographical location or spread over wider areas, as in the case of global value chains that are divided among multiple firms and spread across a wide geographic space. Richter (2006) states that one can perceive the VCA approach as an intervention tool for shaping sectors as well as economies because it takes (on a macro level) all the steps of production into consideration; it analyses the links and information flows; it reveals strengths and weaknesses; it reveals the boundaries between the domestic and international chain; and it allows for international benchmarking. On a micro level, the VCA approach can be used to investigate and improve critical success factors such as quality, price, costs, dependability, volume, design and speed of delivery; and by improving these critical success factors, can improve competitiveness.

Roduner (2005) distinguishes between different participants in the value chain and groups them in micro, macro and meso levels respectively (see Figure 2.4). Firstly, those participants who are directly involved with the primary product are referred to as value chain players and are grouped in the micro level. From Figure 2.4, it can be seen that the micro level includes role-players from the input suppliers, farmers, dealers and traders, until the final consumers, whether the product is consumed locally or exported. Clearly, the micro level includes only those participants who are directly involved with the product (Roduner 2005).

The second level which has to be included in value chain research is the macro level, as suggested by Roduner (2005), who refers to these participants as value chain influencers. The value chain influencers are those participants who, as indicated by their name, influence the value chain. The value chain influencers include those participants who are responsible for the regulatory and administrative conditions as well as for international competition. These conditions include, amongst others, food law and regulations, food control and company inspection, customs and taxes, incentives and free trade agreements.

The third and final level that is included by Roduner (2005) is referred to as value chain supporters and is grouped at a meso level. These participants included in the meso level are those responsible for providing information, training and promotions (see Figure 2.4). Clearly, both the value chain influencers as well as the value chain

supporters have a major influence on a value chain. Therefore, it is important to consider them when conducting value chain analysis, as suggested by Roduner (2005).

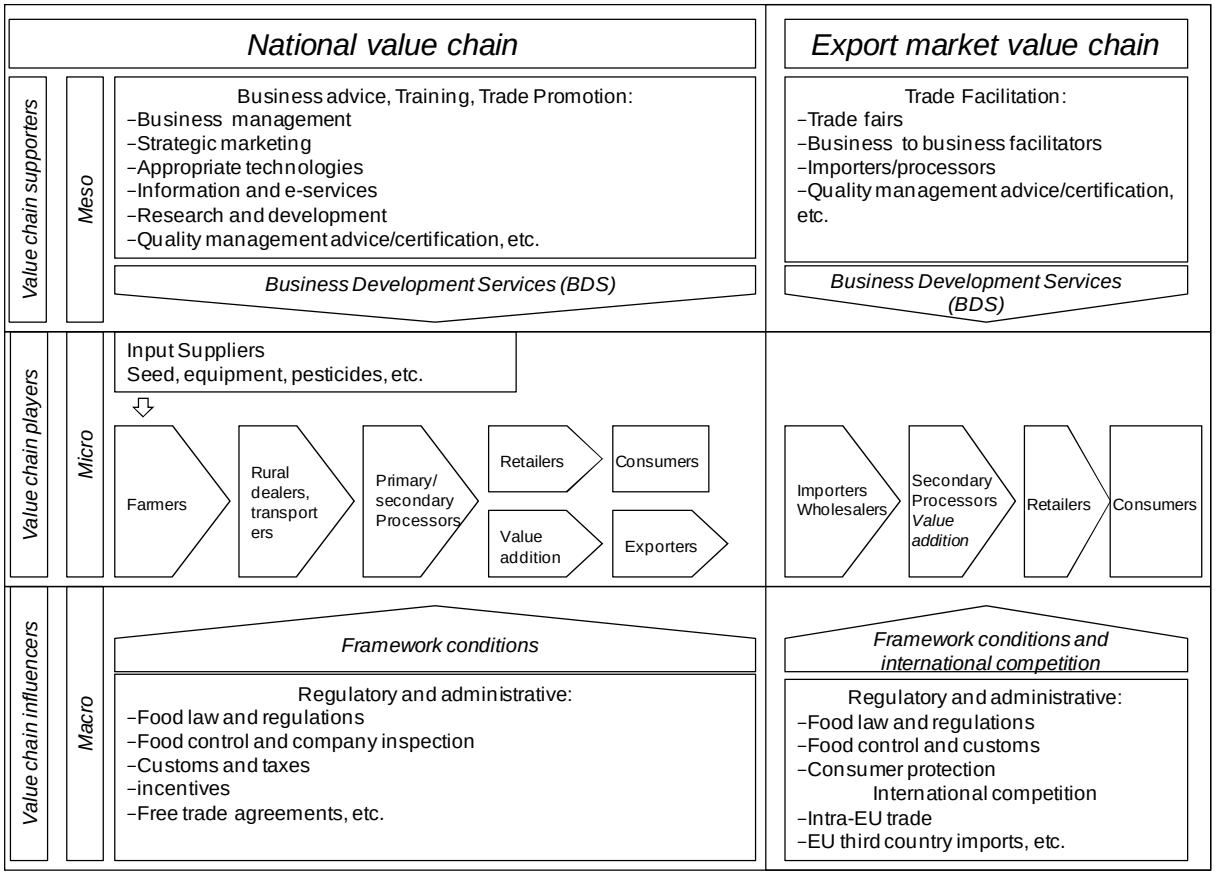

Figure 2.4: Value chain players, supporters and influencers
Source: Will 2004 as in Roduner 2005

2.3 The application of VCA

In order for any industry or product to apply VCA effectively, it is important to know how this industry is constructed in terms of information, product as well as money flows between the different segments/actors in the value chain.

Various methods, discussed in the previous section, can be used to analyse value chains. The most important step and also forming the core of the analysis is value chain mapping. The steps following value chain mapping build on the value chain mapping exercise and therefore additional analysis may become necessary, depending

on the information required. The steps include quantifying and describing value chain detail, economic analysis as well as benchmarking and chain upgrading.

Lusby and Panlibuton (2004) indicate a number of general patterns or steps, given the different approaches to map value chains or sub-sectors (also highlighted by Roduner 2004) when conducting value chain analysis, namely to:

- Identify final markets (set boundaries).
- Identify key functions/activities.
- Identify participants performing each function.
- Map participants according to the specific functions they perform.
- Map inter-relationships between participants.
- Submit a description to private sector and specialists and make the necessary adjustments or improvements.
- Monitor and evaluate.

Figure 2.5 provides an example of what a typical red meat value chain could look like and includes the flows of product, information and money through and between the different segments of the chain.

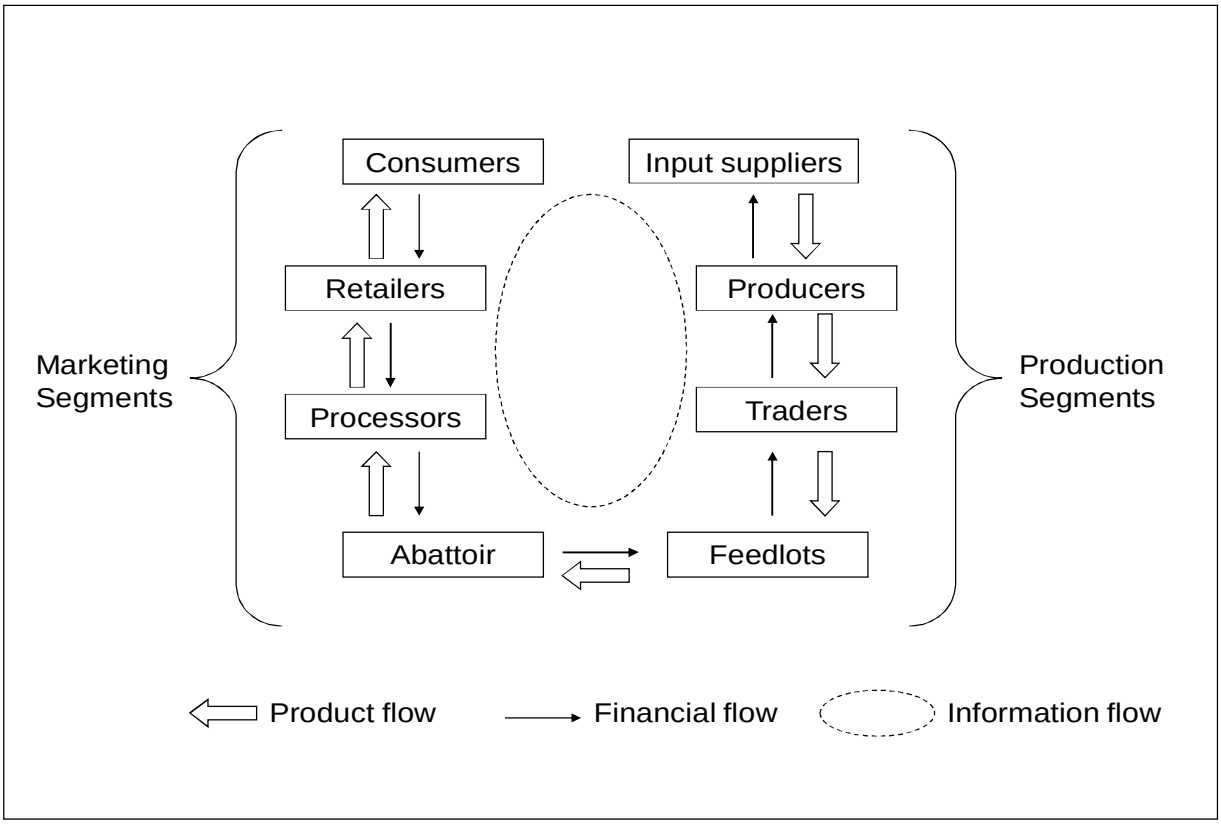

Figure 2.5: Example of a value chain
Source: Schroeder 2003

According to Kaplinsky and Morris (2000), once the value chain in question has been identified and mapped, the task should then be to put numbers and values to the variables under investigation. The variables to be included will depend on the primary question being addressed by the research as well as the point of entry. Some of the variables, amongst others, will include:

- Gross output values.
- Net output values.
- The physical flow of commodities along the chain.
- The flow of services, consultants and skills along the chain.
- Employment, where relevant, distinguishing between permanent and temporary staff, gender, etc.
- Destination of sales – for example to wholesalers and retailers, concentration of sales amongst major buyers and number of buyers.

- Imports and exports, and to which region.

Table 2.2 provides a number of aspects that need to be included in chain analysis. These include commodity characteristics, demand and supply patterns, price relationships and seasonality, food system participants and organisations, sub-sector and food system operation or behaviour, the marketing system infrastructure, government marketing institutions and policies, international trade and commodity competitiveness as well as the representativeness of the period under study.

Table 2.2: Data requirements for chain analysis

Area of investigation	Data required
Commodity characteristic	• Grades and grading systems. • Perishability. • Physical handling requirements. • Packing methods and materials for shipment and sale.
Consumption patterns	• Trends in the domestic and export market. • Consumption patterns by socioeconomic and ethnic group. • Future market prospects.
Supply situation	• Production by region. • Stocks for transformation and consumption by season and region. • Flows between markets, including imports and exports.
Price relationship and seasonality	• Method of procurement. • Secular trends in real prices at the farm gate, wholesale and retail levels. • Seasonal and cyclical trends in prices. • Changes over time in relative price relationships. • Changes over time in input/output price and cost relationships.
Food system participants and organization	• Marketing channels and commodity sub-sector stages. • Important assembly, redistribution and terminal markets. • Types, numbers, and geographical distribution of firms at key sub-sector stages. • Prevalence and importance of alternative institutional arrangements, such as contracts, vertical integration, direct marketing, cooperatives, and spot markets.
Sub-sector and food system operation or behaviour	• Practices and strategies of sub-system participants (individuals, firms, organisations for procuring inputs, processing, storage and marketing of outputs). • Vertical coordination mechanisms: exchange

Area of investigation	Data required
	arrangements, risk-reduction/sharing, information dissemination. • Sources, uses and distribution of production and marketing information. • Adaptability and responsiveness of sub-system to shifting supply/demand, exogenous shocks, policy changes and uncertainty. • Evidence of market power.
Marketing system infrastructure	• Physical infrastructure (transport, including roads, ports, airports and waterways; marketplaces; storage and processing facilities; communications; electricity; water supply). • Infrastructure adequacy and bottlenecks. • Evidence of excess or unutilised capacity.
Government marketing institutions and policies	• Regulatory environment: rules; input and product regulations; laws affecting marketing and trading activities; property rights. • Public marketing institutions (parastatals, cooperatives, joint ventures); the extent and nature of their participation in marketing; effect on the behaviour and performance of private participants in the food system. • Macroeconomic policies: price policies; exchange, interest, wage rate policies; fiscal and monetary policies. • Banking and credit policies.
International trade and commodity competitiveness	• Commodity exports and world market situation. • Imports of the commodity or substitutes and their impact on domestic production, markets and prices. • Trends in exports and imports. • Likely changes in exports and imports, and emerging market opportunities or dependencies. • The competitiveness of exports in particular foreign markets.
Representativeness of the period under study	• Timing of the study relative to the annual commodity production and marketing cycle. • Agricultural and economic characteristics of the year of the study relative to earlier years or climatic cycles.

Source: Kaplinsky and Morris 2000

Once the value chain has been mapped and quantified, the next step will be the economic analysis of the chain. This analysis will draw from, and build on, the various methodologies reviewed for value chain analysis including: SSA and the embedded S-C-P approach therein, CCA or the *filière* approach, GCC, as well as VCA.

2.3.1 Measuring performance in a value chain

An essential part of value chain research is the measurement or evaluation of the performance of the given chain. Baker *et al*. (2009) state that the identification of performance measure variables and the assessment thereof is a crucial component in advancing beyond the description and presentation of a value chain into reasoned analysis that allows for identification and analysis of improvements.

According to Chibba (2007), all members of a value chain, both upstream and downstream, are actors who have an important impact in the performance of the chain and include quality (the degree to which a product is manufactured to the agreed specification); delivery (the ability to deliver consistently on the agreed due date); flexibility (the ability to effectively produce a range of different products); and cost (the ability to offer a lower product price than direct competitors). It is therefore important to evaluate the type of performance measure used given the nature of the value chain, as it can affect the decision-making process.

Beamon (1999) highlights that a generally applicable systematic approach to measure performance in value chains has not been developed because different types of systems require specific measurement system characteristics. According to Aramyan (2006), the large number of performance indicators, and the lack of consensus on what determined the performance of a supply chain, complicates the selection of performance measures. Baker *et al.* (2009) state that value chain performance has not been clearly defined by researchers, nor by the private sector, and not even by development practitioners.

Jie *et al.* (2007) is the most recent of authors in applying four supply chain performance indicators in order to measure supply chain performance, namely (see Figure 2.6, Jie *et al. 2007)*: flexibility, efficiency, food quality and responsiveness (also in Beamon 1999; Li *et al.* 2002; Luning *et al.* 2002; Gunasekaran *et al.* 2004; Aramyan 2006). According to David *et al.* (2006), supply chain performance is a two-dimensional definition which consists of effectiveness and efficiency. Supply chain effectiveness is an indicator of consumer satisfaction while efficiency relates to the objective performance of

processes. In Figure 2.6, quality refers to all aspects linked to the handling of the product/animal pre and post slaughter; while flexibility refers to the agility of the supply chain in responding to changes in the marketplace in order to gain or maintain competitive advantage as well as the responsiveness to changes in consumer demand. Responsiveness refers to the velocity at which the supply chain provides the product to the end consumer and efficiency consists of six indicators, namely farm/plant costs; inventory cost; waste cost; transportation cost; labour cost; and profit (Harmon 2003).

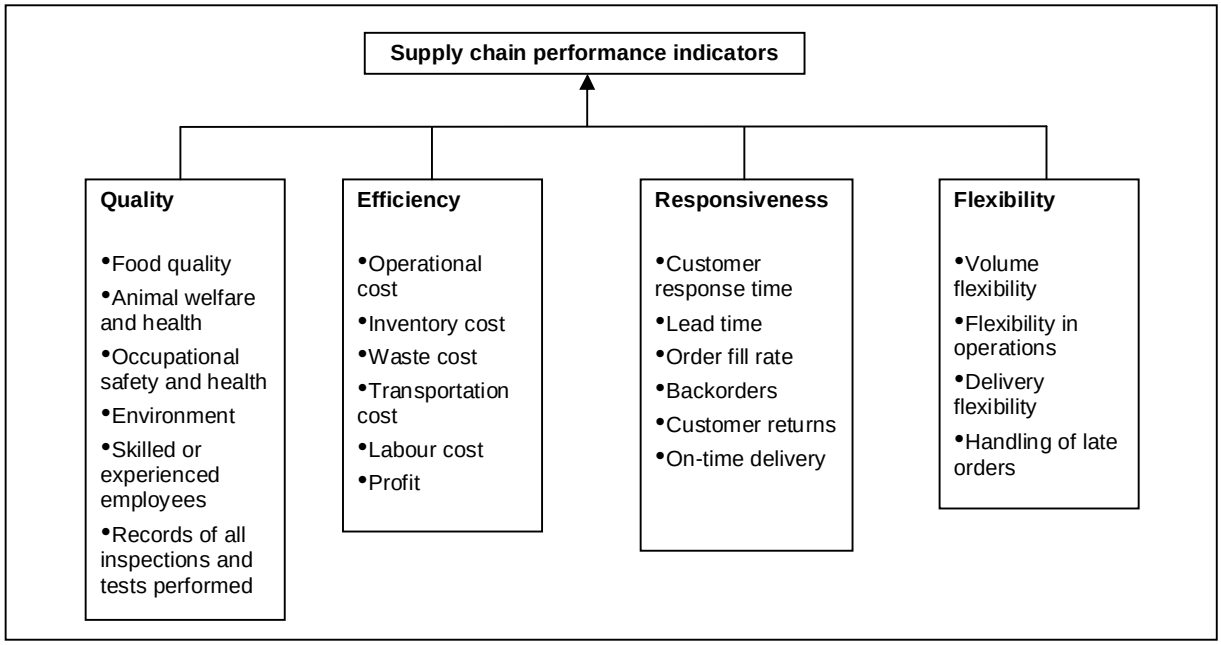

Figure 2.6: A conceptual framework
Source: Jie *et al.* 2007

The Food Chain Centre (FCC) uses a "lean thinking" approach, which is a generic term for a business improvement method that provides a way to do more and more with less and less. The FCC, in partnership with the United Kingdom's Red Meat Industry Forum (RMIF), applies lean thinking (also described as value chain analysis) across whole value chains aimed at improving the efficiency and competitiveness of British red meat. This method of performance measurement involves the reduction of "waste" in the value chain. Waste can be defined as any action within the value chain that adds cost but not necessarily value. The economic analysis of the value chain is the assessment of chain performance in terms of its economic efficiency and includes the determination of the

value added along the different segments of the chain; the cost of production; income at the different levels and the distribution thereof within the chain; transaction costs; the collection and distribution of information and enforcing of contracts; and benchmarking and upgrading.

The perfect scenario would be the ability to collect, measure and analyse all the data in the value chain in a timely, cost-effective and transparent manner, which could then be made available in a perfectly transparent and equal basis to all the actors in the value chain.

2.4 Conclusions

Considering the importance of the first step in a value chain analysis process (the mapping of the value chain), it is necessary to prioritise this step. The mapping of the value chain will provide a better understanding of how the product, information and money flows between the different segments of the chain as well as how the inter-linkages between the different segments function. By mapping the chain, the relative importance of the different segments of the chain can be identified. This will help with the identification of the starting point for the next step, namely the quantification of the value chain.

Given the focus of the VCA approach on the interactions and flows of product, information and money in the value chain and all the activities in each link of the chain, it will help with the identification of areas of waste (adding cost without adding value) and will highlight possible areas of improvement in terms of production efficiency

A number of methodologies and approaches used to analyse value chains have been mentioned in this chapter. It is, however, important to note that it is very difficult to predetermine a specific methodology, given the nature of the project. In order to analyse value chains in terms of performance, value-adding activities, efficiency, competitiveness, etc., there has to be a value chain to start with. For this reason, the mapping and quantification, and the understanding of the interactions between the different actors within the chain are so important. This initial step will, however, only be

as good as the information available and will rely heavily on the participation of the stakeholders or actors within the chain.

Given the importance of information when doing value chain analysis, one of the main challenges will be acquiring useful, reliable and accurate data and statistics for the sector under investigation. It will therefore be important to determine the boundaries or depth of the study, given the overall objective.

CHAPTER 3

Structure, Conduct and Performance of the South African Red Meat Industry

3.1 Introduction

In order to gain a better understanding of the South African red meat value chain and the functioning and roles of the different segments in the value chain, it is necessary to provide an overview of the red meat industry in South Africa. Various authors including Jooste *et al.* (2003); Jooste and Taljaard (2004); Olivier (2004); Oyewumi (2005) and Shongwe (2005) have reviewed the South African red meat industry in detail. These studies are however either outdated or have not considered the complete value chain. For the purpose of this study it is therefore important to provide an updated industry overview, with emphasis on the structure, conduct and performance of the industry without duplicating previous work done.

The South African Red Meat Industry came under pressure during the 1990s due to a number of factors, including the increase in international competition, especially since 1994. This was brought about by the deregulation process and South Africa's compliance with world trade liberalisation rules. Further pressure resulted because of a decline in the per capita disposable income due to poor economic growth. Adding to this is the fact that consumers are becoming more health conscious and price competition from other sources of protein, especially poultry meat, are becoming more important (Jooste and Taljaard 2004).

3.2 Industry structure

The organisational structure of the South African Red Meat Industry Forum (RMIF) is shown in Figure 3.1. Readers of this thesis are encouraged to visit the respective websites of the organisations mentioned for detailed information regarding their functions within the industry (available from: www.redmeat.co.za).

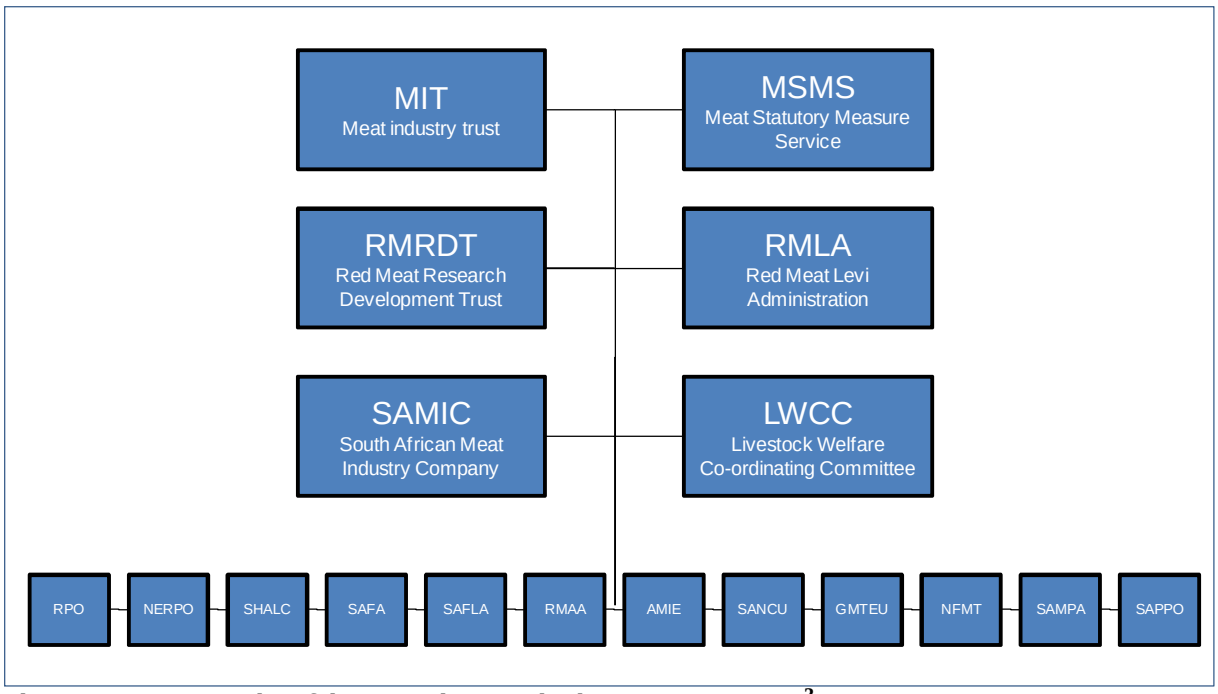

Figure 3.1: South African red meat industry structure[3]
Source: RMIF 2010

[3] **RMIF** RED MEAT INDUSTRY FORUM, **MIT** MEAT INDUSTRY TRUST, **MSMS** MEAT STATUTORY MEASURE SERVICE, **RMRDT** RED MEAT RESEARCH DEVELOPMENT TRUST, **RMLA** RED MEAT LEVY ADMIN, **SAMIC** SOUTH AFRICAN MEAT INDUSTRY COMPANY, **LWCC** LIVESTOCK WELFARE CO-ORDINATING COMMITTEE LEVY ADMIN, **RPO** RED MEAT PRODUCERS' ORGANISATION, **NERPO** NATIONAL EMERGENT RED MEAT PRODUCERS ORGANISATION, **SHALC** SKINS, HIDES AND LEATHER COUNCIL, **SAFA** SOUTH AFRICAN FEEDLOT ASSOCIATION, **SAFLA** SOUTH AFRICAN FEDERATION OF LIVESTOCK AGENTS, **RMAA** RED MEAT ABATTOIRS ASSOCIATION, **AMIE** ASSOCIATION OF MEAT IMPORTERS AND EXPORTERS, **SANCU** SOUTH AFRICAN NATIONAL CONSUMERS UNION, **GMTEU** GAUTENG MEAT TRADERS EMPLOYEES UNION, **NFMT** NATIONAL FEDERATION OF MEAT TRADERS, **SAMPA** SOUTH AFRICAN PROCESSING ASSOCIATION, **SAPPO** SOUTH AFRICAN PORK PRODUCERS ORGANISATION.

3.2.1 Gross value of beef and sheep and goat production

The gross value of beef production in South Africa from 1996 to 2009 as depicted in Figure 3.2. The gross value of beef production increased from R 3.2 billion in 1996/1997 to R 13.1 billion in 2008/2009. This is an increase of just over 307 % in nominal terms over this period, with an annual average growth of 23.6 %.

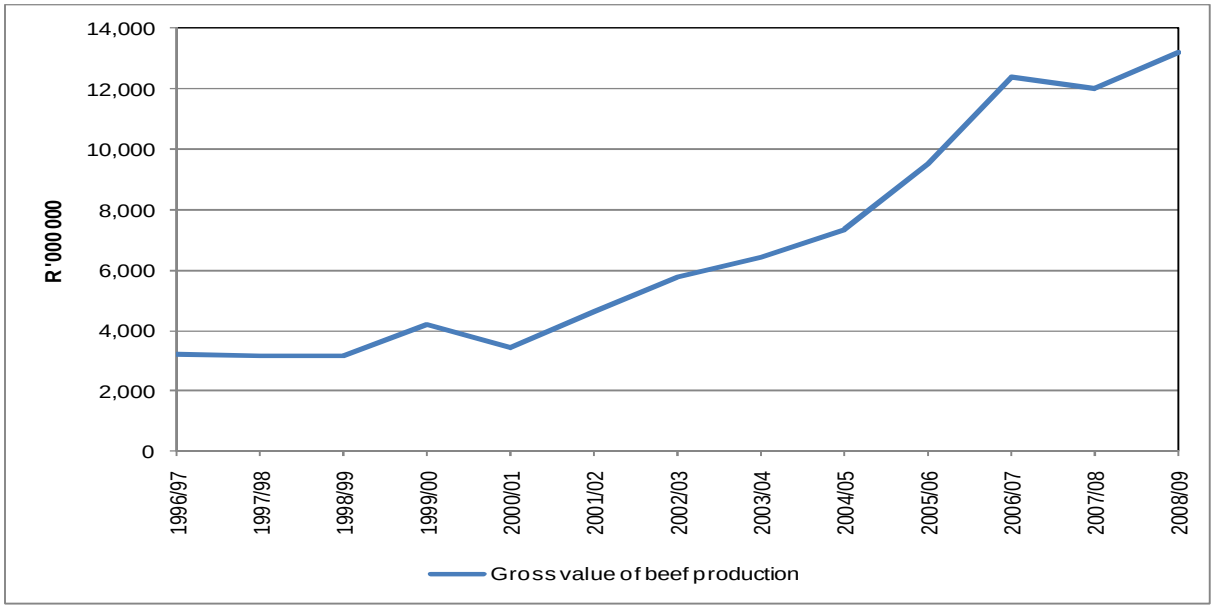

Figure 3.2: Gross value of beef production in South Africa from 1996/97 to 2008/09
Source: DAFF 2010

The gross value of sheep and goat production in South Africa increased by 200 % (15.4 % annually) in nominal terms from 1996/1997 to 2008/2009 (Figure 3.3). This is an increase in the gross value of production from R 1.0 billion in 1996/1997 to R 3.0 billion in 2008/2009.

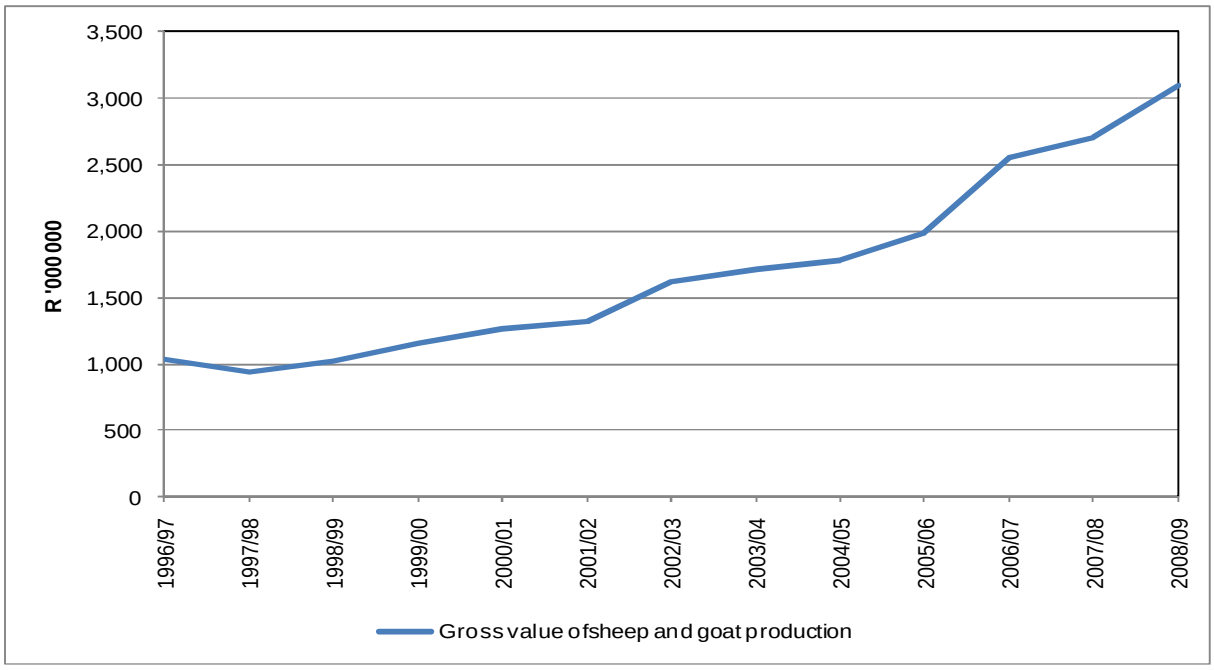

Figure 3.3: Gross value of sheep and goat production in South Africa from 1996/1997 to 2008/2009

Source: DAFF 2010

3.2.2 Animal numbers, distribution and slaughterings

Figure 3.4 shows the South African national cattle herd as well as the number of animals slaughtered on an annual basis from 1970/1971 to 2008/2009. A slight increase in the national herd can be seen, although it seems that it has stagnated between 13 million and 14 million animals since the late 1990s. The sharp increase in the national herd from 1970/1980 to 1980/1981 was due to the inclusion of the informal sector in the national statistics. The commercial cattle herd comprises approximately 65 % of the total herd, implying that the other 35 % of all cattle in South Africa are owned by the non-commercial sector. Approximately 68 % of the national herd is female animals, the majority of which are utilised for meat production (Jooste and Taljaard 2004). From Figure 3.4, a clear cyclical trend in the number of slaughterings is evident. According to Lubbe (1990), this trend is caused by the cyclical nature of female animal slaughterings. The author investigated the decomposition of price time series components in the red meat industry. He states that the combined effect of rainfall, variations in production capacity and price expectations produce an environment conducive to relatively stable prices. Furthermore, livestock expansion

and liquidation processes are fuelled by the rainfall cycle and rainfall expectations. Lubbe (1990) concludes that agricultural policy and farmers' strategies could be more effective if the existence and nature of price and rainfall cycles are known.

Eales (1979) points out that many factors influence the actual level of slaughtering in a particular year and this causes a fluctuation in the volume slaughtered from year to year. The factors identified by Eales (1979) are the following:

- The general state of the economy and the purchasing power of households.
- The price of beef in relation to the consumer price index (i.e. whether consumers regard meat as expensive or not).
- The competition from substitutes such as broiler chickens.
- The relative prices of other agricultural commodities used as inputs in beef production, such as maize; and
- The relative price of agricultural inputs such as land, labour, fuel, fertilisers, pesticides and insecticides.

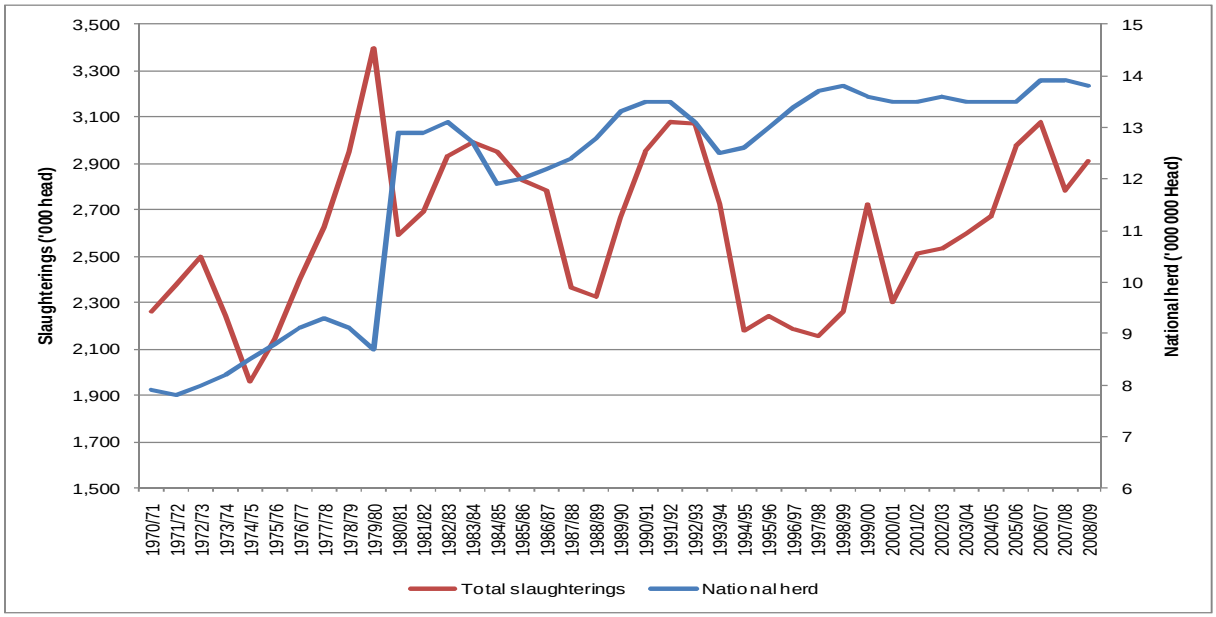

Figure 3.4: South African cattle herd and slaughtering from 1970 to 2009
Source: DAFF 2010

Unlike the slight increasing trend in cattle numbers, the national sheep herd has been steadily declining since the early 1990s (Figure 3.5). The main contributing factors

responsible for this decline in animal numbers, amongst others, includes the conversion from sheep to beef production and the conversion from sheep to game farming in major sheep production areas. These conversions were mainly brought about by the increase in stock theft, predation and, to a lesser extent, climatic changes resulting in drought conditions within some major sheep producing regions.

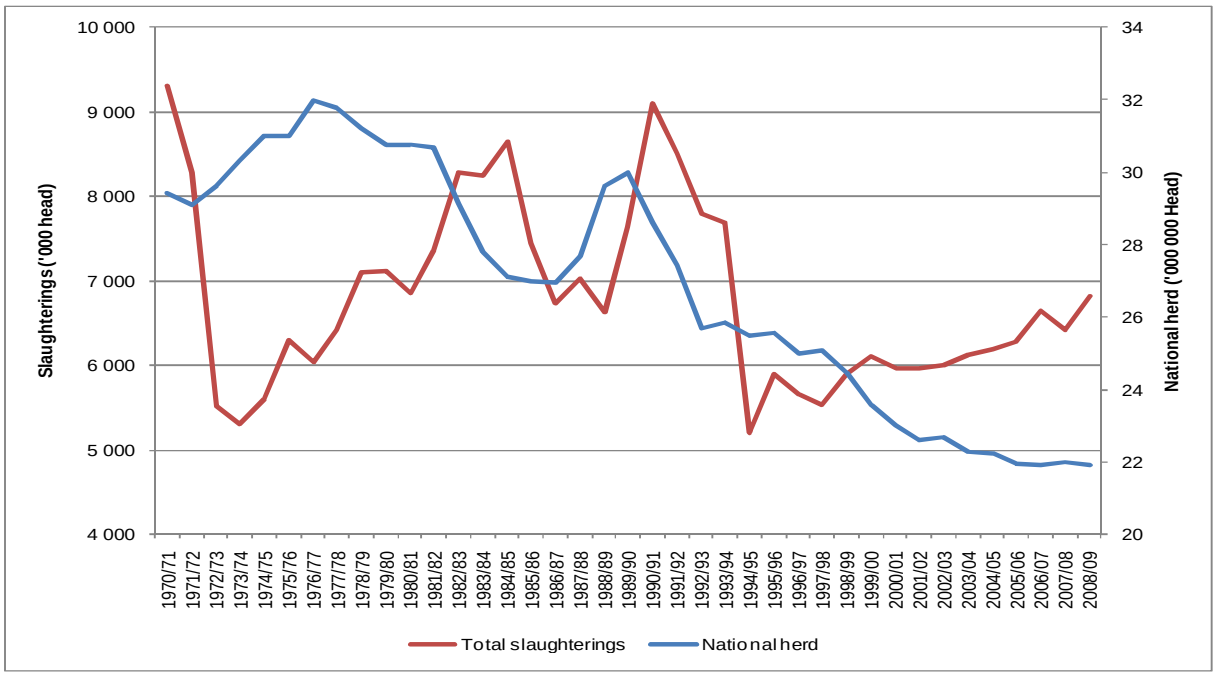

Figure 3.5: South African sheep herd and slaughtering from 1970 to 2009
Source: DAFF 2010

Figure 3.6 represents the distribution of cattle and sheep numbers in South Africa (2008) per province, while Figures 3.7 and 3.8 respectively represent beef and sheep distribution per province in percentage terms. From these figures, it is evident that the main contributors to beef numbers in South Africa are the Eastern Cape (23 %), KwaZulu-Natal (19.7 %) and the Free State (16.9 %); while the Eastern Cape (29.8 %), Northern Cape (25.4 %) and the Free State (19.9) are the main contributors in terms of sheep and goat numbers. Total cattle numbers in South Africa amounted to 14.1 million while the total sheep numbers totaled 24.8 million during 2008 (NDA 2008).

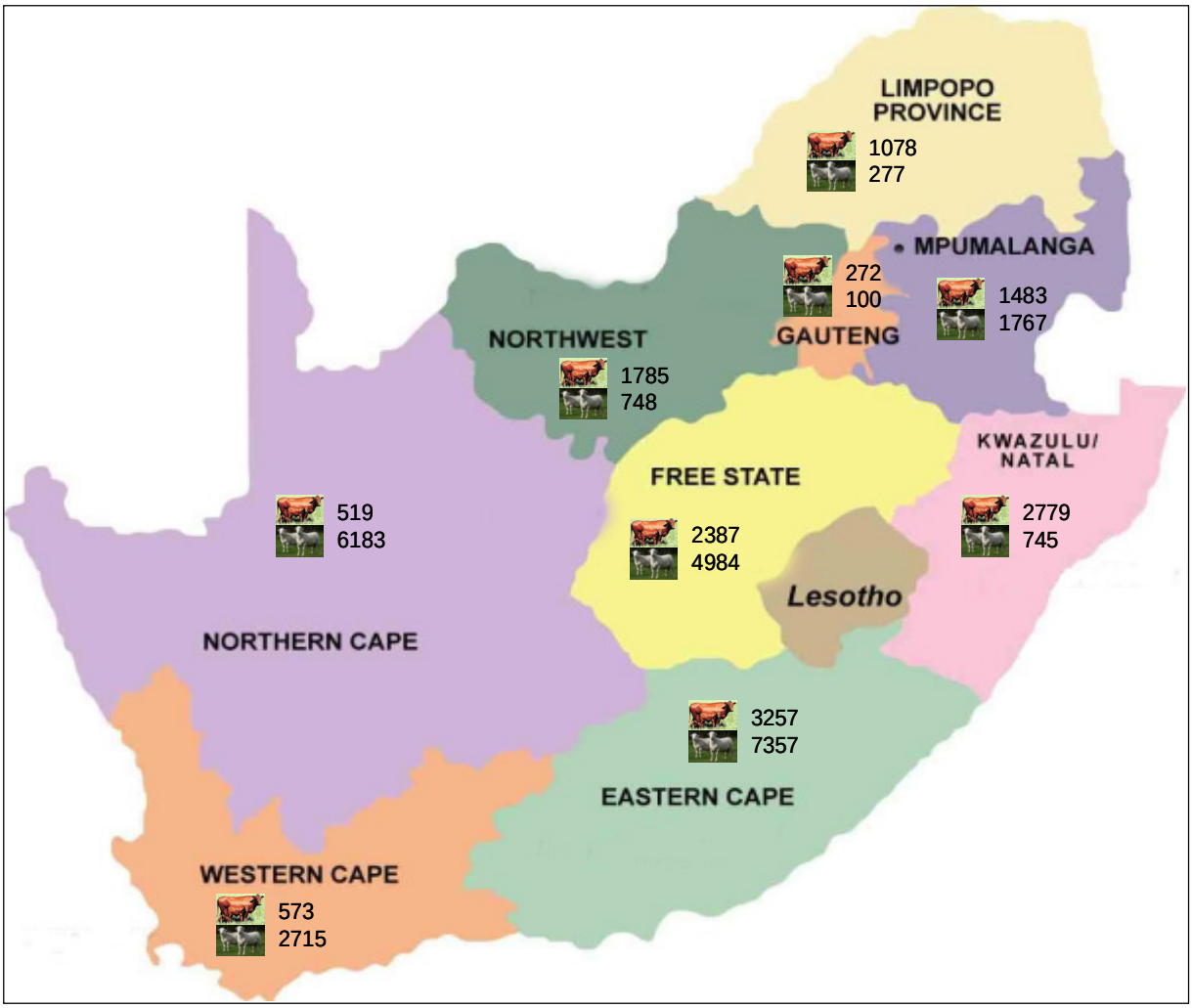

Figure 3.6: Cattle and sheep numbers per province ('000 head)
Source: NDA 2008

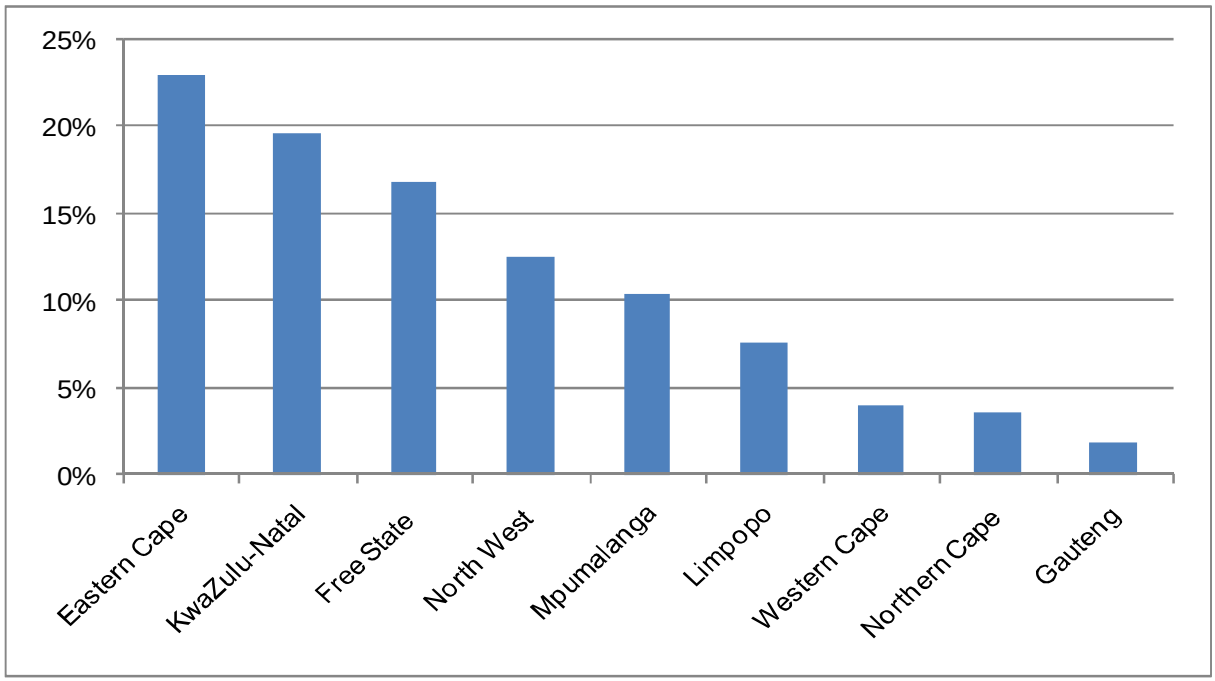

Figure 3.7: Cattle distribution per province (%)
Source: NDA 2008

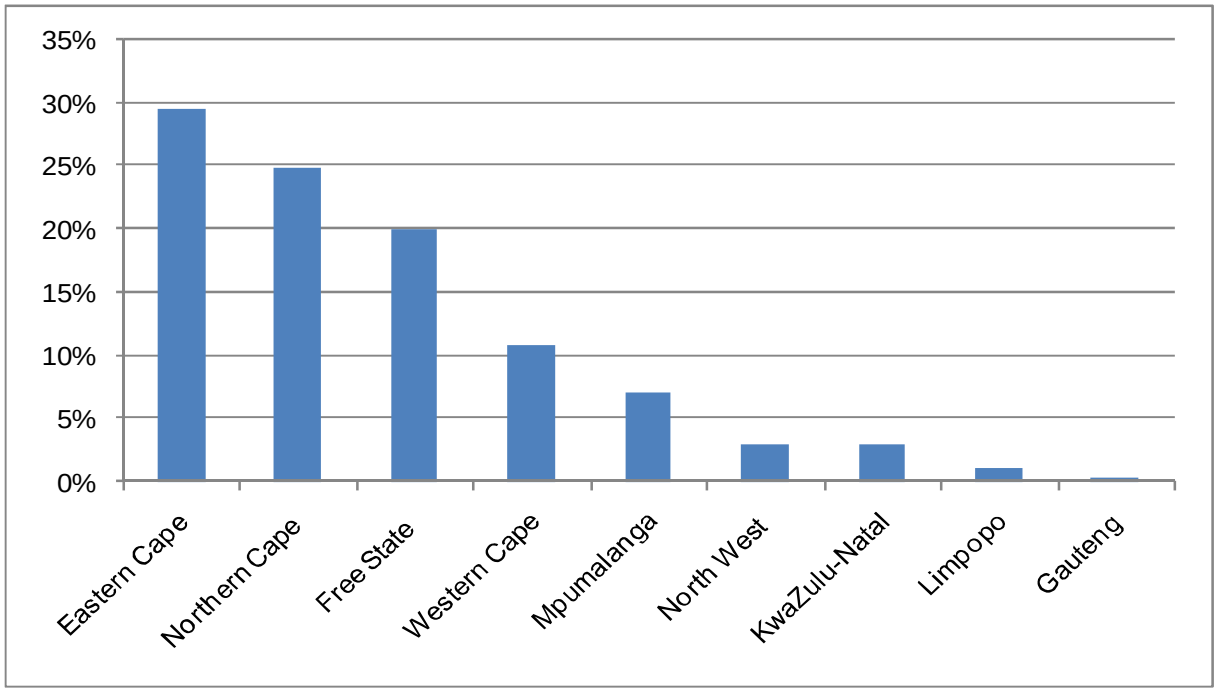

Figure 3.8: Sheep distribution per province (%)
Source: NDA 2008

3.2.3 Production and consumption trends

Figure 3.9 shows the South African (formal) beef production and consumption as well as the per capita consumption from 1970 to 2009. From Figure 3.9, it is clear that South Africa is a net importer of beef, i.e. local consumption exceeds local production (by 26,000 tonnes in 2008/2009). The total as well as the per capita beef consumption has shown a declining trend since the 1970s. The per capita of beef came under severe pressure during the 1990s. However, this decreasing trend turned around in 2000/2001 and increased until 2006/2007, followed by a slight decline towards the end of 2008. The relationship between the real per capita disposable income and the per capita consumption of beef can be seen in Figure 3.10. There is a positive correlation between the real per capita disposable income and beef consumption since 1998/99. Changing diets, urbanisation, economic growth and population growth are still driving food demand in developing countries (GIRA 2009). As the disposable income of South Africa's consumers increases in general, they move towards a more protein-based (meat and dairy products) diet, away from starch and carbohydrate-based diets. This effect can be seen in Figure 3.10, where the steep increase in the real per capita disposal income from 2000/2001 contributed to an increase in the per capita consumption of beef.

According to official statistics, the per capita consumption of beef increased by 47 %, from 12.3 kg per person per annum in 2000/2001 to 18.1 kg per person per annum in 2006/2007, and is currently estimated at 16.7 kg per capita (DAFF 2010). Cognisance must however be taken that this figure could be lower according to industry experts; more in the region of 15 kg per capita. During the same period, the real per capita disposable income increased by 24 % while the nominal per capita disposable income increased by 91 %.

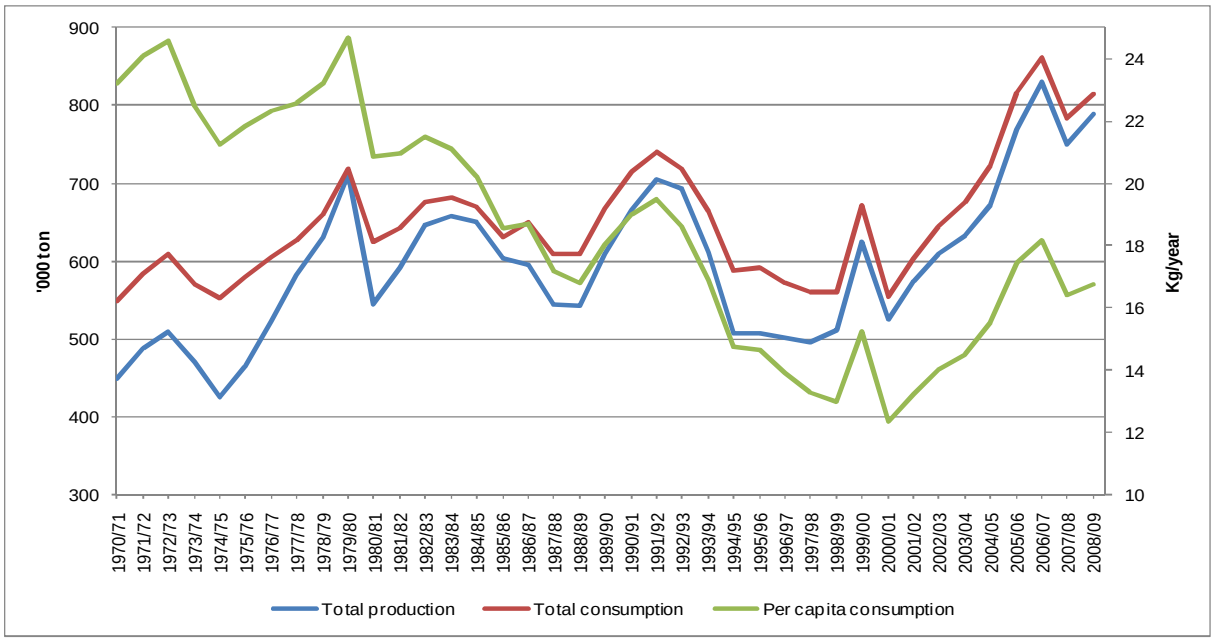

Figure 3.9: Total production, total consumption and per capita consumption of beef from 1970 to 2009

Source: DAFF 2010

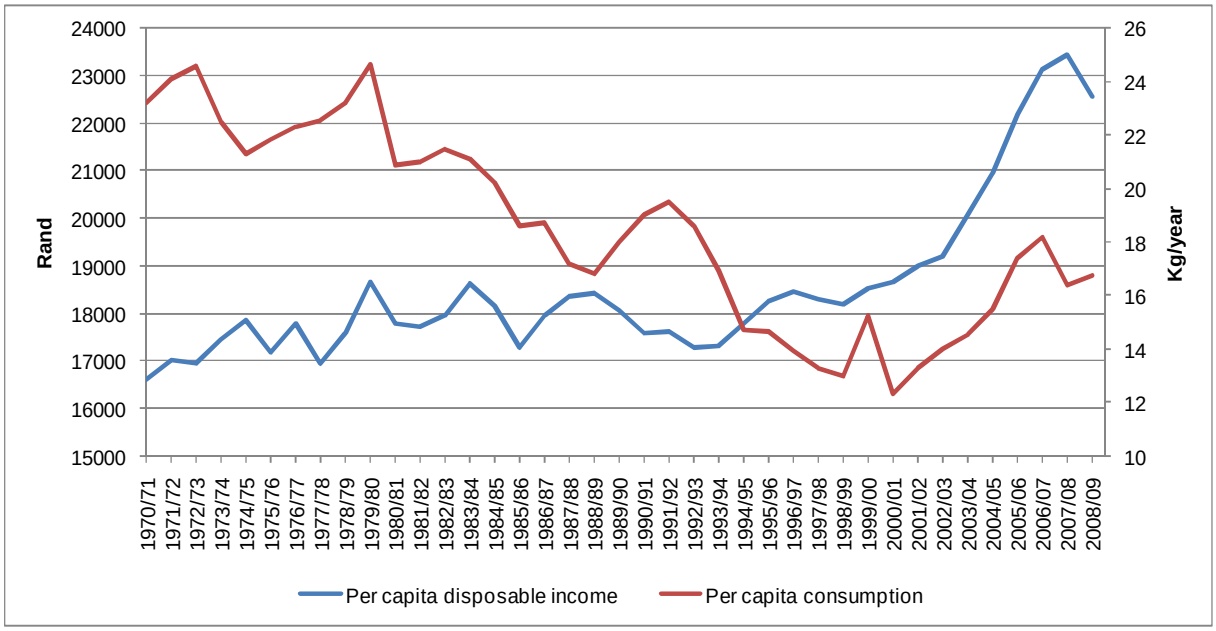

Figure 3.10: Per capita consumption of beef and real per capita disposable income from 1970 to 2009 (2005 base year)

Source: SARB 2010 and DAFF 2010

Production and consumption of sheep and goat[4] meat have been declining since the 1980s (Figure 3.11). After 1995 however, this trend changed into a slightly increasing trend. After a slight decline from 2000 to 2002, a relatively sideways trend in consumption of sheep and goat meat is evident. The per capita consumption of sheep and goat meat ranges between 3 kg and 4 kg per capita per year and is currently at 3.7 kg per capita per year (DAFF 2010).

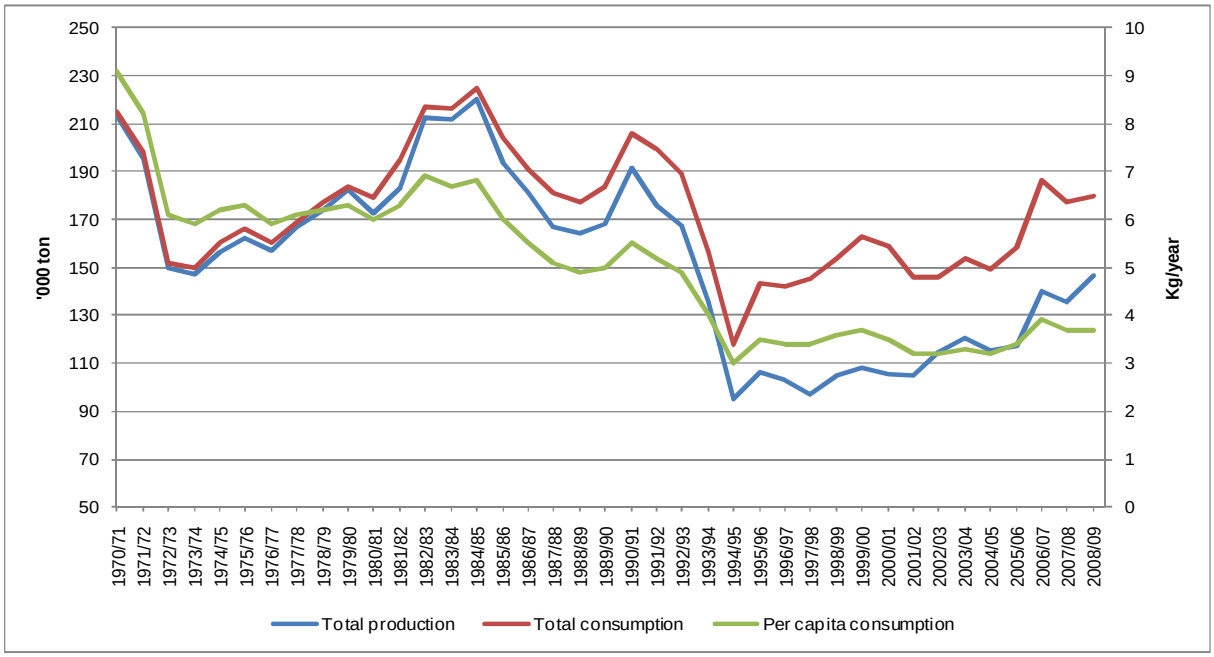

Figure 3.11: Total production, total consumption and per capita consumption of sheep and goat meat from 1970 to 2009

Source: DAFF 2010

The relationship between the real per capita disposable income and the per capita consumption of sheep can be seen in Figure 3.12. Unlike in the case of beef per capita consumption there is not a visible positive correlation between the real per capita disposable income and sheep per capita consumption since 1998/99, i.e. sheep per capita consumption did not increase due to the increase in per capita disposable income.

[4] Goats are included in the national DAFF statistics; it does not however, affect the trend in the data.

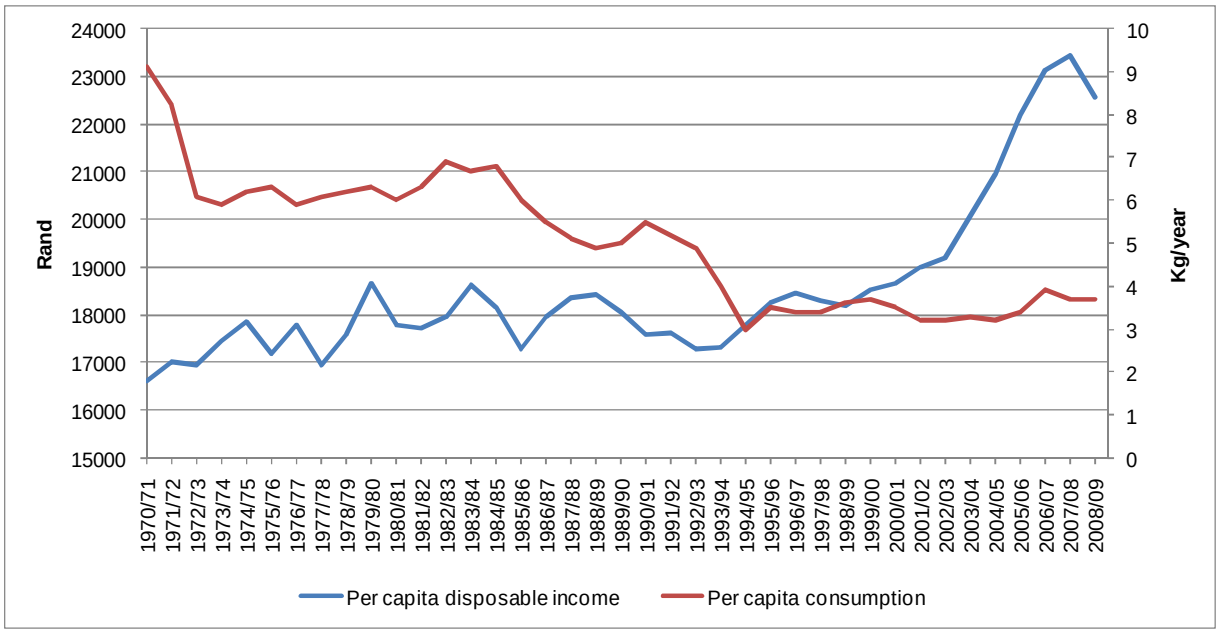

Figure 3.12: Per capita consumption of sheep and goat meat and per capita disposable income from 1970 to 2009
Source: SARB 2010 and DAFF 2010

3.2.4 Price trends

The critical importance of knowledge regarding price information as well as price trends in the red meat industry for decision-making with regard to production practices and marketing opportunities cannot be over-emphasised. Without reliable timely price information, combined with the knowledge of possible future price trends, production and marketing decisions become increasingly difficult.

Inefficient transmission of information through the value chain can lead to asymmetric price transmission, where price shocks at one end of the value chain is not transmitted timely and to the same degree to the opposite end. The way prices are transmitted in a value chain is critically important for the efficient performance of the value chain. The price transmission of the South African red meat industry is analysed in the next chapter.

Figure 3.13 shows the average nominal and real price for beef in South Africa since 1970. Despite being volatile over the short term, there is a clear increasing trend in the

real price for beef since 2000. In terms of constant purchasing power (real price), beef producers are currently receiving the same price levels as in the late 1970s as well as during the mid and late 1980s. Also notable from Figure 3.13 is a seven-year price cycle (indicated by circles) in the real price. The trend has, however, become less intense during recent years with the difference between highs and lows being smaller. In addition to this, the previous two peaks did not follow a seven-year cycle, i.e. 1995 to 2003 (eight years) and 2003 to 2007 (four years).

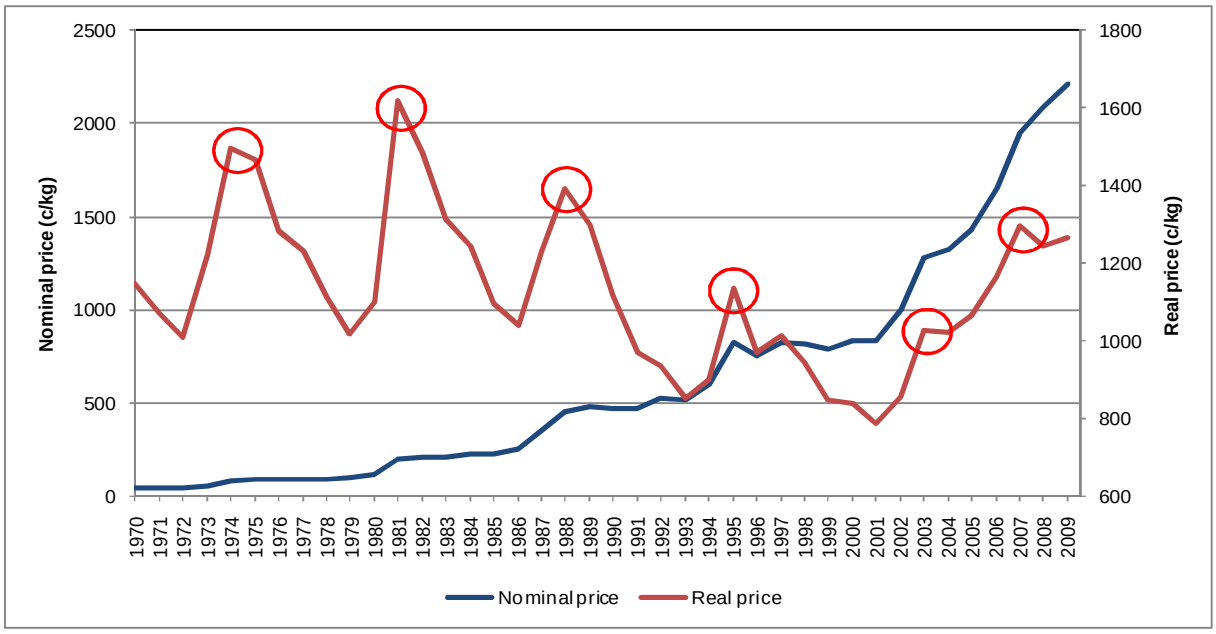

Figure 3.13: Real and nominal prices of beef from 1971 to 2009
Source: DAFF 2010

Nominal price trends for the various beef carcass classes, according to the national classification system as well as the weaner price trend can be seen in Figure 3.14. A relatively symmetrical trend between the various prices is evident from June 2001 to February 2007. After February 2007, the price gap between the different carcass prices and the weaner price increased from an average difference of 59 % between the A2/A3 carcass price and the weaner price from June 2001 to February 2007 to 70 % from February 2007 to June 2010.

The A2/A3 carcass prices had a slight increasing trend from March 2010 (R 24.73/kg) to June 2010 (R 25.49/kg), after which a decreasing trend towards August is evident

(R 23.50/kg). The A2/A3 carcass price for August 2010 is 2.75 % higher compared to the same time the previous year in nominal terms. The weaner price had a slight increasing trend from April 2010 (R 14.95/kg) to August 2010 (R 15.63/kg). The August 2010 price for weaners is 10.2 % higher than the same period in the previous year in nominal terms.

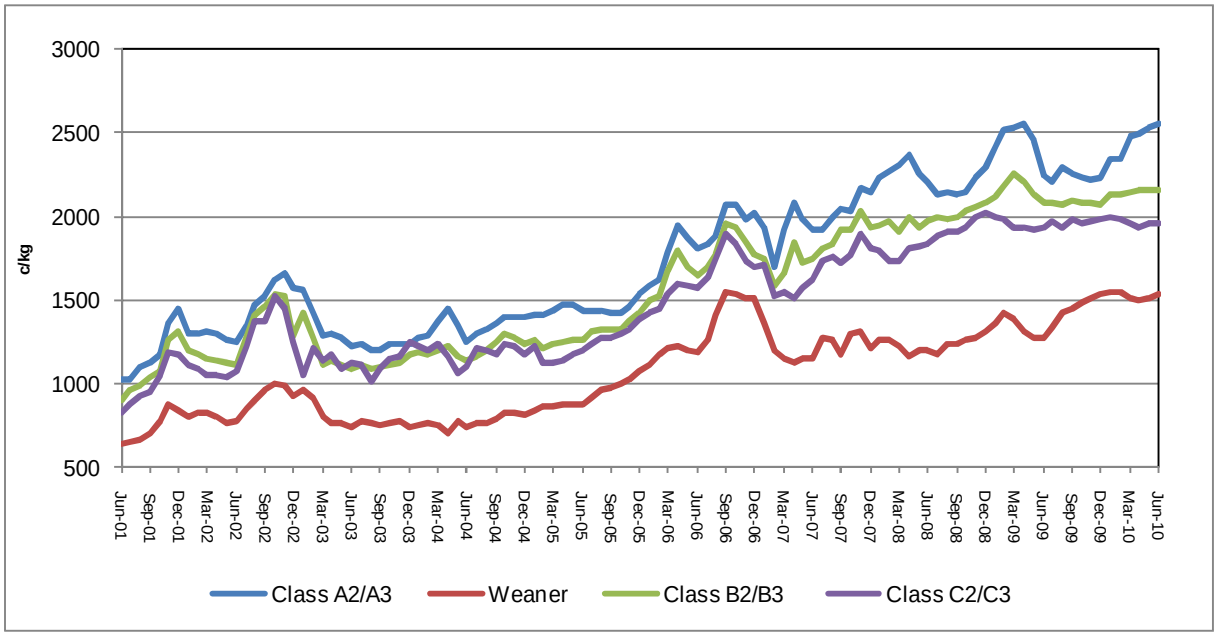

Figure 3.14: Nominal beef carcass and weaner prices from June 2001 to June 2010

Source: AMT 2010

When comparing the real prices (deflated using constant 2008 prices) of the various grades as well as the weaner price over time (Figure 3.15), a clear sideways trend is evident from early 2007. In real terms, therefore, current prices (June 2010) are at the same levels as early 2006 and 2007 prices for all classes including the weaner price.

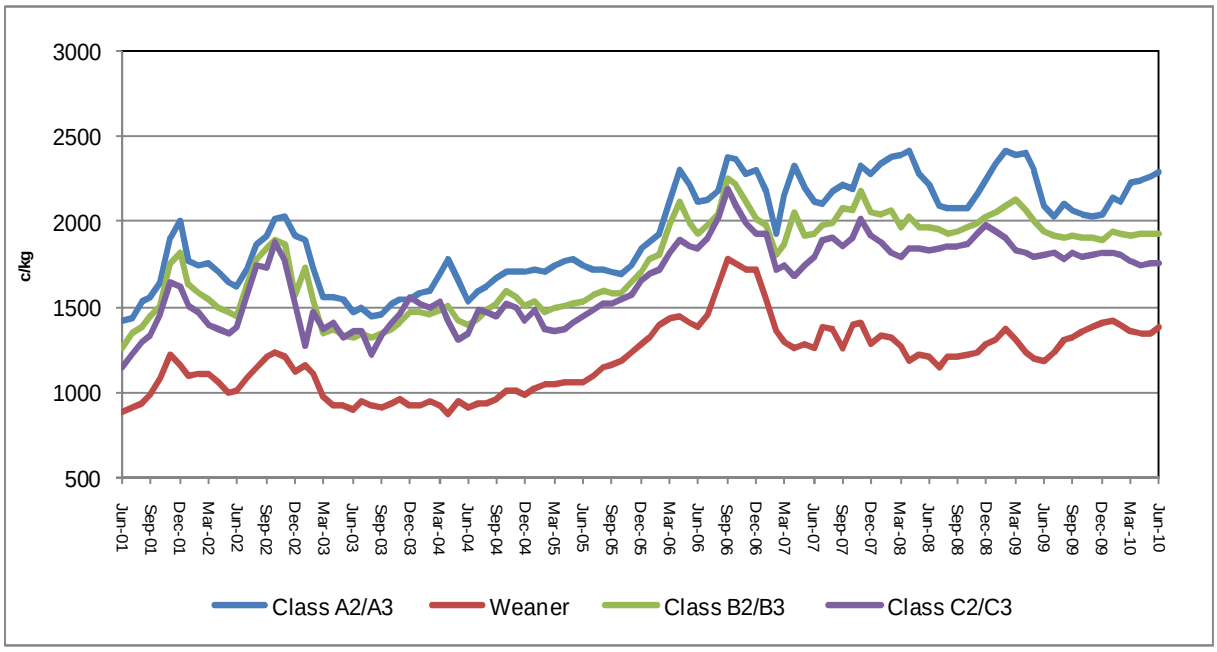

Figure 3.15: Real beef carcass and weaner prices from Jan 2002 to June 2010 (2008 base year)

Source: AMT 2010

Table 3.1 presents the annual carcass price of beef as well as the weaner price change (January 2009 to January 2010) in real and nominal terms. In nominal terms, all prices showed increases while only the A2/A3 carcass and weaner prices increased more than the general inflation in real terms.

Table 3.1: Nominal and real beef price changes (%)

Classes	Nominal	Real
	Jan 09 to Jan 10	Jan 09 to Jan 10
Class A2/A3	13.5	8.9
Class B2/B3	3.4	-0.8
Class C2/C3	1.7	-2.4
Weaner	21.0	16.1
Average	9.9	5.4

Figure 3.16 represents the average nominal and real prices for sheep from 1971 to 2009 at constant 2000 prices. Moderate increases in the nominal price up to 1999 are evident. After 1999 however, the nominal price increased more rapidly towards 2009 (206 %). This increase in the price of sheep meat is brought about by, amongst other factors, a decrease in supply. Real prices moved slightly downwards from the mid 1970s to the early 1990s (1992/1993). Due to the dramatic decline in local sheep and

goat production, real prices increased with (62 %) during the last decade from 1999 to 2009 from R 10.9/kg in 1999 to R 17.8/kg in 2009 in real terms (2000=100).

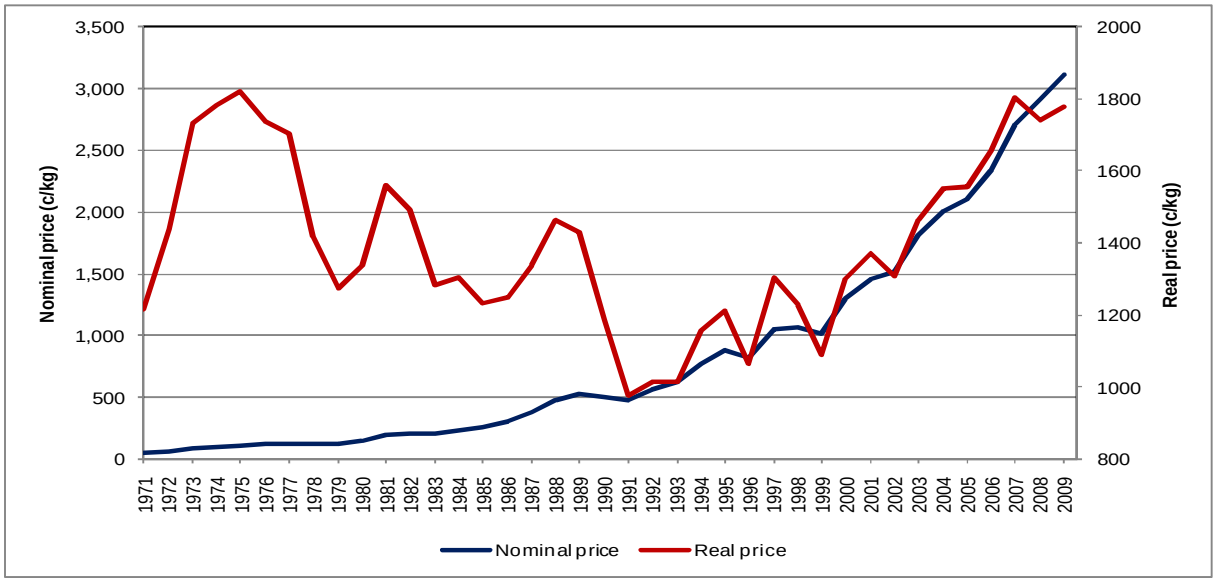

Figure 3.16: Real and nominal prices of sheep from 1971 to 2009
Source: DAFF 2010

Nominal price trends for the various mutton carcass classes are depicted in Figure 3.17. A relatively symmetrical trend between the various classes is evident from June 2001 to June 2010. The A2/A3 lamb carcass price had a slight increasing trend from March 2010 (R 35.72/kg) to August 2010 (R 40.23/kg). The A2/A3 carcass price for August 2010 is 22.6 % higher compared to the same period the previous year in nominal terms.

The C2/C3 carcass price had a slight increasing trend from March 2010 (R 25.26/kg) to August 2010 (R 31.57/kg). Comparing the 2010 trend with that of the previous years, there is a possibility that the price might decrease over the short term and adopt a sideways or slight declining trend towards the end of the year. The August 2010 price for the C2/C3 carcass price is 13.6 % higher than the same period in the previous year in nominal terms.

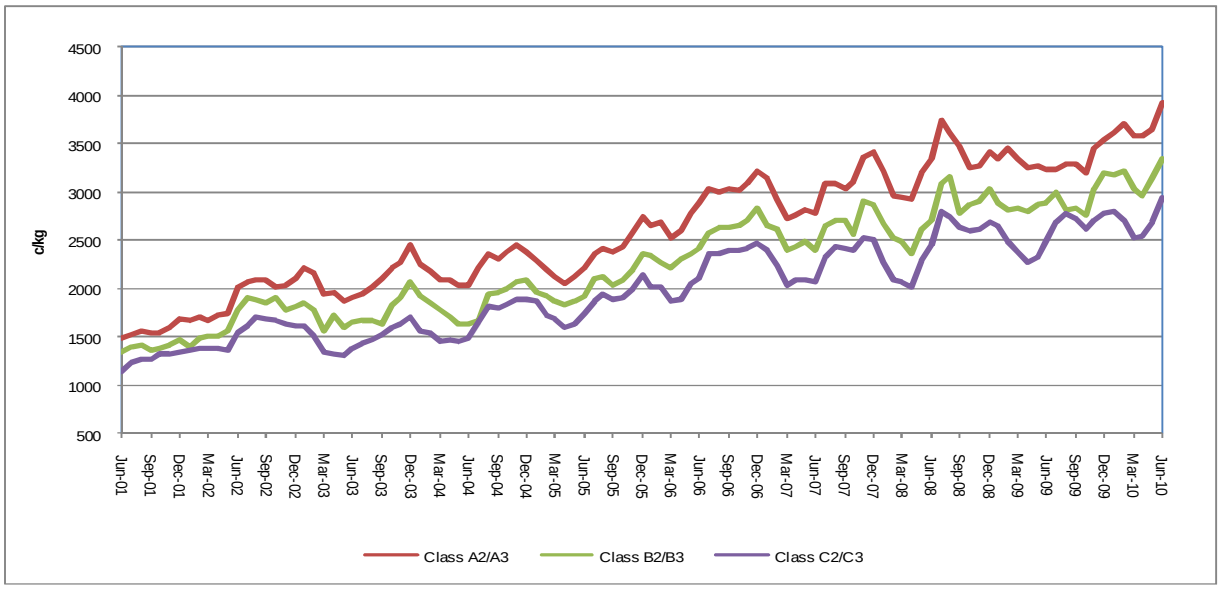

Figure 3.17: Nominal sheep and lamb prices from June 2001 to June 2010
Source: AMT 2010

When comparing the real prices (deflated using constant 2008 prices) of the various grades of sheep carcasses over time (Figure 3.18), a relative sideways trend is evident from early 2009. In real terms therefore, current prices (June 2010) are at the same levels as in mid 2006.

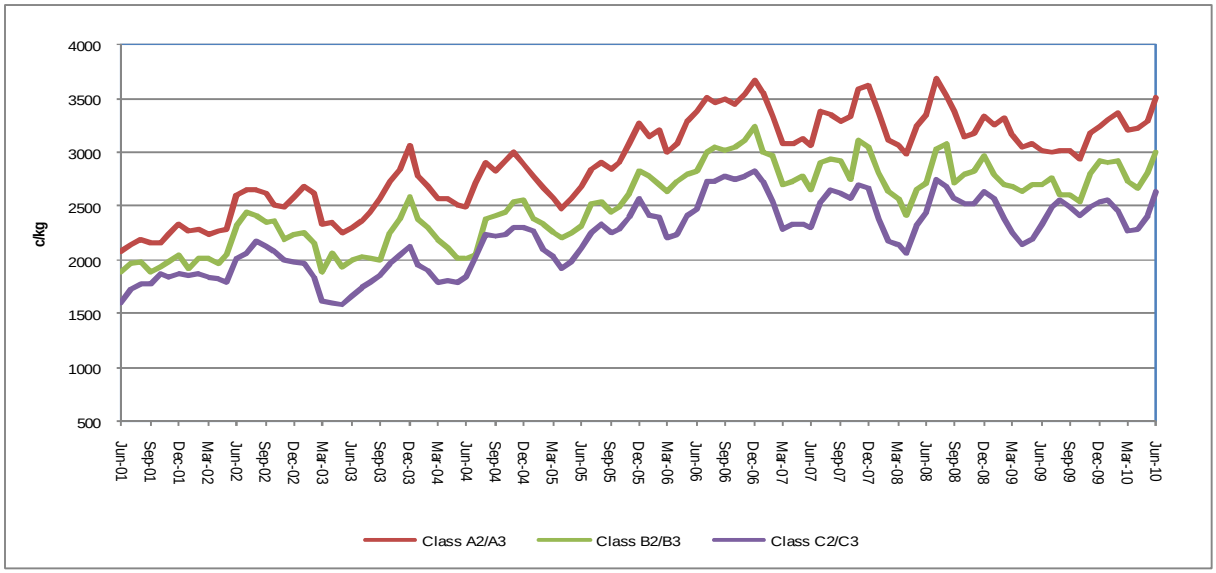

Figure 3.18: Real sheep and lamb prices from June 2001 to June 2010 (2008 = 100)
Source: AMT 2010

Table 3.2 presents the carcass price change of mutton and lamb on a year-on-year basis (January 2009 to January 2010) in real and nominal terms. Unlike in the case of beef, mutton and lamb showed increasing trends for all grades included, although the increases in real terms were smaller compared to the nominal price increases.

Table 3.2: Nominal and real sheep price changes (%)

Classes	Nominal	Real
	Jan 09 to Jan 10	Jan 09 to Jan 10
Class A2/A3	21.5	16.6
Class B2/B3	15.5	10.8
Class C2/C3	17.6	12.9
Average	18.2	13.4

3.3 The South African red meat value chain

The following section provides an overview of the South African red meat value chain in terms of producers, traders/agents, feedlots, abattoirs, wholesalers and retailers.

3.3.1 Producers

The commercial livestock sector comprises of approximately 35,000 farmers (RPO 2011), of which 2,500 are seedstock producers. The informal sector includes 240,000 emerging farmers, of which 87,000 have the ability or potential to join the commercial sector. In addition to this, there are approximately 3 million subsistence farmers (DAFF 2010).

Through discussions with different role players in the industry it became apparent that the commercial livestock production sector in South Africa is well structured, with farming units ranging from a few hectares with a small number of producing animals to large farms with thousands of producing animals. The majority of these cattle producers produce weaner calves that are ready to be marketed at around seven months of age, while the sheep producers mostly produce lamb. Breed variety for both cattle and beef is highly diversified, ranging from indigenous breeds to foreign breeds, to a wide range of crossbreeds as well as breeds specifically adapted for the conditions of South Africa. Management practices including herd management, pasture management, nutritional management, health management as well as breeding and

selection are highly specific and play a critical role in the industry's success. Adding to this is the important role that stud/seedstock farmers' play in providing improved genetic breeding material aimed at increasing production efficiency.

3.3.2 Livestock traders/agents

This sector of the South African red meat industry consists of agents, auctioneers and speculators with the governing authority the South African Federation for Livestock Agents (SAFLA). There is no fixed commission tariff for the industry and individual companies determine their own commission percentage. For auctioneers, the commission usually varies between 5 % and 8 %, depending on the range of services they provide, while for agents, mostly purchasing for feedlots, commission ranges from 1 % to 10 %, but the majority operate within the region of 4 % to 6 % (see section 5.5).

During the survey conducted in the FS province it became apparent that only a small number of commercially-produced animals are marketed through the formal auction system compared to one or two decades ago. However, weekly or monthly auctions still take place, especially in rural areas. In recent years, the formal auction system has mainly been utilised by seedstock or stud producers where high-value animals are being sold for breeding purposes (usually on an annual basis). This is referred to as production sales. Auction type sales are also utilised in the case of sell outs, where a producer will typically stop farming activities. Thus, in terms of the value chain, especially in the case of commercial producers, the use of the auctioning system as a marketing tool has been decreasing over time.

In South Africa, the majority of animals, specifically in the case of beef, are marketed through the feedlot industry (SAFA 2010). Therefore, feedlot owners will typically employ or make use of market agents for product (in this case, weaner calves) procurement. These agents are provided with a base price on a weekly basis, based on current market conditions as well as other criteria specified by individual feedlots such as breed, weight, sex etc. for procurement. In most cases, no or very few contractual agreements take place between producers and feedlots in terms of the procurement

process. This issue represents a challenge in the industry since firm contractual relations should bring about greater stability in the chain and lower volatility.

In addition to auctioneers and agents, there are also a number of speculators in the South African red meat industry. Speculators in most cases own land and will typically procure animals at a low price (compared to prevailing market prices) from various sources, not excluding rural and or emerging and communal producers, and transform these animals into market-ready animals.

3.3.3 Feedlots

The feedlot industry is of grave importance, given the prevalent weaner production system in South Africa. Approximately 70 % to 80 % of all cattle in South Africa is marketed through the feedlot sector (see Olivier, 2004; and Shongwe, 2005). According to Ford (2009) there are approximately 450,000 animals on feed at full capacity, i.e. South Africa has a one-time standing capacity of 450,000 animals; this implies, given an average feeding period of approximately 113 days per animal that the feedlot industry deliver in the region of 1.5 million animals annually. South African feedlots differ in size from a small number of animals to more than 110,000 animals and consist of three different categories, namely farmer feeders, seasonal feeders and commercial feeders.

Factors affecting feedlot profitability can be classified as either economic or management factors. Economic factors relate to factors that cannot be controlled by feedlots and include, amongst others, purchase and sale prices as well as feed prices (usually a function of maize prices). Unlike economic factors feeders can, to a great extent, control management factors that have an effect on average daily gain (ADG) as well as efficiency, which largely depend on the type of animal (and weight) entered into the feedlot in terms of breed (genetics), nutritional background (conditioning) of the animal, nutritional management and the overall health condition of the animal. Economic and management factors should be integrated to make decisions that will enhance the profit potential of a feedlot (AMT 2009).

According to the South African Feedlot Association (2009), the feedlot industry operates according to a specific code of conduct that address issues related to feedlot construction; area/size of pens; certain feedlot management practices; worker identification; handling; feed bunk and water supply; health; emergency slaughter; and emergency precautions. The code of conduct seeks to ensure standards and the use of good animal husbandry practices in all types of feedlots, which can be read with the Code of Practice for the Handling and Transport of Livestock, the five rights of animals, and comply with the Animals Protection Act, 1962 (Act No. 71 of 1962) as amended. Cattle feedlot owners became acutely aware during 2005 of their environmental responsibilities and the heavy fines associated with transgressions. This was brought about mainly by new environmental legislation. In particular, the National Environmental Amendment Management Act (Act No. 8 of 2004) compelled developers, which include feedlot owners, to declare those listed activities that required an impact assessment, but this had been ignored.

The livestock code for feedlots entails the five rights of animals. These rights are included to ensure the establishment of a humane environment for the handling and production of cattle in intensive feeding systems (SAFA 2009). These rights include:

- The right of freedom of movement;
- the right to free access to fresh feed and water at all times;
- the right to appropriate health care;
- the right to freedom from injury and suffering; and
- the right to freedom from harassment.

Feedlots usually, depending on supply, purchase weaner calves ranging from 160 to 250 kg and feed them, depending on ADG and Feed Conversion Ratios (FCRs) for approximately 120 days to an end live weight of 400 - 450 kg.

3.3.3.1 Benchmarking ranges

Table 3.3 shows the benchmarking ranges for different variables that will have an impact on the profitability of feedlots and can be defined as follows (AMT 2009):

- Dressing percentage refers to the ratio between the weight of the carcass and the weight of the live animal slaughtered. The dressing percentage can be influenced by a number of factors including; the relative size of the animal, the genetic quality of the animal (dressing percentage varies between breeds), the percentage fat and bone in a carcass (direct related to breed and feeding rations and methods), feed quality and whether stimulants and or growth rations is used.
- Average Daily Gain (ADG) refers to the daily live weight gained during the feeding period. The ADG are influenced by; the quality of the feed ration, the quality of the animal on feed. (Feed Conversion Ratios FCR's or the amount of feed needed to add a kg of live weight vary depending on the quality of the animal as well as between breeds), weather conditions (ADG declines in colder, wet weather) and stress levels in the feedlot.
- Growth hormones and stimulants are used in many cases to increase the growth of the animal
- Mortality refers to the percentage of animal deaths.
- Morbidity refers to the percentage of sick animals in the feedlot.
- Feeding days refers to the number of days the animal remain on feed to achieve the desired end or slaughter weight.

Table 3.3: Benchmarking ranges

Item	**Range**	
Dressing Percentage	52 %	62 %
ADG	1.3 kg/day	2 kg/day
Growth hormones and stimulants (percentage growth improvement)	8 %	10 %
Mortality	1 %	5 %
Morbidity	1 %	5 %
Feeding days	90 days	130 days

Source: AMT 2009

3.3.3.2 Critical success factors

A common characteristic of the feedlot industry is negative buying/price margins and positive feeding margins. The concept of a negative buying/price margin can be explained by the following example (see Table 3.4: 2010). Suppose a feedlot

purchases a weaner of 220 kg at a price of R 15.08 per kg. If a dressing percentage[5] of 57 % is assumed, it would mean that the feedlot is actually paying R 26.46 per kilogram carcass, whilst the market price per kilogram carcass (A2/A3) at this stage ranges between R 23 and R 24. Hence, a negative buying/price margin.

Table 3.4 further illustrates the sensitivity of the total margin in a feedlot due to the variability in the input prices. For this comparison, it is assumed that the feedlot will purchase the weaner calf in May at a starting weight of 220 kg. The calf is then on feed for approximately 120 days with an ADG of 1.6 kg/day, after which it will be slaughtered in late August at an end live weight of 400 kg, yielding a carcass of 228 kg given a 57 % dressing percentage.

By comparing the above scenario for 2007, 2008, 2009 and 2010, it is evident that the relatively high yellow maize[6] price in 2007 and 2008 led to high negative feeding margins, while the low yellow maize price during 2009 and 2010 led to high feed margins that resulted in profits of R 721 and R 553 per head respectively.

Table 3.4: Margins factors

Item	2007	2008	2009	2010
AGD (kg/day)	1.6	1.6	1.6	1.6
Weaner price (May)	R 11.56	R 12.03	R 12.76	R 15.08
A2/A3 meat price (Aug)	R 19.99	R 21.39	R 22.88	R 23.50
A2/A3:weaner calf price ratio	0.58	0.56	0.56	0.64
Yellow maize price (May-Aug)	R 1,737	R 1,936	R 1,381	R 1,174
Feed margin	R -1	R -69	R 658	R 923
Price margin	R -36	R 36	R 62	R -371
Total margin (profit/head)	R -38	R -33	R 721	R 553

To ensure good feedlot performance, feeds with high a proportion of energy is required. In most cases, this requirement is provided in the form of maize, hominy chop or one of the other grains. The cost of the feeding ration in relation to the beef price has a significant impact on the profitability of the feedlot. The beef-to-grain price ratio can be

[5] This percentage refers to the weight of the carcass after the animal has been slaughtered, i.e. an animal with a weight of 400 kg will have a carcass weight of 228 kilogram.
[6] The yellow maize price was used as a benchmark for feed cost.

used as a barometer for the financial viability of the feeding process. In order to be profitable, this ratio should be higher than 1:13 (DAEA 2005). In other words, one kilogram of beef (carcass value) should be able to purchase at least (or) a minimum of 13 kilograms of maize. If this ratio is lower than 1:13, it indicates that feedlots may experience profitability problems. This also relates to the feed procurement strategies followed by feedlots in order to ensure that they have good quality feed available at affordable prices throughout the year. Figure 3.19 shows the A2/A3 carcass price to yellow maize price ratio trend as well as the norm from June 2001 to August 2010. From this it is evident that the industry has been operating above the 1:13 norm since the end of 2008. It is, however, important to note that although the yellow maize price has been used as a proxy, the South African feedlot industry mainly uses grain by-products such as hominy chop, bran, etc.

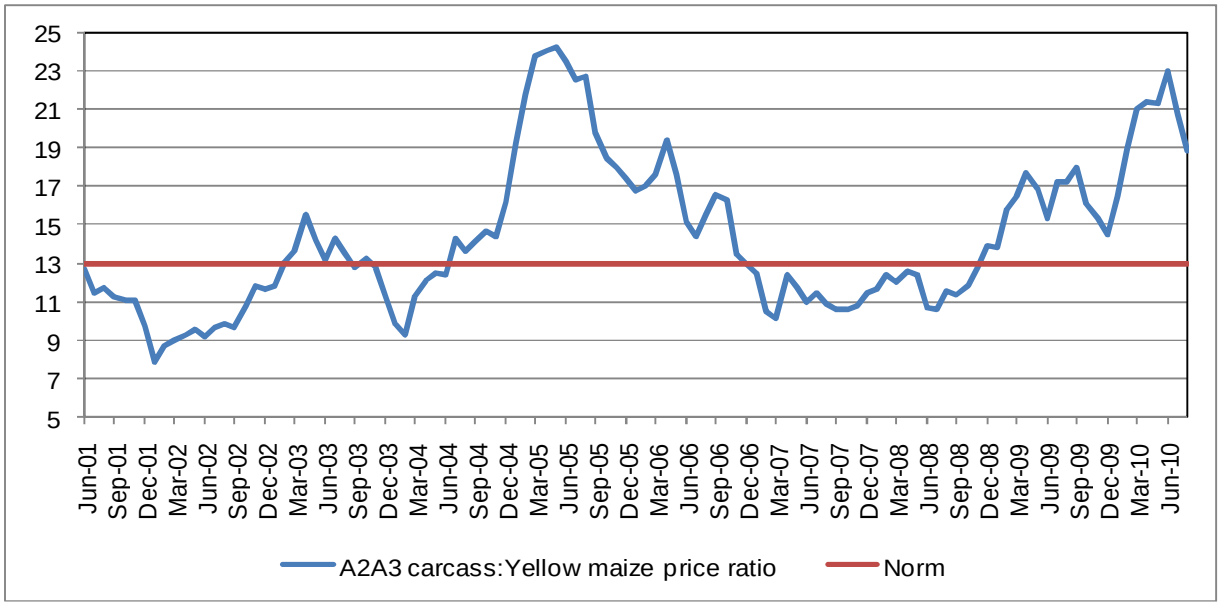

Figure 3.19: A2/A3 Beef carcass to yellow maize price ratio prices from June 2001 to August 2010.

Source: AMT, Grain SA 2010 and own calculations

Figure 3.20 shows the relationship or price ratio between the weaner and the A2/A3 carcass price and can be defined in Equation 1.

$$r = p^1 / p^2 \quad (1)$$

Where:

- r is the weaner:A2/A3 price ratio;
- p^1 is the weaner price; and
- p^2 is the A2/A3 carcass price.

This ratio is one of the most important aspects when considering the profitability of the feedlot industry. The smaller the ratio, the higher the price margin and *vice versa.* In Figure 3.20, the ratio varied between a minimum of 0.49 in April 2008 and a maximum of 0.76 in November 2006. The ratio has a mean of 0.62 for the period January 2002 to December 2009.

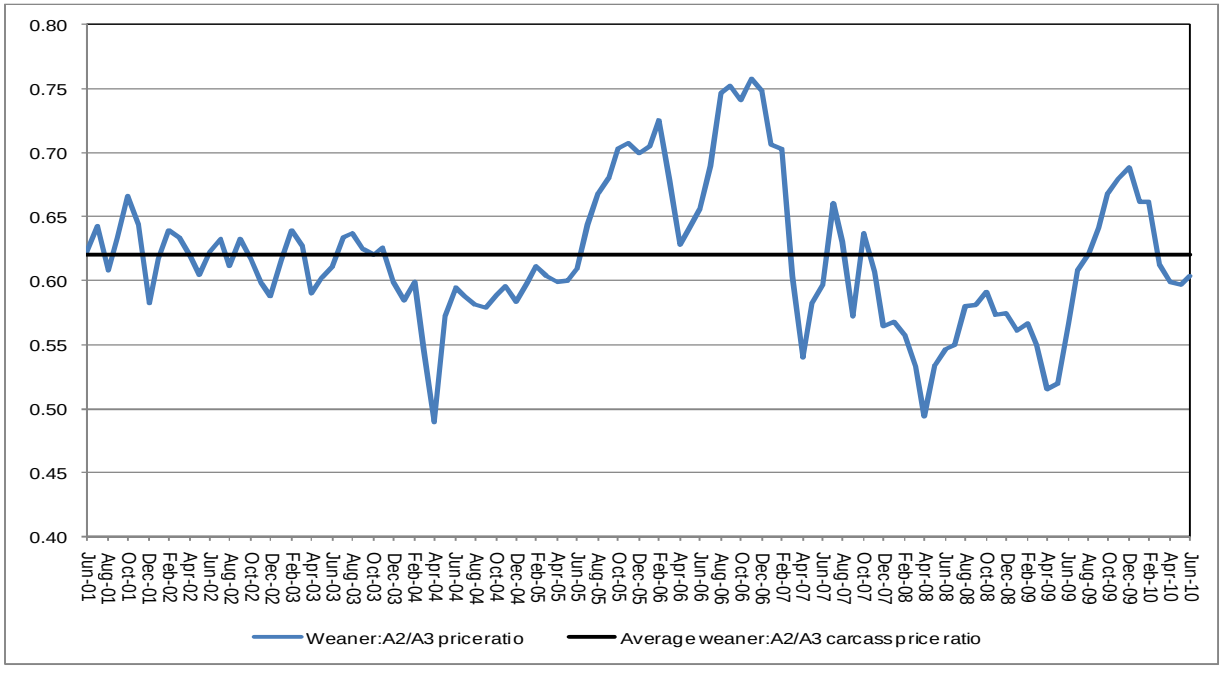

Figure 3.20: Weaner/A2A3 carcass price ratio from June 2001 to June 2010
Source: AMT 2010 and own calculations

3.3.3.3 Size, numbers and distribution of major feedlots

As previously mentioned, feedlots in South Africa differ in size, from feedlots with a small standing capacity to feedlots with standing capacities from 40 000 animals to over 110 000 animals (see Table 3.5). Figure 3.21 shows the geographical location of feedlots exceeding a 10 000 head capacity, indicating that the larger feedlots are situated close to the big cities (Johannesburg, Witwatersrand and Pretoria).

Table 3.5: Feedlot location and capacity

Feedlot	Location	Capacity	% of total*
Karan Beef	Heidelberg	120000	26.67
Bull Brand/Kolosus	Potchefstroom, Magaliesberg	40000	8.89
EAC Group	Sasolburg, Harrismith, Bethlehem	40000	8.89
Sparta beef	Marquard	40000	8.89
Beefcor	Bronkhorstspruit	25000	5.56
SIS	Bethal	22000	4.89
Beefmaster	Christiana	20000	4.44
Chalmar	Wingate	15000	3.33
Manjoh Ranch	Nigel	10000	2.22
Fortress Bonsmara	Frankfort	6000	1.33
Braams Voerkrale BK	Durbanville	4000	0.89
Vergezight Feedlot	Heilbron	3000	0.67
Liebenbergstroom Voerkraal Bpk.	Edenville	2000	0.44

*Note: Percentage of total was calculated given a total standing capacity of 450 000 animals.

Source: SAFA 2010

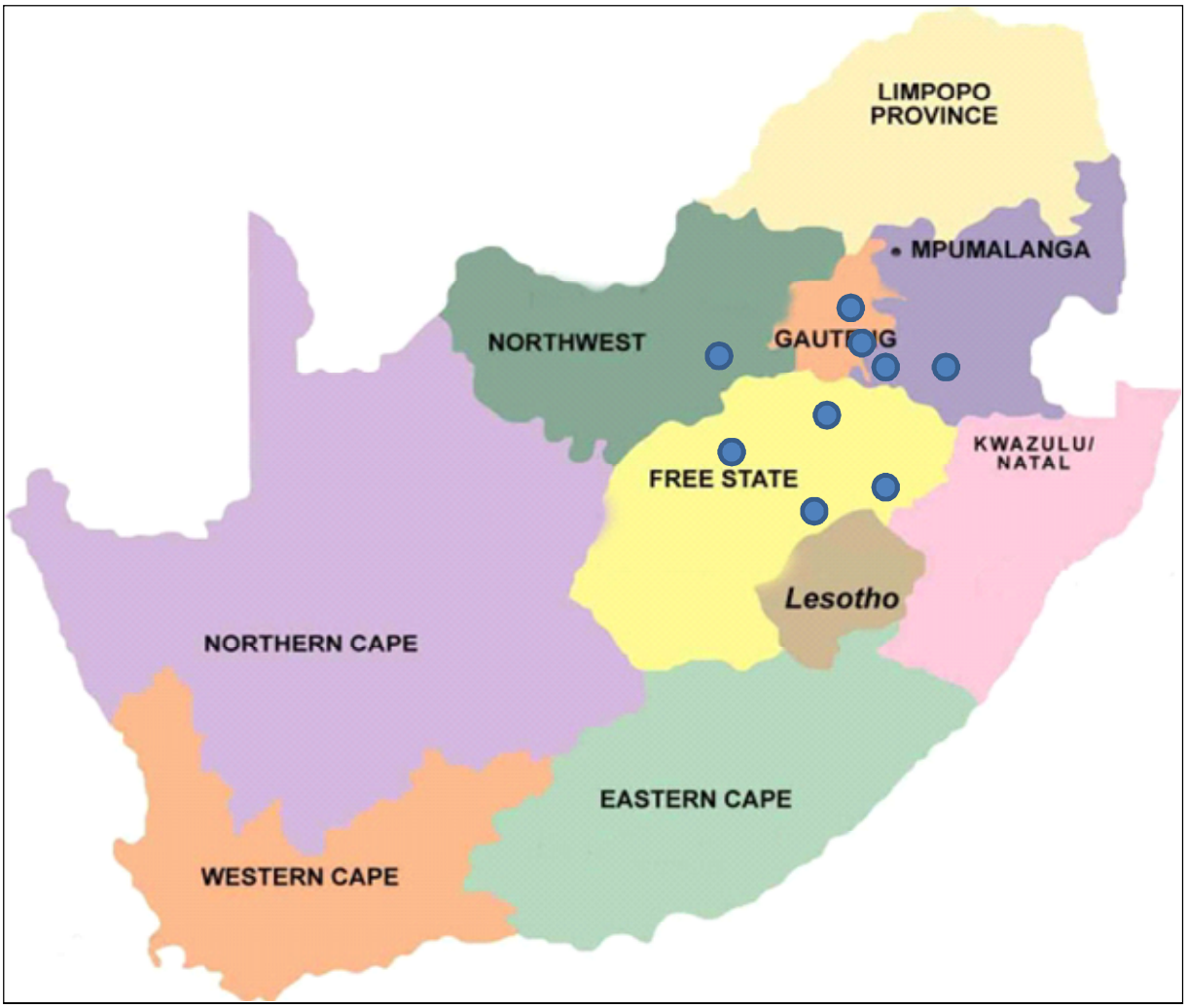

Figure 3.21: Feedlot distribution >10 000 head capacity
Source: SAFA 2010

3.3.4 Abattoirs

The abattoir sector is an important link in the South African red meat value chain, responsible for converting live animals into meat. According to The Butcher (2009) the abattoir sector has been marked with sudden and dramatic changes in regulatory practices due to changes in policies during the past few decades. Prior to the 1990s, anybody who wanted to erect an abattoir had to apply for permission to the Abattoir Commission. This commission was created under the Abattoir Industry Act of the late 1960s after it was determined that the level of hygiene in South African abattoirs was not up to standard. This finding lead to the expansion of the state-owned Abakor

Company, which began to acquire those abattoirs that failed to meet the government imposed standards, usually because they were unable to afford the costs of required upgrades. According to the Agricultural Marketing Act (1968), producers were only allowed to market their livestock in one of the 11 metropolitan areas around the Abakor abattoirs. Evidently, 80 % of the livestock in South Africa was slaughtered in one of the Abakor abattoirs (The Butcher 2010).

During 1992, the Abattoir Industry Act was repealed and the Abattoir Commission was disbanded. The Marketing Scheme, which formed part of the Marketing Act, was also repealed, allowing farmers to market their livestock according to market conditions. Abakor lost its legal and monopolistic status and was no longer under government control, with the expectation that it should become economically self-sufficient, at the same time meat inspection was also privatised. In 1996, the Marketing Act itself was repealed, which ended the era of the marketing boards. These changes created a positive environment for small abattoirs to operate once again. The Meat Safety Act (2000) effectively eliminated or replaced the earlier Abattoir Hygiene Act 121 (1992). The Meat Safety Act is not only directed towards ensuring a safe supply of meat to the domestic market, but also ensures that international standards are met for the export market (The Butcher 2010).

3.3.4.1 Size, numbers and distribution

After the deregulation of the Meat Board in the mid 1990s, a number of smaller abattoirs opened their doors, especially in the rural areas. There are approximately 488 abattoirs in total in South Africa ranging in slaughtering capacity from as little as 2 to 3 units a day to more than 1,500 units a day (RMAA 2009). Most of the larger abattoirs are owned by the feedlot industry, thus backwards vertical integration.

Figure 3.22 shows the abattoir numbers as well as their distribution throughout South Africa. Abattoirs in South Africa can either be classified as high throughput abattoirs (21 to 100 units/day) or low throughput abattoirs (1 to 20 units/day) where one unit equals 1 cattle, 6 sheep, 5 pigs, 4 ostriches or 2 horses. From Figure 3.22, it is clear that in terms of high throughput abattoirs, the Gauteng, Free State and the Western Cape are

the most important with 22, 20 and 17 high throughput abattoirs respectively. In terms of low throughput abattoir, the Eastern Cape and the Free State provinces are the most important, with 73 and 61 abattoirs respectively (RMAA 2009).

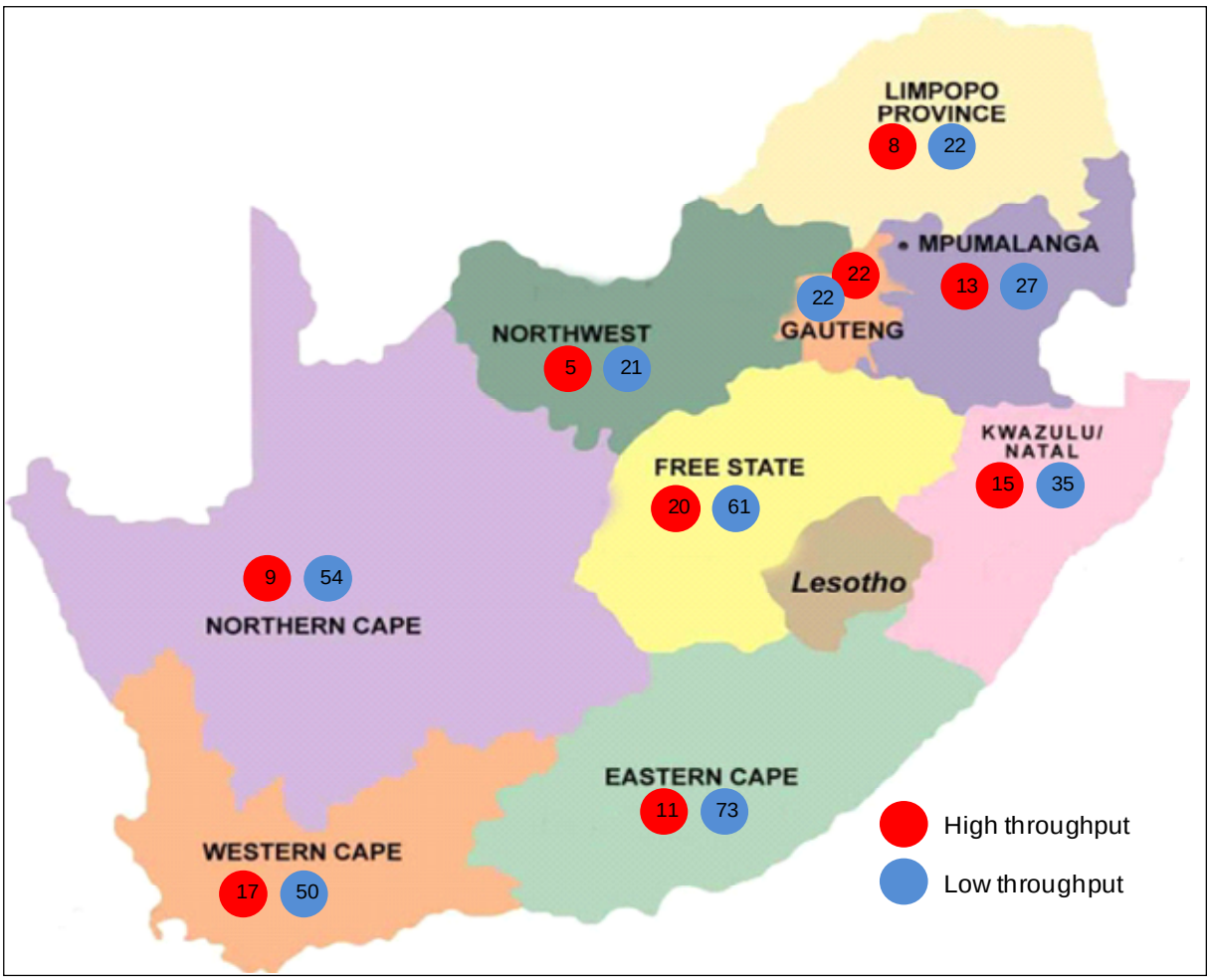

Figure 3.22: Abattoir distribution per province and classification
Source: RMAA 2009

3.3.4.2 Price formation

According to Agri-Market Trends (AMT) (2009) abattoirs purchase animals, either from feedlots or directly from producers at a live weight of approximately 400 kg to 450 kg in order to yield a carcass weight of, in most cases, not exceeding 250 kg in the case of beef (52-58+ dressing percentage). Farmers/feedlot payments are based on cold carcass weight. This implies that the supplier to the abattoir is responsible for the 2 % to 5 % carcass weight loss due to the chilling process. This weight loss depends on,

amongst other factors, the type of animal slaughtered and carcass fat content. The price paid to the supplier/producer also excludes the fifth quarter which includes the hide/skin and the offal. The latter is where the profit in the abattoir industry lies and is also seen as the "slaughtering fee" the farmer has to pay to the abattoir.

The South African Carcass Classification System finds its first application in terms of price formation at abattoir level. Suppliers of live animals are remunerated according to carcass classification, which are based on two main components, namely age and carcass fat content. The carcass classification system is described in Table 3.6. According to the South African Meat Industry Company (SAMIC) (2009) carcasses can be classified into four different classes according to age, which is determined by the number of permanent incisors. In addition to age, carcasses are also classed according to the subcutaneous fat content on a scale from 0 to 6, with 0 having no fat and 6 having lots of fat; the optimum fat content level is between 2 and 3. The thickness of the fat layer is measured between the tenth and eleventh rib, 50 mm from the midline of the carcass in the case of beef and between the third and forth lumbar vertebrae, 25 mm from the midline of the carcass in the case of sheep. Producers are penalised in terms of price based on the age of the animal as well as the fat content (older than A grade and for a fat content below 2 and above 3).

Table 3.6: South African Carcass Classification System

Trait	**Beef/sheep/mutton**						
Age	A		AB		B	C	
Permanent incisors (#)	0		1-2		3-6	>6	
Roller mark	AAA		ABAB		BBB	CCC	
Colour	Purple		Green		Brown	Red	
Tenderness	Most tender		Tender		Less tender	Least tender	
Fat grade	0	1	2	3	4	5	6
Beef (fat thickness mm)	0	<1	>1<3	>3<5	>5<7	>7<10	>10
Sheep (fat thickness mm)	0	<1	>1<4	>4<7	>7<9	>9<11	>11

Source: SAMIC 2008

The long-term variation from the A2/A3 carcass price from June 2001 to August 2010 for beef and mutton/lamb can be seen in Table 3.7. It should, however, be noted that these price differences between classes vary considerably during the year due to supply

and demand factors (see Figures 3.14 and 3.17). From Table 3.7, it is evident that the variation in the national mutton/lamb prices is larger than that of beef with a 16 % price decrease from A2/A3 to B2/B3 and a 31 % price decrease from A2/A3 to C2/C3, in the case of beef, these price decreases were 11 % and 17 % respectively.

Table 3.7: National carcass price variation from the A2/A3 carcass price (%)

	Price decrease from A2/A3 class	
Classes	**Beef**	**Mutton/lamb**
B2/B3	10.66	16.24
C2/C3	17.38	31.49
Weaner calf/lamb	62.91	76.39

Source: AMT 2010

The following aspects became apparent through interviews with the four main retailer groups; when considering carcass weight (in the case of beef), there are a number of important factors to keep in mind; usually, downstream segments in the value chain (wholesalers and retailers) prefer a carcass not exceeding 250 kg. This preference in carcass weight is due to a number of reasons, which include the handling of the carcass. Some cuts, especially the T-bone cut become unfavourable in terms of their suitability for packaging as well as for consumer preferences (a too big carcass yields a long T-bone, i.e. a 300 g cut will be large and thin opposed to short and thick). For carcass deboning purposes, however, a carcass of between 300 kg to 320 kg is still profitable and in many cases, yields better profits than the lighter carcasses.

3.3.5 Retailers

Four retailers (grocery chain groups) were interviewed with the primary focus on procurement of carcasses/primary cuts, carcass characteristics (grades, quality, fat etc.), price formation, value-adding practices, and distribution patterns.

One of the retailers uses a contracted co-packer that is responsible for the procurement, processing, value adding, packaging and the distribution of 75 % of its meat products. All its final (value-added) products are distributed from this centralised distribution centre, located in Gauteng, to the various stores countrywide.

A number of similarities were found between the other three retailers in terms of procurement, distribution as well as value-adding activities and price formulation. Procurement of whole carcasses takes place on a regional level from certified local abattoirs and wholesalers (deboning and packaging facilities) in their different regions. These retailers make use of in-store butcheries that do most of the processing, whereas the value-added range is processed and packed at a centralised facility by either the group itself, or by a contracted co-packer. The procurement of primary (wholesale) cuts instead of whole carcasses is also becoming more popular amongst these retailers. For example, where some retailers used to procure 80 % of their meat in the form of whole carcasses and 20 % in primary cuts five to eight years ago, more recent indications are that only 50 % of meat sales are procured in carcass or side form, 30 % in primary cuts, and 20 % in value-added products such as matured steak cuts, marinated cuts, skewers etc. This tendency is mainly attributed to changes in consumer preferences and also more efficiency and specialisation in the cold chain.

3.3.5.1 Price formation

Block tests are used to calculate a factor or index for a specific meat cut, for example rump. The carcass is physically dissected to determine the yields of the various cuts the carcass consists of in percentage terms. From this, a factor is then calculated to determine the price of a specific cut given the purchase price. The factor is calculated for a break-even price for the carcass and at this point does not include a profit margin. This is, however, only a general estimate, as carcasses will vary in terms of yield for a number of reasons. A more detailed explanation is available in section 5.6.4.1.

3.4 Quantification of the red meat value chain

The South African beef value chain is quantified in Figure 4.23. The commercial sector consists of approximately 35,000 large commercial producers with 2,500 seedstock beef farmers with 8.2 million and 0.5 million animals respectively. The emerging sector on the other hand consists of 240,000 emerging farmers, 87,000 of these farmers have the potential to commercialise, and 3 million subsistence farmers. The total herd size in

this sector is estimated at approximately 5.69 million head. The feedlot industry contributes 65 % to 70 % to total national slaughterings which supply the 488 abattoirs.

Vertical integration is not uncommon in the red meat industry, especially between the abattoir and feedlot sectors. Most of the big feedlots own their own abattoirs or are at least to some extent involved in the abattoir sector. In addition to this, some abattoirs are also integrated vertically downstream in the value chain to wholesale (deboning) level and, in some cases, up to retail level.

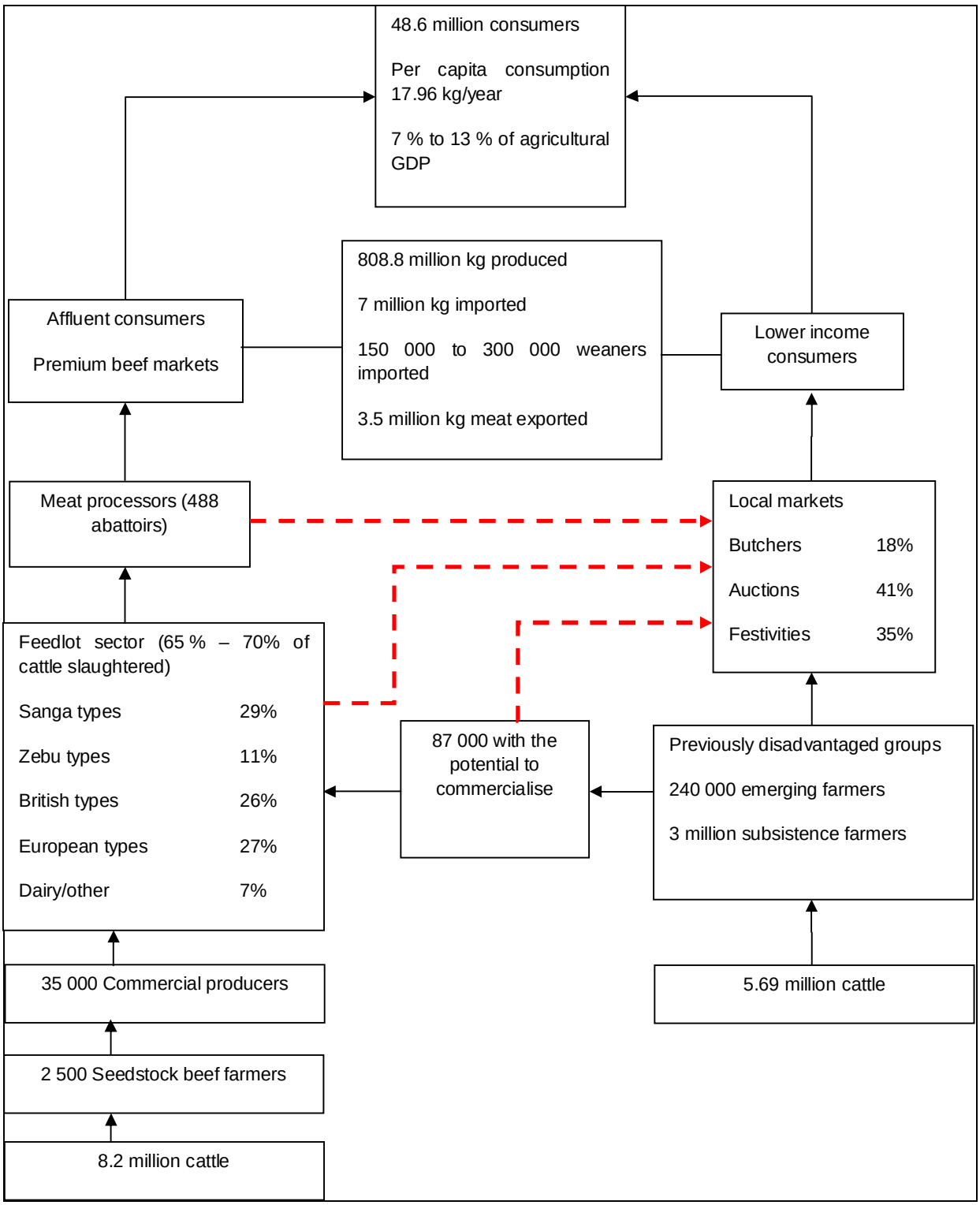

Figure 3.23: South African beef value chain
Source: Adapted from ARC and DAFF 2010

3.5 Conclusions

This chapter empasises the complexity of the South African red meat value chain. There are numerous factors that play a direct role the profitability of the red meat sector as a whole. Changes in supply and demand situations, due to economic factors as well as climatic conditions lead to highly variable meat prices. This variation in meat prices complicates production decisions at every level of the value chain.

Adding to this is the fact that consumers are becoming more health conscious and price competition from other sources of protein, especially poultry meat, are becoming more important. The red meat value chain is a dynamic chain with ever-changing product, information and financial flows. For the industry as a whole to function efficiently, it is critical to adapt or change accordingly.

CHAPTER 4

Price Transmission in the Beef and Lamb Sub-sectors

4.1 Introduction

Since the deregulation and liberalization of the agricultural sector there has been an increasing trend of concentration of certain functions/business entities in agricultural value chains, which in turn could result in or have resulted in anti-competitive behaviour. Evidence to this effect is that several agricultural companies have been found guilty of contravening the Competition Act. A frequently used proxy for oligopolistic or monopolistic behaviour is the nature of price transmission in a particular value chain.

Given the above, a frequently raised concern amongst domestic red meat producers is the relationship between producer- and retail prices, or the price margin. In general retail prices tend to increase at a faster pace than producer prices, contributing to the increase in the price margin over time (Peltzman 2000). Linked to this is the fact that prices at retail level may respond more rapidly to input price increases than to decreases, which is typically known as asymmetric price transmission (APT).

The objective of this chapter is therefore twofold. Firstly, it aims to analyse the producer-retail (PR) price margin within the South African beef and lamb industries, both from a quantitative and qualitative point of view, in order to identify and better understand the margin drivers. Secondly, it aims to investigate the existence of APT within the beef and lamb value chains.

4.2 Data used

For the purpose of this study, the producer-retailer (PR) price margin or price spread is defined as the difference between the price received by a producer or feedlot at abattoir level and the price paid by the final consumer at retail level. Similarly, the terms

"marketing margin" or "marketing bill" are used by Tomek and Robinson (2003), and the USDA (2008) respectively with reference to the same price spread. In this study, the term "price margin" is used and includes all costs incurred as well as profits throughout the various segments of the value (cold) chain from abattoir level to the end consumer (retail level). These costs typically include labour, processing, packaging, energy, infrastructure, logistics and transportation, depreciation, promotion or marketing, interest, maintenance, profit or rent, as well as any other miscellaneous costs.

In order to analyse the PR price margin for the South African beef and lamb value chains, it is important to note that in this analysis, the producer/farm price refers to the A2/A3 beef and lamb carcass prices received by producers (i.e. farmers or feedlots) at abattoir level. These producer prices, which exclude the value of the "fifth quarter",[7] which generally remunerates the slaughtering process, was obtained from the Red Meat Abattoir Association (RMAA) as collected by AMT (2010). The data includes 112 monthly observations over a ten-year period from September 1999 to December 2008 in the case of beef and 100 monthly observations from January 2000 to April 2008 in the case of lamb.

Because carcass values at retail level are not readily available in South Africa, a weighted average carcass equivalent price was calculated using the retail prices of five cuts (as collected by Stats SA 2010[8]) in the case of beef and two cuts in the case of lamb as well as the "block tests" factors used in the industry (SAMIC 2008). This was done to render the producer and retail price series comparable over time. Figure 4.1 shows the nominal retail prices for the individual cuts together with the nominal producer price (A2/A3) for beef and Figure 4.2 for lamb (A2/A3).

[7] Red and dirty offal as well and the hide or skin.
[8] The CPI calculation method changed during this time which resuted in a change in the type of prices that Stats SA collects. To maintain a uniform time series, the most recent data included for the APT analysis is April 2008.

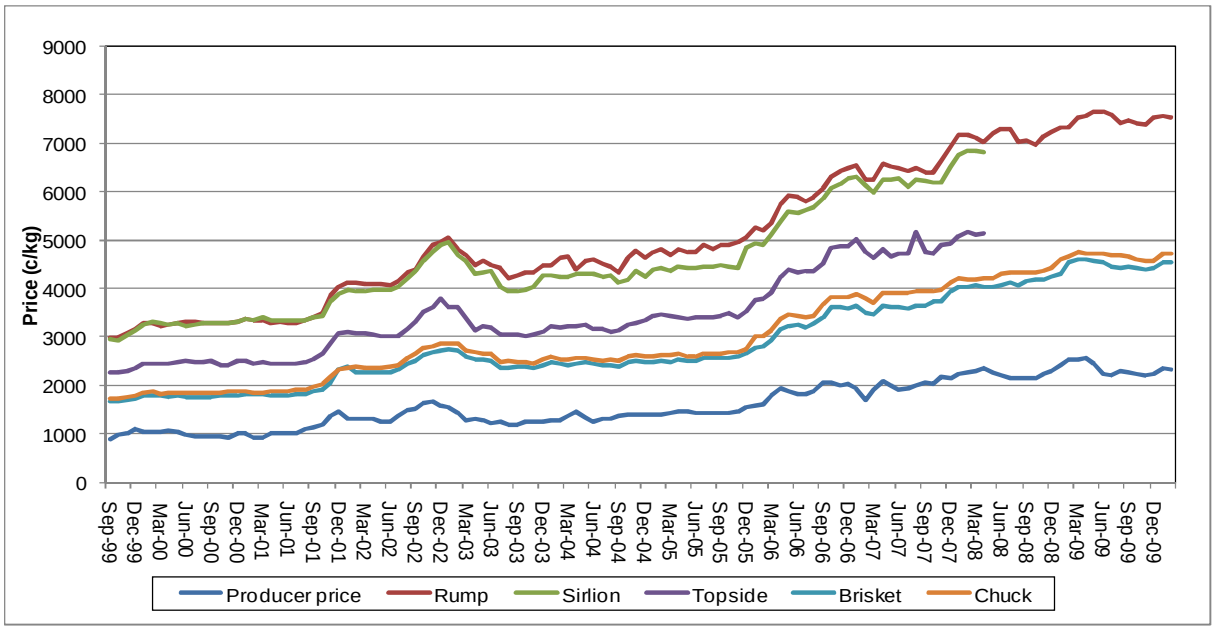

Figure 4.1: Nominal beef producer price and nominal retail rump, sirloin[9], topside[9], brisket and chuck prices from Sept 99 to Dec 09.
Source: AMT as obtained from RMAA and Stats SA 2010

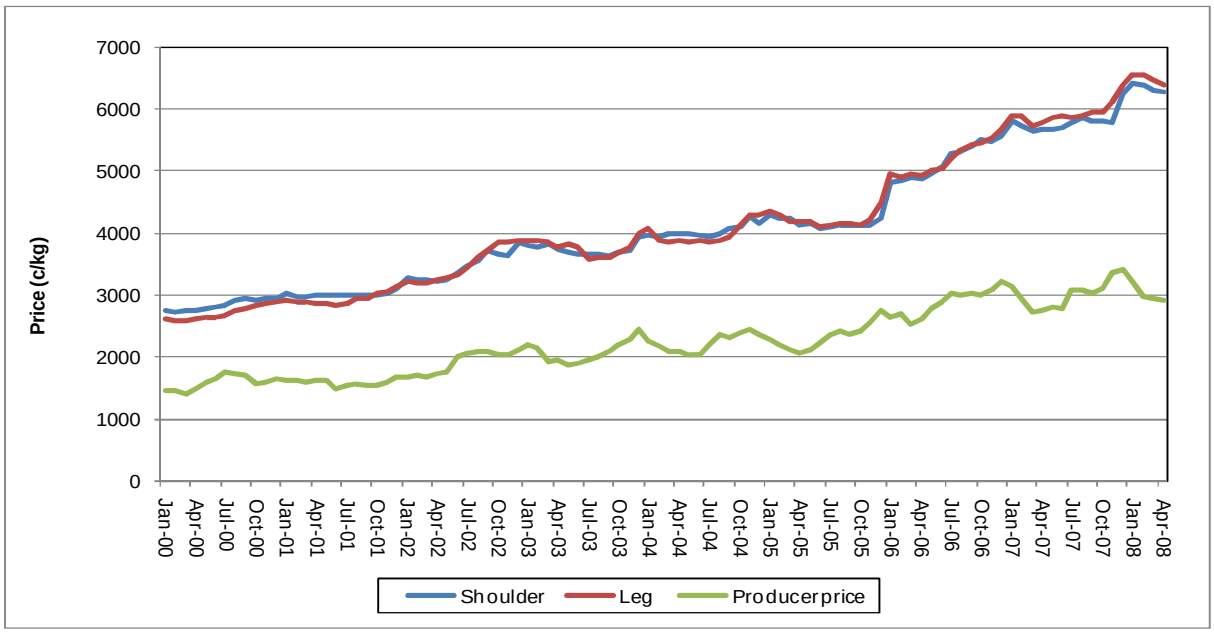

Figure 4.2: Nominal lamb producer price and nominal retail lamb leg and shoulder prices from Jan 2000 to Apr 08.
Source: AMT as obtained from RMAA and Stats SA 2010

[9] The collection of these prices by Stats SA was discontinued due to the change in the food basket used to calculate the CPI. The model for the margin calculation was adapted from June 2008 due to this fact.

Tables 4.1 and 4.2 show the carcass composition (block test), for the purposes of calculating carcass equivalent prices at retail level for beef and lamb respectively (SAMIC 2008). For beef, the five cuts include chuck, brisket, topside, rump and sirloin with a total coverage of 39.2 % of the carcass, while the lamb cuts include shoulder and leg with a total coverage of 32.7 % of the carcass. The calculations were limited to these cuts because of a lack of available retail price information on the remaining cuts.

Table 4.1: Carcass composition for beef (220 kg carcass)

Cut	Share (%)	Kg	Cut	Share (%)	Kg
Chuck	10.8	23.76	Fat	4.3	9.46
Brisket	8.0	17.60	Neck	4.0	8.80
Top side	7.7	16.94	Bolo	4.0	8.80
Silverside	7.7	16.94	Prime rib	3.5	7.70
Bones	7.7	16.94	Flat rib	2.9	6.38
Rump	7.6	16.72	Wing rib	2.7	5.94
Trimmings	6.2	13.64	Hump	1.4	3.08
Shin	5.2	11.44	Fillet	1.1	2.42
Sirloin	5.1	11.22	Aichbone	0.6	1.32
Thin flank	4.4	9.68	Other	0.4	0.88
Thick flank	4.4	9.68	Kidney	0.3	0.66

Source: SAMIC 2008

Table 4.2: Carcass composition for lamb (18 kg carcass)

Cut	Share (%)	Kg
Neck	8.3	1.5
Thick rib	20.2	3.6
Shoulder	14.3	2.6
Chest	8.2	1.5
Rib chop	7.7	1.4
Loin chop	8.3	1.5
Saddle chop	7.6	1.4
Loin	3.4	0.6
Leg	18.4	3.3
Kidneys	0.5	0.1
Trimmings and fat	0.3	0.1

Source: SAMIC 2008

Figure 4.3 presents the nominal producer and retail carcass equivalent prices for beef from September 1999 to December 2008. Figure 4.4 presents the real[10] producer and retail carcass equivalent prices for beef during the same period. From Figures 4.3 and 4.4, it is evident that there is an increasing/widening trend in the PR price margin (19 % from September 1999 to December 2008 in real terms and 116 % in nominal terms, respectively 2 % and 13 % annually). The nominal producer price increased by 156 % (17 % annually) compared to a real producer price increase of 40 % (4.4 % annually) from September 1999 to December 2008. The retail equivalent carcass price increased by 132 % (15 % annually) and 27 % (3 % annually) in nominal and real terms respectively during the same period. The CPI increased with 9.2 % annually while the producer price index for cattle slaughtered increased by 16 % annually during the same period. It is, however, important to note that the calculated retail carcass equivalent price should not be interpreted as is, as this calculated price only represents the specific cuts included.

This price is thus only used as a proxy of the retail price, with the magnitudes, direction and lags of changes being more important than the absolute price level. It is therefore assumed, for the purpose of this study, that these calculated carcass prices at retail level are representative of the changes in the retail meat prices. In other words, these figures show the relative price changes in the selected retail cut prices against carcass prices over time. From Figures 4.3 and 4.4, it can be seen that there is a similar trend and a common seasonal component between the producer- and retail price.

[10] Deflated with the Consumer Price Index excluding mortgage bonds (CPIX)

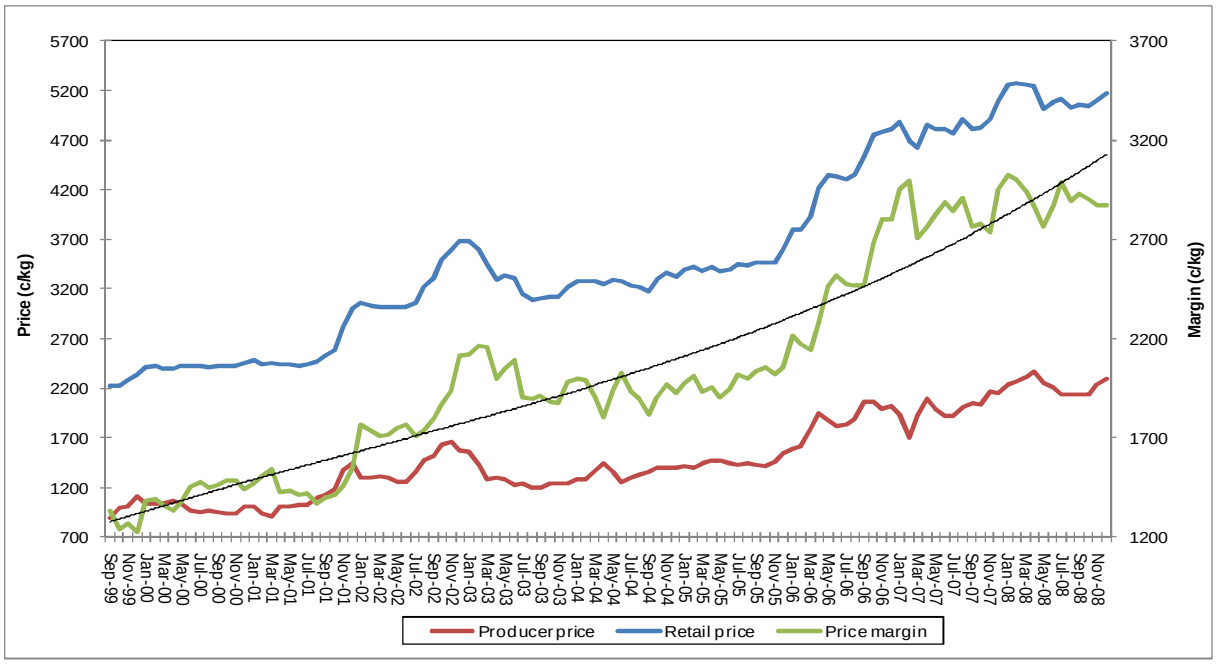

Figure 4.3: Nominal beef producer and retail prices for beef (carcass equivalent) from Sep 99 to Nov 08.

Source: Stats SA 2010, AMT 2010 and own calculations

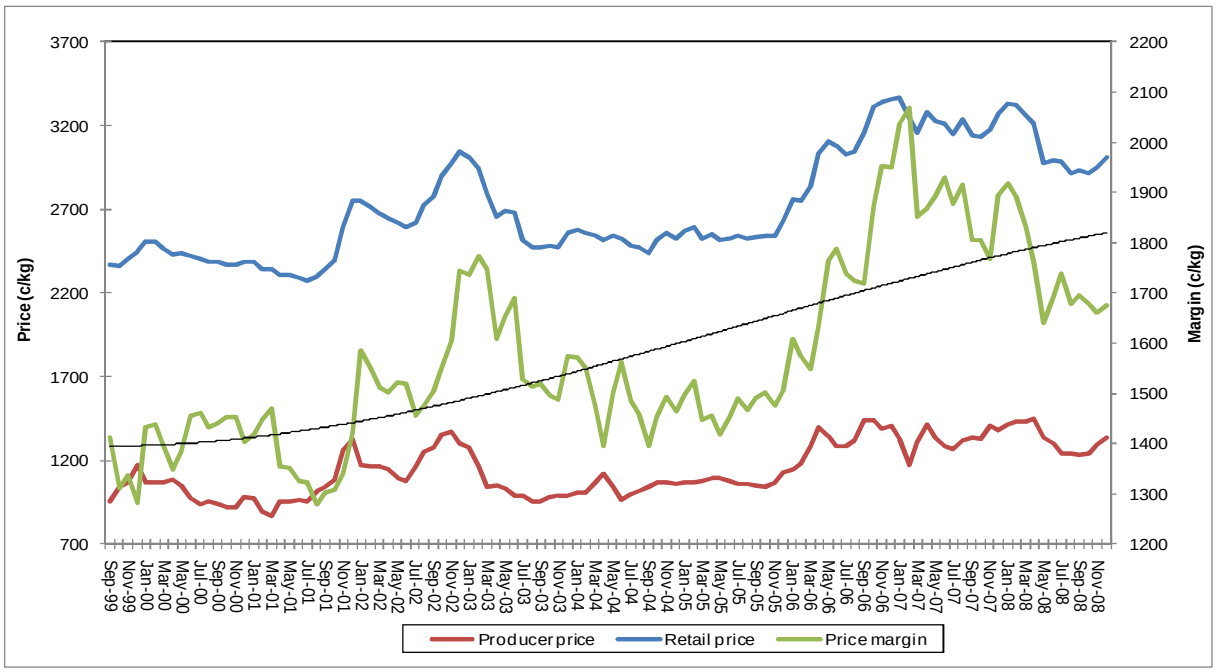

Figure 4.4: Real producer and retail prices for beef (carcass equivalent) from Sep 99 to Nov 08.

Source: Stats SA 2010, AMT 2010 and own calculations

The producers' share (P_s) in the retail price of beef in terms of carcass equivalent, presented in Figure 4.5, is expressed as:

$$p_s = \frac{p_p}{r_p}$$

Where:

p_p represents the producer price at abattoir level and

r_p represents the carcass equivalent retail price.

The producers' share varies between a maximum of 48 % in November 2001 and a minimum of 36 % during February 2007, with an average of 42 % and standard deviation of 2.4 % between September 1999 and April 2008. Although the price margin in absolute value terms shows an increasing trend, the producers' share of the retail beef price remained relatively constant with only a slight increase over the long term.

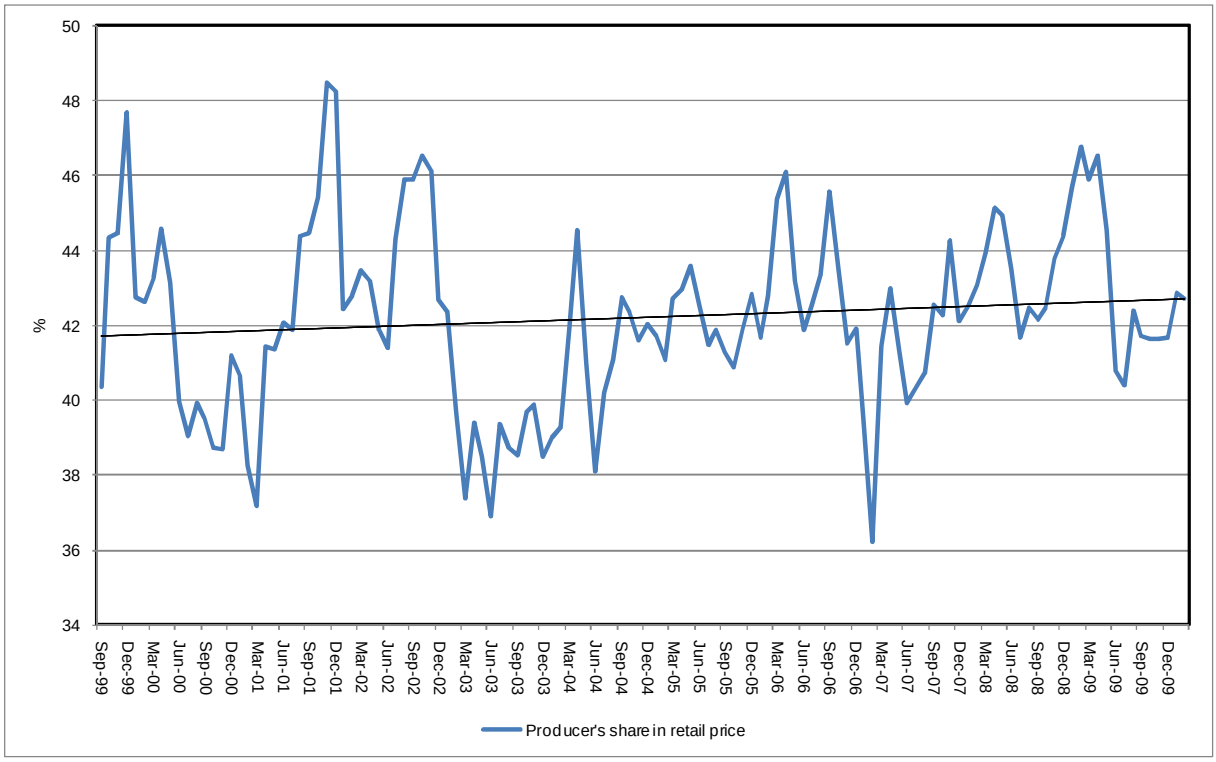

Figure 4.5: Producers' share in the retail price of beef (carcass equivalent) from Sep 99 to Dec 09.

Source: Stats SA 2010, AMT 2010 and own calculations

There is a negative correlation between the price margin and the producers' share, i.e. an increase in the margin result in a decrease in the producers' share and *vice versa.* Although the producers' share in the retail price remained constant over the long term, it should be noted that both the price margin and the producers' share behaved erratically over the short term. Changes in the real price margin range from a maximum increase of 11.9 % from December 1999 to January 2001 to a maximum decrease of 10.5 % from February 2007 to March 2007. The producers' share shows a maximum increase of 14.4 % from February 2007 to March 2007 and a maximum decrease of 12 % from December 2001 to January 2002.

The producer prices as well as the retail carcass equivalent prices for lamb from 2000 to 2008 are shown in nominal and real terms respectively in Figures 4.6 and 4.7. Similarly to the case of beef, the lamb price margin also shows an increasing trend (66 % from January 2000 to April 2008 in the real PR price margin and 182 % in nominal terms, respectively 7 % and 20 % annually) over time. The nominal producer price increased by 100 % (11 % annually) compared to a real increase of 18 % (2 % annually) from January 2000 to April 2008, while the nominal and real retail equivalent carcass price increased by 137 % (15 % annually) and 40 % (2 % annually) respectively during the same period. The CPI increased by 7.7 % annually while the producer price index for sheep slaughtered increased by 13 % annually during the same period.

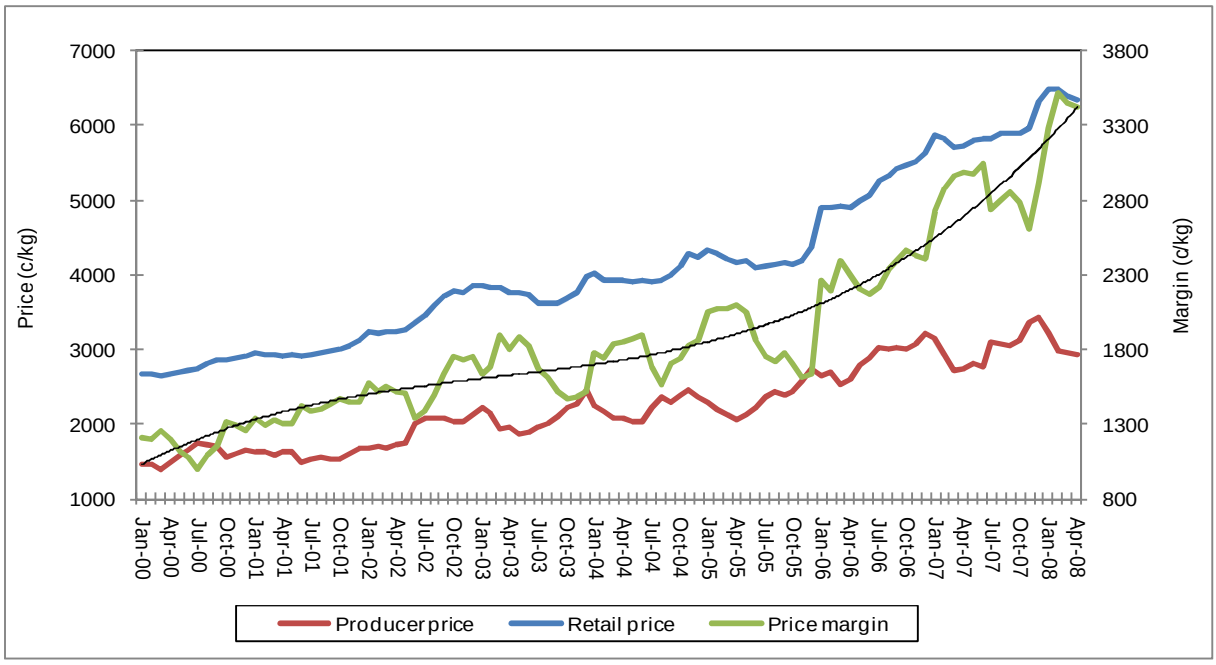

Figure 4.6: Nominal producer and retail prices for lamb (carcass equivalent) from Jan 2000 to Apr 08.
Source: Stats SA 2010, AMT 2010 and own calculations

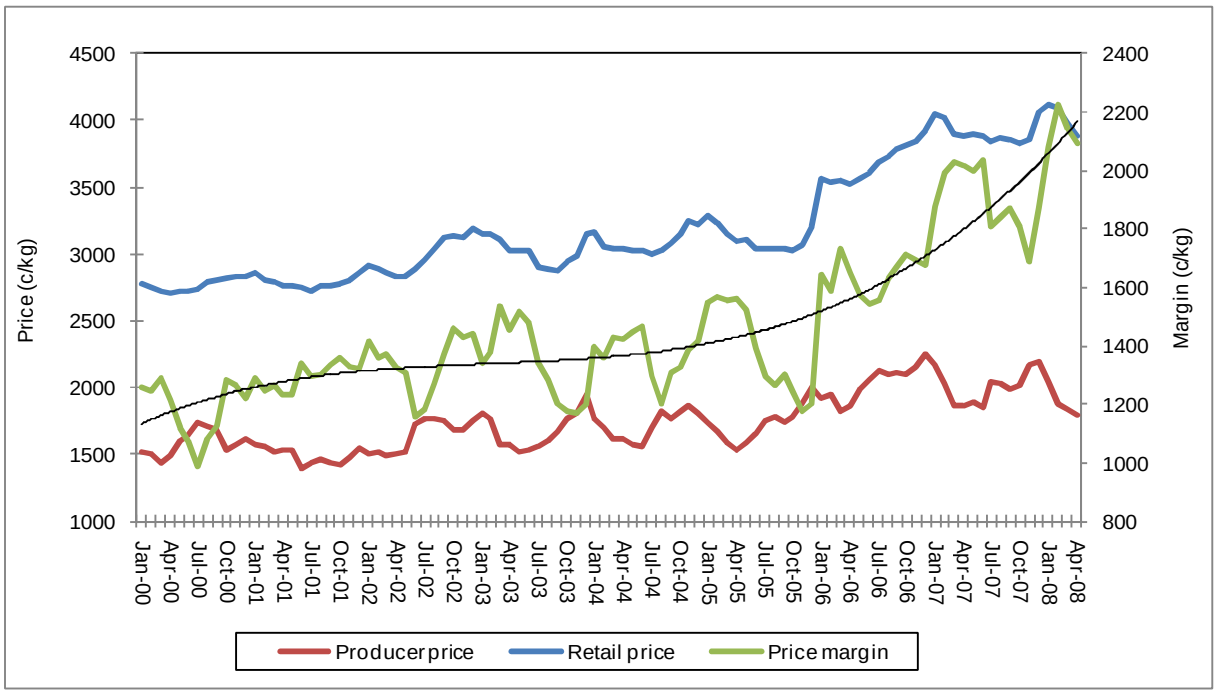

Figure 4.7: Real producer and retail prices for lamb (carcass equivalent) from Jan 2000 to Apr 08.
Source: Stats SA 2010, AMT 2010 and own calculations

Figure 4.8 presents the producers' share in the retail price of lamb in carcass equivalent terms. The producers' share varied between a maximum of 64 % during July 2000 and a minimum of 46 % during February 2008, with an average of 55 % and standard deviation of 3.7 % between January 2000 and April 2008. In contrast to the case of beef, the producers' share in the retail price of lamb had a decreasing trend over time.

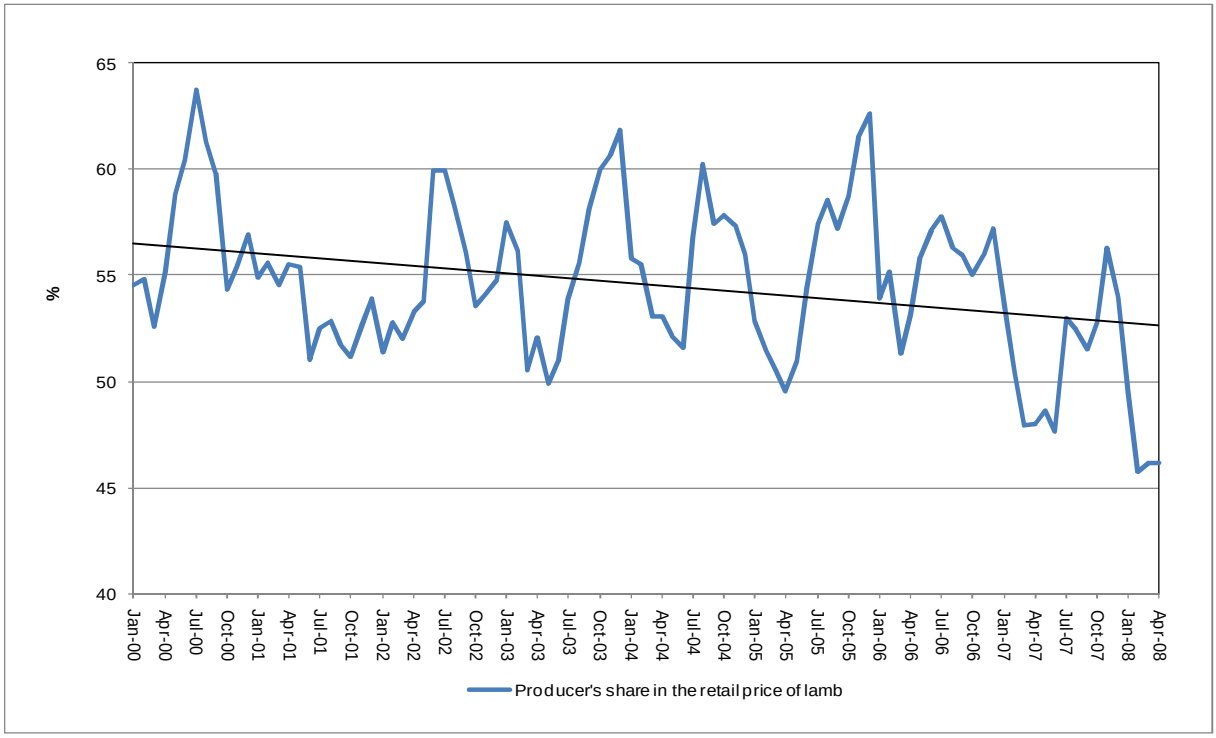

Figure 4.8: Producers' share in the retail price of lamb (carcass equivalent) from Jan 2000 to Apr 08.
Source: Stats SA 2010, AMT 2010 and own calculations

An important consideration for the increasing price margin over time is increasing input costs throughout the value chain in terms of labour, packaging costs, transportation costs, etc. These price increases will cause the price margin to increase. However, in a perfect competitive market where prices behave symmetrically, the opposite should also hold; i.e. as input prices decrease, the retail prices and the price margin should also decrease in the same order – although this is seldom the case.

4.3 Price transmission

One important aspect when considering a value chain is the way prices are transmitted through the various segments of the chain, i.e. from primary producers (upstream) at one end to the end consumer (downstream) at the other end. This vertical price transmission is the primary mechanism through which the various segments in the chain are linked (Meyer and Von Cramon-Taubadel 2004).

For a market to be integrated vertically, price theory suggests that a long-run equilibrium relationship should exist between downstream (retail level) and upstream (producer level) prices. This implies that, in the long-run, prices of goods engaged in economic activity should reflect their scarce economic value (Veselska 2005). Given this equilibrium relationship, it is expected that any external shock(s) to upstream prices should trigger short- and long-run adjustments towards the equilibrium.

Vertical price transmission can either by symmetric or asymmetric. Symmetric price transmission exists when increases or decreases in upstream prices simultaneously trigger appropriate changes in downstream prices, both rapidly and completely, and *vice versa.*

In contrast to symmetric price behaviour, asymmetric price transmission exists where these price shock(s), either downstream or upstream, are not transmitted through the chain in a timely manner and not to the same magnitude. According to Hahn (2004), price margins provide rough measures for the economic efficiency of the various segments of value chains.

A topic closely linked to price margins is price transmissions, which refer to the nature of price adjustments in the marketing system. In other words, how do changes in farm prices influence retail prices and *vice versa*? Tomek and Robinson (2003) make three generalisations of the findings of empirical price transmission studies in the international agricultural market. Firstly, causality usually runs from changes in farm level to retail prices; secondly, time lags are months in length even for perishable products; and thirdly, retail prices appear to respond asymmetrically with adjustments to increasing farm prices occurring faster than adjustments to decreases in farm prices.

The aforementioned emphasises that there is a general concern globally that the transmission of price increases from farm to retail level may occur faster and be of greater magnitude than that of farm price decreases. According to Xia (2007), asymmetry of farm-retail price transmission is detrimental to agricultural producer interests because, if retail prices respond to farm price decreases in the same way as they do to farm price increases, producers will receive more benefits from larger and sooner retail sale increases.

Other studies which found that price increases transmit more rapidly and fuller than price decreases in various agricultural value chains include Hahn (1990) (US Beef and Pork), Bernard and Willett (1996) (US Broiler industry), Aguiar and Connor (1997) (Brazilian dairy processing industry), Miller and Hayenga (2001) (US pork market), Tomek and Robinson (2003) (agricultural product prices in general), Marsh and Brester (2004) (US beef and pork industries), Cutts and Kirsten (2006) (four South African agro-food industries including the maize, wheat, sunflower and fluid milk industries) and Zheng *et al.* (2008) (US Agricultural markets).

4.4 Causes of APT

There are a number of factors that can cause or contribute to APT in the red meat industry, where a live animal is converted, through a number of value-added activities, into a consumable end product. Because red meat is a highly perishable commodity, additional factors needs to be consider when dealing with price transmission.

Meyer and Von Cramon-Taubadel (2004) identified the two main proposed causes for asymmetric price transmission, namely non-competitive markets and adjustment costs. In addition, other causes include issues such as political intervention, asymmetric information within the value chain, and inventory management. Popovics and Toth (2006) agreed with this argument in the sense that while symmetric price transmission charactarises perfectly competitive markets, price asymmetry is a characteristic of non-competitive, imperfect markets.

Peltzman (2000) argued that output prices tend to respond faster to input price increases than to decreases. He also found APT to be the rule rather than the exception because they tended to be the case in more than two out of every three markets examined. The author used three different samples; two of these consisted of monthly price indices for producer and consumer goods at national level in the United States (US) while the third included individual item prices of packed goods from a supermarket chain. Peltzman (2000) stated that the only clear regularity he found was that more volatile input prices are associated with less price asymmetry, and above average asymmetry was found between factory and consumer prices when there were many small intermediaries between the factory and the retailer.

Kinnucan and Forker (1987) found that the producer-retail price transmission process in the US dairy industry is charactarised by asymmetry and that the major impact on retail prices of a change in the farm price is felt sooner when farm prices are increasing than when farm prices are decreasing. The authors further explained that the slower response of retail prices to decreases in farm prices helps to explain the belief that consumers do not benefit from farm price decreases.

Goodwin and Holt (1999) examined price interrelationships and transmission amongst farm, wholesale and retail beef markets in the US from 1981 to 1998. Their results showed that the transmission of shocks appear to be largely one way, with information flowing up the marketing channel from farm to retail level and not in the opposite direction. They found that the responsiveness to price shocks has increased in recent years due to more efficient information transmission through the vertical marketing channels. This emphasises the importance of information flow, especially in terms of price information flow throughout the value chain.

Conforti (2004) highlighted six groups of factors affecting price transmission based on sixteen countries and primarily on basic food commodities, although some important cash crops were also included. These six factors are:

- Transport and transaction costs.
- Market power.

- Increasing returns to scale in production.
- Product homogeneity and differentiation.
- Exchange rates.
- Border and domestic policies.

Conforti (2004) found a number of regularities between these sixteen countries, including that high and fast transmission are relatively more frequent for cereals, followed by oilseeds, while this is generally poorer for livestock markets.

According to Aguiar and Santana (2002), the relationship between farm and retail prices provides insight into marketing efficiency as well as consumer and farmer welfare. Aguiar and Santana (2002) measured price transmission mechanisms for three different groups of agricultural products based on the two arguments normally used to explain price asymmetry, namely market concentration and product storability. They found that neither market concentration nor product storability was required for price increases to be more intensely transmitted than price decreases and their results demonstrate that findings from previous studies cannot be generalised to other industries or for other periods. This highlights the fact that different product markets in different geographical areas cannot be compared even though the same methodology is applied. Goodwin (2006) agree with this in the sense that despite many studies that have investigated the vertical price adjustment process along the food chain, results from the empirical literature are inconclusive. He argues that generalisation is not possible in the case of APT, mainly due to the fact that market structures and that different value chains operate in different ways for different countries and products, especially as some countries have highly evolved value chains with very efficient price transmission mechanisms.

4.5 Quantitative analysis of the South African beef and lamb producer-retail price margins

This section firstly provides the methodology used and secondly the results of the empirical analysis of the PR price margins.

4.5.1 Methodology used

Literature on APT dates back to Gardner (1975), who discovered a stronger impact of retail-level demand shifts than farm-level supply shifts on the farm-retail price spread in the US. It was within this framework that Kinnucan and Forker (1987), focusing on the major dairy products in the US, and Von Cramon-Taubadel (1998), focusing on the German pork market, analysed APT – arguing that the presence of asymmetry in the PR price relationship could lead to APT. Furthermore, Von Cramon-Taubadel (1998) deduced that the price transmission will only be asymmetric if the demand and/or supply shifts are skewed more towards a particular direction (positive or negative). Otherwise APT will not occur, since there will be equal occurrences of larger demand-driven (and smaller supply-driven) transmission in each direction.

Price is the primary mechanism by which various levels of the market are linked, thus market linkages through price transmission are often investigated in APT studies. However, since most price series are non-stationary[11], it is of great importance to ensure that they are made stationary in order to improve the plausibility of estimates and avoid having spurious regressions. For this reason, this study made use of cointegration analysis. Previous studies have also used cointegration analysis for testing for APT (Von Cramon-Taubadel and Fahlbusch 1994; Von Cramon-Taubadel and Loy 1996; Scolnick 1996, Borenstein Cameron and Gilbert 1997, Von Cramon-Taubadel 1998, Frost and Bowden 1999 and Ben-Kaabia and Gil 2007). It is therefore clear that cointegration analysis, as a means of analysing price relationships in value chains for decades, has become a popular evaluation tool.

4.5.1.1 Cointegration analysis

A cointegration test is used to determine the existence of a long-run relationship between economic variables. Prior to a cointegration test, the order of integration of the co-integrating variables is determined to determine whether the variables are stationary or non-stationary. If a series is found to be non-stationary, it is differenced until it is found to be stationary. After determining the order of integration, that is, how many

[11] Processes whose statistical properties vary with time

times a series had to be differenced to become stationary, cointegration test(s) are explored. A widely-applied cointegration test is the Engle and Granger (1987) cointegration procedure. In spite of its popular appeal, the Engle and Granger (1987) test procedure has been criticised because of the symmetric nature of their price adjustment model. Subsequently, Enders and Granger (1998) and Enders and Siklos (2001) suggested the use of threshold adjustment models, for example, the Threshold Autoregressive (TAR) and the Momentum Threshold Autoregressive (M-TAR) models, as these models account for the asymmetric price transmission prevalent in most vertically integrated markets.

The Engle and Granger (1987) cointegration procedure as well as the TAR and M-TAR models are used to carry out the cointegration and error correction tests in this study. According to Granger representation theory, if economic variables are cointegrated, then error correction models can be developed to study the cointegration relationship. Therefore, the aim of using different cointegration procedures is to compare the various approaches and choose the best-fitting error correction model. These cointegrations tests are discussed in the next sections.

4.5.1.2 Engle and Granger cointegration test

The Engle and Granger (1987) procedure is a two-step approach. Firstly, cointegration regression is estimated by simple ordinary least squares (OLS) using Equation 1:

$$y_t^{retail} = \alpha + \beta_1 x_t^{producer} + \mu_t \quad (1)$$

Where, y_t is the retail price, x_t is the producer price and μ_t is the error term. Equation 1 describes the long-run relationship between the series y_t and x_t. Secondly, a residual-based test is used to test for cointegration. The null hypothesis of the test is that there is no cointegration relationship between the variables as against the alternative of cointegration. If the null hypothesis is rejected, the alternative is accepted, implying that the variables in the long-run are cointegrated.

The test is investigated with ADF test procedure as indicated by Equation 2:

$$\Delta\mu_t = \rho\mu_{t-1} + \sum_{i=1}^{n} \lambda_i \Delta\mu_{t-1} + e_t \quad (2)$$

Equation 2 is fitted only if the residual obtained by fitting Equation 1 is not white noise (i.e. it is serially correlated); otherwise, no extra lag structure is used in the test.

4.5.1.3 Threshold cointegration

The threshold cointegration models are fitted on the assumption that the Engle and Granger (1987) two-step approach cannot capture asymmetric adjustment. The models are used to test for the stationarity of the error term as well as to incorporate asymmetric adjustment into the model. The assumption of the threshold models is that adjustments to equilibrium are not instantaneous but threshold driven; adjustment is triggered only when a critical threshold is exceeded. Examples of TAR and M-TAR models are as follows.

4.5.1.3.1 Threshold Autoregressive (TAR) models

In the TAR model, the autoregressive decay depends on whether the adjustment parameter lies below or above a critical threshold. This is quantified as follows:

$$\Delta\mu_t = I_t\rho_1(\mu_{t-1} - r) + (1 - I_t)\rho_2(\mu_{t-1} - r) + \sum_{i=1}^{p} \beta\Delta\mu_{t-1} + \varepsilon_t \quad (3)$$

Where, I is the Heaviside indicator function such that:

$$I_t = \begin{cases} 1 if\ \mu_{t-1} \geq r \\ 0 if\ \mu_{t-1} < r \end{cases} \quad (4)$$

The *r* is the threshold value, ρ_1 and ρ_2 are the speed of adjustment parameters to be estimated. Equation 3 is augmented with lagged changes in the error sequence to ensure the residual errors are white noise.

4.5.1.3.2 Momentum Threshold Autoregressive (M-TAR) models

Note that in the TAR model Equation 3, the autoregressive decay depends on the level of the adjustment parameter μ_{t-1}. Enders and Granger (1998) and Enders and Siklos (2001) suggested an alternative model called M-TAR which allows the autoregressive decay to depend on the first difference of threshold variable μ_{t-1}. To allow for this, the Heaviside indicator, unlike Equation 4, is specified as follows:

$$I_t = \begin{cases} 1 & if\ \Delta\mu_{t-1} \geq 0 \\ 0 & if\ \Delta\mu_{t-1} < 0 \end{cases} \tag{5}$$

For the M-TAR model, Equation 3 is estimated with specification of Equation 5.

4.5.1.4 Error correction model

The short-run dynamics of the long-run relationship are investigated using error correction procedure suggested by Enders and Granger (1998) and Enders and Siklos (2001). The model is as follows:

$$\Delta y_t = I_t \rho_1 (\mu_{t-1} - r) + (1 - I_t)\rho_2 (\mu_{t-1} - r)$$

$$+ \sum_{i=0}^{k} \beta_i \Delta x_{t-i} + \sum_{i=1}^{k} \xi_i \Delta y_{t-i} + ...\sum_{=1i}^{k} \phi_{ni} \Delta x_{n,t-i} + \varepsilon_t , \tag{6}$$

Where ρ_1 and ρ_2 are the adjustment co-efficients for positive and negative disturbances respectively. The model is used in this study to analyse the price adjustment process in the PR beef and lamb markets.

4.5.2 Empirical results

The results are discussed as follows. Firstly, the order of integration of the data is determined. Secondly, the cointegration results are presented after the estimates of the adjustment mechanisms (error correction) in the PR beef and lamb market channels are given in the third place.

4.5.2.1 Stationarity test

Table 4.3 shows the Augmented Dickey Fuller (ADF) tests for unit root. The null hypothesis for this test is that there is a unit root (non-stationary), with the alternative of stationarity. The test is carried out at both levels and first difference with intercept and trend components included. The lag length was selected by minimising the Bayesian Information Criterion (BIC). The results show that both the abattoir and retail prices for beef are non-stationary. The nominal prices were differenced once to make them stationary. The abattoir price for lamb was found to be stationary at levels[12] whereas the retail price was non-stationary but stationary at first difference.

Table 4.3: ADF unit root test*

Prices	Lag length	ADF statistics	Critical value (95 %)	Lag length	ADF statistics	Critical value (95 %)
	Levels			First difference		
RP(beef)	5	-1.6875	-3.4563	1	-6.3272	-3.4549
FP(beef)	3	-2.1586	-3.4553	2	-8.6919	-3.4549
RP(lamb)	1	-1.9583	-3.4563	2	-6.4144	-3.4568
FP(lamb)	1	-4.1007	-3.4563	2	-6.8835	-3.4568

* All test are carried out at 95 % significantly level

4.5.2.2 Cointegration test

The main objective of this section is to determine whether the linear combination of producer and retail prices of beef and lamb has a long-run relationship; that is, if in the long-run, the prices move together.

The Engle and Granger (1987) cointegration test was performed by first fitting long-run equation (1), where, y and x are the retail price (RP) and the farm price (FP). The least square estimates of the regression for beef and lamb markets are $y = 2.2044 + 2.2275x_t + \mu_t$ and $y = -2.0125 + 1.9347x_t + \mu_t$. The t-statistics and the p-values for the intercept and slope of the beef equation are 3.0384 (0.003) and 45.9123 (0.0003) respectively. For the lamb equation, they are -1.5012 (0.1366) and 33.2050 (0.0000) respectively.

[12] Though it was found to be stationary, its first difference was used in the error correction model (ECM) in order to conform with other parameters of the ECM that are in first difference.

Secondly, the cointegration test was performed with ADF Equation 2. The estimated value of ρ for beef and lamb are -0.2815 and -0.2734 (Table 4.4 and 4.5), while their t-statistic for the null hypothesis of no cointegration (i.e. $\rho = 0$) are -3.3651 and -3.8205 respectively. The critical values tabulated in Engle and Granger (1987) for ADF tests for the 1 %, 5 % and 10 % significance levels are 3.77, 3.17 and 2.84 respectively. It can be seen from these critical values that the null hypothesis was rejected at the 5 % level of significant for beef and at 1 % for lamb. This is because the absolute value of the t-statistics is greater than the tabulated critical value at 5 % level for beef and 1 % level of significance for lamb. The result indicates that the farm and retail prices in the beef and lamb market are cointegrated, i.e. they share a certain type of behaviour in terms of their long-term fluctuations.

Table 4.4: Estimates of price transmission in the South African beef market*

Tests	Engle-Granger	Threshold Autoregressive (TAR)	Momentum-Threshold Autoregressive (M-TAR)	Momentum-Consistent Threshold Autoregressive
Col (1)	Col(2)	Col(3)	Col(4)	Col(5)
ρ_1 [a]	-0.2815 (0.0011)	-0.3520 (0.0009)	-0.4475 (0.0001)	-0.4558 (0.0000)
ρ_2 [a]	Na	-0.3375 (0.0002)	-0.2465 (0.0085)	-0.2139 (0.0493)
ϕ [b]	Na	10.0386 (0.0001)	11.0212 (0.0001)	11.7805 (0.0000)
$\rho_1 = \rho_2$ [c]	Na	6.6979 (0.0004)	7.3531 (0.0002)	7.8594 (0.0001)
BIC	3.4934	3.5185	3.5022	3.4897
Lag length	2	1	1	1
Threshold		0	0	-0.05319
Q(26) [d]	14.598 (0.964)	21.824 (0.698)	21.016 (0.741)	20.521 (0.766)
LM [e]	1.9211 (0.3827)	5.9021 (0.3156)	4.2194 (0.5182)	4.5155 (0.4778)
Normality [f]	0.6801 (0.7117)	0.9439 (0.6238)	2.9355 (0.2304)	2.937 (0.2303)
N	104	104	104	104

[a] Entries in this row are the estimated value of $\rho_{1 \text{ and }} \rho_2$ with the p-values in parentheses.
[b] Entries in this row are the sample values of ϕ and ϕ^*. The critical values for these statistics are tabulated in Enders and Siklos (2001) as the ϕ and ϕ^* distributions.
[c] Entries in this row are the sample F-statistic for the null hypothesis that the adjustment co-efficients are symmetric. The p-values are in parentheses.
[d] Q(p) is the p-value for the residual autocorrelation test. It is based on Ljung-Box statistic.
[e] This is the Breusch-Godfrey Lagrange multiplier test of serial correlation.
[f] This is the Jarque-Bera normality test.
*All figures in parentheses are p-values.

Furthermore, cointegration was confirmed with the threshold TAR and M-TAR models. The residuals from the long-run OLS regression obtained by fitting Equation 1 were

used to specify the TAR and M-TAR models as shown in Equations 3 to 5. For the TAR model, the equilibrium relationship depends on the level of the threshold variable μ_{t-1} whereas, the M-TAR models assume it depends on its first difference $\Delta\mu_{t-1}$. Therefore, in the specification of the TAR and M-TAR models, the equilibrium relationship depends on whether the error sequence lies above or below the critical threshold. The two models are fitted with a dummy variable to take the value of one if the μ_{t-1} is greater than zero, otherwise zero for the TAR model or to take the value of one if $\Delta\mu_{t-1}$ is greater than the potential, otherwise zero for the M-TAR model.

Table 4.5: Estimates of price transmission in the South African lamb market*

Tests	Engle-Granger	Threshold Autoregressive (TAR)	Momentum-Threshold Autoregressive (M-TAR)	Momentum-consistent Threshold Autoregressive
Col(1)	Col(2)	Col(3)	Col(4)	Col(5)
ρ_1 [a]	-0.2734 (0.0002)	-0.1997 (0.0375)	-0.3052 (0.0064)	-0.1443 (0.035)
ρ_2 [a]	Na	-0.3548 (0.0005)	-0.2536 (0.0051)	-0.7412 (0.0000)
ϕ [b]	Na	8.0352 (0.0006)	7.3075 (0.0011)	12.6445 (0.0000)
$\rho_1 = \rho_2$ [c]	Na	5.8384 (0.0011)	5.3469 (0.0019)	8.9512 (0.0000)
BIC	4.2508	4.2828	4.2961	4.2032
Lag length	1	1	1	1
Threshold		0	0	-1.2685
Q(12) [d]	10.67 (0.561)	16.7 (0.892)	16.991 (0.882)	12.864 (0.985)
LM	4.4628 (0.48490	4.3757 (0.4967)	5.6493 (0.3418)	2.8539 (0.7225)
Normality	1.7696 (0.4169)	0.1036 (0.5759)	2.0845 (0.3526)	0.2572 (0.8793)
N	100	100	100	100

[a] Entries in this row are the estimated value of ρ_1 and ρ_2 with the p-values in parentheses
[b] Entries in this row are the sample values of ϕ and ϕ^*. The critical values for these statistics are tabulated in Enders and Siklos (2001) as the ϕ and ϕ^* distributions.
[c] Entries in this row are the sample F-statistic for the null hypothesis that the adjustment co-efficients are symmetric. The p-values are in parenthesis.
[d] Q(p) is the p-value for the residual autocorrelation test. It is based on Ljung-Box statistic.
[e] This is the Breusch-Godfrey Lagrange multiplier test of serial correlation.
[f] This is the Jarque-Bera normality test.
*All figures in parentheses are p-values.

The threshold cointegration tests are shown in Tables 4.4 and 4.5. The point estimates of ρ_1 and ρ_2 is used for the test. Two tests were carried out; firstly, the null hypothesis of no cointegration was investigated to find out whether the point estimates (ρ_1 and ρ_2)

are different from zero, i.e., (ρ_1 = 0, and ρ_2 = 0); and secondly, whether the joint distribution of the ρ_1 and ρ_2 is different from zero, (i.e., $\rho_1 = \rho_2 = 0$). The t-statistic from the OLS estimation of the models is used for the test (ρ_1 =0, and ρ_2 =0) while the F-statistics is used for the joint distribution test. The critical value for the test is tabulated in Enders and Siklos (2001).

For the null hypothesis of (ρ_1 = 0, and ρ_2 = 0), the critical values for the 10 %, 5 % and 1 % levels of significance are (-1.91, -2.14 and -2.57) respectively. The results of the beef market in Table 4.4 shows that the t-statistic of the ρ_1 and ρ_2 estimated with TAR and M-TAR model are (-3.4131 and -3.1739-) and (-4.0478 and -2.6866) respectively. For the lamb market in Table 4.5, the t-statistics are (-2.1098 and -3.5858) and (-2.7877 and -2.8648) respectively. It can be seen that the maximum t-statistics for the two models are greater than the tabulated critical values. This means that the retail and producer prices for the beef and lamb markets are co-integrated.

The sample value of the F-statistic, Φ for the TAR and M-TAR models in Table 4.4 are (10.0386 and 11.0212) respectively; and in Table 4.5, they are (8.0352 and 7.3075). The critical values for the 10 %, 5 % and 1 % levels of significance are (4.99, 6.01 and 8.30). The null hypothesis of no cointegration is rejected, confirming cointegration between the prices.

Notably, cointegration is tested beforehand when the threshold is known (i.e. r = 0). However, Enders and Granger (1998) and Abdulai (2002) suggested that using a consistent estimate of threshold is better. In this instance, a threshold model (M-TAR) with an unknown threshold was fitted. The threshold value was estimated using Chan's (1993) method. This is a type of arranged autoregression where optimal threshold was selected using a grid search algorithm by minimising the residual sum of squares (RSS). The threshold values selected through this algorithm are -0.0532 for beef market (Table 4.4, column 5, row 9) and -1.2685 for lamb market (Table 4.5, column 5, row 9). After identifying the optimal threshold, the OLS regression of the M-TAR model was carried out. The null hypothesis of no cointegration was tested as described earlier. The t-statistic of the ρ_1 and ρ_2 estimated with the M-TAR model for beef and lamb are (-

4.5637 and -1.9900) and (-2.1389 and -4.7059) respectively. The test also confirmed cointegration between the retail and farm prices of the beef and lamb markets. The diagnostic test for the Engle and Granger (1987) test and threshold models shows that there are no autocorrelation and the residuals are orthogonal (serially uncorrelated).

4.5.2.3 Test for asymmetry

Since cointegration tests have confirmed that the retail and farm prices have a long-run relationship, it is important to determine the nature of this relationship in terms of how prices are transmitted. If a price increase or decline in one market channel triggers an instant and equal change in the alternate market, then the markets are symmetrically linked. Otherwise, there is an asymmetric relationship between them. This relationship was tested with all the threshold models using the ρ_1 and ρ_2 parameters. The null hypothesis of the test is that the estimates are equal (i.e. $\rho_1 = \rho_2$). Enders and Granger (1998) and Enders and Siklos (2001) suggested that the F-distribution of the OLS regression can be used for this test. The sample values of the F-distribution are shown in row (6) of Tables 4.4 and 4.5 for beef and lamb respectively. The null hypothesis of symmetry is rejected at a 1 % level of significance for all the tests, which implies that the retail-farm relationship in the beef and lamb market is asymmetric. If the relationships between these prices are asymmetric, changes in one price would not cause the same response from the alternate market. Therefore, in the next section, the adjustment to disequilibrium in the market prices is investigated.

4.5.2.4 Error Correction

A cointegration relationship between the retail and producer prices was confirmed in Section 4.5.2.2 using different approaches such as the Engle and Granger (1987), TAR and M-TAR methods. Further investigations into the nature of price transmission in Section 4.5.2.3 show that there is an asymmetric relationship between them. To further examine this asymmetric relationship, it is important to investigate how the prices adjust to economic shocks arising from an alternate market. This was carried out by fitting an asymmetric error correction model as shown in Equation 6. Equation 6 depicts retail price as a function of the positive and negative error correction terms, its own lag and

the contemporaneous and lagged values of the producer price. The M-TAR model with its consistent threshold estimate was fitted and the estimated ECM was derived as follows.

$$\Delta x_t = \sum_{i=0}^{k} \beta_i \Delta x_{t-1} + \sum_{i=0}^{k} \xi_i \Delta y_{t-1} + \vartheta \Delta y_t + \varphi ECT_{t-1}^{+} + \psi ECT_{t-1}^{-} + \varepsilon_t \quad (7)$$

Where, $ECT_{t-1}^{+} = I(Epos^{+})$ and $ECT_{t-1}^{-} = I(Eneg^{-})$. The $Epos^{+}$ and $Eneg^{-}$ are the positive and negative residuals obtained by fitting long-run Equation 1, whereas, the I is the dummy variable specified in Equation 5. The ECT_{t-1}^{+} and ECT_{t-1}^{-} in Equation 7 represents the adjustment parameters ρ_1 and ρ_2 in Equation 6 and are measures of the equilibrium adjustment to shocks.

The results of estimating the error correction model, Equation 7, for beef and lamb markets are shown in Tables 4.6 and 4.7. The result shows that the asymmetric adjustment co-efficients ECT_{t-1}^{+} and ECT_{t-1}^{-} for the beef market (Table 4.6) are both statistically different from zero but only ECT_{t-1}^{-} is statistically different from zero for the lamb market (Table 4.7). This implies that the retail price in the beef market responds to both positive and negative shocks arising from the producer price; whereas the retail price in the lamb market responds more significantly to negative than positive shocks. Notably, the value of ECT_{t-1}^{-} is greater than the ECT_{t-1}^{+} in both markets. Therefore, firstly, it is said to be below its long-run equilibrium value and secondly, the ECT_{t-1}^{-} induces a greater change in the retail price than ECT_{t-1}^{+}. According to Von Cramon-Taubadel (1998), Cuts and Kirsten (2006) and Uchezuba (2010), when the co-efficient of the ECT^{-} is greater than ECT^{+} in absolute terms, the retail price will react faster when the profit margin is squeezed than when it is stretched.

The values of the adjustment parameters also indicate that the adjustment to equilibrium takes place in less than one month, contrary to the expectation that adjustments will be close to one because monthly price data was used in the study. This is an indication that there is a lag in the adjustment to price changes in the beef and lamb markets.

Table 4.6: Estimates of error correction model for beef

Asymmetric Error Correction		
Regressors	ΔRP	ΔFP
Col(1)	Col(2)	Col(3)
Constant	-0.1513 (0.0446)	0.1388 (0.0094)
ΔRP_{t-1}	0.2223 (0.0108)	-0.1979 (0.0013)
ΔFP_{t-1}	0.4971 (0.0000)	-0.1696 (0.0305)
ΔFP_{t}	0.6607 (0.0000)	
ΔRP_{t}		0.3370 (0.0000)
ECT^{+}_{t-1}	0.2053 (0.0042)	-0.3092 (0.0000)
ECT^{-}_{t-1}	-0.2431 (0.0001)	-0.2708 (0.0000)
Diagnostic statistics		
Q(12)	17.005 (0.909)	16.75 (0.916)
LM	7.8866 (0.1626)	13.1236 (0.0222)
Normality	3.0751 (0.2149)	11.2616 (0.0035)
Wald	52.2465 (0.0000)	2.8668 (0.0904)
Durbin-Watson	2.1098	1.517

The interpretation of the ECT^{+}_{t-1} and ECT^{-}_{t-1} coefficients are as follows. In the short-run, the relationship between producer and retail price of beef will return to long-run equilibrium at a speed of 0.2431 (24 %) for the ECT^{-}_{t-1} (negative component) and 0.2053 (20 %) for the ECT^{+}_{t-1} (positive component). Lamb prices return at a speed of 0.2345 (23 %) for the ECT^{-}_{t-1} (negative component) and 0.0445 (4 %) for the ECT^{+}_{t-1} (positive component). The speed of adjustment (convergence) lies between 0 and 1; the closer to one, the faster the adjustment. Therefore, adjustment to negative shocks is greater for beef than lamb. The results also show that there is asymmetry with regard to the speed of price transmission between producer and retail prices of both beef and lamb. In other words, the speed of change in the producer prices of beef and the lamb does not translate to the same speed of change in the retail prices. The diagnostic test for the error correction test shows that there is no autocorrelation and the residuals are orthogonal (serially uncorrelated).

Table 4.7: Estimates of error correction model for lamb

Asymmetric Error Correction		
Regressors	ΔRP	ΔFP
Col(1)	Col(2)	Col(3)
Constant	0.1665 (0.0937	0.1378 (0.3365)
ΔRP_{t-1}	0.1763 (0.0355	-0.2661 (0.0269)
ΔFP_{t-1}	0.2026 (0.0294)	0.3239 (0.015)
ΔFP_{t}	0.1299 (0.0718)	
ΔRP_{t}		0.2678 (0.0718)
ECT^{+}_{t-1}	-0.0445 (0.3012)	0.0676 (0.2734)
ECT^{-}_{t-1}	-0.2345 (0.0001)	0.1844 (0.0352)
Diagnostic statistics		
Q(12)	30.464 (0.249)	17.18 (0.907)
LM	8.8219 (0.1164)	7.4918 (0.1866)
Normality	44.4147 (0.0000)	0.2593 (0.8784)
Wald	11.6614 (0.0006)	0.0001 (0.992)
Durbin-Watson	2.2361	2.1647

4.5.2.5 Causality test

The Granger (1969) causality test was performed to determine how market influence flows. The results show that the lagged and contemporaneous changes in producer prices for beef (Table 4.6, column 2, rows 6 and 7) and lamb (Table 4.7, column 2, rows 6 and 7) induce a significant response from retail prices. In order to determine the direction of the causality, the Granger causality test was performed by testing the joint null hypotheses that current and lagged changes in producer prices do not affect retail prices. The null hypothesis was rejected for both retail and farm equation in the beef market, implying that market influence could flow either way, that is, there is a bi-directional causality between the market prices. On the other hand, the null hypothesis was rejected for retail equation (Table 4.7, column 2, row 15) but not for the farm equation (Table 4.7, column 3, row 15) in the lamb market. The result shows that farm price Granger cause retail price in the lamb market and not *vice versa.*

4.6 Conclusions

Price margins in absolute values within the South African beef and lamb sub-sectors have been increasing over time. The beef producers' share in the retail price of beef has stayed relatively constant, whereas the lamb producers' share has declined slightly. In order to explain the increasing trend in the PR price margin, it is important to understand the functioning of the South African red meat value chain and the changes within the industry. These changes include changes in terms of the level of concentration in the downstream segments of the red meat value chain; continuous product differentiation through packaging; value adding to the product in terms of vacuum packaging, aging and spicing for example as well as the increase in product branding especially in the retail sector during the last six to eight years.

Input and processing costs have increased throughout the whole value chain. These include increases in labour, packaging, transportation, farm feeds, intermediate goods, repair and maintenance. These increases in input costs also resulted in an increase in the PR price margin. However, in perfectly competitive markets where prices behave symmetrically, the opposite should also hold, i.e. as producer prices decrease together with other input prices (for example the diesel price), the retail prices and the price margin are also supposed to decrease in the same order, although this is often not the case.

It should, however, be emphasised that the price margin calculations in this study are based on national averages. Carcass prices differ regionally while retail prices not only differ regionally, but also between different retail groups and between retailers of the same group (outlets from the same retailer) in the same geographical area. Retail price differences will depend on how a specific retailer "balances" a carcass in terms of the pricing of the individual cuts, given the varying demand factors between regions.

Cointegration was found in both the beef and lamb producer price and the retail price, which indicates these prices share a certain type of behaviour in terms of their long-term fluctuations. It is, however, important to determine the nature of this relationship in terms of how prices are transmitted through the chain. The analysis performed show

that price transmission in the PR price relationship in the South African beef and lamb industries are asymmetric. This implies that a change in the price at one level of the chain does not transmit fully and immediately to the other level of the chain.

In the case of the beef market, the retail price responds to both positive and negative shocks in the producer price; while in the case of lamb, the retail price responds more significantly to negative than positive shocks at producer level. However, in both the beef and lamb markets, the retail price will react faster when the profit margins are squeezed rather than stretched.

The speed of adjustment towards equilibrium in terms of negative shocks in the margin is greater for beef and lamb than for positive shocks, which imply that there is asymmetry with regard to the speed of price transmission between producer and retail prices of both beef and lamb. In other words, the speed of change in the producer prices of beef and lamb does not translate to the same speed of change in the retail prices. Thus, there is proof of both asymmetry in the speed and the magnitude of price transmission in both the beef and lamb value chains.

Another concern or perception, especially amongst red meat producers, is that prices are set by retailers. The causality tests performed in this study proved that market influence could flow either way, that is, there is a bi-directional causality between the producer and retail price for beef. In other words, in the case of the beef value chain, producer prices influence retail prices but, depending on the market situation, the retail price can also influence the producer price. On the other hand, the result shows that producer price influences retail price in the lamb market and not *vice versa.*

To interpret these findings, it is important to know how these markets differ from each other in terms of supply and demand variability throughout the year. When the supply of meat is low, producer prices will influence retail prices. Sheep is a scarce commodity (especially in recent years) throughout the year, which puts pressure on the supply side of the market. Beef, on the other hand, varies in terms of supply, depending on seasonal factors, for example the calving season, which explains the bi-directional causality between the producer and retail price for beef.

From the literature reviewed (see section 4.4), it is clear that asymmetric price transmission (APT) is not uncommon, especially in agricultural or food product markets. There are a number of possible reasons for APT; these include menu/adjustment cost[13], inventory costs[14], the fear of price wars, concentration at retail level, non-competitive imperfect markets, political intervention, asymmetric information flow, the number of intermediaries within the value chain, transport and transaction cost, market power, increasing returns to scale in production, product homogeneity and differentiation, exchange rates, and border and domestic policies.

Although not all of the above is applicable to the South African red meat industry, a few can be identified as contributors towards APT. Firstly, for a value chain to function efficiently there has to be timely and accurate information flow in the value chain, not only in terms of price information but also product information to all the role-players, including the consumer. The South African red meat value chain does not, in its current state, relay the message of consumer preferences regarding product quality, consistency in quality palatability etc. from the consumer to the producer. A second contributor to APT is menu cost. Menu cost is the physical action to change product prices on packaging. Thirdly, coupled with menu cost is inventory cost, where retailers first clear products (bought at a higher price) before adjusting prices downwards. Lastly, the number of intermediaries within the value chain, as well as increasing transport and transaction costs, also creates APT conditions.

In addition to above mentioned issues there exists a serious need for value adding to the South African red meat classification system in order to inform consumers of the quality attributes of red meat, specifically with regard to eating quality and carcass traits determining eating quality. Currently, consumers perceive the abattoir roller mark as a trait of healthy meat because of the fact that the animal was slaughtered at an abattoir; however, this is not always the case. Transparency with regard to information, especially product price information, is also crucial for the efficacy and efficiency of the value chain as a whole.

[13] The cost of changing nominal prices of goods, printing catalogues, dissemination of information about price changes, and cost of inflation.
[14] Price changes due to input price changes.

CHAPTER 5

Case Study: Free State Province

5.1 Introduction

In this section a value chain methodology is used that was developed for the Southern African Development Community (SADC) on the Promotion of Regional Integration in the SADC Livestock Sector (PRINT) for the delivery and testing of a methodological package for a Value Added Information and Management System (VAIMS)[15] (SADC 2009). The methodology was derived from the different approaches to value chain analysis discussed in chapter 2.

This section presents an analysis of the case study in the FS province, and includes the mapping as well as the quantification of the cattle and sheep value chains in the FS province.

5.2 Background on the survey area

The FS province was chosen because of the diversified nature of farming activities in the province in terms of livestock production, especially in terms of cattle and sheep production. The FS province has the largest number of farming units in the country (Figure 5.1), followed by the Western and Northern Cape. The FS province produces 26.4 % of the nation's field crops and 15.9 % of the nation's animals on 10.6 % of the land area of South Africa. Gross farming income in the FS province amounted to R 11.9 billion (15 % of national total) in 2007. In terms of animal numbers, 16.9 % of the total cattle herd and 19.9 % of the total sheep herd are found in the province. Agriculture in the FS employs 3.4 % of the province's population, with the average farmer employing 7.2 full time and 6 part time workers (Stats SA 2009).

[15] The project was funded by the 9th European Development Fund. The author of this document played a pivotal role in the development of the methodology. Project Accounting #: 9 ACP SAD 002-10.

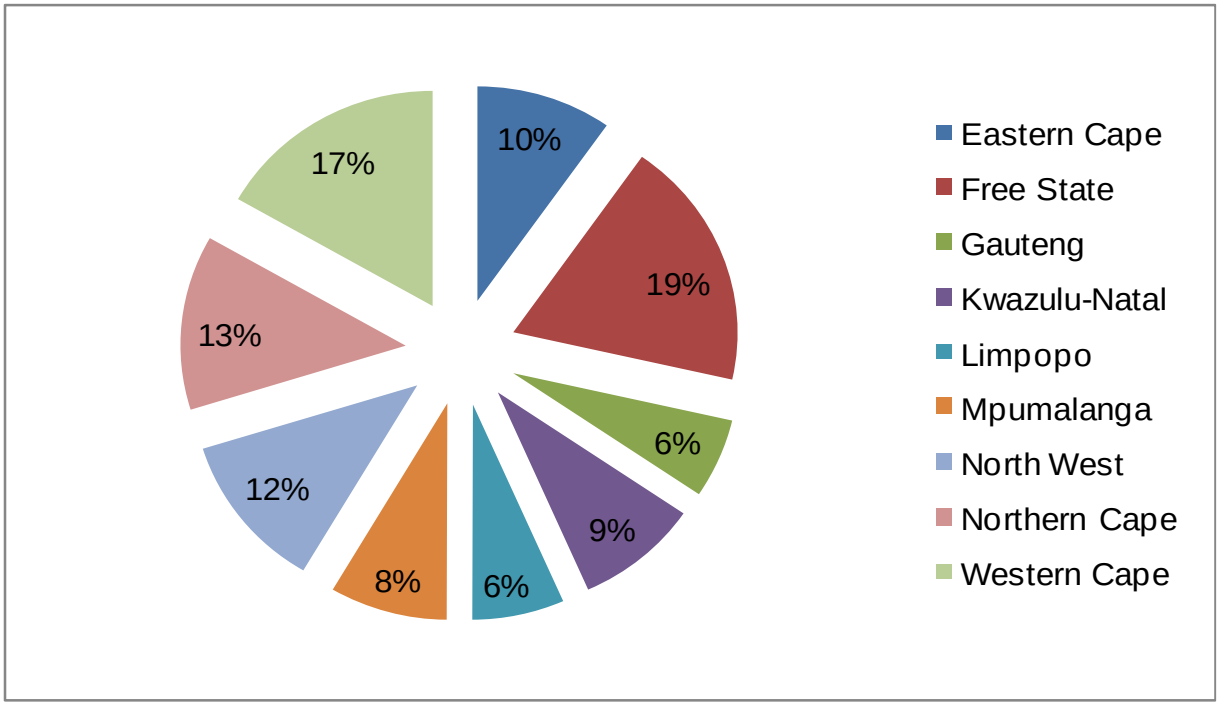

Figure 5.1: Distribution of farming units in South Africa
Source: Stats SA 2009

5.2.1 Sample

As a starting point, a random sample was drawn from a list of red meat producers provided by the Free State Red Meat Producers Organisation (FSRPO) as well as a number of farmers' associations and groups throughout the province. A total of 745 producer contact names and numbers were obtained to populate the sample. A Short Message Service (SMS) text message was sent to these producers to inform them about the survey and they were asked to provide assistance if they were contacted for an interview. Producers were then contacted individually to schedule interviews, which took place during February and March 2010, and data collected applicable to the 2009 production season.

There were 7,515 farming units in the FS province in 2007 (Stats SA 2009). This does not, however, imply that there is the same number of producers. This is mainly due to the fact that in most cases, farmers own more than one farming unit. Producers registered as members of Free State Agriculture totalled 4,556.

Figure 5.2 provides a map of the survey area and indicates the number of commercial producers interviewed in the different regions of the province. A total of 143 producers were surveyed (i.e. 19% of the producer list compiled). These producers are all commercial livestock producers, a smaller sample of smallholder producers was also surveyed and the results calculated separately. This was done because of the substantial differences between these groups of producers or sectors. The results for the smallholder producers surveyed are shown in section 5.4.

When selecting a sample for the downstream linkages in the value chain, it is important to consider the geographical composition of the area surveyed. There might be only a small number of abattoirs in the region servicing a large number of producers and hence also only a small number of butcheries and retailers. This is especially true in the case of the small rural towns of the FS province. As shown previously, according to the Red Meat Abattoir Association (RMAA 2009), there are approximately 20 high throughput and 61 low throughput abattoirs in the province. There are approximately 2.38 million cattle and 4.98 million sheep in the province, with 4 feedlots with standing capacities exceeding 10,000 animals.

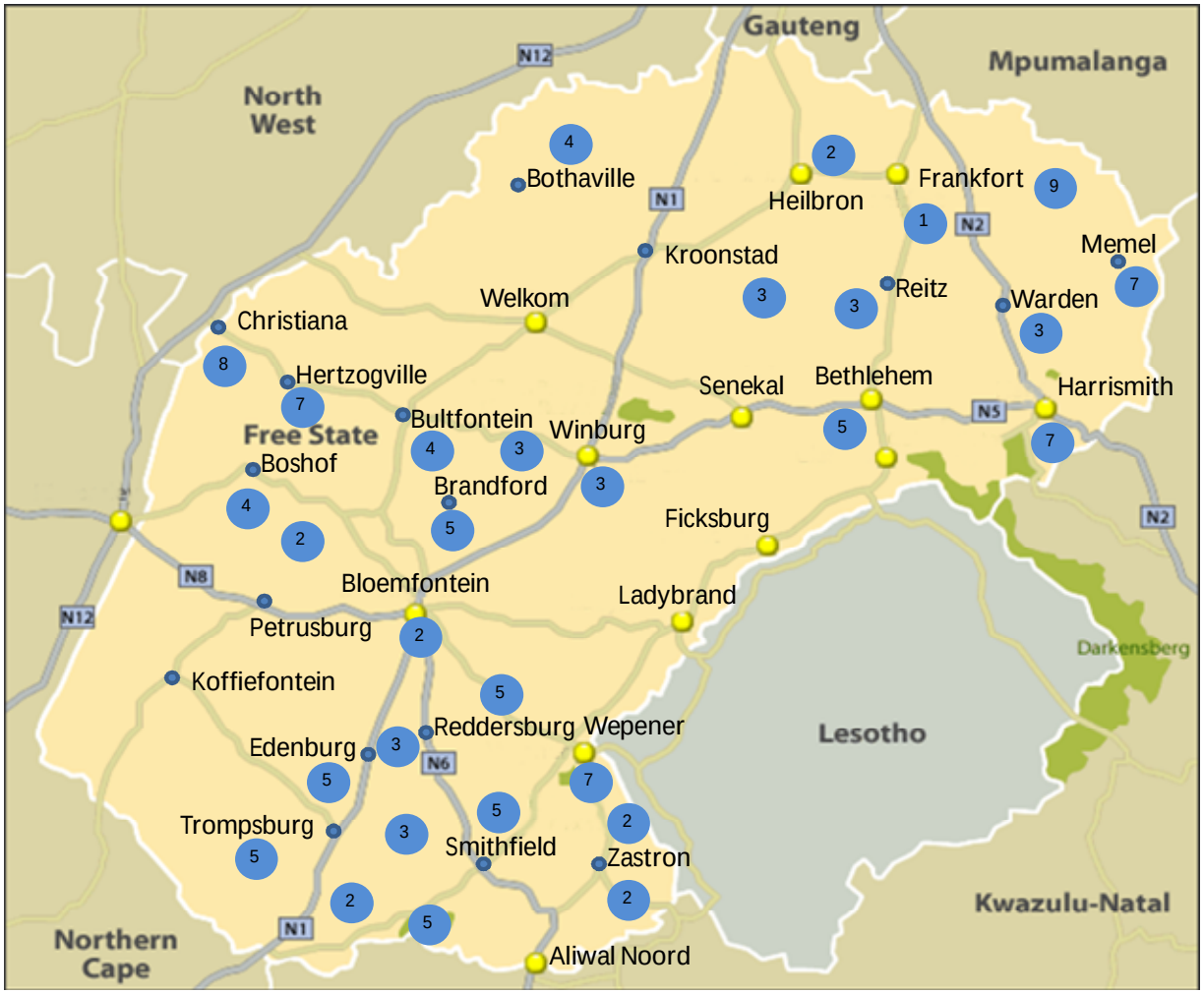

Figure 5.2: Distribution of respondents surveyed

5.2.2 Data collection

For this case study, primary data was captured by means of personal interviews conducted by post-graduate students in the Department of Agricultural Economics at the University of the Free State during February and March 2010.

The following section provides a basic overview of the type of information that the questionnaires obtained. The questionnaires used for the different segments in the value chain are available in the Annexure.

5.3 Commercial livestock producers

The aim of the survey was to collect primary data with regard to the operations of livestock (cattle and sheep) producers in the FS province in order to better understand their production practices, to evaluate the linkages with other downstream segments in the value chain, and to identify constraints and ways to improve the efficiency or performance of the value chain.

The livestock producer questionnaire was divided into the following seven sections:

- General household information,
- household assets and activities,
- detail of livestock operations,
- livestock purchases and sales,
- cost of production,
- infrastructure; and
- miscellaneous information.

The following sections provide the results on the data collected for the commercial cattle and sheep producers in the FS province.

5.3.1 General household information

This section provides an overview of the demographics of the respondents interviewed and provides a broad description of the producer dynamics in the FS province. The general household information is shown in Table 5.1. It is evident that the majority of respondents' main source of income is from farming activities (96 %), the average age of producers interviewed is 46 years, producers received an average of 13 years of schooling and have been living in their respective regions for an average of 29 years, of which 23 years were spent actively farming. The majority of respondents (56 %) indicated that they have at least some kind of training in farming activities.

Table 5.1: General household information

Item	%		
Household head	97		
Male	98		
Married	88		
Farming as primary activity	96		
	Min	**Ave**	**Max**
Number of people in household	1	3	6
Respondent's age (years)	23	46	76
Years of schooling	12	13	22
Years in region	1	29	72
Years actively farming	1	23	59

5.3.2 Household assets and activities

Table 5.2 provides detail on the portion of income generated from various agricultural practices during the survey production year (2009), the year prior to the survey production year (2008) and five years prior to the survey production year (2004). This was done to determine whether there has been a shift in the major income-generating activities over time and to indicate whether livestock activities have been increasing or decreasing over time. From Table 5.2, it is evident that the main contributor towards respondents' income during the past five years has been from livestock operations (60 % in 2009), followed by crop production (35 % in 2009). There has been no significant change in the income-generating activities since 2004. In terms of livestock production, 89 % of respondents indicated that they own cattle while 72 % own sheep.

Table 5.2: Income distribution from various activities for the FS (%)

Activity	2009	2008	2004
Livestock production	59.9	59.9	59.8
Crop production	34.7	35.2	35.2
Off-farm employment	0.2	0.15	0.15
Own business (non-farm)	1.8	1.8	1.9
Other	2.5	2.9	3.01

In order to determine whether there are geographical differences within the province, the province was sub-divided into four regions. These regions consist of the North-Eastern Free State (NEFS), the Southern Free State (SFS), the Western Free State,

(WFS) and the Central Free State (CFS). For a detailed list of towns surveyed in the respective regions, see Appendix Table A1. Although 60 % of income generated in the FS province was from livestock activities (Table 5.2), there are some clear differences when looking at the various regions of the province. From Table 5.3, it is clear that the NEFS and the SFS are mainly livestock production areas, while the WFS and CFS are mainly crop production areas.

Table 5.3: Income distribution from various activities for various regions of the FS for 2009 (%)

Activity	NEFS	SFS	WFS	CFS
Livestock production	**53.0**	**84.1**	40.1	36.2
Crop production	42.7	10.3	**53.3**	**56.4**
Off-farm employment	0.4	0.0	0.0	0.0
Own business (non-farm)	1.7	1.4	4.3	0.0
Other	2.1	4.2	0.0	2.8

Table 5.4 shows the variability in farm size for the FS Province as well as regional comparisons in farm sizes. For the FS province as a whole, farm sizes varied between a minimum of 124 ha to a maximum of 16,500 ha for privately-owned land with an average of 2,703 ha and a median of 1,700 ha. Rented land averaged 727 ha with a median of 200 ha. The maximum number of hectares rented was 5,300 ha. When comparing the average farm size on a regional level in terms of own land, the SFS has the largest average farming unit (3,393 ha) followed by the WFS (2,914 ha). Also in terms of rented land, the SFS has the largest average farm size (1,008 ha), followed by the CFS (685 ha).

Table 5.4: Farm size for the FS province

Free State	**Size (ha)**			
Land ownership	**Min**	**Ave**	**Max**	**Median**
Own	124	2703	16500	1700
Rented	0	727	5300	200
Free State regions	**Average size (ha)**			
Land ownership	**NEFS**	**SFS**	**WFS**	**CFS**
Own	1804	3933	2914	2242
Rented	668	1008	421	685

Employment numbers as well as monthly remuneration figures for full-time and part-time employees is shown in Table 5.5. On average, respondents employ 8.6 full-time male and 0.32 full-time female employees at an average monthly cost of R 1,335 and R 1,193 respectively. Respondents mainly make use of part-time employees during busy times for crop production practices (harvesting and planting) and sheep production enterprises (sheering season), hence the lower numbers of 0.6 and 0.5 male and female employees respectively. Part-time employees are usually appointed on a daily or monthly basis and average remuneration is R 1,261 and R 633 for male and female employees respectively.

Table 5.5: Employment and remuneration for the FS province

	Min	**Ave**	**Max**
Full-time employees			
Male	1	8.6	84
Female	0	0.32	6
Part-time employees			
Male	0	0.6	10
Female	0	0.51	30
Average remuneration R/month			
Full-time employees			
Male	1200	1335	4000
Female	600	1193	2000
Part-time employees			
Male	250	1261	1500
Female	100	633	900

There is little variation in terms of regional employment numbers, compared to the average for the province (Table 5.6). The CFS is slightly higher in terms of permanent employment numbers for male (12.44) and female (1.06) as well as in terms of permanent male remuneration (R 1,487/month).

Table 5.6: Average full-time employment and remuneration for various regions of the FS province

	NEFS	SFS	WFS	CFS
Number				
Male	8.13	7.84	8.77	12.44
Female	0.09	0.36	0.18	1.06
Remuneration R/month				
Male	1341	1245	1397	1487
Female	1230	1151	1230	1147

Table 5.7 shows the main breeds utilised by commercial farmers during recent years. In terms of beef breeds, the Bonsmara (36 %) is the most popular, followed by crossbred cattle (22 %). In terms of sheep, the most popular breeds include Merino (33 %) and Mutton Merino (33 %), followed by the Dohne Merino (18 %).

Table 5.7: Cattle and sheep breeds utilised

Cattle breeds	%	Sheep breeds	%
Bonsmara	34	Merino	33
Crossbreed	21	Mutton Merino	33
Simbra	8	Dohne Merino	18
Simmentaler	5	Dorper	7
Angus	4	Dormer	2
Bovelder	4	Letelle	2
Drakensberger	4	Meatmaster	2
Afrikaner	3	Afrino	1
Beefmaster	3	Landskaap	1
Brahman	2	Van Rooy	1
Brangus	2		
Braunvieh	2		
Charolois	2		
Hereford	2		
Nguni	2		
Sussex	2		
Gelbvieh	1		
Hugenote	1		

5.3.3 Detail of livestock operations

This section shows the herd/flock dynamics in terms of average animal numbers for the 2009 production season (Table 5.8). Adult females contribute 45 % and 44 % to the total cattle herd and sheep flock respectively, while young female animals contribute 13 % of the cattle herd and 11 % in the case of the sheep flock. The total representation of breeding females (younger female animals used for breeding purposes and adults) in the cattle herd is 58 % and 55 % in the sheep flock. Calves and lambs accounted for 36 % and 41 % of the total respective herds/flocks. In the case of cattle, this figure is slightly lower than the estimated national average of 65 %.

Depending on the source (sources vary due to the lack of reliable or accurate information), the national calving percentage, defined as the number of calves born per active adult female animal, for the commercial sector ranges from 55 % to 65 %. Some sources indicate levels as low as 45 % and as high as 80 % in some cases. Given the abovementioned, it is clear that there is a high level of variance between different sources. Scholtz and Bester (2008) estimated the national commercial calving percentage at 60 8 %. However, in this study, the commercial calving percentage for the FS province is calculated at 80 % (Table 5.8), which is relatively higher than the estimated national average of between 55 % and 65 %. This above-average calving percentage for the FS province could be attributed to a number of factors, including better management practices, better genetic material and good pasture management. Given the national commercial averages for lambing percentage at 102 % (GADI, 2010), the average lambing percentage for the FS province is slightly lower at 93 % (Table 5.8).

Table 5.8: Herd/flock dynamics for the FS

	Animal numbers (head)		Percentage of total	
Stock: 2009 production season	**Cattle**	**Sheep**	**Cattle**	**Sheep**
Adult female	296	1182	45	44
Young female	83	291	13	11
Young males	11	31	2	1
Breeding bulls/rams	18	33	3	1
Calves/lambs born in the last 12 months	236	1099	36	41
Castrated males	17	35	3	1
TOTAL	**661**	**2671**	**100**	**100**
Calving/lambing percentage	80	93		
Replacement rate* (%)	28	25		

*The ratio between young and adult female animals.

When looking at the regional variations in the province in terms of herd dynamics, it is evident from Table 5.9 that there is little variation in terms of production efficiency (expressed as calving percentage) between the regions. In terms of the average animal numbers for the 2009 production season, the main contributor is the NEFS (958 head/producer) followed by the CFS (596 head/producer).

Table 5.9: Herd dynamics for the different regions in the FS

	Average animal numbers (head)			
Stock 2009 production season	**NEFS**	**SFS**	**WFS**	**CFS**
Adult female	426	237	286	247
Young female	177	56	65	56
Young males	45	12	69	7
Breeding bulls	34	11	12	11
Calves born in the last 12 months	332	192	212	191
Castrated males	126	14	38	74
TOTAL	**958**	**474**	**565**	**596**
Calving percentage	78	81	74	77

Unlike in the case of cattle numbers, there are notable variations in the flock dynamics on a regional level, especially in terms of lambing percentages (Table 5.10). The NEFS and the SFS have relatively high lambing percentages with 97 % and 96 % respectively compared to the CFS (79 %) and the WFS (72 %). The SFS is by far the biggest contributor in terms of average animal numbers in the province with 4,761 head per

producer, indicating that this part of the province is mainly utilised for sheep production. The SFS had the smallest contribution towards cattle numbers in the province; this is mainly due to the natural resource availability.

Table 5.10: Flock dynamics for the different regions in the FS

	Average animal numbers (head)			
Stock 2009 production season	**NEFS**	**SFS**	**WFS**	**CFS**
Adult female	510	2111	605	442
Young female	165	601	101	105
Young males	46	100	33	0
Breeding rams	19	55	15	14
Lambs born in the last 12 months	497	2020	439	348
Castrated males	184	486	10	40
TOTAL	**1261**	**4761**	**982**	**887**
Lambing percentage	97	96	72	79

Table 5.11 indicates the average cattle and sheep purchases, animal sales, home consumption, animal losses as well as purchase and sales prices for the 2009 production season. It is clear from Table 5.11 that animal sales exceed animal purchases by a large extent. Total cattle purchases averaged 33 head (5 %) compared to average sales of 199 head (30 %). Total sheep purchases averaged only 6 head (0.2%) compared to average sales of 696 head (26 %). The largest contributor towards animal sales is weaner calves (133 head) and lambs (416 head) for cattle and sheep respectively. This phenomenon is typical of commercial livestock farming in South Africa, a fact which is also emphasised by comparing the purchase and sales prices of the animals. Average purchase prices exceed selling prices, which implies that when producers purchase animals, a premium above slaughtering price is paid. This is mainly due to the fact that producers purchase genetically superior animals at a higher price in order to increase the genetic ability/base of their own herds.

Home consumption levels of cattle are relatively low at an average of 0.4 animals per annum, with home sheep consumption at an average of 3 animals per annum. Cattle losses are relatively low (3.9 animals per annum or 0.6 % of the total herd) compared to that of sheep with an average annual loss of 66.9 animals (2.5 % of total herd). In the case of cattle, these losses are mainly due to disease (58 %) and deaths due to calving

difficulties, while sheep losses were mainly due to predation (44 %), disease (39 %) and theft (10 %).

When Table 5.11 is compared to the herd/flock dynamics (Table 5.8), it can be argued that producers are currently (at the time of the study) in a herd/flock building phase, as only 5 % of young female animals are being sold in the case of cattle and 11 % in the case of sheep.

Table 5.11: Animal purchases/sales, home consumption and losses during 2009

Type	Animals purchased (head)	Purchase price /animal (R)	Animals sold (head)	Sales price /animal (R)	Consumed at home (head)	Animals died (head)
Cattle						
Adult female	4.6	5868	30.7	5078	0.2	2.3
Young female	1.8	6024	3.9	3806	0.1	0.2
Young males	0.0		6.1	4375	0.0	0.0
Breeding bulls	0.4	23619	2.7	12312	0.00	0.02
Calves born in the last 12 months	17.2	3279	133	3455	0.06	1.3
Castrated males	9.6	2950	23	4483	0.05	0.1
TOTAL	**33**	**41740**	**199**	**33510**	**0.4**	**3.9**
Sheep						
Adult female	4.1	633	135	759	1.60	12.9
Young female	0.8	650	23	540	0.02	1.7
Young males	0.03	6500	32.1	1094	0.32	0.08
Breeding rams	0.8	5900	19	1442	0.00	5
Lambs born in the last 12 months	0.8	460	416	611	0.72	47.2
Castrated males	0		71	699.	0.25	0.07
TOTAL	**6.4**	**14143**	**696**	**5145**	**3**	**67**

Respondents were asked to identify their current breeding (expansion) strategies given a number of options, including:

- increasing breeding herd/flock;

- decreasing breeding herd/flock;
- keeping breeding herd stable;

and current breeding (growth) strategies including:

- increasing surplus (off-take);
- decreasing surplus;
- keeping surplus stable.

It was found that 52 % of respondents indicated that they are increasing their breeding herds/flocks while 45 % are keeping their breeding herds/flocks stable. In terms of growth strategies, 86 % of respondents indicated that they aim to increase surpluses during the next few years, which implies a probable increase in productivity.

5.3.4 Livestock purchases and sales

This section of the survey was aimed at obtaining qualitative information regarding animal purchases and sales, and included information pertaining to the:

- frequency and the most important time of the year for purchases and sales;
- weight of animals purchased/sold;
- purchased from/sold to whom;
- point of purchase/sale;
- form of payment; and
- reasons for sales and purchases.

Livestock purchases mainly take place during the second half of the year, with August to October being the most important months. Livestock sales are spread more evenly throughout the year with three main peak periods; January to March, June to July, and September to December. Both cattle and sheep purchases are predominantly made from commercial farms, either at farm gate or through the auction system. All payments are in the form of spot cash payments. No purchases take place in the form of contracts while less than 2 % of sales are done with the use of contracts. It was found that 14 % of respondents use agents periodically for purchases while 73 % of respondents make use of agents for animal sales on a periodic basis. For purchases,

respondents pay an average premium of 5.25 % for cattle and 5.15 % for sheep, while for sales, a premium of 5.13 % and 4.95 % is paid in the case of cattle and sheep respectively. Table 5.12 and Table 5.13 provides purchase and sale prices, purchase and sale weights as well as purchase and sale prices per kg for live cattle and live sheep respectively. As mentioned, the purchase price for both cattle and sheep exceeds the selling price. This proves that producers pay premium prices for breeding animals, especially in the case of breeding bulls and breeding rams.

Table 5.12: Live cattle purchase and sales prices and average purchase and sales weights

	Price/animal		Average weight		Price/kg	
Live animals	**Purchase**	**Sales**	**Purchases**	**Sales**	**Purchases**	**Sales**
Adult female	5868	5078	464	511	12.65	9.94
Young female	6024	3805	313	312	19.25	12.20
Young males	*	4375	199	287	*	15.24
Breeding bulls	23619	12312	756	704	31.24	17.49
Calves born in the last 12 months	3279	3455	199	254	16.48	13.60
Castrated males	2950	4483	199	287	14.82	15.62

* No purchases or sales indicated by respondents.

Table 5.13: Live sheep purchase and sales prices and average purchase and sales weights

	Price/animal		Average weight		Price/kg	
Live animals	**Purchase**	**Sales**	**Purchases**	**Sales**	**Purchases**	**Sales**
Adult female	683	669	58	58	11.71	11.45
Young female		556	35	40	*	14.04
Young males	6500	764	*	*	*	*
Breeding rams	6432	1508	89	80	72.36	18.91
Lambs born in the last 12 months	*	608	40	46	*	13.12
Castrated males	*	715	*	40	*	17.98

* No purchases or sales indicated by respondents.

Figure 5.3 depicts the weekly FS beef producer prices per class during the survey period (2009). It is interesting to note the large variation in the different carcass classes during the first two quarters of the year compared to the second two quarters of the year. For example the variation between the A2/A3 carcass price and the C2/C3 carcass price had a maximum of 41 % during week 15 to 18 and a minimum of 12 %

during week 47 to 49. The average provincial difference between the A2/A3 and the C2/C3 price for beef was 24.4 % during 2009 compared to a national average of 20 % during the same time (Table 5.15).

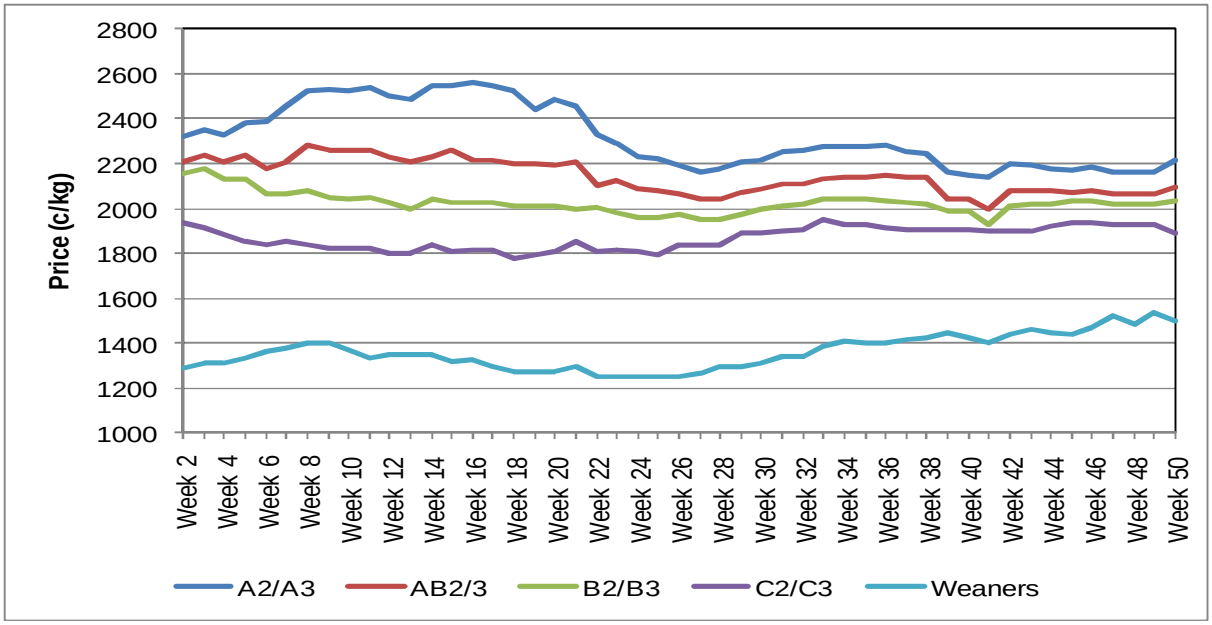

Figure 5.3: Provincial (FS) nominal beef producer prices per class (2009)

The maximum, average, minimum as well as the standard deviation in the various carcass class prices for the FS province (for the survey period) are given in Table 5.14. The A2/A3 price deviated the most from the mean (R 1.42) followed by the weaner (78 c) and AB2/AB3 (76 c) price. Table 5.15 shows the variation in the price of the various carcass classes from the A2/A3 carcass price, both nationally and provincially (FS). It is interesting to note that on a provincial level, prices are more variable for all the carcass classes.

Table 5.14: Provincial (FS) beef carcass price variation per class (2009)

Item	A2/A3	AB2/AB3	B2/B3	C2/C3	Weaners
	Price (c/kg)				
Minimum	2137	2000	1930	1780	1250
Average	2319	2144	2025	1867	1363
Maximum	2560	2283	2173	1950	1535
Standard deviation	142	76	49	51	78

Table 5.15: Beef carcass price variation form A2/A3 price (%)

Classes	FS	SA*
AB2/AB3	8.08	5.74
B2/B3	14.5	10.63
C2/C3	24.4	19.92
Weaner	70.94	68.62

*Source: AMT 2010

Unlike in the case of beef, the price variations in the different classes of sheep carcasses were relatively constant during the survey period (2009). The variation between the A2/A3 carcass price and the C2/C3 carcass price had a maximum of 47 % during week 16 to 18 and a minimum of 30 % during week 36 to 39. The average provincial difference between the A2/A3 and the C2/C3 price for sheep was 35.8 % during 2009 compared to a national average of 29.6 % during the same time (Table 5.17). Note that there is not a national price available for feeder lambs (N/A).

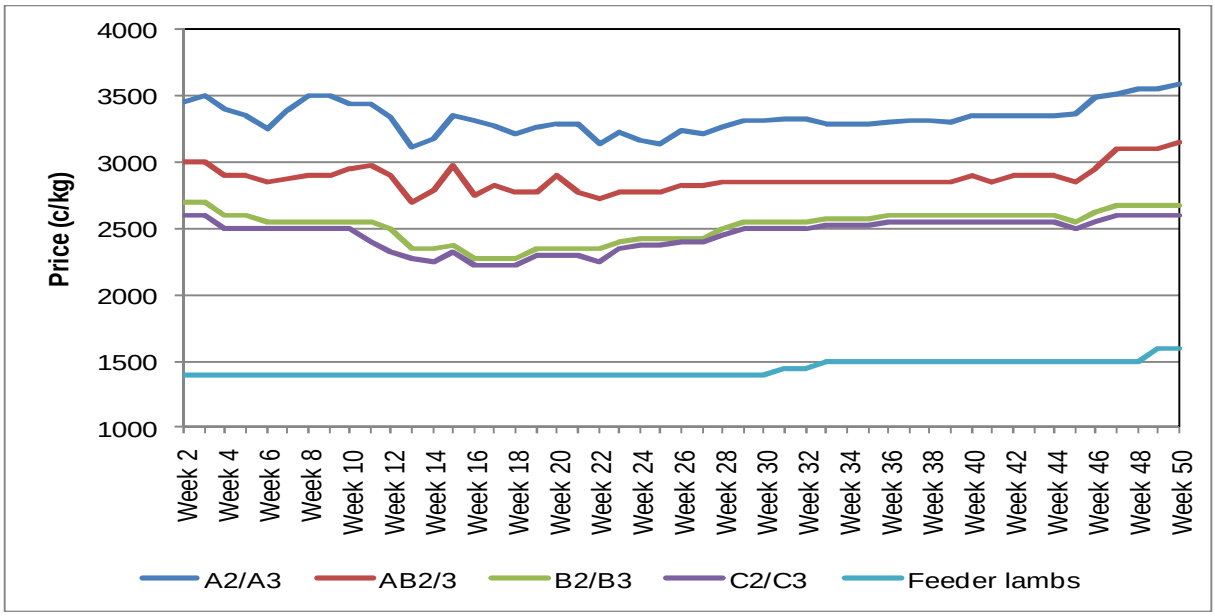

Figure 5.4: Provincial (FS) nominal sheep producer prices per class (2009)

Table 5.16: Provincial (FS) mutton and lamb carcass price variation per class (2009)

Item	A2/A3	AB2/3	B2/B3	C2/C3	Feeder lambs
	Price (c/kg)				
Minimum	3117	2700	2275	2225	1400
Average	3334	2878	2520	2458	1443
Maximum	3583	3150	2700	2600	1600
Standard deviation	112	97	120	118	57

Table 5.17: Sheep and mutton carcass price variation form A2/A3 price (%)

Classes	FS	SA*
AB2/AB3	15.87	13.89
B2/B3	32.44	14.98
C2/C3	35.84	29.62
Feeder lamb	131.29	N/A

*Source: AMT 2010

From Table 5.18, which shows the percentage of sales to the various markets, it is clear that the majority of adult female animals (51 %) are sold to abattoirs. In this case, it is mainly animals that have either underperformed in a herd/flock or have served their purpose and are being culled or replaced. Young female sales are evenly spread between commercial farms (for breeding purposes), brokers/traders (for resale), and feedlots (for finishing). Bulls are mainly sold to commercial farms (45 %) for breeding while 35 % are sold to abattoirs for culling. It was found that 41 % of castrated males are sold to abattoirs for slaughter while 49 % of weaner calves are sold to feedlots for finishing. As in the case of purchases, sales are also predominantly made by using spot cash transactions. As to the reason for purchases, almost all respondents indicated that it was to increase their herd/flock size and to improve the breed genetics while all sales were made for business purposes. It is interesting to note that very few of the commercial cattle sold in the FS province is being marketed through the auction system.

Table 5.18: Cattle sales to various entities (%)

Type	Commercial farms	Auction Yard	Broker/ trader	Abattoir	Butchery	Feedlot
Adult female	10	11	14	**51**	6	7
Young female	**33**	0	**33**	0	0	**33**
Bulls	**45**	5	5	35	5	5
Castrated/other males	0	6	24	**41**	12	18
Calves	7	7	14	21	2	**49**

As in the case of beef, the majority of sheep are marketed through the abattoir sector (Table 5.19), most of the breeding rams are marketed to commercial farms (44 %), while 36 % of lambs are marketed through the feedlot sector.

Table 5.19: Sheep sales to various entities (%)

Type	Commercial farms	Auction Yard	Broker/ trader	Abattoir	Butchery	Feedlot
Adult female	9	9	10	40	9	9
Young female	0	0	17	50	0	17
Breeding rams	44	11	6	28	0	11
Castrated/other males	9	0	27	45	9	6
Lambs	2	2	8	41	5	36

Figure 5.5 shows the attributes preferred by buyers of animals as perceived by producers on a regional level. The condition of the animal, the apparent weight (scales are not always available), the disease status and the age of the animal are the most important attributes preferred by buyers of live animals.

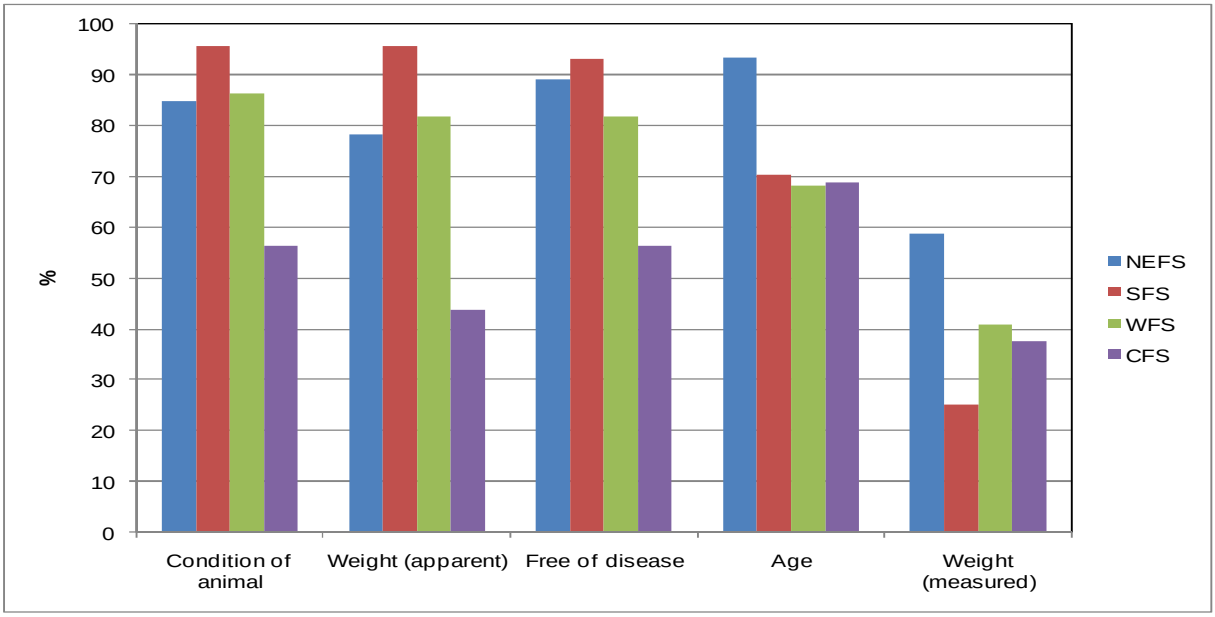

Figure 5.5: Preferred attributes by buyers

Table 5.20 presents the sources of information utilised by producers to determine cattle and sheep purchase and selling prices. The main source of information with regard to purchase and selling price for both cattle and sheep is non-official sources (third party and word of mouth) as well as cell phones (SMS) and price information obtained directly from the buyer or trader.

Table 5.20: Sources for purchase and sales price information

	Source of information									
Type	**Cell phone**	**Buyer /trader**	**e-mail**	**Gov**	**Printed press**	**Radio**	**TV**	**Ext. officer**	**Third party**	**Word of mouth**
	Purchases									
Cattle	**14.8**	**15.6**	0.8	0.8	**9.4**	4.7	1.6	10.2	**22.7**	**19.5**
Sheep	**16.5**	**14.2**	2.4	0.8	**7.1**	3.9	0	10.2	**24.4**	**20.5**
	Sales									
Cattle	**17.5**	**20.4**	1.0	0.5	**13.7**	6.2	1.4	11.4	**15.6**	**12.3**
Sheep	**18.3**	**17.8**	2.6	1.1	**11.0**	4.7	1.1	11.0	**17.8**	**14.7**

5.3.4.1 Off-take rate

It is important to consider the off-take rate for cattle and sheep as it is a good measure for production efficiency, not only between the commercial and the communal sectors

but also internationally. For the purpose of this study, off-take rate is defined as the number of animals marketed as a percentage of the total herd/flock. Jooste (2006) estimated the national off-take rate to be between 23 % and 25 % while Scholtz and Bester (2008) estimated the South African commercial beef off-take rate at 32 %; which is higher than the estimated national average of 25 % (RMRDT, 2008). This study estimates the off-take rate for the FS province at 33 % for the commercial sector (see Table 5.21) which is higher than the estimated 25 % (RMRDT, 2008) and more in line with the estimations of Scholtz and Bester (2008). This off-take rate compares well to counties like Australia (28 %), New Zealand (37 %), the EU (34 %), the US (38 %) and South America, including Argentina, Brazil, Paraguay, and Uruguay (20 %), (Scholtz and Bester 2008).

The national average off-take rate for the commercial sheep sector was estimated at 24 % (DAFF 2010). This study estimates the FS off-take rate for the commercial sheep sector at 34.8 %, which is relatively high when compared to the national average reported by DAFF 2010. There is only a small regional variation in the off-take rate of cattle which ranges from 29 % (NEFS) to 33 % (CFS). The regional variation in the off-take rate of sheep in the NEFS, SFS and the WFS are similar, while the off-take rate for sheep in the CFS is higher at 43 %.

Table 5.21: Off-take rates for the FS province

Type	Off-take rate (%)				
	NEFS	**SFS**	**WFS**	**CFS**	**FS ave.**
Cattle	29	31	31	33	33
Sheep	35	36	36	43	35

5.3.5 Costs of production

Table 5.22 represents the average production cost for cattle and sheep during the 2009 production season as well as a percentage breakdown of the various production cost components. From Table 5.22, it is evident that the major contributors towards production cost for both cattle and sheep are feeding expenses, followed by labour costs, land cost (rental) and fuel cost.

Table 5.22: Total average annual production cost

Item	Average cost (R)		% of average cost	
	Cattle	**Sheep**	**Cattle**	**Sheep**
Feeding expenses	204 502	89 012	**42.7**	**28.4**
Animal health	30 624	24 754	6.4	7.9
Labour costs	73 360	53 892	**15.3**	**17.2**
Electricity	13 259	16 206	2.8	5.2
Land costs (rental)	59 887	48 227	**12.5**	**15.4**
Spares	19 370	17 741	4.0	5.7
Water cost	3 720	1 206	0.8	0.4
Fuel cost	54 358	38 265	**11.3**	**12.2**
Other	20 276	23 998	4.2	7.7
Total average cost	**479 356**	**313 301**	**100**	**100**

An interesting finding in terms of regional variations towards contributions to production cost for beef (Table 5.23) and sheep (Table 5.24) is that the feeding cost for both cattle and sheep in the CFS and NEFS regions exceeds that of the other regions by a large extent. A probable reason for this is the higher stocking ratio (the number of animals per ha) which will lead to an increase in supplementary feeding in these regions, i.e. a more intensive production system.

Table 5.23: Total average annual production cost for cattle per region

Item	% of average cost			
	NEFS	**SFS**	**WFS**	**CFS**
Feeding expenses	50.2	24.4	33.0	71.5
Animal health	7.4	4.6	9.0	2.7
Labour costs	11.7	23.7	19.5	3.0
Electricity	1.7	3.1	4.9	2.7
Land costs (rental)	9.9	21.2	7.4	9.9
Spares	3.0	5.4	7.0	0.3
Water cost	0.2	0.7	1.3	2.3
Fuel cost	11.5	10.5	14.7	7.6
Other	4.4	6.4	3.3	0.0
Total	**100**	**100**	**100**	**100**

Table 5.24: Total average annual production cost for sheep per region

Item	% of average cost			
	NEFS	**SFS**	**WFS**	**CFS**
Feeding expenses	41.6	21.5	23.3	70.9
Animal health	8.5	8.2	8.1	5.4
Labour costs	14.0	19.6	16.6	2.0
Electricity	2.4	5.6	7.2	1.9
Land costs (rental)	8.0	18.2	14.9	8.5
Spares	2.4	7.0	6.6	0.4
Water cost	0.3	0.4	0.3	0.4
Fuel cost	9.8	12.7	17.7	5.5
Other	12.9	6.9	5.2	5.0
Total	**100**	**100**	**100**	**100**

The conversion factors used for converting the different animals into Large Stock Units (LSU) in order to render the analysis comparable are shown in Table 5.25. This was calculated by assuming that 1 LSU equals an animal unit of 450 kg.

Table 5.25: LSU conversion factors

Type	Cattle	Sheep
Adult female	1.08	0.13
Young female	0.69	0.08
Young males	0.54	0.08
Breeding bulls/rams	1.62	0.19
Calves/lambs born in the last 12 months	0.50	0.10
Castrated males	0.54	0.09

A breakdown of annual production cost, revenue and net income per LSU for the 2009 production season is presented in Table 5.26, from which it can be seen that in terms of net annual income generated, sheep performed only slightly better than cattle with a difference of only R 108 per LSU, given the aforementioned assumptions.

Table 5.26: Annual production cost, revenue and net income per LSU

Item	Average cost (R/LSU)	
	Cattle	**Sheep**
Feeding expenses	378	302
Animal health	57	84
Labour costs	136	183
Electricity	25	55
Land costs (rental)	111	164
Spares	36	60
Water cost	7	4
Fuel cost	100	130
Other	37	81
Total cost	**886**	**1063**
Total revenue	**1838**	**2123**
Total annual profit*	**952**	**1060**

* In this case profit is used in an accounting sense.

5.3.6 Infrastructure

The availability and condition of infrastructure plays an important role in the production process. It is therefore important to analyse the availability and quality of the infrastructure in the FS province. In this section, respondents were asked to rate their available infrastructure and animal handling facilities (Figure 5.6) on a scale from 1 to 9, with 1 being very poor and 9 being excellent. This was done in order to identify the various potential constraints within the production section of the value chain linked specifically to infrastructure.

When looking at Figure 5.6, it is clear that the general perception amongst commercial producers regarding the quality and availability of infrastructure is very high. The lowest average rating is 6.74 (out of a possible maximum of nine) for machinery and other equipment. Figure 5.7 shows that there is little variation in terms of perceived quality of infrastructure and handling facilities on a regional basis.

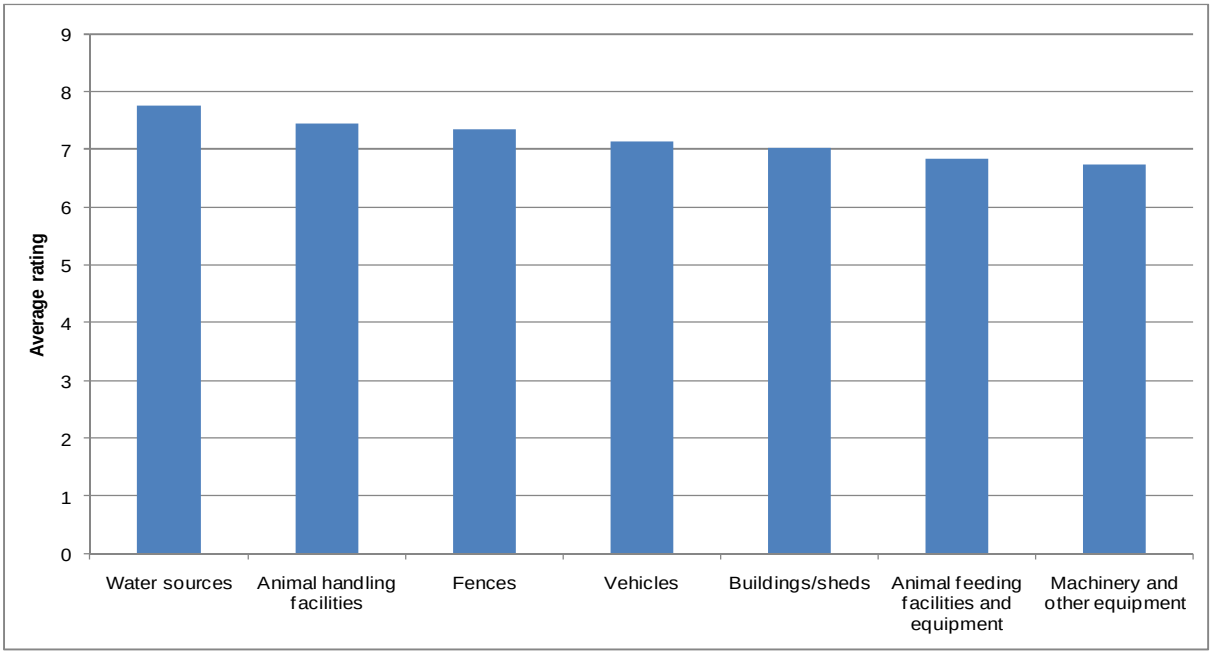

Figure 5.6: Perceived quality of infrastructure and handling facilities for the FS

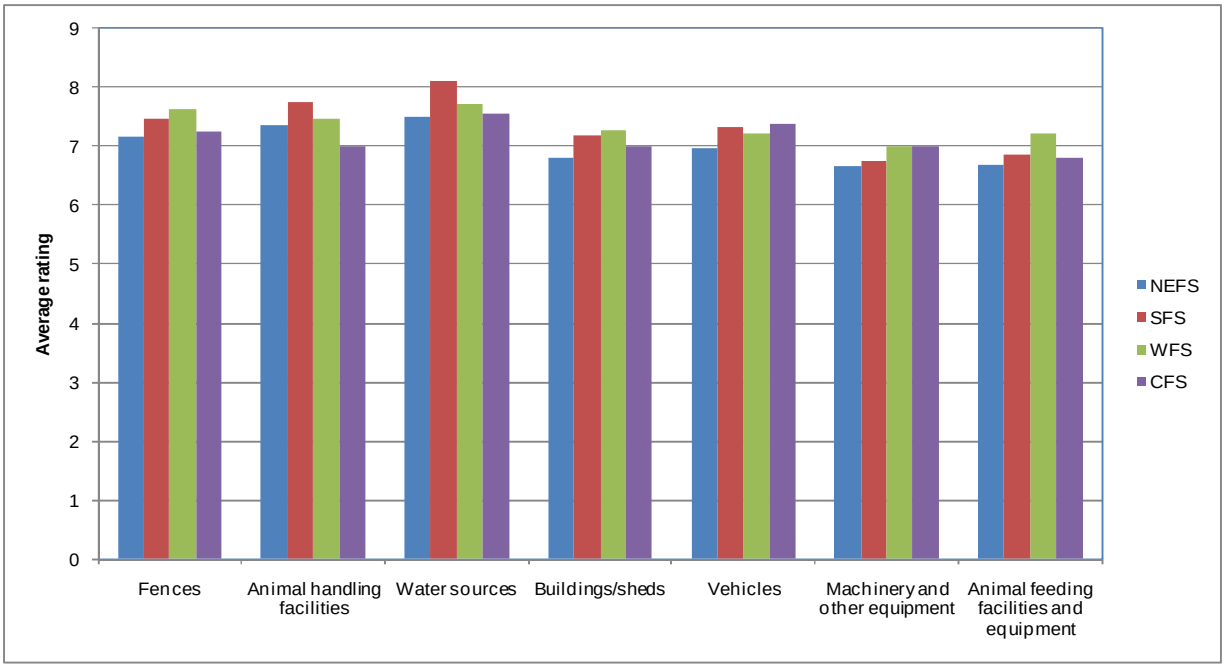

Figure 5.7: Perceived quality of infrastructure and handling facilities for the different regions

5.3.7 Miscellaneous information

In this section, respondents were asked to identify the type of information sources they utilised for various production practices (Table 5.27) and also to value the reliability of the information from 1 (being non-reliable) to 9 (being extremely reliable) (Figure 5.8). In addition to this, respondents were asked to rank their constraints and risks using the same scale. The same questions are asked in the downstream segments of the value chain in order to identify similarities in constraints and risks within the value chain as a whole.

From Table 5.27, it is evident that the main sources for information utilised by the respondents include printed press, a third party and word of mouth. An issue of concern is the fact that 17 % and 26 % of respondents indicated that they have no source of information on product standards and traceability respectively. This is emphasised when looking at the respondents' ratings with regard to the reliability of information (Figure 5.8), where risk management (5) product standards (4.2) and traceability (3.3) received the lowest rankings out of a possible maximum of 9.

Table 5.27: Main sources of information utilised (%)

Information sources						
Practices	**Extension officer/ government**	**Printed press**	**Third Party**	**Word of mouth**	**None**	**Other**
Production practices	4	**21**	**25**	**30**	5	15
Input use	5	**21**	**26**	**31**	4	13
Animal health issues	4	**20**	**25**	**32**	1	**18**
Markets (physical)	2	**22**	**27**	**29**	6	13
Price	6	**25**	**27**	**29**	0	14
Product standards	2	**23**	**22**	**26**	**17**	9
Traceability	2	**21**	**21**	**24**	**26**	6
Risk management	2	**21**	**24**	**29**	11	14

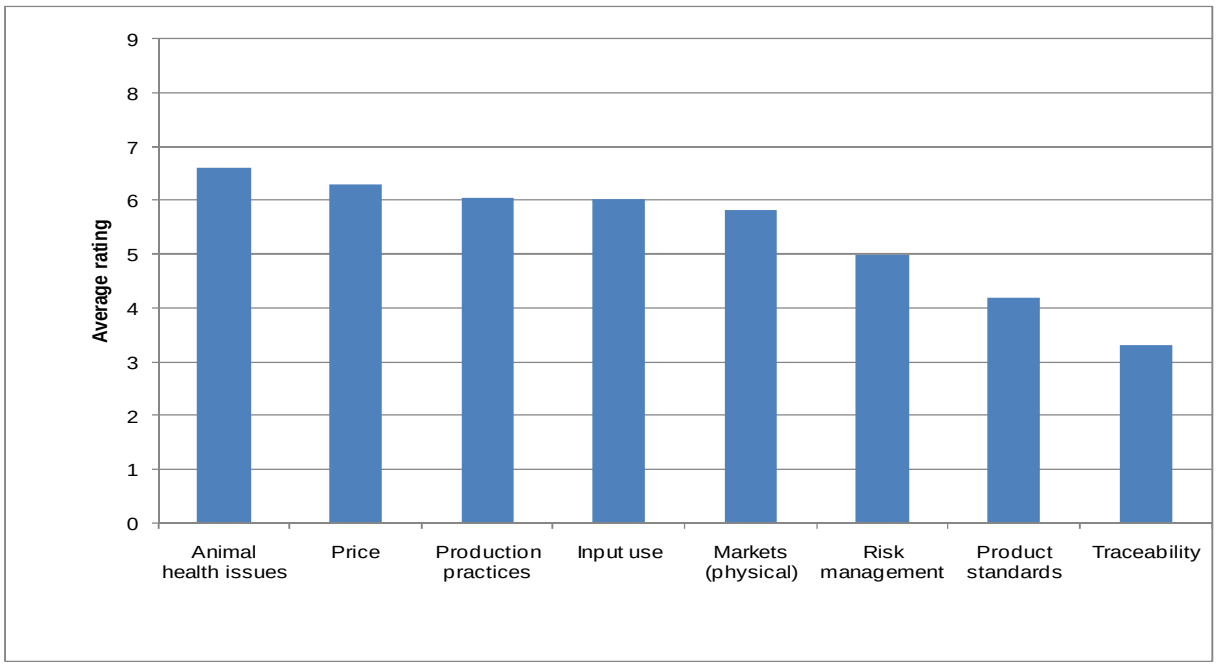

Figure 5.8: Perceived reliability of information in Table 4.27 for the FS

The regional variation in the perceived reliability of information is displayed in Figure 5.9. One interesting trend in the regional variation of perceived reliability in terms of the reliability of information is the fact that the CFS scores the lowest for most of the aspects included, especially in terms of traceability (which was below 1), risk management and product standards.

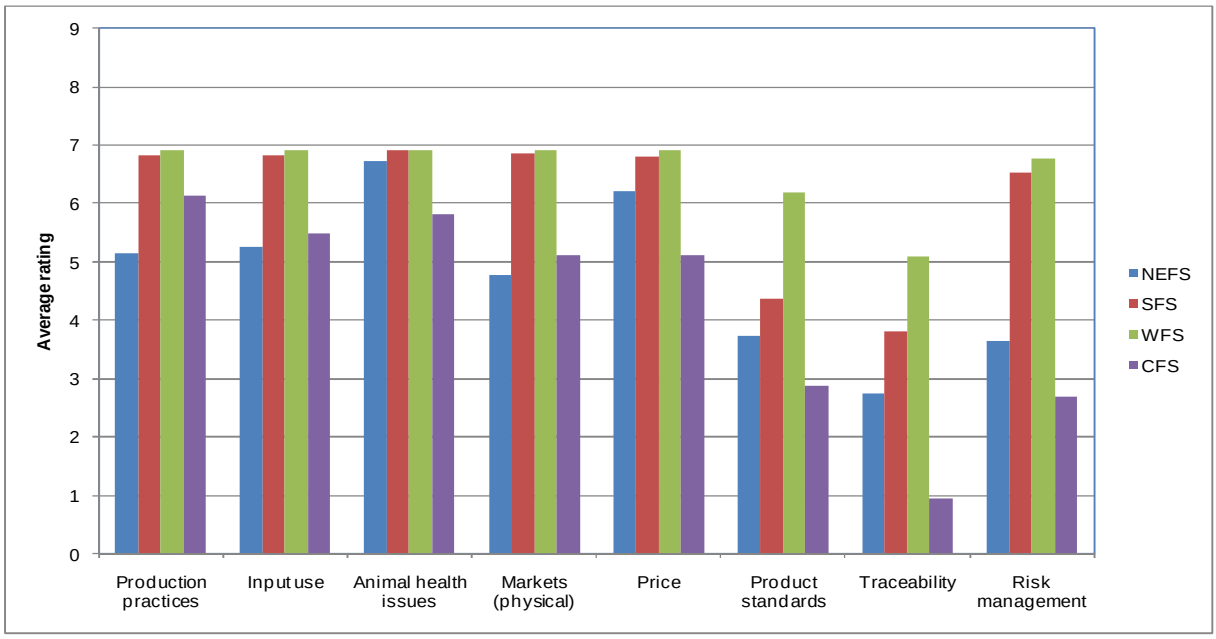

Figure 5.9: Perceived reliability of information for the different regions

In order to identify trends or changes in farming activities during the five years prior to the survey period, respondents were asked to answer either "yes" or "no" to the questions in Table 5.28. One notable change is that 83 % of respondents indicated that the productivity of their animals increased during the past five years, while 69 % of respondents indicated an increase in herd/flock numbers.

Table 5.28: Livestock business changes during the past five years (%)

Activity	Yes	No
More animals in herd/flock	69	31
Higher productivity of animals	83	17
Greater use of technology (breeding, AI, etc)	65	35
Diversification of herd/flock (raising of other types of animals)	59	41
Diversification of business activities (raising feed, slaughter for business purposes)	37	63
Specialisation of livestock activities (e.g. breeding for larger farmers)	8	92

To test the respondents' perceptions on risks and constraints, they were asked to rank a number of possible constraints and risks from 1 (biggest constraint/risk) to 5 (smallest constraint/risk). Table 5.29 and Table 5.30 show the results expressed as a percentage of total responses, i.e. in the case of variability in prices (Table 5.29 and Figure 5.10). It was found that 62 % of respondents ranked this as their biggest constraint/concern; low productivity levels also received high rankings. In the case of risks (Table 5.30 and Figure 5.12), respondents indicated high rankings for the unpredictability in climatic conditions as well as for predation.

Table 5.29: Ranking of constraints expressed in percentage terms

Constraint	Rank				
	1	**2**	**3**	**4**	**5**
Variability in prices	**60**	**25**	4	4	3
Low productivity levels	**24**	**42**	19	6	2
Access to markets	3	14	29	28	17
Access to credit	2	6	18	23	30
Access to inputs	5	8	16	25	29
Access to information	5	5	16	14	19

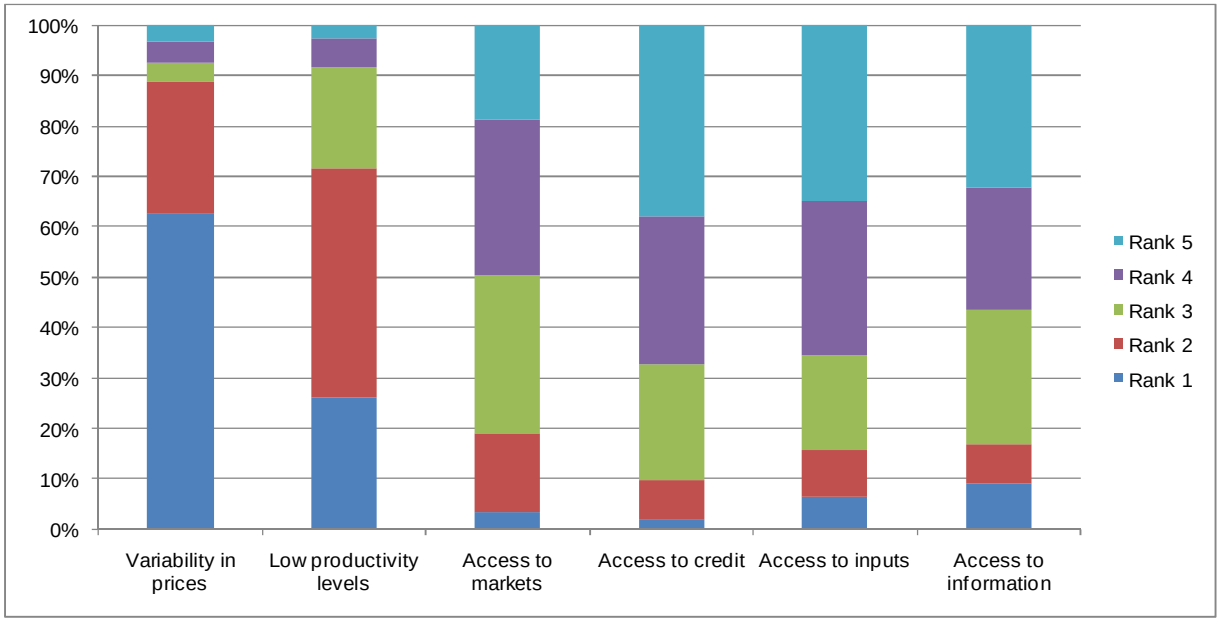

Figure 5.10: Ranking of constraints for the FS

In terms of regional perceptions regarding constraints amongst producers, the NEFS, SFS as well as the CFS ranked variability in prices as the biggest constraint, while producers in the WFS ranked low productivity levels as the biggest constraint (Figure 5.11).

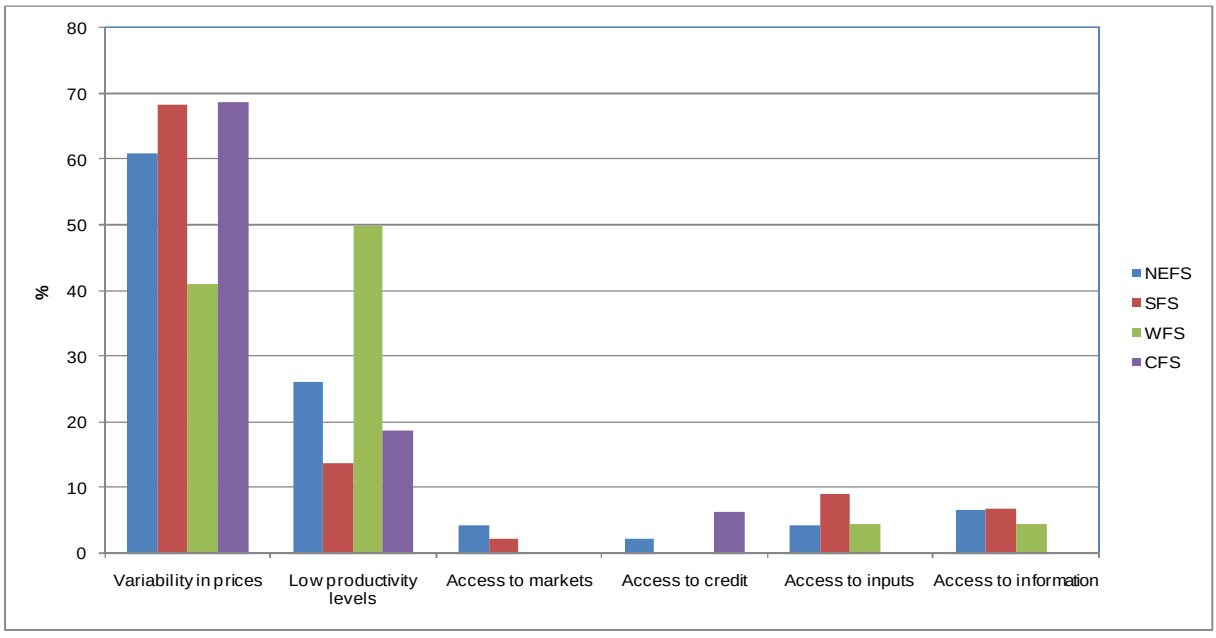

Figure 5.11: Ranking of constraints for the different regions

Table 5.30: Ranking of risks

Risk	Rank				
	1	**2**	**3**	**4**	**5**
Climate	**58**	**21**	9	5	5
Disease	12	23	20	34	5
Availability of inputs	2	6	17	21	28
Non-payment	2	5	15	11	30
Theft/corruption	5	19	21	22	21
Predation	**20**	**25**	18	7	9

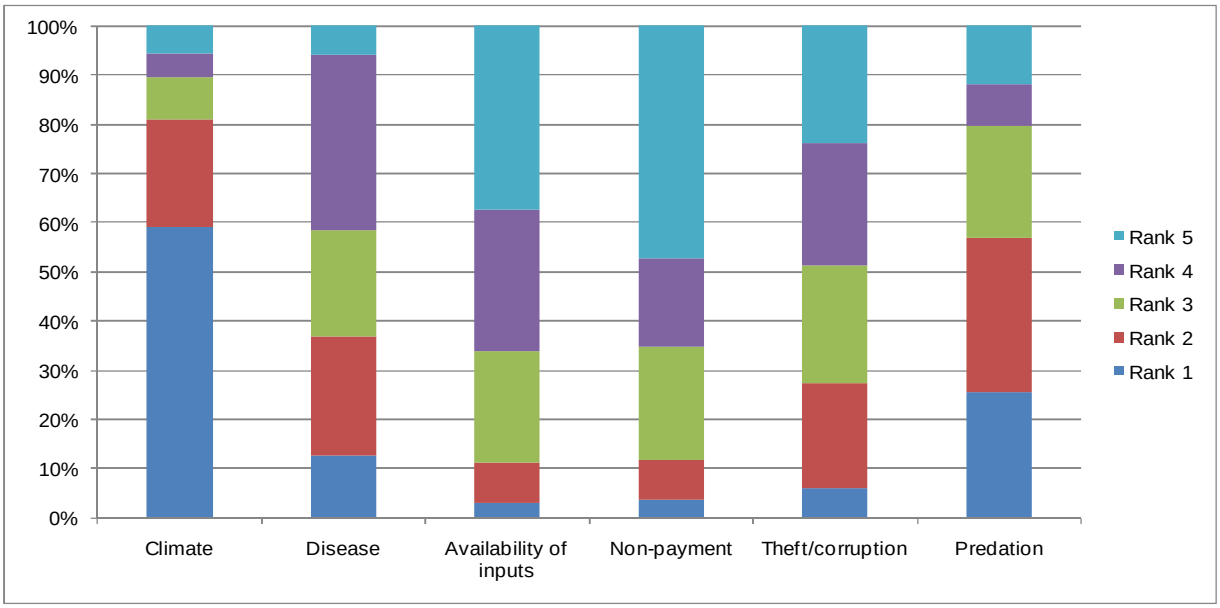

Figure 5.12: Ranking of risks in the FS

In terms of regional perceptions regarding risks amongst producers, all regions ranked climatic conditions as the biggest risk, while producers in the SFS also ranked predation as a large risk (Figure 5.13).

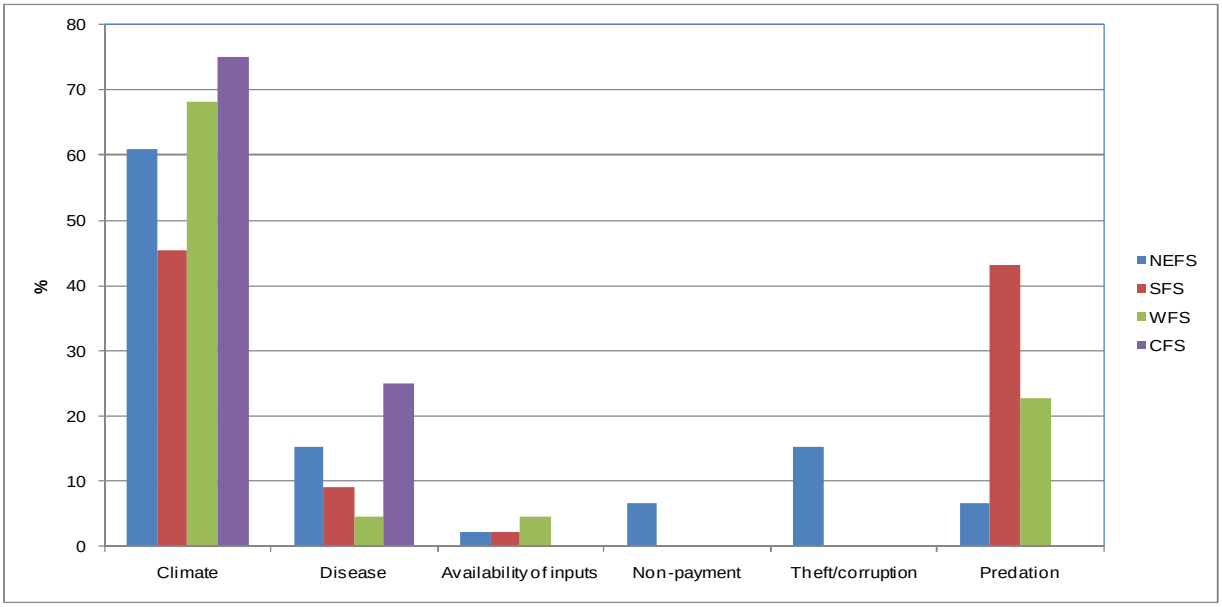

Figure 5.13: Ranking of risks in the different regions

5.4 Smallholder livestock producers

This section provides an overview of the smallholder farmers in the FS province. A smaller sample (23) of these farmers was surveyed due to the homogenous nature in the production practices of these farmers throughout the province. Animal numbers are small compared to that of commercial producers and sales and purchases are limited. Expenses towards animal production are in most cases non-existent, with little or no management in terms of breeding, animal health issues, pasture management, etc., mainly because these animals are grazing on communal land. Similar to what Schwalbach *et.al.* (2001) found in the North West province of South Africa, animals in this sector of the FS province are, in most cases, kept as a status symbol or for religious reasons and are only sold when producers are in need of cash.

5.4.1 General household information

An overview of the demographics of the developing producers interviewed is provided in the following section. This information gives a broad description of the smallholder producer dynamics in the FS. Table 5.31 shows the results of the general household information. From Table 5.31, it is evident that the majority of respondents' primary

activity is farming (77 %), the average age of producers questioned is 48 years, producers received an average of three years of schooling and have been living in their respective regions for an average of 32 years, with 19 years spent actively farming. Only 15.3 % indicated that they have at least some kind of training in farming activities.

Table 5.31: General household information

Item	**%**		
Household head	100		
Male	92		
Married	92		
Farming as primary activity	77		
	Min	**Ave**	**Max**
Number of people in household	2	6.2	11
Respondents age (years)	29	48	80
Years of schooling	0	3	12
Years in region	4	32	58
Years actively farming	4	19	30

5.4.2 Household assets and activities

Table 5.32 provides detail on the portion of income generated from various activities during the survey year (2009), the year prior to the survey year (2008) and five years prior to the survey year (2004). This was done to determine whether there has been a shift in the major income-generating activities over time and to indicate whether livestock activities have been increasing or decreasing over time. From Table 5.32, it is evident that the main contributor to smallholder farmers' income included in the survey during the past five years has been from livestock operations (84 % in 2009) followed by off-farm employment (10 % in 2009). There has been a slight increase in the income generated from livestock production since 2004, while the proportion of income generated from own business has been declining during the same period.

Table 5.32: Income distribution from various activities (%)

Activity	2009	2008	2004
Livestock production	83.8	83.1	74.6
Off-farm employment	10	6.2	14.6
Own business (non-farm)	2.3	6.2	6.9
Remittance	1.5	2.3	1.5
Other	2.3	2.3	2.3

None of the smallholder producers interviewed owns land; their animals graze on communal municipal land. This has several negative implications, especially in terms of breeding practices and herd management, which will be discussed in this section. Employment numbers as well as monthly remuneration figures are shown in Table 5.33. On average, respondents employ 0.3 full-time male employees at an average monthly cost of R 300. These low employment numbers are due to the fact that, in most cases, these producers are farming full-time with a small number of animals and do not require a large amount of labour. These employees are also usually young people who are looking after the animals during the day (herders).

Table 5.33: Average full-time employment and remuneration

Number	Min	Ave	Max
Male	0	0.3	2
Remuneration R/month			
Male	0	300	600

Table 5.34 shows the most popular breeds producers utilise in the communal areas surveyed. In terms of cattle, a crossbreed (73 %) is the most popular, followed by Drakensbergers (13 %), Bonsmara (7 %) and Brahman (7 %). In terms of sheep, only two types of breeds are utilised, namely the Dorper or Dorper crosses (57 %) and the Merino (43 %).

Table 5.34: Cattle and sheep breeds utilised

Cattle breeds	%	Sheep breeds	%
Crossbreed	73	Dorper	57
Drakensberger	13	Merino	43
Bonsmara	7		
Brahman	7		
Simmentaler	5		
Sussex	2		

5.4.3 Detail of livestock operations, purchases and sales

This section shows the average animal numbers as well as the herd/flock dynamics for the 2009 production season (Table 5.35). Adult females contribute 70 % and 72 % to the total cattle herd and sheep flock respectively, which is high compared to the commercial sector (45 % for cattle and 44 % for sheep). Young female animals contribute 4 % of the cattle herd and 11 % in the case of the sheep flock. Calves and lambs account for 21 % and 10 % of the total respective herds/flocks.

National estimations on the calving percentage of the communal sector include those by Clark *et al.* (2005) at 40 % and according to Madzivhandila, Groenewald, Griffith and Flemming (2007), between 43 % and 64 %; while Scholtz and Bester (2008) estimated the national calving percentage in the communal sector at 26.9 %. For the FS province, the smallholder calving percentage was calculated at 29.8 %, which is 10 % below the national average of 40 % as estimated by Clark *et al.* (2005). The lambing percentage for the smallholder sector of the province is even lower than the calving percentage at only 13.2 %. These low levels of productivity can, to a large extent, be attributed to the communal nature of livestock production systems under which the communal farmers operate. Breeding programs, such as selective breeding, and even calving seasons cannot be managed properly due to the lack of basic infrastructure, such as fences, in these communal areas.

In terms of the productivity and competitiveness of the livestock sector, not only in the FS province but for South Africa as a whole, these low productivity figures for the smallholder sector present a huge challenge, as approximately 35 % to 40 % of the total herd is owned by smallholder farmers. This amounts to approximately 5.5 million cattle

(RMRDT, 2008). Only a slight increase in the calving/lambing percentage in the smallholder sector can have significant positive effects on the national red meat industry in terms of production volumes.

Table 5.35: Herd/flock dynamics

Stock 2009 production season	Animal numbers (head)		Percentage of total	
	Cattle	Sheep	Cattle	Sheep
Adult female	23.7	19	70	72
Young female	1.4	3	4	11
Young males	0	0.5	0	2
Breeding bulls/rams	0.9	1.3	3	5
Calves/lambs born in the last 12 months	7.1	2.5	21	10
Castrated males	0.6	0	2	0
TOTAL	33.7	26.3	100	100
Calving/lambing percentage	29.8	13.2		

Table 5.36 indicates average cattle and sheep purchases, animal sales, home consumption, animal losses as well as purchase and sales prices for the 2009 production season. It is clear from Table 5.36 that very few transactions took place in both animal purchases and sales. No cattle purchases were reported for 2009 while sales for the 2009 season only totalled four animals (12 %), with 2.4 head (7 %) being young animals and 1.8 adult female animals (5 %). Home consumption for cattle was 0.6 % of total herd numbers (only young animals were used for home consumption). Cattle deaths were relatively high with 0.6 adult female deaths and a total of 0.9 deaths reported for the 2009 production season or 2.6 % of the total herd.

Sheep purchases are also very low at only 1.5 % of the total herd, while sales are slightly higher at 2.6 %. Home consumption of sheep amounted to 0.8 % of the total herd while losses totaled 3.4 % of the total herd. Animal losses were mainly due to drought, directly linked to the lack of pasture management within the smallholder sector, and disease, which can be linked to poor animal health management. Sheep purchases are predominantly made from commercial farms, at farm gate or through the regional auction system. All payments are in the form of spot cash payments. No purchases or sales took place in the form of contracts and no agents are used for

purchases or sales. Cattle sales were mainly to abattoirs and through the regional auction yards while sheep sales mainly went to abattoirs.

Table 5.36: Animal purchases/sales, home consumption and losses during 2009

Type	Animals purchased (head)	Purchase price /animal (R)	Animals sold (head)	Sales price /animal (R)	Consumed at home (head)	Animals died (head)
Cattle						
Adult female	0	0	1.8	2942	0	0.6
Young female	0	0	0	0	0	0.1
Young males	0	0	0.2	3200	0	0
Breeding bulls	0	0	0	0	0	0
Calves born in the last 12 months	0	0	2.2	3000	0.2	0.2
Castrated males	0	0	0	0	0	0
TOTAL	**0**	**0**	**4**		**0.2**	**0.9**
Sheep						
Adult female	0.4	850	0.6	600	0.2	0.9
Young female	0	0	0	0	0	0
Young males	0	0	0	0	0	0
Breeding rams	0	0	0	0	0	0
Lambs born in the last 12 months	0	0	0	0	0	0
Castrated males	0	0	0	0	0	0
TOTAL	**0.4**		**0.6**		**0.2**	**0.9**

All the respondents indicated that they are currently increasing their breeding herds/flocks and are in the process of increasing their surplus/off-take. This might be a contributing factor for the small sale numbers.

Table 5.37 and Table 5.38 provides live purchase and sales prices, purchase and sales weights, as well as purchase and sales prices per kg for live cattle and live sheep respectively.

Table 5.37: Live cattle purchase and sales prices and average purchase and sales weights

Live animals	Price/animal		Average weight		Price/kg	
	Purchase	Sales	Purchases	Sales	Purchases	Sales
Adult female	*	2942		420		7
Young female	*					
Young males	*	3200		280		11.4
Breeding bulls	*					
Calves born in the last 12 months	*	3000		200		16
Castrated males	*					

* No purchases or sales indicated by respondents.

Table 5.38: Live sheep purchase and sales prices and average purchase and sales weights

Live animals	Price/animal		Average weight		Price/kg	
	Purchase	Sales	Purchases	Sales	Purchases	Sales
Adult female	850	600	50	45	17	13.3
Young female						
Young males						
Breeding rams						
Lambs born in the last 12 months						
Castrated males						

* No purchases or sales indicated by respondents.

Information sources utilised by the smallholder producers are limited to word of mouth type of information, as these smallholder producers do not have access to official information sources. This word of mouth type of information mostly comes from the regional traders/agents and the auction system.

5.4.3.1 Off-take rate of the non-commercial sector

Research done on the South African non-commercial livestock sectors showed that these sectors have not yet reached their full potential (Paterson 1997, Ainslie *et.al.* 2002, Clark *et al.* 2005, and Montshwe 2006). The off-take rate for non-commercial sector, which includes the emerging and communal/smallholder sectors, is estimated at between 7.5 % and 10 %, which is significantly less than the estimated 25 % of the commercial sector (Montshwe 2006 and RMRDT 2008). Scholtz and Bester (2008)

estimated the South African emerging and communal/smallholder beef off-take rates at 25 % and 6 % respectively. This study estimates the off-take rate for the smallholder beef sector in the FS province at 11.8 %; which is marginally higher than the national average of 6 % estimated by Scholtz and Bester (2008) but significantly lower that the commercial beef off-take rate for the province (33 %).

In terms of the sheep off-take rate, this study estimates the FS off-take rate for the communal sheep sector at 2.3 %, which is very low considering the estimated off-take rate of 35 % for the commercial sector in the province.

5.4.5 Costs of production

Table 5.39 represents the average smallholder production cost for cattle and sheep during the 2009 production season as well as a percentage breakdown of the various production cost components. From Table 5.39, it is evident that very little is spent in terms of production costs; the only expenses reported for cattle were for feeding expenses (43 %) and fuel cost (57 %). The main reason for these low production costs is because of the limited amount of working capital combined with the primitive communal production system in which feed, if any, is only purchased in extreme drought situations to keep animals alive. No additional licks or concentrates are provided and little to no animal health practice takes place.

Table 5.39: Total average annual production cost

	Total cost (R)		**% of total cost**	
Item	**Cattle**	**Sheep**	**Cattle**	**Sheep**
Feeding expenses	1769	0	**43**	**0**
Fuel cost	2300	0	**57**	**0**
Total cost	**4069**		**100**	

5.4.6 Infrastructure

In this section, respondents were asked to rate their available infrastructure aimed at the identification of various potential constraints within the production section of the value chain. Respondents were asked to rate their infrastructure and animal handling facilities (Figure 5.14) on a scale from 1 to 9, with 1 being very poor and 9 being

excellent. When looking at Figure 5.14, it is clear that there is a very low respondent perception on the quality of overall infrastructure, with a highest average rating of 1.62 out of a possible 9 for vehicles. All other infrastructure received a rating lower than 1.4 rating. This is mainly due to the lack of or poor maintenance of the infrastructure in the communal farming areas.

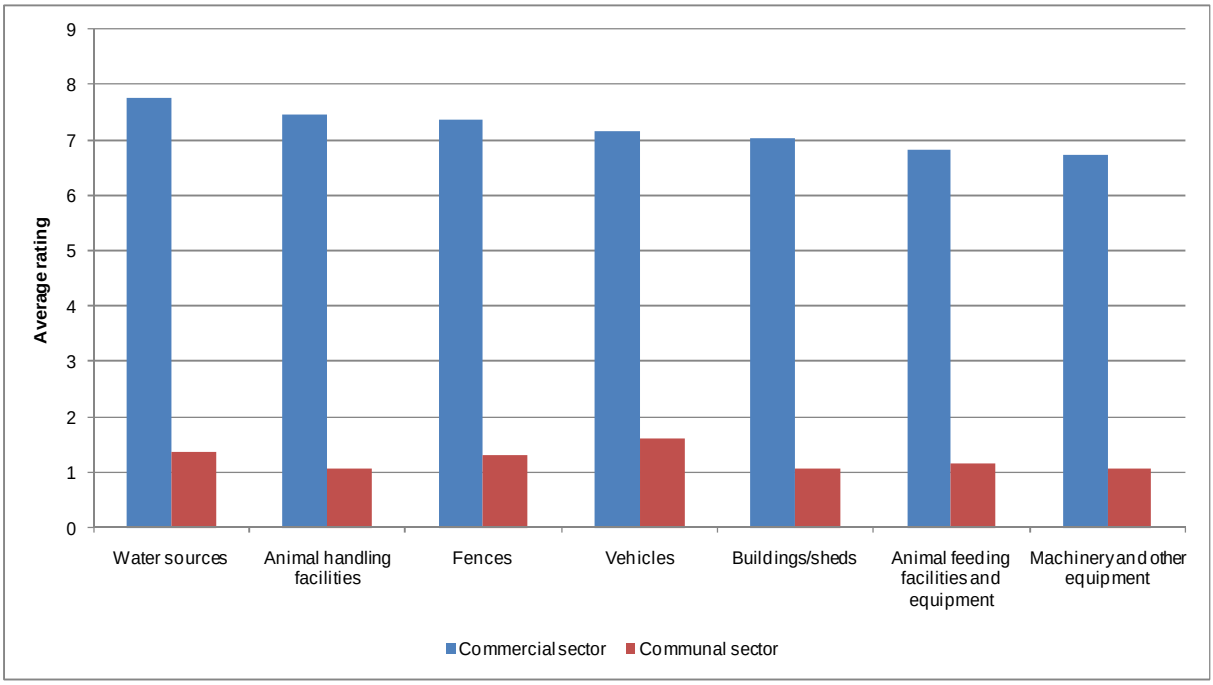

Figure 5.14: Perceived quality of infrastructure and handling facilities

5.4.7 Miscellaneous information

In this section, respondents were asked to identify what types of information sources are being utilised by them for various practices. From Table 5.40, it is evident that respondents have no information sources for the majority of practices.

Table 5.40: Main sources of information utilised (%)

Practices	Extension officer/government	Printed press	Word of mouth	None
Production practices	0	8	8	84
Input use	0	8	8	84
Animal health issues	0	8	8	84
Markets (physical)	0	8	15	77
Price	8	8	15	69
Product standards	0	8	8	84
Traceability	0	8	8	84
Risk management	0	8	8	84

To test the respondents' perceptions on risks and constraints, they were asked to rank a number of possibilities from 1 (biggest constraint/risk) to 5 (smallest constraint/risk). Table 5.41 and Table 5.42 show the results expressed as a percentage of total responses, i.e. in the case of access to credit (Table 5.41 and Figure 5.15), 38 % of respondents ranked this as their biggest constraint/concern; variability in prices and low productivity levels also received high rankings. In the case of risks (Table 5.42 and Figure 5.16), respondents indicated high rankings for animal diseases, which can be explained by the lack in spending on animal health issues, as well as availability of inputs (lack of funding for inputs).

Table 5.41: Ranking of constraints expressed in percentage terms

Constraint	Rank				
	1	**2**	**3**	**4**	**5**
Variability in prices	23	8	8	23	38
Low productivity levels	23	31	15	15	0
Access to markets	8	23	31	23	15
Access to credit	**38**	8	31	15	8
Access to inputs	0	31	8	15	31
Access to information	8	0	8	15	0

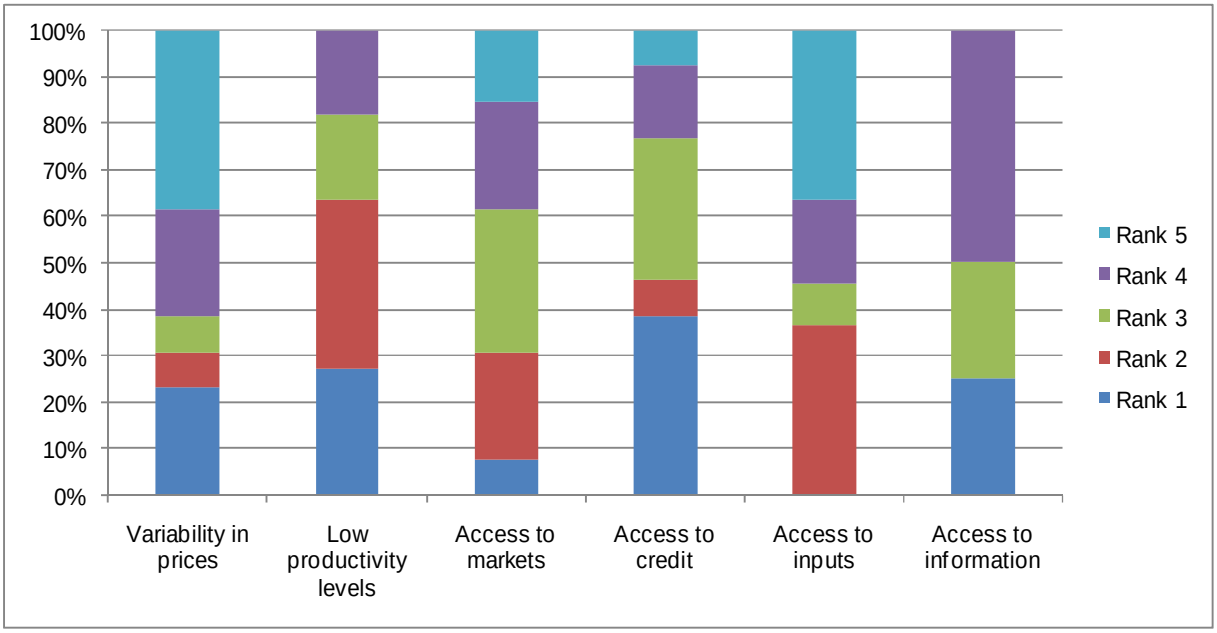

Figure 5.15: Ranking of constraints

Table 5.42: Ranking of risks

Risk	Rank				
	1	**2**	**3**	**4**	**5**
Climate	15	54	8	23	0
Disease	**38**	31	23	0	8
Availability of inputs	**38**	0	46	0	15
Non-payment	0	8	0	8	69
Theft/corruption	8	8	8	31	0
Predation	**0**	**0**	15	38	8

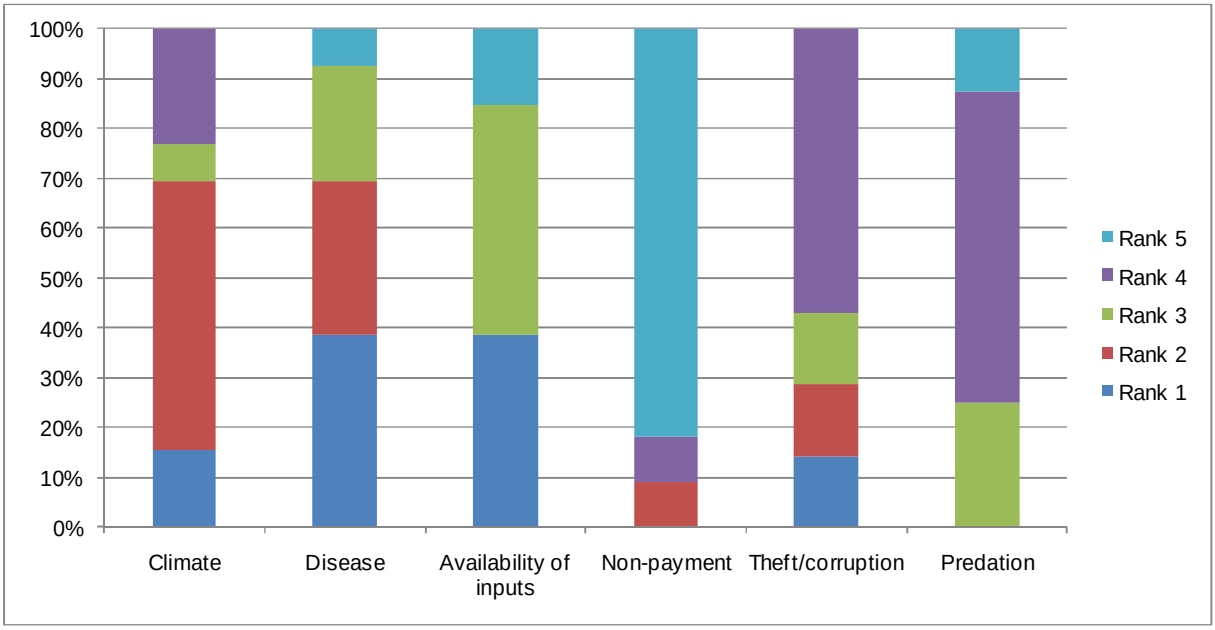

Figure 5.16: Ranking of risks

5.5 Livestock trader/agents

Only a small number of commercially produced animals are marketed through the formal auction system compared to one or two decades ago. Commercial cattle producers in the FS province marketed 11 % of their adult female animals, 5 % of adult male animals, 6 % of castrated males and 7 % of their calves through the formal auction system. This is similar for commercial sheep producers with only 9 % of adult females, 11 % of breeding rams and 2 % of lambs being marketed through the formal auction system during the 2009 production season (Figure 5.17).

It is evident that commercial producers prefer to market their animals directly through agents than through the formal auction system. For instance, cattle producers marketed 14 % of adult female animals, 33 % of young female animals, 5 % of adult males, 24 % of castrated males and 14 % of their calves directly through agents during the 2009 production season. This is also true in the case of sheep/lamb producers where 10 % of adult females, 17 % of young females, 6 % of breeding rams, 27 % of castrated males and 8 % of males were marketed directly through agents. Seventy

three percent of the producers surveyed indicated that they make use of agents for animal sales on a periodic basis.

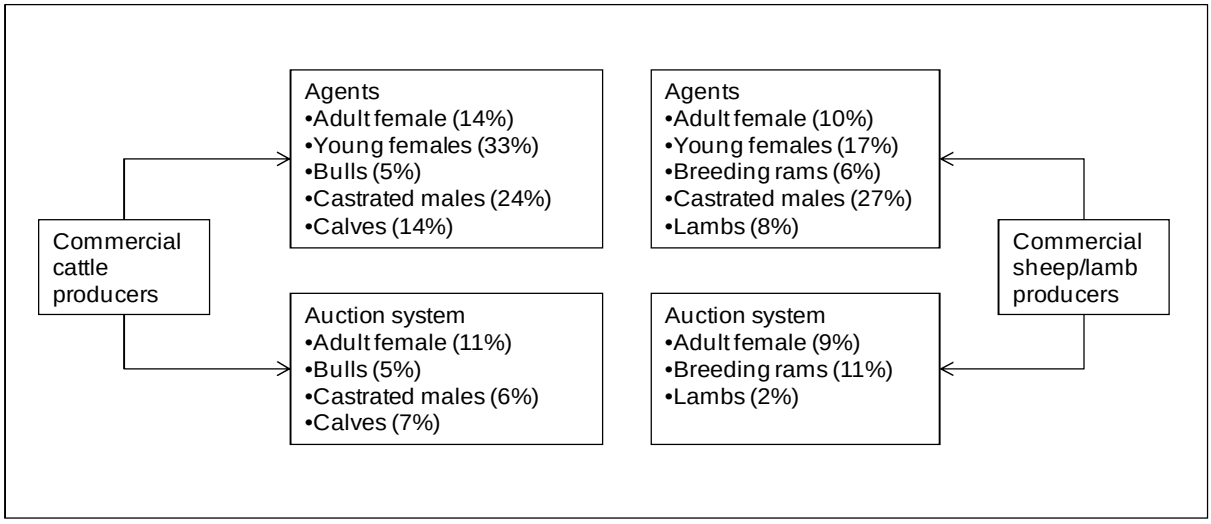

Figure 5.17: Marketing channels utilised by commercial cattle and sheep/lamb producers in the FS

Weekly or monthly auctions still takes place, especially in rural areas. In recent years the formal auction system has mainly been utilised by seedstock or stud producers where high value animals are being sold for breeding purposes (usually on an annual basis,) this is referred to as production sales. Auction type sales are also utilised in the case of sell outs where a producer will typically stop farming activities. Thus in terms of the value chain, especially in the case of commercial producers, the use of the auctioning system as a marketing tool has been decreasing over time. Currently there are 40 nationally registered auctioneers firms registered at SAFLA with 7 in the FS province.

In addition to auctioneers and agents, there are also a number of speculators in the FS red meat value chain. Speculators, in most cases own land and will typically procure animals at a low price (compared to prevailing market prices) from various sources, not excluding rural and or emerging and communal producers, and transform these animals into a market ready animal.

5.5.1 Livestock purchases and sales

In the case of agents, purchases generally take place direct from the producer and to a lesser extent through the auction system. In the case of direct purchases from the producer the price is determined by means of negotiations between buyer and seller. This price is based on prevailing market situations and might also include premiums based on the preferred type and quality of the animal in terms of attributes.

Figure 5.18 depicts the most important animal attributes agents consider when purchasing animals. Respondents were asked to rank the attributes they look at when purchasing animals from 1 to 3, 1 being never, 2, sometimes and 3 always, Figure 5.18 shows the percentage of respondents that ranked the various attributes at 3 i.e. they always consider these attributes when purchasing animals. From Figure 5.18 it is clear that the following is the most important: the disease status of the animal; the age; the visual condition of the animal; the weight (either measured or apparent in the absence of a scale) and to a certain amount the sex of the animal. Less important is the place and time of delivery, specified use of feed and medicine and pelt colour.

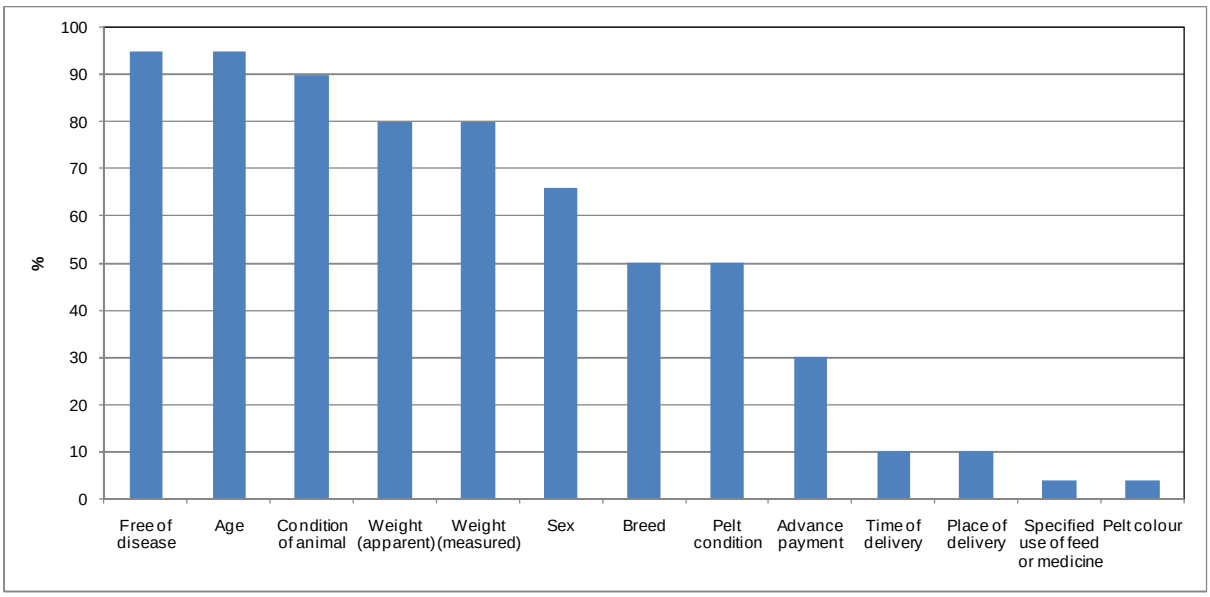

Figure 5.18: Attributes preferred by agents when purchasing animals

Animals purchased by traders/agents usually end up either directly in the feedlot system or at abattoirs. In the case of speculators, animals will typically remain on feed or in the

"veld" for a certain time to condition them for marketing, again either to the feedlot sector or directly to the abattoir. Both purchases and sales takes place throughout the year.

5.5.2 Costs of Production

Table 5.43 provides a percentage breakdown of the cost incurred by livestock traders/agents; it should be noted that traders/agents costs mainly consist of transportation and marketing cost. In case of the livestock traders/agents, feeding expense is by far the largest cost component.

Table 5.43: Contribution to total annual production costs (%)

Item	% of average cost
Feeding expenses	65
Animal health	7
Labour costs	2
Electricity	10
Spares	6
Water cost	2
Fuel cost	7
Other	2

The biggest constraints identified by traders/agents is the variability in prices and to a lesser extent low productivity levels or availability of animals during certain times of the year. Risks identified are theft and corruption, variability in climate conditions and disease.

5.6 Livestock/meat processors and retailers

This section deals with that group of role players in red meat value chain responsible for converting live animals into carcasses or red meat products and includes; abattoirs, processors as well as butcheries and the retail sector. The questionnaire, for the purpose of the survey, combined these sectors as they perform similar functions and vertical integration between them is not uncommon.

Questions focused on purchases and sales with emphases on aspects pertaining to the type of product, suppliers, logistics, value adding activities as well as the scale of vertical integration. The questionnaire consists of the following main sections:

- General information,
- operations,
- livestock/meat purchases,
- primary processing,
- secondary processing,
- meat sales,
- cost of production; and
- miscellaneous information.

5.6.1 General Information

A total of eight respondents were interviewed ranging from abattoirs, butcheries, wholesalers and retailers. Table 5.44 shows the respondents' involvement in activities and facilities, this information provides an idea of the level of vertical integration and diversification. Interesting to note is that 63 % of the respondents interviewed are also involved in farming activities; these are mostly rural abattoir or butchery owners and not uncommon in the FS province.

Table 5.44: Involvement in activities and facilities

Activity/facility	**%**
Farming activities	63
A slaughter facility	75
Cutting facilities	100
Processing facilities	88
Curing/drying/smoking facilities	88
Cold storage facilities	100
Freezing facilities	100
Trucks for meat product transport	88
Sales of skins	75

Employment numbers as well as monthly remuneration figures for full-time employees is shown in Table 5.45, in the case of meat processing and retailing sector, no part time

labour was reported by the respondents. This is mainly because employees require a certain type of training in order to operate sufficiently. On average, respondents employ 20.5 full-time male- and 5.3 female employees at an average monthly cost of R 1,860 and R 2,077 respectively.

Table 5.45: Employment

Number	**Min**	**Ave**	**Max**
Full time employees			
Male	3	20.5	90
Female	0	5.3	12
Remuneration R/month			
Full time employees			
Male	1200	1860	4500
Female	1200	2077	3800

The product range for the respondents are specified in Table 5.46, 50 % of respondents (mainly abattoirs) indicated that they sell cattle carcasses while 63 % indicated that the sell sheep carcasses (butcheries and abattoirs) etc. Only 63 % of the respondents interviewed operated under an official brand name and approximately 80 % of their product is sold using the specific brand name.

Table 5.46: Product range (selling)

	Cattle	**Sheep**
Product	**%**	**%**
Carcasses	50	63
Quarters	75	75
Frozen, deboned meat	63	63
Frozen, bone-in meat	75	75
Fresh, deboned meat	75	75
Fresh, bone-in meat	75	75
Cured or dried products	75	63
Raw Sausages	75	63
Cooked sausages	38	25
Canned meat products	13	13
Ready-to-eat products	50	50
Others	13	13

5.6.2 Operations

The aim of this section is to identify the level of satisfaction of the processor/retailer in respect of the buying and selling arrangements for cattle/beef and sheep/mutton and to identify whether the respondent is part of an association or not. All respondents indicated that they are satisfied with both the purchasing and selling arrangement for cattle/beef while only 88 % of the respondents indicated that they are satisfied with sheep/mutton purchasing and selling arrangements. Seventy five percent of the respondents interviewed are members of a food processor, retailer or other association.

5.6.3 Primary Processing

Primary processing in this case refer to those role-players in the value chain that are responsible for the conversion of live animals into carcasses, i.e. their final product consists of beef sides and quarters as well as whole sheep carcasses, primary processors are mainly abattoirs.

The FS province, which predominantly consist of a large number of small rural towns and only a few larger cities, usually have one or more abattoirs with, in a lot of cases, the same number of butcheries, especially in the smaller rural towns. The main reason for this phenomenon is that these butcheries and abattoirs are vertically integrated with the same owners. The FS province has approximately 20 high throughput and 61 low throughput abattoirs respectively, with the majority of the high throughput abattoirs situated in, or close to the larger cities in the province and the Gauteng province (See Figure 5.19).

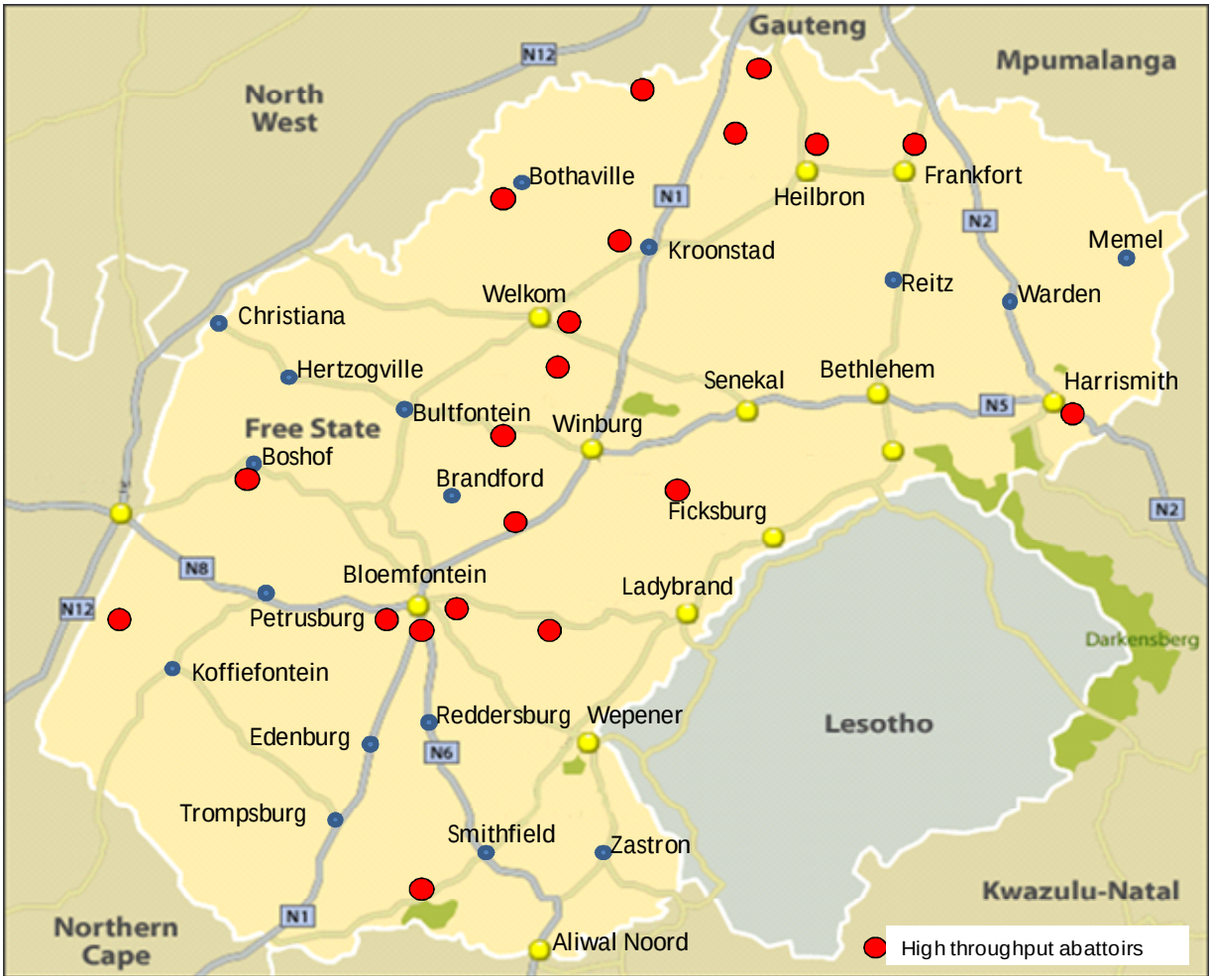

Figure 5.19: Distribution of high throughput abattoirs in the FS

Most abattoirs are capable of keeping a number of live animals on premises, these animals are not kept for longer than one day prior to slaughter. While some larger abattoirs (mainly abattoirs integrated backwards into the feedlots industry) are specific to only one species, the smaller abattoirs in the rural areas is capable of slaughtering both sheep and cattle. Slaughtering capacity varies from occasional slaughtering (mainly butchery owned abattoirs or butcheries with a slaughtering facility) to full time operations.

Private slaughtering is not uncommon in rural abattoirs; the fifth quarter is usually kept by the abattoir as a compensation for the slaughter and is commonly known in the industry as the slaughtering fee.

5.6.3.1 Meat purchases and sales

There exists a definite trend with regard to the time of meat purchases and sales. Respondents identified December as the most important month for purchases as well as sales, while the least important month for purchases and sales indicated by the respondents is during February. This trend is mainly due to the fact that during December, which is the holiday season, meat consumption increases due to an increase in consumers' disposable income (bonus or 13th cheque). In addition to this consumers tend to "treat" themselves during this time and hence expenditure patterns might change over the festive season.

The average distance travelled for cattle and sheep purchases vary during the specific time of the year, as the supply of animals decrease the distance to source animals will increase and vice versa. For the respondents interviewed during the 2009 production season the average distances travelled to acquire cattle and sheep were 36 and 47 kilometers respectively. Only 12 % of the respondents make use of middlemen or agents for purchases. Purchases in the case of abattoirs are mainly from commercial farmers while the retail sector in turn purchase mainly from abattoirs. This is true for both cattle as well as sheep purchases.

The most important quality attributes respondents consider when purchasing animals includes the weight of the animal, the condition of the animal as well as the disease status. In the case of meat/carcass purchases the important factors is the weight of the carcass, grading/fat content and the colour of the meat. No meat purchases took place with the use of contractual agreements.

Figures 5.20 and 5.21 shows the trend in the purchase price for beef- and mutton/lamb carcasses excluding the fifth quarter for the 2009 production season in the FS province. This is the price that the abattoir paid to the producer, excluding the fifth quarter. There was a large variation in the different carcass classes during the first two quarters of the year compared to the second two quarters of the year. The purchase price for the primary processors is equal to the selling price of the primary producers (see Tables 5.15 and 5.17 in Section 5.3.4 for beef and mutton/lamb respectively).

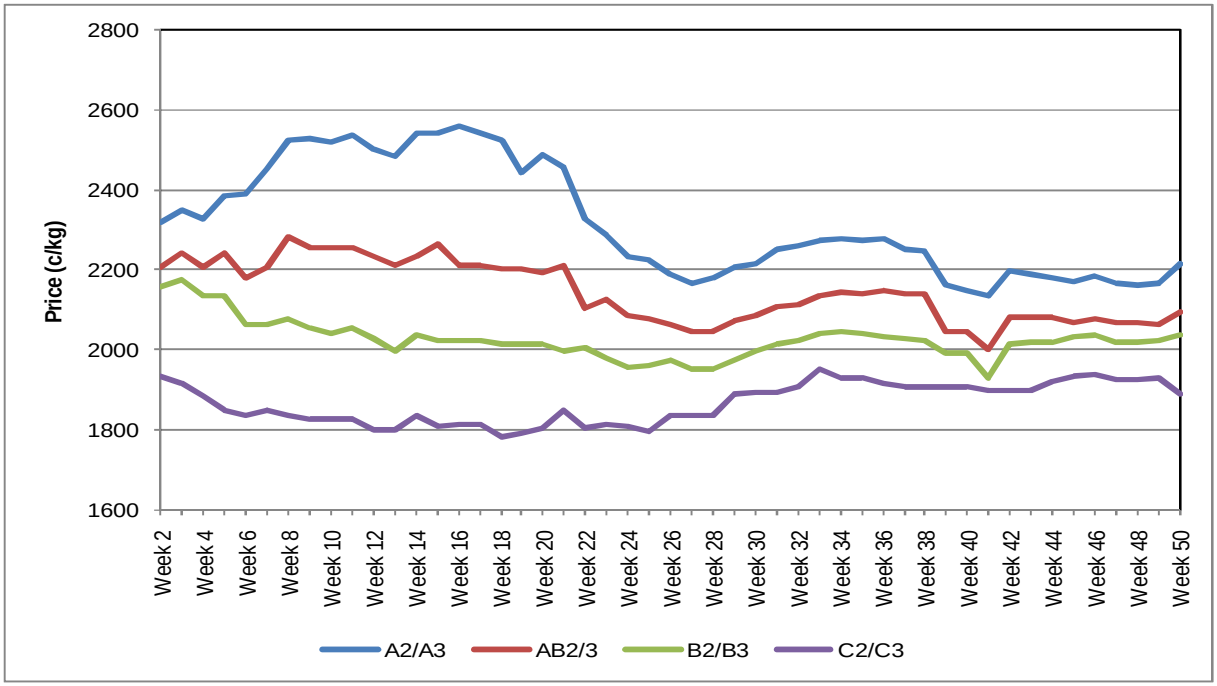

Figure 5.20: Average beef purchase prices for the FS province during 2009

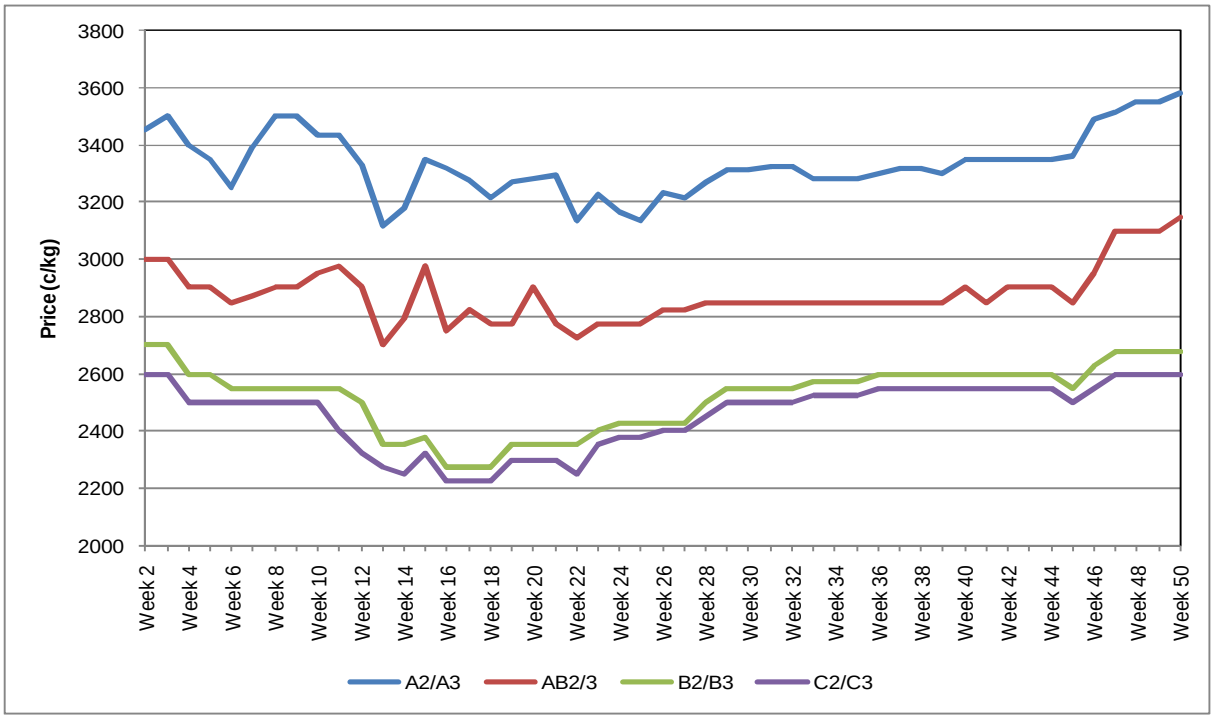

Figure 5.21: Average mutton and lamb purchase prices for the FS province during 2009

Figure 5.22 emphasises the importance of the primary processors as a marketing alternative for the commercial cattle and sheep producers in the FS province. Producers market a large portion of their animals directly to abattoirs and butcheries (with slaughtering facilities). In the case of beef more than half of the adult female animals (57 %), mainly for culling, are marketed directly to these facilities while 40 % of bulls, 53 % of castrated males and 23 % of calves are marketed the same way. Commercial sheep producers marketed 49 % of female adult female animals, 50 % of young females, 28 % of rams, 54 % castrated males and 46 % of lambs to these facilities during the 2009 production season.

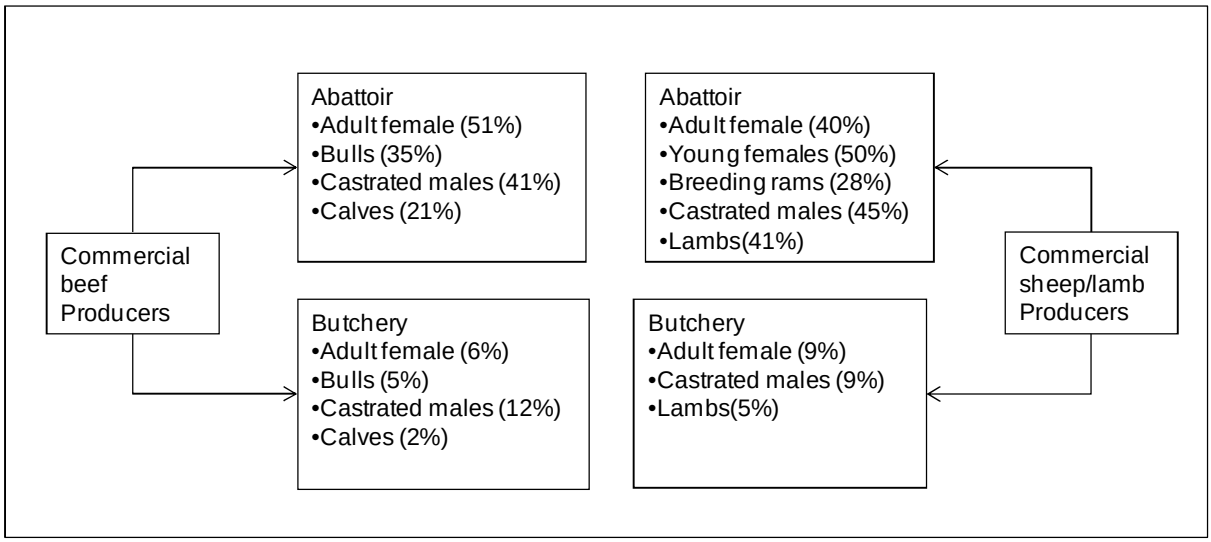

Figure 5.22: Commercial producer sales to primary processors

Health inspections are primarily done by government appointed officials with primary processors paying for the service. Both pre- and post slaughter inspections are made. Rejections are rare and pre-slaughter rejections are mostly due to visually sick animals while post slaughter rejections are mainly due to carcass damage or disease.

5.6.4 Secondary Processing

Secondary processing refers to those role-players in the value chain that are responsible in the conversion of carcasses into meat products, whether it is just restricted to dissecting the carcass into the various cuts, deboning to primary cuts or

additional value adding processes including spicing, vacuum packaging etc and includes abattoirs, wholesalers, deboning plants, butcheries as well as retailers.

As previously mentioned, in the rural areas in the province the abattoir industry is highly integrated. Most abattoirs are owned by the butcheries where the primary processing takes place in the abattoir while the secondary processing is done in the butchery.

5.6.4.1 Meat purchases and sales

Retailers as well as abattoirs use “block tests” similar to those in Tables 5.49 and 5.50, to calculate individual cut prices based on the carcass purchase price. Tables 5.47 and 5.48 shows the average, minimum as well as maximum purchase prices for the different carcass classes for beef and lamb/mutton for the 2009 season respectively. This is the price paid by the secondary processors to primary processors; carcass prices are based on carcass weight excluding the fifth quarter. These purchase prices are directly influenced by offal prices, hide prices and supply and demand factors.

Profit margins are usually based on a complete carcass and not on individual cuts. This implies that the way retailers "balance" carcass prices over the individual cuts differ, not only between different retailers but also between individual outlet stores of the same retail group. This is mainly due to different consumer dynamics linked to a specific geographical area, i.e. the market that the specific store serves. Stores in higher income areas, for example, will typically take a higher profit margin on the more expensive hind quarter cuts compared to fore quarter cuts, which might be sold at a loss in order to balance the overall carcass price and vice versa. This variability of prices between retailer (and outlets from the same retailer) complicates the measurement of price margins based on a single-cut basis. Linked to this is the seasonal variation in the balancing of hind quarter and fore quarter cuts; where hind quarter cuts tend to be more desirable in the summer months when "braais" are more common while fore quarter cuts are more desirable during the winter months when stews and soups are more common.

Because of the abovementioned reasons, it is extremely difficult to calculate an industry-wide price margin for specific cuts and, therefore, even more difficult to

calculate industry profit margins for specific cuts because of different management strategies and differences in costs included in calculation of profit margins.

Table 5.47: Provincial (FS) beef carcass purchase price variation per class (2009)

Item	A2/A3	AB2/AB3	B2/B3	C2/C3
	Price (c/kg)			
Minimum	2179	2040	1969	1816
Average	2365	2187	2066	1905
Maximum	2611	2328	2217	1989
Standard deviation	142	76	49	51

Table 5.48: Provincial (FS) mutton/lamb carcass purchase price variation per class (2009)

Item	A2/A3	AB2/AB3	B2/B3	C2/C3
	Price (c/kg)			
Minimum	3210	2781	2343	2292
Average	3434	2964	2596	2531
Maximum	3691	3245	2781	2678
Standard deviation	112	97	120	118

Table 5.49 provides a typical example of a block test used by butcheries and retailers to determine individual beef cut prices. The carcass is divided into two halves lengthwise at the abattoir; this is mainly done to make the handling process easier. The two halves are further divided into two front and two hind quarters and are then priced according to a calculated factor (column 3) given the carcass composition and the yield (column 2) of the specific cut. The example in Table 5.49 is calculated given the average purchase price of an A2/A3 carcass price in the FS province for the 2009 production season (R 23.65/kg) and a carcass weight of 220 kg. The fore quarters contributes 52 % to the total carcass weight and the hind quarters 48 %. In this case the hind quarters have a price premium of 27.5% over the front quarters. Given this scenario, Table 5.49 provides a break even cut price (column 4) as well as a selling price given a gross margin of 30 % (column 6).

Table 5.49: Individual beef cut selling price estimation

Fore quarter 52 %			Cost			Hind quarter 48 %			Cost		
1	2	3	4	5	6	1	2	3	4	5	6
Cut	**%**	**Factor**	**R/kg per cut**	**Rand**	**R/kg per cut 30% margin**	**Cut**	**%**	**Factor**	**R/kg per cut**	**Rand**	**R/kg per cut 30% margin**
Whole quarter per kg	100.00	1.00	17.64	2,018.35	22.94	Whole quarter per kg	100.00	1.00	30.15	3,184.24	39.20
Body fat	2.82	0.50	8.82	28.46	11.47	Body fat	3.73	0.52	15.77	62.12	20.50
Shoulder	34.66	1.60	28.23	1,119.29	36.70	Bone lean	14.70	0.12	3.47	53.83	4.51
Bone lean	19.77	0.20	3.47	78.41	4.51	Bone with meat	2.42	0.97	29.25	74.75	38.02
Bone with meat	0.00	0.50	8.82	0.00	11.47	Cutting loss	1.00			0.00	0.00
Brisket	14.50	0.90	15.88	263.39	20.64	Fillet	2.40	2.62	79.00	200.22	102.70
Chuck	0.00	1.30	22.94	0.00	29.82	Short loin	0.00	1.80	54.28	0.00	70.56
Cutting loss	1.00			0.00	0.00	Rump	5.14	1.96	59.10	320.79	76.83
Neck, bone in	1.00	1.30	22.94	26.24	29.82	Shin	4.13	0.97	29.13	127.04	37.87
Prime rib	3.76	1.30	22.94	98.66	29.82	Silverside	9.82	1.50	45.23	469.04	58.80
Back fillet	0.00	2.50	44.11	0.00	57.34	Sirloin	4.48	1.95	58.80	278.17	76.44
Shin bone in	0.00	0.80	14.11	0.00	18.35	Short rib	5.79	0.97	29.25	178.84	38.02
Short rib	4.93	0.80	14.11	79.60	18.35	T-Bone	7.58	1.80	54.28	434.46	70.56
Bolo	1.00	1.30	22.94	26.24	29.82	Thick flank	3.69	1.40	42.22	164.50	54.88
Trimmings	16.56	0.89	15.77	298.81	20.50	Topside	7.59	1.50	45.23	362.53	58.80
						Trimmings	27.53	0.52	15.77	458.47	20.50
Closing balance	**100.00**			**2,019.10**		**Closing balance**	**100.00**			**3,184.75**	
									Total	**5,203.85**	**6,765.01**

Source: SAMIC 2010 and own calculations

Similar to the case of beef, the break even cut prices of lamb and mutton are also determined by use of a block test. Table 5.50 provides an example of such a block test. These prices are calculated using the average lamb carcass price (R 34.34/kg) for the 2009 production season in the FS province and a carcass weight of 25 kg. As in the beef example, column 2 shows the yields for the individual cuts, column 3 shows the factor conversion, column 4 shows the break-even price and column 6 shows the individual cut price with a 30 % gross margin.

Table 5.50: Individual lamb cut selling price estimation

Whole carcass	100	%	Cost		
1	2	3	4	5	6
Cut	%	Factor	R/kg per cut	Rand	R/kg per cut 30% margin
Whole carcass per kg	100.00	1.00	34.34	858.50	44.64
Back chops	20.70	1.06	36.40	188.37	47.32
Body fat	1.00	0.25	8.59	2.15	11.16
Bones	1.60	0.25	8.59	3.43	11.16
Neck/hump	5.30	1.07	36.74	48.69	47.77
Cutting loss	0.90				
Kidney fat	2.00	0.16	5.49	2.75	7.14
Kidneys	0.50	0.39	13.39	1.67	17.41
Leg, whole	25.60	1.06	36.40	232.96	47.32
Loin chops	9.20	1.44	49.45	113.73	64.28
Neck	3.40	1.00	34.34	29.19	44.64
Ribs	3.60	0.72	24.72	22.25	32.14
Rib chops	9.50	1.06	36.40	86.45	47.32
Shins	1.00	1.06	36.40	9.10	47.32
Shoulder	3.80	1.06	36.40	34.58	47.32
Stewing meat	7.20	0.83	28.50	51.30	37.05
Trimmings	4.70	0.83	28.50	33.49	37.05
Closing balance	**100.00**			**860.12**	**591.06**

Source: SAMIC 2010 and own calculations

Another important factor to consider is the variability in the shelf life (time the product remains on the shops' shelves) of the different cuts. Lamb carcasses tend to have a shorter shelf live (the product spends less time on the shops shelves) compared to beef, amongst other factors, due to the lesser degree of value-adding activities to lamb carcasses. Beef carcasses are often aged to improve the quality/palatability of the meat, which is either aged in whole carcass form, or as individual or primary cuts. The aging of individual or primary cuts is mainly restricted to the higher value hind quarter cuts. These cuts are vacuum packed and aged (depending on the retailer) for a certain period, ranging between seven and 28+ days; and therefore, the shelf life of these cuts is thereby extended. As in the case of the primary processors, meat is inspected by a designated official before purchase and sales at the cost of the secondary processor.

5.6.5 Processing Cost

The largest contributor towards total annual production cost in this sector is labour cost at 51 % (Table 5.51) followed by land/rental cost (16.7 %) which is a capital cost. Packaging and electricity contributed 12 % and 9.7 % respectively.

Table 5.51: Total annual production cost

Item	% of total cost
Labour costs	51.5
Electricity	9.7
Water and other utilities	2.8
Packaging costs	12.0
Land costs (rental)	16.7
Certification costs	1.5
Animal Transportation	0.6
Other consumables (knives, blades, sharpeners etc)	3.6
Other	1.6

Packaging cost varies considerably between primary processors, secondary processors and retailers. Primary processors or abattoirs specialising only in the slaughtering of animals i.e. the end product is a quarter, half or whole carcass will have little or no packaging costs. Secondary processors, especially where deboning takes place will have higher packaging costs as these primary cuts are usually vacuum packed, especially in the case of beef. The retail sector has the highest packaging cost as a large number of cuts is individually packed, and in many of cases vacuum packed. An example of this is an individually vacuum packed T-Bone or rump steak. Vacuum packing is also more popular in beef hind quarter cuts as it is used as a maturing method.

5.6.6 Miscellaneous Information

Table 5.52 shows the main sources of information utilised by respondents from the processor/retailer sector for the various practices. For all practices in Table 5.52 respondents indicated that they obtain information mainly from non-official sources including word of mouth and a third party (i.e. 43 % of the respondents surveyed indicated that they receive information regarding production practices by word of mouth

etc.). Figure 5.23 shows the respondents' perception regarding the reliability of the information provided by the above mentioned sources. Respondents had to rank the perceived reliability of the information sourced regarding the different practices from 1 (unreliable) to 9 (extremely reliable). Information regarding input use, risk management and government services did not receive high rankings.

Table 5.52: Main sources of information utilised (%)

	Information sources					
Practice	**Extension officer**	**Printed press**	**Government**	**Third party**	**Word of mouth**	**Other**
Production practices	0	0	0	**29**	**43**	0
Input use	13	0	0	**38**	**13**	0
Animal health issues	0	0	0	**25**	**38**	0
Markets (physical)	0	0	0	**38**	**25**	0
Price	0	0	0	**25**	**38**	0
Product standards	0	0	0	**29**	**29**	0
Traceability	0	0	0	**29**	**43**	0
Risk management	0	0	0	**17**	**50**	0
Government services	0	0	0	**13**	**50**	0

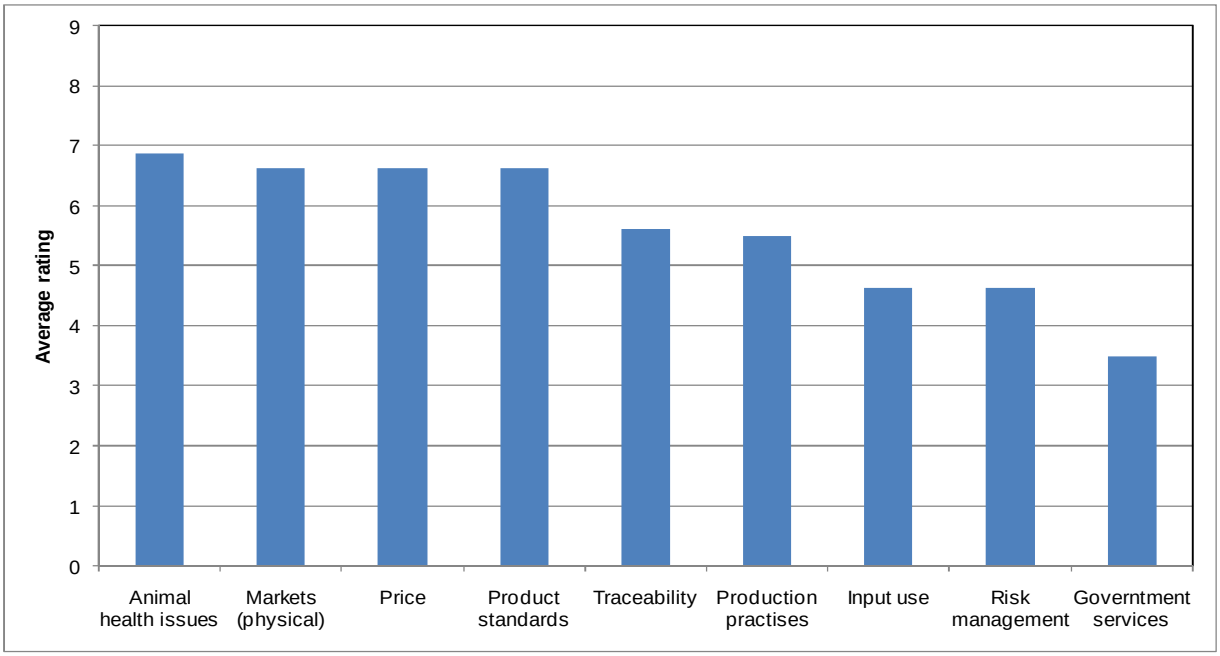

Figure 5.23: Perception on the reliability of information sources

Another important aspect to consider is how the respondents in the processor/retailer industry perceive the risks and constraints associated with the specific industry. Respondents were asked to rank a list of constraints from 1 (biggest constraint) to 5 (smallest constraint). The results are shown in Figure 5.24, and it is evident that respondents identified variability in prices as well as access to information as their two main constraints. In the same manner the respondents were asked to rank a number of risks associated with the industry from 1 to 5, from Figure 5.25 it is clear that the two main risks according to the respondents is water quality and theft/corruption and to a lesser extent non-payment.

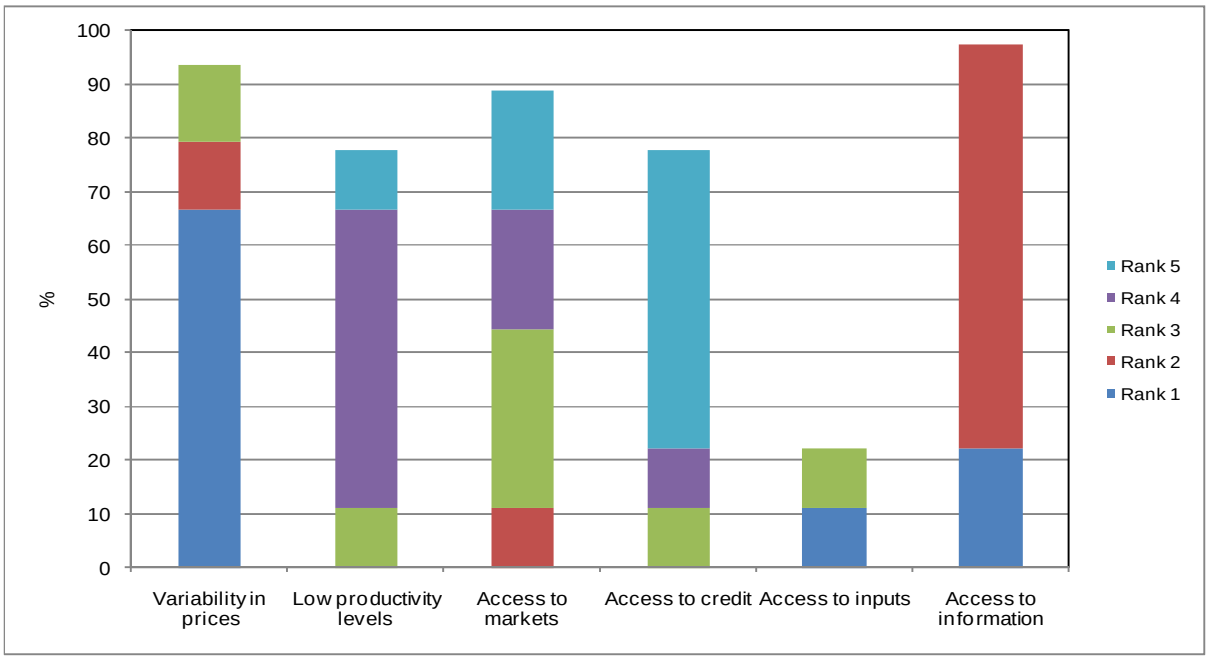

Figure 5.24: Ranking of constraints

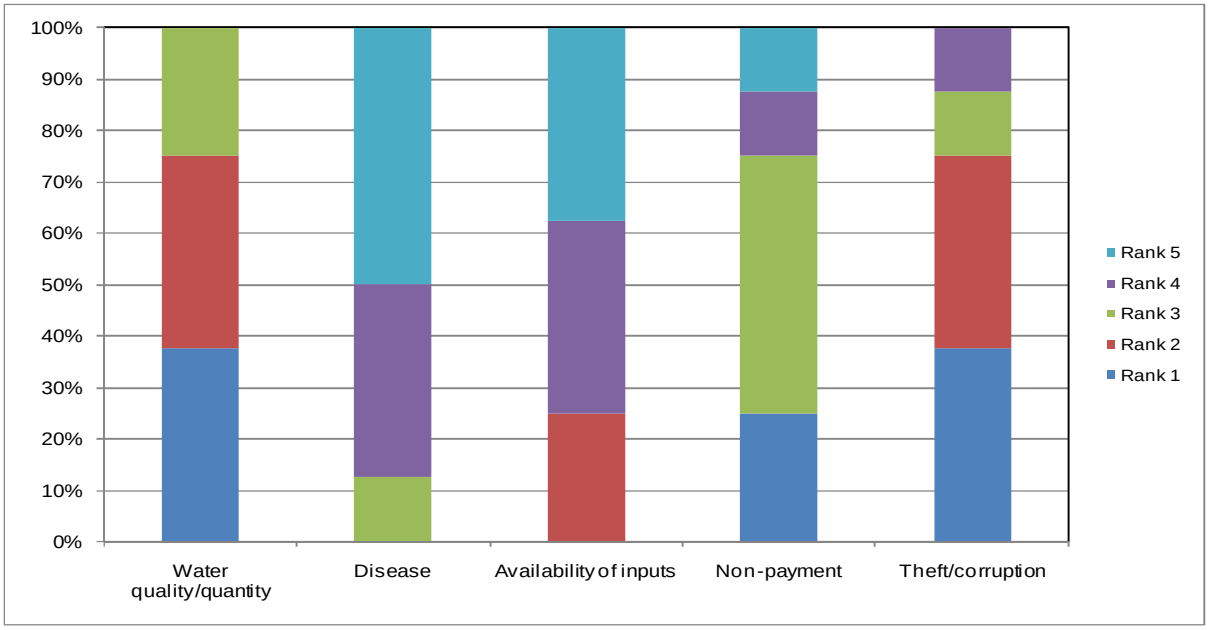

Figure 5.25: Ranking of risks

5.7 Mapping and quantification of the FS cattle and sheep value chain

As mentioned previously, the first step in value chain analyses is the mapping of the value chain in terms of product-, information-, and financial flows between the various segments of the value chain. The second important step in value chain analysis is the quantification of the mapped value chain. Quantitative data is necessary in order to provide a clear representation of the different role players within the chain as well as to analyse the performance of the value chain in question. These performance measures include:

- Product movement or marketing alternatives.
- Revenue at and cost of traded products at each stage of the value chain.
- Herd/flock performance measures.
- Preferred attributes by buyers of animals/meat.
- Production cost distribution in the value chain.
- Profit margin distribution through the value chain.
- Sources and reliability of information across stages.
- Stakeholder's perceptions regarding constraints and risks.

This section maps and provides quantitative data for the FS red meat value chain in order to assess the performance measures.

5.7.1 Product movement or marketing alternatives

The marketing channels directly utilised by the commercial cattle producer in the FS province are illustrated in Figure 5.26. The majority of calves (49 %) are marketed through the feedlot system, 21 % are marketed directly through the abattoir system, 14 % goes through the agents (mainly also to feedlots), 7 % through the formal auction system and an equal amount towards commercial farms with the remaining 2 % directly marketed through butcheries. The sale of young female animals is limited and equally distributed between agents, the feedlot sector as well as commercial farms. The majority of adult female animals (51 %) are marketed directly through the abattoir sector while the remaining 49 % is almost evenly distributed to the remaining marketing opportunities. Bulls are mainly sold to commercial farms (45 %) while 35 % are sold directly to abattoirs mainly for culling purposes. The remaining 20 % of bulls are marketed through the remaining marketing opportunities, 5 % each to agents, feedlots, the auction system and butcheries. Castrated males are predominantly marketed through the abattoir (41 %) and agent (24 %) sectors while calves are mainly marketed through the feedlot (49 %) and abattoir sectors (21 %).

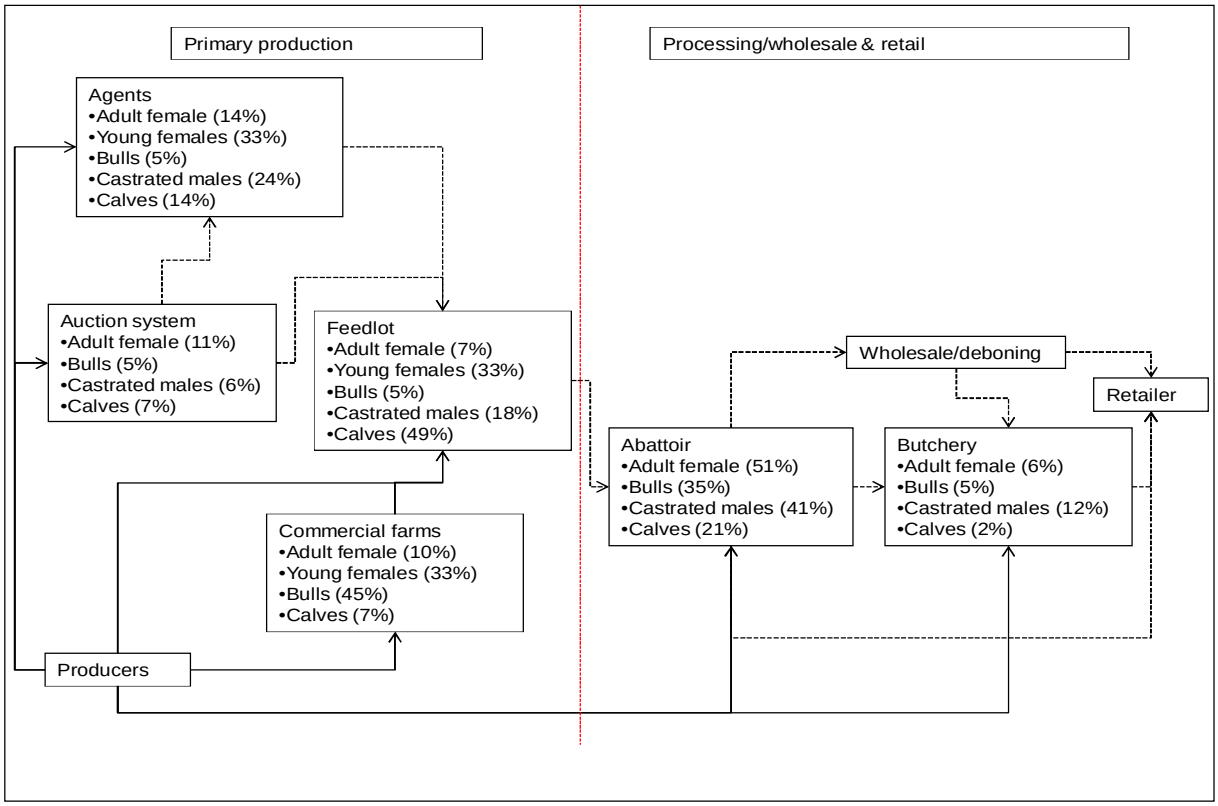

Figure 5.26: Utilisation of marketing channels by commercial beef producers in the FS

The marketing channels directly utilised by the commercial cattle producer in the FS province are illustrated in Figure 5.27. Lambs are mainly marketed to the abattoir sector (41 %) as well as to the feedlot sector (36 %). Eight percent are marketed to agents (mainly also to feedlots), 5 % directly to butcheries while only 2 % are marketed through the auction system and commercial farms. Adult female animals are mainly sold to the abattoir sector (40 %) while half of the young female animals are sold to the abattoir sector. Breeding rams are mainly sold to commercial farms (44 %) and the abattoir sector (28 %). Forty five and twenty seven percent of castrated males are sold to the abattoir sector and agents respectively, while lambs are mostly sold to the abattoir sector (41 %) and the feedlot sector (36 %).

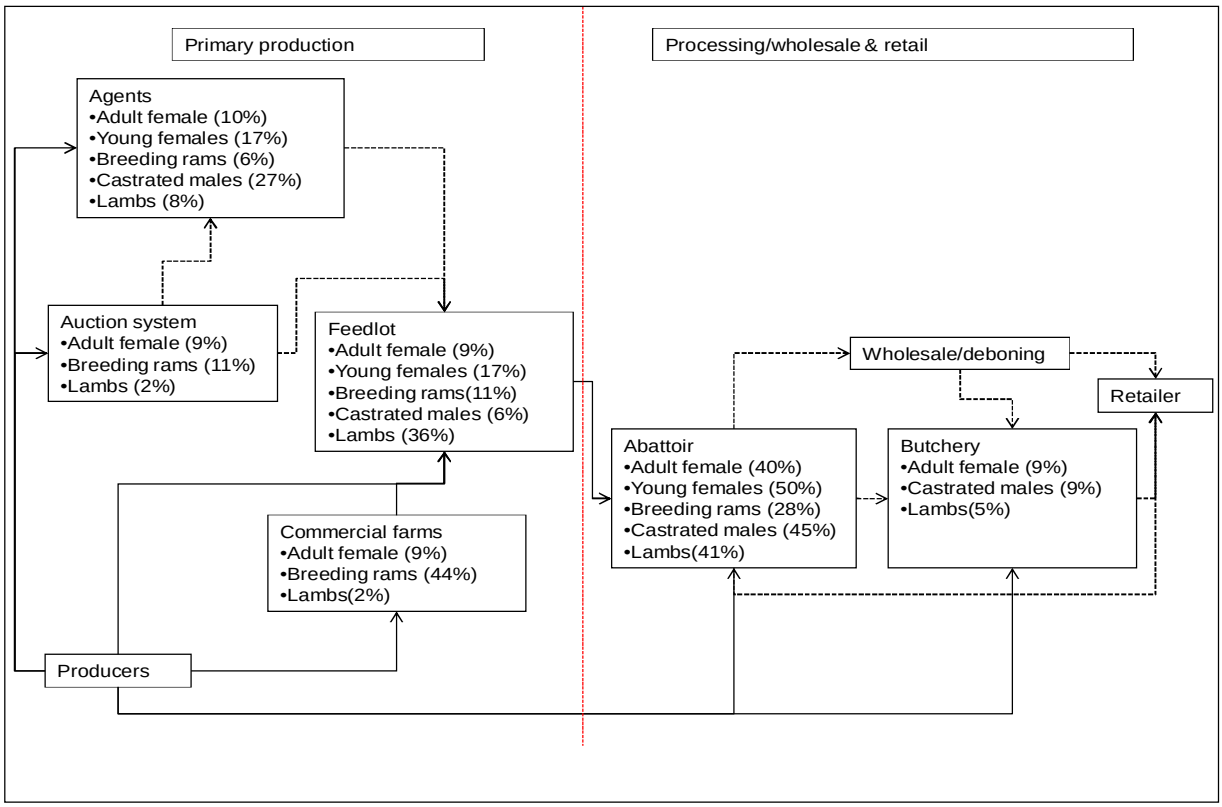

Figure 5.27: Utilisation of marketing channels by commercial sheep producers in the FS

5.7.2 Revenue and cost of traded products at each stage of the value chain

Figure 5.28 shows the average, minimum and maximum purchase- and sales price for weaner calves and the A2/A3 carcass price and Figure 5.29 for lamb and the A2/A3 carcass price at the various stages of the FS cattle and sheep value chains for the 2009 production season. For the feedlot sector, the weaner/feeder lamb live weight equivalent price (WP/LWE) refers to the minimum, average and maximum price paid for live animals. The carcass weight equivalent price of the weaner (WP/CWE) is calculated assuming a dressing percentage of 57 % in the case of beef and 42 % in the case of lambs, given the WP/LWE price. Important to note is that the feedlot carcass weight equivalent selling price (SP/CWE) is less than the WP/CWE price, mainly because this price is calculated given current market situations. In practice the actual selling price will only be realised after approximately three months when the animal is marketed, commonly known in the feedlot industry as a negative buying margin (see Section 3.3.3.2).

Commercial producers selling to primary processors are compensated based on carcass weight; this price excludes the value of the fifth quarter. This is an important consideration as the primary processor needs to maintain a certain gross margin, implying that, as the value of the fifth quarter decreases, the bigger the margin necessary on the carcass to compensate for production costs. Therefore the gross margin taken by the primary processors are directly linked to the value of the fifth quarter. The difference between the retail and butchery sectors' purchase- and selling price is calculated using the block test in Table 5.49 (beef) and Table 5.50 (sheep) plus a gross margin of approximately 25 % to 30 %.

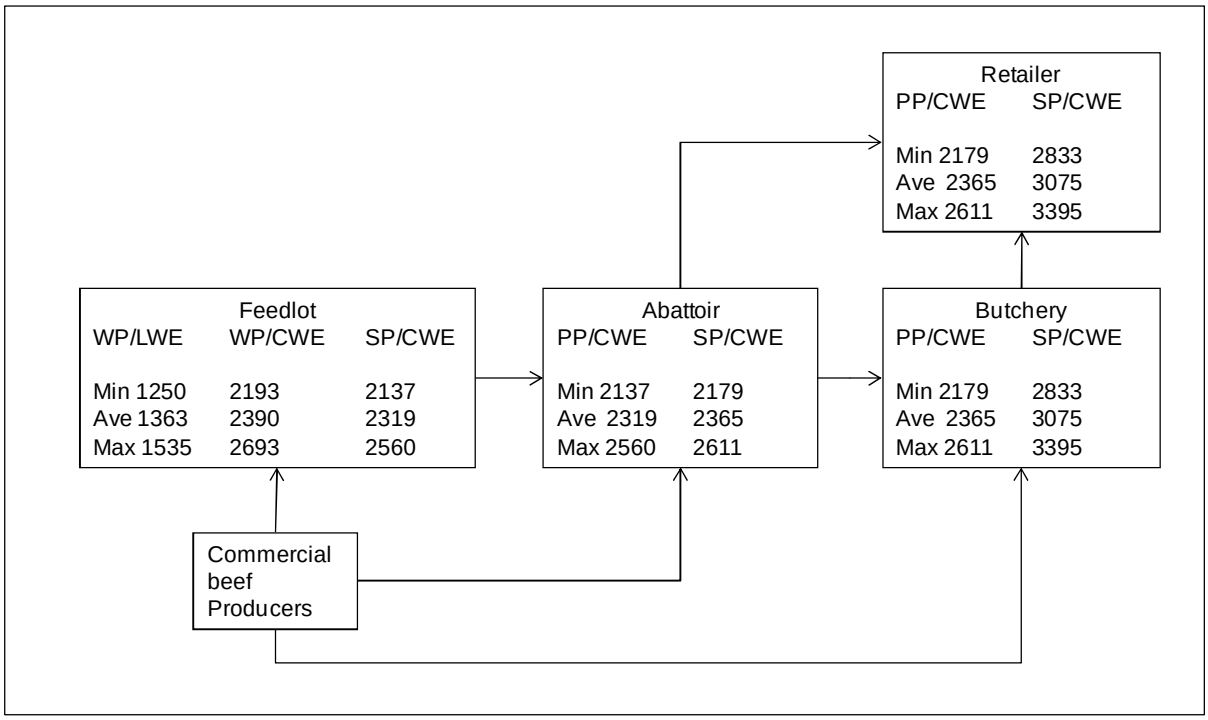

Figure 5.28: Purchase and sales price in the FS beef value chain (cent)

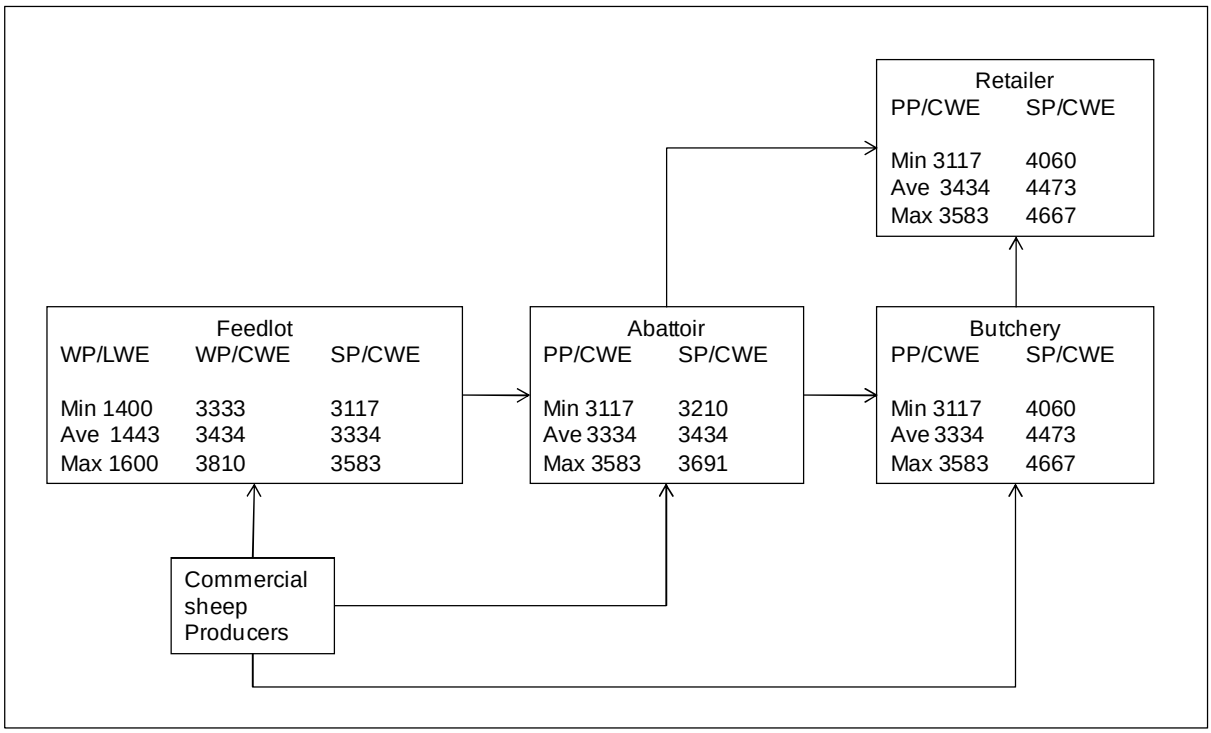

Figure 5.29: Purchase and sales price in the FS lamb value chain (cent)

5.7.3 Herd/flock performance measures

An overview of the FS red meat (cattle and sheep) sector is provided in Figure 5.30. An important consideration when looking at any sector is the performance thereof. For the purpose of this study herd performance is measured using two methods; calving/lambing percentage and off-take rate. Off-take rate may vary due to seasonal or climatic conditions i.e. in a dry year the off-take rate will increase as feed availability decreases. The calving percentage for the FS province averaged 80 % for the 2009 production season while the lambing percentage averaged 93 % for the same period. Off-take rates for the 2009 production season in the FS province were 33 % and 35 % for cattle and sheep respectively. The calving/lambing percentage as well as the off-take rate for the FS province exceeds the national averages (see section 5.4.3 and 5.4.4.1 for national comparisons for calving percentage and off-take rates respectively).

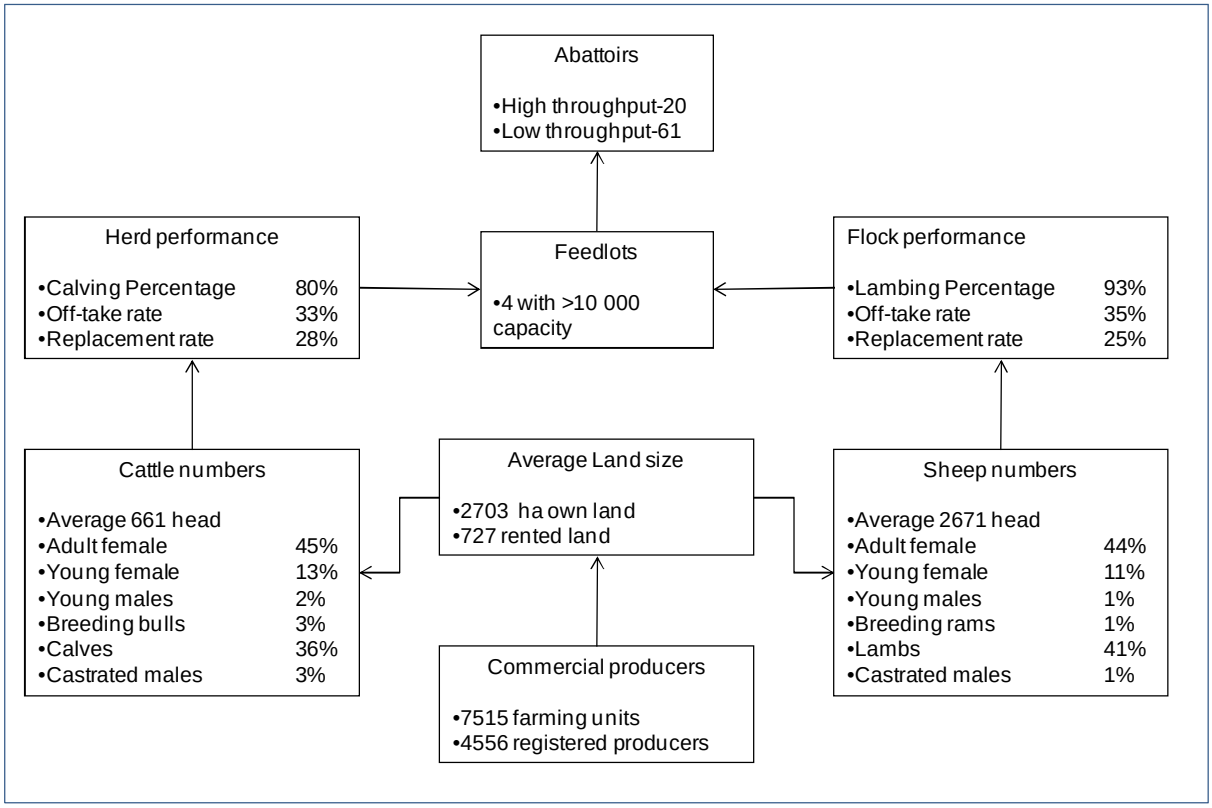

Figure 5.30: FS cattle herd and sheep flock performance.

5.7.4 Preferred attributes by buyers of animals/meat

Figure 5.31 shows the different attributes considered of importance when purchasing an animal or carcass/meat for the different segments of the value chain. For producers as well as traders the disease status, the condition of the animal, its weight as well as age is the most important attributes. While processors/retailers are more concerned with the time since the animal was slaughtered (retailers), the weight and the pelt condition.

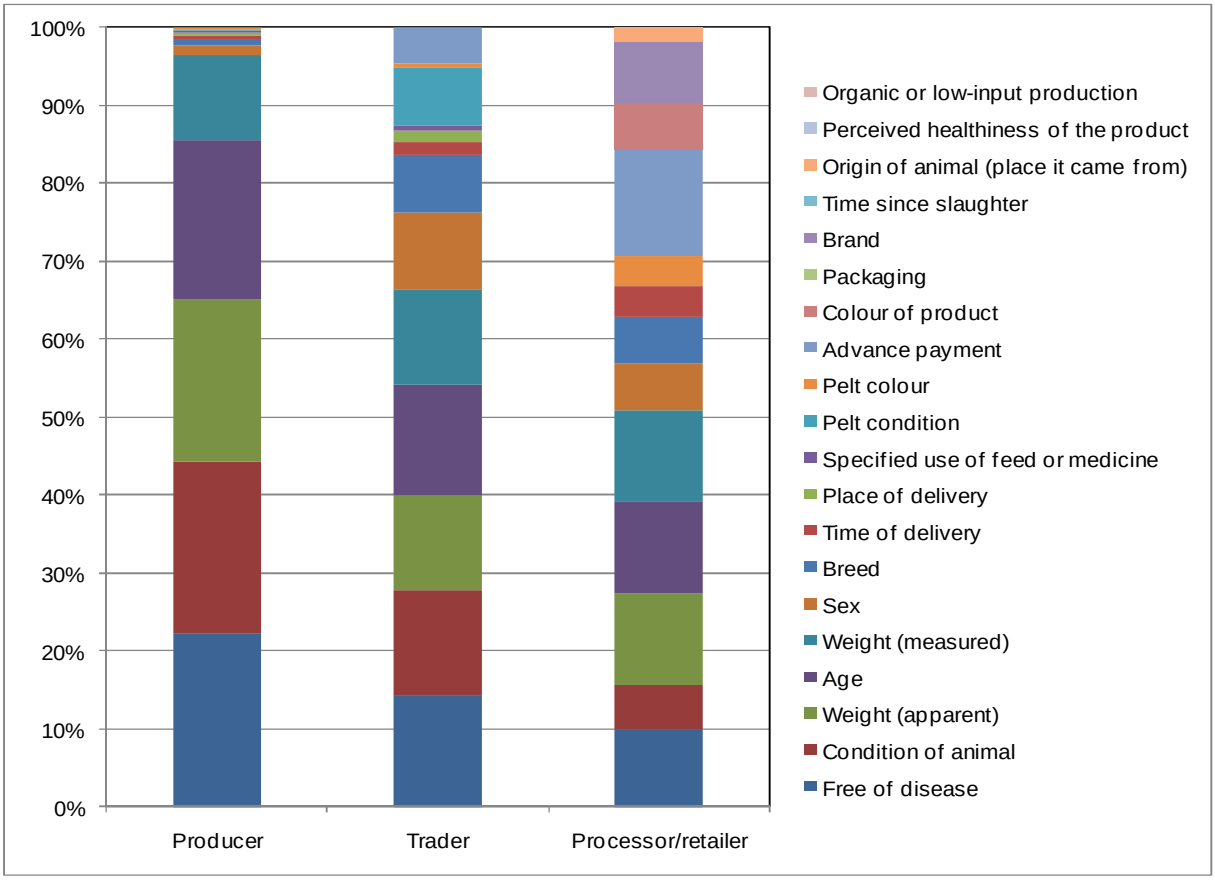

Figure 5.31: Preferred buyers attributes at various segments of the value chain

5.7.5 Production cost distribution in the value chain

Figure 5.32 shows the cost structure for the various segment of the value chain. For cattle- and sheep producers as well as traders feeding expenses contributes the majority towards total expenses. Land, labour and fuel costs also contribute substantially to total production cost for both cattle and sheep producers. Labour cost contributed 50 % towards the total cost in the processor/retail industry followed by rental or capital cost.

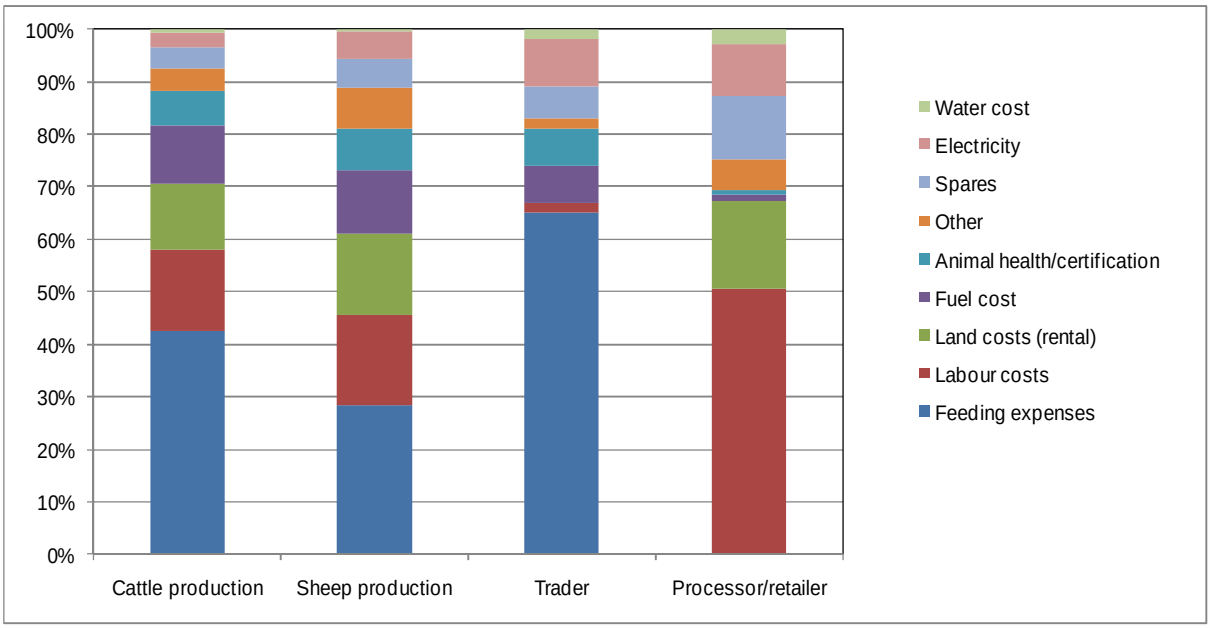

Figure 5.32: Production cost structure at various segments of the value chain

5.7.6 Profit margin distribution through the value chain

The distribution of gross and net profit margins between the producer, primary processor and the retailer sectors are shown in Figure 5.33. For the purpose of this study the gross margin (GM) is defined as the selling price minus the purchasing price or GM=SP-PP. The net margin (NM) is defined as GM minus production cost (PC) or NM=GM-PC. From Figure 5.33 it is evident that the retail sector has by far the largest GM (55.32 % and 59.45 % for beef and lamb respectively), followed by beef producers (31.82 %) and lamb producers (26.99 %). The primary processor or abattoir has the smallest gross margin at 12.86 % and 13.56 % for cattle and beef respectively. The main reason for this low GM is because of the small differences in their purchasing and selling price; in fact it is not impossible for the purchasing price to exceed the selling price, however it should be noted that the profit in this industry is in the value of the fifth quarter.

When considering the NM distribution in Figure 5.33 it is clear that beef and sheep farmers receive the largest share, 52.73 % and 45.79 % respectively followed by the retail sector (26.26 % for beef and 30.12 % for lamb). Like in the case of the GM the primary processors/abattoirs have the lowest NM at 21.01 % and 24.09 % for beef and

lamb respectively. It should be empasised that these values do not represent the NM of the respective industries but their share in the NM. The percentage share NM can be interpreted as the distribution or share of profit in the value chain, i.e. for every rand profit in the beef value chain, the producer receives 43.57 cents and for every rand profit in the lamb sector the producer receives 36.9 cents etc.

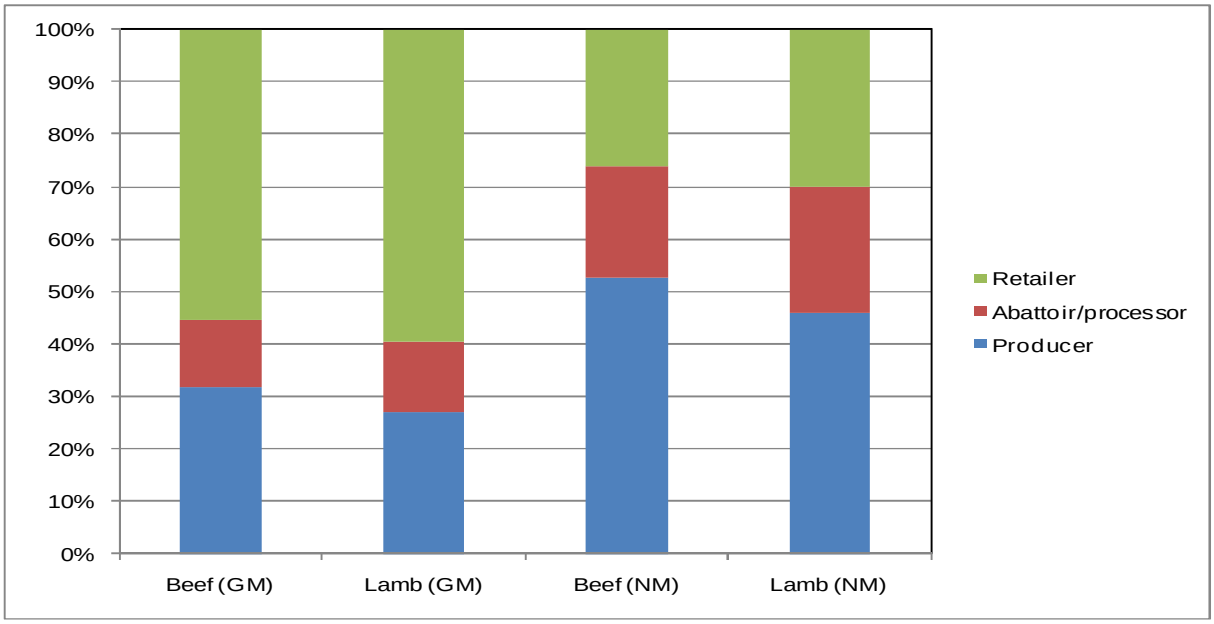

Figure 5.33: Gross- and net margin distribution

5.7.7 Sources and reliability of information across stages

As previously noted a critical prerequisite for a value chain is the availability and reliability of information throughout the various segments of the value chain. Respondents across the FS red meat value chain identified information sources for various factors including; production practices, input use, animal health issues, physical markets, product prices, product standards, traceability and risk management (Figure 5.34). Official source of information are mainly printed press or other media while non-official sources include word of mouth type of information and information from a third party. A concerning issue is that commercial producers (60 % to 70 %) use non-official for most of the factors mentioned; eighty percent of communal producers indicated they have no sources of information available while traders and processors only use non-official sources for information regarding all the mentioned factors.

Respondents ranked the reliability of the information sources in Figure 5.34 from 1 (unreliable) to 9 (extremely reliable). All sources utilised were ranked relatively high with the lowest ranking of just over 3 for traceability issues by producers (Figure 5.35).

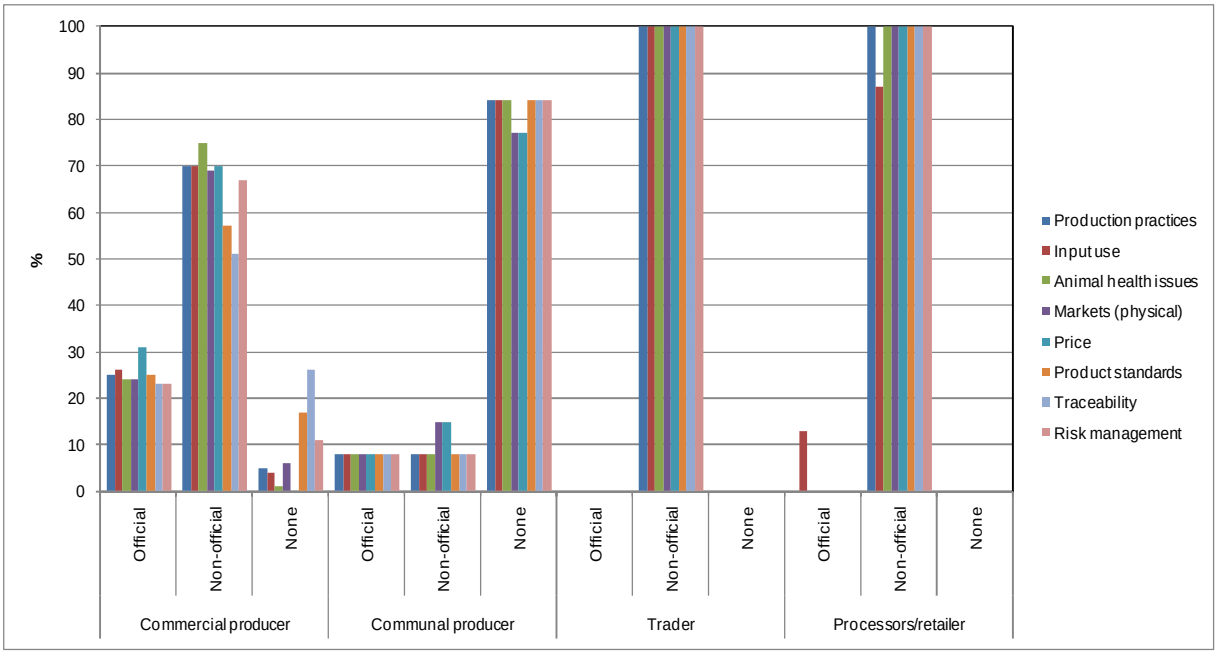

Figure 5.34: Information sources utilised across the various stages of the value chain

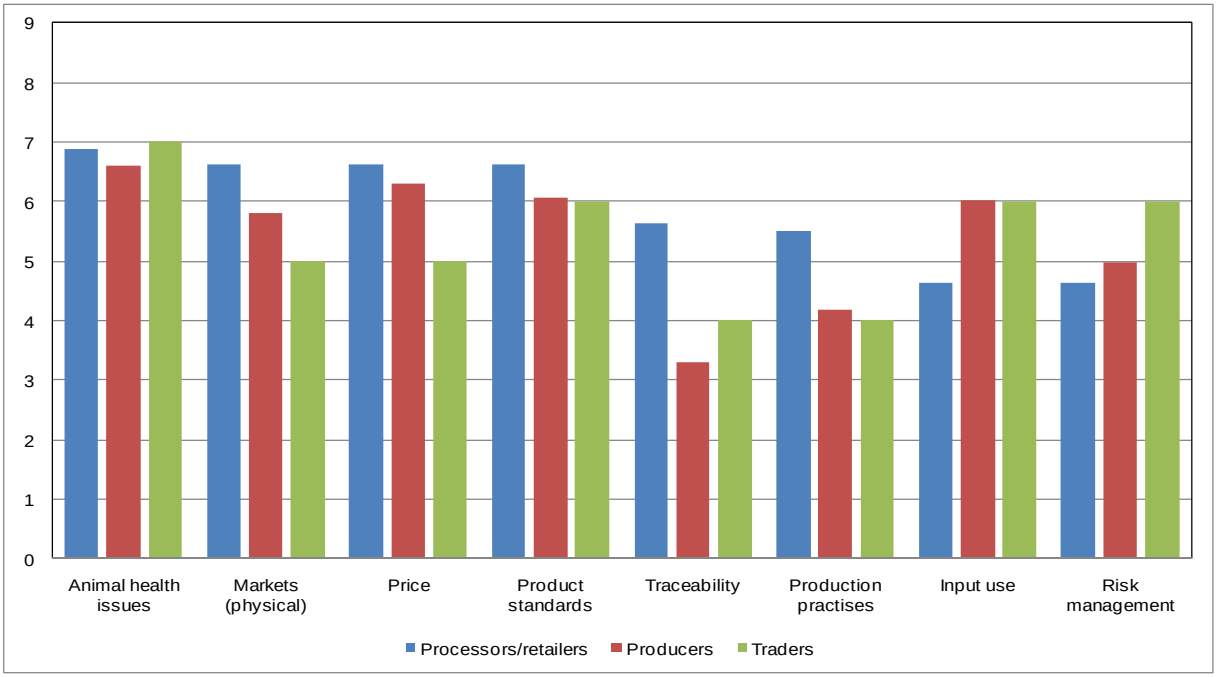

Figure 5.35: Perceptions regarding reliability of information sources at various stages of the value chain

5.7.8 Stakeholders' perceptions regarding constraints and risks

In Figure 5.36, the ranking of the risk perceptions of the various segments in the value chain is shown. For all the role players in the value chain the most predominant constraint is the variability in input and output prices. Low productivity levels also ranked high for producers as well as traders while access to information and inputs received high rankings in the retail industry.

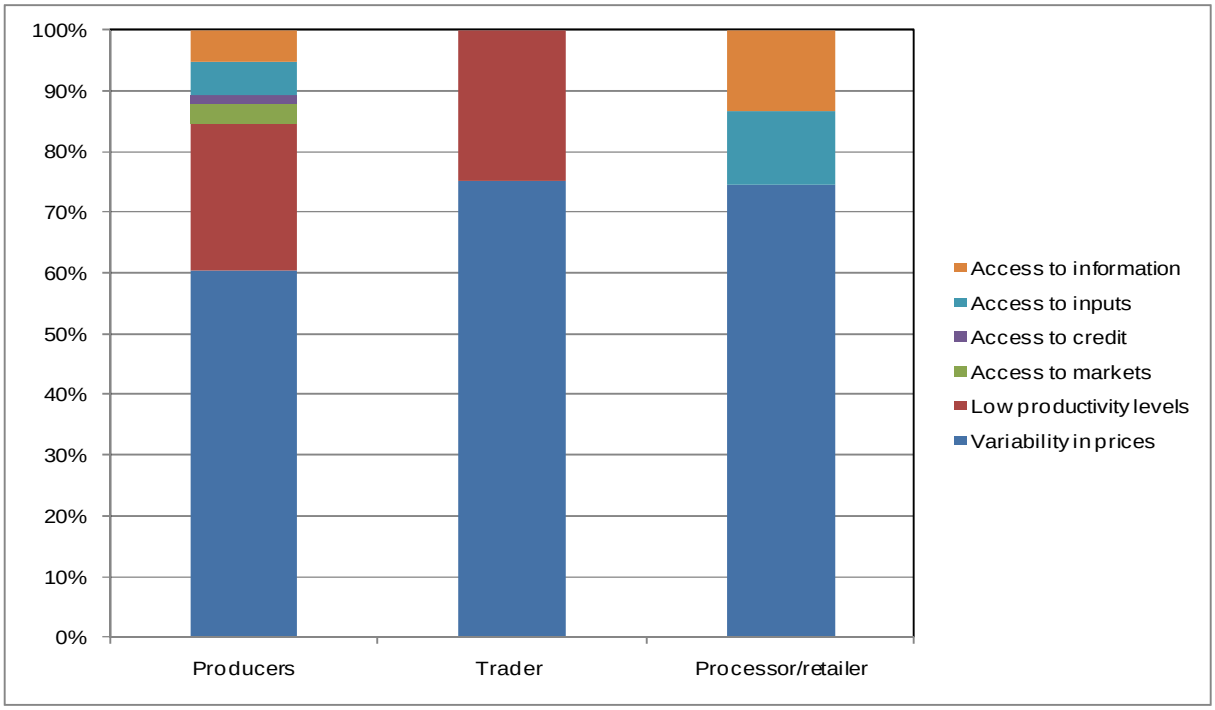

Figure 5.36: Perception of constraints at the various segments of the value chain

Climatic conditions, predation and disease are the main risks identified by producers while traders see theft and corruption as their biggest risk followed by climatic conditions and disease. Retailers ranked water quality, theft and corruption and non-payment as their main risks (Figure 5.37).

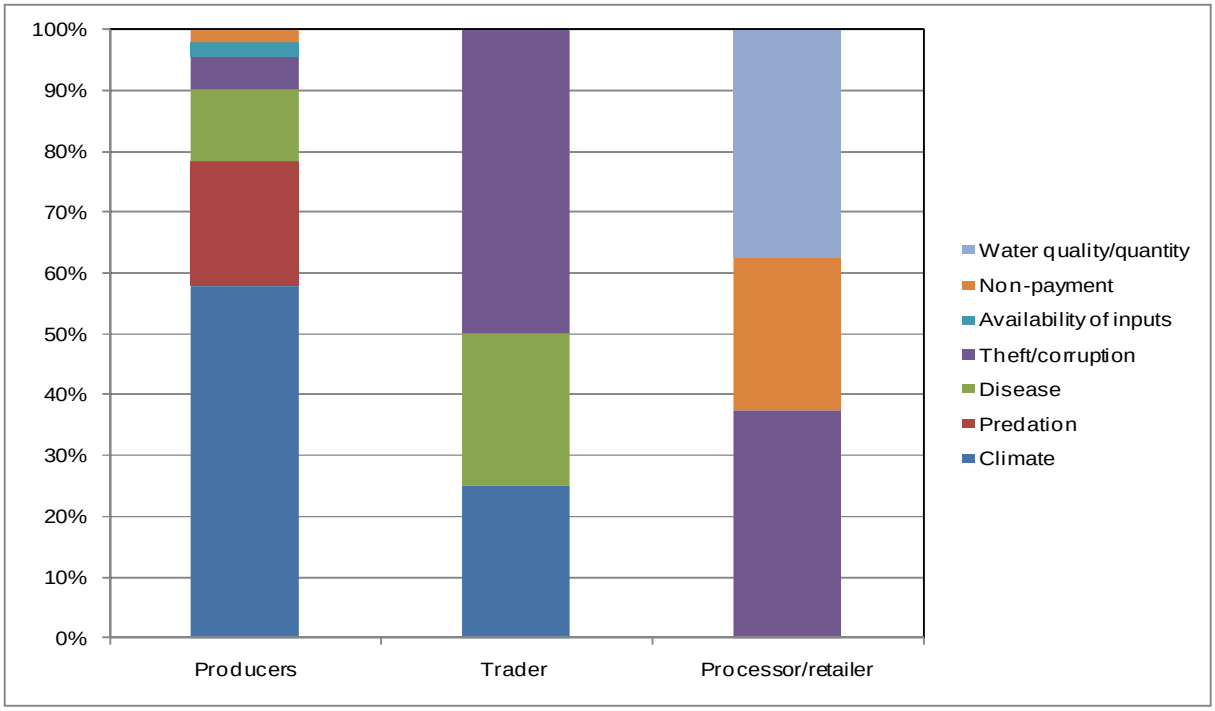

Figure 5.37: Perception of risks at the various segments of the value chain

5.9 Conclusion

Productivity levels are relatively high in the commercial sector, but there are several challenges in the smallholder sector. Addressing these challenges is crucial in order to elevate the industry and to provide mainstream market access to smallholder producers. The results also showed that loose assumptions cannot be made regarding profit margins or distribution of costs between the different levels of the value chain since the factors contributing to costs are quite different. For the smallholder sector the following are major challenges to increase the derived income from livestock production, namely the development of infrastructure in terms of fencing, animal handling facilities and adequate water supply; there is a definite need for education in this sector by means of efficient extension officers specifically related to herd management practices and animal health issues.

Variability in prices is perceived as the biggest constraint by all the role players in the value chain; in order to manage this constraint, accurate and timely information regarding price as well as product flow should be available to all the role players in the value chain.

Increasing input prices will continue to put pressure on the profitability of the industry over the long run, however, adaption of current production systems or adoption of alternative production strategies can alleviate some of the pressure.

A concerning issue is the large number of animal losses due to mainly predation but also animal theft; the issue of theft is a big concern in the downstream levels of the value chain especially at primary and secondary processing stages as well as in the retail sector.

CHAPTER 6

Summary, Conclusions and Recommendations

6.1 Introduction

Population growth estimates combined with predicted increases in red meat consumption, especially in developing countries, provides the South African red meat industry with a challenge. This challenge will be to produce red meat in a sustainable manner given the natural resource restrictions and changing market dynamics.

A first step to address this challenge is to properly understand the underlying dynamics of the industry in a holistic manner to (i) guide decision making in the public and private sector domains, (ii) identify challenges that the industry faces that impedes on its efficient functioning and (iii) create a foundation for the better understanding of the dynamic forces within the industry to allow stakeholders to internalise it in order for them to position themselves so that they can increase their performance at each segment of the industry to the benefit of the entire industry.

By providing only a descriptive profile of a particular industry within a deregulated and liberalised environment is not sufficient any more. To be able to make any normative judgments regarding the performance of an industry, an in depth value chain analysis is needed. This is what this study was set out to achieve for the large (cattle/beef) and small stock (sheep/mutton-lamb) sub-sectors.

6.2 Objectives of the study

This study aimed to map and quantify the large and small livestock agro-food chains in South Africa to firstly, uncover the inter-linkages and better understand the dynamic flow of economic and organisational activities at different stages of the industry, secondly to ultimately identify those factors that significantly affect the performance of these sub-sectors and lastly to provide recommendations to leverage the same to

improve the performance of the mentioned sub-sectors in the long run. In order to achieve this objective the following was addressed:

- Investigate the structure, conduct and performance of the cattle and sheep value chains at a national and regional level;
- Analyse the price transmission mechanisms in the red meat value chain in order to determine the level of price symmetry or the lack thereof; and
- Compile a value chain case study pertaining to the FS province based on structured questionnaires and stakeholder interviews as well as secondary data. The methodology employed can be duplicated in other provinces to map geographic specific red meat value chains.

To achieve abovementioned objectives, a methodological approach based on the latest value chain analysis techniques that are relevant to both the commercial and developing large and small stock systems was applied. Given the importance of the quantification of the value chain in the methodology, emphasis was placed on acquiring relevant primary data at each level of the value chain. A comprehensive set of questionnaires for all the stakeholders in the value chain was developed, tested and applied. The aim of the questionnaire was to capture the primary data necessary to achieve the mentioned objectives.

6.3 Summary

6.3.1 Main issues from the literature review

Various different methods on value chain analysis were reviewed in order to find the most applicable approach considering the dynamics of the value chain in question. From the literature review it became apparent that every value chain is unique in terms of its complexness and its level of evolution, which emphasises the importance to map and quantify each value chain. The mapping of the value chain provides a better understanding of how the product, information and money flows between the different segments of the chain as well as how the inter-linkages between the different segments

function. By mapping the chain, the relative importance of the different segments of the chain can be identified.

The quantification of the value chain entails adding quantitative data to the various role players in the value chain. This quantitative data not only includes data pertaining to animal numbers, producer numbers, farm size etc. but also quantitative data linked to physical flow of commodities along the chain, financial flows, gross and net output values, employment, destination of sales as well as information flows within the value chain etc.

The abovementioned is necessary to evaluate the performance of the value chain and given the importance of this type information when doing value chain analysis, one of the main challenges is acquiring useful, reliable and accurate data and statistics for the sector under investigation.

6.3.2 Structure, Conduct and Performance of the South African red meat red meat industry

This study provided an SCP analysis and overview of the South African red meat industry that assesses the latest trends in the national red meat industry, more specifically the cattle and sheep sub-sectors to gain a better understanding of the South African red meat value chain. The analysis shows that there is still an increasing trend in both the gross value of production of both beef and sheep production and that this sector is still the 3rd largest contributor to the gross value of agricultural production. The national trend in beef herd numbers moved relatively sideways during the past decade; despite this factor, total slaughterings of cattle increased during the same time. Unlike in the case of the beef herd, the national sheep flock has been declining since the late 80s; total slaughtering however showed an increasing trend since the mid 90s.

Total beef production, consumption and per capita consumption have increased since 2000, but beef consumption still exceeds production, and hence South Africa remains a net importer of cattle and beef. Although the production, consumption and per capita consumption of sheep and lamb also showed an increasing trend since 1994 it was at a much slower rate than that of beef. As in the case of beef, South Africa remains a net

importer of sheep, mutton and lamb.

The feedlot industry is an important marketing channel for weaner producers in South Africa e.g. during June 2010 the national one time feeding capacity was in the region of 450 000 animals. Weaner and beef carcass prices, although being variable over the short run, has increased since mid 2009. The average real carcass price increased by 5.4 % from January 2009 to January 2010, while weaner prices increased by 8.9 % during the same time in real terms. Lamb and mutton carcass prices has been increasing since late 2009. The average real mutton price increased by 13.4 % from January 2009 to January 2010, while lamb carcass prices increased by 16.6 % during the same time in real terms. The primary processing industry consists of 488 registered abattoirs with the majority of high throughput abattoirs situated in Gauteng, the Free State and Kwazulu-Natal provinces.

The retail sector is an important outlet for meat in South Africa. Retailers make use of block tests to determine selling prices for various cuts based on the purchase price. Prices do not only differ between different retail groups but also between individual outlet stores of the same retail group. This is mainly due to different consumer dynamics linked to a specific geographical area, i.e. the market that the specific store serves. Stores in higher income areas, for example, will typically take a higher profit margin on the more expensive hind quarter cuts compared to fore quarter cuts, which might be sold at a loss in order to balance the overall carcass price and *vice versa*.

There are numerous factors that have a direct impact on the profitability of the red meat sector as a whole. Changes in supply and demand situations, due to economic factors as well as climatic conditions lead to relatively high variability in meat prices (although much less than in the grain sub-sector).

6.3.3 Price transmission

An important consideration of value chain analysis is to analyse the way prices are transmitted through the various levels of the value chain. Inefficiencies in the transmission of prices will have negative effects on the effectiveness of the value chain. The nature of price transmission in the South African beef and lamb value chains were

investigated, the producer-retail price margin using the A2/A3 carcass price producers receive and a calculated equivalent carcass price at retail level. Several econometric modelling techniques were considered and the most appropriate model was chosen based on several criteria.

This analysis found that price margins in absolute values within the beef and lamb sub-sectors increased over time. Input and processing costs have increased throughout the value chain as a whole. The increases in costs include labour, packaging, transportation, farm feeds, intermediate goods and repair and maintenance. These increases in input costs contributed to the increase in the producer-retail price margin. Price margin calculations based on national averages revealed that carcass prices differ regionally while retail prices not only differ regionally, but also between different retail groups and between retailers of the same group (outlets from the same retailer) in the same geographical area. This is an indication that product prices are very sensitive to the consumer dynamics of a specific region. These differences in retail prices also depend, to a large extent, on the way a specific retailer “balances” a carcass in terms of the pricing of the individual cuts, given the varying demand factors between regions.

Cointegration was found in both the beef and lamb producer- and retail prices, which indicate these prices, share a certain type of behaviour in terms of their long-term fluctuations. APT was found in both the beef and lamb value chains. APT implies that a change in the price at one level of the value chain does not transmit fully and immediately to the other level of the chain. The speed of adjustment towards equilibrium in terms of negative shocks in the margin is greater for beef and lamb than for positive shocks; which imply that there is asymmetry with regard to the speed of price transmission between producer and retail prices of both beef and lamb. In other words, the speed of change in the producer prices of beef and lamb does not translate to the same speed of change in the retail prices. In the case of the beef market, the retail price responds to both positive and negative shocks in the producer price; while in the case of lamb, the retail price responds more significantly to negative than positive shocks at producer level. However, in both the beef and lamb markets, the retail price will react faster when the profit margins are squeezed rather than stretched.

Causality tests performed proved that market influence could flow either way, i.e. there is a bi-directional causality between the producer and retail price for beef. In other words, in the case of the beef value chain, producer prices influence retail prices but, depending on the market situation, the retail price can also influence the producer price. On the other hand, the result shows that producer price influences retail price in the lamb market, but not *vice versa.*

APT is not uncommon, especially in agricultural or food product markets. Various studies shows a number of possible reasons for APT; these include menu/adjustment cost, inventory costs, the fear of price wars, concentration at retail level, non-competitive imperfect markets, political intervention, asymmetric information flow, the number of intermediaries within the value chain, transport and transaction cost, market power, increasing returns to scale in production, product homogeneity and differentiation, exchange rates, and border and domestic policies. However, these findings cannot be genarilised as value chains differ, not only between commodities but also between countries, and even at the regional level within countries.

A few contributing factors can be identified as contributing towards APT in the South African red meat industry, Firstly, for a value chain to function efficiently, there has to be timely and accurate information flow in the value chain, not only in terms of price information but also product information to all the role-players, including the consumer. The South African red meat value chain does not, in its current state, relay the message of consumer preferences regarding product quality, consistency in quality palatability etc. from the consumer to the producer in an efficient manner. A second contributor to APT is menu cost. Menu cost is the physical action to change product prices on packaging. Thirdly, coupled with menu cost is inventory cost, where retailers first clear products (bought at a higher price) before adjusting prices downwards. Lastly, the number of intermediaries within the value chain, as well as increasing transport and transaction costs, also creates APT conditions.

6.3.4 Case study: Free State Province

The lack of primary data, especially farm-level data, necessitated the need for a case study in order to meet the objectives of this study. Initially the aim was to include all provinces in South Africa, however budgetary and time constraints deemed this impossible. The FS province was identified as the survey area as it is one of the main red meat producing provinces.

The FS province consists of 7,515 farming units, which is the largest number of farming units in the country with approximately 4,500 red meat producers. For the survey a sample was drawn from a list of red meat producers provided by the FSRPO as well as a number of farmers study groups, associations and agribusinesses in the province. A total of 745 commercial red meat producer names and contact numbers were obtained through this method. Through the help of the FSRPO farmers were notified with regard to the survey and urged to partake if contacted. Personal interviews were arranged with the selected farmers and the data was collected on farm by post-graduate students at the Department of Agricultural Economics at the University of the Free State. By using post-graduate students with a sound background in agriculture, the quality of the data captured was assured. A total of 143 commercial producers were interviewed successfully (19% of populated sample). Apart from the commercial farmers interviewed, 23 smallholder producers were also interviewed. The smaller sample was due the homogenous nature of this sector' production practices throughout the province. In addition, these farmers are difficult to get hold of; the approached followed was to intercept the farmers as they return their animals to their pens in the evening.

The survey also included the downstream segments of the value chain in the form of abattoirs, processors, butcheries and retailers. In the FS province there is a high level of integration between the aforementioned, the abattoir owner is in many cases a farmer and also owns the butchery in town. Apart from the primary data obtained, secondary data was also obtained from various sources. Industry stakeholders at every level of the value chain were interviewed including all four retailer groups nationally to obtain information regarding operations in general.

On average, 60 % of income generated by primary livestock producers interviewed during the 2009 production season in the province was directly from livestock production. These producers employs on average 8.6 permanent male and 0.32 permanent female labourers.

The commercial red meat sector in the FS province performed above national averages for the 2009 production season. The commercial average calving percentage in the province was 80 %, while the average commercial lambing percentage was 93 %. Although the calving rate varied little on a regional level, lambing rates varied between 72 % (WFS) and 97 % (NEFS), while the lambing rates in the SFS and CFS was 96 % and 79 %, respectively. Older animals in the beef sub-sector are mainly marketed to the primary processing industry, while younger animals are marketed to the feedlot sector. The majority of the animals in the mutton/lamb sector are marketed directly to the primary processing industry. The main production cost components includes feeding expenses, labour cost, land cost/rent and fuel cost.

A major concern amongst the respondents is the variability in meat prices since production decisions are based on dynamic market conditions with variable prices. This concern is not however limited to producers but was also reiterated by the downstream segments of the value chain. Some other concerns highlighted by the producers in this sector was the variable climatic conditions, increasing input prices that puts pressure on the profitability of the sector, and the large number of animal losses due to predation and animal theft

Smallholder producers in the province are more dependent on livestock production than the commercial producers as on average, 84 % of these producers' income was generated directly from livestock production during the 2009 season. Production is predominantly done on communal land and these producers employ 0.3 permanent male mainly young persons, and/or family members. The average calving percentage in this sub-sector in the FS is 30 %, while the lambing percentage is 13.2 % and the off-take rates is very low (12 % for cattle and 2.3 % for sheep where the latter is mainly for home consumption). This is one of the most important critical success factors that need to be addressed in order to improve the performance of this sector. Animal sales

are rare and market access in the case of beef is limited to the informal market, the regional auction system as well as abattoirs while sheep are predominantly sold to abattoirs.

Production expenses are limited to feeding expenses and fuel cost, none of the respondents indicated any expenses towards animal health issues; this can be attributed to both the lack of knowledge with regard to animal management practices (basic animals production skills are limited, for instance herd/flock composition in terms of the ratio of young to old animals are skewed; more than 70 % of the animals in these herds/flocks are old female animals), as well as the lack of necessary funds. Market access is still limited in the developing producer sector; this is mostly due to the poor quality of the animals and the small number of marketable animals at any given time (buyers prefer to fill a truck).

A further contributor to the poor performance of the smallholder sub-sector is the lack of the necessary infrastructure in the communal areas. Without proper fencing and watering facilities, no form of herd management practices in terms of calving seasons, breeding selection and pasture management is possible. The lack of animal handling facilities makes it impossible to ensure good animal health practices. The aforementioned, combined with the lack of education and guidance from qualified extension officers and access to finances remains a big concern in this sub-sector. The main risks identified in this sub-sector include disease (due to lack of proper animal health programs) and poor climatic conditions.

The processing and retailer sector in the province is highly integrated, especially in terms of primary producers, abattoirs and butcheries. This sector employs on average 20.5 permanent male and 5.3 permanent female employees. There are 20 high throughput abattoirs and 61 low throughput abattoirs distributed throughout the province. Output prices at abattoir level are based on input prices and the value of the fifth quarter (including the hide/skin). Abattoirs are an important marketing alternative, especially in the rural parts of the province. Secondary processors sale prices are based on block tests given a certain purchase price. These sales prices vary throughout the province and are determined by purchase prices and specific demand

factors linked to consumer dynamics. The main contributors towards total production costs includes: labour cost (52 %), rental or capital cost (17 %), packaging cost (12 %) and electricity (10 %). Some concerning issues in this sector includes:

- High capital costs combined with legislative requirements.
- In many rural parts there is a lack of enforcement of legislative requirements.
- Too little product information regarding eating quality, guarantees and nutritional values are relayed to the final consumer.
- There are high losses in this sector due to product spoiling.
- Theft is a big concern, especially in the abattoir sector in the FS.

6.4 Recommendations

To ensure the sustainability of red meat production, given the limited availability natural resources it is necessary to improve the efficiency of the red meat sector in South Africa. Increasing the productivity of the smallholder red meat producers should be a major industry objective. This objective should start with the improvement of infrastructure, education of extension officers and simplified and easier access to credit.

In order for any value chain to function both efficiently and ethically, there has to be timely and accurate information flow in the value chain; this does not only include price information but information regarding the product. A big concern amongst role players within the industry is the variability in meat prices and the lack of price information. In many cases production decisions are based on inaccurate and outdated information, although price information are available to some, this price information is not always generalised and leads to misleading comparisons. There is a need for a holistic information management or price reporting system that can provide accurate information regarding product price, product flow (slaugheterings) etc. to all the stakeholders in the industry. Due to the variability in provincial animal and meat prices, this should be definable up to provincial level.

Predation was identified as one of the main reason for losses; this has also been highlighted in other studies. Governing authorities should aggressively address this

problem as it can have catastrophic implications, especially in the mutton/lamb industries in the near future if not addressed urgently.

Regulation in terms of product requirements and safety guarantees is important for the industry to operate successfully. Although these regulations exists, it is not always enforced which leads to an unlevel playing field. The transaction costs of complying with these regulatory requirements is significant, however there are still many irregularities within the whole value chain, especially within the primary processing sector in rural areas that is not enforced or monitored regularly. This has a negative effect on consumer perception regarding the safety and quality of the end product. A starting point in addressing this problem should be an audit of current compliancy conditions in the primary processing industry.

6.5 Limitations to the study

The biggest limitations to this study was the fact that it was limited to only one red meat producing province in the country, mainly due to budgetary and time constraints.

Another concerning factor, especially in the downstream segments of the value chain is the transparency of information in terms of product prices and price determination.

Given the importance of the red meat industry in South Africa it is strongly recommended that the same methodology be applied to the rest of the main red meat producing provinces in the country to provide a regional benchmarking tool and at the same time assess the current state of the red meat industry in South Africa. It is suggested that this methodology should be applied every 2 to 3 years to measure and assess changes and trends in the industry.

REFERENCES

Abdulai, A.,2000, Spatial price transmission and asymmetry in the Ghanaian maize market, *Journal of Development Economics,* 63:327-349.

Abdulai, A., 2002, Using threshold cointegration to estimate asymmetric price transmission in the Swiss pork market, *Applied Economics*, 34: 679-687.

AMT 2009, *Feedlot analysis and outlook*, September 2009, Agrimark Trends PTY (Ltd), Pretoria.

AMT 2010, *Livestock data*, Agrimark Trends PTY (Ltd), Pretoria.

Aguiar, D.R.D. and Connor, J.M., 1997, The effects of changes in regulatory and trade policies on the structure, conduct and performance of the Brazilian dairy processing industry, *Staff Paper No. 97-15*, Department of Agricultural Economics, Purdue University, West Lafayette, IN.

Aguiar, D.R.D. and Santana, J.A., 2002, Asymmetry in farm to retail price transmission: evidence from Brazil, *Agribusiness*, 18(1):37-48.

Ainslie, A., Kepe, T., Ntsebeza, L., Ntshona, Z., and Turner, S., 2002, Cattle ownership and production in the communal areas of the Eastern Cape, South Africa, *Research Report no. 10*. University of the Western Cape.

Aramyan, L., Ondersteijn, C., van Kooten, O. and Oude Lansink, A., 2006, *Performance indicators in agri-food production chains*, in Ondersteijn, C.J., Wijnands, J.H., Huirne, R.B., and van Kooten, O., (Eds.), *Quantifying the agri-food supply chain*, Springer, Dordrecht, pp. 47-64.

Azzam, A., (1999), Asymmetry and rigidity in farm-retail price transmission, *American Journal of Agricultural Economics*, 81:525-533.

Baker, D., Taljaard, P.R., Spies, D.C., Nel, W., Jooste, A., Laubscher, K., Rich, K. and Haskins, B., 2009, *An advanced in value chain analysis for smallholder livestock keepers: VAIMS*, Paper presented at the regional symposium on livestock marketing in

the Horn of Africa: Working towards best practices, Nairobi, Kenya, 21-23 October 2009.

Beamon, B.M., 1999, Measuring supply chain performance, *International Journal of Operation and Product Management*, 19(3):275-292.

Ben-Kaabia, M. and Gil, J.M., 2007, Asymmetric price transmission in the Spanish lamb sector, *European Review of Agricultural Economics*, 34(1):53-80.

Bernard, J. and Willett, L., 1996, Asymmetric price relationships in the US broiler industry, *Journal of Agricultural and Applied Economics,* 28:279-289.

Borenstein, S., Cameron, A.C. and Gilbert, R., 1997, Do gasoline prices respond asymmetrically to crude oil price changes?, *Quarterly Journal of Economics,* 112:305-339.

Boomgard, J.J., Davies, S.P., Haggblade, S. and Mead, D.C., 1986, Subsector analysis: its nature, conduct and potential contribution to small enterprise development, Michigan State University, Department of Agricultural Economics, *International Development Papers No. 26*, East Lansing, Michigan.

Butcher, 2010, *Abattoir regulatory structure*, 1(7), viewed January 2011, from http://www.thebutcherweb.co.za/butchervol1no7snippets.html.

Chan, K.S., 1993, Consistency and limiting distribution of the least squares estimator of a threshold autoregressive model, *Annals of Statistics,* 21(1):520-533.

Chibba, A., 2007, *Measuring supply chain performance measures: prioritizing performance measures*, Licentiate thesis, Luleå University of Technology, 2007:49.

Chibba, A., 2007, *Measuring supply chain performance upstream and downstream the supply chain* – two case studies from Swedish heavy vehicles manufacturers, presented at EUROMA conference in Ankara, Turkey.

Clark, R., Timms, J., Bacusmo, J., Bond, H., Espinosa, E., Gabunada, F., Madzivhandila, T. P., Matjuda, L. E., Motiang, D. M., Nengovhela, N. B. and Toribio, J., 2005, *Designing and managing R&D projects to achieve outcomes from the outset,*

viewed 20 July 2009, from http://www.engagingcommunities2005.org/abstracts/Clark-Richard2-final.pdf.

Conforti, P., 2004, Price transmission in selected agricultural markets, *FAO Commodity and Trade Policy Research working paper No. 7*, March 2004.

Coetzee, L., Montshwe, B.D. and Jooste A., 2005, The marketing of livestock on communal lands in the Eastern Cape province: Constraints, challenges and implications for the extension services, *South African Journal for Agricultural Extension,* 34(1):81-103.

Cutts, M. and Kirsten, J.F., 2006, Asymmetric price transmission and market concentration: An investigation into four South African agro-food Industries, *South African Journal of Economics,* 74(2):323-33.

DAEA, 2005, Department: Agriculture, Environmental Affairs and Rural Development, Kwazulu-Natal, *Feedlotting cattle,* viewed November 2010, from http://www.kzndae.gov.za/AgricPublications/ProductionGuidelines/BeefProduction/FeedlottingCattle.aspx.

DAFF 2010, *Abstract of Agricultural Statistics* (AAS), National Department of Agriculture, Forestry and Fisheries. The Directorate: Agricultural Statistics and Management Information. Pretoria, South Africa.

Dolan, C. and Humphrey, J., 2000, Governance and trade in fresh vegetables: The impact of UK supermarkets on the African horticulture industry, *Journal of Development Studies*, 37(2):147-176.

Enders, W. and Granger, C.W.J., 1998, Unit root test and asymmetric adjustment with an example using the term structure interest rates, *Journal of Business and Economic Statistics*, 16(3):304-311.

Enders, W. and Siklos, P.L., 2001, Cointegration and threshold adjustment, *Journal of Business and Economic Statistics*, 19(2):166-176.

Engle, R.F. and Granger, C.W.J., 1987, Cointegration and error correction: Representation and testing, *Econometrica,* 55:251-276.

Fitter, R. and Kaplinsky, R., 2001, Who gains from product rents as the coffee market becomes more differentiated?, A value chain analysis. *IDS Bulletin Paper (May).*

Francis, M., 2004, *Application of the food value chain analysis method in the UK red meat industry*, Proceedings of the 9 th International Symposium on Logistics, Bangalore, India, 11 - 14 July, pp.104 - 109.

French, B., 1974, The subsector as a conceptual framework for guiding and conducting research, *American Journal of Agricultural Economics,* 1(5):56.

Frost, D. and Bowen, R., 1999, An asymmetric generator for error-correction mechanism, with application to bank mortgage-rate dynamics, *Journal of Business and Economic Statistics,* 17(2):253-263.

Gardner, L., 1975, The farm-retail price spread in a competitive food industry, *American Journal of Agricultural Economics*, 57(3):399-409.

Gereffi, G., 1994, *The organisation of buyer-driven global commodity chains: how US retailers shape overseas production network*, In Gereffi, G. and Korzeniewicz, M. (Eds.) Commodity chains and global capitalism (Westport, Praeger), pp. 95-122.

Gereffi, G., 1999a, International Trade and Industrial Upgrading in the Apparel Commodity Chain, *Journal of International Economics*, 48(1):37-70.

Gereffi, G., 1999b, A commodity chains framework for analysing global industries. In Institute of Development Studies, 1999, *Background Notes for Workshop on Spreading the Gains from Globalisation*, viewed April 2009, from www.ids.ac.uk/ids/global/conf/wkscf.html.

Gereffi, G., 2001, Shifting governance structures in global commodity chains, with special reference to the internet, *American Behavioral Scientist*, 44(10):1616-1637.

Gereffi, G. (ed.), 2002, *Who Gets Ahead in the Global Economy?* In: Industrial Upgrading, Theory and Practice, New York: Johns Hopkins Press.

Gereffi, G and M. Korzeniewicz (eds.), 1994, *Commodity chains and global capitalism*, London: Praeger.

Gereffi, G., Garcia-Johnson, R. and Sasser, E., 2001, The NGO-Industrial Complex, *Foreign Policy*, July-August, pp. 56-67.

Gereffi, G. and Kaplinsky, R., (eds.), 2001, *The value of value chains*, IDS Bulletin, 32(3):19-30.

Gereffi, G. and Memedovic, O., 2003, *The global apparel value chain: What prospects for upgrading by developing countries*, Sectoral Studies Series, United National Industrial Development Organization, Vienna.

Gereffi, G., Humphrey, J., and Sturgeon, T., 2005, The governance of global value chains, *Review of International Political Economy*, United Kingdom: Routledge, 12(1):78-104.

Ghysels, E., Lee, H.S. and Noh, J., 1994, Testing for unit root in seasonal time series, *Journal of Econometrics*, 55:57-98.

Giuliani, E., Pietrobelli, C., and Rabellotti, R., 2005, Upgrading in global value chains: Lessons from Latin American clusters, *World Development,* 33(4):549-573.

Goodwin, B.K. and Holt, M.T., 1999, Asymmetric adjustment and price transmission in the U.S. beef sector, *American Journal of Agricultural Economics*, 81:630- 637.

Goodwin, B.K., 2006, *Spatial and vertical price transmission in meat markets*. Paper presented at the workshop on market integration and vertical and spatial price transmission in agricultural markets, University of Kentucky, USA.

Granger, C.W.J., 1969, Investigating causal relationships by econometric models and cross-spectral methods, *Econometrica,* 37:424-438.

Gunasekaran, A., Patel, C. and McGaughey, R.E., 2004, A framework for supply chain performance measures, *International Journal of Production Economics*, 87(3):333-347.

Hahn, W.F., 2004, Beef and pork values and price spreads explained, *Economic Research service*, U.S. Department of Agriculture, *Report LDP-M-11845-01.*

Hahn, W.F., 1990, Price transmission asymmetry in pork and beef markets, *The Journal of Agricultural Economics Research*, 42:21-30.

Hancock, P.J., Nieuwoudt, W.L. and Lyne, M.C., 1984, Demand analysis of meat in South Africa, *Agrekon*, 23(2):26-29.

HPC, Hans Posthumus Consultancy., 2003, *Capacitating sector analysis: A practical training methodology to analyse value chains*, Training manual for participants.

Harmon, P., 2003, An introduction to the supply chains council's SCOR Methodology, in *Business process trends,* viewed July 2009, from http://www.bptrends.com/publicationfiles/Intro%20SCOR%20Method%20Whitepaper%2001-0311.pdf.

Holtzman, S., 2002, *Using subsector analysis to assess the impact of policy reform on commodity subsectors*, Impact Assessment Report No. 27, Abt. Associates Inc., Massachusetts, USA.

Humphrey, J. and Schmitz, H., 2004, Governance in global value chains, in H. Schmitz (ed.), *Local Enterprises in the Global Economy*, Cheltenham, Edward Elgar, pp. 95-109.

Humphrey, J. and Napier, L., 2005, The value chain approach as a tool for assessing distributional impact of standards on livestock markets: guidelines for planning a programme and designing case studies, *Working paper*, FAO AGA/ESC initiative on market exclusion.

Jie, F., Parton, K. and Cox, R., 2007, Supply chain practice, supply chain performance indicators and competitive advantage of Australian beef enterprises: A conceptual framework, *Australian Agricultural and Resource Economics*, AARES 51st Annual Conference, Queenstown, Australia.

Johansen, S., 1998, Statistical analysis of cointegrating vectors, *Journal of Economic Dynamics and Control*, 12:231-254.

Jooste, A., 1996, *Regional Beef Trade in Southern Africa*, Master's Dissertation, University of Pretoria, Pretoria.

Jooste, A. and Taljaard, P.R., 2004, Review of red meat industry - Chapter 17.1. In Groenewald, J.A. (Ed). *South African agricultural sector review - Evaluation of changes since 1994,* National Department of Agriculture, Pretoria. 2004, pp 410-435.

Jooste, A., Gudeta, Z.A., Botha, E., Taljaard, P.R. and Van Schalkwyk, H.D., 2003, *Investigation into the supply chain for beef*, Food Price Monitoring Committee, Pretoria. (Unpublished).

Jordaan, H., Grovè, B and Magingxa, L., 2008, Assesment of the contribution of water use to value chains in agriculture, *Interim Report: Literature Review. K5/1779//4.*

Kaplinsky, R., 2000, Globalisation and unequalization: What can be learned from value chain analysis, *Journal of Development Studies*, 37(2):117-146.

Kaplinsky, R. and Morris M., 2001*, A Handbook for value chain research*, *A report prepared for the IDRC*, viewed 4 March 2009, from http://www.ids.ac.uk/ids/global/pdfs/vchnov01.pdf.

Kinnucan, H.W. and Forker, O.D., 1987, Asymmetry in farm-retail price transmission for major dairy products, *American Journal of Agricultural Economics*, 69:285-292.

KIT, Faida MaLi and IIRR., 2006, *Chain empowerment: Supporting African farmers to develop markets*, Royal Tropical Institute, Amsterdam; Faida Market Link, Arusha; and International Institute of Rural Reconstruction, Nairobi.

Korver, S., 2010, *Sustainability of the meat chain: A market Imperative*, IMS Congress, Buenos Aires, Argentina, September 2010.

Kula, O., Downig, J. and Field, M., 2006, Globalization and the small firm: An industry value chain approach to economic growth and poverty reduction, *microREPORT#42*, February 2006.

Li, S., Rao, S., Ragu-Nathan, T.S. and Ragu-Nathan, B., 2002, *An empirical investigation of supply chain management practices*, Proceedings of the 33rd annual meeting the decisions science institute, San Diego, CA, November 23-26.

Lubbe, W.F., 1990, Decomposition of price time series components of the red meat industry for efficient policy and marketing strategies, *Agrekon*, 29(4):296-304.

Luning, P.A., Marcelis, W.J., and Jongen, W.M.F., 2002, Food quality management: a techno-managerial approach, Wageningen Pers, Wageningin.

Lusby, F. and Panlibuton, H., 2004, *Value chain analysis*, SEEP network annual general meeting, pre-event workshop: 25-26 October, 2004.

Madzivhandila, T. P., Groenewald, I., Griffith, G. and Fleming, E., 2007, Continuous improvement and innovation as an approach to effective research and development: A 'trident' evaluation of the beef profit partnerships project, viewed 2009, from http://ageconsearch.umn.edu/handle/6017.

Marion, B.W., 1976, Vertical coordination and exchange arrangements: concepts and hypothesis, paper presented at *Seminar on Coordination and Exchange in Agricultural sector, North Central Regional Research Project 117*, Chicago, Illinois, USA.

Marsh, J.M. and Brester, G.W., 2004, Wholesale-retail marketing margin behaviour in the beef and pork industries, *Journal of Agricultural and Resource Economics,* 29:45-64.

Mayoux, L., 2003, *Tricle-down, tricle-up or Puddle?: Participatory value chains analysis for pro-poor enterprise development*, WISE Development, mimeo.

Meyer, J. and Von Cramon-Traubadel, S., 2004, Asymmetric price transmission: A survey, *Journal of Agricultural Economics,* 55(3)581-611.

Meyer-Stamer, J. and Wältring, F., 2007, *Linking value chain analysis and the 'making markets work better for the poor' concept*, Prepared for the pilot project "Innovative approaches to private sector development" GTZ.

Miller, D.J. and Hayenga, M.L., 2001, Price cycles and asymmetric price transmission in the U.S. pork market, *American Journal of Agricultural Economics,* 83:555-562.

Montshwe, B.D., 2006, *Factors affecting participation in mainstream cattle markets by small-scale cattle farmers in South Africa*, Unpublished Master's Dissertation, University of the Free State, Bloemfontein.

NDA 2008, Abstract of Agricultural Statistics (AAS), National Department of Agriculture, The Directorate: Agricultural Statistics and Management Information, Pretoria, South Africa.

Nieuwoudt, W.L., 1985, An economic analysis of demand and policies in the beef industry, *Agrekon*, 24(2):9-13.

Olivier, G.C., 2004, *An analysis of the South African beef supply chain: From farm to fork*, Unpublished Master's Dissertation, Rand Afrikaans University, South Africa.

Oyewumi, O.A., 2005, *Modeling tariff rate quotas in the South African livestock industry*, Unpublished Master's Dissertation, University of the Free State, South Africa.

Paterson, A. G., 1997, *Farm support services in South Africa*, Unpublished report, Development Bank of Southern Africa, Midrand.

Peltzman, S., 2000, Prices rise faster than they fall, *Journal of Political Economy*, 108(3):466-502.

Ponte, S., 2001, *The 'latte' revolution?, Winners and losers in the restructuring of the global coffee marketing chain*, *CDR Working Paper 01.3*, Centre for Development Research, Copenhagen.

Porter M. E., 1985, *Competitive advantage: Creating and sustaining superior performance*, N. York: The Free Press.

Propovics, P.A. and Toth, J., 2006, Tendencies of price transmission and asymmetric effect of price in the Hungarian dairy sector, *Kozgazdasagi Szemle (Economic Review)*, 53(4):349-364.

Rich, K.M. and Narrod, C.A., 2005, *Perspectives on the supply chain management of high-value agriculture: The role of public-private partnerships in promoting smallholder access*, Paper presented for the International Conference: Public-Private Partnerships for Harnessing the Potential of Rainfed Agriculture, New Delhi, India, October. 19, 2005.

Rich, K.M., Baker, D., Negassa, A. and Ross, R.B., 2009, *Concepts, applications, and extensions of value chain analysis to livestock products in developing countries: A review and research agenda,* Presentation at the International Association of Agricultural Economics Meetings, Beijing, China, August 2009.

Richter, P., 2006, *Value chain promotion and business environment reforms*, Asia Regional Consultative Conference, Donor Committee for Enterprise Development. Bangkok, 29 November to 1 December 2006.

RMRDT, Red Meat Research and Development Trust, 2008, Research and development plan for large stock and small stock meat industries in South Africa, October 2008, Pretoria, viewed May 2009 from http://www.samic.co.za/samic/rd.htm#rdRMRDT.

RMAA, Red Meat Abattoir Association, 2009, *Annual report,* Menlo Park, Pretoria.

RMIF, Red Meat Industry forum, 2010, *Organisational structure,* viewed November 2010 from http://www.redmeatsa.co.za/node/195.

Roduner, D., 2004, *Draft report on value chains: Analysis of existing theories, methodologies and discussions of value chain approaches within the development cooperation sector*, Swiss Afency for Development and Cooperation.

Roduner, D., 2005, *Value-chains: What is behind this, new key word? And what is the role of development agencies in value chain development in developing countries?*, Rural Development News, 2.

SADC, Southern African Development Community, 2009, *Value Added Information Management System (VAIMS) for livestock value chains in the SADC region*. Developed for the SADC PRINT project entitled Promotion of Regional Integration in the

SADC Livestock sector funded by the EU under the Southern African PRINT programme implemented throughout SADC, Gabarone, Botswana.

SAFA, South African Feedlot Association, 2009, *National environmental guidelines,* viewed 15 October 2009 from, http://www.safeedlot.co.za/index.asp?Content=148.

SAFA, South African Feedlot Association, 2010, viewed, 14 July 2011, from http://www.safeedlot.co.za/index.asp?Content=90.

SAMIC, South African Meat Industry Company, 2008, viewed 18 June 2008, from http://www.samic.co.za/.

SAMIC, South African Meat Industry Company, 2010, viewed October 2010, from http://www.samic.co.za/index.php?option=com_content&view=article&id=14&Itemid=21.

Schmitz, H. and Knorringa, P., 2000, Learning from global buyers, *Journal of Development Studies,* 37(2):177-205.

Schmitz, H., 2005, *Value chain analysis for policy-makers and practitioners*, International Labour Office, Geneva.

Scholnick, B., 1996, Asymmetric adjustment of commercial bank interest rates: Evidence from Malaysia and Singapore, *Journal of International Money and Finance,* 15:485-496.

Scholtz, M.M, and Bester, J., 2009, Off-take and production statistics in the different South African cattle sector: Results of a structured survey, *South African Journal of Animal Science,* (in press).

Schroeder, T.C., 2003, *Enhancing Canadian beef industry: Value-chain alignment.* Document prepared for the National Beef Industry Development Fund, Canfax Research Services.

Schwalbach, L.M., Groenewald, I.B. and Marfo, C.B., 2001, A survey of small-scale farming in the North West province of South Africa, *South African Journal of Animal Science,* 31(3):200-204.

Shongwe, M.A., 2005, *Beef quality: Will consumers pay for less fat*, Unpublished Master's Dissertation, University of the Free State, South Africa.

Simons, D., Francis, M., Bourlakis, M. and Fearne, A., 2003, Identifying the determinants of value in the UK red meat industry: A value chain analysis approach, *Journal of Chain and Network Science*, 3(2):109-121.

Stamm, A., 2004, *Value chains for development policy, challenges for trade policy and the promotion of economic development*, GTZ concept study, Eschborn.

Stats SA, Statistics South Africa 2009, *Census of commercial agriculture, 2007*, viewed 7 June 2009, from http://www.statssa.gov.za/publications/statsdownload.asp?PPN=P1102&SCH=4534.

Stats SA, Statistics South Africa 2010, Obtained from the National Agricultural Marketing Council – Food Price Monitoring reports. http://www.statssa.gov.za/.

Tallec, F. and Bockel, L., 2005a, Commodity chain analysis: Constructing the value chain, functional analysis and flow charts, Prepared for the Food and Agriculture Organization of the United Nations, FAO.

Tallec, F. and Bockel, L., 2005b, *Case study on commodity chain analysis: Analysis of the suburban market, horticulture sub-sector of Bomako (Mali),* Prepared for the Food and Agriculture Organization of the United Nations, FAO.

Tallec, F. and Bockel, L., 2005c, *Case study on commodity chain analysis: Irrigated rice chain of the Niger's office (Mali): Financial and Economic Accounts*, Prepared for the Food and Agriculture Organization of the United Nations, FAO.

Tomek, W.G. and Robinson, K.L., 2003, Agricultural product prices, Fourth Edition. Cornell University Press, Ithaca and London.

Uchezuba, D., 2010, Measuring asymmetric price and volatility spillover in the South African poultry market. Philosophiea Doctorate Dissertation, University of the Free State, Bloemfontein, South Africa.

USDA, 2008, United States Department of Agriculture, viewed December 2008, from http://www.usda.gov/wps/portal/!ut/p/_s.7_0_A/7_0_1OB?navid=SEARCH&q=marketing+bill&site=usda.

Veselska, E., 2005, The process of vertical coordination and its consequences within the beer commodity chain, *Agricultural economics- Czech),* 51(9):419-426.

Von Cramon-Taubadel, S., 1998, Estimating asymmetric price transmission with the error correction representation: An appilcation to the German pork market, *European Review of Agricultural Economics*, 25:1-18.

Von Cramon-Taubadel, S. and Fahlbusch, S., 1994, *Identifying asymmetric price transmission with error correction models*, Poster session EAAE European Seminar in Reading.

Von Cramon-Taubadel, S. and Loy, J.P., 1996, Price asymmetry in the international wheat market, *Canadian Journal of Agricultural Economics*, 44:311-317.

Weatherspoon, D.D. and Reardon,T., 2003, The rise of supermarkets in Africa: Implications for agrifood systems and the rural poor, *Development Policy Review*, 21(3): 333-355.

Xia, T., 2007, *Asymmetric price transmission and food retailers' selling strategies*, Selected paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Portland, OR, July 29-August 1, 2007.

Zheng, S., Miller, D.J., Wang, Z. and Kai, S., 2008, *Meta-evidence of asymmetric price transmission in U.S. agricultural markets*, Faculty of Agriculture, Kyushu University, 53(1):349-356.

ANNEXURE A: Regional breakdown of the FS province

Table A.1 Regional breakdown of the FS province

Towns in region			
NEFS	**SFS**	**WFS**	**CFS**
Bethlehem	Philipolis	Hertzogville	Brandfort
Bothaville	Springfontein	Christiana	Bultfontein
Cornelia	Trompsburg	Boshoff	Winburg
Harrysmith	Smithfield	Dealesville	Theunissen
Heilbron	Reddersburg		Bloemfontein
Memel	Bethulie		
Petrussteyn	Edenburg		
Reitz	Weppener		
Vrede	Zastron		
Warden	Van Stadensrus		
	Dewetsdorp		

ANNEXURE B: Livestock producer survey

DATE	
TIME STARTED	
TIME ENDED	
Name of Enumerator	
Enumerator code	
District (code):	
Ward (code):	
Village (code):	

SECTION 1: GENERAL HOUSEHOLD INFORMATION

1.1 Respondent's name	
1.2 Respondent's relationship to household head	
Codes	*1= Household head* *2 = Spouse* *3 = Child* *4 = Other relative* *5= Other member*
1.3 Number of people in household	

1.4 Household head information		*Codes*
Gender		*1=Male, 2=Female*
Marital status		*1=Married, 2=Single, 3=Divorced/separated, 4=Living together, 5=Widow/widower, 9=Other*
Age (years)		
Years of schooling		
Primary activity		*1=Student, 2=Farmer, 3=House/farm help, 4=Government/parastatal employee, 5=Private sector employee, 6=Self-employed (non-farm), 9=Other*
Years in village		

SECTION 2: HOUSEHOLD ASSETS AND ACTIVITIES

2.1 Please detail the percentage of income received from following activities:

	% today	% 1 years ago	% 5 years ago
Livestock production			
Crop production			
Livestock trading			
Crop trading			
Off-farm employment			
Own business (non-farm)			
Remittances			
Other			
TOTAL			

2.2 How long have you been engaged in farming activities?	years
2.2.1 Do you have any training in farming activities	*Code: 1=Yes, 2=No*
2.2.1.1 If yes, specify	
2.3 Why are you in this business	

2.4 How many employees do you employ?

		Number of employees	Monthly wage rate	Payments in kind
Full-time employees	Male			
	Female			
Part-time employees	Male			
	Female			
Family Labour	Male			
	Female			

2.5 Please provide information on access to land and land use

Plot ID	Size of each plot (ha)	Land ownership (code)	Current land use (for land used by household) (code)
1			
2			
3			
4			
5			

Codes

Land ownership

1= Family owned, 2=Rent in (no payment), 3=Rent out (payment), 4=Rent in (payment), 5=Freehold title, 6=Communal land, 9=Other

Land use

0=Idle/fallow, 1=Crop cultivation, 2=Livestock grazing/fodder/fodder trees, 3=Fruit trees/gardening, 9=Other

2.6 Do you own…

Cattle		*Code: 1=Yes, 2=No*
Sheep		*Code: 1=Yes, 2=No*

2.6.1 What breeds do you use?

	Now	5 years ago	**reason for change (code)**
Cattle			
Sheep			

Code: 1=Disease resistant, 2=Drought resistant, 3=Fertility, 4=Higher growth, 5=Demanded by buyer, 6=Better mothering ability

2.6.2 Why do you keep livestock?

				Own consumption			
	Draft power	Status	Selling of surplus	Normal	Religious reasons	Cultural traditional	
Cattle							*Code: 1=Yes, 2=No*
Sheep							*Code: 1=Yes, 2=No*

2.7 Are you satisfied with buying arrangements for your livestock?	*Code: 1=Yes, 2=No*	**2.8 Are you satisfied with selling arrangements for your livestock?**	*Code: 1=Yes, 2=No*
Cattle		Cattle	
Sheep		Sheep	
Goats		Goats	

2.9 Are you a member of an agricultural, farmer or other association or group?		*Code: 1=Yes, 2=No*

SECTION 3: DETAIL OF LIVESTOCK OPERATIONS

3.1 Please specify current inventories, purchases, sales, and inflows/outflows in the past 12 months

	Stock this year	This time last year (more/less)	Animals purchased in the last 12 months	Purchase price/animal	Animals sold in the past 12 months	Sales price/animal	Consumed at home in the last 12 months	Animals died in the past 12 months	Reason for losses (code)
Cattle									
Adult female									
Young female									
Young males									
Breeding bulls									
Calves born in the last 12 months									
Castrated males									
TOTAL									
Sheep									
Adult female									
Young female									
Young males									
Breeding rams									
Lambs born in the last 12 months									
Castrated males									
TOTAL									

Code: 1=Disease, 2=Drought, 3=Theft, 4=Predators, 5=Don't know, 9=Other

3.2 What is your current breeding (growth/expantion) strategy

Increasing breeding herd		*Code: 1=Yes, 2=No*	Increasing surplus (offtake)		*Code: 1=Yes, 2=No*
Decreasing breeding herd		*Code: 1=Yes, 2=No*	Decreasing surplus (offtake)		*Code: 1=Yes, 2=No*
Keeping breeding herd stable		*Code: 1=Yes, 2=No*	Keeping surplus (offtake) stable		*Code: 1=Yes, 2=No*

3.3 How do you identify your animals?

	Cattle	**Sheep**	
Now them by name, looks or patterns			*Code: 1=Yes, 2=No*
Brandmark or tattoo			*Code: 1=Yes, 2=No*
Individual animal identification system			*Code: 1=Yes, 2=No*
Formal animal identification system (traceability system)			*Code: 1=Yes, 2=No*

SECTION 4: LIVESTOCK PURCHASES AND SALES

4.1 Please provide information on the livestock purchases and sales you made in the last 12 months

	Month of last purchase (1=Jan, 2=Feb … 12=Dec.)	Month of last sale (1=Jan, 2=Feb … 12=Dec.)	Approximate average weight of animal (kg)		Purchased from (code)	Sold to (code)	Where (code)		Form of payment (code)		Reason for (code)	
			Purchase	Sales	Purchase	Sales	Purchase	Sales	Purchase	Sales	Purchase	Sales
Cattle												
Adult female												
Young female												
Bulls												
Castrated/other males												
Calves												
TOTAL												
Sheep												
Adult female												
Young female												
Breeding rams												
Castrated/other males												
Lambs												
TOTAL												

Codes Question 4.1

Purchased from

1. Smallholder farm
2. Commercial farm
3. Government farm
4. Auction yard
5. Village market
6. Town/city market
7. Broker/trader

9 Other

Sold to

1. Smallholder farm
2. Commercial farm
3. Government farm
4. Auction yard
5. Village market
6. Town/city market
7. Broker/trader
8. Informal slaughter facility
9. Abattoir
10. Butchery
11. Retailer
12. Final consumer (live animal)
13. Final consumer (slaughtered animal/meat)
14. Other

Where purchased/sold

1. Farm gate
2. Village market
3. Parallel local sales pen
4. Local collection point
5. Local business centre
6. Local dip tank
7. Regional auction yard
8. Regional town
9. Other

Form of payment

1. Contract
2. Spot cash payment
3. loan
4. Exchange

9 Other

Reason for purchase

1. Replace animal that died
2. Increase herd size
3. Breed improvement
4. Resale before fattening
5. Resale after fattening

9 Other

Reason for Sale

1. Household expenses
2. Business
3. Culling
4. Social obligations/festivals

9 Other

4.2 Where do you obtain price information from?

	Purchases	Sales
Cattle		
Sheep		

1=Cell phone, 2=buyer/trader, 3=e-mail, 4=Announced by government, 5=Newspaper, 6=Radio, 7=TV 8=Extension officer 9=Third party, 10=word of mouth

4.3 On average, what percentage of your purchases/sales are made from the following channels?

	Purchases		**Sales**	
	Cattle	Sheep	Cattle	Sheep
Smallholder farms				
Commercial farms				
Government farm				
Auction yard (uses auction sale)				
Village market (less than 20 animals/day)				
Town/city market				
Broker				
Informal slaughter facility				
Abattoir				
Butchery				
Retailer				
Final consumer/live animal				
Final consumer (slaughtered animal/meat)				
Other				

4.4 How has your use of the channels in Q4.3 changed in the last 5 years?

	Purchases		**Sales**	
	Cattle	Sheep	Cattle	Sheep
Smallholder farms				
Commercial farms				
Government farm				
Auction yard (uses auction sale)				
Village market (less than 20 animals/day)				
Town/city market				
Broker				
Informal slaughter facility				
Abattoir				
Butchery				
Retailer				
Final consumer/live animal				
Final consumer (slaughtered animal/meat)				
Other				

Code: 1=Increased, 2=Stayed the same, 3=Decreased

4.5 Who pays for transport costs at purchase/sales

	Older cattle		Weaners		Sheep	
	Purchase	**Sales**	**Purchase**	**Sales**	**Purchase**	**Sales**
To market						
From market						

Code: 1=Farmer, 2=Buyer, 3=Broker, 9=Other

4.6 How much does transport cost?

	Cows	**Young cattle**	**Sheep**
Cost to market (per animal)			
Distance to market (km)			
Other transport costs			

4.7 What mode of transport is used to take animals to market?

Cattle	
Sheep	

	Purchase	**Sales**	
4.8 Do you use a broker or middleman for purchases/sales			*Code: 1=Yes, 2=No*

4.8.1 If yes, how much do you pay him/her per animal

Cattle		
Sheep		

4.9 Do you use contracts to purchase/sell livestock?

Cattle			*Code: 1=Yes, 2=No*
Sheep			*Code: 1=Yes, 2=No*

(IF NO, GO TO QUESTION 4.13)

4.10 If contracts are used, do they specify:

	Purchase	Sales
	1=Yes, 2=No	
Age		
Sex		
Breed		
Weight (measured)		
Weight (apparent)		
Condition of animal		
Free of disease		
Specified use of feed or medicine		
Pelt condition		
Pelt colour		
Time of delivery		
Place of delivery		
Advance payment		

4.11 If contracts are used, what proportion of purchases/sales is made with them?

Purchase	Sales

Code: 1=0-25% 2=25%-50%, 3=50-75%, 4=75%-99%, 5=All purchases

4.12 Rate the quality attributes buyers look for

	1=never, 2=sometimes, 3=always
Age	
Sex	
Breed	
Weight (measured)	
Weight (apparent)	
Condition of animal	
Free of disease	
Specified use of feed or medicine	
Pelt condition	
Pelt colour	
Time of delivery	
Place of delivery	
Advance payment	

4.13 For animals slaughtered at home, what is done with by-products?

	Channel
Offals	
Hides	
Others	

Code=1 Kept; 2=Sold to trader, 3=Sold to processor, 4=throw away

SECTION 5: COSTS OF PRODUCTION

5.1 Please detail the different costs of production incurred by cattle operations

Production input costs	Physical units	Where purchased	Who paid for this (code)	Total cost	Time linked to total cost
Feeding expenses					
Animal health					
Labour costs					
Electricity					
Land costs (rental)					
Housing costs (rental)					
Spares					
Water cost					
Fuel cost					
Other					

Code
Where purchased 1=local general store, 2=farmers cooperative, 3=local veterinary, 9=other
Who paid for this1=Yourself (cash), 2=yourself (credit), 3=Government, 4=Other
Time linked to total cost 1=Day, 2=week, 3=month, 4=year

5.2 Please detail the different costs of production incurred by sheep operations

Production input costs	Physical units	Where purchased	Who paid for this (code)	Total cost	Time linked to total cost
Feeding expenses					
Animal health					
Labour costs					
Electricity					
Land costs (rental)					
Housing costs (rental)					
Spares					
Water cost					
Fuel cost					
Other					

Code
Where purchased 1=local general store, 2=farmers cooperative, 3=local veterinary, 9=other
Who paid for this1=Yourself (cash), 2=yourself (credit), 3=Government, 4=Other
Time linked to total cost 1=Day, 2=week, 3=month, 4=year

SECTION 6: Infrastructure

6.1 Rate quality/availability of the following (1=poor, 9=very good)

Fences	
Animal handling facilities	
Water sources	
Buildings/sheds	
Vehicles	
Machinery and other equipment	
Animal feeding facilities and equipment	

SECTION 7: MISCELLANEOUS INFORMATION

7.1 Sources and reliability of information

Type	Main sources (code)	Reliability of source (code)
Production practices		
Input use		
Animal health issues		
Markets (physical)		
Price		
Product standards		
Traceability		
Risk management		

Code 1=Extension officer/government, 2=Newspaper, 3=Third party, 4=word of mouth, 5=None 9= Other

Code (rank 1=not reliable. 9=very reliable)

7.2 How has your livestock business changed over the last 5 years

	1= Yes, 2=No
More animals in herd/flock	
Higher productivity of animals	
Greater use of technology (breeding, AI, etc)	
Diversification of herd (raising of other types of animals	
Diversification of business activities (raising feed, slaughter for business purposes)	
Specialization of livestock activities (e.g., breeding for larger farmers)	
Other	

7.3 Constraints

Rank the following constraints in order of importance (1=most important, 5=least important)

Variability in prices	
Low productivity levels	
Access to markets	
Access to credit	
Access to inputs	
Access to information	

7.4 Risk

Rank the following risk factors in order of importance (1=most important, 5=least important)

Climate	
Disease	
Availability of inputs	
Non-payment	
Theft/corruption	
Predation	

ANNEXURE C: Livestock trader survey

DATE	
TIME STARTED	
TIME ENDED	
Name of Enumerator	
Enumerator code	
District (code):	
Ward (code):	
Village (code):	

SECTION 1: GENERAL HOUSEHOLD INFORMATION

1.1 Respondent's name

1.2 Respondent's relationship to household head

Codes	*1= Household head*
	2 = Spouse
	3 = Child
	4 = Other relative
	9= Other member

1.3 Number of people in household

1.4 Household head information

Gender		*Codes*
Marital status		*1=Male, 2=Female* *1=Married, 2=Single, 3=Divorced/separated, 4=Living together, 5=Widow/widower, 9=Other*
Age (years)		
Years of schooling		
Primary activity		*1=Student, 2=Farmer, 3=House/farm help, 4=Government/parastatal employee, 5=Private sector employee, 6=Self-employed (non-farm), 9=Other*
Years in village		

1.5 Are you registered as a commercial company?		*Code: 1=Yes, 2=No*
1.5.1 What is your company's name		
1.6 Do you have your own livestock production operation?		*Code: 1=Yes, 2=No*
1.7 Do you slaughter any animals, or have them slaughtered, before sale?		*Code: 1=Yes, 2=No*
1.7.1 If yes, what is the fee		
Cattle		Per animal
Sheep		Per animal
1.8 How long have you been engaged in trading activities?		years
1.8.1 Do you have any training in trading activities		*Code: 1=Yes, 2=No*
1.8.1.1 If yes, specify		

1.9 How many employees do you have?		Number of employees	Daily wage rate	In Kind
Full-time employees	Male			
	Female			
Part-time employees	Male			
	Female			
Family Labour	Male			
	Female			

2.1 Are you satisfied with buying arrangements for your livestock?		**2.2 Are you satisfied with selling arrangements for your livestock?**	
	Code: 1=Yes, 2=No		*Code: 1=Yes, 2=No*
Cattle		Cattle	
Sheep		Sheep	

2.3 Please detail the percentage of income received from following activities

	% today	% 1 year ago	%5 years ago
Livestock sales			
Meat sales			
Crop sales			
Off-farm employment			
Own business (non-farm)			
Other			

2.4 Do you have capacity for holding animals between purchase and sale?

Code: 1=Yes, 2=No

2.4.1 if YES, for how many animals for 1 month?

Cattle		animals
Sheep		animals

2.5 Indicate land availability and access

Plot ID	Size of each plot (ha)	Land ownership	Current land use (for land used by household)
1			
2			
3			
4			
5			

Codes

Land ownership
1= Family owned, 2=Rent in (no payment), 3=Rent out (payment), 4=Rent in (payment), 5=Freehold title, 6=communal land, 9=Other

Land use
0=Idle/fallow, 1=Crop cultivation, 2=Livestock grazing/fodder/fodder trees, 3=Fruit trees/gardening, 9=Other

2.6 Are you a member of an agricultural, farmer or other association or group?

SECTION 3: LIVESTOCK PURCHASES

3.1 Please provide information on the livestock purchases you made in the last 12 months

	Month of last purchase (1=Jan, 2=Feb … 12=Dec.)	Main purchase month	Worst Purchase month	Number of animals purchased	Average price per animal (LC)	Where do you obtain price information (code)	Approximate average weight of purchased animal (kg)	Transport cost from market (per Animal)	Purchased from (code)	Where purchased? (code)	Form of payment (code)	Reason for purchase (code)	Number of purchases per year
Cattle													
Adult female													
Young female													
Young males													
Breeding bulls													
Castrated males													
TOTAL													
Sheep													
Adult female													
Young female													
Young males													
Breeding rams													
Castrated males													
TOTAL													

Codes **Question 3.1**

Where do you obtain price information from?

1. Cell Phone
2. Buyer/trader
3. e-mail
4. Announced by government
5. Newspaper
6. Radio
7. TV
8. Extension officer
9. Third party
10. Word of mouth

Purchased from

1. Smallholder farm
2. Commercial farm
3. Government farm
4. Auction yard
5. Village market
6. Town/city market
7. Broker/trader

9 Other

Where purchased

1 Farm gate
2 Village market
3 Parallel local sales pen
4 Local collection point
5 Local business centre
6 Local dip tank
7 Regional auction yard
8 Regional town
9 Other

Form of payment

1 Contract
2 Spot cash payment
3 loan
4 Exchange
9 Other

Reason for purchase

1 Replace animal that died
2 Increase herd size
3 Breed improvement
4 Resale before fattening
5 Resale after fattening
9 Other

3.2 On average, what percentage of your purchases are made from the follow channels and changes compared to 5 years ago?

	Cattle		Sheep	
	Purchases	Change (code)	Purchases (%)	Change (code)
Smallholder farms				
Commercial farms				
Government farm				
Auction yard (uses auction sale)				
Village market (less than 20 animals/day)				
Town/city market				
Broker				
Informal slaughter facility				
Abattoir				
Butchery				
Retailer				
Final consumer/live animal				
Final consumer (slaughtered animal/meat)				
Other				

Code Change: 1=Increased, 2=Stayed the same, 3=Decreased

3.3 Do you co-operate with other traders on…

	1=never, 2=sometimes, 3=always
Transport	
Information about market prices	
Information about animals available for sale	
Information about sellers	
Areas in which you buy	
Disease control	
Food safety issues	
Setting buying prices	
Setting selling prices	
Other	

3.4 Who pays for transport costs at purchase | *Code: 1=Farmer, 2=Buyer, 3=Broker, 9=Other*

3.5 What mode of transport is used for

Purchased livestock?	
Sold livestock?	

3.6 Do you use a broker or middleman for purchase? *Code: 1=Yes, 2=No*

3.6.1 If yes, how much do you pay him/her per animal

Cattle	
Sheep	

3.7 Rate the quality attributes you look for in purchasing

	1=never, 2=sometimes, 3=always
Age	
Sex	
Breed	
Weight (measured)	
Weight (apparent)	
Grade	
Condition of animal	
Free of disease	
Specified use of feed or medicine	
Pelt condition	
Pelt colour	
Time of delivery	
Place of delivery	
Advance payment	

3.8 Do you use contracts to purchase livestock? *Code: 1=Yes, 2=No*

(IF NO, GO TO SECTION 4)

3.9 If contracts are used, do they specify:

	1=Yes, 2=No
Age	
Sex	
Breed	
Weight (measured)	
Weight (apparent)	
Grade	
Condition of animal	
Free of disease	
Specified use of feed or medicine	
Pelt condition	
Pelt colour	
Time of delivery	
Place of delivery	
Advance payment	

3.10 If contracts are used, what proportion of purchases is made with them?

Cattle	
Sheep	

Code: 1=0-25% 2=25%-50%, 3=50-75%, 4=75%-99%, 5=All purchases

SECTION 4: LIVESTOCK SALES

4.1 Please provide information on the livestock sales you made in the last 12 months

	Month of last sale (1=Jan, 2=Feb … 12=Dec.)	Main sales month	Worst sales month	Number of animals sold	Average price per animal (LC)	Where do you obtain price information (code)	Approximate average weight of sold animal (kg)	Transport cost from market (per Animal)	Sold to (code)	Where sold? (code)	Form of payment (code)	Reason for sales (code)	Number of sales per year
Cattle													
Adult female													
Young female													
Young males													
Breeding bulls													
Castrated males													
TOTAL													
Sheep													
Adult female													
Young female													
Young males													
Breeding rams													
Castrated males													
TOTAL													

Codes **Question 4.1**

Where do you obtain price information from?

1. Cell Phone
2. Buyer/trader
3. e-mail
4. Announced by government
5. Newspaper
6. Radio
7. TV
8. Extension officer
9. Third party
10. Word of mouth

Where sold

1. Farm gate
2. Village market
3. Parallel local sales pen
4. Local collection point
5. Local business centre
6. Local dip tank
7. Regional auction yard
8. Regional town
9. Other

Sold to

1 Smallholder farm
2 Commercial farm
3 Government farm
4 Auction yard
5 Village market
6 Town/city market
7 Broker/trader
8 Informal slaughter facility
9 Abattoir
10 Butchery
11 Retailer
12 Final consumer (live animal)
13 Final consumer (slaughtered animal/meat)
14 Other

Reason for Sale

1 Household expenses
2 Business
3 Culling
4 Social obligations/festivals
9 Other

Form of payment

1. Contract
2. Spot cash payment
3. loan
4. Exchange
9 Other

4.2 On average, what percentage of your sales is made from the following channels and changes compared to 5 years ago?

	Cattle		Sheep	
	Purchases (%)	Change (code)	Purchases (%)	Change (code)
Smallholder farms				
Commercial farms				
Government farm				
Auction yard (uses auction sale)				
Village market (less than 20 animals/day				
Town/city market				
Broker				
Informal slaughter facility				
Abattoir				
Butchery				
Retailer				
Final consumer/live animal				
Final consumer (slaughtered animal/mea				
Other				

Code Change: 1=Increased, 2=Stayed the same, 3=Decreased

4.3 Who pays for transport costs at sales

Code: 1=Farmer, 2=Buyer, 3=Broker, 9=Other

4.4 Do you use a broker or middleman for sales?

Code: 1=Yes, 2=No

4.4.1 If yes, how much do you pay him/her per animal

Cattle	
Sheep	

4.5 Do you use contracts to sell livestock?

Code: 1=Yes, 2=No

(IF NO, GO TO SECTION 4.8)

4.6 If contracts are used, do they specify:

	1=Yes, 2=No
Age	
Sex	
Breed	
Weight (measured)	
Weight (apparent)	
Grade	
Condition of animal	
Free of disease	
Specified use of feed or medicine	
Pelt condition	
Pelt colour	
Time of delivery	
Place of delivery	
Advance payment	

4.7 If contracts are used, what proportion of purchases is made with them?

Cattle	
Sheep	

Code: 1=0-25% 2=25%-50%, 3=50-75%, 4=75%-99%, 5=All purchases

4.8 Rate the quality attributes buyers look for

	1=never, 2=sometimes, 3=always
Age	
Sex	
Breed	
Weight (measured)	
Weight (apparent)	
Grade	
Condition of animal	
Free of disease	
Specified use of feed or medicine	
Pelt condition	
Pelt colour	
Time of delivery	
Place of delivery	
Advance payment	

SECTION 5: COSTS OF PRODUCTION

5.1 Please detail the different costs of production incurred by your farm

Production input costs	Physical units	Where purchased	Who paid for this (code)	Total cost	Time linked to total cost
Insurance					
Feeding expenses					
Animal health					
Labour costs					
Electricity					
Land costs (rental)					
Animal housing costs (rental)					
Spares and maintenance					
Transport					
Marketing, incl. Office admin, tel etc..					
Inspection cost					
Commission					
Miscellaneous payments to authorities					
Other					

Code

Where purchased 1=local general store, 2=farmers cooperative, 3=local veterinary, 9=other

Who paid for this1=Yourself (cash), 2=yourself (credit), 3=Government, 4=Other

Time linked to total cost 1=Day, 2=week, 3=month, 4=year

SECTION 6: MISCELLANEOUS INFORMATION

6.1 Sources and reliability of information

Type	Sources (code)	Reliability (code)
Production practices		
Input use		
Animal health issues		
Markets (physical)		
Price		
Product standards		
Traceability		
Risk management		
Government services		

Code 1=Extension officer, 2=Newspaper, 3=Government, 4=Third party, 5=word of mouth, 6=None 7= Other

Code (rank 1=not reliable. 9=very reliable)

6.2 Constraints

Rank the following constraints in order of importance (1=most important, 5=least important)

Variability in prices	
Low productivity levels	
Access to markets	
Access to credit	
Access to inputs	
Access to information	

6.3 Risk

Rank the following risk factors in order of importance (1=most important, 5=least important)

Climate	
Disease	
Availability of inputs	
Non-payment	
Theft/corruption	
Predation	

7.5. General question

	1= Yes, 2=No
7.5.1 Are you satisfied with the current meat classification system? if no, go to 7.5.2	

7.5.2 Why not (choose only the most applicable)

The current system does not serve its purpose	
I do not benefit from the system	
Consumers do not understand the system	
The system does not relay quality attributes of meat through the chain	
Other, please specify	

ANNEXURE D: Meat processor/retailer survey

DATE	
TIME STARTED	
TIME ENDED	
Name of Enumerator	
Enumerator code	
District (code):	
Ward (code):	
Village (code):	

SECTION 1: GENERAL HOUSEHOLD INFORMATION

1.1 Respondent's name

1.2 Household head information

		Codes
Gender		*1=Male, 2=Female*
Marital status		*1=Married, 2=Single, 3=Divorced/separated, 4=Living together, 5=Widow/widower, 9=Other*
Age (years)		
Years of schooling		

1.3 Are you registered as a commercial company?		*Code: 1=Yes, 2=No*
1.3.1 What is your company's name?		
1.4 Do you also buy and sell animals as a trading operation?		*Code: 1=Yes, 2=No*
1.5 How long have you been engaged in processing/retailing activities?		years
1.6 Do you have any training in farming activities		*Code: 1=Yes, 2=No*
1.6.1 If yes, specify		

1.7 Do you own, or are you financially involved in:	Code: 1=Yes, 2=No
Farming activities	
A slaughter facility	
Cutting facilities	
Processing facilities	
Curing/drying/smoking facilities	
Cold storage facilities	
Freezing facilities	
Trucks for meat product transport	
Sales of skins	

1.8 How many employees do you employ?

		Number of employees	Monthly wage rate	Payment in kind
Full-time employees	Male			
	Female			
Part-time employees	Male			
	Female			
Family Labour	Male			
	Female			

1.9 What types of products do you sell?

	Beef	Sheep meat
	Code: 1=Yes, 2=No	
Carcasses		
Quarters		
Frozen, deboned meat		
Frozen, bone-in meat		
Fresh, deboned meat		
Fresh, bone-in meat		
Cured or dried products		
Raw Sausages		
Cooked sausages		
Canned meat products		
Ready-to-eat products		

1.10 Does your firm have a brand? *Code: 1=Yes, 2=No*

1.10.1 if yes, what % of sales use that brand? *%*

SECTION 2: OPERATIONS

2.1 What are your core business activities?

		Buy			
Sell		Live Animals	Carcasses	Processed meat	Packaged meat
	Live Animals				
	Carcasses				
	Processed meat				
	Packaged meat				

2.2 Are you satisfied with buying arrangements?

	YES/NO
Cattle	
Sheep	

2.3 Are you satisfied with selling arrangements?

	YES/NO
Cattle	
Sheep	

2.4 Are you a member of a trader, food processor, retail or other association or group? *Code: 1=Yes, 2=No*

SECTION 3: LIVESTOCK MEAT PURCHASES

3.1 Please provide information on the meat purchases you made in the last month

	Number of animals purchased	Volume of meat bought (kg)	Average price per kg	Where do you obtain price information (code)	Transport cost from market (per load)	Purchased from (code)	Where purchased? (code)	Form of payment (code)	Number of purchases per week
Cattle									
Young animals									
Old animals									
Whole/half/quarter/ carcasses									
Deboned primary cuts									
cooked or packaged									
Offal									
Other									
TOTAL									
Sheep									
Young animals									
Old animals									
Whole/half/quarter/ carcasses									
Deboned primary cuts									
cooked or packaged									
Offal									
Other									
TOTAL									

Codes **Question 3.1**

Where do you obtain price information from?

1 Cell Phone
2 Buyer/trader
3 e-mail
4 Announced by government
5 Newspaper
6 Radio
7 TV
8 Extension officer
9 Third party
10 Word of mouth

Purchased from

1 Smallholder farm
2 Commercial farm
3 Government farm
4 Auction yard
5 Village market
6 Town/city market
7 Broker/trader
8 Informal slaughter facility
9 Abattoir
10 Butchery
11 Retailer
12 Other

Where purchased

1 Farm gate
2 Processor gate
3 Local collection point
4 Local business centre
5 Village market
6 Regional town market
7 Abattoir gate
8 Butchery door
9 Other

Form of payment

1 Contract
2 Spot cash payment
3 loan
4 Exchange
9 Other

3.2 Rank the months in which animal/meat purchases were the highest and lowest

	Most important month for purchases (1=Jan, 2=Feb, … 12=Dec. 13=All)	Least important month (1=Jan, 2=Feb, … 12=Dec. 13=All)
Cattle		
Sheep		

3.3 On average, what percentage of your 254urchases is made through the following chan and changes compared to 5 years ago?

	Cattle		Sheep		Goats	
Smallholder farms	Purchases	Change (code)	Purchases (%)	Change (code)	Purchases (%)	Change (code)
Commercial farms						
Government farm						
Auction yard (uses auction sale)						
Village market (less than 20 animals/day)						
Town/city market						
Broker/Trader						
Informal slaughter facility						
Abattoir						
Butchery						
Retailer						
Final consumer/live animal						
Final consumer (slaughtered animal/meat)						
Trader						
Other						

Code Change: 1=Increased, 2=Stayed the same, 3=Decreased

3.4 Who pays for transport costs at purchase

Code: 1=Self, 2=Buyer, 3=Broker, 4=Delivery included in purchase price 9=Other

3.4.1 What is the average distance traveled?

Cattle	
Sheep	

3.5 Do you use a broker or middleman for purchase? | | *Code: 1=Yes, 2=No*

3.5.1 If yes, how much do you pay him/her per kg of meat

Cattle	
Sheep	

3.6 Rate the quality attributes you look for in purchasing;

	1=never, 2= sometimes, 3=always
Age	
Sex	
Breed	
Weight (measured)	
Condition of animal	
Free of disease	
Specified use of feed or medicine	
Pelt condition	
Pelt colour	
Time of delivery	
Place of delivery	
Advance payment	
Size of carcass/number of teeth	
Grading	
Fat content	
Color of the carcass/meat	
Whether it is matured	
Packaging (e.g. vacuum packaged)	
Other	

3.7 Do you use contracts to purchase meat? | | *Code: 1=Yes, 2=No*

(IF NO, GO TO SECTION 4)

3.8 If contracts are used, do they specify:

	1=Yes, 2=No
Age	
Sex	
Breed	
Weight (measured)	
Weight (apparent)	
Condition of animal	
Free of disease	
Specified use of feed or medicine	
Pelt condition	
Pelt colour	
Time of delivery	
Place of delivery	
Advance payment	
Date of delivery	
Quantity to be delivered	
Frequency of deliveries	
Quality requirements	

3.9 If contracts are used, what proportion of purchases is made with them?

Cattle	
Sheep	

Code: 1=0-25% 2=25%-50%, 3=50-75%, 4=75%-99%, 5=All purchases

SECTION 4a: PRIMARY PROCESSING

4.1. Do you slaughter animals *1=Yes, 2=No*

If no, go to SECTION 4b

4.2 Do you hold animals on feedlot prior to slaughter? *1=Yes, 2=No*

4.2.1 If yes, for how long do you hold animals on average?

Cattle		**days**
Sheep		**days**

4.3 Do you have facilities to slaughter more than one type of animal *1=Yes, 2=No*

4.3.1 If yes, what animals can you slaughter at the same time?

Cattle		*1=Yes, 2=No*
Sheep		*1=Yes, 2=No*

4.4 Do you slaughter animals for a fee (without buying the animal or meat products)?		*Code: 1=Yes, 2=No*

4.4.1 if yes, what fee do you charge?

Cattle		*Per animal*
Sheep		*Per animal*

4.5 What is your slaughter capacity per day of the following?

Cattle		**animals**
Sheep		**animals**

4.6 How many animals do you slaughter on average per month of the following?

Cattle		**animals**
Sheep		**animals**

4.7 How often and long is your facility in operation?

Cattle		**days/week**		**hours/day**
Sheep		**days/week**		**hours/day**

4.8 Are animals inspected prior to slaughter?		*1=Yes, 2=No*

4.8.1 If yes, who pays for inspection?	
Code: 1=self, 2=Government, 3=seller, 4=exporter	

4.8.2 Who does the inspection?	
Code: 1=self, 2=Government, 3=vet, 4=buyer	

4.8.3 How much are inspection costs, on average?

Beef		**per kg**
Sheep		**per kg**

4.9 What are the main reasons for rejection of live animals

Infection with disease		*1=Yes, 2=No*
General morbidity		*1=Yes, 2=No*
Other		*1=Yes, 2=No*

4.10 Is meat inspected prior to sale/delivery? | | *1=Yes, 2=No*

4.10.1 If yes, who pays for inspection? | |

Code: 1=self, 2=Government, 3=seller, 4=exporter

4.10.2 Who does the inspection? | |

Code: 1=self, 2=Government, 3=vet, 4=buyer

4.10.3 How much are inspection costs, on average?

Beef		**per kg**
Sheep		**per kg**

4.11 What are the main reasons for rejection of carcasses

Disease		*1=Yes, 2=No*
Condition		*1=Yes, 2=No*
Damage		*1=Yes, 2=No*
Other		*1=Yes, 2=No*

SECTION 4b: SECONDARY PROCESSING

4.12 Do you further process meat? | | *1=Yes, 2=No*

4.13 Do you custom process meat products for specific buyers? | | *1=Yes, 2=No*

4.13.1 If yes, what percentage of your meat products is custom processed?

Cattle		**%**
Sheep		**%**

4.14 What is your storage capacity of the following?

	chilling	**freezing**	
Cattle			**kg**
Sheep			**kg**

4.15 How much meat do you carry/store on average per day of the following?

Cattle		**kg**
Sheep		**kg**

4.16 What types of packaging do you use to sell final meat products?

No packaging		*1=Yes, 2=No*
Vacuum		*1=Yes, 2=No*
plastic bags		*1=Yes, 2=No*
Polystyrene and plastic		*1=Yes, 2=No*
Boxes		*1=Yes, 2=No*
Other		*1=Yes, 2=No*

4.17 Is your facility inspected by a designated official?		*1=Yes, 2=No*

SECTION 5: MEAT SALES

5.1 Please provide information on the meat sales you made in the last months

	Volume of meat sold (kg)	Average price per kg	Where do you obtain price information (code)	Transport cost from market (per load)	Sold to (code)	Where sold? (code)	Form of payment (code)	Number of sales per week
Cattle								
Whole/half/quarter/ carcasses								
Deboned primary cuts								
cooked or packaged								
Offal								
Other								
TOTAL								
Sheep								
Whole/half/quarter/ carcasses								
Deboned primary cuts								
cooked or packaged								
Offal								
Other								
TOTAL								

Codes **Question 5.1**

Where do you obtain price information from?

1. Cell Phone
2. Buyer/trader
3. e-mail
4. Announced by government
5. Newspaper
6. Radio
7. TV
8. Extension officer
9. Third party
10. Word of mouth

Sold to

1 Village market
2 Town/city market
3 Butchery
4 Retailer
5 Final consumer
6 Traders/brokers
7 Exporters
8 Supermarkets
9 Government contract
10 Other

Where sold

1 Processor gate
2 Village market
3 Local collection point
4 Local business centre
5 Supermarket
6 Regional town
9 Other

Form of payment

1. Contract
2. Spot cash payment
3. loan
4. Exchange
9 Other

5.2 Rank the months in which meat sales were the highest and lowest

	Most important month for sales (1=Jan, 2=Feb, … 12=Dec.)	**Least important month (1=Jan, 2=Feb, … 12=Dec.)**
Cattle		
Sheep		

5.3 On average, what percentage of your sales is made from the following channels changes compared to 5 years ago?

	Cattle		Sheep		Goats	
	Sales (%)	Change (code)	Sales (%)	Change (code)	Sales (%)	Change (code)
Village market (less than 20 animals/day)						
Town/city market						
Butchery						
Retailer						
Final consumer (slaughtered animal/meat)						
Traders						
Exporter						
Supermarket						
Government contract						
Other						

Code: 1=Increased, 2=Stayed the same, 3=Decreased

5.4 Do you use a broker or middleman for sales? | | *Code: 1=Yes, 2=No*

5.4.1 If yes, how much do you pay him/her per kg of meat | |

5.5 Do you use contracts to sell meat? | | *Code: 1=Yes, 2=No*

(IF NO, GO TO SECTION 6)

5.6 If contracts are used, do they specify:

	1=Yes, 2=No
Age of animal	
Sex	
Breed	
Weight (measured)	
Weight (apparent)	
Condition of animal	
Free of disease	
Specified use of feed or medicine	
Time of delivery	
Place of delivery	
Advance payment	
Colour of product	
Packaging	
Brand	
Time since slaughter	
Origin of animal (place it came from)	
Perceived healthiness of the product	
Organic or low-input production	
Other	

5.7 Rate the importance that BUYERS attach to:

	1=never, 2=sometimes, 3=always
Age of animal	
Sex	
Breed	
Weight (measured)	
Weight (apparent)	
Condition of animal	
Free of disease	
Specified use of feed or medicine	
Time of delivery	
Place of delivery	
Advance payment	
Colour of product	
Packaging	
Brand	
Time since slaughter	
Origin of animal (place it came from)	
Perceived healthiness of the product	
Organic or low-input production	
Other	

5.8 If contracts are used, what proportion of purchases is made with them?

Code: 1=0-25% 2=25%-50%, 3=50-75%, 4=75%-99%, 5=All purchases

SECTION 6: COSTS OF PRODUCTION

6.1 Please detail the different costs of production incurred by your firm

Production input costs	Physical units	Where purchased	Who paid for this (code)	Total cost	Time linked to total cost (code)
Feeding expenses					
Labour costs					
Electricity					
Water and other utilities					
Packaging costs					
Land costs (rental)					
Certification costs					
Animal Transportation					
Other consumables (knives, blades, sharpeners etc)					
Inspection cost					
Other					

Code

Where purchased *1=local general store, 2=farmers cooperative, 3=local veterinary, 9=other*

Who paid for this*1=Yourself (cash), 2=yourself (credit), 3=Government, 4=Other*

Time linked to total cost *1=Day, 2=week, 3=month, 4=year*

SECTION 7: MISCELLANEOUS INFORMATION

7.1 Sources and reliability of information

Type	Main sources (code)	Reliability of source (code)
Production practices		
Input use		
Animal health issues		
Markets (physical)		
Price		
Product standards		
Traceability		
Risk management		
Government services		

Code 1=Extension officer, 2=Newspaper, 3=Government, 4=Third party, 5=word of mouth, 6=None 7= Other

Code (rank 1=not reliable. 9=very reliable)

7.2 How has your retail business changed over the last 5 years

Expansion of processing capacity		*Code 1= Yes, 2=No*
Expansion of meat processed		*Code 1= Yes, 2=No*
Improved technology		*Code 1= Yes, 2=No*
Diversification in products produced (boneless cuts, e.g.)		*Code 1= Yes, 2=No*
Diversification of business activities (e.g., slaughter for business purposes)		*Code 1= Yes, 2=No*
Specialization of processing activities (e.g., dedicated supplier to supermarket)		*Code 1= Yes, 2=No*
Other		*Code 1= Yes, 2=No*

7.3 Constraints

Rank the following constraints in order of importance (1=most important, 5=least important)

Variability in prices	
Low productivity levels	
Access to markets	
Access to credit	
Access to inputs	
Access to information	

7.4 Risk

Rank the following risk factors in order of importance (1=most important, 5=least important)

Water quality/quantity	
Disease	
Availability of inputs	
Non-payment	
Theft/corruption	

7.5. General question

1= Yes, 2=No

7.5.1 Are you satisfied with the current meat classification system?
if no, go to 7.5.2

7.5.2 Why not (choose only the most applicable)

The current system does not serve its purpose	
I do not benefit from the system	
Consumers do not understand the system	
The system does not relay quality attributes of meat through the chain	
Other, please specify	