Mapping the economic structure and organisation of selected South African mango export supply chains

By

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DEDICATION

To my parents Loice and Danford, who sacrificed for me to go to school; my husband Dr Paida Mhangara and our two sons Tadiwanashe Gerald and Tawananyasha Ronald.

THIS IS FOR YOU!

DECLARATION

I declare that this dissertation is my own work. It is submitted for the degree of Master of Science to the University of Pretoria. It has not been submitted to any other degree or examination in any other university.

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Sophia Mahoya

November 2012

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TO GOD BE THE GLORY!

ABSTRACT

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Degree : MSc Agric (Agricultural Economics)

Department : Agricultural Economics, Extension & Rural Development

Supervisor : Professor J. F. Kirsten

This dissertation is the outcome of a study to map the economic structure and organisation of two selected mango export chains from South Africa by applying selected supply chain analysis tools. The study is part of an inventory on the export of fresh fruit and vegetables commissioned by the European Commission under the Veg-i-Trade Project Work Package 1. The two selected chains were the *Bavaria* fresh mango and the *Blue Skies* freshly cut mango export supply chains. The study sought to understand how food safety and quality standards are shaping the structure and relationships in the two export chains given the prevalence of food scares and scandals. An inventory of the activities and the various actors along the mango export supply chains was made in order to identify the structure and functioning of the chains and the issues and constraints faced with the various quality and safety standards.

The objective of the study was to identify the actors and the role they play, determine the governance structure and relationships and identify the quality management programmes and standards employed in the two selected export chains. In addition, the study sought to identify and analyse the different information exchange categories and use of information between the different links along the chains.

A qualitative research approach that incorporates case study methodology was used as the inquiry strategy. Through this methodology, the investigation untangled the complexity of the mango export supply chains which is faced with the challenge of maintaining a chain that guarantees adherence to customer specifications and client needs.

The study's findings established that food safety and quality management standards are shaping the structure and organisation of the chains and their stringency has increased with a widened and deepened scope. In addition, the ability to adopt a standard is directly affected by the scale of business operation and standards are technical barriers to entry for small scale mango producers and exporters mainly because of the high certification and operational costs. In reaction to the standards, it was noted that *Bavaria* and *Blue Skies* mango export chains are buyer-driven with a high degree of vertical coordination enforced by contracts. The two chains are modular with the use of and strategic positioning of category managers; a high degree of asset specificity and forward integration to reach their markets resulting in a shortened supply chain. Supply chain coordination is carried out on contracted logistics and cold chain services with regulatory functions provided by the Department of Agriculture, Forestry and Fisheries (DAFF) and the Perishable Product Export Control Board (PPECB) in South Africa and agricultural and health inspectors in the United Kingdom (UK). There is also product and process differentiation.

It was also noted that compulsory certification of quality and food safety standards is the prerequisite to access export markets. The standards used in the *Bavaria* and *Blue Skies* mango export chains are the Hazard Analysis Critical Control Point (HACCP) and Global Good Agricultural Practice (Global GAP). These are used in conjunction with the British Retail Consortium (BRC), Fairtrade, Ethical Trade Initiative (ETI), International Food Standard (IFS) and Linking Environment And Farming (LEAF). Quality audits and inspections are carried out at each supply chain level to ensure safety and adherence to quality requirements. The supply chain actors carry out continuous quality assessment and one way to achieve this was through the application of the Plan-Do-Check-Act (PDCA) cycle.

Quality and safety standards have also resulted in improved traceability in the *Bavaria* and *Blue Skies* Mango export chains. Traceability systems in the *Bavaria* and *Blue Skies* mango export chains are more automated though they are not harmonised, thus Paltrack, Xsense^{TM}, Caretrace and TempTrip. Automated information systems used to share and exchange information are internet and email as well as barcodes which are used with Radio Frequency Identification (RFID) and Electronic Data Interchange (EDI). Manual information systems in use are mainly telephones, facsimile and mobile phones. It was also established that major issues and challenges in the *Bavaria* and *Blue Skies* mango export chains are a result of factors that affect mango perishability, mainly post harvest handling procedures thus packaging, transportation, storage, ripening and distribution. If not managed well, poor safety and quality management result in economic losses due to product rejections, product recall and cessation of buyer-supplier relationships.

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ACRONYMS AND ABBREVIATIONS

ABBREVIATION	MEANING
ACSA	Airports Company of South Africa
BRC	British Retail Consortium
CA	Controlled Atmosphere
DAFF	Department of Agriculture, Forestry and Fisheries
ECR	Efficient Consumer Response
EDI	Electronic Data Interchange
EFSIS	European Food Safety Inspection Service
ETI	Ethical Trade Initiative
EU	European Union
EUREP GAP	Euro-Retailer Produce Working Group-Good Agricultural Practices
FPEF	Fresh Produce Exporters' Forum
FPM	Fresh Produce Markets
FPT	Fresh Produce Terminal
GAP	Good Agricultural Practices
Global GAP	Global Good Agricultural Practices
GPS	Global Positioning system
HACCP	Hazard Analysis of Critical Control Points
ICT	Information and Communication Technology
IFS	International Food Standard
ISO	International Organisation for Standardisation
JEE	Joint Effort Enterprise
LEAF	Linking Environment And Farming
MRL	Maximum residue level
PDCA	Plan-Do-Check-Act
PHC	Pack House Code
PPECB	Perishable Products Export Control Board
RFID	Radio Frequency Identification
SAMGA	South African Mango Growers Association
TQM	Total Quality Management
UAE	United Arab Emirates

UK	United Kingdom
USA	United States of America
WHO	World Health Organisation

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The string of food safety scares, scandals and food borne disease outbreaks during the last decade has resulted into a regulatory dilemma and a global meltdown of consumer confidence in the food supply chain (Banati, 2011). These include the finding of salmonella in contaminated basil and fresh peppers in 2007 and 2008 respectively, that affected Europe and North America (Lynch, Tauxe & Hedberg, 2009) as well as the 2006 *E. coli* case of contaminated spinach (Pouliot & Sumner, 2010). This has had a significant effect on food demand and profitability (Pouliot & Sumner, 2010), as sales fall because of consumers becoming more sceptical of buying that particular food. In addition, the credibility of food safety of the entire global food value chain is affected (Banati, 2011). A year ago, the European countries and North America were hit by yet another food borne disease outbreak: *E. coli* O104:H4 in bean sprouts, which started in Germany, in which "...4,075 cases and 50 deaths..." were reported by 21 July 2011 (WHO, 2011).

As a result, there have been significant changes in food policy and legislation imposed by major importing markets such as Europe and the United States of America (USA) with regards to food safety and quality and aimed at restoring consumer confidence in the system (Banati, 2011; Lynch *et al*., 2009). For example, the British Retailer Consortium (BRC) for Global Standards for retail branded products seeks to address food safety and quality from the source focusing on processes rather than products (BRC, 2012).

Addressing the above issues has been complicated by the evolution of the agricultural supply chains into global food value chains and further into value chains that are buyer-driven and more complex (Gereffi, Humphrey & Sturgeon, 2005; Reardon, Barrett, Berdegue & Swinnen, 2009). This transformation has been

compounded by problems emanating from inefficiency in supply chain coordination in the face of food safety and quality concerns. The focal point of value chains as elucidated by Webber and Labaste (2010) is the creation of customer value through product development, promotion and innovation, whereas supply chains are mainly concerned with costs management and efficiencies. Balancing the two in the transformation process is a challenge in agricultural food chains, given the food safety and quality concerns. This transformation of agricultural supply chains has become a global trend and it is evident in the fresh fruit and vegetable supply chains (Ewane, 2010; Wever, Wognum, Trienekens & Omta, 2010). In the same vein, developments in the South African agricultural exports chains are also echoing this global movement and the mango export supply chains are no exception as they responds to consumer demands (Ramasodi, 2006).

In order to deliver the desired quality of products preferred by consumers, actors in the supply chain have an obligation to work independently and collectively as a unit (Van der Vorst, Da Silva, & Trienekens, 2007; Webber & Labaste, 2010), a feat which needs coordination of the chain. This is achieved by integrated supply chain management (SCM) which requires a well synchronised and efficient system. Van der Vorst *et al.* (2007:13) define SCM as:

> "...the integrated planning, implementation, coordination and control of all business processes and activities necessary to produce and deliver, as efficiently as possible, products that satisfy market requirements."

As such, activities core to the chain are jointly planned and coordinated by the network of actors based on trust and openness in communication (Van Roekel, Willems & Boselie, 2002). SCM systems and tools are thus aimed at improving the production processes, logistics, use and exchange of information as well as enhancing quality management (Van Roekel *et al*., 2002). An integrated (or coordinated) approach in a supply chain has benefits such as increased sales and reduced transaction costs; improved traceability and tracking leading to improved food safety and quality management in addition to improved communication and transparency (Trienekens & Wognum, 2009; Van Roekel *et al*., 2002).

Investigative tools of SCM that make use of chain analysis and mapping of the supply chain (Webber & Labaste, 2010:52, Wever *et al*., 2010) are important in assessing a supply chain. These facilitate an understanding of the network of chain actors and their activities, power relations, information flows as well as an assessment of the relationship between quality management and chain dynamics. This notion is applicable to all food chains of which the South African fresh and freshly cut mango export chains are fundamental components.

Globally mangoes are an essential part of subtropical fruits that are grown and exported by more than 60 countries. South Africa is a relatively small player as an exporter and in 2010 it was ranked 25 in the global export market with a market share of 0.62% (Trade Map, 2011). The South African mango export supply chain is made up of a network of chain actors through which fresh or freshly cut mangoes are handled from the orchard to the consumer. These actors include input suppliers, producers/growers, pack houses, processors, exporters, logistics service providers, buyers, grower groups and regulatory bodies such as the government as well as retailers and consumers.

1.2 PROBLEM STATEMENT

The prevalence of food scares, scandals and food contamination leading to food borne disease outbreaks in the global food chains has led to different reactions by the various supply chain actors, in particular, how to regulate the chains. Notable is the proliferation of private food safety and quality standards imposed by buyers in a bid to prevent rather than react to problems related to food safety and quality (United Nations, 2007). There is also consensus that agricultural supply chains are buyer-driven and that food safety and quality standards influence the structure and governance of chains (for example Dolan & Humphrey, 2007; Gereffi *et al.*, 2005; Temu & Marwa, 2007).

The South African mango export chains are not immune to the changes taking place in global fresh produce trade. Principally, concerns about food safety and quality in mango export chains emanate from the factors that affect perishability as mangoes are highly perishable. In the South African case, this is compounded by the existence of numerous service providers as the mangoes have to be handled by the various actors as they move along the chain. To mitigate the food scares and food borne diseases in a bid to ensure that safe and quality products are delivered to the consumers, buyers then put pressure on farmers and other role players to adhere to food safety and quality standards.

Given that South Africa is also a player in the global market of mangoes and the issue of food safety and quality, understanding how agricultural supply chains adjust in response to the quest for better quality management and safety is therefore important. Critical aspects of the South African mango export supply chains that are directly affected by food safety and quality standards include governance structure and relationships, information use and exchange coupled with quality management. The study seeks to explore how and to what extent food safety and quality standards are influencing the governance structure and relationships, quality management, use and exchange of information in the selected mango export chains.

Clarity is therefore needed on the following questions:

i. Are the mango export chains adjusting to global trends? If yes, how?

ii. Are the supply chains optimally functioning?

iii. Are there risks and potential threats from the chains emanating from supply chain coordination?

Understanding the South African mango export supply chains' adjustment to food safety and quality standards is important in order to gain knowledge of behaviour of the chains. Past literature on South African mangoes has focused on diverse aspects of mangoes. Breedt (2009) analysed the economic impact of food safety and quality

systems whilst other scholars looked at pest and diseases (e.g. Korsten, 2006), logistics (e.g. Ortmann, 2005; Van Dyk & Maspero, 2004) and markets and trade of fresh fruit and vegetables (e.g. Louw, Chikazunga, Haankuku & Ndanga, 2009; Tregurtha & Vink, 2002).

1.3 OBJECTIVES

The purpose of the study is to map the economic structure and organisation of two selected mango export supply chains from South Africa through SCM investigative tools that make use of supply chain analysis and mapping. Through this an examination of the activities and the various actors along the mango export supply chains will give insight into how the chains are adjusting to the challenge posed by food safety and quality standards imposed by the buyers. This will be examined under the aspects of governance, quality management, information use and exchange.

The study therefore intends to achieve the following objectives:

- To identify the actors and the role they play in the two selected mango export supply chains
- To investigate governance structure and relationships in the mango export supply chains
- To examine the quality management programmes and standards employed by the different levels of the mango export supply chains
- To identify and analyse the different information exchange categories and use of information between the different links of the chains

1.4 CONTRIBUTION OF THE STUDY

The study will contribute to the global debate on private standards and the control of fresh fruit and vegetables supply chains at large by using the case study of the South Africa mango export supply chains.

The study will also contribute to existing knowledge of mangoes in South Africa, particularly in the field of marketing and trade. In addition, it will expand the knowledge of the subtropical mango export industry by making use of supply chain mapping and analysis tools in order to examine the organisation and economic structure of the chains given the mandatory food safety and quality standards. This will uncover the different aspects of the mango export chains such as role players and their networks, governance structure and relationships and quality management and how information is used and exchanged. An examination of the various facets will ultimately shed light on how the fresh and freshly cut mango export chains function, the challenges, best practices and trends.

1.5 DELIMITATIONS

A number of delimitations are applicable in this study. Firstly, the focus of the study will be the two selected mango export supply chains of *Bavaria* and *Blue Skies* from the mango sub-sector of South Africa. The study will only focus on fresh and freshly cut (prepared or mini-processed) mangoes and therefore exclude other processed products such as mango atchar, concentrate, dried fruit and juice.

The study will also have a narrow focus of mapping the mango export supply chain and not on the mango industry as a whole. Therefore, it will deal with fresh and prepared mango exports and will investigate the following issues: governance and relationships; quality management and standards; and information use and exchange. It will shy away from a direct investigation of some of the issues that are critical in the industry, such as the reason for decline in production and exports of mangoes and mango products. In addition, the focus will be only those exporters who

are accredited by private food safety standards and other role players along the narrow and specific supply chain of fresh and freshly cut mango exports.

1.6 RESEARCH METHODOLOGY

This research is qualitative in nature and based on the multiple case study methodology. Its aim is to make an inventory of two selected mango export supply chains from South Africa in order to gain insights by exploring the governance structure and relationships, quality management, information use and exchange. The multiple case study methodology was chosen as it is best suited to exploratory and explanatory research as stated by Saunders, Lewis and Thornhill (2009). The study is part of an inventory study on the export of fresh fruit and vegetables commissioned by the European Commission under the Veg-i-Trade Project (www.veg-i-trade.org).

1.6.1 Research design and methods

A multiple case study methodology that incorporates the sampling technique of snowballing was employed as the inquiry strategy that ensured that the network of actors in a particular supply chain was identified and their contacts availed until the end of the chain (Saunders *et al*., 2009). The case study method was identified as the more appropriate one as it enabled an in-depth understanding of the *Bavaria* and *Blue Skies* mango export chains and was more suitable in providing preliminary information which could be used for further research (Leedy & Ormrod, 2010).

Case study methodology allowed the use of multiple data sources and triangulation that enabled the data to be reconciled and verified (Leedy & Ormrod, 2010; Yin, 1994). Moreover, sufficient time was taken to understand the aspects of governance, quality management, use and exchange of information in each of the respective chains. Data was collected using interviews, direct observation and secondary sources such as websites and archival documents. However, the case study methodology has its own drawbacks in that it is time consuming and costly, especially in cases where the respondents are geographically dispersed (Kothari, 2009 & Saunders *et al*., 2009). According to Tellis (1997), each source of data has its

own merits and demerits for example, interviews are insightful and targeted yet they suffer from reflexivity and bias. On the other hand, observations are time consuming and costly though they are contextual with observations done in real time whilst secondary sources give a holistic view of the subject over time despite the problem of retrieving and accessing the data (Tellis, 1997). The drawbacks of the case study methodology can be alleviated by adequate preparation by the researcher, using a checklist of interview questions, ensuring that interviews in one geographic area are pooled in order to reduce costs as well as maintaining a neutral stand during interviews and not getting carried away.

The study follows the methodology used in the 'EU's 6th Framework Integrated Project Q-Porkchains' whose focus was the European Pork Chains (Trienekens, Wognum, Nijhoff-Savvaki, & Wever, 2008). The aspects to be studied were based on the identified study themes under Work Package 1 of the Veg-i-Trade project. These include governance structures and relationships of the mango export chains, quality management and the use and exchange of information (www.veg-i-trade.org). The research design followed the four stages by Yin (1994) thus: designing of case study; conducting the study; analysis of evidence and interpretation in which conclusions and recommendations were made.

1.6.2 Data collection

The first stage of the data collection process involved the identification of the different actors in the South African mango export industry. In the mango export industry, growers/producers and exporters organisations play an important role as custodians of information about the industry (Tregurtha & Vink, 2002). For example, the South African Mango Growers Association (SAMGA) has affiliated members who are certified under different food safety and quality management standards and was thus a focal point in terms of data collection. On the other hand, the Fresh Produce Exporters' Forum (FPEF) was useful for gathering information about exporters and export statistics, and the Department of Agricultural Forestry and Fisheries (DAFF) and the Perishable Products Export Control Body (PPECB) were involved in the handling of agricultural produce from the farm to the port of exit.

The organisations were contacted over the telephone and by email. Additional information on the industry was acquired through secondary sources such as organisational year books and reports as well as websites. Based on the available export information, supply chain actors were then streamlined to fit the supply chain of fresh and freshly cut mango exports to the United Kingdom (UK). Two mango export chains were selected that deal with fresh and freshly cut mangoes, namely the *Bavaria* and *Blue Skies* mango export chains respectively. The rationale was to include large companies whose main export product was mangoes or mango products with markets in the UK in which archival and market intelligence data was available.

The second stage in the application of the snowballing technique entailed identifying and making contact with one actor in the *Bavaria* and *Blue Skies* mango export chains and asking the actor to identify the other actors involved in the chain. The new actors were contacted and asked to identify subsequent links until the end of the chain. The initial contact was provided by SAMGA, which is the growers' organisation. The following were identified as the units of analysis in the two selected mango export chains of *Bavaria* and *Blue Skies*: input suppliers, the growers, exporters, processors, transport and logistics support services, regulators and buyers.

Characterisation of the two chains involved collection of primary data on identified supply chains actors by contacting resource persons and industry experts. This was done through a mix of fieldwork, face-to-face in-depth interviews, telephone interviews and emails with the use of semi-structured questions designed to answer the research questions. This process follows the guidelines indicated in Leedy and Ormrod (2010) and Saunders *et al*. (2009). The actors spanned a larger area due to their different roles in addition to mango production hence the interviews were not geographically based. Data collection was carried out from June 2011 to April 2012 with time taken in each interview varying between one hour and one and half hours. In all a total of 21 supply chain actors were interviewed and all interviews were transcribed. The interviews were centred on the aspects of governance structure and relationships, quality management, use and exchange of information in the supply

chains faced with compulsory quality and food safety standards. Secondary data was sourced from a methodical desk research on the literature on fresh and freshly cut mango export chains from South Africa and searching the Internet for relevant information about the two selected chains.

The subsequent stage involved an in depth analysis on the aspects under study based on the gathered information. Inferences were then made in the last stage based on the research objectives in order to understand the functioning of the *Bavaria*n and *Blue Skies* mango exports chains in the face of obligatory quality and food safety standards. The framework of analysis by Trienekens *et al.* (2008) was then used to interpret the data.

1.7 OUTLINE OF THE STUDY

The first chapter has introduced the reader to the purpose of the study with a brief background on the subject provided by the short literature review. The objectives of the study and the problem statement are also stated in the chapter. The method of enquiry is also described in addition to the delimitations and the contribution of the study.

Chapter 2 provides an overview and a description of the mango export supply chain from South Africa. This is followed by the analysis of governance structures and relationships in the *Bavaria* and *Blue Skies* mango export chains in Chapter 3. Chapter 4 focuses on the quality management and standards used in the two selected mango export supply chains, while Chapter 5 will examine the use and exchange of information along the *Bavaria* and *Blue Skies* mango export chains. Lastly the summary, conclusion and recommendations will be the main focus of Chapter 6.

CHAPTER 2

DESCRIPTION OF THE SOUTH AFRICAN MANGO INDUSTRY AND THE *BAVARIA* AND *BLUE SKIES* MANGO EXPORT CHAINS

2.1 INTRODUCTION

As the focal point of this study, mango exports from the mango sub-sector of the subtropical fruit industry will be discussed in depth. However, an understanding of the background of mangoes in South Africa is crucial in order to undertake the study and to understand the *Bavaria* and *Blue Skies* mango export supply chains. The purpose of this chapter is to give a general overview of the mango industry through an analysis of production and marketing channels followed by a description of the *Bavaria*n and *Blue Skies* mango export chains.

2.2 OVERVIEW OF THE SOUTH AFRICAN MANGO INDUSTRY

This section provides an overview of the South African mango industry, with a focus on production, marketing channels and exports.

2.2.1 Mango production

The mango, *Magnifera indica L* of the Anacardiaceae family, prior to the 1700s was first harvested in Southeast Asia and is now widely grown around the world (DAFF, 2011; Mai, 2009). In South Africa, mangoes are an integral part of the subtropical fruit industry, which comprises avocados, papayas, litchis, mangoes, bananas, guavas, granadillas and pineapples. It is critical as a source of income from exports and sales through the local fresh produce markets (FPM), informal traders, supermarkets, processors and green grocers. The industry also contributes to food security and employment along the supply chain with direct employment estimated at 3 000 in 2010 (DAFF, 2011).

Mangoes are subtropical fruits (hence the name subtropical) and are also grown in tropical climates. Globally, the major producers of mangoes are India, Brazil, Mexico, Peru, Thailand and China (Trade Map, 2011). In South Africa, mangoes do well in areas whose altitude ranges between 300 and 950 metres above sea level, with average rainfalls between 300 and 1 000mm, thus mostly areas in the North Eastern part of the country (DAFF, 2011). Flowering takes place in winter, but due to differentials in temperatures in the growing regions, the ripening is affected giving rise to the various harvest periods.

The main cultivars grown in South Africa are Heidi, Tommy Atkins, Sensation, Kent and Keitt (DAFF, 2011). The 2011 total production volume of mangoes was 52 800 thousand tonnes (DAFF, 2012) under 7 583 hectares, with the largest volume coming from the Limpopo Province. Total production from Limpopo accounted for 66% of total mango production for that season with major production areas being Hoedspruit, Tzaneen as well as the Letaba region (DAFF, 2012). During the same year, 26% of total mango production came from the Mpumalanga Province from regions such as Komatipoort and Malelane while KwaZulu-Natal contributed 6% with mangoes coming mainly from the Pongola region. The remaining 2% came from the Eastern Cape and other provinces. Figure 2.1 below shows the distribution of mango production as elaborated above.

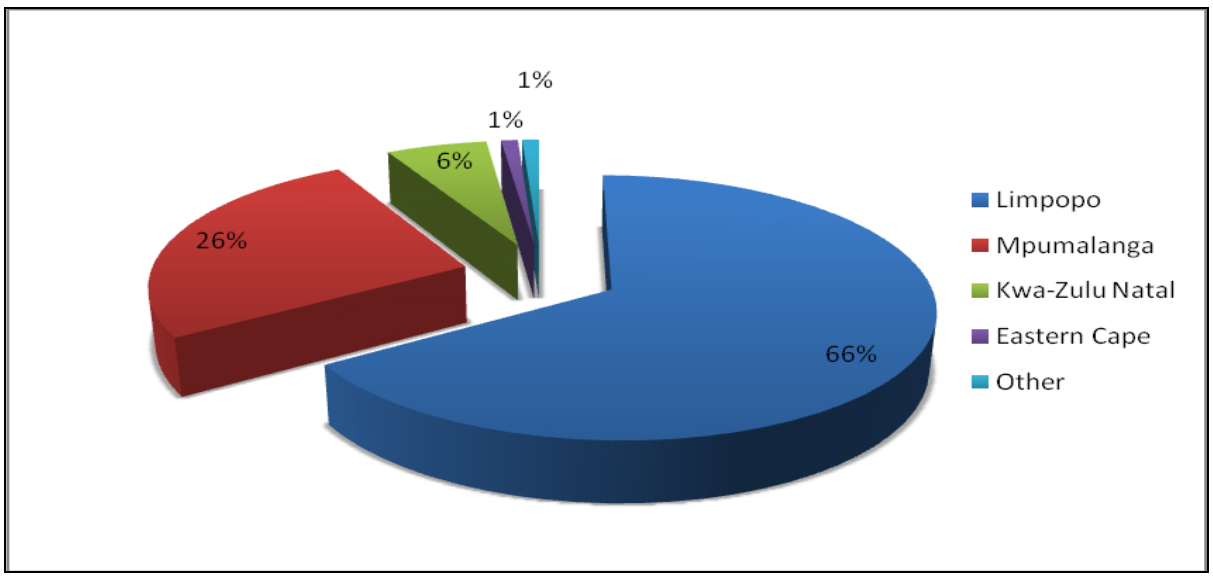


Figure 2.1: Mango production regions in South Africa in 2011

Source: DAFF (2012)

The 2012 DAFF agricultural statistics for the 2011 season ranked mangoes fourth among other subtropical fruits (DAFF, 2012), with gross earnings of R186 million in 2010 (DAFF, 2011). This represents “9% of the total gross value of production”’ of the subtropical industry in South Africa (DAFF, 2011:3).

According to DAFF (2012), production of mangoes has been on the increase from 68 400 tonnes in the 2006 season to a peak of 90 600 tonnes in the 2008 season. However, production declined significantly by 47% in 2009, close to half of the 2008 production quantity. An improvement of 14% was recorded in the 2010 season, which was encouraging though far from the 2008 season. The improvement was then dampened by the 2011 season which recorded a decline of 4%. The decline in production has been attributed to diseases and pest problems which affect the quality and quantity (Du Preez, 2011). The trend in mango production from 2006 to 2011 is depicted in Figure 2.2 below.

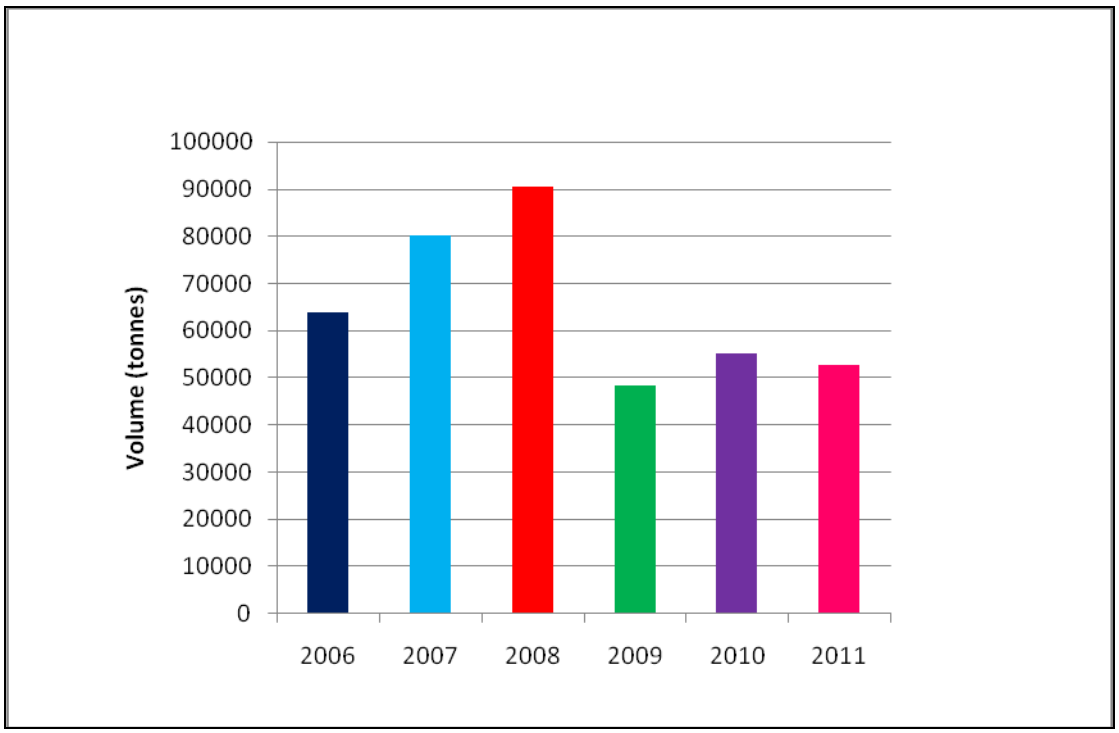


Figure 2.2: Mango production trends from 2006 to 2011

Source: DAFF (2012)

2.2.2 Marketing channels

The deregulation of the South African agricultural industry in 1997 changed the landscape of marketing and trade in fruit, opened up access to overseas markets, and made it very competitive (Ramasodi, 2006). As a result of deregulation, price determination is solely dependent on market forces of supply and demand, hence fluctuations in processing, domestic sales as well as exports (Ramasodi, 2006).

Once harvested, mangoes in South Africa are sold and distributed through three channels namely:

i. **Local sales**

This mainly comprises sales through the fresh produce markets (FPM). However, domestic sales of mangoes are also done through direct marketing to informal traders, greengrocers and to retail supermarkets such as *Woolworths*, *Pick n Pay*, *Fruit & Veg* and *Food Lovers Market*, *Shoprite, Checkers* and *Spar* (Du Preez, 2011).

ii. **Processing**

The channel accounts for two thirds of domestic mango sales. For example, in the 2011 season, 36 900 tonnes (66% of total production) was channelled to the processing industry (DAFF, 2012). Principally, mangoes are processed into different products such as juice, canned mango, concentrate, mango pulp, jam, dried mangoes and chutney. Green mangoes are processed into atchar. The mango kernel is also crushed to extract oil used to make soap and cosmetics as well as alcohol (DAFF, 2011). The other innovative use is in salads and exports in the form of freshly cut mangoes as in the case of *Blue Skies* South Africa.

iii. **Export**

Despite the revenue in foreign currency, the export channel is the least significant in terms of sales intake out of total mango production, with only 9% intake in the 2011 season (DAFF, 2012).

Figure 2.3 (below) shows the distribution of mango sales from 2006 to 2011. Comparing the three marketing channels in the 2011 season, out of the 52 800 tonnes produced, 13 100 tonnes (25%) were sold though the major FPM and 36 900 tonnes (66%) were absorbed by the processing industry (DAFF, 2012). The remaining 5 700 tonnes (9%) were exported. Overall, the most preferred channel is processing though this has also been fluctuating, with the highest volume over the period under consideration being 61 300 tonnes in the 2008 season. The 2009 season saw a significant decline of 53% in processing volume with only 28 600 tonnes channelled for processing. However, there has been a steady seasonal increase from 2009 to 2011 in mangoes destined for processing from 28 600 tonnes to 36 900 tonnes respectively (DAFF, 2012).

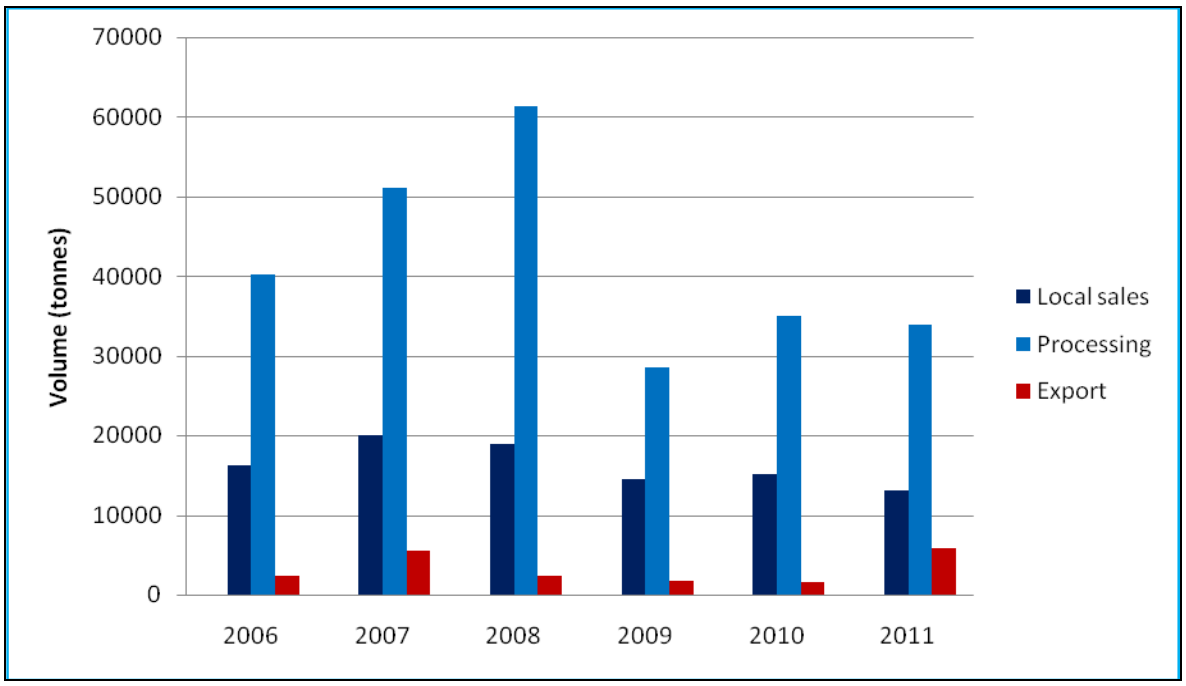


Figure 2.3: Distribution of mango sales

Source: DAFF (2012).

Local sales through the FPM have also been fluctuating over the 2006 to 2011 period with dips in 2009 and 2011 representing a decrease of 24% and 14% respectively compared to the previous seasons (DAFF, 2012). This could be attributed to an increasing volume of mangoes being channelled to processing or sold through direct marketing and to supermarkets, as indicated above.

2.2.3 South African mango exports

Globally, with regards to exports and global hectares, South Africa is comparatively small, having accounted for 0.62% of the total world mango exports during the 2010 season, and ranked number 25 according to Trade Map (2011). The top producer and exporter of mango in 2010 was India with exports valued at slightly above US$1.2 million, which represents 17.9% of world mango exports (Trade Map, 2011). The other major players were Mexico, Brazil, Peru, Thailand, China, Philippines, Egypt and Pakistan (Trade Map, 2011). As for imports, the USA was the largest global importer of mangoes, to the value of US$345 million in 2010, representing 22.2% in world imports followed by the Netherlands, China, Germany, the UK and Canada (Trade Map, 2011).

Mangoes from South Africa are exported to different regions of the world. In 2010, most mangoes were destined for Europe and the Middle East, as seen in Figure 2.4 (below). Europe accounted for 38% of South African mango exports during the said season followed by the Middle East and the Far East with 30% and 18% respectively (FPEF, 2011). Major markets within Europe were Switzerland, the UK, the Netherlands, France, Germany, Spain, Belgium and Turkey (Trade Map, 2011).

In Asia, South African mangoes were destined for United Arab Emirates (UAE), Saudi Arabia, Indonesia, Singapore, Hong Kong and Malaysia (Trade Map, 2011). The other important importer is the USA whose imports were 104 tonnes in 2010 (Trade Map, 2011) though historically the USA's demand for mangoes has remained steady around 100 tonnes per year over the last decade (DAFF, 2011). In Africa, Ghana was a major importer, absorbing 13% of South African mangoes during the 2010 season, which were later re-exported to the UK and other markets after processing. The 1% represents Zambia, Zimbabwe and other countries that exported less than 50 tonnes each (Trade Map, 2011).

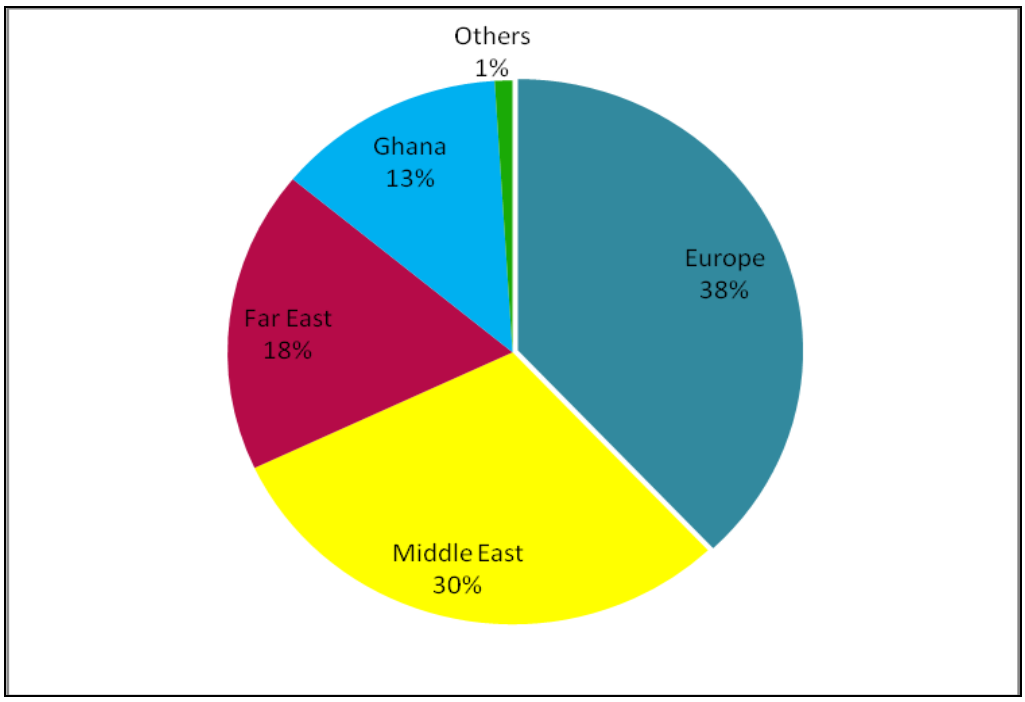


Figure 2.4: Export distribution of South African mangoes in 2010

Source: FPEF (2011).

The trend in exports has not been encouraging since the drought of the 2004 season (DAFF, 2011), with a general shift by growers away from exports towards selling to the local supermarkets at fixed prices and for processing, which as indicated by DAFF (2011) is less risky and has lower transport costs. Mango export volumes from 2006 to 2011 seasons are shown in Figure 2.5 (below) and it can be seen from the graph that there was a sharp increase of 58% in mangoes exports in the 2007 season over the previous season. This was followed by a steep decline of 58% in 2008. From 2008 to 2010, mango exports were on a steady decline, until 2011 in which a sharp rise of 73% was witnessed.

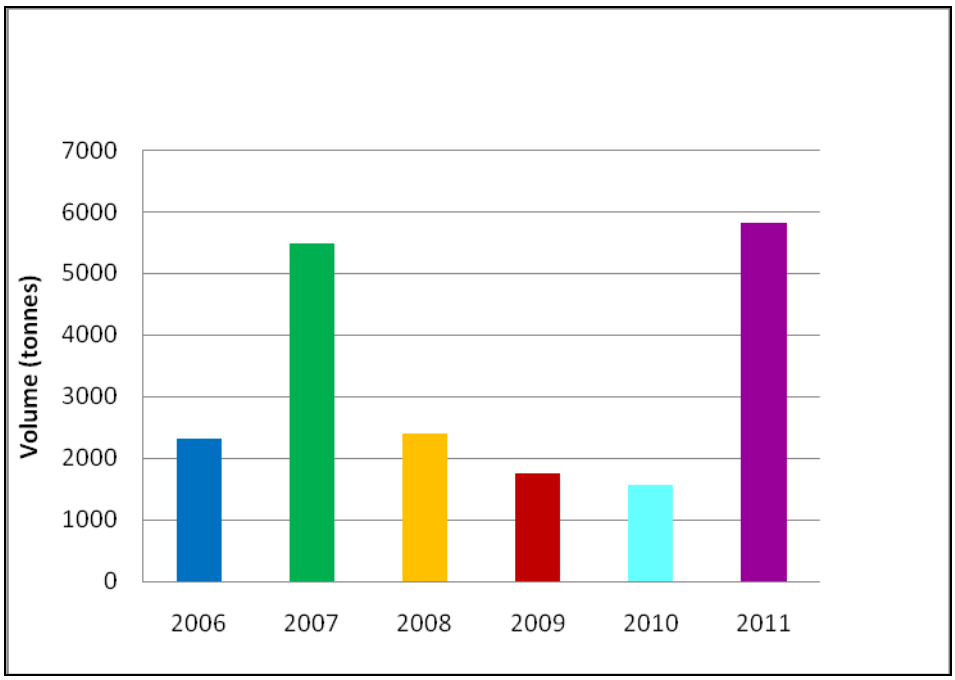


Figure 2.5: Mango exports from 2006 to 2011

Source: DAFF (2012).

The decline in South African mango exports can be explained by a fall in world mango prices which is not attractive for exports. The fall in price is a result of increased supply from countries such as Brazil, Mexico, Uruguay, Ecuador and Peru (DAFF, 2011 & Du Preez, 2011). These southern hemisphere countries pose vicious competition to South Africa as their harvesting seasons are similar (DAFF, 2011). However, despite the decline in export volumes, DAFF (2011) noted that on average the nominal price of mangoes exported per tonne has been rising significantly though this is affected by the fluctuating exchange rate. Over the ten year period from 2000 to 2010 the nominal price increased from R3 036/ton to R22 611/ton respectively (DAFF, 2011).

2.3 DESCRIPTION OF THE *BAVARIA* AND *BLUES SKIES* MANGO EXPORT SUPPLY CHAINS

The South African mango export supply chains are complex and the following sections seek to pinpoint and describe the intricacies. Focus is on two selected chains from the South African mango industry, namely the *Bavaria* and *Blue Skies*

mango export chains. The aim is to delineate the role-players and their importance along the supply chain, as well as the flow of mangoes along the respective chains.

In order to have a synchronized supply chain the foundation lies in the economic structure, the organisation and sound management of the chain through chain coordination. The economic structure of a chain refers to the way the different actors are related as each entity contributes separately in the transformation of raw materials into value added products (Ewane, 2010 & Giovannini, 2008).

According to Van Melle, Coulibaly, and Hell, (2007), elements that constitute the economic structure of a supply chain are: chain actors, products, markets and marketing channels, quality standards, regulations, infrastructure and governance. On the other hand, organisation of the supply chain refers to the way the various players interact as they execute different delivery transactions, with the end result being the export of mangoes to different countries and consumption thereof (Zuniga-Arias, 2007). The supply chain is a composite relationship of an assortment of role-players or businesses that interact in handling a product from one actor to another and from one level to the other from production until it reaches the consumer (Hugos, 2011, OECD, 2006).

The mango export supply chain from South Africa is a subset of a broad supply chain that encompasses all links in both the domestic and export activities, as shown in the diagrammatic representation of the links in Figure 2.6 (below). Generally, the supply chain from the farm to the consumer is long owing to the presence of intermediaries and their activities in post harvest handling and logistics (Vermeulen, Jordaan, Korsten, & Kirsten, 2006). This is so because of stringent requirements imposed by private standards to ensure food safety and premium quality (Gereffi *et. al.*, 2005; Temu & Marwa, 2007) as a result of growing consumer awareness on health and food safety (Gil, Aguayo & Kader, 2006; Sothornvit & Rodsamran, 2008). Hence, there is need to have an ‘effective cold chain management’ (Kosten, 2006:53) to ensure quality and safe mangoes.

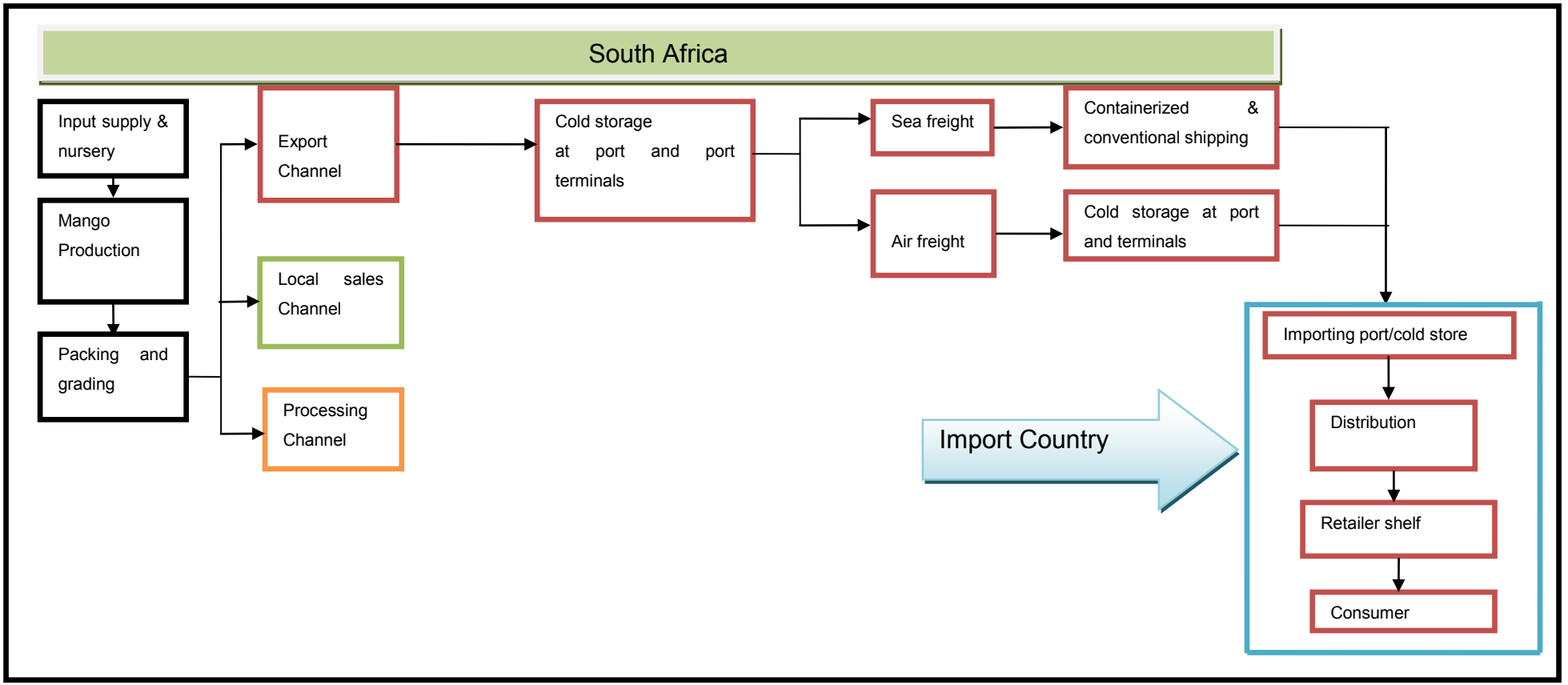


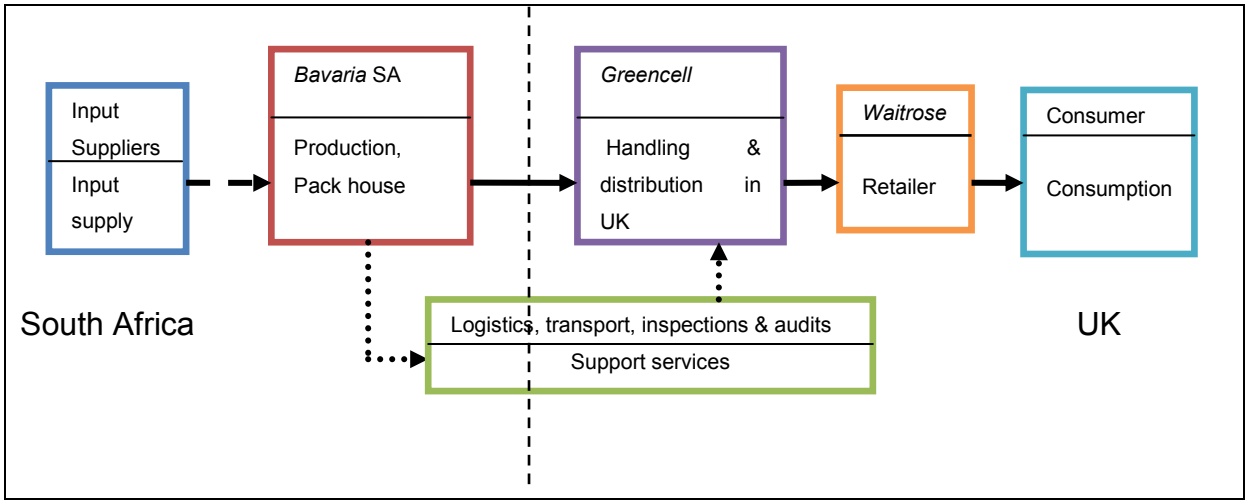
Figure 2.6: Generalised mango export supply chain

Source: Interpretation by the researcher

2.3.1 The *Bavaria* fresh mango export supply chain

A field visit to *Bavaria* Fruit Estate (referred to as '*Bavaria*' in the study) was conducted in order to understand the *Bavaria* fresh mango export chain. The company, based in the Limpopo Province, is a mango and citrus grower, a processor of dried fruit and an exporter. Once harvested, post-harvest handling of fruit, such as washing, treatment, grading and packaging, is done at two pack houses at the farm prior to distribution to the local market, export and processing channels. *Bavaria* is the largest grower of mangoes, with more than 750 hectares under mango production. In the 2010/11 season, 10% of total production was exported, 23% was sold through the FPM, local supermarkets and direct marketing to informal traders, and 67% was processed into dried fruit, atchar and juice (Du Preez, 2011).

Presented in Figure 2.7 (below) is a diagrammatic representation of the flow and handling of mangoes in the *Bavaria* fresh mango export supply chain to *Waitrose.*



Note: Solid line = flow of mangoes; dash line= inputs flow; dotted line= handling by service providers

Figure 2.7: Bavaria fresh mango export supply chain to Waitrose.

Source: Interpretation by researcher

Bavaria specialises in growing Fairtrade mangoes and exports these as fresh mangoes to Europe, the Middle East and other markets. In the UK, Fairtrade mangoes are sold to *Waitrose*. Mango export marketing is done by category management in Europe and South America. In South Africa, marketing is done by *Westfalia Marketing*, whilst *Greencell* (formerly *Westfalia Marketing UK)* is responsible for marketing, handling and distribution of the mangoes in the UK.

The issue of category management is central in the fresh mango export chains, hence the need for an explanation. Category management is a form of network governance classified under modular linkages (Humphrey & Schmitz, 2008) in which product groups or categories are managed as 'strategic business units' (Seifert, 2002:33) by a lead supplier with the aim of shortening the supply chain (Zuurbier, 1999). The business unit can be producer-owned as in the case of *Greencell*. The concept was a result of the need for efficiency in meeting consumer demand called Effective Consumer Response (ECR) which resulted in changes being made in food supply chains, processes and linkages (King & Phumpiu, 1996; Seifert, 2002). Suppliers are streamlined so as to maintain consistency in pricing and quality resulting in competitive advantage (Hingley, 2005), reduced costs, growth in revenue and profitability as well as consumer satisfaction (Seifert, 2002). In this system, the category managers function as middlemen for the suppliers, retailers and agents and are responsible for product procurement and have to maintain a seamless supply of products to the retailer as well as value addition, quality assurance and distribution depending on the retailer's demands (Hingley, 2005). One drawback of category management is that retailers prefer large scale suppliers (Hingley, 2005) with the repercussion of exclusion of small scale suppliers.

2.3.2 The Blue Skies freshly cut mango exports supply chain

In the same vein as the *Bavaria* fresh mango export supply chain, a field visit to *Blue Skies South Africa* was conducted in order to obtain an in-depth understanding of their operations. It was noted that *Blue Skies South Africa* (referred to as '*Blue Skies*' in the study) is a subsidiary of the *Blue Skies Holding Limited* based in the UK. Apart

from South Africa, the holding company has subsidiaries and processing facilities in Ghana, Brazil and Egypt and pack houses in Gambia and Senegal (*Blue Skies*, 2012). Their speciality is processing and exporting of exotic, deciduous and subtropical fruit salads to major UK supermarkets, such as *Marks & Spencer*, *Waitrose* and *Sainsbury's* as well as in other European countries (Veldsman, 2011).

With a total workforce of over 2 000 in the countries it operates, *Blue Skies* is able to supply fruit to retailers and other customers in Africa, Europe and South America (*Blue Skies*, 2012). In 2010, the revenue of just below £3.5 million was realised in South Africa out of the sale of 234 tonnes of fruit salads, of which 35.4 % was sold in the local market. The highest sales revenue of just below £15.5 million was received from Ghana from an output of 3 798 tonnes (*Blue Skies*, 2012).

Blue Skies freshly cut mango export chain to the UK was examined. In South Africa, *Blue Skies* is situated in Balfour in the Mpumalanga province and sources different fruits including mangoes from a pool of 39 growers who meet specific requirements such as Global GAP certification (Veldsman, 2011). The company specialises in the packaging of freshly cut fruits for export and local markets. The fruits are cut into cubes and packed as is or mixed with other fruits to make salads and then exported or sold locally. Apart from exporting, *Blue Skies* supplies major local retailers such as *Woolworths* with fresh fruit salads. Examples of the packaged fresh salads in which fresh mangoes are a component are shown in Figure 2.8 below.

Figure 2.8: Fresh mango salad prepared by *Blue Skies*

Source: *Blue Skies* (2012)

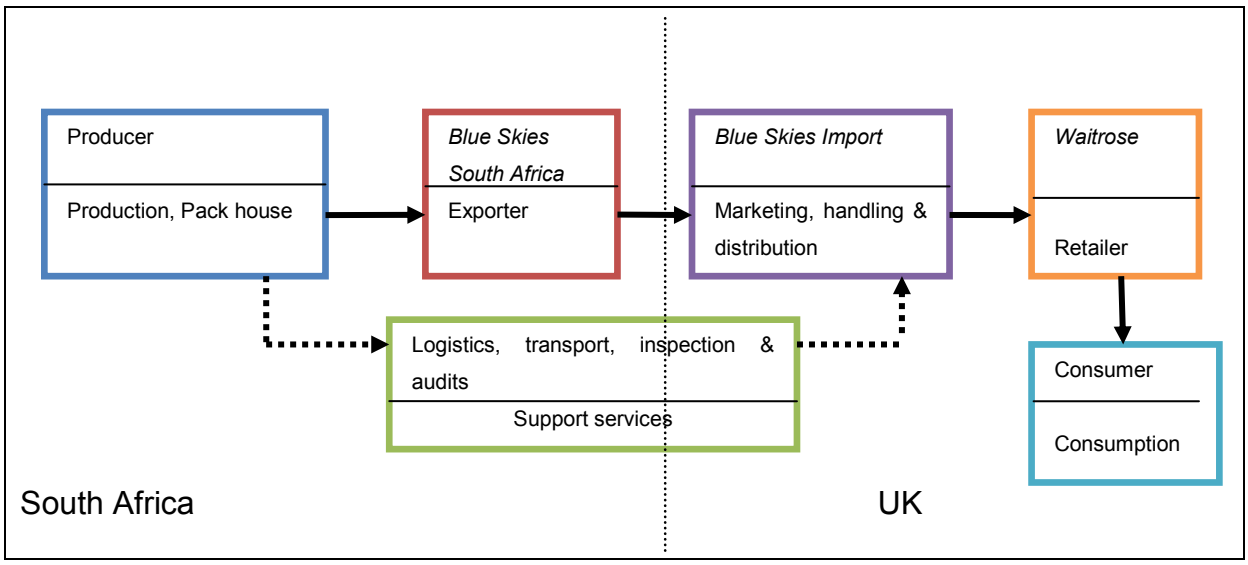
The processed fruit is pre-packed and priced according to the different retailers' specifications, for example *Waitrose* and *Woolworths,* at the Balfour factory. Figure 2.9 shows an example of the freshly cut mangoes packaged for *Waitrose* priced at £1.99 per 200g.

200 g at £1.99

Figure 2.9: Fresh cut mangoes packed for *Waitrose*

Source: *Waitrose* (2012).

Exports are sent by air and the product is delivered to the retailer within 48 hours. The mode of operation of the *Blue Skies* subsidiaries is similar in that they are market-oriented and source fruit from a pool of growers in order to meet their focused demand in providing a seamless supply to the market throughout the year. Supply chain coordination is done on logistical and distribution services that are contracted whereas the marketing and handling is done by the category managers. Figure 2.10 below shows the flow of freshly cut mangoes and handling in the *Blue Skies* export chain from South Africa.



Note: Solid line= flow of freshly cut mangoes; dotted line= handling by service providers

Figure 2.10: Blue Skies fresh cut mango export chain

Source: Interpretation by researcher

2.3.3 *Bavaria* and *Blue Skies* mango exports supply chain actors

From the selected mango exports chain presented in Figure 2.7 and 2.10 above, an assortment of role players is evident and their role in the chains is indispensable. Below is a brief description of the chain actors in the *Bavaria* and *Blue Skies* mango exports chains:

i. Producer and Exporter

In the *Bavaria* fresh mango export chain, the producer (*Bavaria*) also owns the pack house and is the exporter and has contractual agreements with retailers in the importing country. *Bavaria* is also a processor specialising in dried mangoes and supplies the domestic markets such as fresh produce markets, informal traders and supermarket chains. With the *Blue Skies* pre-packed freshly cut mango export chain, producer and exporter are separate entities. *Blues Skies* source mangoes from a pool of growers and process the mangoes and then export them in order to full fill orders from the market. In South Africa, the grower base consists of 39 regular growers (Veldsman,

2011). One of the growers, *Jonkmanspruit Mangoes* indicated that in the 2010/11 season, 22 tonnes of fresh mangoes were supplied to *Blue Skies* and half of its mango production was exported during the said season (Van Vuren, 2011).

ii. Buyers

The main buyers in the *Bavaria* and *Blue Skies* Chains are the large retailers in the UK such as *Waitrose*, *Sainsbury's*, *Marks & Spencer* and *Tesco*. Fresh and freshly cut mangoes are also supplied to other markets in Europe, the Middle East and America. In South Africa, *Blue Skies* is also a buyer of fresh mangoes from *Bavaria* and other growers for instance *Jonkmanspruit Mangoes*.

iii. Input suppliers

At production level, *Bavaria* requires an assortment of inputs such as chemicals, fuel, water, fertiliser and irrigation, as well as electricity. The orchards are under irrigation with the use of drip irrigation, which is more efficient to meet the 9,000 to 9,500m^3/ha/a water required by mature mango trees. Fertilisers are also mixed in the irrigation water, a process called 'fertigation' (Du Preez, 2011). Other inputs include harvest essentials such as containers, plastic or wooden boxes, lug bins and nylon or plastic picking bags. *Bavaria* has its own nursery (Du Preez, 2011). With *Blue Skies*, inputs are supplied by more than 250 suppliers, and these include mainly packaging equipment and materials, chemicals, clothing, safety materials and water which are used extensively at the Balfour factory (Veldsman, 2011).

iv. Support services

Fresh mangoes, once harvested, have a high degree of perishability which has a serious impact on quality. To maintain fruit quality there is need for precise coordination of activities and temperature control along the supply chain from pack house to the consumer, which is provided by the cold chain. With a special focus on freshly cut and fresh mangoes to the UK, *Bavaria* and *Blue Skies* are able to meet their market demand through effective chain

coordination of support services. In South Africa, *Bavaria* employs the services of *Westfalia Marketing* as marketers and freight forwarders in addition to other contracted logistics services along the cold chain. In the UK *Greencell UK* (its category management referred to as *Greencell* in the study) then handles, markets and distributes the fresh mangoes (Du Preez, 2011). According to Veldsman (2011), *Blue Skies* also contracts the logistics services along the cold chain in South Africa while the mother company is responsible for marketing, sales and handling of freshly cut mangoes as well as contracting distribution services in the UK.

The different service providers that are involved along the cold chain are: transporters, cold stores, air lines (though small quantities of fresh mangoes exit the country via this route), shipping lines, freight companies, distributors and other logistic companies. *Blue Skies South* uses Sky Services' freight forwarding services as well as the British Airways World Handling Cargo for transportation (Veldsman, 2011). The mangoes remain the property of either *Bavaria* or *Blue Skies* though it will be in the hands of service providers.

v. Growers' association and export administration service providers

The two groups of service providers are not contracted yet they play an oversight role in the movement of mangoes along the supply chain. These are:

SAMGA- Growers Association

SAMGA's role is to conduct market and product research, promotion, an information centre and provision of extension services to the producer (SAMGA, 2011; Tregurtha & Vink, 2002). Founded in 1977, SAMGA is a growers' organisation with 80% of growers as affiliated members (SAMGA, 2011).

Fresh Produce Exporters' Forum (FPEF)

In addition to SAMGA's supporting role is the FPEF. It is an organisation that serves the interests of fruit exporters in South Africa and administers the exportation of fruit globally. As an information centre it provides the much needed information on fruit trade and as well being the face of exporters in the international arena. In addition, FPEF acts as a link between the government and exporters (Tregurtha & Vink, 2002).

Regulators

As part of support service, DAFF and the Perishable Products Export Control Board (PPECB) provide regulatory services under the Agricultural Product Standard Act No. 119 of 1990 amended in 1998. Actors in the fresh mango export supply chain are registered with the PPECB and DAFF so as to gain access to the export market and maintain standards in the industry. The export manual outlines the complimentary functions of the PPECB and DAFF as follows (DAFF, 2010):

- The PPECB has been authorised by DAFF to carry out inspection at end points such at port terminals and perform food safety audits and certify the mangoes and other fruits as well as other agricultural produce for export. PPECB also carries out inspections at pack houses and along the cold chain to ensure adherence to set standards such as cooling temperature of the mangoes. In doing so the PPECB acts as an antenna that collates information at inspection points and receives information that is dispatched from cold stores and ships.

- DAFF carries out sanitary and phytosanitary (SPS) inspection on farms and pack houses to enforce compliance to requirements of the different markets and specific markets such as the EU to ensure highest quality of mangoes destined for exports. DAFF also issues phytosanitary certificates to exporters which sometimes are issued by the PPECB.

2.4 SUMMARY

This chapter has provided an overview and description of the South African mango export supply chain in which mango production, sales and distribution were discussed. Furthermore, a description of the *Bavaria* and *Blue Skies* mango supply chains was made. It was noted that the largest mango production region is the Limpopo Province, followed by Mpumalanga Province, KwaZulu-Natal and the Eastern Cape. Fresh mangoes are sold and distributed through local markets, processing and exports.

In the two selected mango export supply chains from South Africa, *Bavaria* and *Blue Skies* export chains were discussed. *Bavaria* is a producer, packer and exporter of Fairtrade fresh mangoes to *Waitrose* with marketing, handling and distributing done by *Westfalia* subsidiaries thus, *Westfalia Marketing* and *Greencell* in the UK. *Blue Skies*, on the other hand, specialises in processing and packaging exotic, deciduous and subtropical fruits for sale in the local and export markets. In both chains, supply chain coordination is carried out on contracted logistics and cold chain services along the supply chain.

From the chapter it can be concluded that mango marketing is dynamic. In terms of volume there has been a shift towards processing as the most favoured marketing outlet. However, it is a cause for concern that mango exports are continuously declining in South Africa, therefore a closer look at this area is recommended. It can also be concluded that *Bavaria* and *Blue Skies* are able to meet their market demand through effective coordination of support services through contracts and by use of category managers in the import country (UK).

Bavaria and *Blue Skies* share the following characteristics:

i both chains are market-oriented

ii supply chain coordination of support services is needed in order to move their mangoes effectively along the supply chain

iii Category management, though common, differs in positioning along the chain. *Bavaria*'s category management is placed downstream in the import country to oversee the marketing and distribution, while *Blue Skies'* are upstream, where they not only procure fresh mangoes from growers but are involved in the chain from processing until the mangoes get into the hands of the mother company in the import country.

It should be noted that the two selected mango export chains of *Bavaria* and *Blue Skies* are just part of a vast industry, therefore a further look at the South African mango export industry would shade more light on the activities and how the industry operates.

CHAPTER 3

GOVERNANCE STRUCTURE AND RELATIONSHIPS IN THE *BAVARIA* AND *BLUE SKIES* MANGO EXPORT CHAINS

3.1 INTRODUCTION

This chapter seeks to examine the governance structure and relationships in the *Bavaria* and *Blue Skies* export chains. Firstly, an overview of governance structures and relationships in agricultural commodity chains will be given, followed by an analysis of the structure and relationships in the two chains. Furthermore, the issues and challenges encountered in the *Bavaria* and *Blue Skies* mango export chains will be elaborated upon.

As in any supply or value chain, the structure and relationships that are prevalent in the South African mango export industry are an indication of the nature of coordination or governance that exists among the network of chain actors. As part of the global food chain and its dynamic nature, the thriving of the mango export industry from South Africa depends on its ability to conform to global trends and innovation. The insurgence of private food safety and quality assurance standards over the past decade alongside public standards has brought many changes in the way the chains are coordinated globally and domestically (Swinnen & Maertiens, 2007). However, the greatest challenge in coordinating the export chain is food safety and quality in the face of highly perishable products such as mangoes in satisfying consumers' expectations (Gereffi *et al*., 2005).

3.2 OVERVIEW OF GOVERNANCE STRUCTURE AND RELATIONSHIPS

In order to understand the governance and relationships in the two selected South African mango exports chains of *Bavaria* and *Blue Skies*, a synopsis on governance is appropriate. Governance is defined by Humphrey and Schmitz (2008:263) as "the inter-firm relationships and institutional mechanisms through which non-market, or 'explicit', coordination of activities in the chain is achieved". Filho (2008:2) simplifies this by writing that governance consists of the "power relations which determine how the human, financial and material resources will be used" in a supply chain.

The relationship among the network of chain actors can be formal or informal, ranging from single and ad hoc to long-term transactions. However, degree of control and type of institution affect transaction costs (Ewane, 2010:9). The author adds that actors in a supply chain will always choose a governance structure that will "economise" transaction costs. However, this will depend on asset specificity, frequency of exchange and degree of uncertainty (Ewane, 2010). The other factor that affect the choice of coordination mechanism and hence transaction costs, especially in an export supply chain, is information asymmetry. This, as Ewane (2010) and Wever *et al.* (2010) point out, increases risk, uncertainty and opportunism once one exchange partner has advantage over the other in terms of information. As a result, higher levels of coordination exist where there is higher risk (Peterson, Wysocki & Harsh, 2001), which in turn influences the type of governance structure. Zuurbier (1999:24) listed the factors that affect the choice of coordination mechanism as 'relation, firm, industry, product and institutional.'

A number of studies indicate the types of supply chain governance structures as ranging from spot markets to long term relationships, contracts and vertical integration at the other extreme (for example, Cook & Chaddad, 2000; Dolan & Humphrey, 2000; Martinez, 2002; Peterson *et al.,* 2001 & Wever *et al*., 2010). The structure is also determined by the scope of services and the intensity of partner involvement (Zuurbier, 1999). In spot markets, transactions are characterised by money as the invisible hand of the market (Peterson *et al*., 2001) and therefore the

governance mechanism. There is an exchange of goods and services between autonomous buyers and sellers who can be individuals or firms (Peterson *et al*., 2001 & Wever *et al.*, 2010). In addition, the scholars characterise spot markets as more efficient in adapting to prices changes with market forces determining price changes. There is also a high level of competition though buyers and suppliers have more control with limited sanctioning of their activities.

On the other hand, in hierarchy or vertical integration there is more control of exchange activities by management as a result of higher risk levels. In between the two extremes the other forms of "contracting arrangements" (Sartorius & Kirsten, 2006:4) such as verbal agreements, formal and relational contracts are found, each exhibiting characteristics of both spot market and vertical integration (Wever *et al.*, 2010). Generally, contracts (both formal and informal) foster the buyer - supplier relationships and regulate supply and production (Al–Oun, 2009). However, in the case of relational contracts with their informality, there is incomplete information hence they are incomplete in nature thus trust becomes indispensable in reducing risk and transaction costs (Doyer, 2002). Formal contracts are relatively easy to enforce and become binding once the parties agree.

Peterson *et al*. (2001:152) illustrate that as one moves across the continuum it starts with the invisible hand to a mixture of invisible and "...managed characteristics..." and at the extreme end only "...managed characteristics.." In summary, moving across the continuum, there is increase in the degree of intensity of coordination control from low to high levels (Peterson *et al.,* 2001), as illustrated in Figure 3.1 (below).

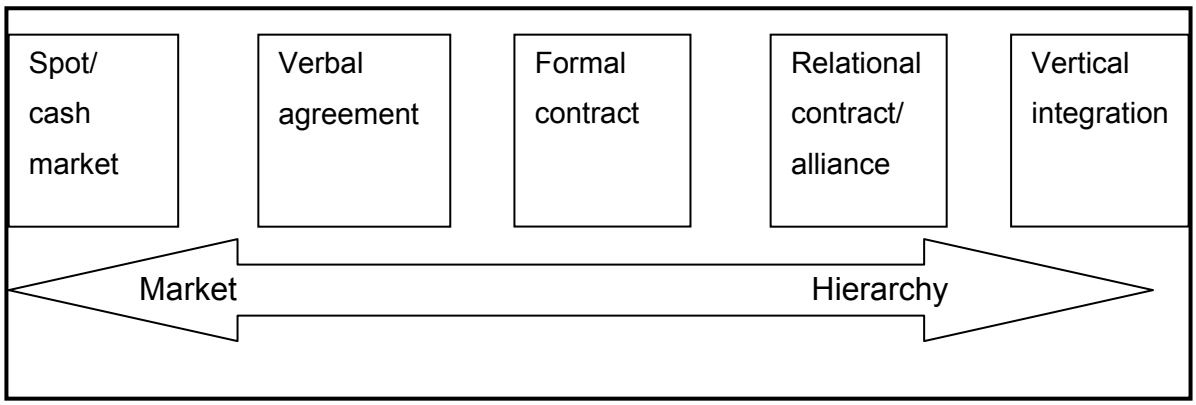


Figure 3.1: A continuum of governance structures

Source: Peterson *et al.* (2001:151) and Wever *et al*. (2010:230)

In the last two decades trade in fresh produce has been conducted on spot markets controlled by the invisible hand (Peterson *et al*., 2001; Temu & Marwa, 2007). Faced with the challenge of food safety and quality, the need for minimising risk and error, and at the same time remaining profitable, the industry had to transform, resulting in a continuum of power relations (Peterson *et al*., 2001). Food safety and quality standards shape the governance structure and relationships that prevail in a supply chain (Ouma, 2010; Ponte & Gibbon, 2005; Temu & Marwa, 2007; Wever *et al*., 2010). In the global export food chains study, it is well documented that most fresh fruit and vegetables export supply chains are buyer-driven, for example in Dolan and Humphrey (2000), Gereffi *et al. (*2005) and Temu and Marwa (2007).

Buyer-driven chains are characterised by private governance and vertical coordination in response to food safety and quality concerns by consumers and the need to supply the products in a reliable, consistent and timely manner (Swinnen & Maertens, 2007). In order to achieve this, the activities within the chain are determined using three parameters mentioned by Humphrey and Schmitz (2008) on what, how to, how much and when. Therefore, the product is specified together with the processes and the quantities over a specified timeline. Humphrey and Schmitz (2008) further elaborate on the nature of coordination of the networks of supply chain actors, indicating that this can be done through:

i. Modular linkages, where the products and services are customised according to retailer requirements as a result of relatively easy information exchange. An example of this is category management in agricultural value chains.

ii. Relational linkages which involve strategic partnerships

iii. Captive linkages where suppliers are reliant on the big retailers.

Against this backdrop, a discussion of governance and relationships of the *Bavaria* and *Blue Skies* mango export chains is detailed in the subsequent sections.

3.3 GOVERNANCE AND RELATIONSHIPS IN THE *BAVARIA* FRESH MANGO EXPORT CHAIN

Bavaria is a producer and exporter of Fairtrade fresh mangoes to the Middle East and Europe, among other markets. The export supply chain to *Waitrose* will be the main focus of analysis in relation to this study. The company is market-oriented and exports are in response to the dictates of the buyer. Mango export marketing is done in conjunction with *Westfalia* through its marketing arm called *Westfalia Marketing*, with category management in Europe and South America. The mode of export operations is based on the *Westfalia* approach (Du Preez, 2011) of production, packing, shipping and selling (*Westfalia*, 2012). This is as result of the fact that *Bavaria* was part of *Westfalia* until 2010 and shares ownership of Westfalia's import businesses (Du Preez, 2011).

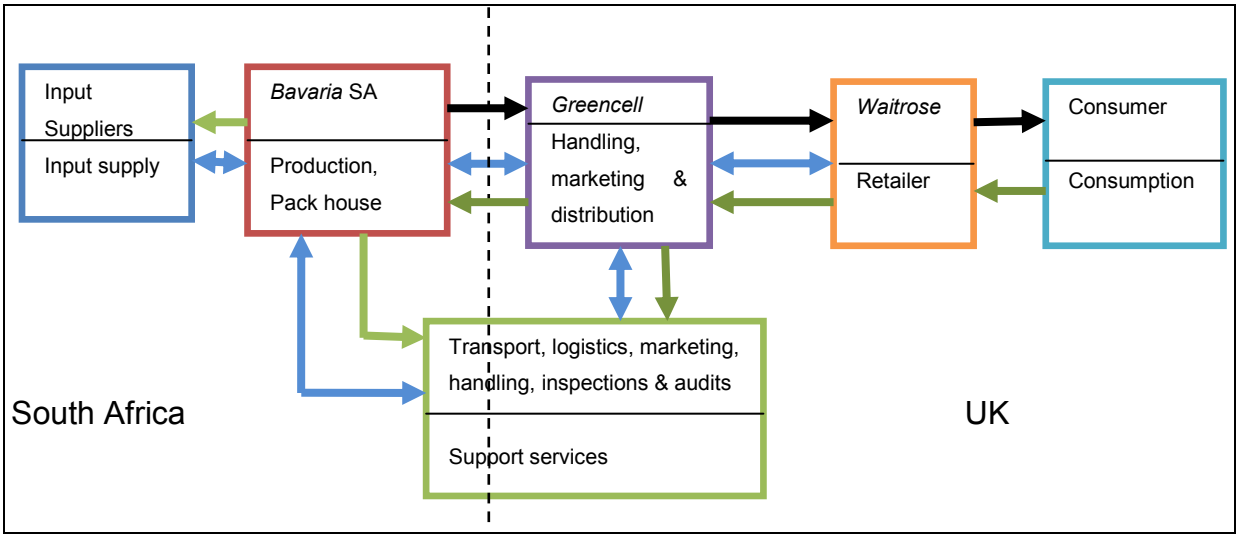
In order to understand the fresh mango supply chain of *Bavaria* it would be fitting to have a preview of how *Westfalia* carry out its export business. *Westfalia* has its headquarters in South Africa and sales and marketing is done through *Westfalia Marketing*. It also have subsidiary companies in the UK, the Netherlands, France, Peru and Colombia that are involved in sales and marketing and are managed by category managers. Mangoes and other fruits are procured and distributed from

Westfalia and other farms such *Bavaria* or other markets in over 40 countries and distributed to markets and retailers throughout the world. The purpose of this is to meet market demand and ensure a seamless supply of the product all year round. *Westfalia* also has handling facilities for packaging and ripening in the six countries (*Westfalia*, 2012).

As a result of its history and marketing relationship with *Westfalia*, *Bavaria* employs the same export approach. Fairtrade mangoes are grown, go through pack house processes and are then exported through *Westfalia Marketing*. Supply chain coordination on contracted logistics and cold chain services along the supply chain is carried out. Through category management, the company has been able to maintain its relationships with buyers such as *Waitrose*. Category management is a strategy that has enabled it to procure mangoes from different regions of the world throughout the year, thereby ensuring a seamless supply to the retailers (Du Preez, 2011), and to do away with seasonal procurement and distribution. In the UK case, once the mangoes get to the import port, the sales, marketing, handling and distribution are carried out by the category management called *Greencell*. The fresh mangoes are then sold as determined by *Greencell* to *Waitrose* and other buyers.

Bavaria exhibits a high degree of vertical coordination of supply chain activities with a wide scope of activities and intense involvement of the supply chain actors. The company has positioned itself further downstream to control the marketing and distribution of fresh mangoes in the countries by use of category management (*Greencell*). The governance structure is a result of *Bavaria's* need to meet the demand of providing premium safe and quality mangoes to the buyers and to reduce transaction costs associated with food safety and quality standards, information and logistics with the result of increased revenues, profitability and market share. The presence of *Greencell* and its positioning is also strategic as this cements Bavaria's role as a preferred fresh mango supplier with a guaranteed market.

Presented in Figure 3.2 below is a diagrammatic representation of the flow of money and fresh mangoes as well as the contractual relationships in the *Bavaria* fresh mango export chain to *Waitrose*.



Note: Solid black arrow = flow of mangoes; solid blue arrow= contract relationship; sold green arrow= flow of money.

Figure 3.2: Structure and relationships in the *Bavaria* fresh mango export chain to *Waitrose*

Source: Interpretation by researcher

3.3.1 Relationship between *Bavaria* and buyers

The buyer being considered in the *Bavaria* chain is *Waitrose*. It was observed that the *Bavaria* fresh mango exports supply chain is characterised by movement of Fairtrade mangoes on a consignment basis under formal closed contract with the buyer, but the relationship is long-term. Formal contracts between *Waitrose* and *Bavaria* guarantee low transaction costs and risk in addition to "on time delivery and the delivery of products with desired quality attributes" (Reardon *et al*., 2009:1120).

For the UK market, once the fresh mangoes reach the import port, *Bavaria*'s fresh mangoes are handled by *Greencell* which then clears the mangoes, and distributes to *Waitrose*. From this point until the retailer, *Greencell* carries the risk of the mangoes. The following terms are fixed in the agreement between *Bavaria* and the buyer: Global GAP, Fairtrade and HACCP certification are required of the producer, price and payment period are fixed, product specification such as Production Unit Code (PUC) and Pack House Code (PHC). In addition, mango size, maturity and the

degree of ripeness of mangoes, cooling temperature, residue levels, packaging and volumes to be exported are specified. However, the frequency of delivery and volumes moved is variable.

The nature of communication between *Bavaria* and *Waitrose* is firm-to-firm with great reliance on real time exchange of information. On a daily basis, there is communication and information shared includes orders, payment terms and transfers, shipment delays and other problems requiring prices renegotiation. *Bavaria* is able to trace the fresh mangoes using a tracing system called Xsense^{TM} (Du Preez, 2011) through which information about temperature and relative humidity of the fresh mangoes at a particular point along the export route is relayed.

3.3.2 *Bavaria*'s relationship with logistics and cold chain service providers

Different service providers avail services to *Bavaria* for handling, marketing and logistics along the cold chain from the farm until the retailer or importer. The effectiveness of the coordination of these services through supply chain management ensures that the fresh mangoes arrive in the UK in the condition specified by *Waitrose*. The time taken for a shipment to reach the UK for example (up to three weeks) increases the risk of mangoes over ripening and even going bad, notwithstanding the exchange of hands. This has a direct economic effect on the producers' profitability if mangoes over ripe resulting in lower than expected prices. Despite the fall in prices, *Bavaria* is liable for other transaction costs. For example, per 25 kg carton of mangoes exported in 2010, *Bavaria's* costs of exporting averaged R1 820 (Du Preez, 2011). This included PPECB fees, transport, sea freight, marketing and agent fees, traceability system (Xsense$^{TM)}$), customs and clearing fees (Du Preez, 2011).

Once the fresh mangoes have passed through the pack house handling and grading process they are cooled down to 8 to 10^{o} Celsius. Through the handling and marketing services of *Westfalia Marketing*, Fairtrade mangoes are transported to the port for shipping with reputable companies, such as Imperial Logistics that meet the

requirements of and are certified by the PPECB in order to maintain the cold chain. At the port of exit, the Fresh Produce Terminal (FPT) and the Southern Africa Fruit Terminals (Pty) Ltd (SAFT) play a crucial role in providing cold chain logistics for handling fresh produce intended for sea shipment.

FPT and SAFT provide services such as cold storage, packing, loading bays and berths, plug in points for containers, cargo dispatching and receiving, as well as tracking and tracing facilities. The Container Fruit Terminal (SAFT) in Cape Town is tailor-made for subtropical fruits exports. The mangoes are shipped by sea in reefer containers fitted with Controlled Atmosphere (CA) technology that retards ripening, and temperature is controlled. Once the customs formalities and PPECB inspection have been carried out and the mangoes are passed for export, they are loaded onto a vessel and the ship departs for the UK. In the UK, *Greencell* handles the logistics of clearing and distribution to the retailer using their own transport and cold stores services.

Bavaria and contracted service providers enjoy long-term formal and closed relationships with *Bavaria* carrying the risk until the mangoes are in the hands of *Greencell*. Thereafter, *Greencell* becomes responsible until the mangoes exchange hands with the retailer. The relationship among *Bavaria*, *Greencell* and *Waitrose* is long-term with formal firm-to-firm communication on a daily basis during the transaction period. Using information technology such as internet, emails, telephones and cell phones the parties are able to pass information about the movement of the mangoes and any problems arising, for example, truck breakdown, delays at port, errors on delivery notes, and changes in stowage plans. Communication on the departure of the mangoes from South Africa and their arrival in the UK, the handling and distribution activities and prices, are also important to keep the producer up to date with what is happening.

The following contracts terms are fixed:

i. Identification (name) of service provider, description of the consignment/load thus fruit specification details (name, PUC, PHC, variety, grower, grade, class, temperature, packing date, net and gross weight), cost and volume per load and terms of payment.

ii. Transportation/ shipping details such as shipping space, temperature and incoterms; cooling temperature, data logging and destination of the mangoes. For sea transport, the nature and quantity of shipment and stowage details must be specified. Thus: waybill number, container number, shipper details, bill of lading, customs release order, departure date and expected date and time of arrival.

iii. Truck or ship must be refrigerated to maintain the temperature, and reliability is a requirement in case of breakdown leading to a break in the cold chain.

iv. Service provider must be registered and certified by the PPECB on a yearly basis in South Africa. Shipper must be registered under the recognised quality assurance regimes e.g., 360^{o} Quality. In the UK, *Waitrose* requires trucks and handling and distribution facilities to have relevant food safety and quality assurance certifications e.g. HACCP, BRC and Ethical Trade Initiative (ETI).

v. Mangoes must undergo food safety and quality assurance inspection before and after loading in South Africa and the UK, as meet customs clearance and phytosanitary requirements of the UK.

vi. Service provider must be insured and claiming procedure stated in case of mangoes going bad in the hands of service provider as well as disposal procedure in the case of mangoes being rejected for export upon inspection by agricultural inspectors.

3.4 *BLUE SKIES* MANGO EXPORT CHAIN GOVERNANCE AND RELATIONSHIPS

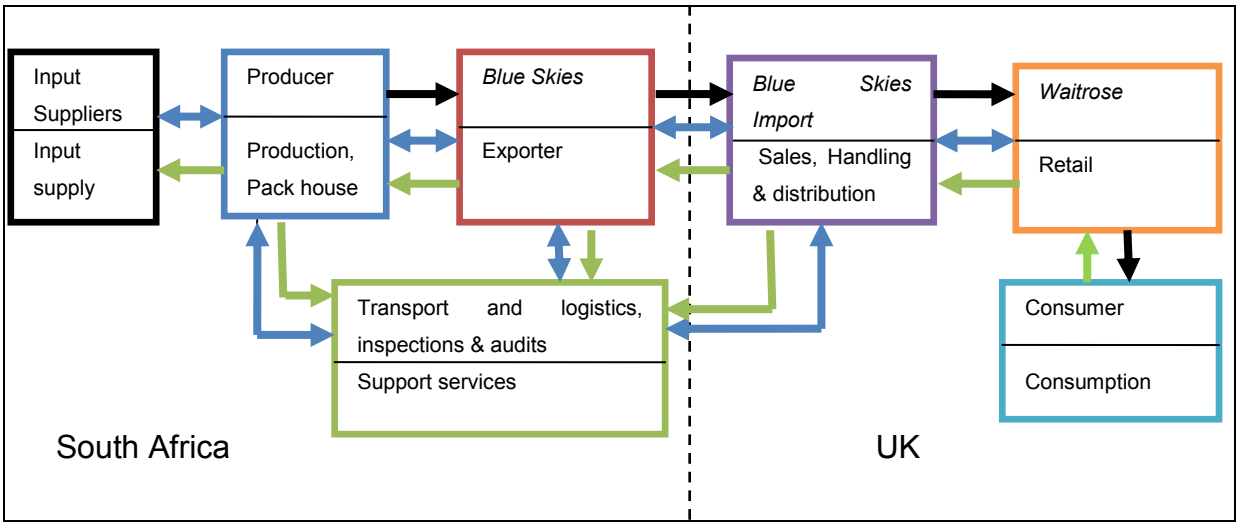
Blue Skies' mother company*, Blue Skies Holdings Limited*, has a decentralised vertically coordinated governance structure in which its subsidiaries in Africa and Brazil are managed by category managers. However, strategic decisions such as marketing and sales are centralised (*Blue Skies*, 2012). *Blue Skies'* governance structure is a result of the need to meet the demands of retailers and dictates of food safety and quality standards as well as reduced transaction costs and increased market share, sales revenue and profitability by curving a market niche of value added mangoes.

Blue Skies Holdings Limited uses the strategy *of* positioning its subsidiaries further upstream next to the grower as the buyer, processor and exporter with a high degree of asset specificity and operations under category management. The company's success is hinged on supplying a differentiated product, mainly freshly cut exotic, deciduous and subtropical fruit and salads, in customised packaging with the product available on the retailers' shelves within the shortest period after leaving the factory (Veldsman, 2011). The entry strategy involve the penetration into a country where no similar activities exist, enabling it to dictate terms of operations (*Blue Skies*, 2012). It controls the chain from procurement from grower until the mangoes are exchanged with the retailers. The business model used by the mother company and its subsidiaries is called the Joint Effort Enterprise (JEE), and is based on the principle of growing a sustainable business that is profitable without compromising the people and the environment (*Blue Skies*, 2012).

A look at the *Blue Skies'* pre-packed mango export chain shows that there is an exchange of ownership from producer to *Blue Skies* during the procurement of raw mangoes from the grower. The mangoes are processed, custom packed, labelled and priced according to retailer instructions and exported via air with *Blue Skies* carrying the risk of the processed mangoes. Once they reach the UK, risk is transferred to *Blue Skies Holdings Limited* (referred to as *Blue Skies Import* for the purposes of this study). *Blue Skies Import* then clears the processed mangoes and is

responsible for sales, handling, and marketing. From *Blue Skies Import* distribution centre, the mangoes are delivered to the retailer and risk is transferred to the retailer and subsequently the consumer.

The flow of money (export revenue) is backwards from consumer to the producer who has to pay for contracted services and inputs. Figure 3.3 below shows the flow of freshly cut mangoes and salads, money and contractual relationships along the *Blue Skies* mango export chain. Supply chain coordination is done on contracted logistics and cold chain services.



Note: Solid black arrow = flow of mangoes; solid blue arrow= contract relationship; sold green arrow= flow of money.

Figure 3.3: Structure and relationships in the *Blue Skies* fresh cut mango export chain

Source: Interpretation by researcher

3.4.1 *Blue Skies* relationship with the producers

Blue Skies has informal (open) and formal (closed) contract agreements with the producers. Two of the producers that were surveyed are *Bavaria* and *Jonkmanspruit Mangoes*. With *Bavaria*, the contracts are formal and closed with raw mangoes supplied on a consignment basis on a once-off agreement (Du Preez, 2011). On the other hand, *Jonkmanspruit Mangoes* enjoys an open and informal contract (verbal)

agreement with *Blue* Skies with many shipments taking place throughout the duration of the harvesting season (Van Vuren, 2011). The two producers have a long-term relationship with *Blue Skies*. For supply to *Blue Skies* in South Africa, risk is transferred from the producer to *Blue Skies* at Balfour and for Ghana, at the port of exit, thus Cape Town Container Terminal for *Bavaria* and in Ghana for *Jonkmanspruit Mangoes* (Du Preez, 2011 & Van Vuren, 2011). The risk transfer, transport and customs handling responsibility and cost distribution are determined by the international commercial terms (or incoterms) that the parties agree under contract (Hien, Laporte & Roy, 2009).

In the case of informal contracts the existence of a long-term relationship between the *Jonkmanspruit Mangoes* and *Blue Skies* is evidence of the smooth flow of exchange transactions. The longevity of the relationship means that problems identified at the initial stages of the relationship are ironed out (Van Vuren, 2011), however, the possibility of them occurring cannot be ignored, and hence trust is a very important ingredient in this case.

The following contract terms between *Blue Skies* and the producers are fixed: payment terms, price, size of mangoes, ripeness, residue levels, Global GAP certification, timing of delivery and incoterms though the frequency of delivery and volumes moved varies.

The nature of communication between *Blue Skies* and the producers is firm-to-firm. There is real time exchange of information using the Internet, emails, telephones and cell phones with daily communication and information shared on orders, payment terms and transfers, shipment delays and other logistical problems. *Blue Skies* uses Caretrace to enable all interested parties to trace and track the mangoes (*Blue Skies*, 2012). Caretrace is an interactive online traceability system using product expiry date that allows users to share information and to track and trace the product from production to the shelf (*Blue Skies*, 2012).

3.4.2 Relationship between *Blue Skies* and buyers

The buyer being considered in the *Blue Skies* chain is *Waitrose* though mangoes are also sold to *Marks & Spencer*, *Sainsbury's* and other retailers in the UK. From its Balfour factory, *Blue Skies* supplies prepared freshly cut mangoes and salads to *Waitrose* over a six-month period under long-term formal closed contracts. However, an all-year-round seamless supply to retailers is ensured through category management and procurement from other parts of the world (*Blue Skies*, 2012). The formality of exchange lowers the risk and ensures that the specified and customised prepared mangoes are delivered timely (within 48 hours) under prescribed conditions. The buyers dictate the conditions under which the mangoes are prepared as well as the formality of transactions.

Blue Skies retains ownership of the freshly cut mangoes and salads until they are dispatched at the holding company in the UK, where the mangoes are sorted for distribution to the retailers. Risk is transferred to *Blue Skies Import* until there is handover of the pre-packed mangoes to the retailer and then to the consumer. The following terms are fixed in the agreement between *Blue Skies* and the buyers: BRC, Global GAP and Fairtrade certification is required of the producer. Product specification details must be accessible as part of the label on the packaging. Other terms are cooling temperature, and volumes to be exported over the six month period. However, the frequency of delivery and volumes moved are variable, depending on orders.

The nature of communication between *Blue Skies* and the retailers is firm-to-firm using manual systems such as telephones and mobile phones as well as electronic using internet and emails. On a daily basis, there is communication and information shared includes demand forecast, orders, payment terms and transfers. Any delays and other problems are also communicated. Using Caretrace, *Blue Skies* and the retailers can track and trace the prepared mangoes until it reaches the shelf (*Blue Skies*, 2012; *Waitrose*, 2012).

3.4.3 *Blue Skies*' relationship with logistics and cold chain service providers

Blue Skies relies on support services for logistics along the mango export chain. It is important to note that the support services are fragmented, hence the need for effective coordination of these services through supply chain management in order to lower risk of product losses and over-ripening. *Blue Skies*' freshly cut mangoes from South Africa reach the retailer shelf within 48 hours and have a shelf life of six days, hence the need for air shipping (Veldsman, 2011). Logistical service providers include Sky Services (forwarding and shipping agent in South Africa) and the British Airways World Handling Cargo in the UK. The company also contract services such as transportation from the factory to the airport and from the import port to the holding company and for distribution to retailers. Once the freshly cut mangoes have been packed at the Balfour factory they are transported to the Sky Services cold stores at the Oliver Tambo International Airport cargo section, where they are cooled until about an hour before departure. During peak season, freshly cut mangoes are shipped daily (Veldsman, 2011).

Blue Skies enjoys long-term formal and closed relationships with service providers, with the exporter carrying the risk until the prepared mangoes exchange hands at the holding company in the UK. *Blue Skies Import* takes over the risk until the exchange with retailer. The relationship is long-term with formal firm-to-firm communication on a daily basis during the export season. Information exchanged include orders, movement of the mangoes and any problems arising such as truck breakdown, delays at airports, errors on delivery notes, changes in stowage plans communicated daily using the telephones, internet, mobile phones and emails. Communication is also made on the departure of the mangoes from South Africa and arrival in the UK, the handling and distribution and sales and prices.

The following contracts terms are fixed:

i. Service provider identification, description of the load and therefore fruit product specification details (customised package, labelling, packing date, temperature, net and gross weight), cost and volume per load and terms of payment.

ii. Transportation and shipping details such as shipping space on the cargo plane and incoterms; cooling temperature, data logging and destination of the prepared mangoes. The forwarding agent, in this case Sky Services must provide information on air way bill number, shipper details, bill of lading, customs release order, departure date and expected date and time of arrival in the UK (Veldsman, 2011).

iii. Refrigeration of trucks to maintain mango temperature.

iv. In South Africa, service providers must be registered and certified by the PPECB on a yearly basis and airport services by the Airports Company of South Africa (ACSA). In the UK, trucks and cold storage must have relevant food safety and quality assurance certifications, e.g. BRC, HACCP and ETI.

v. Mangoes to undergo food safety and quality assurance inspection before and after loading in South Africa and the UK, as well meeting customs clearance and phytosanitary requirements of the UK.

vi. Service providers must be insured and claiming procedure stated.

vii. Disposal procedure in the case of processed mangoes being rejected for export upon inspection by health and agricultural inspectors.

3.5 ISSUES AND CHALLENGES IN THE *BAVARIA* AND *BLUE SKIES* MANGO EXPORT CHAINS GOVERNANCE AND RELATIONSHIPS

The export supply chains of Bavaria and Blue Skies have their own issues and challenges as they adjust and react to mandatory food safety and standards. Presented in the following sections is a discussion of the issues and challenges faced by respondents in the study.

3.5.1 Developments in the *Bavaria* and *Blue Skies* mango export chains

There have been changes in the South African mango export supply chains over the last decade, and with the advent of private standards in response to food safety and quality requirements by large retailers, the supply side has to respond accordingly (Gereffi *et al.,* 2005:84). The *Bavaria* and *Blue Skies* mango export chains evolved from being production-oriented to market-oriented chains in response to consumer requirements (Du Preez, 2011). The evolution meant a move away from pushing supply into the market (thus production-oriented) to ECR in which products are supplied to meet consumer demand (market-oriented) (Seifert, 2002) characterised by changes in chain governance structures in order to survive in the global market.

In terms of the governance structure, the *Bavaria* and *Blue Skies* mango export chains are conforming to the global trend of being buyer-driven. The retailer, *Waitrose*, through the use of private standards, dictates the conditions under which the mangoes are produced and prepared as well as the formality of transactions. In response, developments in the *Bavaria* and *Blue Skies* mango export chains indicate that they are modular supply chains with forward integration, evidenced by the use of and positioning of category managers. This is a strategic move that serves to shorten the supply chain, increase control of activities, reduce transaction costs and increase efficiency, resulting in high returns and concentration of wealth in a few supply chain actors. The move is also made possible by, and is a reaction to the buyers' dictates of strict food safety and quality standards that favour large companies with high capital outlay because of high asset specificity. The *Blue Skies* chain also exhibits

hierarchical characteristics with its UK headquarters dictating activities of category managers.

Bavaria and *Blue Skies* have also responded to the tightening of private standards by supply chain management of logistics and the cold chain through use of contracts. Tightening coordination and having strict contracts are necessary as the industry is dominated by support services that are provided by numerous companies with different owners. The existence of contracts as a sanctioning mechanism along the supply chain is important as it reduces risk of economic losses to the producer as well as the retailer.

3.5.2 Major challenges

The major issues and challenges in the *Bavaria* and *Blue Skies* mango export supply chains arise from management of factors that contribute to accelerated perishability of the mangoes. These include, post-harvest handling procedures for instance packaging, transportation, storage, ripening and distribution. Proper management of these factors will result in reduced losses and mango damage and hence increased shelf life. The factors pose a logistical challenge along the cold chain and have serious repercussions mainly to the producers as they bear the losses, depending on the contract terms (Du Preez, 2011 & Van Vuren, 2011).

Along with perishability, the *Bavaria* and *Blue Skies* export supply chains are characterised by many service providers whose activities are disjointed yet important to ensure an efficient cold chain. All these factors feed into an export market that is highly organised and demands a high-quality product from the suppliers. The challenge therefore is to harmonise the supplier and buyer faced with highly perishable products, such as fresh mangoes and freshly cut mango salads to the satisfaction of both parties and the consumer (Du Preez, 2011).

A number of challenges were cited by the different respondents along the supply chains. These include the following:

i. **Truck breakdown, congestion and protracted shipment time**

This affects mostly the fresh mango export chain. Respondents cited the breakdown of trucks transporting the mangoes to loading zones and congestion at loading zones of container terminals (sometimes up to 3 days to load) (Du Preez, 2011, Lonrho Logistics, 2012, & Van Vuren, 2011). In addition, there is a prolonged shipment period of up to 3 weeks when the mangoes are in transit from South Africa to the UK. These challenges mainly result in mangoes over-ripening in transit leading to low market prices from the buyer and losses for the producer and exporter. To minimise losses, the respondents in the fresh mango chain suggested that it would be ideal to load the container at the pack house instead of export cold stores, or alternatively at the port (though this costs more). This would not only cut losses but also reduce the lead time from production to consumption.

ii. **Dead weight loss**

Freight forwarders, container terminals and shipping lines also cited the problem of producers and exporters overstating the weight of the mangoes. This becomes obvious when mangoes are reweighed at the export cold storage and when being loaded into containers. This has a bearing on costs and planning information, which is used to produce the load list as communicated to the shipping line prior to delivery. The producer or exporter is the one that incur the dead weight cost.

iii. **Communication bottleneck**

Some producers/exporters send shipping requests to the container terminals and freight forwarders very late, which clogs the planning of stowage and shipping/load list. Furthermore, due to breakdown of trucks and other unforeseen circumstances, an intended delivery might be

cancelled. If this happens late, it results in dead weight, which has cost implications to the producer/exporter and other supply chain actors.

iv. **Delay in processing insurance claims**.

Even though there is recourse in case the mangoes are rejected upon arrival at import markets or sold at lower than agreed prices, the producer/exporter can lodge a claim against the shipping line, port or logistic service provider. However, this takes up to two years for a claim to be paid (Van Vuren, 2011). In addition, upon a successful claim, there is partial recovery since the producer/exporter is refunded for the "cost of the container and not the content" (Van Vuren, 2011).

Despite the challenges in the *Bavaria* and *Blue Skies* mango export chains, as respondents pointed out, some aspects of the supply chain coordination were regarded as best practice. It was reiterated that there was a need to continue following the protocols in order to meet retailer and consumer demand but at the same time remain viable. This will allow the companies to continue to access export markets such as the UK, which over time will ensure competitive advantage over competing countries.

The challenges cited above in the *Bavaria* and *Blue Skies* export chains are prevalent. Contract agreements are a sanctioning mechanism and they determine market access, therefore the continued use of and tightening formal contracts with clear terms of agreements between the producers and category mangers as well as logistic service providers can be used to mitigate the bottlenecks. This was also cited as obligatory in order to lower risk, especially with the current challenge of breaks in the cold chain, and makes accountability essential. Some actors preferred to have open relationships based on trust and proven good performance gained with working with each other over a long time. However, this arrangement is problematic to new entrants who have to prove their competence and degree of trust.

The existence of an effective cold chain along the mango export chains remains indispensable because mangoes are highly perishable. Meeting the quality required by the retailer is possible through a cold chain that enables delay in ripening of the mangoes. The use of refrigerated trucks, cold stores and refrigerated shipping was cited as mandatory along the chains. The regulatory role played by DAFF and PPECB in inspection of mangoes and facilities, certification and auditing in addition to the UK regulators were also recommended in ensuring that mangoes meet required quality standards by the retailers.

3.5.3 Future expectations

Producers such as *Jonkmanspruit Mangoes* who supply *Blue Skies* with fresh mangoes expect to continue with verbal agreement and open relationships in doing business in the future, as it is a tried and tested method (Van Vuren, 2011). On the other hand, *Bavaria* as a supplier of fresh mangoes to *Blue Skies* will continue to use the formal closed contracts (Du Preez, 2011) as it eliminates misunderstandings.

It is also envisaged that an increasing number of retailers would want to control the supply chain from the farm and upstream activities as a result of food safety concerns and quality, as well as reduced risk and transaction costs. The strategy of *Blue Skies Holdings Limited* in streamlining the grower base and having a central distribution system is expected to continue to be the norm among exporters (Lonrho Logistics, 2012). In turn, more producers are expected to form alliances and small producers will have to join larger businesses in order to survive (Veldsman, 2011). These alliances will have the control at each level of the supply chain by having their category managers doing business up to the level of distribution in importing markets instead of middlemen. *Bavaria*'s export operations are based on this model, as explained by Du Preez (2011) who called it the '*Westfalia* model'.

According to Du Preez (2011), the *Westfalia* group also has a growers' club, which it is using to test the possibility of subcontracting the growing of their breed of mango cultivars in countries in the northern hemisphere so as to ensure a yearly supply of

mangoes to markets. If this is successful, more alliances are expected to follow suit, not only to secure export markets but to supply the local markets. In addition, small producers are expected to amalgamate and venture into niche marketing for survival and to evade competition from big businesses (Du Preez, 2011).

3.6 SUMMARY

The chapter sought to examine the governance structure and relationships in the *Bavaria* and *Blue Skies* mango export chains. A review of governance structure and relationships in agricultural commodity chains was made, followed by an analysis of the two chains. Lastly, an overview of the major issues and challenges was presented and the developments in governance structure and relationships, challenges and future expectations outlined.

It was noted that the governance structure and relationships in the *Bavaria* and *Blue Skies* chains are a reaction to private standards dictated by buyers and public food safety as well as quality assurance standards. This is a reaction to the need to meet food safety and quality requirements of highly perishable products such as mangoes in order to satisfy consumer needs and perceived value, reduce transaction costs, and increase revenue, profitability and market share. To achieve this, supply chain activities are coordinated through contracts. Contract terms with buyers and support services are formal, closed and have long-term relationships with day to day firm-to-firm communication during the transaction period. *Bavaria* and *Blue Skies* mango export chains are buyer-driven, with exports made in response to buyers' requirements. They are modular chains with a high degree of vertical coordination that use category management in forward integration to reach their markets, with high asset specificity and a shortened supply chain. *Blue Skies* also has a hierarchical form of governance.

The major issues and challenges in the *Bavaria* and *Blue Skies* are a result of factors that affect mango perishability, mainly post-harvest handling procedures such as packaging, transportation, storage, ripening and distribution. The challenges are

compounded by the presence of numerous service providers who handle the mangoes posing a logistical dilemma faced by a highly organised export market that demands high quality product from the suppliers. The major challenges in the two chains were cited as: break in the cold chain, communication bottlenecks, dead weight problems and protracted insurance claims.

Contracts and category management, regulatory functions of PPECB and DAFF, adhering to private standards and the use of cold chain and supply chain coordination were cited as best practices in mitigating the challenges. In the future, formal and informal contracts are expected to remain as more retailers increase control of supply chains because of heightened food safety concerns and quality. In turn, more producers' alliances are expected, with small producers as part of the alliances and downstream control of the marketing activities, mostly through category management.

CHAPTER 4

QUALITY MANAGEMENT AND STANDARDS IN THE *BAVARIA* AND *BLUE SKIES* MANGO EXPORT CHAINS

4.1 MANGO QUALITY

This chapter seeks to unveil the quality programmes and standards as well as delineate the elements used by actors in the *Bavaria* and *Blue Skies* mango export supply chains. This analysis is based on the Plan-Do-Check–Act (PDCA cycle) in continuous quality management based on the European Pork Chain study (Trienekens *et al*., 2008). In addition, the study will look at private and public standards and the corresponding audits and inspections, the issues and constraints.

Quality is a concept that is defined and judged by the supply chain actor who acquires the product or service and each level of the supply chain has its own perception (definition) of quality (Van Tilburg, Trienekens, Ruben & Van Boekel, 2007:5-6; Zuniga-Arias, 2007:50). For example, quality to the producer is yield, uniformity of size and disease resistance whilst the processor and exporter might consider consistence and reliability of supply (Zuniga-Arias, 2007:50). The retailer would look at extrinsic attributes such as aroma, size and colour whilst the consumer is concerned about intrinsic attributes such as freshness and taste, in addition to food safety and ethical issues (Van Tilburg *et al*., 2007).

In the case of the *Bavaria* and *Blue Skies* mango export supply chains, the retailers influence mango quality as they decode consumers' quality perception through private standards. With regards to fresh mango quality, the process of production and the end product characteristics influence quality and subsequently the standards to be effected (Ziggers & Trienekens, 1999). For example, in the *Bavaria* Fairtrade fresh mango export chain at producer level, production practices and pack house activities affect the yield, size and grade, aroma and colour (Du Preez, 2011). With *Blue Skies*,

chemicals used, packaging material, processing conditions such as temperatures and robustness of the mangoes used affect the quality of the freshly cut mangoes (Veldsman, 2011). This in turn will determine how the retailer and consumer will perceive the mangoes or freshly cut mangoes.

Mangoes are highly perishable and susceptible to diseases and damage during the pre- and post-harvest handling processes, hence greater emphasis is put on quality (Martinez & Poole, 2004) and safety standards. Maintenance of quality of mangoes is of utmost importance owing to physiological changes that take place along the chain, thereby reducing the shelf life of the products (Sothornvit & Rodsamran, 2008:407). Gil *et al.* (2006) state that physical damage and extreme temperatures lower the vitamin C content of mangoes and increase susceptibility to oxidation, all of which have a negative effect on quality.

Alongside food quality, food safety ranks highly in agricultural supply chains as a result of increased consumer awareness and media attention to food scares and food borne contaminations (Narrod, Roy, Okello, Avendaño, Rich & Thorat, 2009). Food safety is embedded in quality (Grunert, 2005) thus is perceived by the consumer as part of the quality package. Therefore, food safety and quality management must be a continuous process that is implemented from the orchard to consumption, with a focus on prevention rather than restoration (United Nations, 2007).

Whilst adopting food safety and quality standards ensures market access it has its own drawback of increased capital outlay and compliance costs. Ineffective food safety and quality management may result in poor quality products, which may be rejected or sold at lower than expected prices. In addition, food contaminations may occur, leading to product recall and the buyer ceasing to procure from the supplier in question and thereby resulting in economic loss to the supplier and the network of chain actors such as service providers (Pouliot & Sumner, 2010; United Nations, 2007).

4.2 QUALITY MANAGEMENT AND STANDARDS IN THE *BAVARIA* AND *BLUE SKIES* SUPPLY CHAINS

Quality management is crucial to the supply chain of the two companies. As such, the subsequent sections will review quality management, followed by a discussion on the quality and safety management elements in the Bavaria and Blue Skies chains and the application of the PDCA cycle.

4.2.1 Quality management

Quality management in the *Bavaria* and *Blue Skies* mango export chains encompasses "…both biological management of the produce as well as human management of activities and procedures…" (Ewane, 2010:47). The management of quality is achieved through quality management systems that are put in place in response to the requirements of the buyer. Total quality management (TQM), an entirety of quality management systems (Moosa & Sajid, 2010) requires each actor along the chain to have a structured quality management process in place (Scott, Wilcock & Kanetkar, 2009). Different methods are used for continuous improvement, for example International Organisation for Standardization (ISO) standards, HACCP, lean manufacturing and Six Sigma; a combination of methods can be used by the actors (Jones, Parast & Adams, 2010; Scott *et al*., 2009).

TQM requires continuous improvement of systems and processes and one of the tools used is the PDCA cycle that was pioneered by Deming (Deming, 1994) in provision of products and services that are customer- and market-oriented, consistent and specialised (Scot *et al*., 2009). The PDCA cycle is a tool that is applicable to the different quality management methods and that, according to Chountalas, Tsarouchas and Lagodimos (2009), enables the actor to set objectives and develop a plan on how to achieve the objectives. The objectives of quality and safety in the *Bavaria* and *Blue Skies'* mango export chains cascade from the buyers through category management to the producers and other supply chain actors and enabled through contractual agreements. Public and private audits and inspections

are carried out to enforce compliance with the reward of continued market access and cessation of contract for non adherence. To the supply chain actor, getting certified opens up frontiers in global trade. The PDCA cycle is divided into four phases as follows: the 'do stage' is implementation of the plan, followed by 'check stage', in which results are measured, and lastly the 'act stage', that allows for corrections and improvement of plans (Chountalas *et al*., 2009:899).

However, quality management cannot be discussed as a lone subject without considering food safety. Mangoes' high degree of perishability poses a challenge in managing quality to ensure safety, to address this, and the need to satisfy consumers' expectations, many private food safety and quality assurance standards have been introduced over the last decade (Gereffi & Lee, 2009). Standards based on quality management can be private or public, as well as being at national or international level. Exporters in the global agricultural food chain have to adhere to food safety measures and quality standards dictated by their markets. In the same vein, it is mandatory that *Bavaria* and *Blue Skies* meet the food safety and quality standards set by the retailers in order for them to continue to export. The application of PDCA cycle will be made on the quality management elements and standards used in the *Bavaria* and *Blue Skies* mango export chains.

4.2.2 Food safety and quality standards in the *Bavaria* and *Blue Skies* chains

As required by the UK retailers, including *Waitrose* to which it is a supplier of Fairtrade mangoes, *Bavaria* is certified under the following food safety and quality standards: Global GAP, Fairtrade and HACCP (Du Preez, 2011). In order to enforce compliance to quality programmes/standards, inspections and audits are carried out by public authorities at the producer - pack house level. DAFF inspects the orchard whilst PPECB certify the pack house yearly after quality audits and inspection. For every load of fresh mangoes exiting the pack house, PPECB inspection is carried out before the load is released to be transported to the port terminals. Private standard audits are also carried out by third parties on behalf of the retailers.

In the UK, *Greencell* receives the fresh mangoes and dispatches them to the retailer. *Greencell* is certified under BRC, Linking Environment And Farming (LEAF), and the Ethical Trade Initiative (ETI). It receives the fresh mangoes and carries out internal quality inspection before they are cold stored (and ripened if need be), packaged and distributed to the retailer. Government agricultural inspectors also inspect the mangoes upon arrival at the import port. BRC certification requires that *Greencell* be audited every two years, and this is done by the European Food Safety Inspection Service (EFSIS) and covers food safety (*Greencell*, 2012).

In the case of *Blue Skies*, its objective is to export high-quality fresh packed cut mangoes with cooling temperature maintained at 5^0C and delivered to the retailer within 48 hours in 'thermal insulation packaging' (*Blue Skies*, 2012). The aim is to preserve the natural flavour of the mangoes (*Blue Skies*, 2011), to achieve which *Blue Skies* adhere to Global GAP standards, as well as Fairtrade and BRC. It sources mangoes from Global GAP certified producers such as *Bavaria* and *Jonkmanspruit Mangoes* (Veldsman, 2011). Freshly cut mango safety is ensured through strict sanitary standards at the Balfour processing factory and along the cold chain, as well as through adherence to BRC standard which incorporates HACCP. All critical control points are monitored continuously (*Blue Skies*, 2012).

In South Africa, *Blue Skies'* compliance to quality programmes and standards is enforced through audits and inspections internally and externally by the retailers, PPECB and DAFF. Internal audits and inspections are conducted by trained quality assurance workers (*Blue Skies*, 2012). Public inspection of the mangoes is carried out by PPECB at the premises and the airport before the processed mangoes are loaded onto the airplane. In addition, DAFF issues a Certificate of Acceptability that is renewed yearly. On the other hand, individual retailers also carry out inspections and audits at the premises, for example, the Fairtrade audit by *Waitrose* is done yearly. BRC audits are done every two years whilst Global GAP audits take place annually.

In the UK, the mother company is certified under BRC, Fairtrade and the International Food Standard (IFS) for food safety. *Blue Skies Import* inspects the prepared mangoes at the airport and it has technical personnel who oversee food safety and quality from the airport until the time the mangoes get to the retailer. Fairtrade and IFS audits are also conducted annually and BRC's every two years (*Blue Skies*, 2012).

Towards the end of *Bavaria* and *Blue Skies'* mango export chains is the common retailer *Waitrose*. Quality management at *Waitrose* is based on in-house frameworks that ensure meticulous sourcing, product traceability and adherence to quality standards that guarantee integrity, product safety and quality (*Waitrose*, 2012). Food technologists are responsible for quality assurance along the supply chain. *Waitrose* uses HACCP to ensure food safety and is a member of BRC (for food safety) and ETI, LEAF and the Fairtrade standard. HACCP audits are carried out annually, and BRC's biannually.

4.3 APPLICATION OF THE PLAN-DO-CHECK-ACT CYCLE IN THE *BAVARIA* AND *BLUE SKIES* MANGO EXPORT CHAINS

The application of the PDCA cycle on the *Bavaria* and *Blue Skies* mango export chains is based work done by Trienekens *et al*. (2008) on the European Pork Chain study. In the two selected mango export chains of *Bavaria* and *Blue Skies*, the PDCA cycle is an effective tool to use on a blueprint for critical activities that affect food safety and quality along the mango export supply chains. Based on these activities, audits and inspections can be carried out to assess the risks and take corrective action in order to achieve TQM. Critical points along the supply chain determine the intrinsic and extrinsic quality attributes of a product, and this differs for each commodity (Van Tilburg *et al.,* 2007). For example, in the fresh mango export supply chain of *Bavaria*, mangoes must be transported at 8-10^{0}C, whereas the freshly cut mangoes from *Blue Skies* are transported at below 5^{0}C. Hence, the shelf lives of mangoes in the said chains are different and this determines the degree of safety risk.

Critical activities in the *Bavaria* and *Blue Skies* export chains that requires continuous management are mainly the pre- and post-harvest activities. For example, activities such as chemicals and spraying regimes, fertilisation, irrigation, harvesting and pack house processes at farm level are critical. The producer has to plan, carry out the activities, use the checks and balances set by the standards, and assess and take corrective action. From processing level and along the cold chain, post-harvest activities such as processing itself and packaging, transportation, cold storing as well as handling at distribution centres are important. The PDCA cycle is applied to these defined critical activities, and according to requirements set by the food safety and quality standards such as Global GAP, BRC Fairtrade, IFS, ETI and LEAF, that is applicable to each actor. Table 4.1 (below) gives a summary of the application of PDCA cycle in the *Bavaria* and *Blue Skies* mango export chains quality and safety management.

It is important to note that the application of the PDCA cycle on the *Bavaria* and *Blue Skies* mango export chains is a continuous process. Below is a discussion of the application of **plan**, **do**, **check** and **act** stages as applied to the identified critical activities at each supply chain level of the two mango export chains. The PDCA cycle is applied to the different quality and food safety standards used in the two export chains.

Table 4.1: Quality and safety management in the Bavaria and Blue Skies mango export chains

Framework based on European Pork Chain study (Trienekens *et al.,* 2008)

Application of the PDCA cycle						
Supply chain level and actor	**Quality and safety programme or standard**	**Plan**	**Do**	**Check**	**Act**	**Inspection and audit by public authorities**
Production- pack house *Bavaria & Jonkmanspruit Mangoes*	**Public** Global GAP, HACCP **Private-** Fairtrade	• Quality and safety objectives • Input requirements: fertilisers, chemicals, nursery trees, bins) • Production process: fertigation, spraying, pruning, harvesting • Pack house processes: washing, sorting and grading, chemical treatment, cooling, storage, personnel training • Delivery schedules • Equipment maintenance	• Procure inputs • Record keeping of pre- and post harvest procedures and deliveries • Contract with logistics support services, and buyers • Internal training of workers	• Update and Check records • Internal audits and mock audits • Global GAP yearly audits • Use of scanners in pack house to detect problems areas • Ensure contract terms are adhered to & good practices to protect environment • Equipment working condition	• Tracing fruit to orchard/ field • Adjusting the pre or post harvest procedure in question • Examination of samples • Communicate with buyers • Repair/replace factory equipment	**DAFF** Annual phytosanitary inspection of orchards and pack houses **PPECB** Inspection and audit of pack house annually **Global GAP** yearly audits

Supply chain level and actor	Quality and safety programme or standard	Plan	Do	Check	Act	Inspection and audit by public authorities
Processing *Blue Skies South Africa*	**Public** Global GAP, Certificate of Acceptability **Private:** BRC, Fairtrade	• Quality and safety objectives • Input and fresh mango procurement • Cutting and packaging • Delivery and export of freshly cut mangoes • Waste disposal • Equipment maintenance • Personnel hygiene	• Contract grower in advance • Order inputs in advance • Worker training on hygiene • Cut and pack mangoes • Transport to airport • Contract signing with buyers and support services	• Internal audit of fruit handling and sanitation in the factory • Record keeping of temperature data • Inspecting loading facilities and trucks and check all documentation before dispatch • Correct procedure is being followed on waste disposal	• Check orders of input on receipt • Correct any handling and delivery errors and ensure trucks are refrigerated • Keeping track of dispatched cargo • Alert *Blue Skies* Import of the cargo in advance • Repair/replace equipment • Sanitisation of equipment and correct waste disposal	**DAFF** Annual phytosanitary inspection of orchards and pack houses **PPECB** Inspection and audit of pack house annually **Global GAP** yearly audits

Supply chain level and Actor	Quality and safety programme or standard	Plan	Do	Check	Act	Inspection and audit by public authorities
Handling, marketing and distribution *Greencell*	BRC, LEAF, ETI	• Sales and marketing, handling and distribution of the mangoes • Receipt of mangoes at port and customs clearance • Logistics to distribution centre • Storage space and capacity given product specification • Handling and distribution • Dispatch • Workers' hygiene and working conditions	• Contract signing with stakeholders • Receive and clear shipped cargo from the port • Schedule delivery to *Waitrose* • Communicating with *Westfalia Marketing, Bavaria* and *Waitrose* on quality and delivery issues • Workers training on handling fruit • Sanitary treatment of handling facilities and trucks	• Temperature audit • Inspect the mangoes before temporary storage • Check phytosanitary requirements on export documents • Check the correctness of shipment documents • Check delivery schedules and trucks • BRC, ETI and LEAF audits	• Recording and monitoring fresh mango temperature before dispatch • Adjust temperature accordingly • Record keeping of temperature data • Notify *Bavaria* , *Westfalia Marketing* and *Waitrose* of any quality problem • Dispose of damaged or rotten fruit according to regulations	Inspection of mangoes by UK plant inspectors

Supply chain level and Actor	**Quality and safety programme or standards**	**Plan**	**Do**	**Check**	**Act**	**Inspection and audit by public authorities**
Handling, marketing and distribution *Blue Skies Import*	BRC, IFS, Fairtrade	• Sales and marketing, handling and distribution freshly cut mangoes • Receipt of mangoes at airport and customs clearance • Logistics to distribution centre • Delivery schedules • Distribution to *Waitrose* • Workers' hygiene and conditions of employment	• Contract signing with *Waitrose* and workers and subsidiaries • Receive and clear shipped cargo from the port • Schedule delivery to *Waitrose* • Communicating with supplier and *Waitrose* on quality issues • Workers training on handling fruit • Sanitary treatment of handling facilities and trucks	• Temperature audit • Inspect the mangoes before temporary storage • Check phytosanitary requirements on export documents • Check the correctness of shipment documents • Check delivery schedules and trucks • Check status of BRC, IFS and Fairtrade audits	• Recording and monitoring mango temperature before dispatch • Adjust temperature accordingly • Record keeping of temperature data • Notify suppliers, *Blue Skies SA* and *Waitrose* of any quality problem • Dispose of damaged or rotten fruit according to regulations	Inspection of mangoes by UK plant inspectors

Supply chain level and actor	Quality and safety programme or standard	Plan	Do	Check	Act	Inspection and audit by public authorities
Waitrose	**Public** HACCP **Private** BRC, Fairtrade, ETI, LEAF	• Pricing, marketing (e.g. advertising) and selling • Mango sourcing strategies • Fairtrade audits and supplier visits • Receipt of fresh mangoes, warehousing, packaging (if required) and shelving • Working conditions of workers	• Contract signing with suppliers and workers • Acknowledge receipt of fresh mangoes and verify all delivery documentation. • Verify the temperature data and whether mangoes meet quality requirements • Examine load prior to warehousing • Worker training on mango handling and packaging	• Inspect mangoes when delivered to see if they meet required food safety and quality standards • Audit temperature data to see problem areas affecting fresh mango quality along the cold chain. • BRC, ETI and LEAF audits	• Accept or reject mangoes if they do not meet required standard • Notify supplier and agent about the quality and or/problems as well as to service providers • Recall product • Track and trace the product • Supplier visit and Fairtrade audits • Cease procurement from problem supplier	Inspection and Certification by health officials from the UK agriculture and health department.

4.3.1 The PLAN stage

Each actor along the mango export supply chain plans the activities that fulfil the supply chain requirements and each planned output feeds into the next level. Critical activities are identified in line with the relevant food safety and quality standard. Each actor has to plan the maintenance of fruit quality and safety without breaking the cold chain through monitoring the pre- and post-harvest processes or the sanitary and phytosanitary conditions. The vertically coordinated nature of *Bavaria* and *Blue Skies* mango export chains entails that activities be done according to contractual agreements.

4.3.1.1 Producer/ pack house level

At producer- pack house level (carried out by *Bavaria* and *Jonkmanspruit Mangoes*) critical activities that affect the intrinsic and extrinsic attributes of mangoes were identified as follows: fertiliser and chemical application, irrigation schedules, personnel hygiene, harvesting, maintenance of equipment and transportation. After harvesting, the fresh mangoes are transported to the pack house where they are cooled, washed, treated, graded/sorted and palleted or containerised and made ready for delivery and transportation to either *Blue Skies* premises at Balfour or for export.

The producer therefore has to plan the scheduling of activities taking into consideration the contractual requirements by quality standards that are dictated by retailers through category management. For instance, Fairtrade requires that the workers be treated fairly with no child labour and other ethical guidelines, such as on protection of the environment and animal welfare, are adhered to (Du Preez, 2011). Global GAP requires strict record keeping and plant protection products (e.g. chemicals) that affect maximum residue levels to be identified and used correctly, thus ensuring a strict regime of Good Agricultural Practices (GAP) (Global GAP, 2008). From harvest to reaching the consumer, temperature control of mangoes

becomes the central critical issue. Pack house activities are also planned according to set standards. The producer also needs to plan the delivery of the mangoes to the buyer and has to contract refrigerated transport as well as other logistical services such as forwarding and shipping agents.

4.3.1.2 Processing level: Blue Skies

At processing level, at the *Blue Skies'* Balfour factory*,* the critical activities are inputs procurement (e.g. packaging material), delivery of fresh mangoes, cutting, packing, labelling, transportation, water and organic waste disposal. Equipment maintenance and personnel hygiene are essential in a processing industry to avoid food contamination. After packaging, the freshly cut mangoes have to be loaded into refrigerated trucks and transported to the airport for export to the UK. Therefore, *Blue Skies* has to plan its input procurement, fruit procurement (from Global GAP certified farmers), processing, packaging and labelling of fruit according to retailer requirements and waste disposal. These activities are done in accordance with government regulations and contract conditions stipulated by the private standards. For example, BRC (its focus is for retail branded products) seeks to address food safety and quality from the source, focusing on processes rather than products (BRC, 2012).

The exporter also needs to plan the logistics of moving the packaged freshly cut mangoes to the airport, thus *Blue Skies* uses refrigerated transport, and have a contract with *Sky Services* that secure cargo space and carry out customs clearance procedures. The contract also stipulates among others issues the important factor of temperature. Freshly cut mangoes are maintained at below 5^0C at the factory, *Sky Services'* cold store and in transit until it reaches the UK. The sanitary and phytosanitary requirements as well as ethical trade requirements have to be planned and adhered to as dictated by *Waitrose* and other buyers and through the *Blue Skies* head quarters.

4.3.1.3 Handling, distribution and retailer level in the UK

Greencell and *Blue Skies Import* in the UK have to plan the clearance of the mangoes upon arrival at the port. Contract terms include quality inspection, transportation to distribution centres and delivery to *Waitrose* as well as marketing, and these have to be planned in advance. *Greencell* also need to plan for handling activities such as ripening and repackaging before mangoes are dispatched to the retailers. Delivery of both fresh and freshly cut mangoes must be done within the shortest possible time.

Waitrose, for its part, has to prepare for receipt of the mangoes at its distribution centres and thus consider warehouse capacity, inventory and shelf space. Advanced planning of marketing, pricing and demand management are done with responsibilities such as procurement of mangoes passed on to *Greencell* and the *Blue Skies Import*. As the proprietor of the Faitrade standard, *Waitrose* carry out supplier audits and hence has to plan the distribution of its resources into sourcing, supplier visits and audits of Fairtrade certification, training of its workforce and suppliers and traceability.

4.3.2 The DO stage

Different activities are carried out by each actor to fulfil the objective of providing superior safe and quality fresh and processed mangoes to the consumer. Identified activities should align with Global GAP, BRC, LEAF, ETI, IFS or Fairtrade requirements that are applicable to that particular supply chain level. To ensure compliance, all exchange transactions are bound by a contract which is the standard procedure. The following sections briefly describe the **DO** stage at the different supply chain levels of the *Bavaria* and *Blue Skies* mango export chains:

i. Producer- pack- house level

Bavaria and *Jonkmanspruit Mangoes* enter into a contract with logistics support services, input suppliers and buyers, this is the sanctioning mechanism that ensure adherence to food safety and quality standards. The producers procure inputs such as fertilisers and chemicals and have to monitor their application in the orchards. They also keep records of pre- and post-harvest procedures. Workers are trained in all areas both in the orchard and pack house as well as in hygiene. The servicing of equipment also needs to be carried out as specified by the standard. The producers also need to make deliveries to the buyer (in this case the category management) and this requires refrigerated transport as stipulated in the contracts.

ii. Processing level

At *Blue Skies'* Balfour factory, the company contract mango growers and order inputs for processing in advance before the mango season and consolidate their orders according to contract terms agreed with *Blue Skies Import* and the buyers. The company also enters into contracts with reputable logistics service providers. The maintenance of equipment is also planned as well as worker training on hygiene. During the mango season, the processing is carried out under strict sanitary conditions and the freshly cut mangoes are transported to the airport in refrigerated trucks.

iii. Handling and distribution level in the UK

Greencell and *Blue Skies Import* receive the exported fresh mangoes and freshly cut mangoes. They secure their markets and sign contracts with the buyers (*Waitrose*) and workers, then receive and clear shipped cargo from the port and schedule delivery to *Waitrose*. *Greencell* and *Blue Skies Import* inspect the mangoes at the port, track them and notify the suppliers and *Waitrose* of any delays and quality issues. Workers are also trained on

mango handling as well as sanitary treatment of handling facilities and trucks.

iv. At retailer level

Waitrose receives and inspect the mangoes from *Greencell* and *Blue Skies Import*, as well as verifying all delivery documentation and temperature data. It checks whether they meet quality requirements as stated by the phytosanitary certificate and the contract with suppliers. If the mangoes pass quality inspection they are sold but if not, any quality problems are communicated with the parties involved. Worker training on mango handling, packaging and marketing is carried out.

4.3.3 The CHECK stage

To ensure adherence to set standards and quality requirements by the buyers, actors along the fresh mango export supply chain carry out audits and inspections which are essential as enforcement mechanisms. The activities under the 'check' stage are described below:

i. Producer- pack-house level

Bavaria and *Jonkmanspruit Mangoes* are bound by contract to keep records of production and pack houses processes that are updated every time an activity takes place, for example, spraying. Verification of pack house processes is also made using installed scanners in the pack house as well as checking the working condition of equipment. The producer also ensures that contract terms are adhered to as they are legally binding, and carries out internal audits and mock audits in preparation of the Global GAP and Fairtrade annual audits. These ensure good agricultural practices and protection of the environment and workers. The government plays a critical role of auditing and inspecting through DAFF and PPECB, thereby ensuring that set standards are adhered to.

ii. Processing level

At *Blue Skies* Balfour factory, delivered inputs used for processing, for example packaging material, are checked. Internal audits of fruit handling and sanitation in the factory are carried out, as well as mock audits in preparation to the Fairtrade audits. Records are kept of temperature data on exported fruit to ensure quality and for traceability. Loading facilities and trucks are inspected and all export documentation checked before freshly cut mangoes are transported to the airport. Checks are also done to ensure that the correct procedure is being followed with regards to waste disposal.

iii. Handling and distribution in the UK

Greencell and *Blue Skies Import* in the UK inspect the mangoes upon receipt and before they enter temporary storage. They check the correctness of shipment documents as well as phytosanitary requirements on export documents in accordance with buyer requirements. They have to conduct a temperature audit of the mangoes from the supplier as well as to the buyer. Delivery schedules and trucks are checked before the mangoes are dispatched to *Waitrose*. Audits of BRC, ETI, IFS, Fairtrade and LEAF are also carried out to ensure quality and safety of the mangoes.

iv. Retailer level in the UK

When the mangoes are received at *Waitrose*, the retailer checks the temperature data and audits the data to identify any problem areas affecting mango quality along the cold chain. *Waitrose* also inspects mangoes when delivered to see if they meet required food safety and quality standards as stipulated on the phytosanitary certificate, and the private standard. BRC, HACCP, ETI and LEAF audits are also carried out on the premises.

4.3.4 The ACT stage

The ACT stage in the Bavaria and Blue Skies mango export chains is detailed as follows:

i. Production-pack-house level

For quality and safety management, *Bavaria* and *Jonkmanspruit Mangoes* react by tracing fruit back to the orchard, by checking the record and adjusting the pre- or post- harvest procedure in question. They also examine samples of soils and mangoes and inspect orchards and the pack house to identify any problem, be it pests and/or diseases, chemical damage, equipment failure or any other issues. Buyers are notified and the necessary remedial actions taken, for instance repairing or replacement of factory equipment. Sometimes the mangoes destined for export fail to pass the PPECB inspection process and so are sold to the local market.

ii. Processing level

At *Blue Skies'* Balfour factory, any incoming order of fresh mangoes or other inputs are inspected and recorded upon receipt, and if there is any discrepancy or quality problem this is corrected by informing the supplier and agreeing on a solution. A solution may, for example, be returning the defective product to the particular supplier. *Blue Skies* also have agronomists who provide extension services to contracted growers to ensure quality mango production. During delivery of freshly cut mangoes to the airport, a technical team keeps track of dispatched cargo (Veldsman, 2011 & *Blue Skies*, 2012). When the processed mangoes exit South Africa, or if there is a delay or cancellation of orders, *Blue Skies Import* is notified. At the factory, faulty equipment is repaired or replaced and workers are trained in hygiene, sanitation and the correct methods of waste disposal.

iii. Handling and distribution in the UK

Greencell and *Blue Skies Import* will continue to record and monitor mango temperature from the time the cargo is cleared until delivery at *Waitrose* and adjust temperature accordingly. Records are kept of temperature data and if there is a problem the supplier and the buyer are notified. Rotten, damaged or diseased mangoes are disposed off according to the government agricultural and health regulations.

iv. Retailer level: UK

Upon delivery of mangoes to *Waitrose* distribution centre, the retailer accepts or rejects those that do not meet the required standard after inspection. The retailer notifies the supplier and agent about the quality and/ or problems to service providers. *Waitrose* also tracks and traces the product if there is a quality problem and can recall the mangoes and/or cease procurement from the problematic supplier. The retailers also schedule supplier visits and enforces Fairtrade certification for its supplier base.

4.4 ISSUES AND CONSTRAINTS IN THE *BAVARIA* AND *BLUES SKIES* MANGO EXPORT CHAINS

There are a number of issues and constraints in the export chains of the companies, particularly regarding quality and safety management.

4.4.1 Developments in quality and safety management

Quality and safety management in the agricultural supply chain has evolved dramatically over the last decade owing to mandatory standards from buyers. This was echoed by the *Bavaria* and *Blue Skies* mango export chains respondents, who indicated that the stringency of food safety and quality standards by retailers had increased. The scope of the standards has also widened and deepened, from

addressing safety and quality (for example HACCP and BRC) to the environment and ethical issues such worker welfare and child labour (e.g., Fairtrade, ETI and LEAF). In addition, the role has also changed towards market entry and barriers to entry as well as quality and safety management (Du Preez, 2011). The power of the lead firm such as *Waitrose* has also become more pronounced.

In addition, the standards also focus on the process in order to eliminate contamination. For example, fresh mangoes supplied to *Blue Skies* were sourced from growers who are certified by Global GAP, with emphasis on quality management of the production processes at grower level. *Blue Skies* itself is Global GAP and BRC. BRC uses HACCP as its foundation (Veldsman, 2011) and it also focuses on quality management of the production processes. The other trend that emerged is that of large local retailers such as *Woolworths*, *Pick n Pay*, *Fruit and Veg* and *Spar* becoming more stringent in their sourcing requirements. They are buying mangoes and other produce only from Global GAP certified producers, with some adding their own standards.

Regarding logistics, and in response to growing concerns for food safety and quality over the past decade, there has been improvement in the transport and shipping services along the fruit and vegetable cold chain from South Africa (Sky Services, 2011). Noteworthy is the extensive use of refrigerated containers and reefers by shipping lines (Lonrho Logistics, 2012 & Sky Services, 2011). With fresh mangoes, sea transport has become the preferred mode of transportation, due to the high costs of air transport incurred by their bulky nature (Van Vuren, 2011). Inland transporters and shipping lines as well as cold stores have invested in advanced cooling technologies to meet the quality requirements stipulated by retailers (Agrilink, 2011).

Producers and exporters in the *Bavaria* and *Blue Skies* export chains expressed positive sentiments about adoption of quality and food safety standards as they are a form of incentive. It was indicated that that there had been increased market access to the global market. Increased stringency and buyer influence has also resulted in

boosted consumer confidence, especially with private standards, and consequently higher retailer bargaining power. For example, the Fairtrade standard ensures competitive advantage to the retailer with the producer receiving premium prices for the mangoes and increased gross margins (Du Preez, 2011). In the case of *Blue Skies*, the exporter has capitalised in a retailer branded processed product that also gives a competitive edge to the supply chain actors.

4.4.2 Quality and safety management constraints

In spite of quality and safety management standards opening up trade frontiers for the *Bavaria* and *Blue Skies* chain actors, respondents face some constraints in the management of quality and safety standards. One characteristic of standard adoption is the high capital outlay required in the form of initial capital investment and recurrent operation costs requirements, for example, audits, inspections, certification, inputs and chemicals (Darroch, 2010). A typical example is the EUREP GAP (now Global GAP) certification costs of a litchi and mango export farm in South Africa presented by Vermeulen *et al*. (2006). According to the scholars, in 2006, R13 000 was the estimated initial capital outlay for a farm without a pack house, with an additional recurrent operational costs of R6 000. Meanwhile, for a farm with a pack house the annual operational cost was estimated at R35 000.

The high certification costs are a positive investment considering the benefits that come with certification, but this is feasible only for large supply chain actors such as *Bavaria*, *Jonkmanspruit Mangoes* and *Blue Skies*. For small scale producers and exporters it is a barrier to entry into the mango export business as these costs are incurred by the producer or exporter and not borne by the retailer (Hingley, 2005). This constraint is also compounded by a proliferation in the standards for different markets which escalate costs (Van Vuren, 2011). This has resulted in producers (large and small) becoming more risk averse and cost saving. By implication, producers prefer market outlets that are less stringent with the smallest possible risk,

such as the processing industry and domestic supermarkets, although the returns are lower than the export market (Du Preez, 2011).

The other constraints in managing mango safety and quality emanate from logistics and cold chain management. Respondents cited breaks in the cold chain, especially at the port and container terminals, resulting in mangoes over-ripening and so causing financial losses to the producers. The problem is exacerbated by delays in unloading trucks at the ports and congestion, especially during peak periods, with up to three days being taken for a truck to be offloaded. Another cause of cold chain breaks is the handling of trans-shipment cargo and the lack of adequate equipment at the ports. This has resulted in loss of quality and increased lead times, in turn leading to high operational costs to the transporter and the producer (Fleet Watch, 2011).

An additional bottleneck with logistics is the long transit time for sea shipments, for example up to three weeks to reach the UK (Van Vuren, 2011). The more time taken in transit the higher the probability of rejection by buyers, especially the retailers, as the mangoes may become over-ripe (Du Preez, 2011). This is of more significance if there has been a break in the cold chain, with cost implications to the producer who has to renegotiate a lower price or sell the mangoes through other markets at lower than expected prices.

The other logistical constraint is a result of the scrapping of refrigerated rail transport which is critical for transportation of the fresh mangoes from production areas such as Limpopo (Du Preez, 2011& Van Vuren, 2011). This has increased the cost of transportation with the use of road transport. These problems are compounded by challenges such as truck breakdowns that may lead to a break in the cold chain.

Overall, the quality and safety constraints in the *Bavaria* and *Blue Skies* mango export chains result from the perishability of mangoes which make it difficult to move from the farm to the retailer shelf. The retailer controls the supply chains by imposing

conditions in the form of food safety and quality standards that demands a mango or mango product with specific quality and safety level. The *Bavaria* chain is affected mostly by breaks in the cold chain as the route is longer and mangoes have to pass through several supply chain actors thereby making it a riskier chain in terms of safety as compared to the *Blue Skies* one. On the other hand, the *Blue Skies* chain despite being shorter, it is more costly due to air transport. Thus there is a trade off in terms of transit time, costs, compromised mango quality and safety between the two chains. The high degree of vertical coordination and the use of category management coupled with enforcement and sanctioning mechanisms are essential for maintaining such chains.

4.4.3 Best practices

Actors along the *Bavaria* and *Blue Skies* mango export supply chains cited the following as best practices in order to meet quality requirements and standards as well as sustainability in the long run:

i. At producer-pack house level: fruit harvesting and post-harvest handling techniques are very important and non-observance of these results in poor fruit quality. It is important that pickers observe good hygiene, for example, keeping finger nails very short to prevent damage to the fruit, and removal of latex and neutralisation to avoid post-harvest diseases. In addition, mangoes for export can be picked separately. Once picked they must be stored in the shade in lug boxes that do not cause scratches, and transported to the pack house (Du Preez, 2011).

ii. Global GAP has become accepted as the operational private standard that ensures growers entry to global markets. No export organisation or agent accepts fruit from an orchard that is not Global GAP certified. Growers also have the liberty to choose their markets and seek certification independently from Global GAP.

iii. The increasingly stringent requirements of private standards to meet food safety and quality are costly yet indispensable if producers and other supply chain actors are to remain viable. Having the business certified under the different private standards has become a way of differentiating oneself from the rest of the supply chain actors, and this has become a catalyst to overcome technical barriers to entry.

iv. DAFF's and PPECB's involvement in the supply chain as regulators was also regarded as best practice.

v. It has also become standard practice to carry out mock internal audits though the frequency and timing of such activities is dependent upon each actor. Some respondents preferred to do this prior to Global GAP audits, for example, to ensure that all is in order before the private standard audits are carried out.

vi. Along the two mango chains, good hygiene of workers, sanitation of premises such as pack houses and processing factory as well as proper waste disposal were cited as best practices, as these eliminate the contamination of fresh and freshly cut mangoes.

vii. Temperature data logging from pack house to the retailer was also cited as the best measure of an effective cold chain and for preserving the quality of mangoes in transit.

viii. It is also best practice for the producer to be reimbursed by the actor who is handling the mangoes at the time the mango quality problem occurred. However, this has to conform to the contractual agreement terms.

4.4.4 Expectations

The major expectation pointed out by stakeholders is that the stringency of private standards will continue to increase and evolve even further. More retailers are also expected to develop and require their own private standards. This will inflate the cost of certification with negative consequences, especially for small producers. Along the supply chain, cold chain technologies will continue to evolve and more products will be introduced. An example is the move away from controlled atmosphere to ozone in cold stores along the supply chain (Sky Services, 2011).

It is also expected that more prominence will be placed on corporate social responsibility, environmentally friendly activities and climate change by retailers, and this will come as a part of the package of the quality standards (Du Preez, 2011). This is being enforced through Fairtrade but more retailers are expected to either join in or devise their own standards.

4.5 SUMMARY

The aim of the chapter was to explore quality management and standards along the *Bavaria* and *Blue Skies* mango export supply chains. The chapter also sought to apply the Plan-Do-Check–Act (PDCA cycle) in the management of quality and safety in the two mango export chains. In addition, an outline of the major issues and constraints was presented.

It was noted that quality and safety management in the *Bavaria* and *Blue Skies* mango export supply chains requires actors to conform to food safety and quality assurance standards dictated by the buyers. Quality management elements used in the two supply chains are Global GAP, Fairtrade, BRC, HACCP, ETI, IFS, and LEAF, and these are enforced through contract arrangements. Compliance is enforced through audits and inspections internally and externally by the retailers, PPECB and DAFF. Public audits and inspections are carried out by DAFF and PPECB in South

Africa and by the agricultural and health departments in the UK. The tool, called the PDCA cycle, was applied in the study on identified critical activities and processes at each level of the chain, according to the standard employed by the actor. The PDCA cycle ensures continuous quality and safety improvement of systems and processes.

Over the last decade, stringency of food safety and quality standards by the retailers has increased. The scope has widened and deepened from addressing safety and quality to environmental and ethical issues. The role of standards has also changed towards market entry and increased barriers to entry, as well as quality and safety management and the pronounced role of the lead firm. Constraints in the management of quality and safety standards include high certification costs, which are a barrier to entry for small scale producers, though for large exporters they are a positive investment. The other constraint is inefficiency in logistics and the cold chain management which increases the transit time, resulting in the increased risk of loss to the producer and exporter. Poor safety and quality management result in economic losses due to product rejections, product recall and cessation of the buyer-supplier relationship. However, it is expected that the stringency, scope and role of quality and safety management standards will increase in the future, and this will continue to pose barriers to entry to small scale chain actors.

CHAPTER 5

USE AND EXCHANGE OF INFORMATION IN THE *BAVARIA* AND *BLUE SKIES* MANGO EXPORT SUPPLY CHAINS

5.1 INTRODUCTION

The aim of the chapter is to explore the use of information and information exchange in the *Bavaria* and *Blue Skies* mango export chains. Information on product, process and planning will be the main focus, followed by an overview of the major issues and challenges.

In every supply chain, the administration and utilisation of information are indispensable as the product moves along each stratum. How the information is exchanged and used up and down the supply chain underlines the efficiency of the whole chain. Information use and exchange in agricultural supply chains is important for traceability, given the proliferation of food safety and quality standards (Zuniga-Arias, 2007). As a result, supply chain coordination becomes indispensable (Olivier Fourie & Evans, 2006). The use and exchange of information in the *Bavaria* and *Blue Skies* mango export chains will be discussed below.

5.2 IMPORTANCE AND BENEFITS OF INFORMATION USE AND EXCHANGE

The use and exchange of information in any supply chain is very important as it enables a smooth flow of processes involved in the movement of a product along the network of supply chain actors, as well as the ability to trace and track a product. The quality of information shared among the various levels of the chain is also important, including aspects such as precision, appropriateness and sufficiency. Benefits of effective information-sharing include reduced risk and uncertainty,

reduced transaction costs, improved efficiency, quality and value addition (Trienekens & Wognum, 2009). Tracking and tracing systems should be able to provide answers to who, what, when, where, how, and how much questions (DAFF, 2010). This is achieved through effective supply chain coordination in which there is a backward and forward flow of information. In the *Bavaria* and *Blue Skies* mango export supply chains, the effective use and exchange of information have multiple benefits, as illustrated by Matopoulos, Vlachopoulou, Manthou and Manos, (2007) in table 5.1 (below).

Table 5.1: Benefits of effective use and exchange of information

Activity	Benefits of Supply chain coordination
Procurement of inputs (e.g. Fertilisers, chemicals, packaging materials, fresh mangoes)	• Less time searching for new suppliers of inputs and growers • Easier management of a reduced supply base • More stable prices paid to suppliers based on contract agreements
Order processing (e.g. packing and transportation of mangoes to port by *Bavaria*; processing retailer customised freshly cut mangoes by *Blue Skies*)	• Increased responsiveness (e.g. request for freshly cut mangoes/ order is daily and a processed order exit the country daily from *Blue Skies*)
Delivery and Distribution (e.g. of freshly cut mangoes to *Waitrose* by *Blue Skies* Import)	• Faster • Flexible delivery since information about the mangoes such as date and time of arrival at import port is known beforehand.
Sales and Demand management (at *Greencell* and *Blue Skies* Import as well as *Waitrose)*	• More accurate forecasts on supplies and • Joint resolution of forecasts as information on demand and prices is shared.
Customer service (by *Waitrose)*	• Improved mango availability since suppliers (*Bavaria* and *Blue Skies*) have category managers ensuring all year round supply.

Source: Matopoulos *et al*. (2007:179) and interpretation by researcher.

Information exchange also enhances the relationship between the retailer and supplier and among chain networks, hence impacting on governance (Dimitriadis &. Koh, 2005). For example, in the *Bavaria* and *Blue Skies* mango export chains, information is exchanged between *Waitrose* and the suppliers vertically. At the same time, *Bavaria* and *Blue Skies* have to exchange information with the network of service providers, and this requires a high degree of coordination achieved through SCM. There is a forward and backward flow of information in the two chains with the PPECB and among chain actors. Information on processes, procedures (e.g. internal audits, inspections) and products (e.g. provenance, product specification, packed date, expiry date) is exchanged and used.

Efficacy of tracking and tracing systems in a supply chain is dependent on supply chain coordination mechanisms of enterprise activities of individual actors; and the network of actors along the chain until the product reaches the consumers (Nel, 2009). Comprehensive supply chain management which incorporates the effective use and exchange of information is therefore the foundation of tracking and tracing systems in any supply chain, given the global food safety and quality concerns (Olivier *et al.,* 2006).

In the *Bavaria* and *Blue Skies* mango export supply chains, the issue of quality and food safety is important. The presence of food safety and quality assurance regimes (thus Global Gap, BRC, ETI, IFS, LEAF and Fairtrade) dictate the nature of information to be used and exchanged as well as traceability. Traceability is emphasised, especially when exporting to the UK, such that the supply chain has to comply with the tracking and tracing requirements. Mai (2009:61) states that:

> "…traceability systems are used for accurate and timely identification of products, their origin, location within the supply chain and efficient product recall. Furthermore, they help to determine the origin of a food safety problem, comply with legal requirements and meet consumers' expectations for the safety and quality of purchased products."

5.3 TYPE OF INFORMATION USED IN THE *BAVARIA* AND *BLUE SKIES* EXPORT CHAINS AND EXCHANGE CATEGORIES

Process and product information defined by the private and public institutions are obligatory and these are maintained through certification (Gereffi *et al*., 2005) and are an integral part of traceability. From grower to the exit point, different process and product information is used for tracking and tracing the product back to the point of origin and to inform the buyer. The efficiency of this, however, depends on the information systems employed. The type of information used in the *Bavaria* and *Blue Skies* mango export chains and the exchange categories are discussed below.

5.3.1 Product Information

Product information is important in identifying and describing the intrinsic (internal and intangible) and extrinsic (physical) features of a product and hence making it easier to make consumption and purchasing decisions (Van Haperen, 2009). Montanari (2008) concurs, and in addition categorises product information in terms of information pertaining to raw materials and processes required to make the product and product identification using the extrinsic and intrinsic characteristics. Of importance to the consumer is also product information such as labelling, giving an indication of batch number, expiry date and origin which also links with process information (Tregurtha & Vink, 2002). This information is indispensable and is used to trace the product to the point of production. Along the *Bavaria* and *Blue Skies* mango export chains, contracts form part of the documentation detailing product information on quality such as temperature, prices, identity of product, producer and buyer.

5.3.2 Process and planning information

Process information gives an indication of processes that the mangoes go through until they reach the retail shelves. These include pesticides regimes at orchards, pack house processes, transportation and shipment data. This information

contributes to the attributes of the mangoes which affect quality and safety. Planning information, on the other hand, gives an indication of the type of information needed at each part of the supply chain by each actor in order to execute the required process for the effective movement of the mangoes along it. Planning and processing information must be reliable and of higher quality and readily available in order for the actors to match their production, quality, sales and markets as well as managing risk (Trienekens, 2010). The quality of planning and processing information is important in reduction of transaction costs (Doyer, 2002), which is essential when considering logistics complexity and distribution processes (Trienekens, 2010). Product, process and planning information is shared among actors in the supply chain through different information systems, as described below.

5.3.3 Information systems used

Today, information and communication technology (ICT) play a crucial role in the exchange of information, and this has helped to shorten lead times and reduction of transaction costs (Doyer, 2002), in addition to tracing and tracking and demand forecasting. ICT, as stated by Olivier *et al*. (2006), consists of:

i. Hardware, for example equipment such as computers, labels and identification tags; and

ii. Software, for instance computer programs such as Paltrack, Xsense™, Caretrace and Compu-clearing.

A blend of software, hardware and skilled personnel in ICT is indispensable as they make up an information system that is an integral part of supply chain coordination and the success of the chain. In the mango export supply chain, both automated and manual information systems are used.

Table 5.2 (below) shows the information used in the *Bavaria* and *Blue Skies* mango export chains under the different information exchange categories as well as the information systems used. This is then discussed in section 5.4. The methodology used in the European Pork Chain study (Trienekens *et al*., 2008) was applied in explaining the use and exchange of information in the two chains. The *Bavaria* and *Blue Skies* mango export chains were discussed together so as to eliminate repetition of shared information categories among actors. Each supply chain actor's product, process and planning information was detailed, as well as the information systems used.

Table 5.2: Use of information and information exchange categories

Application based on the European Pork Chain study (Trienekens *et al*., 2008)

Supply chain actor	Product information	Process information	Planning information	Information systems
Producer- pack house *Bavaria* & *Jonkmanspruit Mangoes*	• Grower name • Production Unit Code (PUC) • Pack house code (PHC) • Product specification details (Size, cultivar, grade, weight, ripeness) • Phytosanitary certificate	• Planting, weeding and pruning dates • Irrigation schedules and volume of water • Fertilisation-schedules (sometimes mixed in irrigation water called fertigation) • Quantities and type of fertiliser used • Spraying- name of chemical, date and time of spraying and orchard number • Harvesting- date, orchard number, quantity • Post harvest: ➢ name of chemicals used ➢ quantity of mangoes per grade stored in cold room ➢ temperature of cold room	• Production processes and schedules: ➢ cultivars used ➢ planting ➢ weeding ➢ pruning ➢ fertigation ➢ spraying ➢ harvesting • Forecast: demand, markets and quantities • Pricing • Quality- date of quality audits and inspections • Market information (prices, demand, quantity, quality requirements) • Logistics to port and shipping (contract freight forwarders)	• Telephone, and mobile phone, facsimile • Internet & email • EDI • RFID • Bar code • Paltrack • Xsense™

Supply chain actor	Product information	Process information	Planning information	Information systems
Processing *Blue Skies South Africa*	• Product specification details (processor name, description e.g., freshly cut, weight, price, buyer's name) • Phytosanitary certificate stating ➢ MRLs ➢ prohibited pest and diseases ➢ Global GAP and other conditions such as country of origin	• Input procurement- type, date of receipt, quantity • Fresh mangoes procurement- grower details (PUC & PHC), Global GAP certification, deliveries • Order processing- ➢ quantity of cut mangoes, ➢ packaging material used, ➢ quantity of freshly cut mangoes ➢ loading onto refrigerated trucks ➢ transported to the airport ➢ Loading on to the cargo section ➢ date and time of departure and arrival • Public and private inspections and audits details and dates	• Procurement of mangoes (price, quantity, quality, contract with growers) • Delivery schedules e.g. to airport • Delivery and shipping dates, transport and shipper's details (Sky Services) • Schedule of delivery to airport • Use of tracking and tracing device • Audits by PPECB, BRC and Fairtrade yearly	• Telephone, and mobile phone, facsimile • Internet • Email • EDI • RFID • Caretrace • TempTrip

Supply chain actor	Product information	Process information	Planning information	Information systems
Handling and distribution UK *Greencell* UK and *Blue Skies* Import	• PUC and PHC • Product specification details • Supplier's name and country of origin • Phytosanitary requirements on certificate • Buyer's name and Incoterms	• Delivery notes and invoices, air way bill and bill of lading details • Temperature logging data • Date and time of arrival at port and dispatch; temperature on arrival and dispatch, required cooling temperature in transit • Handling and distribution details- ripening, repackaging, delivery details • Details and dates of inspections and audits by private and public entities	• Demand forecasting, marketing and pricing • Procurement and payment • Delivery schedules and routes • Inventory and warehouse information • Capacity and stock control records • Cooling ripening and equipment availability • Use of tracking and tracing devices	• Telephone, and mobile phone, facsimile • Internet, email • EDI and RFID • Two way radios, GPS • Caretrace, Xsense™, TempTrip • Stock management and control system

Supply chain actor	Product information	Process information	Planning information	Information systems
Retailer level *Waitrose*	• Supplier name/code and country of origin • PUC and PHC • Product specification details • Phytosanitary requirements	• Delivery notes and invoices • Temperature data log sheet along the cold chain • Date and time of dispatch and arrival, temperature on dispatch and arrival	• Planning procurement of mangoes • Demand forecasting and mango marketing • Receipt of mangoes and verification process • Analysis of temperature data sheet • Supplier visits and Fairtrade audits	• Telephone, and mobile phone, facsimile • Internet, email • EDI and RFID • Caretrace

5.4 INFORMATION USE AND EXCHANGE BETWEEN ACTORS IN THE *BAVARIA* AND *BLUE SKIES* MANGO EXPORT SUPPLY CHAINS

Information is used in various ways between actors in the supply chains of both companies. The following section seeks to elaborate on how information is used and exchanged among actors in the Bavaria and Blue Skies mango export chains.

5.4.1 Producer / pack house level: *Bavaria* and *Jonkmanspruit Mangoes*

At producer level, *Bavaria* and *Jonkmanspruit Mangoes* conduct planning of production and processes such as date, quantity and time of planting, fertigation, pruning, weeding, harvesting, and post-harvest treatment. Records are kept of these processes and the information used and shared during tracing and audits in relation to compliance to specific private standards, for example, the Global GAP and Fairtrade (Du Preez, 2011 & Van Vuren, 2011).

Traceability systems begin with the producer relaying particular information of the fresh mangoes and processes to be used throughout the whole chain to track and trace the product. Product information that is shared along the supply chain originates at production level and is shared until the mangoes reach the particular retailer. Product information used at this level is the grower names, the PUC or orchard code, PHC, product specification details, thus: the intrinsic and extrinsic feature such as size, cultivar, grade, weight, ripeness and aroma (PPECB, 2011). The producer must also have a phytosanitary certificate that stipulates quality conditions, for example, the absence of a specific mango pest or disease (PPECB, 2011). No export will be allowed if the certificate is not available.

According to PPECB (2011), it is mandatory that product information be displayed when labelling the product. The label must be clearly visible, easily accessible and display accurate information. The visibility of the barcode makes it user-friendly. The grower also keeps a record of processes for the particular production unit from which that particular cultivar of mangoes was grown. This information is retrievable and should indicate planting, weeding and pruning dates. If any pesticides or herbicides were used these must be indicated. The producer uses telephone, mobile phones and facsimile to relay information and interact, while RFID, EDI Paltrack and

Xsense^{TM} are used for traceability (Du Preez, 2011; Van Vuren, 2011 & Veldsman, 2011).

5.4.2 Processing level: *Blue Skies South Africa*

As a buyer of fresh mangoes and processor, *Blue Skies* requires information to plan for procurement of mangoes. Price, quantity, quality, contract details with grower and Global GAP certification are therefore some of the critical information to be communicated. *Blue Skies* also procures inputs such as packaging material, and requires information to plan delivery schedules, such as shipping dates, transport and forwarding and handling agents' details (Sky Services and BA World Handling Cargo). It also needs to have information on traceability and devices, and to plan for audits by the PPECB, BRC and Fairtrade, as well as internal ones.

Product information that is shared with the buyers consists of product specification details, including name of process/code (Blue Skies South Africa), description of the mangoes e.g., freshly cut, weight, price and buyer's name (*Waitrose*). Product information also includes information on phytosanitary requirements by the buyer stated on the certificate (the MRLs and absence of pest and diseases).

Process information used by *Blue Skies* emanates from the processes involved in the cutting of the mangoes and all processes till they are airlifted to the UK. The following information is shared: for input procurement: the type, date of receipt, quantity; for fresh mango procurement, the grower details (PUC & PHC), Global GAP certification and delivery schedules. For order processing: the quantity of cut mangoes, packaging material used, quantity of freshly cut mangoes loaded onto refrigerated trucks, transported to the airport and loaded on to the cargo section, date and time of departure and arrival in the UK. Public and private inspections and audit details and dates are also kept as records. Information systems used by *Blue Skies* include telephone, mobile phone, internet, email and facsimile for communication, as well as EDI, RFID, Caretrace and TempTrip to track and trace the freshly cut mangoes.

5.4.3 Handling and distribution level, UK: *Greencell* and *Blue Skies Import*

Planning information is required by both *Greencell* and *Blue Skies Import,* and this is also dependent on the processes. For example, the two must forecast demand, marketing and pricing of the mangoes in conjunction with the buyer and supplier (Veldsman, 2011). Procurement and payment terms are planned as well as the schedules and routes. In the warehouse, an inventory is made to ascertain capacity using stock control records (Agrilink, 2011). The exporter has to ensure that traceability systems are in good working condition.

The following product information is shared at the level of *Greencell a*nd *Blue Skies Import*: PUC and PHC if the cargo is fresh, otherwise the processor's name will suffice. Product specification details as well as supplier's name and country of origin need to be stated (Veldsman, 2011). In addition the phytosanitary certificate will show the requirements of the buyer (Sky Services, 2011). On the documentation, name of buyer (*Waitrose)* will be indicated as well as the incoterms (Du Preez, 2011, Sky Services, 2011 & Veldsman, 2011).

The manual information systems used by *Greencell* and *Blue Skies Import* are: telephone, mobile phone and two-way radios. The automated systems used are: Global Positioning system (GPS), internet, email, facsimile, electronic data interchange (EDI), radio frequency identification (RFID), Caretrace, Xsense^{TM} and TempTrip. Stock management and control system are used for traceability of the mangoes (*Blue Skies*, 2012 & *Greencell*, 2012).

5.4.4 Retail level: *Waitrose*

Upon delivery of either fresh mangoes or freshly cut mangoes at the *Waitrose* distribution centre, the necessary quality checks and inspection are carried out on the mangoes, based on the information contained on the delivery note and invoice. The retailer checks the following product information: supplier name/code, PUC, PHC, product specification, country of origin and the phytosanitary certificate. During the process, information such as dates and time of dispatch and arrival, as well as temperatures on dispatch and arrival, are recorded along with an analysis of the temperature data log sheet used in transit along the cold chain.

For process planning, *Waitrose* requires information for mango procurement, and therefore the company needs to do marketing and demand forecasting. Planning is also carried out on inspection of mangoes and information on deliveries, and product specification is required. Analysis of the temperature data log sheet is also done to verify quality. *Waitrose* also visits its suppliers during Fairtrade audits; hence a database with suppliers' details is kept (*Waitrose*, 2012). The following information systems are used by *Waitrose*: telephone, and mobile phone, internet, email, facsimile, EDI and RFID, Caretrace as well as stock management systems.

5.5 ISSUES AND CHALLENGES IN THE USE AND EXCHANGE OF INFORMATION IN THE *BAVARIA* AND *BLUE SKIES* MANGO CHAINS

5.5.1 Developments in the use and exchange of information

Over the past decade there has been a marked improvement in communication (Du Preez, 2011), believed to be a result of effective supply chain coordination and improved information technology such as email, internet, and mobile phones that are quicker and in real time. Producers are more aware of consumer preferences and buyer requirements and can communicate effectively cutting lead times and oversupply (Van Vuren, 2011). In addition, traceability systems have improved greatly and are continuously evolving.

Though cutting edge traceability systems are being used, there seems to be a shortfall because a contaminated product can reach the consumer without being detected, after which it has to be recalled. A case in point is the *E. coli* O104: H4 outbreak in Germany, for which the WHO expressed the importance of information use and exchange. This was elaborated by the WHO (2011), in which it was pointed out that the "outbreak has reinforced the importance of speed, coordination, information sharing and preparedness".

Waitrose and other large retailers also increased their reliance on EDI and the internet for communication, which has become a global trend and is expected to increase (*Waitrose*, 2012). Some technology, such as facsimile, is expected to become obsolete, however the bar-coding system will remain useful at the producer-

pack house level (Van Vuren, 2011). Furthermore, along the supply network, RFID will be increasingly adopted, as well as use of tracking electronic chips inserted in cartons (such as TempTrip), which gives real-time information on the whereabouts and temperature of produce at each level of the value chain (Du Preez, 2011).

5.5.2 Challenges

One major drawback that affects the South African fresh produce industry as a whole is lack of harmonisation of traceability systems (Olivier *et al*., 2006:6), which affects the fresh mango export supply chain as well. For example, *Bavaria* uses Xsense^{TM}, while *Blue Skies* uses Caretrace and TempTrip and *Waitrose* uses Caretrace (*Blue Skies*, 2012; Du Preez, 2011; *Waitrose*, 2012). However, because different exporters export to different markets, especially retailers with their own private standards, the bottleneck might persist in the mango export chains.

At producer – pack house level the main challenge cited was that of different product information used and exchanged for the domestic and export market, for instance the size, degree of ripeness and cultivar. The export market has strict requirements on quality and safety, for example, only first grade fresh mangoes of a particular size, ripened to a specific degree, chilled to 8^0C and transported under chilled conditions are exported (Du Preez, 2011). Post-harvest handling of mangoes for the export and domestic markets has to be managed well, to which end *Bavaria* and *Jonkmanspruit Mangoes* have separate slots for post-harvest handling processes and packaging for the export and domestic markets (Du Preez, 2011; Van Vuren, 2011).

The other challenge cited was that of communication and reliability of information used and exchanged among supply chain actors. A case in point is demand forecasting, which was pointed out as a major cause of loss, especially for the producers and exporters. As result of the competition from other countries supplying the same markets, if there is an oversupply due to overestimating demand during the planning stages, the export price drops (Du Preez, 2011). To alleviate this, SAMGA, FPEF and category managers in the UK play a crucial role in providing market information (Du Preez, 2011).

The other communication bottleneck is incorrect packaging and labelling of the mangoes, especially at the producer - pack house level, with mangoes destined for the export market. This cause delays at PPECB checkpoints, and during unloading at ports and export cold stores, with export processes being stalled until the producer rectifies the problem. Another problem is delays caused by the producer who sends delivery and export details to the export cold storage late, or non-communication of changes and cancellations (Van Vuren, 2011; Sky Services, 2011). In addition, support services such as freight forwarders sometimes mix up information sent to shipping companies, causing further delays (Van Vuren, 2011). Unreliability of information not only affects the lead time but is also a cost to the exporter, who has to bear dead weight cost and losses of revenue as a result of lower than anticipated market price if mangoes are over ripe.

The constraints in the use and exchange of information are usually mitigated by use of strict formal contracts in which penalties are clearly stipulated (Sky Services, 2011) and real time information exchange. The vertically coordinated nature of the *Bavaria* and *Blue Skies* chains and the involvement of category management use market access as a carrot and cessation of supplier contracts as a stick which also mitigate the constraints as supply chain actors strive for continuity in the export business.

5.5.3 Best practices

In the *Bavaria* and *Blue Skies* mango export chain, real time communication has become best practice in doing business thanks to the advent of emails, RFID, Internet, EDI and satellites. As a result of improved information technology, the actors along the mango export supply chains are able to communicate effectively and timely (Du Preez, 2011; Van Vuren, 2011).

Tracking and tracing systems are also standard practice in the industry. The harmonisation of traceability systems is seen as a best practice that will reduce all problems faced when tracking and tracing products across borders (Du Preez, 2011, Olivier *et al*., 2006:6).

Bar-coding is used extensively, however the technology is limited if pallets instead of cartons are loaded, and this result in problems when tracking and tracing small quantities of the product (Du Preez, 2011). To counteract this problem, many support services are using RFID, so if a problem with food quality arises the mangoes can quickly be traced back to the orchard with all of the accompanying process information. Temperature data log sheets are also regarded as the best practice in the two chains as they give a picture of the cold chain and it is possible to trace where a break occurred. This also informs the producer where to claim insurance if such recourse is available, as specified in the contract.

5.6 SUMMARY

The focus of the chapter was use of information such as product, process and planning as well as the type of information systems used in the *Bavaria* and *Blue Skies* mango export chains. The methodology used in the European Pork chain study (Trienekens *et al.,* 2008) was applied in delineating the information exchange categories and the information used by each actor in the *Bavaria* and *Blue Skies* mango export chains. This was followed by a discussion on use and exchange of information and the major issues and challenges pertaining to use of information and exchange in the two selected mango export chains.

Information used in the *Bavaria* and *Blue Skies* mango export chains was categorised into product, process and planning. The types of information systems used were also discussed. Information use and exchange as well as the information systems in use define the effectiveness of traceability along the supply chains. With respect to product information, it was generally observed that the production unit code and the pack house code were used throughout the chain from the grower to the retailer. Intrinsic (e.g. aroma, ripeness) and extrinsic (e.g. colour, size, grade) product information is also used extensively in the *Bavaria* and *Blue Skies* mango export chains. It was noted that it is mandatory that product information be displayed when labelling the mangoes. Delivery notes, invoices, product handling instructions and temperature data log sheets are also standard as they are exchanged at each link as well as real time communication and traceability systems.

Variations in the shared information occur as a result of different processes and this is based on planning information for example, product information for fresh mangoes was different from that for freshly cut mangoes. Both automated and manual information systems are used in the *Bavaria* and *Blue Skies* mango export chain, the major ones being the radio frequency identification, electronic data interchange, Internet, emails, stock management control systems, telephones, mobile phones and facsimiles.

With trends, there is generally an improvement in the use of information and exchange thereof, evidenced by the better communication and improved traceability systems. Large retailers such as *Waitrose* have also increased reliance on EDI and the internet for communication. However, lack of harmonisation of traceability systems in the supply chain, unreliability of information and communication problems were cited as the major bottlenecks which are mitigated by adhering to strict formal contracts and the real time information exchange.

CHAPTER 6

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 SUMMARY

The study aimed at making an inventory of two selected fresh and freshly cut mango export supply chains from South Africa through mapping the economic structure and organisation. This was achieved through supply chain management investigative tools that make use of supply chain analysis and chain mapping, though a cost analysis could not be carried out due to lack of cost data. Two mango export supply chains were selected; *Bavaria* and *Blue Skies*. The European Pork chain framework (Trienekens *et al.,* 2008) framework was applied in delineating the governance structure and relationships, quality management and use of and of exchange of information.

An overview and description of the South African mango export industry was presented, in which mango production, sales and distribution were discussed. This was followed by a description of the two selected mango export supply chains from South Africa thus *Bavaria* and *Blue Skies* mango export chains. It was noted that the largest production region is the Limpopo Province followed by Mpumalanga Province, KwaZulu-Natal and the Eastern Cape. Fresh mangoes are sold and distributed through three channels thus: local markets, processing and exports with the largest volume of mangoes sold through the processing channel and the least channelled for export.

It was established that *Bavaria* is a producer, packer, exporter of Fairtrade fresh mangoes to *Waitrose* with marketing, handling and distribution carried out by *Westfalia Marketing* (in South Africa) and *Greencell* in the UK. *Blue Skies*, on the other hand, specialises in processing and packaging exotic, deciduous and subtropical fruits for sale in the local market and for export. In both chains, supply chain coordination is carried out on contracted logistics and cold chain services along the supply chain. *Bavaria* and *Blue Skies* are able to meet their market demand

through effective coordination of input suppliers and support services. The other essential role players are South African Mango Growers Association (SAMGA), Fresh Produce Exporters' Forum (FPEF) and regulators, thus Department of Agriculture Forestry and Fisheries (DAFF) and the Perishable Products Export Control Board (PPECB).

It was also established that the governance structure and relationships in the *Bavaria* and *Blue Skies* chains are a reaction to private standards dictated by buyers and public food safety as well as quality assurance standards. This is a reaction to the need to meet food safety and quality requirements of highly perishable products such as mangoes in order to satisfy consumer needs and perceived value. To achieve this, there is widespread use of contracts. Contract terms with buyers and support services are formal, closed and long-term with day-to-day and firm-to-firm communication during the transaction period. *Bavaria* and *Blue Skies* mango export chains are buyer-driven and exports are made in response to buyers' requirements. They are also modular chains that make use of category management and use forward integration to reach their markets with a high degree of asset specificity and a shortened supply chain. *Blue Skies* also has a hierarchical form of governance.

Quality and safety management in the *Bavaria* and *Blue Skies* mango export supply chains is done in order to conform to food safety and quality assurance standards dictated by the buyers. The Plan-Do-Check-Act (PDCA) cycle was applied on identified critical activities and processes in accordance to the different quality and food safety chains used by *Bavaria* and *Blue Skies*. Quality management elements used in the two selected mango export supply chains are Global GAP, Fairtrade, BRC, HACCP, ETI, IFS, and LEAF. In South Africa, PPECB and DAFF play crucial roles in regulating and overseeing quality and safety management in the two supply chain through inspections and audits. DAFF carries out public audits and inspections are at grower-pack house level and PPECB along the chain, until the load of fresh produce exits the country. PPECB certification is conducted annually. In the UK, apart from private standards, the agricultural and health departments inspect the mangoes at the port of entry and along the chain to ensure safety and quality.

Due to perishability of the mangoes, effective information use and exchange with information systems in the *Bavaria* and *Blue Skies* mango export supply chains were found to be the key to efficient traceability. In the *Bavaria* and *Blue Skies* mango export chains, information used was categorised into product, process and planning. The types of information systems used were also discussed. With respect to product information, it was generally observed that the production unit code and the pack house code ware used throughout the chain, from the grower to the retailer. Intrinsic and extrinsic product information is also used extensively in the *Bavaria* and *Blue Skies* mango export chains. It was noted that it is mandatory that product information be displayed when labelling the mangoes. Delivery notes, invoices, product handling instructions and temperature data log sheets are also standard as they are exchanged at each link. Manual and automated information systems are used in the *Bavaria* and *Blue Skies* mango export chains. These are radio frequency identification, electronic data interchange, Internet; emails, stock management control systems, telephones, mobile phones and facsimiles.

The major issues and challenges in the *Bavaria* and *Blue Skies* are a result of factors that affect mango perishability, mainly post-harvest handling procedures such as packaging, transportation, storage, ripening and distribution. The challenges are compounded by the presence of numerous service providers who handle the mangoes, thus posing a logistical dilemma for a highly organised export market that demands high quality product from the suppliers. Poor safety and quality management result in economic losses due to product rejections, product recall and cessation of buyer-supplier relationship.

The major challenges in the two chains were cited as breaks in the cold chain and communication bottlenecks, both contributing to dead weight problems and protracted insurance claims. In addition, there are high certification costs which are a barrier to entry for small scale producers and exporters, though they are a positive investment. Inefficiency in logistics and the cold chain management were also cited, and this increases the transit time, resulting in increased risk of loss to the producer and exporter. The bottlenecks in the *Bavaria* and *Blue Skies* chains are mitigated mainly by use of contracts as a coordination mechanism which specify the conditions and penalties, and through the use of an effective cold chain that combat mango perishability. Regulatory functions of PPECB and DAFF, as well as use of quality

audits and inspection are also indispensable in aiding supply chain actors to adhere to private food safety and quality standards.

As best practices, there is also reliance on real time communication and traceability systems as well as temperature data logging from pack house to the retailer which are regarded. However, it is expected that the stringency, scope and role of quality and safety management standards will increase in the future and this will continue to pose barriers to entry to small scale chain actors. Formal and informal contracts are expected to remain as more retailers increase control of supply chains because of heightened food safety concerns and quality. In turn, more producers' alliances are expected with small producers as part of the alliances and downstream control of the marketing activities, mostly through category management.

6.2 CONCLUSION

The organisation and economic structure of the *Bavaria* and *Blue Skies* mango export chains reflect the developments that are taking place in the global agricultural supply chains. The dynamic changes are a result of a proliferation of food safety and quality standards put in place to mitigate the food scares and food borne diseases that have marred agricultural supply chains. Poor mango safety and quality management results in economic losses due to product rejections, product recall and cessation of buyer-supplier relationships.

Food safety and quality management standards are shaping the structure and organisation of the two chains and their stringency has increased with a widened and deepened scope. It can be concluded that the governance structure and relationships in the *Bavaria* and *Blue Skies* mango export chains show that both chains are buyer-driven and market-oriented, with a high degree of supply chain coordination of support services. Activities are sanctioned by contracts and this reduces risks of loss during product handling and hence reduced economic losses to the supply chain actors. *Bavaria* and *Blue Skies* mango export chains are modular in nature and use category management and forward integration to reach their markets. They have a high degree of asset specificity and a shortened supply chain. *Blue Skies* also has a

hierarchical form of governance in which centralised decisions made by the holding company are implemented by category management upstream.

There is product and process differentiation as well as strategic positioning of category managers along the chains, resulting in *Bavaria* and *Blue Skies* gaining competitive advantage on the global market. *Bavaria* specialises in the export of fresh Fairtrade mangoes with category management close to the market, whilst *Blue Skies* specialises in the export of freshly cut mangoes and salads that are retailer custom packed. *Blue Skies* category managers are positioned upstream close to the source of raw materials. The positioning is advantageous in that lead times in delivering the mangoes are shortened and the cost of acquiring market information reduced as a result of improved traceability though traceability systems remain heterogeneous.

However, the ability to adopt a standard is directly affected by the scale of business operations and adoption is mandatory in order to access global export markets which ultimately are a technical trade barrier leading to the exclusion of small scale producers and exporters. Due to the high capital outlay and certifications costs of standards, large scale mango producers and exporters are able to get certified as they are able to meet the costs and requirements unlike small scale operations. In the case study, because of their large scale of operations, B*avaria* and *Blue Skies* are able to secure certifications of different standards and access export markets. Food safety and quality certification is an investment which pays off immediately in the ability to access markets. Though the recurrent operational costs of certification such as audits are high, these are recouped over time as the producers and exporters continue to export.

6.3 RECOMMENDATIONS

The principal challenge in the *Bavaria* and *Blue Skies* mango export chains emanate from the fact that mangoes are highly perishable and the markets and the enlightened consumer requires high quality and safe products. This is achieved through food safety and quality standards which shape supply chains' structure and relationships. It should be noted that the two selected mango export chains of *Bavaria* and *Blue Skies* are just part of a vast industry. The case study of the two

chains highlights food safety and quality standards' importance both as a means to access export markets and as technical barriers to entry into global export markets.

Therefore, the following recommendations are made:

i. Further studies on the South African mango export industry would shed more light on how quality and food safety standards are affecting the mango export industry as a whole.

ii. An assessment should be made of standards as technical trade barriers and the impact on small scale agriculture and its future in South African agriculture and globally.

iii. There is need to look at how the mango industry is reacting to private and public quality standards in terms of innovations and performance, and to carry out value chain analysis.

iv. It is important to address the bottlenecks in the mango export chains as they are affecting the efficiency and functioning of the chains.

v. Mango exports have been continuously declining in South Africa, therefore a closer look at this area is recommended. There is a need to examine the reason for preference towards mango processing as the most favoured marketing outlet, as this has a bearing on mango export in the long run.

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APPENDIX: INTERVIEW QUESTIONS

These generic questions formed the basis of the interview to the different role players. Questions asked sought to explore the exchange relations, quality management and standards used information use and exchange.

Interview type:
Name of company:
Date:

Description of core business*:*

EXCHANGE RELATIONS

What type of contracts do you have with your clients?

[1] [ ] Verbal agreement
[2] [ ] Open or relational
[3] [ ] Handshake agreement
[4] [ ] Seasonal contract

1. Frequency of transactions with the client-is it once off or long term?
2. Indicate the major problems you face as an actor.
3. What are the best practices in the means of carrying out exchange transactions?
4. How has your core business along the fresh mango supply chain changed over the last decade?
5. What are your expectations of the exchange dimensions in the next five years?

Quality management and standards

1. Which quality management standards do you use as a supply chain actor?
2. Do you undergo quality standard certification process? If yes, from whom, e.g. government etc.?
3. Do you do quality assurance audits / inspections? If yes, how frequently?
4. In case of emergencies, breakdowns e.t.c., how do you ensure that the product being delivered reaches intended destination in a good state within expected time?
5. Who carries risk (where do ownership of product begins and end?).
6. Indicate the major problems you face as a role player with regards to quality management and standards in the fresh produce supply chain?
7. What do you regard as the best practices in ensuring quality management as a role player?
8. As a supply chain actor along the fresh mango export chain, how has quality management and standards changed over the last decade?
9. What are your expectations with regard to quality management and standards in the next five years?

Information use and exchange

1. Explain the importance of information to your core business and the significance of information use and exchange along the fresh mango export supply chain.
2. What type of information do you keep as records and for planning purposes as an actor in the fresh mango export supply chain?
3. Do you use manual or automated information system to trace and track the mangoes, trucks, cargo e.t.c along the supply chain?
4. If answered automated above, please specify the name of the systems
5. When conducting business, do you use email, Internet, phone, e.t.c.?
6. How frequently do you record and update information of the fresh mangoes, truck movement and cargo e.t.c.?
7. Do you encounter problems in the use and exchange of information with clients? If yes, indicate the nature of the problem(s).
8. What do you consider as the best practice in the way information is used and exchanged in your core business along the fresh mango export supply chain?
9. Indicate the changes that have taken place in the way information is used and exchanged in the past 10 years.
10. What are your expectations of information use and exchange in the next 5 years?