



A procurement marketing framework for the potato processing market in the Eastern Free State

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BLOEMFONTEIN

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DECLARATION

I declare that the thesis which is hereby submitted for the Philosophiae Doctor with an endorsement in Business Administration at the Business School, University of the Free State, is my own independent work and that I have not previously submitted this work, either as a whole or in part, for a qualification at another university or at another faculty at this university. I also hereby cede copyright of this work to the University of the Free State. The thesis is based on five-article publishable scientific paper format. The articles were published in the following Journals: Agrekon, International Farm Management Association, African Journal of Agricultural research.



Dirk B. Strydom

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Summary

A procurement marketing framework for the potato processing market in the Eastern Free State

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The potato processing industry's production has increased over the last few years by as much as 143% within 10 years; together with this there is also an increased growth in the import of frozen fries. This puts direct pressure on the processing companies to procure good quality potatoes at reasonable prices, in order to remain competitive. Within the South African potato industry there are two main marketing channels for producers to market their potatoes, these are the table potato channel and the processing potato channel. There are many differences between these two channels, such as pricing structures, risks and after-harvest costs structures.

Processing companies have no framework to assist them in structuring and strategize regarding their procurement marketing. The aim of this study is to develop a procurement marketing framework that will assist processing companies with the establishment of longer term contracts and relationships with producers as suppliers. This framework is constructed

by evaluating the needs of producers, transaction costs, the profit margins, risks, purchase agreements and incentives such as Decision Support Systems (DSS).

Within the study the advantages and disadvantages of the processing industry were identified. A matrix is developed in order to quantify and rank these advantages and disadvantages. The results were used to develop and recommend procurement strategies. The contract potato producers are the clients of the processing companies in terms of backwards marketing, thus it is important to determine the characteristics of these producers. Characteristics of these producers were determined by using a Principal Component Regression (PCR) and a Logit model. The identified characteristics assist processing companies with identifying their target producers. The characteristics also help in terms of developing new contractual agreements according to the needs of producers and processing companies.

Transaction costs are extremely important for producers when making marketing decisions. The magnitude of transaction costs were determined and compared between the two marketing channels by using a questionnaire and applying statistical analysis. It was found that the processing industry, which uses contracts as a governance structure, has the lowest transaction costs.

In terms of risks, the yield risk and price risk of each channel were quantified by using a Cumulative Distribution Function (CDF). Because of the different after-harvest cost structures, a model was developed to calculate a farmgate price for both channels. This allows the two channels to be compared and the most profitable channel to be identified. It was found that the yield risk for both channels were the same over a period of seven years, although the table potato channel has a higher level of risk in terms of prices. By means of using all the information retrieved from these models, a DSS was developed which enables the producers to make a marketing decision according to the producers' current market prices for both channels and the risk aversion level of the producer. The DSS calculates a breakeven contract price, where the producer is indifferent between the two marketing channels.

Combining the results in terms of transaction costs, risks and profit margins, a procurement marketing framework was developed in order to develop procurement marketing strategies. This first of a kind of framework quantifies the different elements and identifies the regions

that need improvements. The basis of the framework is based on the procurement marketing theories where one combines requirements and incentives.

The study contributes to the field of knowledge by means of the development of new incentives and procurement strategy tools, which can be used by processing companies to structure longer term contracts.

Opsomming

'n Verkrygingsbemarkingsraamwerk vir die aartappel- prosesseringsmark in die Oos-Vrystaat

deur D B Strydom

Graad: Philosophiae Doctor met 'n endossement in
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Produksie in die aartappel-prosesseringindustrie het in die afgelope jare met soveel as 143% binne 10 jaar toegeneem. Tesame hiermee was daar ook 'n toename in die groei van die invoer van bevrore aartappelskyfies. Dit plaas direkte druk op die produserende maatskappye om goeie gehalte aartappels teen redelike pryse te verkry om kompetend te wees. Daar is twee hoofbemarkingskanale in die Suid-Afrikaanse aartappelindustrie waarvan aartappelproduseerders gebruik kan maak om hul produkte te bemark, naamlik die tafelaartappelkanaal en die prosessering-aartappelkanaal - elk met verskillende prysstrukture, risiko's en na-oeskoste-strukture.

Prosesseringsmaatskappye het geen verwysingsraamwerk wat ondersteuning in die strukturering en strategiebeplanning rakende verkrygingsbemarking kan bied nie. Die doel van hierdie studie is om 'n verwysingsraamwerk vir hierdie mark te ontwikkel wat sodanige verkrygingsmaatskappye kan help om langtermynkontrakte en verhoudings op te bou met produseerders as die verskaffers. Die raamwerk is daargestel deur die evaluering van die produsent se behoeftes, transaksiekoste, winsmarge, koopoooreenkomste en insentiewe soos die Besluitnemingsondersteuningstelsel.

Die voor- en nadele van die prosesseringsindustrie is in hierdie studie geïdentifiseer. 'n Matriks is ontwikkel om hierdie voor- en nadele te kwantifiseer en te rangskik. Die resultate is gebruik om verkrygingstrategieë te ontwikkel en aan te beveel. Die kontrak-aartappelprodusente is die kliënte van die prosesseringsmaatskappye met betrekking tot terugwaartse bemerking. Daarom is dit belangrik om die eienskappe van die produseerders te bepaal. Eienskappe van die produseerders word bepaal deur gebruik te maak van 'n Prinsipiële Komponent Regressie en 'n Logit-model. Die geïdentifiseerde eienskappe help prosesseringsmaatskappye met die identifikasie van hul teikenprodusente. Die eienskappe is ook tot hulp ten opsigte van die ontwikkeling van nuwe kontrakoooreenkomste volgens die behoeftes van die produsente en die prosesseringsmaatskappye.

Transaksiekoste is baie belangrik vir produsente wanneer bemerkingsbesluite geneem word. Die omvang van die transaksiekoste is bepaal en 'n vergelyking is tussen die twee bemerkingskanale getref deur van 'n vraelys en statistiese analise gebruik te maak. Daar is bevind dat die prosesseringsindustrie wat van kontrakte as staatstrukture gebruik maak, die laagste transaksie- koste het.

Sover dit risiko's, opbrengsrisiko en prysrisiko van elke kanaal aangaan, is dit gekwantifiseer deur gebruik te maak van 'n Kumulatiewe Distribusiefunksie. As gevolg van die verskil in oeskostestrukture, is 'n model ontwikkel wat die prys vanaf die plaashek vir albei kanale kan bereken. Dit beteken dat die twee kanale vergelyk kan word om sodoende die mees winsgewende kanaal te identifiseer. Daar is egter bevind dat die opbrengsrisiko vir albei kanale oor 'n tydperk van sewe jaar dieselfde gebly het, alhoewel die tafel-aartappel 'n hoër risiko ten opsigte van prys inhou. Deur al die inligting wat deur middel van die modelle verkry is, te gebruik, is 'n DSS-model ontwikkel wat produsente in staat stel om, in ooreenstemming met die huidige produsentemarkprys ten opsigte van albei kanale en die risiko-aversievlak van die produsent, besluite te neem. Die DSS bereken 'n gelykbreek-kontrakprys waar die produsent onpartydig tussen die twee bemerkingskanale staan.

Deur die resultate van die transaksiekoste, risiko's en winsmarge te kombineer, is 'n verkrygingsbemarkingsraamwerk vir verkrygingstrategieë ontwikkel. Dit is die eerste tipe raamwerk wat verskillende elemente kwantifiseer en streke identifiseer waar verbeteringe aangebring moet word.. Die basis van die raamwerk is gebaseer op die verkrygingsbemarkingsteorieë waar behoeftes en aansporings gekombineer word.

Hierdie studie dra tot die kennisveld by deur middel van die ontwikkeling van nuwe aansporings- en verkrygingstrategieë wat deur maatskappye gebruik kan word om langtermynkontrakte daar te stel.

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1.1. Introduction and background

The potato industry in South Africa is important to the South African economy. It contributed approximately 38% of the gross value of vegetables produced in South Africa during 2007 (National Department of Agriculture (NDA), 2008). The potato industry consists mainly of suppliers of seed potatoes, table potatoes, and potatoes for the processing industry. During 2007, the processing industry handled about 19% of the potatoes harvested in South Africa, of which 55% were processed into potato chips, 43% into crisps, and the remaining 2% was used for canning, mixed vegetables and some other uses (Potato SA, 2009). The last decade saw a substantial increase in the volume of potatoes that were processed into frozen fries – from 70000 tons in 1997 to 170000 tons in 2007, which reflects a growth of 143% (Potato SA, 2009). Thus, frozen fries are becoming increasingly important as a final product within the potato industry of South Africa. According to these figures, the potato processing industry in South Africa is a growing industry.

In terms of the fresh produce industry (table potatoes), there was substantial growth as well. This growth is mainly because of factors such as improved technology, better cultivars and better production systems, and the like. However, the largest contributor to the growth is the introduction of new cultivars. The main cultivar produced is the Mondial cultivar, mainly because of the fact that it is a large potato which is attractive to consumers and which produces high yields. Mondial, according to Potato SA (2012), constitutes 58% of the total potato market.

South African potato producers have two main marketing channels. The first is the normal fresh market, which is referred to as the spot market. The second channel is the processing

market, which can be divided into two sub-sectors, namely frozen fries and crisps. This channel is known as the contract market.

Both main marketing channels within the potato industry have made some industry changes and have grown over time. These changes make it difficult for producers to choose between the different channels. The table potato channel is the oldest channel and the most popular marketing channel. The processing channel only started at a later stage and currently has a high growth and is constantly growing.

The problem is that processing companies do not obtain enough potatoes from producers in order to satisfy the demand through production. This means that procurement marketing (backwards marketing) is struggling. According to Tunisini and Bocconcelli (2009), procurement marketing is becoming increasingly important, even more than sales marketing. In agri-business procurement, marketing is very important, mainly because if the company does not receive the raw material (commodities) it cannot produce the final product.

In an agricultural environment, procurement marketing is based on four legs: Transaction costs, risk, profit margins and contractual agreements. These four variables are the most important variables when producers choose between the two marketing channels. The question is how the two channels compare regarding each variable from the perspective of producers and what possible strategies might be developed from these variables in order to compile a procurement framework for processors.

1.2. Aim and objectives

The aim of this study is to assist potato processing companies in South Africa with their procurement marketing by means of constructing a procurement marketing framework. According to Rhodes, Dauve and Parcell (2007), producers evaluate a marketing channel according to the following attributes: profit margins, risk, transaction costs and purchase agreements. In order to satisfy the aim of the study, these attributes will be evaluated and compared between the two different marketing channels, together with the development of new marketing strategies and incentives.

The aim is supported by the following objectives:

- To evaluate literature regarding theories, such as transaction cost economics, contract marketing, procurement and framework analysis.
- To analyse producers' perceptions of the processing industry to identify those factors that prevent them from entering into contracts.

Producers are the clients of the processing companies, thus it is important to understand what the disadvantages are and also what the producers foresee as advantages within the processing industry. In this objective strategies will also be identified in order to develop longer-term contracts. The advantages, disadvantages and strategies will be collected by means of using focus group interviews with both producers and processors. In order to quantify the advantages and disadvantages a matrix is developed. This matrix will assist in the relevance of each factor.

- To determine the magnitude of transaction costs within the potato industry's different governance structures.

Transaction costs are very important for producers; the magnitude of each marketing channel is determined by means of using a questionnaire according to the Transaction Cost Economic theory. The data are analysed and confirmed by means of using Anova tables and the Fisher exact test. These results obtained can assist processing companies in identifying the attributes where there are high levels of transaction costs. The strategies in this section are developed in order to reduce transaction costs.

- To determine the characteristics of contract potato producers.

In the transaction cost objective it is identified that the contract producers have lower transaction costs. Thus, in order to obtain more producers the contract must be amended according to the characteristics of contract producers. The results obtained from the questionnaire were analysed by means of combining a Principal Component Regression (PCR) and a Tobit model. This section also identified the target producers which processing companies might approach for contracts.

- To determine the price risk, yield risk and profit opportunities of both marketing channels.

There are different yields, prices and purchase agreements for each channel. In order to quantify the yield, and price risk Cumulative Distribution Functions (CDFs) are developed from historic prices. This gives the researcher the ability to determine which marketing channel was historically the most profitable. Before the research can use these CDFs, a model is developed in order to determine the farmgate prices of each marketing channel. In order to compare the two channels, the Gross Production Value is calculated which is then used in order to compare the two channels.

Owing to the difference in yields and prices, a Decision Support System is created in order to assist producers in their marketing decisions. This is done by means of using risk averse levels and certainty equivalents in order to simulate a breakeven contract price. The breakeven price is the level where the producers are indifferent between the two channels according to the producers' risk levels. This is a new method developed to assist producers in marketing decision making.

- To develop a procurement marketing framework, together with possible marketing strategies.

The procurement framework is developed by means of quantifying each attribute (risk, profit, purchase agreement and transaction costs) into a framework. This framework provides the user with an index that is used rank the attributes. These attributes are then complemented with marketing strategies and incentives, which is a new concept in procurement marketing theory.

1.3. Conceptual framework

According to Shields and Tajalli (2006), the most appropriate micro-conceptual framework to use for this research is a Practical Idea Type. This framework is advantageous mainly when research findings are used to make recommendations, which means that the intention is to improve current programmes and to rate these specific programmes, such as contract marketing in agriculture.

In order to determine why producers are reluctant to participate in the processing market, the researcher must analyse the perceptions of the industry. This means, the advantages, and the disadvantages of the industry must be evaluated. According to Jooste, Strydom, Du Plessis and Berndt (2009), the most appropriate method is to use a matrix, mainly because of the quantitative data the researcher will receive. This will provide the researcher with critical information of what are the most important variables to evaluate within the four legs mentioned in the previous section. In order to compile a procurement marketing framework, the four legs will be examined for both marketing channels, namely spot (fresh produce) and contract (processing).

The first leg is transaction costs: it is important to determine the magnitude of transaction costs within each marketing channel. According to Williamson (2000), Transaction Cost Economic Theory suggests that transactions associated with high levels of transaction cost require a governance structure that can contribute to the reduction of high transaction costs and risk. Thus, agricultural contracts are the most suitable governance structure, given the high transaction costs associated with the potato processing industry (Vermeulen, Kirsten & Sartorius, 2008). However, this can differ from commodity to commodity and this is why it is important to evaluate the transaction costs between the two markets.

The second leg is profit margins: the profit margins will be compared for both the above-mentioned channels. The production processes of both the industries differ and that implies that their transfer costs differ. In order to calculate and compare the two channels, a complete cost analysis must be done to obtain a farmgate price. The farmgate price will make it possible to compare the two marketing channels.

The third leg is price risks associated with each channel. According to Du Preez and Van Zyl (2010), the spot market has a high price volatility, which largely contributes to price risk. The contract market also has risk, although the magnitude is not known. According to Richardson, Schumann and Feldman (2004), a triangular distribution can be used to calculate the risk of producers in not covering their direct allocated costs, indicating the magnitude of risk. It is therefore important to evaluate the risk and to compare it with the spot market.

In the fourth leg, it is important to evaluate the different types of purchasing agreements of the two channels. It is also important to evaluate how these agreements are performing and

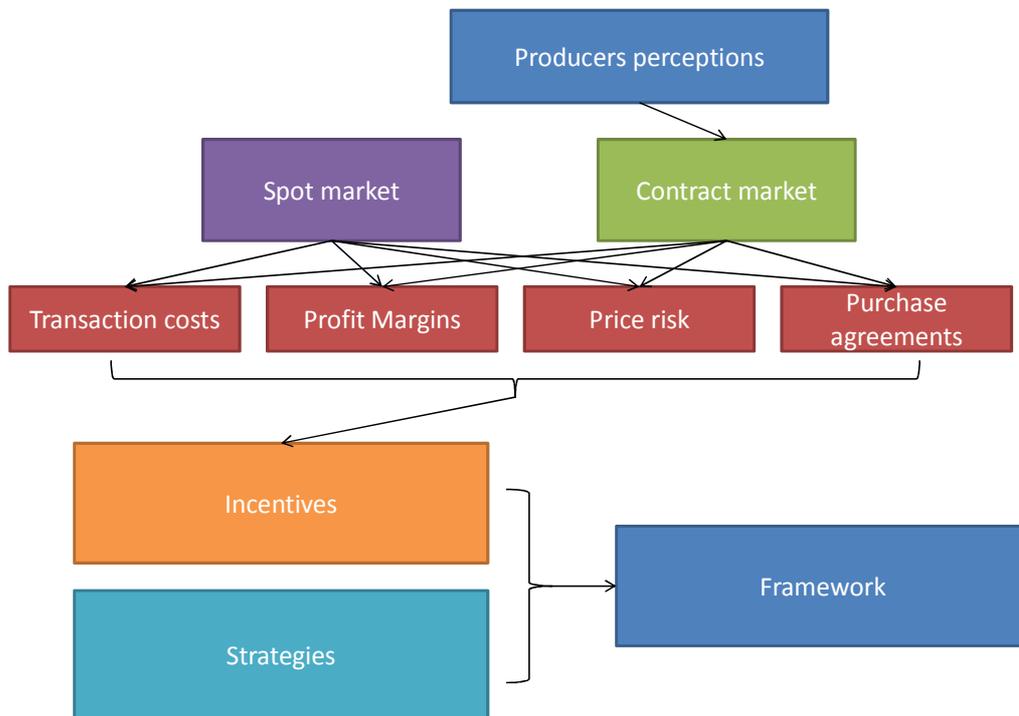
what new strategies can be used to attract new producers within the agreements. According to Vermeulen *et al.* (2008), contract theory can be used to evaluate contracts within the processing industry.

From the results obtained in the four legs above, various incentives can be developed in order to enhance the procurement of processing potatoes. These can include incentives such as a negotiating tool, which can be used in the marketing process. The negotiating tool can be developed by means of constructing a standardised enterprise budget. This budget can be used to calculate risk and price margins. Most of the processing companies cannot increase the prices paid to producers owing to limited profit margins and import competition. Thus, in order to increase the profit margin of the producer, the production cost must decrease.

In order to reduce production costs Gereffi, Humphrey and Sturgeon (2005) have suggested supply chain management, which can generate economies of scale. They have suggested that companies should use economies of scale (price discrimination of volume) to reduce the client's (producer's) costs. Thus, the processing companies can buy inputs, such as fertilizer in bulk, and then sell the fertilizer to the producers at a lower price than the normal market price. This will decrease the production costs and increase the producer's profit margin with no need for price increases as an incentive.

Strategies can also be developed from the results and the incentives. These strategies will assist processing companies with the procurement process and to reposition their agricultural departments according to the strategies. The procurement framework will be developed from the results, incentives and strategies in order to assist processing companies to obtain new producers and increase their procurement quantities and quality. Figure 1.1 is a summary of the main concepts that will be used in the research.

Figure 1.1: Establishing long-term contracts in the South African potato processing industry



Source: MacDonald, Perry, Ahearn, Banker, Chambers, Dimitri, Key, Nelson & Southard (2004) and Williamson (2000)

1.4. Research design

According to Bryman and Bell (2007), the in-depth single organisation case study combined with a comparative study will be the most appropriate design for this specific study. This is mainly because the focus of the study is only on the potato processing industry and not the entire vegetable processing industry. The case study will consist of qualitative components, using data collection strategies at a single point in time. This research design will be used to determine the perceptions of the producers in this specific industry along with the evaluation of transaction costs. This means that the case study design will mostly take place in the form of a representative/typical case, which is defined by Bryman and Bell (2007) as “To explore a case that exemplifies an everyday situation or form of organisation”. The case study design is important because it will be used in order to determine the producers’ perceptions (advantages and disadvantages) of the processing industry, together with the possible transaction costs present in the industry.

A mixture of designs is used since the assessment of the producers' perceptions, using a case study design, uses qualitative data which consist of textual data. These data will assist with the confirmation of the quantitative results regarding transaction costs, price risks purchase agreements and profit margins. With the knowledge gained from the case study design it will be possible to develop a questionnaire. Thus, the qualitative research will facilitate the quantitative research. The data will consist of numerical and textual terms which will assist the researcher in developing and confirming hypotheses.

1.5. Conclusion

Although the potato processing market is a fast-growing industry, processors are struggling to procure potatoes from producers. This procurement marketing framework will assist processing companies by means of first evaluating the profit margins, transaction costs, price risks and contractual agreements from the viewpoint of the producers. Secondly, these views will be used to develop a framework which will assist the processing companies with their procurement marketing.

The framework will be developed as a generic framework which can be used for other commodities, with small adjustments. The thesis was written in a scientific paper format with five published papers addressing each critical concept.

1.6. Study outline

Chapter 2 is an overview of the relevant theories used within the study, as well as an overview of the South African potato industry. Chapter 3 indicates the different research methodologies used in order to arrive at the relevant results, as well as the incorporation of the different methodologies used. Chapter 4 is an explanation of potato producers' perceptions regarding long-term contracts and the potato processing industry. Chapter 5 evaluates the magnitudes of transaction costs within the different potato marketing channels. The characteristics of contract potato producers are determined in Chapter 6, followed by the creation of a Decision Support Model, which quantifies the price risk, yield risk and profit opportunities within the different marketing channels in Chapter 7. Chapter 8 is the development of a procurement marketing framework with the relevant possible marketing

strategies. The final chapter, Chapter 9, includes the final conclusions and recommendations in view of possible procurement marketing strategies.

2.1. Introduction to procurement marketing

The literature review will provide an understanding of the theories used within the research, such as Procurement Marketing, the New Institutional Economics Theory, Transaction Cost Theory and contract marketing. These will be combined with a review of the implementation of the specific theory.

Procurement and marketing as a holistic picture is becoming increasingly important. Various authors have dedicated their attention to the importance of the association between marketing and procurement and have identified that both are inevitable and beneficial (Piercy, 2009; Sheth, Sharma & Iyer 2009). Sheth *et al.* (2009) have reasoned that these two focus areas should work closely together, mainly because of two reasons:

The first is related to the fact that marketers become solution oriented rather than product focused and they thus will need to source products and services from third party vendors with a consequent and inevitable deeper involvement of the purchasing department. The second reason is connected with the emergence of customer-centric marketing coupled with produce-to-order processing, which will lead to a better alignment of marketing and purchasing to deliver solutions to customers.

Authors such as Lambert and Cooper, (2000), Jüttner, Christopher and Baker (2007), and Bals, Hartmann and Ritter (2009) have investigated the same ideology in Supply Chain Management and all of them came to the same conclusion as the above-mentioned authors. According to Tunisini and Bocconcelli (2009), “especially when it is recognized that the

supply chain moves to create value in the eye of the customer who is the one who activates the supply chain and to which supply chain processes are directed”.

Procurement has also started to become one of the most important stages within a business environment. There is a new thinking about procurement: it is not only a purchasing department but also a highly strategic-oriented department. Lamming and Cox (1995) and Hardt, Reinecke and Spiller (2007) have indicated that procurement departments are becoming increasingly strategic within companies. Strategic action is needed to improve a company's performance within the procurement department's effectiveness (Gadde & Håkansson, 2001; Trent, 2004; Axelsson, Rozemeijer & Wynstra 2005; and Monczka, Trent & Handfield 2005).

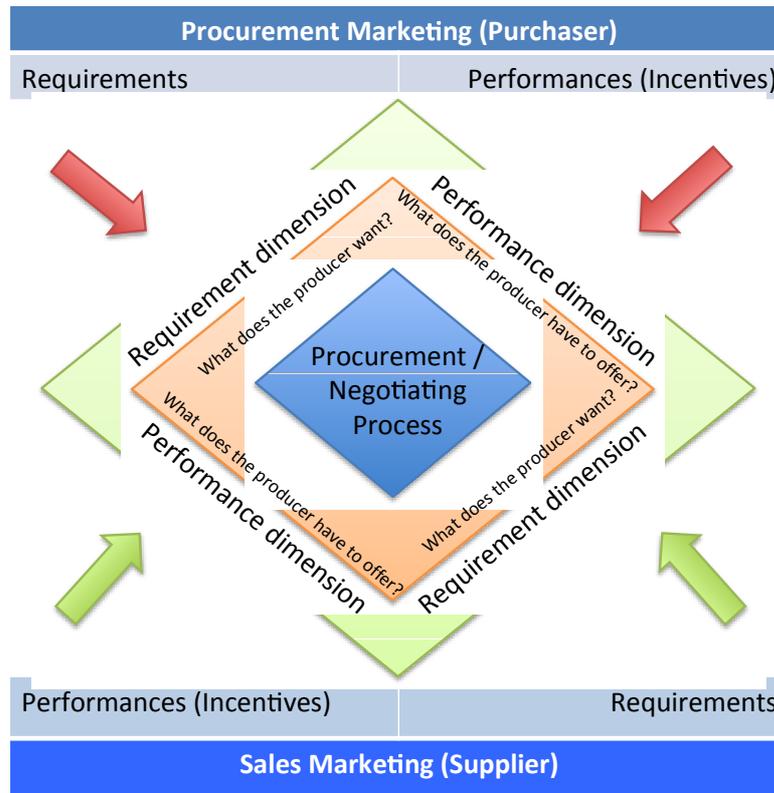
In agriculture this is even more important since the raw materials used in the production process are normally commodities (Masuku, Kirsten & Owen, 2004). Accordingly, new strategies are needed to improve the procurement process of processing potatoes in South Africa.

2.1.1. Coalition and Incentive-Contribution theory

Innovation and acceptance are almost the most important in terms of procurement marketing. Processing companies need to think strategically and innovatively to attract producers to produce for them. This means that there is a need for incentives and persuasive negotiation. According to Koppelman (2003), everything a company does affect its corporate image. It does not go unnoticed how a company treats the environment, its suppliers, staff and customers. This means that a company cannot afford to take short cuts.

Koppelman (2003) identified certain theories that must be kept in mind with procurement marketing. The first theory is Coalition theory, the basic principle of which is that if everyone within the business environment (staff, suppliers and directors) is satisfied, the business has long-term feasibility. In terms of procurement it is simple if the supplier feels that he must procure at low prices, the producers will start to investigate methods to decrease costs. This will lead to lower quality, or even worst case, alternative buyers. The second theory is Incentive – Contribution theory, highlighted by Figure 2.1 below.

Figure 2.1: Incentive- Contribution theory within procurement marketing



Source: Koppelman (1998)

According to this theory, buyers will always prefer to purchase at the lowest cost, although the buyer must also provide the supplier with something to convince the suppliers to sell the produce. This theory is based on two divisions, namely the requirements and the performances. The importance of the requirement is to identify the objectives of both the supplier and the buyer and to determine what the requirements are to satisfy these objectives. In terms of performances, the questions to be answered are: what incentives are in place for the supplier if the performance is up to standard and what are the benefits for the buyer.

This theory links up with Rhodes *et al.* (2007) who state that a producer will evaluate the profit, effort, capital requirements/costs and benefits of a product before making a producing and marketing decision.

2.2. Introduction to the Economics of Institutions

In order to develop a procurement-marketing framework in the potato processing industry, comparisons will be made between the table potato industry and the potato processing

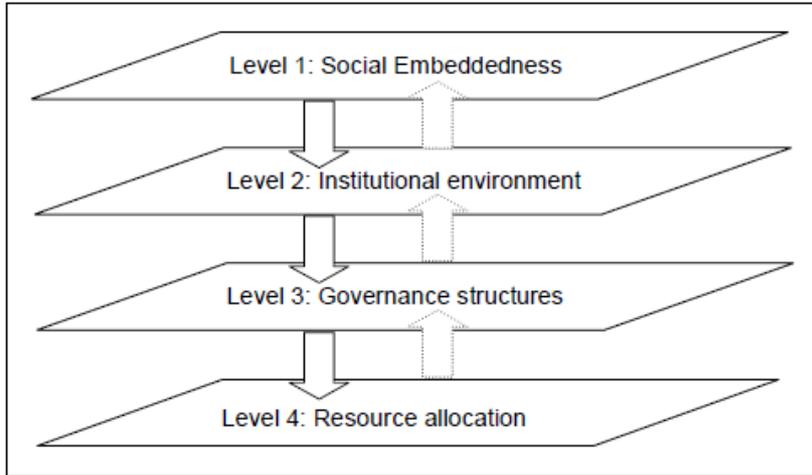
industry. The largest difference between these industries, in terms of market structures, is the form of governance. The table potato industry operates in a spot market, while the processing industry operates in a contractual market. It is important to evaluate which governance structure is the best suited: this could then be used to promote contract agreements with new marketing strategies. The researcher identified New Institutional Economics, more specifically Transaction Cost Economics, as the most appropriate theory to compare these two structures, mainly because Transaction Cost Economics evaluates governance structures.

Williamson (1998) has stated that the concept of a firm as a production function must change more to a firm as a governance structure, which is an organisational structure. From this point of view new theories were developed, such as New Institutional Economics. According to Jordaan, Grové, Khaile and Maenetja (2009), Neo-classical economics is considered to be insufficient for the purpose of evaluating different governance structures. Jordaan *et al.*(2009) state that Neo-classical economics fails to explain the high occurrence of market failure and imperfect markets, which exist mainly in developing countries. This failure and imperfection mainly results from the higher transaction costs and information asymmetries founded in these countries. According to Harrera (2005), institutional economics overcomes all of the limitations mentioned above. Institutional economics is fundamentally concerned with problems of market coordination and the incentives for economic agents to devise institutional responses in terms of market imperfections (Dorward, Chirwa, Kelly, Jayne, Slater & Boughton, 2008). In terms of a micro perspective, the theory is concerned with the institutions of governance that deal with modes of organisation and contract within businesses and markets (Jordaan *et al.*, 2009). Thus, given the above-mentioned points, it was decided to use New Institutional Economics as a base theory for this study.

According to Williamson (1998), “The New Institutional Economics Theory” is divided into two parts. Part one deals with the institutional environment – the rules of the game – and traces its origins to Ronald Coase’s 1960 paper on “The Problem of Social Cost”. Part two deals with the institutions of governance – the play of the game – and originates with Coase’s 1937 paper on “The Nature of the Firm”. Williamson (2000) developed the Economics of Institutions Framework, which focuses on four different levels of social analysis used to analyse institutions. Figure 2.2 below illustrates the different levels of social analysis. The first level is the level of Social embeddedness, followed by the Institutional environment on

the second level. The third level is Governance structures and the fourth level is Resource allocation.

Figure 2.2: Williamson’s Economic of Institutions framework levels



Source: Adopted from Jordaan *et al* (2009) and Milagrosa (2007)

Social embeddedness refers to customs, traditions, and societal norms. At this level, changes in customs, traditions and societal norms occur at the rate of centuries to millennia, which mean that changes take place in a period of over 100 years (Williamson, 2000). The informal and formal rules of the institutions are stated in the institutional environment. This level is often explained as the rules of the game (Milagrosa, 2007). At this level, changes in terms of informal and formal rules of institutions take place at a rate of 10 years to a century. “Governance structure generally refers to the way by which transactions are coordinated” (Jordaan *et al.*, 2009), for example contractual agreements. The last level, which is Resources allocation, investigates among others, the prices and production quantities of the specific institution.

Jordaan *et al.* (2009) and Milagrosa (2007) have explained that the respective levels are connected together as shown by the arrows in Figure 2.2 above. The downward moving arrows indicate that the higher level places constraints on the lower levels. “The level of social embeddedness thus determines the character of institutions that are formed in the institutional environment” (Williamson, 1998). Whereas the type of governance structure used is based on the institutional environment, the mode of governance at the third level determines the manner in which resources are allocated in the last level. The upward arrows again indicate feedback from the lower level to the upper level (Milagrosa, 2007). The

purpose of this study is to develop a procurement marketing framework within the potato processing industry. Accordingly, the focus will be on level three, which refers to governance structures.

2.2.1. Governance structures

Milagrosa (2007) defined governance structures as “the manner in which production and marketing activities are organised among interested parties”. Generally, there are three different types of governance structures within the agriculture industry (Williamson, 1996 cited by Jordaan *et al.*, 2009). These structures are the spot market, hierarchy/vertical integration and hybrid modes. “With vertical integration the trading partners are under unified ownership; where the hybrid mode preserves ownership autonomy which means that in the presence of hybrid governance structure, one party still can act on possible price movements without consulting the other party” (Jordaan *et al.*, 2009).

A transaction (producer to buyer of commodity) can be organised in a number of different ways with different amounts of costs being incurred. The fact that different modes of governance do exist, implies that one should analyse and compare the alternative governance structures in order to choose the most effective structure. Such an analysis, however, can only be done comparatively, since transactions are costly (Herrera, 2005). More specifically, the comparison is based on the costs associated with the respective governance structures. “The choice of governance structure depends on which co-ordination mechanism entails the lowest relative transaction cost” (Milagrosa, 2007). The Transaction Cost Economic Theory suggests that transactions associated with high levels of transaction cost require a governance structure that can contribute to reducing high transaction cost (Williamson, 2000).

2.2.2. Transaction cost

The fundamental argument in Transaction Cost Economics is that economic governance is a prerequisite for using resources in an economically optimal manner and thus also for enhancing economic efficiency. Within Transaction Cost Economics, institutions are hypothesised to be transaction cost minimising, which may evolve with changes in the nature and source of transaction cost (Kherallah & Kirsten, 2002). The approach of Transaction Cost Economics is to regard transactions themselves as the basic unit of analysis. There is confusion between transactions cost and transformation cost. “Transaction cost is distinguished from transformation cost which relate to the transformation of the physical

product into the end-product consumed by the end-consumer. Cost such as transport, storage and processing are considered to be transformation costs. Cost associated with assembly, distribution, negotiation, payment, distribution of risk, financing and enforcement, on the other hand, are considered to be transaction costs” (Jordaan *et al.*, 2009).

In order to understand transaction cost, Hai (2003) cites Williamson (1989) who states that there are three attributes of transaction cost determining transaction cost, namely asset specificity, transaction uncertainty and transaction frequency. It is expected of a firm to choose the governance structure that will minimise the transaction costs associated with the specific transaction under consideration. The next sections will describe some of the transaction attributes mentioned above.

2.2.2.1 Asset specificity

Asset specificity relates to the ability of the specific asset to be transferred to alternative uses (Williamson, 2000) or the opportunity cost of assets in terms of alternative uses. Assets considered to be highly specific are those assets with comparatively low value elsewhere, which consequently give the owner of the asset a strong interest to continue with the transaction (Hai, 2003). According to Milagrosa (2007), “asset specificity relates to the amount of money, time and effort put into the transaction by the transacting parties”.

Typically, potato production is associated with high-level asset specificity. It is associated both with a high level of temporal asset specificity and physical asset specificity. Physical asset specificity refers to the requirement of specialised physical assets to fulfil the transaction. Physical asset specificity associated with the production of potatoes, moreover, relates to the need for physical assets that are exclusively used for potatoes. Such specific physical assets include, amongst others, harvesting equipment which can only be used to harvest potatoes. The need for such specific physical assets contributes to increasing the level of transaction cost for potato producers.

2.2.2.2 Temporal specificity

Temporal specificity refers to the situation where the value of the product is constrained by time. The importance of temporal specificity for agricultural production revolves around biological conditions, causing seasonality in production, and the perishable nature of agricultural products. While timing of the production of an agricultural product is important,

timing is just as important when selling the agricultural product. Selling activities must be timed in order to capture the highest possible profits for the product that is marketed (Milagrosa, 2007). Temporal specificity relates to the fact that potatoes are mainly produced in the summer rainfall areas, with only a small part being produced during winter. Since potatoes for processing are sensitive to changes in sugar content, such potatoes cannot be stored. In addition to the lack of storability of potatoes, there is also a limited window period for harvesting. The late harvesting of potatoes has a negative impact on the quality thereof and thus on their suitability for processing. Finally, the fact that potatoes can only be planted on the same parcel of land every fourth year owing to soil health problems, can also be considered as evidence of a high level of temporal specificity.

2.2.2.3. Uncertainty

Uncertainty of the transaction itself can originate from two sources (Rindfleisch and Heide, 1997; Verhaegen and Van Huylbroeck, 2002), namely exogenous and endogenous sources. “Exogenous to the transaction - meaning environmental uncertainty. Environmental uncertainty could take two forms: first, uncertainty in the institutional environment (changes in market policies, practices and regulations) or second, uncertainty in the market environment (variation in demand, changes in price of complementary and substitute products)” (Milagrosa, 2007). “Endogenous to the transaction – meaning behavioural uncertainty, which could be the difficulty to calculate or supervise the behaviour of transaction parties. Endogenous uncertainty comes in the form of actions of key market players that affect how transactions are conducted” (Milagrosa, 2007).

Various authors have used Transaction Cost Economics as a methodology, including Hobbs (1997), Mantungul, Lyne and Ortmann (2001), De Bruyn, de Bruyn, Vink and Kirsten (2001), Milagrosa (2007), Jordaan and Kirsten (2008) and Jordaan *et al.* (2009). Most of these authors mainly used proxy variables (possible causes of transaction costs) to represent transaction cost in regression analyses. Hobbs (1997) argued that the findings from his study “provide evidence of the importance of transaction cost in determining vertical coordination in an agri-food chain” (Jordaan *et al.*, 2009).

Mantungul *et al.* (2001) evaluated the influence of transaction cost on crop marketing. This study was done in the communal areas of Impendle and Swayimana in KwaZulu-Natal. In this specific study, the authors also used proxy variables in order to evaluate the influences of

transaction costs on crop marketing. Mantugul *et al.* (2001) concluded that transaction costs have a significant effect on the preferred marketing channel of crop marketing.

In contrast with the above-mentioned studies using proxy variables, recent research done by Milagrosa (2007) and Jordaan *et al.* (2009) employed thorough assessments of the levels of transaction cost associated with alternative governance structures. The main argument in these studies is that the focus must be on what governance structure is the most suitable and not on what kind of transaction cost exists. Both authors analysed governance structures such as the spot market and the contract market.

Milagrosa (2007) assessed the attributes of the transaction associated with the respective governance structures for the vegetable market in the Benguet Province of the Philippines. Milagrosa (2007) used attributes identified by Williamson (1996) which are asset specificity, temporal specificity and uncertainty. The conclusion of Milagrosa (2007) was that the hybrid mode governance structure is the most suitable for the studied region.

Jordaan *et al.* (2009) used the same methodology as Milagrosa (2007). Jordaan *et al.* (2009) used this methodology to determine the contribution of water used to value chains in agriculture. This research was based on a case study of raisin production and marketing along the Orange River in the Northern Cape Province. In this research the same attributes were used as by Milagrosa (2007). Jordaan *et al.* (2009) concluded that the contract (hybrid mode) of governance is the most suitable structure for these raisin producers.

2.3. Agricultural contracts and price risks

Profit is the reward for risk-taking, accordingly any profit seekers in the farming business, or in any other business, must be prepared to bear some risk (Varangis, Larson & Anderson, 2002). Because of risk and uncertainty components, high fluctuations in yields and prices have occurred in agricultural products, as proven by Jordaan, Grové, Jooste and Alemu (2007), which lead to high income fluctuations in agriculture.

Price risk is a major source of risk to producers, both locally and internationally (Woodburn, 1993; Coble and Barnett, 1999). Price risk is important mainly because of the fact that high variability in profits is a direct result of variability in prices. Prior to the deregulation of

markets in 1996, grain prices were determined by the commodity boards and were fixed. This period of regulation ended with the proclamation of the Marketing of Agricultural Products Act of 1996, ordering the decommissioning of most of these control boards. Groenewald, Geldenhuys, Jooste, Balyamujura & Doyer (2003) argue that the variability of prices has increased since deregulation. Jordaan *et al.* (2007) confirmed the increase of variability by determining the price volatility of field crops that are traded on the South African Futures Exchange (SAFEX). Since potato prices are determined by the fresh produce markets, the price of potatoes is highly volatile. This high volatility is confirmed by Du Preez and Van Zyl (2010).

Price volatility refers to the degree of unpredictable change in prices over time. Volatility is therefore associated with the error terms obtained from the prediction of prices. The increase in price variability has exposed South African producers' price risk management abilities. Du Preez and Grové (2011) used the conditional standard deviation (CSD) as the measure of volatility and the ARCH/GARCH approaches for the quantification of the volatility in the South African potato market. The data used in this study were weekly average price data from January 1985 until July 2007. Du Preez and Grové (2011) concluded the following:

There is not a great difference between the average volatilities of all the markets except for Cape Town, which is notably lower than the other markets. For the period 2003 to 2007 the volatility per market is from highest to lowest; Pietermaritzburg, Durban, Kimberley, Tshwane, Port Elizabeth, Johannesburg, Bloemfontein and Cape Town. The movement within average yearly volatility is relatively sideways for all of the markets.

According to the above-mentioned, one can conclude that the fresh produce market prices are highly volatile and the question is how one would manage this risk.

Risk management strategies are developed to provide some protection in situations in which the consequences of a decision are not known when the decision is made. Risk strategies are defined as the methods applied to remove or reduce, partly, the effects of factors creating risk in agriculture (Akcaoz & Ozkan, 2005). The selection of good risk strategies depends on the farm operator, the financial institution and risk attitude of the producer (Akcaoz & Ozkan, 2005). There are numerous ways in which risk can be managed. The use of a derivative market is very popular, although this is not an alternative in the potato industry.

A futures potato contract was listed on the South African Futures Exchange (SAFEX) in 1995. This contract was a cash sales contract which means that no physical delivery would take place. According to SAFEX (1995), the prices of the futures contract were calculated by means of using the National Potato Price Index (NAPPI). The NAPPI is based on a three-day weighted average price per 10kg pocket of class 1 medium potatoes traded on the following municipal fresh produce markets: Johannesburg, Pretoria, Durban and Cape Town. This calculation was done by the clearing house in order to make sure that no one could manipulate the price of potatoes. SAFEX (1995) explains that the clearing house calculated the price by using equation 1 below:

$$NAPPI = \frac{(V_1 + V_2 + V_3 + V_4)}{(N_1 + N_2 + N_3 + N_4)} \dots\dots\dots(1)$$

Where

V_i are the total rand values to two decimal places of Class 1 medium potatoes sold on the Johannesburg, Pretoria, Durban and Cape Town municipal fresh produce markets respectively for the last five business days, including the current business day.

And

N_i are the total number of 10kg pockets of Class 1 medium potatoes sold on the Johannesburg, Pretoria, Durban and Cape Town municipal fresh produce markets respectively for the last five business days, including the current business day.

According to Gravelet - Blondin (2010), this futures contract was one of the best contracts ever listed on SAFEX, although it was never traded. Gravelet - Blondin (2010) explained that the supply side (the producers) showed a high interest in this contract mainly because they could have managed the risk effectively in a free market environment. The problem was on the demand side. The processors argued that they wanted a certain cultivar potato which was suited for their specific needs and this is why they preferred to use forward contracts where they directly could have had a contract with farmers. In order to get the opinion of the normal consumer, SAFEX visited wholesalers who normally buy from the fresh produce markets. The conclusion from the wholesalers was that they do not carry any price risk, mainly owing to the fact that they merely shift their risk to the consumers. For example: If a

10kg pocket of potatoes sold for R10/pocket on the fresh produce market, the wholesaler would just add its margin (for argument's sake, R2/pocket) and sell it to the consumer (R12/pocket); if the price changes on the market, it changes for the consumer. The main conclusion was that potatoes are not a commodity anymore but a differentiated product and that there is need for risk management in terms of the derivative market on the demand side.

Other methods to manage price risk, amongst others, are the use of insurance, price-pooling (where farmers have the opportunity to reduce price risks through marketing arrangements) and, management of available debt and savings. However, forward contracting of produce is a much more effective and relatively widely used form of risk management for farmers, the most common being a contract for the sale of a crop in the physical market (local market) (Varangis, Larson & Anderson, 2002), which is a method employed by processing companies currently.

Futures contracts and forward contracts may cause confusion. A futures contract relates to a standard quantity and quality of a commodity for delivery in standard futures periods at a price agreed in advance between the buyer and the seller. Some futures contracts do not allow for physical delivery to take place and provide only for cash settlement of the difference between the contract price and the market price of the commodity at the futures date. Even those futures contracts which do allow for physical delivery are usually offset before delivery by buying or selling in the market (JSE, 2010).

A forward contract is an alternative hedging tool to a futures contract, but suffers from the disadvantages, namely that performance is usually not guaranteed, trading is usually conducted informally and physical delivery of the precise quantity and quality of the specified commodity must take place for hedging to be achieved (South African Futures Exchange (SAFEX), 1995).

Given the unavailability of a futures contract in South Africa and the levels of price variability and transaction cost associated with the production of potatoes, one would expect that more contracts would be used and not just the spot market. In further explanations, forward contracting will be referred to as contracts in order to eliminate confusion.

Contracting may be regarded as a hybrid mode of governance and is not a new phenomenon in agriculture. A hybrid mode provides a form of safe-guarding. For a number of years, farmers have used formal contracts in obtaining agricultural inputs such as land, credit and equipment. According to Rhodes *et al.* (2007), agricultural contracts have three important characteristics, namely the allocation of value, allocation of decision rights, and allocation of risk. “Allocation of value refers to how the contractee and contractor share in the value of the commodity or product being produced. Allocation of decision rights refers to the provision of the contract that require the grower to follow a certain protocol. Allocation of risk establishes whether the contractee or contractor bears the cost, should something go wrong” (Rhodes *et al.*, 2007).

There are two main types of contracts used for transactions in agricultural commodities. Firstly, a production contract which deals with a specific farmer and contractor who is responsible for production inputs and practices, as well as a mechanism for determining the payment. This type of contract often specifies certain inputs to be used, production guidelines and allows the contractor to give technical advice and make field visits (MacDonald *et al.*, 2004). The second type of contract is generally known as a marketing contract. Marketing contracts specify a price and an outlet for a certain commodity. This is usually done before the commodity is harvested and is ready to be marketed. The pricing mechanisms often limit a farmer’s exposure to wide price fluctuations and the contract must be delivered at a certain period of time, quality and quantity (MacDonald *et al.*, 2004; Cesar, Borja-Aburto, Dorland, Munoz Cruz, Brander & Cropper, 2005). Potato processing companies in South Africa make use of both these contracts but the main focus is on marketing contracts. A marketing contract can be broken down into more complex formats. Slangen (2005) and Peterson, Wysocki & Harsh (2001) identified contracts such as classical contracts, neo-classical contracts and relationship contracts. Table 2.1 below illustrates the different characteristics of each of these contracts. The typical contract used in the potato industry is a neo-classical contract as explained by Slagen (2005) and Peterson *et al.* (2001).

Farmers are moving to agricultural contracts for a number of reasons. “Most importantly it is a form of spreading risk (both price and production risk) between participants to the specific transaction and thus to reduce transaction cost” (Kirsten & Sartorius, 2002). Other benefits, according to Kirsten and Sartorius (2002), are that producers’ barriers to entry into the market are reduced and they have new methods of marketing and distribution channels (a

combination of the spot and contract market). Normally farmers have access to expertise from their various input providers, but contracts give them the opportunity to access new levels of managerial skills and technical expertise from the buyers' field officers (Kirsten & Sartorius, 2002). Processors too may benefit from obtaining a product of high quality and a reduced uncertainty in the supply of raw materials. Rhodes *et al.* (2007) have explained that agribusiness uses contracts in order to control product quality. Costs to processing companies are reduced as a result of production cost being passed on to the producer, without the loss of control of the product.

Table 2.1: Different characteristics of contracts

Contract Type	Classical Contract	Neo-classical contract	Relational contract
<i>Contract duration</i>	Short relationship duration	Relationship duration longer	Long-term relationship
<i>Frequency of exchange</i>	Occasional exchange/transaction	Occasional to recurrent exchange/transaction	Recurrent exchange/transaction
<i>Coordinating mechanism</i>	Price is main coordinating mechanism	Price and safeguards coordinate actions	Relationship is main coordinating mechanism, price less important
<i>Focus of control</i>	Immediate transaction	Fulfilling contract terms	Relationship
<i>Interest in gains</i>	Self interest in gains	Self-interest in gains, but reciprocity is valued	Reciprocity highly valued, mutual interest in gains
<i>Role of safeguards</i>	Safeguards are of little importance	Price and safeguards are important	Safeguards very important
<i>Identities of transacting parties</i>	Identities of transacting parties irrelevant	Identity of transacting parties known, and sometimes transaction decisive	Identity of transacting parties known and important and is transaction decisive
<i>Disagreements and renegotiation</i>	Transaction disagreements renegotiated by parties involved, Arbitrator sometimes included	Transaction disagreements renegotiated by parties involved, Arbitrator sometimes included	Transaction disagreements negotiated by parties involved
<i>Governance structure supporting the contract</i>	Market-based	Hybrid	Hybrid

Source: Slangen (2005) and Peterson *et al* (2001)

“Processors moreover have the ability to reduce the cost of the raw commodity supplied by the contracted farmer through assuming the marketing risk of the farmer and thus reducing related farmer marketing and transport costs” (Glover, 1984; and Kumar, 1995 as cited by Kirsten and Sartorius, 2002). Contracting, however, may also have some disadvantages for participants. Disadvantages to producers include, amongst others, loss of autonomy, increased production risk, increased market power of the processor, increased concentration of production, and in certain instances, reduced producer income. In developing countries, processors face a further disadvantage through the large numbers of small farmers who are spatially dispersed and require high levels of inputs and support (Key & Rusten, 1999 as cited by Kirsten and Sartorius, 2002). According to MacDonald *et al.* (2004), agricultural contracts can reduce various transaction costs in the vegetable industry, such as yield and price uncertainties. Goodhue and Hoffman (2006) indicated more specifically that longer-term contracts could reduce transaction costs to a greater extent.

Despite the above disadvantages, contracting is widely used, especially in the USA. According to MacDonald *et al.* (2004), production and marketing contracts governed about 36% of the value of US agricultural production in 2001, which had increased substantially from about 12% in 1991. The use of contracting, however, varies across farm types. Forty-two per cent of production value on commercial farms is governed by contracts, compared to 24% and 13% of production values on intermediate and rural residence farms, respectively, in the USA. Similarly, the proportion of US crop production sold under contract is becoming increasingly large (Paulson, Schnitkey & Sherrick, 2008). In 2005, 41% of the value of US production was sold under contracts compared to 39% in 2003, 11% in 1999 and 10% in 2001 (MacDonald *et al.*, 2004).

2.4. Introduction to Framework Analysis

Framework analysis is a qualitative method that originated in an independent qualitative research unit in the Social and Community Planning Research Institute, situated in London, England. It was developed by two researchers, Jane Ritchie and Liz Spencer in 1994 (Srivastava & Thomson, 2009). Framework analysis was explicitly developed in the context of applied policy research, with the aim to meet specific information needs and provide outcomes or recommendations, mostly within a short timeframe (Lacey & Luff, 2007).

2.4.1. Purpose of Framework analysis

The aim of framework analysis is to generate, identify and trace a phenomenon's major concepts which together constitute its theoretical framework (Jubareen, 2009). It shares many mutual features with other types of qualitative analysis, but its benefit is that it provides organised and visible stages to the analysis process. This gives the funder of a project, or other interested parties, a clear understanding about the stages by which the results have been obtained from the data. It can be used when data collection and analysis occur simultaneously (Lacey & Luff, 2007).

This methodology is about the interplay between the introduction, derivation of theories from data, and conclusion aimed at hypothesising the relationship between theories. The selected texts and literature for framework analysis should effectively represent, and focus on, the relevant phenomenon. It should also represent practices that are related to this phenomenon (Jubareen, 2009). Meyers (2009) has stated that framework analysis suggests the continuous interplay between data collection and analysis, as cited in Jubareen (2009).

Although framework analysis may generate theories, the prime concern is to describe and interpret what is happening in a particular setting (Ritchie & Spencer, 1994, as cited in Srivastava & Thomson 2009). "Framework analysis is better adapted to research that has specific questions, a limited time frame, a pre-designed sample and a priori issues. In the analysis, data is sifted, charted and sorted in accordance with key issues and themes", (Srivastava & Thomson, 2009). The interconnected stages in the framework approach explicitly describe the processes that guide the systematic analysis of data from initial management through to the development of descriptive to explanatory accounts (Smith & Firth, 2011).

2.4.2. The stages of Framework Analysis

According to Pope, Ziebland and Mays (2000), Lacy and Luff (2007), and Srivastava and Thomson (2009), there are five key stages of Framework Analysis, namely:

- Familiarisation
- Identifying a thematic framework
- Indexing/Coding
- Charting
- Mapping and Interpretation.

The first stage of familiarisation is the process during which the researcher becomes familiarized with the collected data and gains a general idea of the collected data (Ritchie & Spencer, 1994). Lacy and Luff (2007) describe this stage as “whole or partial transcription and reading of data”. In other words, the researcher becomes immersed in the data by studying the field or reading the transcripts. Throughout this process the researcher will become aware of key ideas and frequent themes and make notes of them. Owing to the sheer volume of data that can be collected in qualitative research, the researcher may not be able to review all of the material. Thus, a selection of the whole set of data would be utilized. Therefore, it is important that the researcher ensures that a variety of sources and cases are selected (Ritchie & Spencer, 1994, as cited in Srivastava & Thomson 2009).

Identifying a thematic framework, the second stage, occurs after familiarisation when the researcher recognizes emerging themes or issues in the data set. It is at this stage that the researcher must allow the data to dictate the themes and issues. To achieve this end the researcher uses the notes taken during the familiarisation stage (Srivastava & Thomson, 2009). Although the researcher may have a set of a priori issues, it is important to maintain an open mind and not force the data to fit the a priori issues. However, since the research was designed around a priori issues it is most likely that these issues will guide the thematic framework. Ritchie and Spencer (1994) stress that the thematic framework is only tentative and there are further opportunities for refining it at subsequent stages of analysis (Srivastava & Thomson, 2009). According to Lacy and Luff (2007), the development and refinement of the thematic framework should be achieved in the subsequent stages. This involves both rational and intuitive thinking. It involves making judgements about meaning, about the relevance and importance of issues, and about hidden connections between ideas.

Indexing refers to the recognition of portions or sections of the data that correspond to a particular theme. This process is applied to all the textual data that has been gathered (i.e. transcripts of interviews) (Srivastava & Thomson, 2009). This is where the thematic framework is applied to the data, by using codes to identify particular pieces of data which resembles to conflicting themes. This is called “coding” (Lacey & Luff, 2007). For the sake of convenience Ritchie and Spencer (1994) recommend that a numerical system be used for the indexing of references and be annotated in the margin beside the text.

Charting, the fourth stage, refers to the specific pieces of data that were indexed in the previous stage which are now arranged in charts of the themes. This means that the data is lifted from its original textual context and placed in charts that consist of the headings and subheadings that were drawn during the thematic framework, or from a priori research inquiries or in the manner that is perceived to be the best way to report the research (Ritchie & Spencer, 1994). The important point to note here is that although the pieces of data are lifted from their context, the data is still clearly identified according to what case it came from. For clarity, cases should always be kept in the same order in each chart (Srivastava & Thomson, 2009). Headings from the thematic framework can be used to create charts of the data so that reading is easy over the whole dataset. Charts can be either thematic for each different theme across all the respondents (cases), or by case for each respondent across all themes (Lacey & Luff, 2007).

The final stage, mapping and interpretation, involves the analysis of the key characteristics as laid out in the charts. This analysis should be able to provide a schematic diagram of the event/phenomenon, thus guiding the researcher in his or her interpretation of the data set. It is at this point that the researcher is aware of the objectives of qualitative analysis, which are: “defining concepts, mapping range and nature of phenomena, creating typologies, finding associations, providing explanations, and developing strategies” (Ritchie & Spencer, 1994, as cited in Srivastava & Thomson, 2009). Once again, these concepts, technologies, and associations are reflective of the participant. Therefore, any strategy or recommendations made by the researcher echo the true attitudes, beliefs, and values of the participants.

2.5. The South African potato industry

The overview of the South African potato processing industry will provide a clear scenario of the South African potato industry.

2.5.1. South African potato industry overview

According to PotatoSA (2012) the world production of potatoes are 321.8 million tons with the largest producers being Asia, Europe and Africa producing 154, 107.5 and 23.4 million tons respectively in the 2010’ production season. Malawi is the largest producer with 7.7 million tons, followed by Egypt with 3.6 million. South Africa produced 2 million tons in the 2010 production year; the bulk of these potatoes were produced under irrigation. According

to the above-mentioned, South Africa is producing 9% of the potatoes in Africa. The gross value of potatoes in South Africa for the 2009 production season was R2.88 billion; this is a contribution of 3% to the total agricultural gross value.

The major potato producing provinces in South Africa are the Free State, Western Cape, Limpopo and Mpumalanga. The industry has divided the producing regions into 16 regions, which are presented in Table 2.2 below.

Table 2.2: Potato production regions of South Africa in 2009

Region	Tons	% of total
Limpopo	383528	21%
Western Free State	294270	16%
Eastern Free State	196132	11%
Sandveld	267823	14%
Kwazulu Natal	136496	7%
Northern Cape	73124	4%
South West Free State	45803	2%
Mpumalanga	109897	6%
Eastern Cape	62336	3%
Northwest Province	90402	5%
Gauteng	29970	2%
North East Cape	54254	3%
Ceres	38878	2%
Marble Hall	53753	3%
South West Cape	6202	0%
South Cape	9653	1%

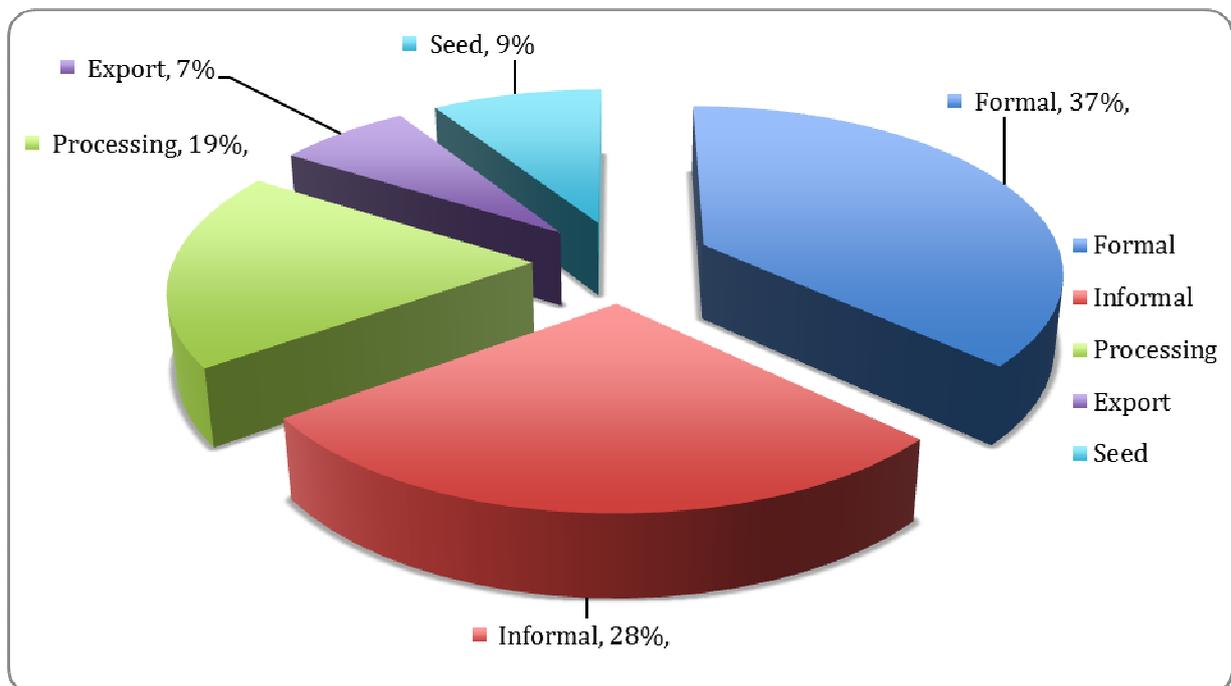
Source: PotatoSA (2009)

The Eastern Free State is the third largest producing region and contributed 11% to the total potatoes produced. The reason why the Eastern Free State has been chosen for the purpose of this study, and not the Western Free State or Limpopo regions, is mainly because the Eastern Free State is the largest processing potato production region. PotatoSA (2009) indicated that there are 681 commercial farmers producing potatoes in South Africa. The study area had a

total of 69 producers in 2009, which is the second largest region in terms of commercial producers.

Figure 2.3 below provides a graphical indication of the total potato distribution within South Africa. In 2008 the two largest markets were the formal market (37%) and the informal market (hawkers and townships) (28%). The processing industry contributed 19% to the distribution of the 2008 potato crop.

Figure 2.3: Distribution of potatoes in South Africa



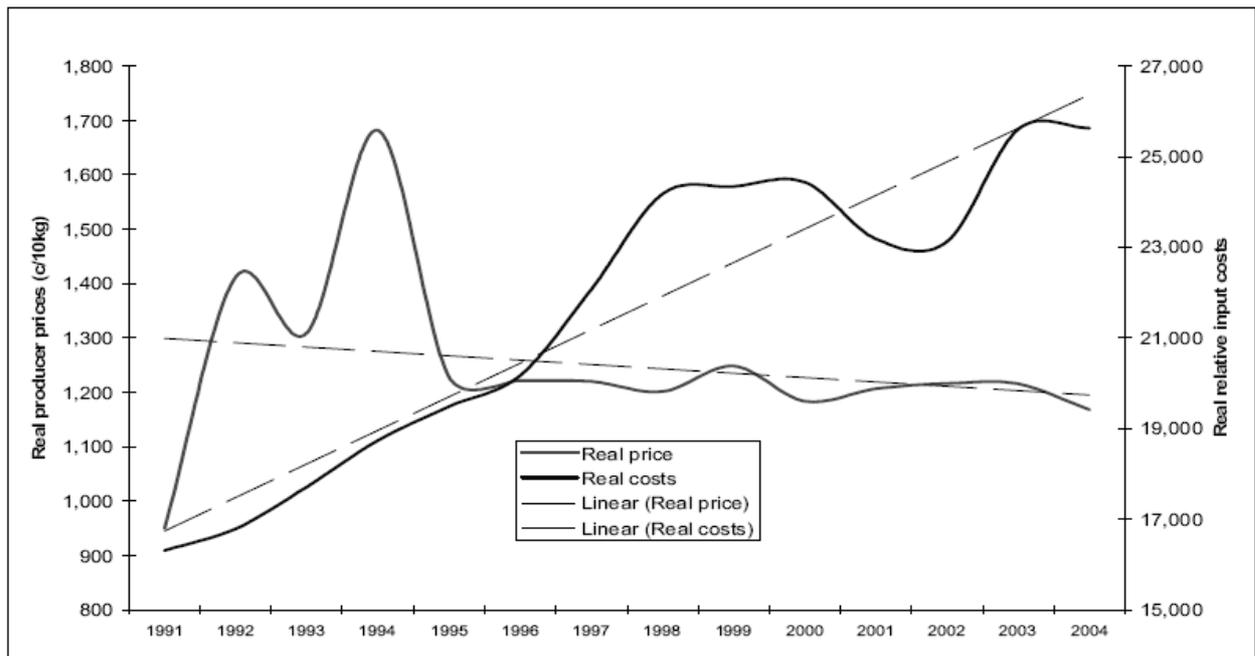
Source: PotatoSA (2009)

Although the processing industry is not the largest component of the potato industry, it is increasing its share at a fast rate relative to the other components. This increase in share emphasises the importance of the processing component within the potato industry. The need to develop the processing industry through research can also be ascertained from the increase, since processing is starting to become a larger role player within the potato industry.

Increasing input prices is a problem in the South African potato industry. Increasing production costs are threatening the global competitiveness of the South African potato industry as the producers are under pressure owing to the cost/price squeeze created. This cost/price squeeze is evident from Figure 2.4 below and illustrates the stagnant producer

prices and escalating input prices (National Agricultural Marketing Council (NAMC), 2007). The cost/price squeeze emphasises the importance of contracts and the processing industry, mainly because of the fact that producers wish to obtain the highest profit margin at the lowest risk. If the producers make use of contracts, they can reduce their price risk, mainly because they are not exposed to the volatile spot market prices.

Figure 2.4: Comparison of real price of inputs and real producer prices



Source: NAMC (2007)

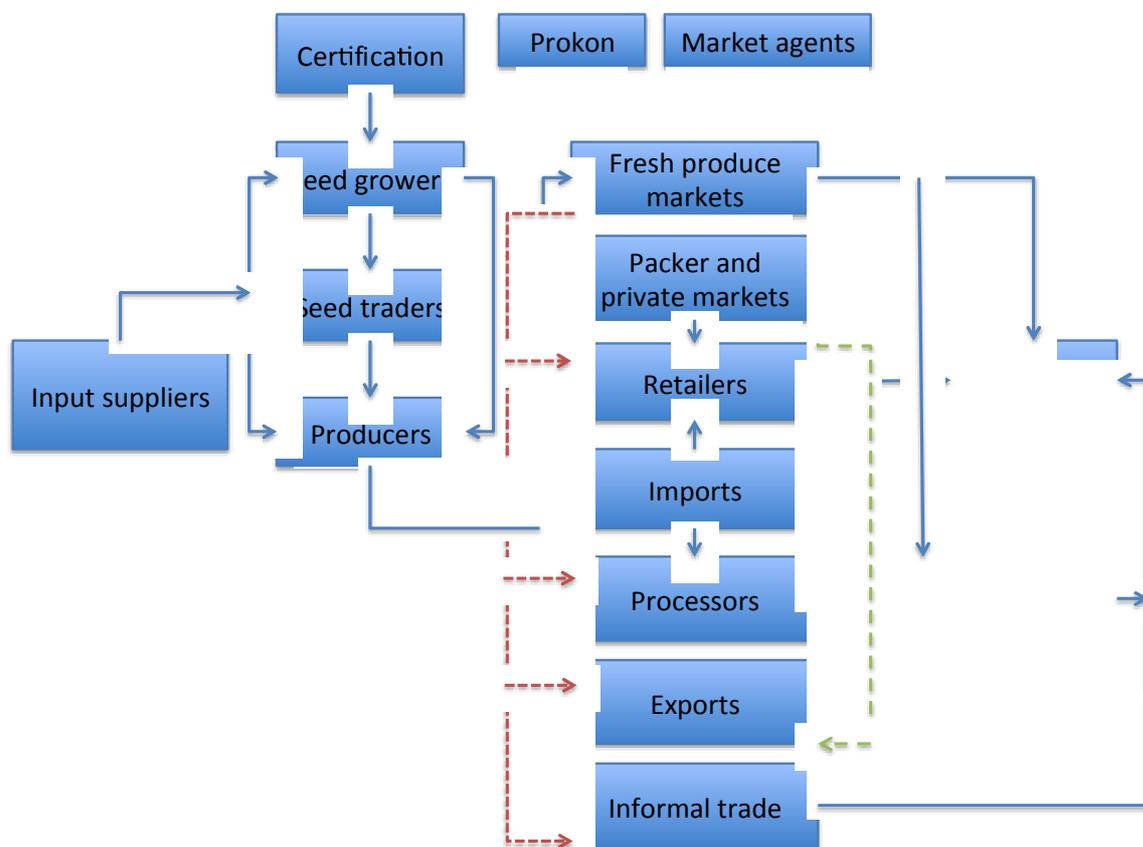
2.5.2. South African potato processing industry

The supply chain of the South African potato industry is explained in Figure 2.5 below. The processors in South Africa mainly use domestic potatoes for the production of the final products, as illustrated in Figure 2.5. According to the processing companies, none of the processors use imported potatoes, but if the potato prices are too low these processors may import final products (frozen fries).

The potato processing industry has experienced a strong positive growth over the last few years, as indicated by Figure 2.6 below. In 1998 South African potato processing companies processed an estimated 260000 tons of potatoes and this increased to an estimated 385000 tons in 2008. This is a growth of 48% over 10 years (Potato SA, 2009). The growth in the industry can be ascribed to the following factors, namely the expansion of the fast food

industry; the higher average income of the population; the enlargement of processing facilities; and the increase of urbanisation (Potato SA, 2009). According to Van Aardt (2010), the average income growth of the South African population is 2,7% (nominal). Although the SA processing industry is growing fast, it is still behind in size when it is compared with the potato processing industries in developed countries (Potato SA, 2009). The USA processed 42% of their total potato market in 2008 (Keijberts, 2008), while South Africa only processed 19%. The growth in this industry also indicates the importance of the establishment of contracts, more specifically long-term contracts, in order to reduce the transaction costs and price uncertainties in the industry.

Figure 2.5: The South African potato supply chain

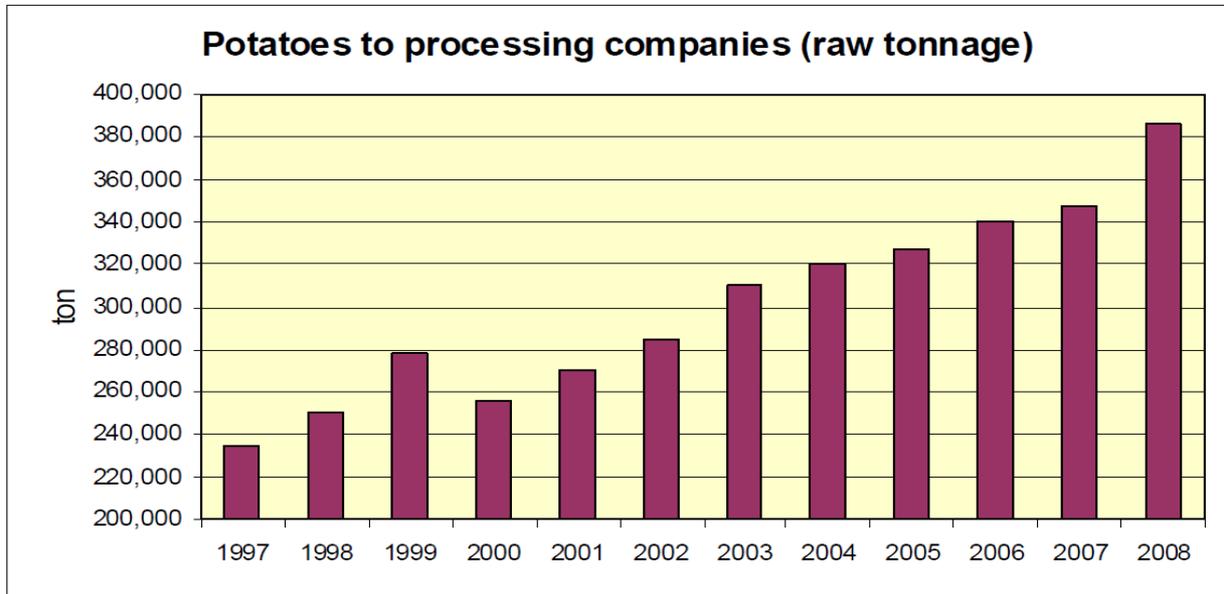


Source: PotatoSA (2009)

The potato processing industry is divided into various different types of final products, such as French fries (fresh fries), frozen/chilled products (frozen fries), crisps, mixed vegetables (canned and frozen), baby food, reconstructed potato products and a small quantity of potato starch (Potato SA, 2009). Frozen fries are the largest category with 43.9% of all processed

potatoes, followed by crisps with 36.6% of the total. As mentioned earlier, the largest processing potato region in South Africa is the study area, with a production share of 20%.

Figure 2.6: Potatoes distributed to processing companies



Source: PotatoSA (2009)

The largest manufacturers within the frozen fries industry are McCain Foods, Lambertsbaai Canning Co and Mine Corp. The largest crisp producers are Simba, Willards and Frimax (Hannekom, Ellis, Sissons & Willemse, 2009). The processing industry contracted 320000 tons from producers and the rest of the balance is purchased from the fresh market industry (Potato SA, 2009). This means that 83% of the processing potatoes are contracted in South Africa and if the industry is growing as mentioned earlier, it means that contracting will become increasingly important in the near future.

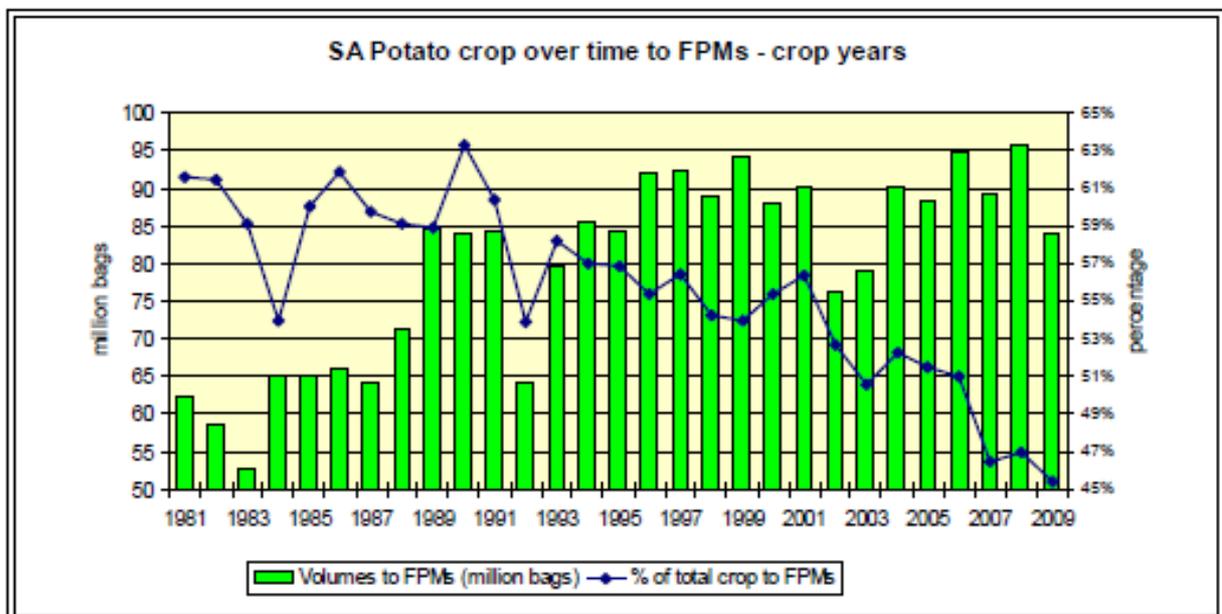
The potatoes for the processing industry are normally bought from the producers and no middleman forms part of the process. The potatoes are also not washed/bagged and are loaded in bulk, which is convenient for producers and more cost effective (Strydom, Van Niekerk, Jordaan & Willemse, 2009). It is more convenient mainly because of the fact that producers do not have to spend time in washing and sorting the potatoes, resulting in lower labour costs.

2.5.3. Table potato industry

According to Figure 2.5 above, a producer in the table potato industry can sell his or her produce to the following channels: a retailer, exporter, private packer/market or the national fresh produce market. The table potato industry sells most of the potatoes in South Africa as reflected in Figure 2.3 above and is still the most favourable marketing channel. The bulk of table potatoes are sold to agents at the national fresh produce markets. According to PotatoSA (2009), the national fresh produce markets set the price mechanism for potatoes. This is very important in terms of this study, mainly because processors will determine the contract price by means of evaluating the fresh produce market's prices. The price of potatoes is determined by supply and demand at the national fresh produce markets on a daily basis. This creates a price risk, mainly owing to the existence of price volatility as proven by Du Preez and Van Zyl (2010). Figure 2.7 below indicates that the amount of potatoes delivered to fresh produce markets is increasing, although the percentage of the total crop received is decreasing. This can be because of numerous reasons: ineffective management, under-developed, and old facilities, amongst others.

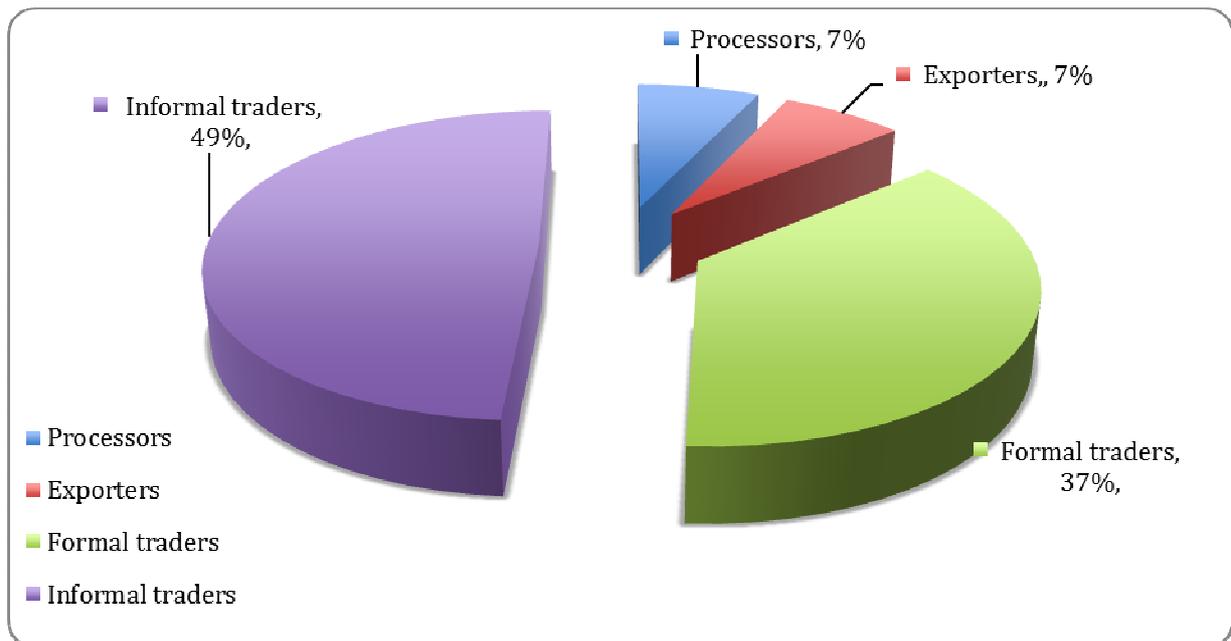
According to the National Agricultural Marketing Council (NAMC) (2007), South Africa has 18 commission-driven fresh produce markets, with Johannesburg being the largest. Most of the buyers on the fresh produce markets are informal traders amounting to 49%.

Figure 2.7: SA crop over time delivered to fresh produce markets (FPM)



Source: PotatoSA (2009)

Figure 2.8: Buyers of potatoes on the fresh produce market in 2008



Source: PotatoSA (2009)

Table potatoes are normally washed, sorted and bagged before they are sold. The bagging of potatoes is an effective marketing strategy for producers in the table potato industry. Some of the main differences between the table potato industry and the processing industry are as follows:

- The table potato industry washes and bags potatoes, whereas the processing industry only loads in bulk.
- The cultivars used by the table industry differ from the cultivars used by the processing industry. However, there are cultivars that can be used in both industries but this is not always favourable. This is mainly because the processors prefer a potato with certain attributes, depending on their needs.
- In the table potato industry no prices are fixed and the producers negotiate a price with the market agent on a daily basis. In the processing industry the producers negotiate with processors and normally have a predetermined price.

2.6. Chapter summary

In this study the following theories will be used as a basis in order to develop a procurement-marketing framework: The two procurement marketing theories namely, Collision and Incentive–Contribution will be the focus of the framework. In order to investigate the

transaction cost magnitude, New Institutional Economics will be reviewed; more specifically the focus will be on Transaction Cost Economics. Contract marketing will be evaluated in order to determine the dynamics of different agricultural contracts. In order to establish long-term contracts, the table potato industry and the processing industry must be compared. The main distinction between these two industries is the form of governance. The processing industry makes use of contracts where the table potato industry makes use of the spot market.

Research summary

This chapter provides an explanation of the research design, the data collection strategy, measurement, and the data analysis plan used in order to obtain the results.

3.1. Research design

According to the views of Johnson and Turner (2003), the in-depth single organisation case study combined with a comparative study will be the most appropriate design for this specific study. This is mainly because the focus of the study is only on the potato processing industry and not the entire vegetable processing industry. The case study will consist of qualitative components, using data collection strategies at a single point in time. This research design will be used to determine the perceptions of the producers in this specific industry along with the evaluation of transaction costs. This means that the case study design will mostly take place in the form of a representative/typical case, which is defined by Bryman and Bell (2007) as “To explore a case that exemplifies an everyday situation or form of organisation”. The case study design is important because it will be used to determine the producers’ perceptions (advantages and disadvantages) of the processing industry, along with the possible transaction costs present in the industry.

A mixture of designs is used since the assessment of the producers’ perceptions, using a case study design, uses qualitative data, which consist of textual data. These data will assist with the confirmation of the quantitative results regarding transaction costs, price risk purchase agreements and profit margins. With the knowledge gained from the case study design it will be possible to develop a questionnaire. Thus, the qualitative research will facilitate the quantitative research. The data will consist of numerical and textual terms, which will assist

the researcher in developing and confirming hypotheses. Motivations for the chosen design will be further elaborated on, as indicated below.

3.2. Data collection strategy

Data will be collected from the agricultural staff at the processing companies (owing to the sensitivity of results, the companies cannot be named), as well as from their producers, over a period of two months. These data will be collected by means of interviews. The interviews will consist of focus group interviews, involving staff members of the processing companies, followed by focus group interviews involving the producers. A focus group interview can be a structured or semi-structured discussion of the producer's perception regarding the processing industry. A focus interview is used mainly owing to the fact that the respondents chosen were recently participating in negotiation and strategy projects within agricultural contracts. The results of the focus groups' interviews will serve as a basis for information for a questionnaire. A detailed description of the respondents will be reflected in the sampling design.

Only one researcher will interview the respondents in order to eliminate bias and variability. This method will give an overview of the important factors that will contribute to the establishment of a procurement marketing framework. The interviews will also indicate the magnitude of transaction costs and will help to identify the most important transaction costs in the potato processing industry. It is important to use focus group interviews because of the fact that important information may be obtained from these discussions that is not always known to the researcher and other participants. Focus group discussions comprise phase one of the data collection strategy (Bryman & Bell, 2007).

In the second phase of the data collection strategy information will be obtained by means of a structured questionnaire for the producers. The chosen questionnaire will be in the form of a telephonic questionnaire. This type of data collection method is used because it is cheaper and quicker to administer compared to personal interviews. Furthermore, potential influence and interference from the interviewer is absent. Since the respondents have several time constraints, a telephonic questionnaire will also be more convenient in these circumstances (Johnson & Turner, 2003).

The factors causing producers to be reluctant to participate in the processing industry will also be assessed. This will be done by means of using the same structured questionnaire mentioned above, with open-ended questions. This method is chosen because more qualitative data will be generated and the importance resides in the respondents' views and not the interviewer's views. Some of the farms are not close to each other, implying increased travelling distances impacting on cost and time. In order to obtain flexibility, a qualitative structured questionnaire with open-ended questions is the most appropriate strategy in this regard (Bryman & Bell, 2007). Since many companies use the above method for research purposes, respondents may get agitated with the interviews. The problem will be solved by determining, during the focus group discussions, the most appropriate time for the respondents to be approached for the purposes of the research. The respondents will also receive a notice letter along with their monthly industry information from the PotatoSA regional advisor, which will inform them of the questionnaire. *Chips* (a magazine of the potato industry) will also publish an article informing potato producers about the study.

The profit margins and price risks will be calculated by means of using secondary data sources. These sources include co-operatives' production cost manuals, specifically the Griqualand-West Co-operative (GWK) production cost manual. Various other sources, such as mechanical cost manuals developed by agricultural engineers, historical price and yield data received from PotatoSA, and contracts used by processing companies will also be used.

As the above indicates, the researcher will make use of both inter- and intra- method mixing to obtain data. Johnson and Turner (2003) define inter-method mixing as a combination of alternative data collection methods and intra-method mixing as a combination of responses and data requested with the aid of the same data collection method. As previously mentioned, qualitative research will be used to facilitate the quantitative research.

3.3. Sampling design

This study focuses on two different focus groups. The views of the potato producers and agricultural staff members at the processing companies regarding procurement, transaction costs, price risks and profit margins within the potato processing industry are collected.

South Africa has two prominent companies in the potato processing industry (Hannekom *et al.*, 2009), one in the French fries industry and one in the crisps industry. Based on human resource management records, these companies have 20 agricultural staff members each. The population of the study will be all the agricultural staff members of both the potato processing companies, namely 40 staff members. The total number of producers includes table potato and processing potato producers in the Eastern Free State, namely 70 producers.

In phase one, focus group interviews are used for interest groups, agricultural staff and producers. A census method will be used in the case of the staff members. A census is used because the population is relatively small and there are no extraordinarily high travelling constraints related to the potato processing companies. The respondent unit will be represented by employees and the respondent framework will be a list of all the agricultural staff members.

There are travelling constraints related to the producers as they can be situated in different geographical areas. Since the population is not small and various constraints are noticeable, the researcher will use non-probability sampling in the form of a quota sample (Bryman & Bell, 2007). This tie in with the fact that the processing companies will assist in identifying the most suitable candidates for the research. The sampling method also complements the focus group interviews mentioned earlier. The respondents will be categorised according to farm size. A producer who farms on 100ha and less is classified as a small-scale producer and a producer who farms on 101ha and more is classified as a large-scale producer. This classification is done to remove bias factors, because the needs of small-scale producers and larger producers may differ. Three small-scale producers and three large-scale producers will be identified by the potato processing companies. The sample size will consist of six producers chosen by the processing companies and the sample unit will be each individual producer. The sample framework is the list of each potato processing company's producers.

In the second phase of the data collection, the producers are surveyed by means of structured telephonic questionnaires. Since the travelling constraints (urban areas, dispersed areas) are low when using these questionnaires, a census method will be used and all the respondents will be interviewed. The sample population comprises 65 questionnaires and since it is a census method, the sample size and the population will be the same. The sampling unit is

each individual person, whereas the sample framework will consist of the producer list of PotatoSA.

3.4. Research ethics

The research proposal will be presented to PotatoSA, which is a producing organization assisting both the processors and the producers. This will be done in order to gain approval for the study and to obtain possible funding. Confidentiality and preferences in terms of nondisclosure issues will be discussed during the consultation and will be implemented into the proposed study according to a formal, signed contract. The results of the study will remain the views of the author and PotatoSA will not be liable for any disputes.

Written approval will be signed and obtained from each participant. Participation will be entirely voluntary and the benefits and purpose of the study will be explained in a formal letter which will be sent to each respondent. In order to protect the personal information and views of the respondents, none of the information provided will be traceable by any means. Completed questionnaires and interviews will include no personal information that might result in harm to a respondent. Digital recording, as well as written notes, will be approved prior to the focus group discussions. Findings of the study will firstly be communicated to PotatoSA. After the approval of the study, written as well as oral presentations will be made to PotatoSA. A short summary of the findings will be published in the monthly CHIPS magazine, which is published by PotatoSA and a presentation will be made at the annual PotatoSA congress after approval. A letter of gratitude will be sent to all the respondents to thank them for all their time and expertise on the completion of the study.

3.5. Chapter summary

This chapter is a chapter that explains the research methodology. The research was mostly based on qualitative and quantitative data. Secondary data as well as data obtained from questionnaires were used. Various statistical methods were used in order to obtain results.

**Factors effecting longer-term farm contracts in the frozen fries processing
industry**

**Factors effecting longer-term farm contracts in the frozen fries
processing industry**

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4.1. Introduction

Risk and uncertainty induces high fluctuations in the yield and prices of agricultural products (Jordaan *et al.*, 2007), which in turn leads to high income fluctuations. Du Preez and Van Zyl (2010) state that since potato prices are determined by means of fresh produce markets, the price of potatoes is highly volatile. The increase in price variability has exposed South African producers' price risk management abilities. There are numerous ways in which risk can be managed. The use of a derivative market is one of the all-time favourites, although in the potato industry this is not a viable option.

A futures potato contract was listed on the South African Futures Exchange (SAFEX) in 1995. According to Gravelet - Blondin (2010) (Personal communication with R Gravelet - Blondin of the South African Futures Exchange (SAFEX) on 12/06/2010), this futures contract was one of the best designed contracts ever listed on SAFEX, although, it was never traded. Gravelet - Blondin explained that the supply side (the producers) showed a high interest in this contract mainly because they could have managed their risk effectively in a free market environment. The problem was on the demand side. The demand side stated that they had no need for such a contract since they merely transfer the risk to the consumer.

Other methods to manage risk, amongst others, entail the use of insurance, price-pooling (where farmers have the opportunity to reduce price risks through marketing arrangements) and management of available debt and savings. Forward contracting of produce, currently used by processing companies, is a much more effective and relatively widely used form of risk management for farmers with the most common being a contract for the sale of a crop in the physical market (local market) (Varangis *et al.*, 2002).

A forward contract is an alternative hedging tool to a futures contract, but performance is usually not guaranteed and trading is usually conducted informally and physical delivery of the precise quantity and quality of the specified commodity must take place for hedging to be achieved (SAFEX, (1995). Given the unavailability of a futures contract and the levels of price variability and transaction cost associated with the production and processing of

potatoes, one would expect that more long-term contracts should be used for the sales of potatoes and not just the spot market or short-term contracts⁴.

Contracting may be regarded as a hybrid mode of governance, which is not a new phenomenon in agriculture and implies a form of safe-guarding. For a number of years, farmers have used formal contracts to obtain agricultural inputs such as land, credit and equipment. According to Rhodes *et al.* (2007), agricultural contracts have three important characteristics, namely the allocation of value, decision rights and risk.

There are two main types of contracts used for transactions in agricultural commodities. Firstly, a production contract that deals with a specific farmer and contractor who are responsible for production inputs and practices, as well as a mechanism to determine the payment. This type of contract often specifies certain inputs to be used, production guidelines and allows the contractor to give technical advice and make field visits (MacDonald *et al.*, 2004). The second type of contract is generally known as a marketing contract. Marketing contracts specify a price and an outlet for a certain commodity. This is usually done before the commodity is harvested and is ready to be marketed. The pricing mechanisms often limit a farmer's exposure to wide price fluctuations, the contract must be delivered within a certain period of time, and be of a specified quality and quantity (MacDonald *et al.*, 2004). Potato processing companies in South Africa make use of both these contracts, but the main focus is on marketing contracts. A marketing contract can be broken down into more complex formats. Slangen (2005) and Peterson *et al.* (2001) identify classical contracts, neo-classical contracts and relationship contracts with the neo-classical contract the most typical contract used in the potato industry.

Farmers (producers) are moving to agricultural contracts for a number of reasons. "Most importantly, it is a form of spreading risk (both price and production risk) between

⁴Forward contracting will be referred to as contracts in order to eliminate confusion in the rest of the paper.

participants to the specific transaction and thus to reduce transaction cost” (Kirsten & Sartorius, 2002). Other benefits, according to Kirsten and Sartorius (2002), are that producers’ barriers to entry into the market are reduced and they have new methods of marketing and distribution channels (a combination of the spot and contract market). Normally farmers have access to expertise provided by various input providers, but contracts give them the opportunity to access new levels of managerial skills and technical expertise from the buyers’ field officers (Kirsten & Sartorius, 2002). Besides the contracts, processors may benefit from obtaining a product of high quality and a reduced uncertainty of the supply of raw materials. Rhodes *et al.* (2007) explain that agribusiness use contracts in order to control product quality. Costs to processing companies are reduced as a result of production cost being passed on to the producer, without the loss of control of the product.

Various authors, including Bogetoft and Olesen (2002), Singh (2008) and Chakraborty (2009), have indicated that contracts are successful, but they need to be customised according to the commodity. Chakraborty (2009) indicated that each commodity/producer has different needs, which will have an impact on the structure of the contracts. Bogetoft and Olesen (2002) examined agricultural marketing contracts in Denmark that included commodities such as peas and potatoes and found that each commodity, and thus their evaluation, was unique. In order to enhance evaluation and the development of contracts, Bogetoft and Olesen (2002) identified ten rules listed in Table 4.1 below.

Table 4.1: Ten rules of contract development

Co-ordination	1 Co-ordinate production
	2 Balance the pros and cons of decentralisation
	3 Minimise the costs of risk and uncertainty
Motivation	4 Reduce the costs of post-contractual opportunism
	5 Reduce the costs of pre-contractual opportunism
	6 Do not kill co-operation
	7 Motivate long-term concerns
Transaction costs	8 Balance the pros and cons of renegotiation
	9 Reduce direct costs of contracting
	10 Use transparent contracts

Source: Bogetoft and Olesen (2002)

In South Africa, most potatoes produced for the processing industry fall under short-term contracts. Accordingly, contracting has an important role to play in the South African potato industry. The processors of frozen fries in South Africa are striving to get producers to enter into long-term contracts in order to reduce their uncertainty and hence also transaction cost. Potato producers are, however, reluctant to enter into long-term contracts. This means that within South Africa various incentives need to be developed, such as negotiating models and supply chain management for long-term contracting. Gereffi *et al.* (2005) have indicated that producers could use the economies of scale to manipulate the supply chain in order to increase their profits. This economy of scale is achieved mainly by backward vertical integration into the supply chain. Potato processors in South Africa must develop these kinds of incentives in order to establish longer-term contracts.

The aim of this paper was to provide companies with sufficient information regarding advantages and disadvantages of the processing industry and to develop a price setting model in order to reduce negotiating time. Potato processing companies can then use the information and model to set longer-term contracts. In order to achieve the aim, the advantages and disadvantages of potato processing companies in South African according to the potato producers was determined. A price setting model was also designed to be used as a tool to assist the negotiating process.

4.2. Methodology

4.2.1. Identifying the factors that hinder potato producers from entering into long-term contracts with processing companies

Factors that influence producers' decisions to sign contracts were examined. In order to quantify the factors, an analysis of the advantages and disadvantages of the processors in the view of producers was carried out (Jooste *et al.*, 2009). The advantage/disadvantage analysis was quantified by evaluating the magnitude (given by producers) and the importance (obtained from processing companies) of elements in the form of a matrix. The magnitude had Likert scale ratings of 1 (very low), 2 (low), 3 (medium), 4 (high), 5 (very high) that were assigned to advantages, and in the case of disadvantages the Likert scale was the same, but with negative values. The importance of each rating was also quantified by assigning a

Likert scale of 1 (not important), 2 (less important), 3 (important), 4 (more important), 5 (very important). Elements were ranked by multiplying the magnitude by the importance: a high score was positive and a low score negative. The data were collected using a structured questionnaire with open-ended questions and Likert scales (Bryman & Bell, 2007).

South Africa has two prominent companies in the potato processing industry (Hannekom *et al.*, 2009): one in the French fries industry and one in the crisps industry. These companies have 20 producers in the Eastern Free State region. The travelling constraints relating to the producers being situated in different geographical areas resulted in the use of non-probability sampling in the form of a quota sample (Bryman & Bell, 2007). The producers were categorised according to farm size to reduce bias: a small-scale producer, produced potatoes on 100ha or less and a large-scale producer produced potatoes on 101ha or more. Five small-scale and five large-scale producers identified by the processing companies from their producer lists were included in the study. The data received from the producers were transformed into frequency tables, which indicate the magnitude of the matrix.

4.2.2. Development of a price setting model

Various production cost data were needed to develop a price setting model for procurement marketing. The enterprise budget data, specifically from the potato industry, were used for the development of the model and was gathered using secondary data sources. The sources include co-operatives' production cost manuals, specifically the Griqualand-West Co-Operative (GWK) and PotatoSA production cost manuals. Mechanical cost manuals developed by agricultural engineers were also used.

The price setting model was developed to assist agricultural managers with the negotiating process and contract development between producers and processors. Thus, the model had to assess the impact of a price premium paid by the processor as an incentive for producers to consistently produce potatoes of a high quality. This was done by constructing an enterprise budget for each producer up to direct allocated cost (variable cost). These budgets were then linked into a standardised budget from which a model was created to establish an equitable price model that could be used to calculate a price and minimised subjectivity in the

determined price. Potential prices for potatoes could also be calculated in order to motivate a specific price to producers and the board members.

The aim of the price setting tool is to determine the magnitude by which a price premium could reduce the risk of a potato producer not covering his or her direct allocated costs. In order to calculate this, information was needed on the direct allocated cost and gross revenue (GR) associated with the production of potatoes for processing. The direct allocated cost figure was obtained from the focus group discussions and was estimated to be R66 038 per hectare for the Eastern Free State. The R66 038 direct allocated cost was for potatoes produced under irrigation in the Free State Province for the 2010/11 production season. It is important to note that some costs normally not included in an enterprise budget, such as depreciation, were included in the budget for the purpose of evaluating the impact of the pricing model. This was done because the interviewed producers argued that processing companies exclude such costs when negotiating for a price, which then results in a false estimate of the profitability of potato production at the offered price. The tool was designed so that the user could use the direct allocated cost relevant to his or her personal situation. Once the direct allocated cost was calculated, the next step was to obtain a distribution of gross revenues to determine the probability that the gross revenue would not be sufficient to cover direct allocated costs.

By definition, gross revenue was calculated by multiplying yield with the price that was received for the product (Van Zyl, Kirsten, Coetzee & Blignaut, 1999). Since the aim of this tool was to measure the impact of a price premium on the probability of not covering production cost, a fixed price was used in the calculation. A distribution of potential yields was obtained by simulating a stochastic yield from a triangle distribution with specified minimum, maximum, and most likely yields using Simetar (Richardson *et al.*, 2004). Again, for the purpose of this study, the respective yields were identified through discussions with potato producers. A distribution of gross revenues was obtained by multiplying the simulated yields with the specified price. The specified price was taken as the average price that was received for potatoes for the 2010/11 season. A cumulative probability distribution (CDF) graph of the gross revenue was used to determine the probability that the producer might not be able to cover his or her direct allocated costs. In the case of the Eastern Free State, the

probability was determined that the gross revenue would be equal to or less than R66 038 per hectare and thus insufficient to cover direct allocated costs. The scenario where no premium was included in the price served as the base category (baseline) for further comparisons.

In order to determine the impact of a price premium, different scenarios were compiled where the specified price was replaced by a price plus a different premium for each scenario. For the purpose of this study, price premiums of 10% and 20% of the specified price were used to show the reduction in the probability of the producer not covering his or her direct allocated cost. In practice the processing company using the developed model could decide what percentage premium to add to the specified price. The gross revenue for the respective scenarios was calculated by multiplying the new prices with the simulated yields. Similar to the baseline, CDF graphs were drawn of all the gross revenue distributions to determine the probability of the producer not meeting the direct allocated costs for each scenario. The magnitude of the decrease in the probability of not covering the direct allocated cost served as an indication of the impact of price premium implementation on risk. In the last section of the model the producer could indicate the preferred gross margin and the model was designed to calculate the contract price to reflect the identified margin, given the production cost. This means that the producers can effectively determine the preferred contract price in order to pay the total cost including own remuneration. A summary of the main calculations in the model is given in Table 4.2 below.

Table 4.2: Summary of main calculations in model

Name	Where	Calculation Method
Rank	Matrix	Magnitude x Importance
Total Income	Enterprise budget	Contracted price x Yield x hectares
Total production costs	Enterprise budget	Sum of costs
Sensitivity analysis	Enterprise budget	(Price x yield) - total costs
Risk factor (simulated yield)	Price setting model	Simetar triangular distribution (min, max, most likely)
Risk factor	Price setting model	(Simulated yield x price) < production costs
Preferred contract price	Price setting model	(-production costs / (production cost margin-1)) / yield
CDF	Price setting model	Simetar CDF graph

4.3. Results and Discussion

4.3.1. *Perceptions of producers*

The potato producers which sold to the processing industry in the Eastern Free State identified the following advantages and disadvantages:

Advantages

A **well-established global company** in South Africa that would not experience growth pains and had sufficient experience was seen as a strength. Producers indicated that they would hesitate to sign a contract if the processing company was not well-known and trusted. A contract with a well-known processing company also helped with credit applications because the producer could use the contract (insurance of payment) to motivate the application of production credit to a financial institution.

Bulk transport was an advantage as it saved time and labour costs.

Logistics of the processors were of a high standard. The producers confirmed that they did not struggle with trucks being late or problems with the availability of trucks. This was an advantage because some of the transport companies delivering goods at the fresh market were expensive and not always available at a specific time. Own transport was also expensive because of high diesel prices, maintenance and opportunity costs (vehicles could be used for other commodities).

The processing plants of the processor had to have the **capacity to process commodities**. This was mainly because the quality of potatoes is very sensitive. Potatoes that are ready must be harvested and transported to the processing plant/factory as soon as possible in order to prevent quality penalties. A processing company with a high processing capacity had a competitive advantage.

The existing producer list comprised **loyal and experienced** producers. Some producers had delivered produce to a specific company for more than five years. This signified that the

company had a reliable and loyal client/producer base and that producers trusted the processor. Some of the producers encountered problems with their potato yields, owing to factors such as seed quality and diseases. The processing company supported these producers **financially** and with extension services. This was important for longer-term contracts, mainly because the producer would have a little less risk.

The field agents (extension officers) were also seen as a positive factor for some of the smaller producers. They helped the producers intensively with the management of their crops, as well as managing delivery of their crops to the processing plants.

If there was a deficit in the supply of potatoes for processors and the producer had already delivered his or her full contract, some of the processors were willing to buy the producers' **redundant stock at a flat rate (specific price)** without deductions.

The advantages of processing companies from the perspective of producers are shown in a matrix in Table 4.3 below. The main advantage of a processor was the processing capacity, followed by bulk transport. The identified advantages should be used by processors when establishing long-term contracts with producers, because these factors would influence producers to commit.

Table 4.3: Advantages of processing industry from the perspective of potato producers

Advantages			
	Magnitude	Importance	Rank
Flat rate	2	1	13%
Compensation	2	2	27%
Established	2	4	53%
Loyal experienced producers	2	4	53%
Logistics	2	5	67%
Extension officers	2	5	67%
Bulk transport	3	4	80%
Processing	3	5	100%

Disadvantages

The producers indicated the following disadvantages of processors:

Grading systems were problematic, specifically the human errors involved with the grading of products. The producers also indicated that the grading system was very strict on quality performance, requiring higher producer performance to satisfy these standards. According to the producers, this was not matched with higher prices. The producers also had a concern that when market prices were low, more cargos were rejected, implying that processing companies would then buy lower quality potatoes from the fresh produce market. Some of the larger producers indicated that the grading system was acceptable, and stated that it was the producers' responsibility to have high standards.

The **holdback fee** and the payment period of some processors was a disadvantage. The holdback fee is a deposit that producers pay for each freight delivered, and if the producers do not deliver his or her contract quantity, he or she loses this fee. According to the producers, some of the processors had a payment period within two weeks, whereas some of the larger processing companies had a payment period of a month. This was subsequently directly connected to a loss of interest and cash flow.

The **preferred cultivar** for processors, such as the Pentland Dell, was not a popular potato on the market. Thus if the producer had a problem with his or her grading and the freight was rejected, the producer faced economic losses. This was mainly because they had added costs, such as washing and packaging, added to a low market price of an unpopular cultivar.

Some of the larger producers indicated that the **extension officer** appointed by the processing companies may incur extra cost for the processor, which would in turn reflect on the producer's price. The larger producers obtained information from their fertilizer provider specialists, as well as from other specialists in the field. The conclusion was that the extension officers should be contracted.

Transport cost was an issue for some of the producers. They indicated that everyone paid the same transport cost. This was a problem for producers near the processing plant, because their transport cost would be lower and they felt that they subsidised the producers further from the processing plant.

The producers stated that **harvesting teams** must take more responsibility. Some of the producers hire harvesting teams from processors or from those contracted by processors. These teams are not always on time with harvesting and the producers are subsequently penalised. There are also cases where the harvesting team’s equipment is faulty, which can lead to lower quality whereby the producer is penalised for these low qualities.

Some of the processors did not want producers to **produce commodities for other processing companies** (crisps vs. frozen fries). The producers found this a disadvantage, mainly because the different companies were used for risk management purposes. Companies in the crisp market process smaller potatoes, thus the potatoes rejected by the frozen fries companies (which prefer larger potatoes) can be sent to the crisp producers. This will improve the financial position of the producer since the producer would have fewer rejections.

As was done with the advantages, the disadvantages of processing companies from the potato producer perspectives are shown in a matrix format in Table 4.4 below.

Table 4.4: Disadvantages of the processing industry from the perspectives of potato producers

Disadvantages			
	Magnitude	Importance	Rank
Transport costs	-1	3	-20.00%
Holdback	-2	2	-26.67%
Other companies	-2	2	-26.67%
Extension officer	-1	5	-33.33%
Grading system	-2	4	-53.33%
Cultivars	-2	4	-53.33%
Harvesting teams	-2	4	-53.33%

The largest disadvantages for a processor were the grading system, cultivars and harvesting teams. The above-mentioned disadvantages and advantages of long-term contracts must be used by processors in order to develop tailor-made contracts. This means that the processing companies must place more emphasis on the advantages, and in terms of the disadvantages they must, however, exclude the disadvantage or convert it into an advantage. In order to establish long-term contracts with producers, the processors must therefore focus on these elements and convert the disadvantages into advantages.

4.3.2. Assessing the impact of using a price setting model on the risk faced by potato producers not able to cover direct allocated costs

Price risk and negotiating time are important for producers and accordingly it is important that farmers and processors manage this process together. This meant a model had to be developed to complement these factors: a main problem in negotiating was that the agricultural manager would struggle to satisfy both the producers and the board members of a processing company. The model was developed in order to reduce the negotiating time between producer and processor and to increase the efficiency of the negotiating process

Examples of the price setting model output are given in Figures 4.1 below to 4.5 below and are respectively an information page, production costs, CDF graph, calculations with graphical output and tabular output.

Figure 4.1: Example of the price setting model information page

Info sheet

Farm name:

Total ha:

Yield/ha: (Expected Yield)

Do you sell some of your potatoes on the fresh produce markets as well? (Yes or No)

If YES, what is the percentage of each size group sold, including processing? If NO, proceed to row 18

Processing	Large	Medium	Small	Baby
<input type="text" value="70%"/>	<input type="text" value="5%"/>	<input type="text" value="15%"/>	<input type="text" value="5%"/>	<input type="text" value="5%"/>

This includes processing, thus the total distribution of crop

Expected prices on fresh produce markets for the following sizes:

	Large	Medium	Small	Baby
Rand per ton	<input type="text" value="R 3 000"/>	<input type="text" value="R 2 500"/>	<input type="text" value="R 2 000"/>	<input type="text" value="R 1 800"/>

Fill in the prices that you can obtain on the fresh produce markets, before any deductions

Average market price: Average table potato market price per ton, given the % filled in above (before deductions, like commission)

1 Income: (Expected contract price per ton for processing)

2 Type of land: (Dry land or irrigation)

3 Diesel price: (Normal pump Diesel price)

4 Harvest: (Hand or mechanical)

5 Labour: Price/worker/day

Permanent:

Casual:

Drivers:

6 Interest: (Months of production loan)

Interest: (Interest rate on production loan)

Developed by: Dirk Strydom - UFS

Only change data in the yellow blocks. First put in your own data and press the blue "Calculate" button at the bottom. Then go and put down your own costs by pressing either the pink or green button at the bottom, depending if you are doing irrigation or dry land potatoes.

This section is only completed if you selected "Yes" in row 7, which confirms that you sell potatoes on fresh produce markets as well.

Figure 4.2: Example of the price setting model production costs

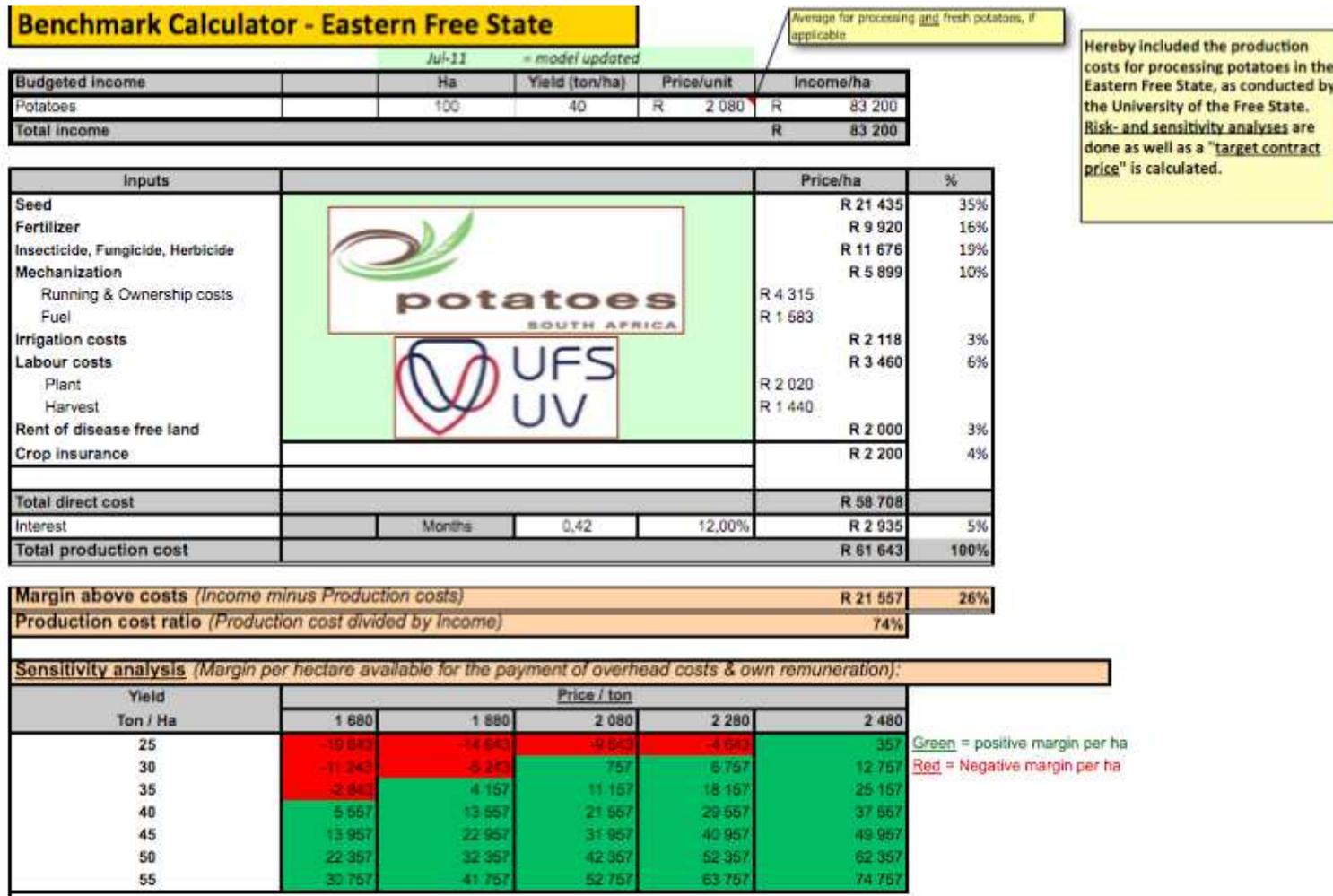


Figure 4.3: Example of the cumulative Distribution Function of different price premiums given production costs

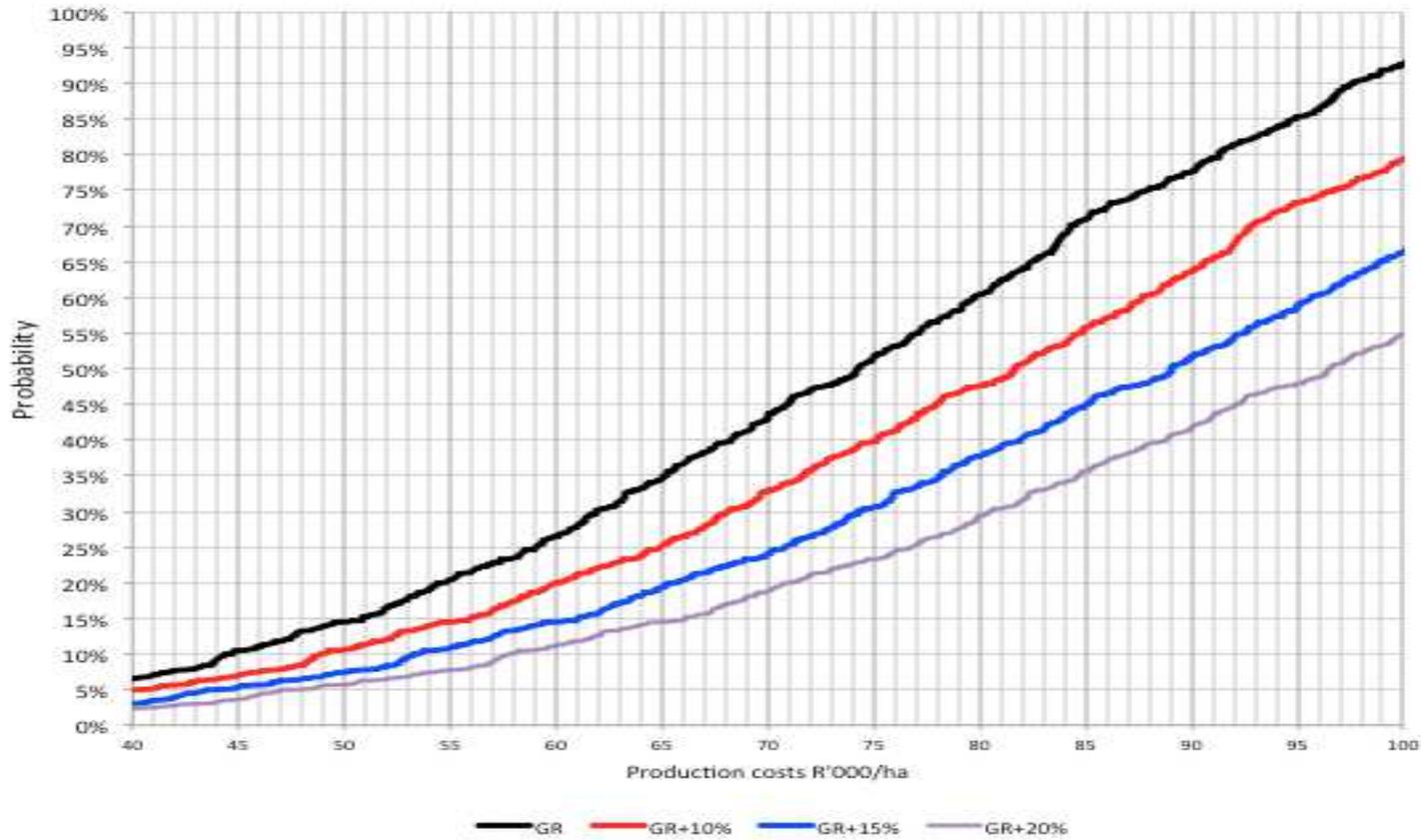


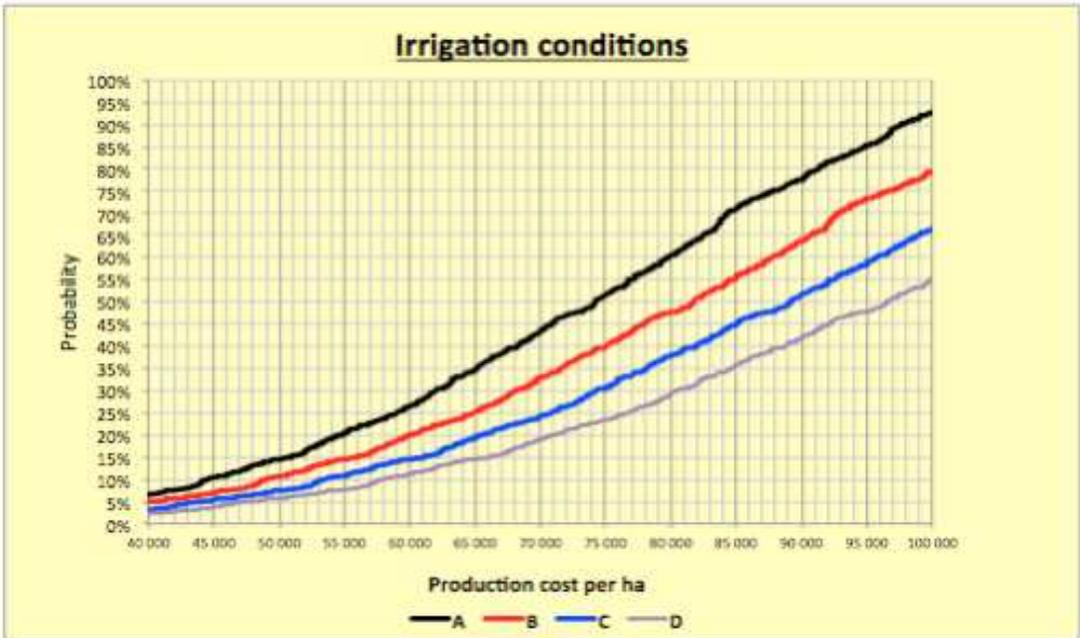
Figure 4.4: Example of the price setting model calculations with graphical output

In the following section the risk of not paying back the production cost is calculated, given 4 price scenarios and the calculated production cost.

Risk factor:	Different price scenarios			
	A	B	C	D
Price in R per ton:	R 2 080	R 2 288	R 2 496	R 2 704
Production cost in R per ha	R 61 643	R 61 643	R 61 643	R 61 643
Probability of not paying back production costs	29%	22%	16%	12%
	Irrigation		Dryland	
Minimum expected yield	10	ton/ha	8	
Most likely expected yield	40	ton/ha	20	
Max expected yield	55	ton/ha	30	

Risk of not paying back production costs: Calculated by means of using risk simulations (see next 4 rows)

This is the yields used in the simulation to calculate the above risk



Given a specific production cost per ha and price scenarios A to D, what is the probability that I will not have enough money to pay back my production costs?

GRAPH EXPLANATION

This graph is only applicable if you indicated on the info sheet that you do irrigation.

Figure 4.5: Example of the price setting model calculations with tabular output



In order to assess the impact of using a price setting model, the first step was to quantify the direct allocated costs associated with the production of potatoes for the processing industry. The demonstration of the model was based on an enterprise budget that was compiled after discussions with potato producers in the Eastern Free State region who supply to the processing industry. The direct allocated cost associated with the production of potatoes for processing under irrigation in the Eastern Free State was calculated to be R66 038/ha (yield of 40ton/ha) for the year 2011. A producer would need to obtain at least a price for the potatoes which would cover the direct allocated cost of R66 038/ha. Thus, the producer would cover the variable costs in the short-term. The output of the model provided a graphical presentation of the results in the form of a Cumulative Distribution Function CDF graph, and also provided the user with an actual value (percentage), which indicated the probability of not being able to cover the direct allocated costs for the year. The CDF was calculated from the simulated yields multiplied by the fixed price, subtracting the fixed production costs.

The distribution, GR, represents the gross revenue that can be obtained at the initial price specified by the processor. Given the direct allocated cost of R66 038/ha, the graph in Figure 4 indicates the probability for the producer not being able to cover that cost as 21%. If the processor is willing to pay a premium of 10% more than the initial specified price (GR+10%) to a producer who is consistently producing a product of a high quality, the probability of that producer not being able to cover the direct allocated costs decreases substantially to 15%. In the case where the producer has built a good reputation and supplies a good quality product

and the processor offers a premium of 20% higher than the initial specified price (GR+20%), the probability of the producer not being able to cover the direct allocated cost reduces even further to 12%.

The results are also presented in table format from which a producer can identify the probability of being unable to cover the direct allocated cost. From Table 4.5 below it is evident that the probability of the producer who only receives the initial specified price for the potatoes being unable to cover his or her direct allocated cost is 12%, followed by 2% and 0% with the implementation of the premiums.

Table 4.5: Risk reduction by means of price premiums

	R2000/ton	Given + 10%	Given + 20%
Production cost	R 66 038	R 66 038	R 66 038
Possibility to get production cost or less	26%	20%	15%

One of the major disadvantages of the processing industry as indicated by the producers was that they carry most of the risk. Although producers were not alone in bearing the risk, their perception that they are bearing all the risk may prevent participation in long-term contracts with processors. A price premium for consistently high quality production of potatoes may serve as an incentive for producers to aim for good quality potato production, since the risk of not being able to cover direct allocated cost is reduced. Producers may also be more willing to participate in long-term contracts with a processor who is willing to offer the premium for the consistent supply of high quality potatoes. Thus, the implementation of a quality premium may correct some of the disadvantages specified by producers and contribute to producers and processors entering into long-term contracts.

The following example summarises the working and importance of the model:

The producer and agricultural manager will calculate production costs together. The producer can then indicate what is the preferred gross margin and the model will calculate a contract price. The model then uses the contracted price in order to calculate the risk of not

covering the production costs (given the fixed price, fixed production costs and simulated yields). If the risk is too high for the producer, they can renegotiate a price. The agricultural manager of the processing company can also indicate to a producer that if better quality potatoes are produced, the risk can be decreased by means of a premium: this method would be an incentive for better quality potato production/procurement. The agricultural manager can also use the risk figure as a motivation for prices to the procurement manager, which will decrease negotiating time and deliberation.

4.4. Conclusion and recommendations

The aim of this paper was to investigate the factors that hinder South African potato producers from entering into long-term contracts with potato processing companies. Various strengths of the industry were identified by means of an advantage/disadvantage analysis. Producers mentioned that major processing companies were well established and had the capacity to process harvested potatoes when required, which was an advantage. There were also some perceived disadvantages in the processing industry. The producers listed the main disadvantages as high transaction cost, mainly owing to uncertainty and asset specificity associated with producing potatoes for processing. In order for processors to get more producers to enter into long-term contracts, the aspects that the producers have regarded as advantages of the industry should be considered and the specifications included in long-term contracts. Similarly, processors should concentrate on converting or excluding the specified disadvantages into either advantages or, at least, opportunities.

The price setting model that has been designed may contribute towards converting some of the identified disadvantages into advantages or opportunities. The model can be used to determine price premiums that can serve as incentives for the production of potatoes of a sufficiently high quality as required for the purpose of processing. Thus, it may form part of a marketing model in order to establish longer-term contracts. Producers can also benefit from using the model in decision making, since the model allows for risk consideration when calculating potential gross income at the proposed contract price.

Processors need to think innovatively to get producers to engage in longer-term contracts. They should focus on creating incentives in longer-term contracts that are attractive to producers rather than only regulating the quality through levying penalties. Higher quality potatoes and the increased attractiveness of long-term contracts can be created by means of making grading systems more transparent.

Further research on how to set up strategies regarding the advantages and disadvantages is needed. This can be done by means of using an experimental research method where one of the independent variables is manipulated. The accuracy of the analysis can be improved by constructing a structured questionnaire for all the producers and processors of the processing industry. This will increase the spread of producers and econometrical evaluations can be carried out in order to eliminate bias. Finally, it is important to realise that this paper did not assess the economic impact for processors of using the developed pricing model to calculate price premiums to serve as incentives for producers.

**Reduction of transaction cost within the South African potato processing
industry**

**Reduction of transaction cost within the South African potato
processing industry**

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5.1. Introduction

The potato industry in South Africa is important to the South African economy. It contributed approximately 38% of the gross value of vegetables produced in South Africa during 2007 (National Department of Agriculture (NDA), 2008). The potato industry consists mainly of seed potatoes, table potatoes and potatoes for the processing industry. During 2007, the processing industry handled about 19% of the potatoes harvested in South Africa, of which 55% were processed into potato chips, 43% into crisps, and the remaining 2% was used for canning, mixed vegetables and other use (Potato SA, 2009). The last decade saw a substantial increase in the volume of potatoes that were processed into frozen fries – from 70000 tons in 1997 to 170000 tons in 2007, which reflects a growth of 143% (Potato SA, 2009). Thus, frozen fries are becoming increasingly important as a final product within the potato industry of South Africa and as a market for producers.

Potato producers incur high levels of transaction costs that include temporal and physical asset specificity. Asset specificity relates to the ability of the specific asset to be transferred to alternative uses (Williamson, 2000) or the opportunity costs of assets in terms of alternative uses. Assets considered to be highly specific are those assets with comparatively low value elsewhere, which consequently gives the owner of the asset strong interest to continue with the transaction (Hai, 2003). According to Milagrosa (2007), “asset specificity relates to the amount of money, time and effort put into the transaction by the transacting parties”. Temporal specificity relates to the fact that potatoes are mainly produced in the summer rainfall areas with only a small part being produced during winter. Processing potatoes are extremely sensitive to changes in sugar content and cannot be stored. The potatoes also have a limited window period for harvesting. Late harvesting of potatoes has a negative impact on the quality thereof and thus on their suitability for processing. Finally, the fact that potatoes that can only be planted on the same parcel of land every fourth year owing to soil health conditions is also evidence of a high level of temporal specificity.

Physical asset specificity associated with potato production relates to the need for physical assets that are used exclusively for potatoes. Such specific physical assets include, amongst others, harvesting equipment that can only be used to harvest potatoes. The need for such specific physical assets contributes to increased transaction costs for potato producers. Two other causes that influence transaction costs are the uncertainty in the yield variability of the potatoes and the variability in the price for the potatoes.

South African potato producers have two main marketing channels. The first is the normal fresh market, which is referred to as the spot market. The second channel is the processing market, which can be divided into two sub-sectors, namely frozen fries and crisps. This channel is known as the contract market. There are also various structures that can be used to manage producers' transaction costs and marketing strategies, one of which is the Transaction Cost Economic Theory.

Transaction Cost Economic Theory is one of the "branches" of New Institutional Economics (Kherallah & Kirsten, 2002). The fundamental argument in Transaction Cost Economics is that economic governance is a prerequisite for using resources in an economically optimal manner, and thus also for enhancing economic efficiency. Within Transaction Cost Economics, institutions are furthermore hypothesised to be transaction cost-minimizing, which may evolve with changes in the nature and source of transaction costs (Kherallah & Kirsten, 2002). A firm is expected to choose the governance structure that will minimise the transaction costs associated with the specific transaction under consideration.

Various authors, such as Hobbs (1997), Mantungul, *et al.* (2001), De Bruyn *et al.* (2001), and Jordaan and Kirsten (2008) have used Transaction Cost Economic Theory in their research methodology. The authors mainly used proxy variables to represent transaction costs in regression analysis. The main focus of the more recent research is that the transaction itself is the basis of analysis. Jordaan (2012) assessed the attributes of the transaction associated with the respective governance structures and includes the spot and contract market. Milagrosa (2007) used Transaction Cost Economics to determine the most effective governance structure for the vegetable industry in the Northern Philippines. Jordaan (2012)

used the same theory to evaluate the most effective governance structure for raisin producers in the Northern Cape. Both authors concluded that the contracting structure is the most effective transaction cost minimizing structure compared to other governance structures, such as the spot market.

Contracting has an important role to play in the South African potato industry because the processing industry is growing at a fast pace. The potato processors of South Africa are, however, striving to get more permanent long-term contract producers to enter into the processing industry. These contracts also benefit producers, mainly because of a reduction in uncertainty and also because producers can use the contracts as security in order to obtain production loans. South African producers sometimes struggle to enter into long-term relationships because of issues such as economies of scale, the strict quality requirements of the buyer and the fact that the buyer requires constant volumes all year round. According to Vasilescu (2009); Ortman and King (2007); and Birchall, Chanaron and Soderquist (1996), producers can overcome these obstacles if there is closer cooperation within the supply chain. Weatherspoon and Reardon (2003) argue that producers can overcome obstacles within a market if they collaborate and obtain economies of scale. Gonzalez-Diaz, Newton and Alliston (2006) state that producers are too far removed from their consumers and need to integrate into the supply chain to make it shorter and move closer to their market. Gonzalez-Diaz *et al.* (2006) proposed a business model called a Farmer Controlled Business (from here on Farmer Controlled Business and collaborative structures will be referred to collectively as alliances). With this model, producers are still the owners and managers of their own farm units, but they can share in the benefits of being part of a bigger collaborative organisation. International studies have found that collaboration allows smaller farm units to gain economies of scale, share resources, minimise risk, enter new markets and decrease their transaction costs (Milagrosa, 2007; English Farming and Food Partnerships, 2004). Therefore, it is important to evaluate currently successful alliances in the potato industry in order to establish a better marketing strategy for both producers and processors.

Alliances can allow producers to buy inputs, produce, or market in collaboration. An alliance can be constituted as a formal legal entity, such as a cooperative or private company, which allows producers to remain the owners of their farms (Gonzalez-Diaz *et al.*, 2006). The

establishment of alliances can provide a vehicle for producers to overcome the obstacles they face in the market. These alliances can assist producers in becoming more adaptive, efficient and flexible within the supply chain (Terziovski, 2003). Producers who form alliances are able to share their skills and expertise, and achieve greater marketing power within the industry. Alliances can enhance the competitiveness of producers and allow them to form relationships with the businesses which offer market contracts (Coviello, Ghauri & Martin, 1998). They also provide producers with the opportunity to take advantage of economies of scale and still be the managers and owners of their farms (Business Environment Specialists, 2009) and therefore allow flexibility in their management practices (Venkataramanaiah & Parashar, 2007). When producers form relationships with their buyers, it leads to vertical linkages which can also result in horizontal linkages that can build capacity and provide these producers with access to markets (Business Environment Specialists, 2009).

The aim of this study was to assist potato processing companies in South Africa to establish long-term relationships with producers and also to reduce producers' transaction costs. The magnitude of transaction costs within the potato industry's different governance structures (table and processing) was determined and consideration given to whether formation of alliances assisted potato producers to overcome the obstacles they faced in the market. The critical elements necessary to establish longer-term relationships between producers and processors were identified.

5.2. Data and procedures

5.2.1. Data

5.2.1.1. Transaction costs

A structured questionnaire was used to conduct telephonic interviews in 2010 to determine the magnitude of the transaction costs within the potato industry. The study area consisted of the Eastern Free State region of South Africa in which the largest concentration of farmers producing potatoes for the table and processing industries was found. A census method was used and all the respondents (n=70), identified from a producer list of Potatoes South Africa (PSA), were included in the study.

The questionnaire was compiled from a literature review and submitted to three key role-players within the potato industry for review. Corrections and suggestions were incorporated until the role-players agreed that all the important aspects were captured in the questionnaire. A pilot study was conducted and two PSA managers and two commercial farmers were interviewed.

5.2.1.2. Farmer Controlled Businesses

Successful alliances within the potato industry were identified by PSA. An alliance was deemed successful when producers made a contribution in terms of production, marketing and hectares planted within their area. Five alliances were identified within five different provinces in South Africa (Free State, Limpopo, Mpumalanga, KwaZulu-Natal and Western Cape). Members in each alliance farmed in the same area. Each manager of an alliance was interviewed. Qualitative information was collected regarding the success factors and benefits of the alliance. The study focused on one industry, as single industry studies offer greater control over extraneous variations, such as industry characteristics and problems that are specific to the industry (Mohr & Spekman, 1994; McDougall and Robinson, 1990).

The questionnaire was pre-tested on industry representatives and minor adjustments were made to the questionnaire before use. Face-to-face interviews ensured that the respondents completely understood the questions and were able to elaborate on their answers. The questionnaire consisted of open-ended questions, which ensured that the respondents could supply in-depth information about the reasons why they established the alliance, the advantages it holds and also the key elements that ensure the successful relationship with their buyer. The five alliances comprised the following:

Alliance A (Free State)

Alliance A produced and marketed their potato tubers, and also re-invested in the group by building laboratory and storage facilities. They successfully regulated the production in the area and as a result there has been a drastic decline in potato viruses spreading in the area. The alliance had 14 members and they had expanded to include growers who sell tubers to the alliance on a contract basis. The alliance identified their key success factors as follows: their management team, a feasible mission and vision, loyal members, and specialist employees who were able to give expert advice to the members.

Alliance B (Limpopo)

In order to decrease their input costs, this alliance established their own fertilizer plant. A group of eleven producers were invited to join the alliance as equal shareholders. The members lived in close proximity and they therefore perceived regular communication between members and transparency as their key success factors.

Alliance C (Mpumalanga)

Alliance C was originally a cooperative, which converted to a private company. The alliance had five members who pooled their production and packaging in one pack-house and transported their commodities to a buyer. They also had an on-farm laboratory. The members identified their standard of technology, their exclusivity (only 5 members) and their integration into the supply chain as their key success factors. They did not have any long-term contracts and negotiated prices on a seasonal basis. Negotiations were based on price offered and trustworthiness of the buyer.

Alliance D (KwaZulu-Natal)

Producers established Alliance D as a marketing channel for fresh potatoes. The members paid a membership fee, which made them loyal to the group. This alliance gave potato producers economies of scale as they marketed their produce in a pool. From a buyer's perspective, buyers preferred working with the alliance as they did not have to negotiate with 50 producers but rather with one representative from the alliance on behalf of the 50 members. This alliance also planned to integrate into the supply chain by processing their potatoes.

Alliance E (Western Cape)

Alliance E produced a specific cultivar to meet the requirements of the consumer (baking, boiling and frying). Producers in the alliance marketed under the brand name of the alliance. Thus, producers gained access to new markets, specifically the retailers selling to high-income consumers. The consumers were willing to pay extra for a differentiated, branded and high-quality product, which is what the alliance could provide.

5.3. Procedures

The approach of Williamson (2000), as adopted and refined by Milagrosa (2007) and Jordaan and Grové (2010), was first used to establish the magnitude of transaction costs for both the table potato industry (spot market) and the processing potato industry (contract market). The actual amount of transaction cost could be calculated, but the level of transaction cost for each governance structure could be determined, given the attributes of the respective transactions (Jordaan & Grové, 2010).

Asset specificity was represented by different proxy variables. Assets specifically used for production within a governance structure were regarded as physical asset specific. The producers were asked whether they invested in their own transport vehicles, made use of additional equipment and had invested in additional packaging materials relevant to the other governance structure. The relative strength of the respective proxies for physical asset specificity was elicited by expressing the number of respondents who indicated having invested in the specific physical asset as a percentage of the total number of respondents who used the specific governance structure. The higher strength was indicated by ++ and lower strength indicated by +. In terms of human-specific questions, the respondents were asked to indicate their number of years of formal education, farming experience and age: the higher the number of years, the higher the level of human specificity.

Uncertainty was linked to proxies, such as delayed payments, buyers who withheld important information, buyers who manipulated prices, freight rejections, overall risk relevant to the alternative governance structure (spot vs. contract), and price uncertainty at planting time. All the proxies could increase transaction cost levels and producers were asked whether any were present in their specific governance structure. The magnitude of each proxy was measured by expressing the number of respondents as a percentage of the total number of respondents using the specific governance structure under consideration, or by calculating an average value for each proxy.

Transaction frequency was measured by determining the number of times producers had contact with their buyers (negotiating, extension services and price information): the more the contact between the buyer and the producer, the higher the transaction frequency.

Other proxies representing transaction cost included search and information, negotiation and pricing. When the producer made an effort to search for information, the transaction costs for the specific governance structure increased. Longer price negotiations resulted in higher transaction costs, delayed payment, and consequently higher transaction cost for the specific governance structure. The producers were asked whether they made extra efforts to collect price information, length of price negotiation, and payment period (from delivery to payment). The average responses were measured using a Likert scale of 1 – 5 and relative strengths were indicated as: + Low, ++ High and +++ Very High.

The results of the relatively small sample size were tested for significant differences between the governance structures for each proxy using SPSS and Microsoft Excel, the Fisher exact and ANOVA test. The relative weights of transaction cost represented by each proxy were then added and compared for both of the governance structures to indicate the governance structure with the highest transaction cost.

5.4. Results and Discussion

5.4.1. Transaction costs

The potato industry for human consumption consists of two main sectors, the table potato sector and the processing potato sector. The table potato sector mainly makes use of the governance structure called the spot market. In this governance structure, the producers receive the price determined by the market, namely the fresh produce market. The processing industry uses a hybrid governance structure, more specifically contracts. In this governance structure, the buyer (processor) of the produce determines the price. In this section both of these governance structures will be compared in terms of transaction cost.

Sixty-three of the seventy interviews were eligible for analysis and seven responses to the questionnaires were insufficient, possibly because respondents did not wish to share sensitive

information. Twenty producers (32%) used the contract market and forty-three (68%) used the spot market.

The attributes of the transactions investigated were physical asset specific, human asset specific, uncertainty, frequency and other proxy variables. Table 5.1 below provides a summary of the transaction cost associated with potato producers in the Eastern Free State region.

Table 5.1: Transaction attributes by type of governance structure used by potato producers in the Eastern Free State region.

Transaction attribute	Total farmers¹	Percentage of respondents²	Relative strength³	Level of significance in difference
Physical assets				
<i>Invest in equipment</i>				1%
Contract market	3	15%	+	
Spot market	40	93%	++	
<i>Invest in packaging</i>				1%
Contract market	2	10%	+	
Spot market	39	91%	++	
<i>Additional processes</i>				1%
Contract market	1	5%	+	
Spot market	40	93%	++	
<i>Invest in transport</i>				5%
Contract market	5	25%	+	
Spot market	23	53%	++	
Human	Average years			
<i>Age</i>				
Contract market	44.40		NA ⁴	

Transaction attribute	Total farmers¹	Percentage of respondents²	Relative strength³	Level of significance in difference
Spot market	43.65		NA	
<i>Experience</i>				
Contract market	21.77		NA	
Spot market	22.5		NA	
<i>Education</i>				
Contract market	14.84		NA	
Spot market	13.9		NA	
Uncertainty	Number of farmers			
<i>Delayed payments</i>				
Contract market	3	15%	NA	
Spot market	7	16%	NA	
<i>Buyer withhold info</i>				
Contract market	10	50%	NA	
Spot market	18	42%	NA	
<i>Manipulation of prices</i>				1%
Contract market	11	55%	++	
Spot market	0	0%	-	
<i>Rejection of freight</i>				1%
Contract market	19	95%	++	
Spot market	0	0%	-	
<i>Price certainty at plant time</i>				1%
Contract market	19	95%	+	
Spot market	27	63%	++	
<i>Risk relative to other governance</i>	Scale 1-5			1%

Transaction attribute	Total farmers¹	Percentage of respondents²	Relative strength³	Level of significance in difference
Contract market	2.25		+	
Spot market	3.79		++	
Frequency				
<i>Contact with buyer</i>	Scale 1-5			1%
Contract market	2.07		+	
Spot market	3.1		++	

¹Number of producers responding; ²Percentage of producers who responded relative to the total for each governance structure; ³“+” Low transaction cost; “++” High transaction cost;

⁴Difference is not statistically significant, thus one cannot assign a weight on the relative strength of transaction cost caused by the specific attribute under consideration; NA = Not Applicable

5.4.1.1. Asset specificity

A significant number of respondents selling on the spot market made use of all three attributes within asset specificity (Table 5.1 above). This indicated that the producer needed additional equipment, such as washing and drying facilities, which was only used within the production system of the spot market. The respondents had to make use of additional packaging material in order to produce for the spot market, thus increasing the transaction cost. The producers in the spot market also made use of their own vehicles and additional production processes, which increased the transaction cost. Overall, the transaction cost of the spot market in terms of asset specificity was much higher than the transaction cost of the contract market.

5.4.1.2. Human asset specificity

None of the attributes within human asset specificity were statistically significant, mainly because the difference between the two governance structures sample size was too small for comparison.

5.4.1.3. Uncertainty

There were no significant differences between the two governance structures in terms of delayed payments and buyers who withheld important information. The rest of the attributes had, however, a significance level of 1% and included buyers who *manipulated prices*,

rejection of freights by the buyers, *certainty of final prices* at planting time and the level of *overall risk* relevant to other governance structures. Manipulation of prices by buyers could not occur in the fresh market system according to the producers and therefore none of the producers in the spot market governance structure indicated that this was a problem. In the contract governance structure, 55% of the producers indicated that price manipulation was a problem and subsequently had higher transaction costs. Similarly, in the spot market, freights were not rejected and the producers only received a lower price for sub-standard produce. In the contract market, 95% of the producers indicated that freight rejection increased their transaction cost. However, data from the questionnaire indicated that not one of the producers had a rejection larger than 10% of the total produce.

The producers were asked to indicate the *certainty of prices* at planting time for delivery after harvesting. Most (95%) of the producers in the contract market, but only 63% of the producers in the spot market, were certain of their prices. In terms of the *overall risk* relative to other governance structures on a scale from low to high, the contract market had a lower average than the spot market (2.25 and 3.479 respectively). This indicated that the perceived risk was higher in the spot market, which meant that the higher the risk, the higher the transaction cost.

In summary, the first two attributes indicated that the contract market had a higher transaction cost level and the last two attributes indicated that the spot market had higher transaction cost. Thus, one can conclude that both of these governance structures had high transaction costs in terms of uncertainty.

Regarding the level of frequency, producers were asked how much *contact* they had with buyers. On a scale of low to high, the spot market producers had more contact with buyers than contract producers (averages of 3.1 and 2.07 respectively). Thus, the spot market had a higher transaction cost.

5.4.1.4. Other proxies representing transaction costs

Other proxies representing transaction costs for each governance structure are presented in Table 5.2 below. The topics, such as search and information, and negotiation, were chosen to give an indication of transaction costs. Producers were asked if they experienced trouble in finding information. In the spot market 60% of the producers indicated that they searched for price information, thereby increasing the transaction cost because of increased management time and cost. On the other hand, only 25% of the producers in the contract market indicated that they searched for price information.

Negotiation of prices and the payment periods were examined. The negotiation period and payment period were deemed very important because these factors might be time consuming. The subsequent transaction costs would increase in terms of time management and cash flow. The contract market had the highest average for both factors, which meant that the contract market had higher transaction cost in terms of negotiation (Table 5.2 below).

Table 5.2: Other proxies representing transaction costs for each governance structure

Transaction attribute	Total farmers	Percentage of respondents	Relative strength*	Level of significance in difference
Search and information				
<i>Search for price information</i>				5%
Contract market	5	25%	+	
Spot market	26	60%	++	
Negotiation	Average**			
<i>Negotiation of prices</i>				10%
Contract market	3.15		++	
Spot market	2.58		+	
Pricing				
<i>Period before paid</i>				1%
Contract market	3.90		++	
Spot market	3.07		+	

*Relative strength: + Low, ++ High +++ Very High

**Average response measured using a Likert scale of 1 – 5

A summary of the relative strengths of transaction cost for the two governance structures is given in Table 5.3 below. The spot market was the governance structure associated with the highest transaction cost. This indicated that the contract market was the best cost minimising governance structure and confirmed the results of previous authors such as Milagrosa (2007) and Jordaan and Grové (2010). However, with uncertainty and negotiation the contract market generated higher transaction costs than the spot market. Marketing strategies and management practises can improve these transaction cost levels and can facilitate the process of long-term contract development.

Table 5.3: Summary of transaction cost results for potato producers

Transaction attribute	Governance Structure	
	Spot market	Contract market
Physical assets	High	Low
Human	NA	NA
Uncertainty	High	High
Frequency	High	Low
Search and information	High	Low
Negotiation	Low	High
Total transaction costs	High	Low

5.4.2. Farmer Controlled Businesses

Alliance A

This alliance had obtained the exclusive rights to a Dutch potato cultivar. In order to access the market and decrease the costs of obtaining the rights to the cultivar, the producers in the area formed an alliance in order to market the cultivar as an organisation. This allowed the producers to increase their marketing power in the potato industry. The alliance controlled production in the area by specifying planting dates for each member. This decreased the risk of disease spreading in the region and therefore maximised output. As a result of controlling the production, the alliance was able to provide constant volumes to their buyer, at a standardised quality.

Alliance B

This group of farmers had identified fertilizer as the main contributor to high input costs. Accordingly, they started their own fertilizer plant to increase their profit margins. The alliance was able to provide their members with the opportunity to obtain rebates from buying their inputs from the alliance. The members of the alliance were able to decrease the fertilizer cost in the area and also expand their plant to service more producers who were not part of the alliance. By allowing non-members to buy from the plant, the alliance increased their capacity and economies of scale, as they bought and produced in larger volumes.

Alliance C

This group of producers formed a cooperative. As a cooperative they were able to invest in storehouses located at a central location. This enabled the producers to combine their products, pack in a central location, and transport from there. Their logistics improved and their costs decreased. In the long-term they were able to streamline the procedure by packaging and transporting their products themselves. This enabled the producers to integrate forward into the supply chain. In addition, the alliance built a testing laboratory and was able to trace each potato back to the land on which it was produced. The alliance could ask a premium from their buyer because they did their own packing, transport, testing and could guarantee the traceability of their commodity. Thus, their transaction costs were increased.

Alliance D

These producers established the alliance in order to create a marketing channel for their fresh potatoes. The alliance had 26 shareholders who were loyal to the group and accordingly did not sell their produce through another marketing channel. Their loyalty was ensured because they were able to generate higher prices in the alliance using economies of scale and they were guaranteed payment within a specified time.

Alliance E

This alliance wanted to enter a high-income market and supply to a specialised retailer. The alliance obtained the rights to a cultivar that complied with the requirements of their buyer and their target market. The consumers would pay a premium for the differentiated and exclusive brand. The alliance were also able to pool their skills and resources in order to

create their own packaging that served to inform the buyer on the best suitable uses for the specific cultivar (baking, boiling or frying).

5.4.2.1. Important elements within an alliance

It is important to identify the critical elements that have to be in place in order to establish a relationship with the buyer. The following elements were identified as very important:

Administration

Sound administrative policies must be in place to ensure the transparency of the alliance. Administrative policies also assist in negotiation processes when the manager of the alliance can prove why they are negotiating for a higher price. From the interviews with the alliances, it was clear that higher producer prices should not be the primary objective of forming the alliance. Higher prices are only generated as the relationship between buyer and producer matures and becomes mutually-dependant.

Trust

The alliances indicated that trust amongst the members of the alliance is most important as there will always be other alliances which see them as competitors, or even suppliers who feel threatened by a successful alliance. Trust between a buyer and producer takes time to establish, but a contract is always needed, nevertheless.

Access to updated information

Many of the interviewed alliances carry out market research in terms of producer, input and consumer prices, as well as supply and demand, or employ a person responsible for communicating all major market trends to the members of the alliance. This is important for long- and short-term strategic planning and both producer and buyer can learn from each other.

Traceability of the commodity

Traceability of the commodity is becoming more important to consumers and therefore also to the buyer. The interviewees indicated that in order for them to earn a premium, they marketed their cultivars under a brand name. They also developed new packaging, which informed consumers about the attributes of the cultivar. This assisted the consumer to buy potatoes most suited for their needs (baking, boiling or frying).

Marketing

Marketing as a group was more affordable and more effective. When the members pooled their produce, the alliance was provided with more marketing power and the opportunity to negotiate better prices was obtained. Many of the alliances indicated that they did not market in collaboration with their buyer. They marketed their produce as a group to their buyer, who then sold to the rest of the chain.

5.5. Conclusion

The South African table potato market is associated with spot market governance whereas the processing potato sector mainly makes use of a more hybrid format of contracting. The magnitude of these governance structures was tested in the study. The spot market had the highest transaction costs in the following attributes: physical assets, frequency and search for information. In terms of uncertainty, both the spot and the contract market had high transaction costs. The contract market had higher transaction costs in the negotiation attribute because the spot market producers had to accept the market price and there was no real opportunity for bargaining. In the contract market, constant negotiation was present and could become time-consuming. The spot market had the highest transaction costs, which makes the contract market a transaction cost minimising governance structure. However, the contract market still had some attributes which had high transaction costs. In order to establish long-term contracts these transaction costs must be reduced.

In order to overcome barriers to and participate in specific governance structures, producers formed alliances. Members of five alliances were interviewed and critical elements that had to be in place in order to establish a relationship with the buyer were identified as administration, trust, access to updated information, traceability of the commodity and marketing.

This study indicated that producers in Farmer Controlled Businesses lowered their transaction costs and formed long-term relationships with buyers when critical elements such as trust, information, and so on were in place. There is still a need to quantify the decrease in costs and the effect of the relationship on the sustainability of the producer, especially in times

where market concentration, mechanisation and changes in the economy are some of the key factors affecting producers in South Africa.

**Characteristics of potato contract producers in the South African potato
processing industry**

**Characteristics of potato contract producers in the South African
potato processing industry**

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Submitted to Agrekon – Accepted with changes

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6.1. Introduction and background

Fresh produce and processing are the two main marketing channels for the South African potato industry. The channels make use of different governance structures and procurement methods. The fresh produce channel predominantly uses a spot market (table potatoes). According to Rhodes *et al.* (2007) this is an open market that competes in a similar fashion to perfect competition. The processing industry, on the other hand, uses a contract governance structure.

Contractual arrangements are becoming increasingly important in improving the effectiveness and efficiency of agricultural supply chains (Ali & Kumar, 2011). Two related and powerful trends have emerged in current farming practices. Firstly, farmers and producers use agricultural contracts to guide the marketing and production of commodities. Secondly, there is a production shift from smaller to larger farms, which increases the economies of scale. Combined structural changes like these affect cost and productivity, not only in agriculture, but also in the broader food sector. Rhodes *et al.* (2007) find that processors in the agricultural industry make use of two specific contracts in order to procure commodities, namely production contracts and marketing contracts.

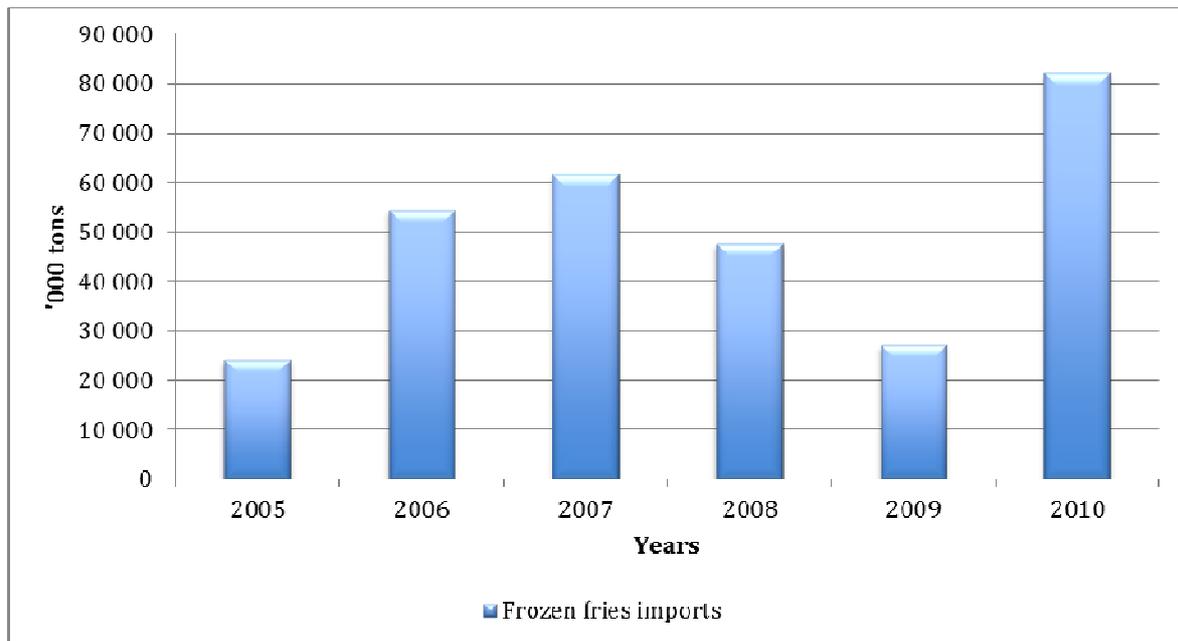
Production contracts focus on compensation, contractor responsibilities, and farmer-provided grower services, all of which are defined in the contract. Contractors usually hold ownership of the commodities and provide key inputs in transport, veterinary services, feed and seedlings, during production. Marketing contracts focus on the commodity that is delivered to the contractor. The processing companies specify a mechanism for commodity price determination or a specific commodity price, product quantity to be delivered, quality standards, and delivery outlet. Pricing mechanisms can limit a farmer's risk regarding the wide fluctuations in market prices, and price premiums can be specified for commodities with desired levels of specified attributes. In South Africa, most of the potatoes for frozen fries are sold under marketing contracts (referred to as contracts henceforth).

In terms of supply chain analysis, the use of contracts is not a new topic. Various authors have investigated and developed the contract theory. Tregurtha and Vink (1999) emphasised the importance of trust and relationships within contracts.

Little attention, however, has been paid to factors that influence producers' opinions and perceptions of contracts. Research suggests that marketing methods used by the producer, profitability, and the number of buyers to whom the producer sells, significantly influence attitudes toward marketing contracts (Ali and Kumar, 2011; Lawrence and Grimes, 2001). Thus, low-cost producers who market their products via group marketing or individual contracts have more positive attitudes towards marketing contracts than producers selling on the spot market do. Masuku, Kirsten, Van Rooyen and Perret (2003) have also indicated that trust is very important. The conclusion from their study was that "relationships characterized by trust, physical and psychological commitment as well as cooperation between exchange parties is more important for mutual benefit and good quality relationship".

According to PotatoSA (Personal communication P van Zyl, 22-10-2011), 352 873 tons of potatoes were used for processing purposes in 2010, which had increased by 38% over the period 2000 to 2010. South Africa also imports large amounts of frozen fries, depending on the exchange rate and European production seasons. Import competition is confirmed by the import propensity data (imports/consumption), which increased from 2% in 2005 up to 6% in 2010. The import figures are illustrated in Figure 6.1 below. The fast growth in frozen fries production and import competition compels local processing companies to contract with local farmers in order to ensure quality as a core competency. Thus, it is important for processing companies to determine their target producers and to establish which type of producers will be interested in participating in contract farming.

Figure 6.1: Frozen fries imports into South Africa



(Source: Personal correspondence P van Zyl, PotatoSA industry information, 2011)

The aim of this study was to assist frozen fries processors to establish target producers and determine which producers would participate in contract marketing. The characteristics of producers willing to participate in contract marketing were determined and procurement strategies developed.

6.2. Data and methodology

A telephonic interview was conducted to determine the characteristics of producers who would participate in contract marketing within the potato industry. The study area comprised the Eastern Free State (South Africa) because this region best represented the table and processing potato industry with a high concentration of table and processing potato producers. Telephonic questionnaires obviated travelling and a census method was used. All Eastern Free State producers listed at Potatoes South Africa (PSA, the organisation representing potato producers in South Africa) were interviewed (n=70).

The questionnaire was compiled from a literature review and discussions with key role-players within the potato industry. Questions regarding the characteristics of producers who would find contracts favourable were included. Corrections and suggestions from the

discussions were incorporated, and the questionnaire was submitted to role-players for another round of discussion. After consensus was reached that the questionnaire encompassed all important aspects, a pilot survey including two Potato South Africa managers and two commercial farmers was conducted.

Data variables that did not differ much between respondents were confirmed by a correlation matrix (Table 6.2 below). The correlation indicated the presence of multi co-linearity, which could lead to a lack of significance of individual variables (Gujarati, 2003). In order to overcome this problem, Principal Component Regression (PCR) was used to reduce the observed variables into a much smaller set of principal components. The variables that were reduced and excluded from the study according to the anti-image matrix were as follows:

- Age
- Education
- Experience
- Profit
- Size
- Credit options
- Distance to market
- Ownership of land
- Trust
- Conflict

These variables were also tested by means of running a Logit regression in Simetar. However, none of these variables were significant at a 95 % confidence interval.

The PCR method standardises all variables to a mean of zero and standard deviation of one, thereby minimising problems associated with scaling (Shiimi, 2010). The number of factors in principal component analysis can be determined by using the Kaiser Criterion. This criterion explains that only factors with an eigenvalue greater than 1.00 should be retained. The eigenvalue is a measure of the amount of variance (of the original variables) explained by the principal component. An eigenvalue of 1.00 indicates that the principal component explains at least the amount of variance contained in one of the original variables.

According to Filzmoser (2001) in Shiimi (2010), the principal component regression primarily estimates response variables at the basis of hypothesised explanatory variables. The nature of the study data that included outliers made least square (LS) regression and

classical PCA vulnerable. Outliers influence parameter estimates and therefore PCR and linear multiple regression need to be made more robust. Shiimi (2010) explains the application of PCR as follows: in a PCR the dependent variable \mathbf{Y} is regressed on a subset of the principal components. “The estimated regression coefficients for the principal components in the chosen subset are used to obtain regression coefficients for the original columns of \mathbf{X} ” (Hwang & Nettleton, 2002). Magingxa, Alemu and Van Schalkwyk (2006) use the PCR method within a maximum likelihood estimation framework.

The matrix below uses standardised variables in order to calculate the eigenvalues and eigenvectors $(\lambda_1, \lambda_2, \dots, \lambda_k, v_i)$ in Equation 1 below and Equation 2 below.

$$|C-\lambda I| = 0, |C-\lambda_j I|V_j = 0 \quad (1)$$

In order to obtain matrix v the eigenvectors V_j were arranged into a matrix reflected in Equation 2 below.

$$\mathbf{V} = \begin{bmatrix} v_{11} & v_{12} & \cdot & \cdot & \cdot & v_{1k} \\ v_{21} & v_{22} & \cdot & \cdot & \cdot & v_{2k} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ v_{k1} & v_{k2} & \cdot & \cdot & \cdot & v_{kk} \end{bmatrix} \quad (2)$$

The matrix \mathbf{V} is orthogonal as its columns satisfy the conditions $v_i'v_i = 1$ and $v_j'v_i = 0$ for $i \neq j$

$$\mathbf{Z} = \mathbf{X}^S \mathbf{V} \quad (3)$$

“Where \mathbf{X}^S is $n \times k$ matrix of standardised original variables, and \mathbf{V} is the eigenvector matrix as defined in Equation 3. There are k explanatory variables, as there are k variables. The new sets of variables (explanatory variables), unlike the original variables, are orthogonal, i.e. they are uncorrelated” (Shiimi, 2010).

As explained above, the Kaiser Criterion indicates that only factors with an eigenvalue greater than 1.00 will explain the observed variance. The next step is to eliminate the explanatory variables with the smallest eigenvalues.

After the explanatory variables have been calculated and explanatory variables with the smallest eigenvalues have been eliminated, the explanatory variables having a significant impact on the probability of decision-making of whether to produce for the contract market or not, must be identified.

Table 6.1: Anti-Image matrix before reduction with a correlation of 0.3 and higher between variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	0.492	-0.361	-0.866	-0.014	0.014	-0.013	-0.023	-0.128	-0.16	0.145	0.048	-0.112	0.045	-0.119	-0.083	0.054	-0.229	0.178	0.068	0.071	-0.044	-0.08	-0.229	0.151	0.014	-0.189
2	-0.361	0.297	0.304	-0.028	-0.22	0.27	-0.174	0.164	-0.179	0.128	-0.3	0.065	-0.286	0.114	0.32	0.382	-0.186	0.033	-0.201	-0.429	-0.298	-0.099	0.345	-0.428	-0.243	0.023
3	-0.866	0.304	0.492	-0.095	-0.027	-0.065	0.024	-0.014	0.22	-0.211	0.039	0.128	0.026	0.141	-0.014	-0.217	0.236	-0.139	0.129	-0.033	0.085	0.048	0.092	-0.149	0.035	0.268
4	-0.014	-0.028	-0.095	0.565	0.21	0.057	0.103	0.114	-0.217	0.12	-0.146	-0.209	0.077	0.129	-0.207	0.067	0.022	-0.045	-0.219	0.054	0.002	-0.007	-0.187	-0.09	-0.055	-0.006
5	0.014	-0.22	-0.027	0.21	0.37	-0.202	0.216	0.189	0.115	0.034	0.157	-0.075	0.435	0.328	0.009	-0.153	-0.17	0.094	-0.111	-0.11	0.254	0.379	-0.369	0.093	-0.124	-0.01
6	-0.013	0.27	-0.065	0.057	-0.202	0.772	0.12	-0.16	-0.234	0.037	-0.002	0.09	-0.338	0.088	0.084	0.465	0.084	-0.219	-0.07	-0.057	-0.351	-0.133	0.279	-0.217	-0.008	-0.052
7	-0.023	-0.174	0.024	0.103	0.216	0.12	0.821	-0.124	0.039	-0.198	-0.198	0.072	0.042	0.14	-0.164	-0.04	0.265	-0.099	0.132	0.085	0.268	0.348	-0.134	0.145	-0.139	0.167
8	-0.128	0.164	-0.014	0.114	0.189	-0.16	-0.124	0.745	0.199	0.15	0.001	-0.002	0.018	0.123	0.102	0.079	-0.206	-0.06	-0.334	-0.25	0.008	-0.027	0.135	-0.022	-0.113	-0.014
9	-0.16	-0.179	0.22	-0.217	0.115	-0.234	0.039	0.199	0.549	-0.082	0.241	0.115	0.097	0.079	-0.299	-0.354	0.274	-0.359	0.035	0.027	0.335	0.045	-0.035	0.162	0.199	0.099
10	0.145	0.128	-0.211	0.12	0.034	0.037	-0.198	0.15	-0.082	0.799	0.058	-0.284	0.084	-0.13	0.132	0.127	-0.26	-0.089	-0.4	-0.159	-0.004	-0.168	0.015	-0.138	-0.016	0.019
11	0.048	-0.3	0.039	-0.146	0.157	-0.002	-0.198	0.001	0.241	0.058	0.869	0.277	0.126	0.045	-0.01	-0.092	0.03	0.108	-0.007	0.023	0.088	-0.092	-0.155	-0.052	0.227	0.074
12	-0.112	0.065	0.128	-0.209	-0.075	0.09	0.072	-0.002	0.115	-0.284	0.277	0.833	-0.216	0.097	0.059	0.087	0.002	-0.06	-0.05	-0.292	-0.042	-0.045	0.227	-0.173	-0.082	-0.067
13	0.045	-0.286	0.026	0.077	0.435	-0.338	0.042	0.018	0.097	0.084	0.126	-0.216	0.626	-0.077	0.068	-0.337	-0.128	-0.01	-0.01	-0.019	0.246	0.125	-0.348	0.088	-0.036	0.077
14	-0.119	0.114	0.141	0.129	0.328	0.089	0.14	0.123	0.079	-0.13	0.045	0.097	-0.077	0.569	-0.013	0.247	0.101	-0.047	0.099	-0.11	-0.151	0.153	0.126	-0.072	-0.059	-0.119
15	-0.083	0.32	-0.014	-0.207	0.009	0.084	-0.164	0.102	-0.299	0.132	-0.01	0.059	0.068	-0.013	0.333	0.338	-0.315	0.267	-0.195	-0.255	-0.365	-0.137	0.269	-0.103	-0.193	-0.064
16	0.054	0.382	-0.217	0.067	-0.153	0.465	-0.04	0.079	-0.354	0.127	-0.092	0.087	-0.337	0.247	0.338	0.399	-0.139	0.049	-0.092	-0.138	-0.415	-0.266	0.31	-0.058	0.047	-0.195
17	-0.229	-0.186	0.236	0.022	-0.17	0.084	0.265	-0.206	0.274	-0.26	0.03	0.002	-0.128	0.101	-0.315	-0.139	0.686	-0.633	0.3	0.446	-0.039	0.211	0.032	0.164	0.147	0.146
18	0.178	0.033	-0.139	-0.045	0.094	-0.219	-0.099	-0.06	-0.359	-0.089	0.108	-0.06	-0.01	-0.047	0.267	0.049	-0.633	0.818	-0.043	-0.234	-0.187	-0.102	-0.185	-0.057	0.096	-0.071
19	0.068	-0.201	0.129	-0.219	-0.111	-0.07	0.132	-0.334	0.035	-0.4	-0.007	-0.05	-0.01	0.099	-0.195	-0.092	0.3	-0.043	0.63	0.279	-0.121	0.06	-0.08	0.274	0.246	0.1
20	0.071	-0.429	-0.033	0.054	-0.11	-0.057	0.085	-0.25	0.027	-0.159	0.023	-0.292	-0.019	-0.11	-0.255	-0.138	0.446	-0.234	0.279	0.448	0.06	-0.022	-0.03	0.396	0.181	0.003
21	-0.044	-0.298	0.085	0.002	0.254	-0.351	0.268	0.008	0.335	-0.004	0.088	-0.042	0.246	-0.151	-0.355	-0.415	-0.039	-0.187	-0.121	0.06	0.726	0.137	-0.283	0.148	-0.023	0.099
22	-0.08	-0.099	0.048	-0.007	0.379	-0.133	0.348	-0.027	0.045	-0.168	-0.092	-0.045	0.125	0.153	-0.137	-0.266	0.211	-0.102	0.06	-0.022	0.137	0.497	-0.159	-0.048	-0.259	-0.022
23	-0.229	0.345	0.092	-0.187	-0.369	0.279	-0.134	0.135	-0.035	0.015	-0.155	0.227	-0.348	0.126	0.269	0.31	0.032	-0.185	-0.08	-0.03	-0.283	-0.159	0.35	-0.153	-0.228	-0.169
24	0.151	-0.428	-0.149	-0.09	0.093	-0.217	0.145	-0.022	0.162	-0.138	-0.052	-0.173	0.088	-0.072	-0.103	-0.058	0.164	-0.057	0.274	0.396	0.148	-0.048	-0.153	0.378	0.132	-0.146
25	0.014	-0.243	0.035	-0.055	-0.124	-0.008	-0.139	-0.113	0.199	-0.016	0.227	-0.082	-0.036	-0.059	-0.193	0.047	0.147	0.096	0.246	0.181	-0.023	-0.259	-0.228	0.132	0.706	0.046
26	-0.189	0.023	0.268	-0.006	-0.01	-0.052	0.167	-0.014	0.099	0.019	0.074	-0.067	0.077	-0.119	-0.064	-0.195	0.146	-0.071	0.1	0.003	0.099	-0.022	-0.169	-0.146	0.046	0.457

1 = age; 2 = education, 3 = experience; 4 = credit; 5 = profit; 6 = less marketing costs; 7 = market information; 8 = convenience; 9 = only channel; 10 = less risk; 11 = less quality penalties; 12 = credit options; 13 = risk; 14 = size; 15 = distance to market 16 = ownership of land 17 = transport; 18 = price certainty; 19 = pay; 20 = negotiation period; 21 = number of contacts; 22 = conflict; 23 = payment delay; 24 = price knowledge; 25 = price; 26 = information withheld

Once the insignificant explanatory variables from Equation (3) above were identified and eliminated, Equation (4) below was obtained in terms of the retained hypothesized variables (Shiimi, 2010).

$$\mathbf{P} = \mathbf{F}(\alpha_0^s + \mathbf{Z}\gamma + \varepsilon^o) \quad (4)$$

where $\mathbf{Z} = \mathbf{X}^s \mathbf{V}$ and $\gamma = \mathbf{V}' \boldsymbol{\varphi}^s$. \mathbf{Z} is an $n \times \ell$ matrix of retained explanatory variables, \mathbf{V} is a $k \times \ell$ matrix of the eigenvectors corresponding to the ℓ retained components, γ is $\ell \times 1$ vector of coefficients associated with the ℓ variables. Standard errors of the estimated coefficients γ are represented by a $\ell \times 1$ vector.

$$\mathbf{Var}(\hat{\gamma}) = \hat{\delta}^2 (\mathbf{Z}'\mathbf{Z})^{-1} = \hat{\delta}^2 \mathbf{diag}(\lambda_1^{-1}, \lambda_2^{-1}, \dots, \lambda_\ell^{-1}) \quad (5)$$

where $\hat{\delta}^2$ is the variance of residuals from Equation 4 above. Thus the standard error of γ may be given by

$$k^s = (s.e.\hat{\gamma}_1 s.e.\hat{\gamma}_2 \dots s.e.\hat{\gamma}_\ell) \quad (6)$$

Results from Equation 4 above can then be changed back to explanatory variable estimators of the standardised variables:

$$\begin{bmatrix} \alpha_{1,EV}^s \\ \alpha_{2,EV}^s \\ \cdot \\ \cdot \\ \alpha_{k,EV}^s \end{bmatrix} = \begin{bmatrix} V_{11} & V_{12} & \cdot & \cdot & \cdot & V_{1\ell} \\ V_{21} & \cdot & \cdot & \cdot & \cdot & V_{2\ell} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ V_{k1} & \cdot & \cdot & \cdot & \cdot & V_{k\ell} \end{bmatrix} \times \begin{bmatrix} \hat{\gamma}_1 \\ \hat{\gamma}_2 \\ \cdot \\ \cdot \\ \hat{\gamma}_\ell \end{bmatrix} \quad (7)$$

where $\hat{\gamma}_i$ is estimator of γ_i in Equation 5 above. The constant $\alpha_{\cdot,EV}^s = \bar{y}$.

A PCR combined with a Logit model was used in order to identify characteristics of a contract producer. A Logit model was chosen for the regressions because the dependent variable was a binary variable, whether producers produced for the contract market (1) or the spot market (2). Two software programs, SPSS and Simetar, were used for the calculations (Richardson *et al.*, 2004).

6.3. Results and Discussion

In order to compile a marketing strategy to establish long-term contracts, it was important to identify producers who would participate in a contract governance structure. Strydom *et al.* (2011) determined that the contract market was the transaction cost minimising governance structure when compared to a spot market structure. Twenty-six variables that could influence the producer in choosing between a spot market and a contract market were identified before PCR was implemented. In order to use PCR, a correlation of 0.3 and higher between variables had to be obtained. This was the case with the data set in Table 6.1 above. The Keiser-Meyer Olkin Measure of Sampling Adequacy (MSA) had to be more than 0.5 for the model and each individual variable. Variables less than 0.5 were excluded from the model by using an anti-image correlation matrix. This action was repeated until the MSA of all the variables was more than 0.5. The MSA of all the variables before exclusion is presented in Table 6.2 below. This action reduced the variables to 13, with an overall adequate MSA of 0.858 (Table 6.3 below).

The PCR excluded components with an eigenvalue smaller than 1 according to the Kaiser Criterion. After the exclusion of the variables, there were 3 components with eigenvalues of more than 1. Communalities represented the proportion of the variance in the original variables that was accounted for by the factor solution. The factor solution should explain at least half of each original variable's variance, so the communality value for each variable should be 0.50 or more, and if not, the variable must be excluded. This action excluded another two variables, whereby the rest of the variables were used in the final regression. These were identified as: less marketing costs¹², market information, convenience, only marketing channel, less risk, less quality penalties, credit options, transport, price certainty, negotiation period and number of contacts (Table 6.4 below).

¹² This includes all the costs after harvesting eg. commission, packaging, washing.

Table 6.2: Anti-Image correlation matrix before reduction with Olkin Measure of Sampling Adequacy (MSA) higher than 0.5 for each individual variable

	Less marketing costs	Market information	Convenience	Only channel	Less risk	Less quality penalties	Credit options	Risk	Transport	Price certainty	Payment	Negotiation period	Number of contacts
Less marketing costs	0.907	0.233	-0.249	-0.082	-0.048	0.096	0.008	-0.14	0.188	-0.251	0.006	0.054	-0.187
Market information	0.233	0.909	-0.143	0.016	-0.129	-0.247	0.148	-0.034	0.15	0.012	0.059	-0.017	0.233
Convenience	-0.249	-0.143	0.81	0.266	0.088	0.086	0.009	0.015	-0.167	-0.062	-0.233	-0.195	0.029
Only channel	-0.082	0.016	0.266	0.657	0.057	0.191	0.127	0.047	0.179	-0.366	-0.194	-0.127	0.179
Less risk	-0.048	-0.129	0.088	0.057	0.882	0.111	-0.294	0.106	-0.088	-0.223	-0.312	-0.056	0.081
Less quality penalties	0.096	-0.247	0.086	0.191	0.111	0.924	0.269	-0.03	0.072	0.049	-0.122	-0.026	0.005
Credit options	0.008	0.148	0.009	0.127	-0.294	0.269	0.879	-0.188	0.014	-0.026	-0.065	-0.314	0.006
Risk	-0.14	-0.034	0.015	0.047	0.106	-0.03	-0.188	0.916	-0.05	-0.168	0.031	-0.051	0.065
Transport	0.188	0.15	-0.167	0.179	-0.088	0.072	0.014	-0.05	0.808	-0.61	0.13	0.334	-0.174
Price certainty	-0.251	0.012	-0.062	-0.366	-0.223	0.049	-0.026	-0.168	-0.61	0.844	0.016	-0.159	-0.155
Payment	0.006	0.059	-0.233	-0.194	-0.312	-0.122	-0.065	0.031	0.13	0.016	0.779	0.12	-0.234
Negotiation period	0.054	-0.017	-0.195	-0.127	-0.056	-0.026	-0.314	-0.051	0.334	-0.159	0.12	0.66	-0.082
Number of contacts	-0.187	0.233	0.029	0.179	0.081	0.005	0.006	0.065	-0.174	-0.155	-0.234	-0.082	0.91

Table 6.3: Kaiser-Meyer-Olkin Measure of Sampling Adequacy

KMO and Bartlett's Test		
<i>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</i>		.858
<i>Bartlett's Test of Sphericity</i>	<i>Approx. Chi-Square</i>	383.589
	<i>df</i>	78
	<i>Sig.</i>	.000

Table 6.4: Regression results of Logit model of factors influencing probability to use contract market as governance structure.

Variables	Coefficient	Standard error	T-value	Probabilities ¹	
Constant	-0.7036704	0.284469	-2.47362	0.0161	**
Less marketing cost	0.0547363	0.02301	-2.37883	0.0211	**
Market information	0.06470677	0.031927	2.026689	0.0478	**
Only channel	0.19250515	0.104535	1.841543	0.0712	*
Less quality penalties	-0.02772562	0.012829	2.161144	0.0353	**
Transport	0.1428942	0.07506	-1.90372	0.0625	*
Price certainty	-0.0218822	0.009041	-2.4203	0.0190	**
Negotiation period	0.0313511	0.013508	-2.32096	0.0242	**
Number of contacts	0.43800231	0.24151	1.813597	0.0755	*
Convenience	0.00772205	0.012534	0.616086	0.5405	NS
Less risk	-0.0198771	0.008033	-2.47431	0.0166	**
Credit options	-0.0006627	0.004534	-0.14616	0.8844	NS
Model summary					
Number of observations	63				
% correct prediction	77.78%				
Number of contract market producers	20				
Number of spot market producers	43				

Notes:

¹*, **, indicates a 10% and 5% level of significance respectively; NS indicates not significant

After PCR reduction, the remaining components were regressed using a Logit model. The Logit model was chosen because the dependent variable is binary. The PCR was set to use components with an eigenvalue more than 1. In this study, 3 factors with an eigenvalue more than 1 were identified and used in the regression. The model correctly predicted 77.78% of the observations, implying that the model had a good fit. The probability of the model was also significant at a 5% level of significance.

Only nine variables were significant at 5% and 10% levels of significance (Table 6.4 above). This provides a basis for the processors to tailor-make their contracts and to approach producers who are more inclined to enter into contracts. The characteristics of contract producers were as follows:

Less marketing costs

Contract producers significantly ($P < 0.05$) favoured low marketing costs. The producers were asked whether obtaining less marketing costs would make them choose a specific governance structure, i.e. the contract (1) or the spot market (0) (1 not at all; 5 main reason). Therefore a positive coefficient indicated that as the variable increased, the more likely the producer would favour a contract market. In this case, the variable was positive, which meant that the more producers deemed lower marketing costs important, the more likely they would be to participate in contract marketing. Possible reasons for the positive outcome might be that producers do not have to advertise on potato bags or telephone market agents in order to sell their potatoes.

Processing companies must promote the fact that contract farming for potato processing has lower marketing costs than the spot market. This means that there is a decrease in transaction cost (time, costs and effort). This will draw the attention of producers and they will find the need to calculate these costs and evaluate contract prices.

Market information

Contract producers would be significantly ($P < 0.05$) concerned about market information. The producers were asked whether obtaining more market information (daily price, demand and supply and daily agent data) would be a reason to choose a specific governance structure

(1 not at all; 5 main reason). The variable was also positive, which meant that contract producers wanted to receive more market information. Processing companies can develop decision support models that will assist producers in making a more effective and calculated decision regarding the pricing of their produce. This can include, for example, a model that calculates the fresh produce price by subtracting all the marketing costs, versus a contract price over a historic period. This information will give the producers an idea of which prices are more profitable over a period and which are not simply based on the previous production year's figures.

Only channel

The hypothesis for this variable was that some producers neither had access to washing/bagging nor wanted to invest in such facilities, which means that the contract market was their sole marketing channel. This variable was significant at 10% ($P < 0.1$) with a positive coefficient, which confirmed the hypothesis. Therefore, some producers only made use of a contract market because that was their sole marketing channel and they subsequently needed less on farm investment.

Processing companies should promote the fact that a producer would not need additional facilities. This will attract new producers to participate, firstly in the processing industry and secondly, in contract marketing. This can also help in terms of obtaining credit, because producers do not need a large capital investment to produce processing potatoes compared to fresh produce potatoes.

Less quality penalties

The hypothesis was that spot market producers would favour a specific market where they did not incur quality penalties (such as rejected freights). This variable was significant at 5% ($P < 0.05$) with a negative coefficient giving an indication that the hypothesis could be accepted. This meant that producers who were sensitive to quality penalties were not interested in the contract market as a governance structure, thus choosing the spot market.

It is important that processing companies attract producers. Currently with contracts, producers only get a maximum price and a discount scale for lower standard potatoes. This method discourages producers because the price they could realise is not clear, while the

discounts are highlighted. Processing companies must give a minimum standard with a minimum price and supply a scale based on price premiums for better quality. This method will not only make contracts attractive, but will also encourage producers to deliver a better quality product. In order to facilitate rejections, processing companies should develop systems whereby potatoes may be used for other purposes, and freight is not rejected in its entirety on quality constraints. Potato processing companies could sort poor quality potatoes and pay the producer a discounted price. However, the standards must be specified within the contract. As an example, after a freight is labelled as rejected (not up to minimum standard) a discounting scale would be used to calculate a new price and the freight would not simply be sent back to the producer at additional costs. This will provide the producers with the perception that their freight is not just rejected, but that the processing company is still willing to assist producers. This is very important mainly because producers might have only one freight of poor quality, but the rest might be up to standard.

Transport

This variable was significant at 10% ($P < 0.1$). The hypothesis was that contract producers would not make use of their own transport to deliver their produce. The producers were asked what type of transport they used (1 = buyer transport, 0 = own or hired transport). The coefficient of this variable was positive, which meant that contract producers preferred not to make use of their own transport.

Processing companies must indicate in the contract that producers do not pay extra transport costs, which is included in the suggested contract price. The procurement manager must also use the transport aspect as a promotional item. The manager must market the support that a processing company provides in the case of transport arrangements and logistical difficulties.

Price certainty

The hypothesis for this variable was that contract market producers would have a high certainty of prices at planting time, because the contract would be based on a specific price. The extent of quality penalties would, however, be unknown. This variable was significant at 5% ($P < 0.05$). Producers were asked to indicate their levels of certainty (1 very uncertain, 5 very certain) in order to evaluate the hypothesis. Price certainty had a positive coefficient indicating that contract producers had a high certainty of prices at planting time and the

hypothesis could be accepted. The reasoning behind price certainty is that contract market producers are reasonably sure of their end product price, whereas spot market are producers only aware of current prices (planting time) and not the harvest price.

Processing companies must offer attractive prices in order to attract producers. The result indicates that the producers want to know the price levels setting a minimum price in a contract and have the facility of earning higher prices through premiums. This will reduce the transaction cost and risks, thereby making contract marketing more attractive to producers.

Negotiation period

The hypothesis for this variable was that price bargaining would take longer in the spot market than the contract market. The variable had a significance of 5% ($P < 0.05$) and a positive coefficient. The hypothesis was rejected because the coefficient was positive, indicating price bargaining took longer in the contract market than the spot market. The main reason for this was that in the spot market producers could bargain directly with market agents for small price changes, but still had to sell their produce. In the contract market, producers bargained with a buyer (agricultural manager), after which the processing management would approve the price, which is a time consuming process. Another factor that played a role was the fact that contract producers negotiated prices before planting, whereas the spot market producers bargained at harvest time. From the moment that spot market producers harvest their produce they do not have much time for price negotiation, and so they do not have many options.

There is a need for decision support models, which will assist producers and processing companies with price negotiations. The procurement manager has to answer to a board of directors and satisfy producers. If the prices are too high, the board will give the instruction to cut costs and if prices are too low producers will not participate in contract marketing. Therefore, the procurement manager is in need of models that indicate the price level relevant to costs and a model that compares the spot price with the contract price over a period of time. Given that the contract price and the spot price differ, the two prices must be compared at a fair level that takes yield differences and additional marketing costs (table > processing) into account.

Frequency of contacts between buyer and producer

The hypothesis for this variable was that contract market producers had less contact with buyers than spot market producers in terms of price negotiation. In this regard, producers were asked how much contact they had with their buyers (1 daily, 5 monthly). The variable was significant at 10% ($P < 0.1$) with a positive coefficient. This meant that the hypothesis could be accepted that contract producers had less contact with their buyers. Spot market producers had daily contact with their market agents during harvesting and delivery of their produce. The contract producer only had weekly or monthly contact with buyers. Accordingly, producers who wanted less contact with buyers preferred the contract market.

The frequency of contacts between buyer and producer are important to farmers; this is a similar characteristic as negotiation. The contract marketing system has longer once-off negotiating periods, after which the contract producers only obtain market information from the buyers. Spot market producers have shorter negotiating periods, but the frequency is high because they negotiate prices on a daily basis during harvest time. This means that contract producers do not want long negotiating periods and they do not want a high frequency. The processing companies must bring this to the attention of producers through marketing and promotions. Contract producers will only have contact with the buyers in order to receive market information and to obtain technical advice. This is important because spot markets have a high frequency in terms of price negotiation, but no technical information is obtained from the buyer.

Less risk

This variable was significant at 5% ($P < 0.05$) and the hypothesis was that the contract market had a lower overall risk profile than the spot market. The producers were asked to indicate the level of risk relative to the alternative/substitute governance structure (1 very low, 5 very high). The coefficient was negative, implying that the higher the risk, the lower the possibility that the contract producers would produce for the specific market. This meant that the hypothesis could be accepted and that producers chose the contract market because of a lower risk profile. Accordingly, a producer preferring the contract market would be a risk-averse person.

Rhodes *et al.* (2007) have indicated that contract marketing has lower risks than spot marketing. However, this differs for each commodity in the potato market and producers cannot use futures to hedge themselves, mainly owing to the unavailability of a traded potato contract. This means that producers must make use of contracts to lock in quantities as well as prices. Strydom *et al.* (2012) indicated that the contract market has lower transaction costs than the spot market for potato producers. The question is how the processing companies illustrate to the producers that they have lower risks with a contract. Processing companies must make use of negotiating models and decision support models. These models must give the producers an idea of what their risks are when producing for each of the different marketing channels. This will facilitate the negotiating process as well as the producer's decision to use contract or spot markets. Promotional material regarding the advantages and disadvantages of contracts in terms of risk must be used to promote contracts. A few examples are pull-up banners, flyers and posters with research results indicating the risk differences, and articles in local potato producers' magazines. The strategy must be to remind the producers of the benefits of contracts. Table 6.5 below is a summary of all the chosen characteristics that must be used when considering contracts for producers.

Table 6.5: Summary of contract producer characteristics

Variables	Probabilities
Produce at minimum risk	0.0166
Want to obtain a minimum price (certainty)	0.019
Prefer channel with less marketing cost	0.0211
Want a channel with a small negotiation period	0.0242
Want to have less quality penalties	0.0353
Want to obtain more market information	0.0478
Do not want to make use of own transport	0.0625
Only marketing channel available without additional on-farm investment	0.0712
Frequency of contacts between buyer and producer must be smaller	0.0755

Various authors have evaluated characteristics for different industries regarding contracting. Bogetoft and Olsen (2002), Ali and Kumar (2011) and Lawrence and Grimes (2001) confirm some of the variables identified by the results. These are variables such as minimum risk, prefer less quality penalties, smaller negotiating period and want to obtain more market information. However, as stated by Ali and Kumar (2011), the characteristics differ for every industry, thus each industry must be evaluated on its own.

6.4. Conclusion

Imports are increasing in the South African processing and frozen fries industry, which makes procurement more complex. Imports put pressure on local producers to procure better quality potatoes at a pre-determined price. This also has an effect on the producers of processing potatoes and puts pressure on their profit margins. If it is not worthwhile for the producers to produce processing potatoes (contract market), they will produce the alternative, namely table potatoes (spot market). In order to ensure sufficient supply of quality and quantity, processing companies must make use of a suitable procurement strategy, such as contract marketing and more specific long-term contracting. This study determined the characteristics of a contract producer by interviewing producers using one of two governance structures, either the contract or the spot market in the Eastern Free State region of South Africa. After the identification of the characteristics, suggestions were made in terms of strategies to attract producers.

Out of 26 possible characteristics of a contract producer, nine were identified as significant ($P < 0.1$ or $P < 0.5$). The variable, marketing costs, was identified indicating that producers chose the contract governance structure as that which would decrease marketing costs. Regarding the variable, market information, contract market producers were not as concerned about market information compared to the spot market producers. Accordingly, producers who are sensitive to marketing costs, but are not concerned with market information, should be targeted for long-term contracts.

Some producers indicated that the contract market was their only channel of production. This meant that producers who do not have access to washing and sorting facilities should be

targeted for long-term contracts. Spot market producers were more sensitive to quality penalties than contract producers were. Thus, producers sensitive to quality penalties should be excluded from the long-term contract target group, or their concerns must be addressed.

Transport and price certainty were important to producers. A contract producer did not wish to transport his or her produce and preferred that the buyer collected the produce on the farm. At planting time, a contract producer preferred to be certain of the final produce price. Contract producers also preferred to negotiate prices and so should form part of the target market. Some contract producers indicated that they produce for the contract governance structure because there is less risk involved. This meant that producers who are risk-averse should be targeted for long-term contracts. Contracts should be developed in order to reduce the current price and production risks even further.

It is important for processing companies to use these characteristics to establish a contract that is price transparent and self-explanatory. This will provide the producers with information that contracts do not simply penalise them, but will also help and protect them so as to manage external risks, such as price movements.

There is a need for processing companies to reduce negotiating time and to provide farmers with market information. Processing companies must have marketing strategies in place which explain the benefits of their type of marketing channel and how it is constructed. This means that the model explained by Strydom *et al.* (2012) can be used to reduce negotiating time and to set minimum prices with premiums in contracts, and not maximum prices with quality penalties. There is also a need for a decision support model. This model will assist producers in the choice between the different marketing channels. In this support system, prices for both channels must be evaluated according to comparable prices and historic price trends.

In conclusion, it is important that processing companies promote the benefits of their marketing channels. Characteristics of contract producers must be evaluated and then models,

contracts and marketing strategies must be developed that complement these characteristics. This will ensure higher quality and quantities since the processing companies will attract more producers and there will be incentives in place to produce higher quality potatoes. This paper was written only from the viewpoint of producers, without focusing on processors. Accordingly, additional research is needed in terms of the cost/benefit implications for processors, along with the impact of change regarding competitiveness.

**Enhancing decision support through calculating utility weighted contract prices – A
potato study**

**Enhancing decision support through calculating utility weighted
contract prices – A potato study**

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Submitted to Agrekon

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7.1. Introduction and background

Price risk is a key source of risk to producers both locally and internationally (Woodburn, 1993). Large fluctuations in yields and prices of agricultural products create a high income risk profile for producers (Jordaan, Grové, Jooste & Alemu, 2007). Furthermore, Jordaan *et al.* (2007) have argued that price variability is an important component of profit variability; thus it is very important to quantify agricultural products price variability. According to Du Preez & Van Zyl (2010), the table potato market (spot market) has a high price volatility, which largely contributes to price risk. The volatility has decreased over time because the proportion of the potato crop grown under irrigation has increased, which has stabilized the supply of potatoes on the fresh produce markets (FPM). Nonetheless, potato prices on FPM remain relatively volatile and should be an important consideration in potato farmers' risk management decisions.

There are numerous ways in which price risks can be managed; of which the use of the derivative market is only one method. Unfortunately, in South Africa potato producers do not have access to derivative contracts. The alternative is to make use of forward contracts. Forward contracting of produce is a relatively widely used form of risk management for farmers, the most common being a contract for the sale of a crop (Varangis, Donald and Anderson, 2002). Contract marketing limits price risk, owing to the shifting of risk from the seller to the buyer (Perry, MacDonald, Nelson, Hahn Arnade & Plato, 2005; Rhodes, Dauve and Parcel, 2007; Kirsten and Sartorius, 2002). Currently the only marketing channel using contracts as a pricing format within the potato industry is the processing industry.

Normally the table potatoes have higher prices than processing potatoes but are subject to price variability, whereas processing potatoes have a fixed contract price. However table potatoes have larger marketing costs (Transport, packaging, commission fees etc.), which make it difficult to determine the best marketing channel in terms of prices. Processing potatoes also have a lower yield than the table potato, this have a direct influence on the

Gross Production Value (GPV). The question potatoes farmers have, given the marketing costs, price risk and yield risk is which marketing strategy would be the most suited strategy. It is important for producers have sufficient information regarding which marketing channel will be the most risk efficient between processing and table potatoes.

In terms of marketing, information is one of the most important resources in order for producers to be efficient. As indicated by Singh *et al.* (2008), there is a need for the development of tools to assist producers in their day-to-day decision-making. Singh *et al.* (2008) also states that “The business of farming has entered a new era – an age where key to success is perfect, timely information and careful decision making”. According to Newman, Lynch and Plummer (2000), a Decision Support System (DSS) can provide producers with reliable and timely information to aid decision making.

Newman *et al.* (2000) defined a DSS as a computerized system, which assists producers to solve complex problems and to enhance decision-making. DSS is an integrated approach assisting producers in making improved decisions. Normally a DSS provides a quantitative output that assists the user regarding specified problems. In terms of a DDS for managerial decision within marketing, Wierenga (2011) has classified a few different approaches namely: Descriptive approach and a Normative approach as illustrated in Table 7.1:

Wierenga (2011) explains that the focus of the descriptive approach is on how decision-makers behave, whereas the normative approach focuses on what the best course of action is in a given situation (i.e., how decision-makers should behave). A rational producer will take decisions that maximize his or her expected utility. The utility maximization theory supports use of a normative approach. However, because the producer has imperfect information, producers’ observed decisions might be sub-optimal relative to decisions taken had more information been available to them.

Table 7.1 Existing approaches to marketing decision making.

• Descriptive approaches
–Structural observation: What do managers do? (Mintzberg, 1973 and Mintzberg, 1990)
–Decision process approach: Flow charts of marketing decisions (Howard, 1963 and Hulbert, 1981)
–Marketing games, for example MARKSTRAT (Gatignon, 1987)
• Normative approaches
–Optimization: modeling of the marketing process and finding the values for the marketing instruments that maximize the objective function
–Maximization of expected utility (decision making under uncertainty)

Source: Wierenga, (2011)

The main aim of this study is to develop a DSS, which will provide potato producers with sufficient information in order to make an informed decision regarding potato-marketing channels. The decision-support tool explicitly quantifies and compares the historic price risk of the marketing alternatives. The historical comparison will provide the producers with information regarding which strategy were the most suitable on a historical basis given yield and price risks. However this only solves the question of which channel is the most profitable on a historical basis. It is important for producers to know at the current contract price which channel will be the most suitable according to the producers risk aversion level. If the producer has the current prices of both channels, the DDS model must assist the producer in order to choose a channel at that specific moment. By means of calculate a utility breakeven contract price for various risk aversion levels the model can assist producers. The utility breakeven contract price will be the specific level where the producer is indifferent between the two channels.

7.2. Data and procedures

The Eastern Free State was chosen as the study area mainly because of the fact that the region has an approximately equal balance between table potatoes and processing potatoes. Seven years of historical Fresh Produce Market (FPM) data were obtained from PotatoSA to provide time-series information on table potato prices. These prices (R/10 Kg) were weighted average prices within the timeframe of the Eastern Free regions delivery dates. Seven years' weighted average historical contract price (R/ton) data were also provided by the two most dominant processing companies in South Africa (market share >70%). (Only seven years data were available from the processing companies). The given contract prices were paid out prices, meaning that quality penalties are already subtracted. In order to compare the channels real¹⁵ price data were used.

7.2.1. Deterministic model – Farmgate

In order to compare table potato prices with processing potato prices the table potato prices were converted to farm gate prices by means of developing a marketing and packaging model that deducts marketing and packaging costs incurred by producers in the sale of table potatoes from the FPM price. These marketing and packaging costs include accrual cost such as depreciation and investments on fixed assets. It is important to deduct these costs mainly due to the fact that processing potatoes do not have these costs, thus a farm gate price must be calculated. The deterministic model developed in this study is a user-friendly, interactive Excel spreadsheet model, designed for use by potato producers. Because each producers' packaging costs differ (mainly due to factors such as sorting machines sizes and economy of scale), it is necessary for the model to compute these costs according to the producers specific scenario.

The model makes use of a partial budgeting method for this purpose. In order to calculate this partial budget, the producer completes the input parameters given in the model. These input parameters include the following: hectares planted, yields, capacity per day, the market price received, labour costs, commission percentages, replacement values of assets and direct packaging costs (pallet, bags, net wrapping etc.). The parameters are as illustrated in Figure 7.1 and 7.2 below.

¹⁵ Basis 2005

Figure 7.1: Variables used for packaging costs within the partial budget

Complete the yellow blocks			
Hektaar geplant	Hectares planted	Quantity	Unit
		200	Ha
Opbrengs	Yield	Quantity	Unit
		24	ton/ha
		2400	bags/ha
Kapasiteit per dag	Capacity per day	Quantity	Unit
Pakstoor	Packaging shed	9000	bags/day
Markprys	Marketprice	Price	Unit
		R 21.88	R/10kg
Pakstoor arbeid	Packaging labour	Quantity	Unit
Permanent	Permanent	4	persons
Nie permanent	Not Permanent	105	persons
Kommissie	Commission	Quantity	Unit
Agent & mark	Agent & market	12.5%	% of sales
Vurkhyser	Forklifts	Quantity	Unit
		1	
Vaste Bates	Fixed assets	Replacement value	Unit
Stoor	Shed	R 1000000	R/unit
Vurkhyser	Forklifts	R 60000	R/unit
Sorteer masjien	Sorting machine	R 1200000	R/unit



After the producer has completed the parameters the model calculates the current packaging and marketing costs, given current market prices. Results from the calculations are illustrated in Figure 7.2 below.

Figure 7.2: Packaging costs of table potatoes within the model

2012: Koste van aartappelbemarking - pakstoor tot markvloer						
2012: Cost of potato marketing - packhouse to market floor						
Hektaar geplant	Hectares planted					
Opbrengs	Yield	200	ha			
Kapasiteit	Capacity	24	ton/ha			
		9 000	bags/day			
		Cost/bag	Cost/ha	Cost/farm	% of costs	
Chemikalië	Chemicals	R 0,06	R 144	R 28 800	0,6%	
Vervoer na VPMe	Transport to FPMs	R 2,54	R 6 096	R 1 219 200	26%	
Leë 10 kg sakkie	Empty 10 kg bag	R 1,61	R 3 864	R 772 800	16%	
Pallet	Pallet	R 0,10	R 240	R 48 000	1,0%	
Stik	Stitch	R 0,04	R 96	R 19 200	0,4%	
Net	Net	R 0,03	R 72	R 14 400	0,3%	
Elektrisiteit	Electricity	R 0,06	R 144	R 28 800	0,6%	
Kommissie (VPMe)	Commission (FPMs)	R 2,90	R 6 954	R 1 390 800	30%	
Arbeid (pakstoor)	Labour (shed)	R 0,97	R 2 317	R 463 413	10%	
Diesel (pakstoor)	Diesel (shed)	R 0,09	R 217	R 43 315	0,9%	
Finansieringskoste*	Financing costs*	R 1,12	R 2 685	R 537 009	11%	
Onderhoud (pakstoor)	Maintenance (shed)	R 0,25	R 610	R 122 000	3%	
Totaal	Total	R 9,77	R 23 439	R 4 687 737		

Analysis of 2012 marketing costs showed that the largest cost items were commission fees and transport costs, contributing 30% and 26% of total costs, respectively. After accounting for packaging costs the model calculates a comparable farm gate price for both marketing channels. Producers can use the cost results to benchmark their costs against other producers' costs in the same area.

Since the average yields of table potato cultivars and fresh produce cultivars differ, a Gross Production Values (Yield x Price) were calculated in order to compare the two marketing channels¹⁶.

7.2.2. Stochastic Model

Both production and price risks were incorporated into the model through the use of risk simulation procedures. Risk simulation is concerned with random draws from a specified distribution that is used to characterize risk. In this research, empirical distribution is used to characterize price risk while triangle distribution is used to characterize production risk. The general procedure to simulate multivariate probability distributions follows the procedure developed by Richardson, Klose and Gray (2000). Next the procedure that was used to quantify risk is discussed.

7.2.2.1. Price risk

The model allows for the comparison of price risk of table potatoes and processing potatoes as well as the price risk of table potatoes net of packaging using empirical distributions. Important to note is the fact that the historical contracted prices for processing potatoes is used to characterize historical contracted price variability. Thus, the decision-maker will be able to compare table potatoes price variability with the historically realized contracted prices for processing potatoes. Such a comparison allows the decision-maker to determine whether the contracted prices for processing potatoes were historically better when compared to table potatoes. Owing to the sparse nature of the dataset, it was decided to smooth the cumulative probability distributions using a Parzen kernel estimator (Richardson *et al.*, 2006). The resulting characterizations of price risk are shown in Figure 7.3.

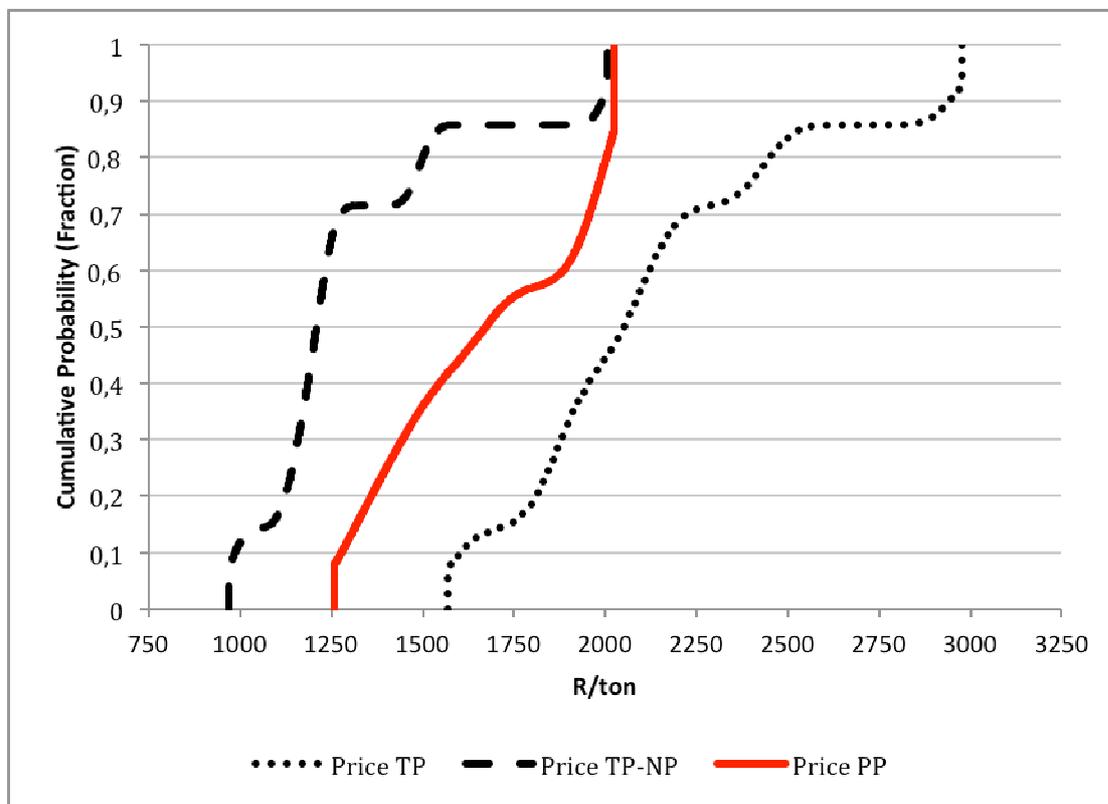
Figure 7.3 below shows that the market prices for table potatoes are first degree stochastic dominant over the historical contracted prices of processing potatoes. However, the market price variability of table potatoes is much larger when compared to the contracted price variability of processing potatoes. Care should be taken in concluding that historically it is

¹⁶ Note that the production cost of table and processing are the same except for the marketing and packaging costs. This means the production costs are the same up to the end of harvesting.

better to market on the fresh produce market, since the market prices do not reflect the extra packaging cost associated with marketing potatoes on the fresh produce market. When packaging cost is accounted for, the historical contracted prices of processing potatoes are always larger than the market prices of table potatoes.

Cognizance should be taken of the fact that price alone should not be used as the guiding principle to decide whether table potatoes or processing potatoes will be should be grown. The reason is that differences exist in the expected yields and yield variability of table potatoes and processing potatoes.

Figure 7.3: Cumulative probability distributions for table potatoes (TP), processing potatoes (PP) and table potatoes net of packaging (TP-NP) (2005-2011)



7.2.2.2. Yield risks

The yield risks of table potatoes and processing potatoes were quantified using the personal, subjective views of a group of table potatoes and processing potatoes producers. Each producer was asked to provide his or her subjective view of the maximum and minimum possible potato yield, as well as the most likely potato yield that was expected. These estimates are sufficient to represent the yield risk by means of a triangular distribution (Hardaker, Richardson, Lien & Schumann, 2004). A pooled estimate of the potato yield risk

was obtained using procedures used by Grové (2008). The procedure entails 101 (every percentile from zero to 100) draws from each decision-maker's triangle distribution of yield risk. The data points from all the decisions-makers draws were then pooled to characterize the potato yield risk as an empirical distribution. The table potatoes and processing potatoes yield risk is shown in Figure 7.4 below.

Figure 7.4: Cumulative probability distribution of table potato (TP) and processing potato (PP) yields.

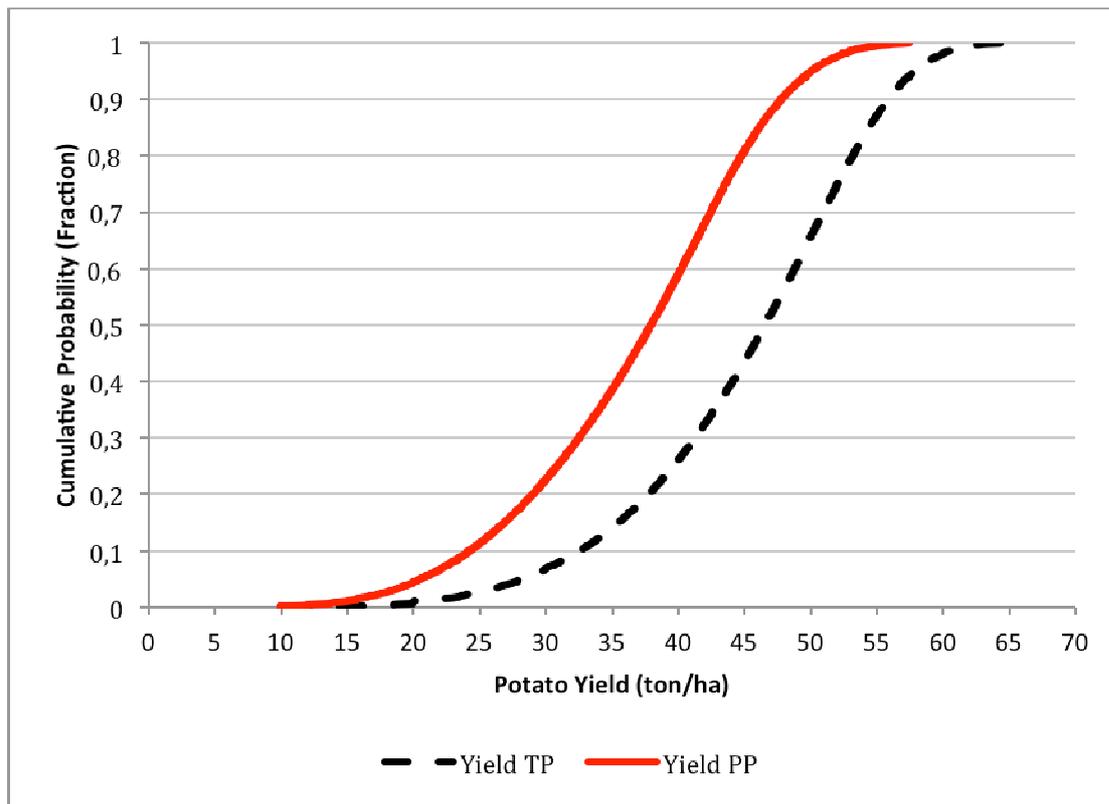


Figure 7.4 above shows that table potatoes have a higher expected yield and higher yield variability when compared to processing potatoes. The subjective views confirmed the notion that there is almost a 10t/ha difference in the expected yield potential of table potatoes and processing potatoes. The larger yield variability of table potatoes mainly stems from the expectation that under unfavourable conditions the yields of table potatoes will be similar to processing potatoes. As a result the table potatoes cumulative probability distribution has a longer left tail.

7.2.2.3. Calculating utility weighted breakeven contracted processing potato prices

Comparing the gross production values of the processing potatoes marketing channel with the fresh produce marketing channel only provides a historical view of which channel is most favorable. However, such a comparison does not provide a decision-maker with any decision support with regard to the level of the contracted processing potatoes price that will make him or her indifferent between using the fresh produce marketing channel or the processing potatoes marketing channel.

To aid decision-making, the concept of utility weighted risk premiums (Hardaker *et al.*, 2004) was further developed to calculate the utility weighted contracted processing potatoes price for decision-makers with varying degrees risk aversion. Hardaker *et al.* (2004) define a utility weighted risk premium as the difference between the certainty equivalents (CE) of two alternative risky choices at a specified level of risk aversion. The risk premium indicates the minimum increase in the certainty equivalent of the less preferred alternative to make a decision-maker indifferent between the two alternatives. In this case indifference is expressed in terms of the level of the contracted processing potatoes price.

The utility weighted contracted processing potatoes price was calculated with the following constrained non-linear programming model while assuming a negative exponential utility function:

$$\max (P^{PP})$$

$$CE^{PP} = \ln \left\{ \left(\frac{1}{n} \sum_j^n e^{-r_a(x) P^{PP} Y_j^{PP}} \right)^{\frac{-1}{r_a(x)}} \right\}$$

$$CE^{FP} = \ln \left\{ \left(\frac{1}{n} \sum_j^n e^{-r_a(x) P_j^{FP} Y_j^{FP}} \right)^{\frac{-1}{r_a(x)}} \right\}$$

$$CE^{PP} = CE^{FP}$$

where CE^{PP} and CE^{TF} define the certainty equivalent of processing potatoes and table potatoes respectively, n is the total number of states of nature, P^{PP} is the contracted processing potatoes price, P_j^{TF} is the table potatoes price in each state of nature, Y_j^{PP} and Y_j^{TF} are the potato yields of processing potatoes and table potatoes in each state of nature and $r_a(x)$ is the level of absolute risk aversion. Stochastic price and potato yields were generated using the multivariate empirical risk simulation procedure developed by Richardson *et al.* (2000) to represent a 1000 states of nature in the programming model. The objective of the programming model is to maximize the contracted price of processing potatoes conditional on the certainty equivalent of processing potatoes being equal to the certainty equivalent of table potatoes. The levels of absolute risk aversion were appropriately scaled using the procedure outlined in Grové and Oosthuizen (2010) such that the scaled values of absolute risk aversion do not exceed the risk aversion values reported in applied MOTAD studies.

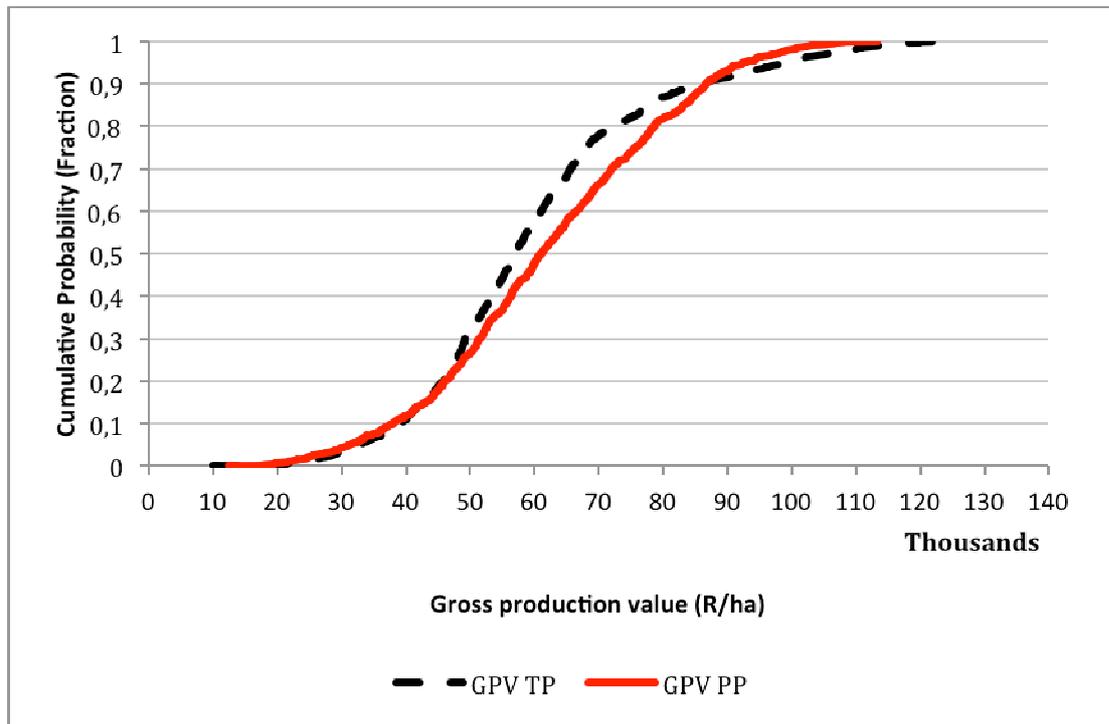
7.3 Results

The results consist of two different sections the first section is an explanation of the historical comparison between the two marketing channels and the second section is the calculation of the utility weighted breakeven contract price according to different risk aversion levels.

7.3.1 Historical marketing channel price comparisons

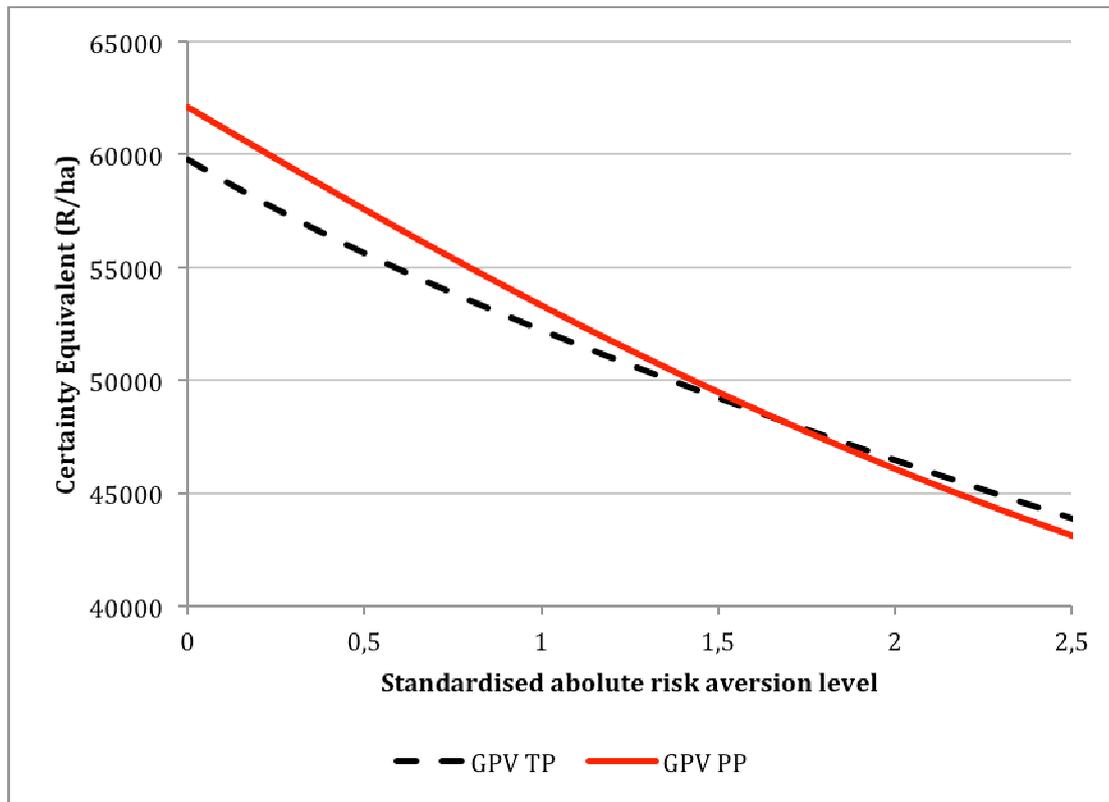
In order to compare the two marketing channels, a GPV value for the two channels was calculated based on seven years historical data. The CDF presented in Figure 7.5 below, shows that the GPV's of the two marketing channels are similar when the range of GPV's between R10 000 and R50 000 is considered. After R50 000/ha the processing potatoes will earn more GPV than the table potatoes up to R87 000/ha. At the top range (beyond R87 000/ha) table potatoes will obtain a higher GPV than processing potatoes. However, the table potato obtained the maximum GPV of R126 000/ha. According to the CDF it is difficult to choose between the two channels. Because of the cross-over of the different alternatives none of the channels have a second order stochastic dominancy, therefore it is important to consider the risk aversion levels of the producers in order to make an informed decision.

Figure 7.5: Cumulative Distribution Function of the GPV for both potato marketing channels



Because it is difficult to determine which marketing channel is the best, Stochastic Efficiency with Respect to a Function (SERF) is used to calculate the Certainty Equivalents (CE) at different risk aversion levels. Figure 7.6 indicates that a producer with a risk aversion of 0 will prefer the processing market, this will continue up to a risk aversion level of 1.6. At risk aversion levels as high as 1.7 and beyond the producer will change to the table potato market. This is basically justified by the fact that none of the channels had a second order dominance in the CDF discussed earlier.

Figure 7.6: Certainty Equivalents for table and processing GPV at different risk aversion levels.



7.3.2 Contract price decision support

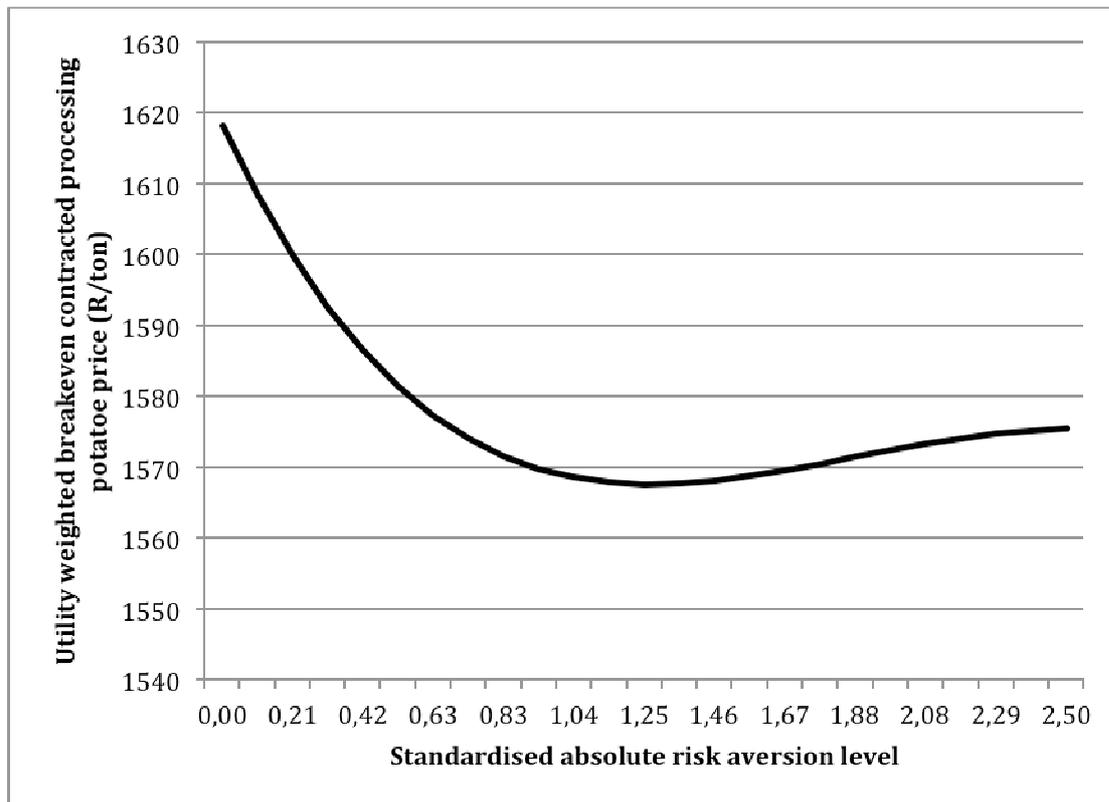
Because each producer's yields, prices and risk aversion levels differ, the question will be. Given a producer's specific scenario what must the difference in price be in order for the producer to still produce processing potatoes under fixed contract prices? Therefore, at which price will the producer be indifferent between the two marketing channels?

According to the utility-weighted break-even processing contract prices presented in Figure 7.7, a risk neutral producer (standardizes risk aversion coefficient = 0) will be indifferent between the two marketing channels at a contract price of R1618/ton. The contract price is calculated according to the risk aversion level, price risk and yield risks for both marketing channels. As the producer becomes more risk averse the producers are willing to accept a lower contracted price for the processing potatoes in order to be indifferent. The decision means that the producers are willing to receive less on his contract price but the utility is

satisfied in term of risk aversion. The lowest price is at a level of R1568/ton with a risk aversion level of 1.35. After this level the breakeven contract price increases.

The difference between the neutral risk aversion producer and a highly risk averse producer in terms of breakeven contract prices is very small. However, one must keep in mind that the difference is only based on price and yield risk, and that this excludes transaction cost. Thus if producers only evaluate prices the risk is lower in terms of the processing industry. The DSS model created can assist producers to use historical data and to make the necessary marketing decision regarding their produce at any given time.

Figure 7.7: Utility weighted breakeven contract price according to different risk aversion levels



7.4 Conclusion

In potato marketing there are various uncertainties that influence marketing decisions. The two main marketing channels are for table potatoes and processing potatoes. The table potatoes make use of a Fresh Produce Market (FPM) in order to determine prices and the processing potatoes make use of contracts. Normally table potatoes, have higher prices than

processing potatoes, but this is subject to price variability, whereas processing potatoes have a fixed contract price. However table potatoes have larger marketing costs (transport, packaging, commission fees etc.), which make it difficult to determine the best marketing channel in terms of prices. The processing potatoes also have a lower yield than the table potatoes and this has a direct influence on the Gross Production Value (GPV). The question which potato farmers face given the marketing costs, price risk and yield risk, is which strategy would be the most suited strategy. It is important for producers to know the risk efficiency of processing and table potatoes.

The main aim of this study is to develop a decision support tool, which will provide potato producers with sufficient information to make an informed decision regarding potato-marketing channels. The decision-support tool explicitly quantifies and compares the historic price risk of the marketing alternatives. In order to compare the two marketing channels on a deterministic model was developed. The model captures the producer specific data and then calculates a farmgate price and compares these data sets at a farm gate level. A CDF was calculated in order to determine historically which marketing channel had the preferred GPV distribution, after accounting for the cost of marketing. The CDF indicated that it would be difficult to choose a marketing channel just from evaluating the CDF. This is mainly due to the fact that none of the channels have a second order stochastic dominance. This it is important to evaluate the channels according to different risk aversion levels. A SERF was used to calculate a Certainty Equivalent at various GPV levels. According to the SERF processing potatoes was the preferred strategy up to a risk aversion level of 1.7.

Because each producers yields and risk aversion levels differ the question will be given a producers specific scenario what must the difference in price be in order for the producer to still produce processing potatoes under fixed contract prices? Thus at which price will the producer are indifferent between the two marketing channels? The utility breakeven contract price is the specific level where the producer is indifferent between the two channels. This assists the producers in making his marketing decision regarding the most suitable contract. According to the utility-weighted break-even processing contract prices, a risk neutral producer will be indifferent between the two marketing channels at a price of R1 618/ton. As producer becomes more risk averse they are willing to receive a lower price for the

processing potatoes in order to be indifferent. The lower price decision means that the producers are willing to receive less on his contract price but the utility is satisfied in term of risk aversion.

In conclusion, the decision support model in this study will be an important informational tool to producers mainly because of the fact that producers can evaluate their current cost, GPV's and benchmark themselves against producers in the same region. The model also assists producers in deciding which market channel will be suitable according to their risk aversion levels. The producers will also have sufficient information in assisting with production/marketing decisions (processing vs. table). Processing companies can also make use of the model in terms of procurement marketing strategies, mainly because the company can use the results of the model for negotiating processes, as well as for promotional material. Transaction costs in terms of price negotiation are high according to Strydom *et al.* (2012), and this model will assist in decreasing transaction costs.

It is recommended that further research be carried out in terms of risk diversification and transaction costs implications. It would be important for producers to know how to utilize both of the channels for optimal efficiency.

Proposed procurement marketing framework for potato processing companies

**Proposed procurement marketing framework for potato
processing companies**

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8.1. Introduction

The potato processing industry's production has increased over the last few years, by as much as 143% within 10 years, and together with this there has also been an increased growth in the import of frozen fries. This places direct pressure on the processing companies to procure good quality potatoes at reasonable prices, in order to remain competitive. Given this, the producers on the other hand have different marketing channels to choose from, namely table potatoes and processing potatoes. This means that the processing companies also have indirect competition from other marketing channels.

Table potatoes have a spot market governance structure where the prices for the potatoes are set on an organized market structure, namely the local fresh produce markets. In terms of processing potatoes, the governance structure is a contract structure, which uses a Decentralized Individual Negotiation (DIN) price discovery model where the prices are negotiated directly between the processing company and the producer. This means that table potatoes (spot market) have a variable price and processing potatoes (contract market) have a fixed price within a specific season.

Given all of this and the fact that the potato processing market is a fast growing industry, processors are struggling to procure sufficient quantity and quality potatoes from producers owing to indirect competition and imports.

8.2. Procurement marketing

Procurement and marketing as a holistic picture is becoming increasingly important. Procurement is increasingly regarded as a strategic function in the business environment (Lamming & Cox, 1995; Hardt *et al.*, 2007; Gadde & Håkansson, 2001; Trent, 2004; Axelsson *et al.*, 2005; Monczka *et al.*, 2005; Piercy, 2009; Sheth, Sharma & Iyer, 2009). Various authors, as indicated above, have done work on this subject and Koppelman was the only author to develop a theory.

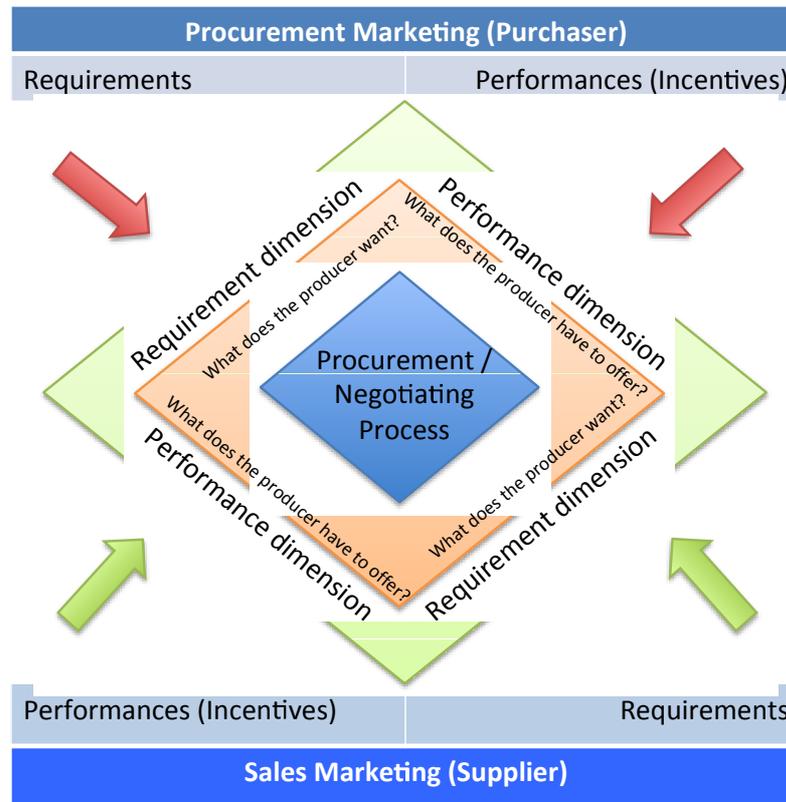
According to Koppelman (2003), there are a few aspects that make procurement difficult, amongst others: costs, prices, time, innovation and acceptance. With a free market system

and globalisation, the competition between businesses is increasing. This means that processing companies must keep their costs as low as possible. If a company can achieve economies of scale, costs can be decreased and a final product can be provided to the consumer, or the next person in the value chain, for a more reasonable price and the processing companies can be competitive.

One of the problems regarding agricultural raw materials is the volatility in supply. Furthermore, South Africa does not have import tariffs on frozen fries, which allows the import of frozen fries into South Africa at relatively low prices, compared to the domestic products. Another important factor in terms of the procurement of raw materials is the window of procurement. Potatoes are grown in different regions at different times in South Africa, which means that the processing company must have a comprehensive procurement management strategy.

Koppelman (2003) identified certain theories that must be kept in mind with procurement marketing. The first theory is Coalition theory, the basic principle of which is that if everyone within the business environment (staff, suppliers and directors) is satisfied, the business has long-term feasibility. The second theory is Incentive–Contribution theory, as highlighted by Figure 8.1 below.

Figure 8.1: Incentive- Contribution theory within procurement marketing



Source: Koppelman (1998)

According to this theory, buyers will always try to purchase at the lowest cost, although a buyer must also provide the supplier with something to convince the supplier to sell the produce. This theory is based on two aspects, namely the requirements and the performances. The importance of the requirements aspect is to identify the objectives of both the supplier and the buyer and to determine what the mutual requirements are to satisfy these objectives. In terms of the performances aspect, the question to be answered is: What incentives are in place for the supplier if the performance is up to standard and what are the benefits for the buyer?

The aim of this paper is to develop a procurement contract and to set up a procurement marketing framework to assist processing companies with the establishment of longer-term contracts and relationships. This framework is constructed by evaluating the needs of producers, transaction costs, the profit margins, price risks and incentives such as Decision Support Models.

8.3. Important aspects within procurement marketing

According to Rhodes *et al.* (2007), procurement is based on four pillars within agriculture: Risk, Profit, Transaction Costs and Governance structures. Various studies, such as Strydom *et al.* (2012 a, b, c) and Strydom and Grové (2012), have examined all of these pillars and the following results were obtained.

8.3.1. Contractual agreements

Strydom, Willemse and van Zyl (2012a) investigated the perceptions of potato producers towards the processing industry by means of investigating the advantages and disadvantages of the potato processing industry, as listed in Table 8.1 below.

Table 8.1: Advantages and Disadvantages when delivering to processing companies

Disadvantages		
Disadvantages	Description	²⁰ Rank
Transport costs	That all the producers pay the same transaction costs	-20.00%
Holdback	There is a holdback fee until all the contracted tons are delivered (cash flow)	-26.67%
Other companies	Can only produce for the contracted company and not for other companies (diversify risk)	-26.67%
Extension officer	The use of extension officers are responsible for additional costs (small producers)	-33.33%
Grading system	The grading system is not transparent	-53.33%
Cultivars	The processing companies only prefer certain cultivars	-53.33%
Harvesting teams	The harvesting teams of the companies are inefficient	-53.33%
Advantages		
	Description	

²⁰ Rank according to relevance and importance: the more negative the value is, the larger disadvantage of the factor, the more positive the value is the larger the advantage.

Flat rate	Additional tons delivered after contract are priced at a flat rate	13%
Compensation	If the producer crop has diseases or production problems the processing company will assist	27%
Established	Some of the companies are well established	53%
Loyal experienced producers	Some of the companies have a loyal producer client base	53%
Logistics	Logistics are well organized which assist with the harvesting	67%
Extension officers	Extension officers assist in farming practices (large producer)	67%
Bulk transport	Bulk transport reduces transaction costs	80%
Processing	Processing capacity of plants are high which assist producers during harvesting	100%

Source: Strydom *et al.* (2012a)

To enter any contract, a sense of trust is an imperative factor. This has been proved by various authors, such as Tregurtha and Vink (1999), and Masuku *et al.* (2003). The grading system creates a lack of trust, mainly because the producers do not always agree with the grading results.

In order to determine prices, the processing companies make use of a Decentralized, Individual Negotiation (DIN) method. In order to facilitate this process, a price setting model was developed. The model can be used to determine price premiums that can serve as incentives for the production of potatoes of a sufficiently high quality required for the purpose of processing. Thus, it may form part of a marketing model in order to establish longer-term contracts. Producers can also benefit from using the model in decision-making, since the model allows for price risk consideration when calculating potential gross income at the proposed contract price.

According to the Coalition Theory mentioned in section 8.2, everyone in the procurement channel must be satisfied in terms of the purchase agreements and processes. In order to satisfy this theory, the advantages must be incorporated/complemented in the procurement contract and the disadvantages must be converted to advantages or excluded from the contract.

In terms of contractual agreements of processors it is also important to identify the target producers, in other words, what type of farm/producer characteristics are appropriate in terms of contractual agreements. Strydom, van Zyl and Willemse (2012b) have stated that in order to compile a procurement marketing strategy, it is important to know who will participate in a contract governance structure as used by processing companies. The characteristics were determined by using a questionnaire and data analysis was carried out with a Principal Component Regression (PCR) combined with a Logit model. Shimi (2010) also used the same analysis in his study. The following characteristics were identified, ranked from most important to least important according to probabilities, with a minimum of 10% probability, as shown in Table 8.2 below:

Table 8.2: Characteristics of contract potato producers

Variables	Probabilities
Produce at minimum risk	0.0166
Wants to obtain a minimum price (certainty)	0.019
Prefer channel with less marketing cost	0.0211
Wants a channel with a small negotiation period	0.0242
Wants to have less quality penalties	0.0353
Want to obtain more market information	0.0478
Do not want to make use of own transport	0.0625
Only marketing channel available without additional on farm investment	0.0712
Frequency of contacts between buyer and producer must be smaller	0.0755

Source: Strydom (2012b)

All of the above-mentioned characteristics can be used to establish procurement marketing strategies and to improve the current contracts. These characteristics are not only the identification of a target market, but are also an identification of certain features that can be used as motivation within the procurement marketing plan. Processing companies can use these characteristics in order to determine or approach possible new producers.

8.3.2. Transaction costs

The potato industry is divided into two main marketing channels, namely table potatoes and processing potatoes. These two channels have different production and marketing processes after the harvesting of potatoes, creating a difference in transaction costs.

Strydom, Terblanche, Van Zyl and Willemse (2012c) calculated the magnitude of transaction costs for both of the abovementioned marketing channels. The different attributes of transaction costs were evaluated, namely physical asset specificity, human asset specificity, uncertainty, and frequency, as well as other proxies that represent transaction costs. All of these attributes had a transaction cost with a statistically significant difference, except for human asset specificity.

Overall, the contract market had the lowest transaction costs in terms of these attributes, although there were some attributes where the spot market had lower costs than the contract market.

It was concluded that the spot market has the highest transaction costs, which makes the contract market the transaction cost-minimising governance structure. This was also proved by Jordaan and Grové (2010) and Milagrosa (2007). The transaction costs were determined for the producers, thus, what is the producers' transaction costs in terms of different marketing channels? This is very important in terms of marketing procurement as explained by Koppelman (2003) in Figure 8.1. However, it is important to mention that the processing industry has high transaction costs in certain categories. This gives an opportunity to processing companies to evaluate these high transaction costs and then to decrease them with new strategies.

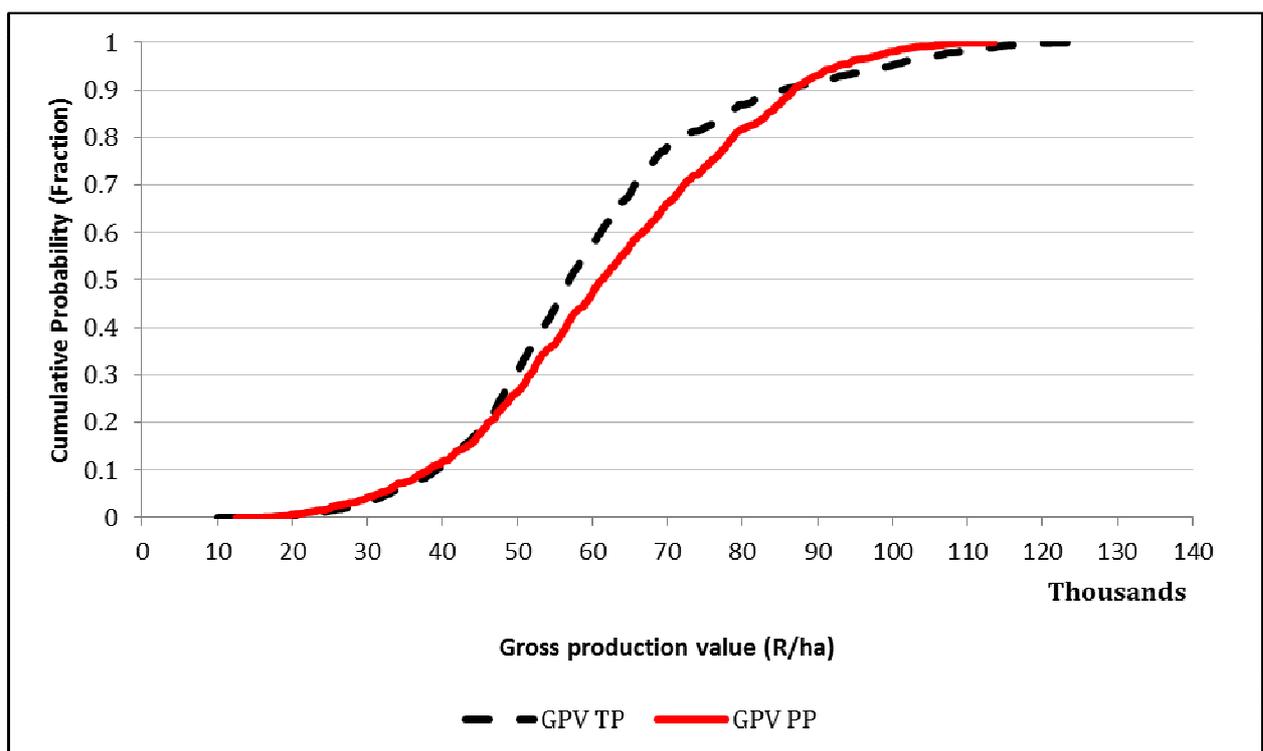
8.3.3. Profit margins

It is imperative that producers evaluate which marketing channel provides the best profit margins. This forms part of the producers' requirements within the Koppelman (2003) procurement theory. According to Strydom and Grové (2012), it is difficult to compare the two channels, mainly because of the fact that the production processes of the two channels differ. If the additional costs, namely packaging and marketing costs, are converted to the same basis, processing potatoes realize a higher price for the producers than table potatoes.

The table potato cultivars also have a higher yield than the processing potato cultivars. In order to compare the two channels, one must first calculate the Gross Production Value (GPV). The GPV²¹ is calculated according to a yield of 42 tons/ha for processing potatoes and 50 tons/ha for table potatoes. In order to make it easier to choose between the two channels, a Cumulative Distribution Function of the historic GPVs of seven years for both channels was calculated and illustrated in a graph.

According to the CDF calculated in Figure 8.2 below, processing potatoes had an 86% chance of obtaining a higher GPV over the period analysed than table potatoes, up to a benchmark of R82000/ha. The GPV is used as a measure of profit margin owing to the fact that all other costs for both the marketing channels are the same and this means that the GPV will be the determining factor in terms of profit.

Figure 8.2: Cumulative Distribution Function of GPV for table and processing potatoes (2005-2010)



Source: Strydom and Grové (2012)

²¹ Production costs of both channels are the same value

8.3.4. Price risk

According to Malan, Louw and Blignaut (2010), effective budgeting and financial bookkeeping are not the only requirements for managing a profitable agricultural business. Agriculture is a high risk business and the decision environment changes on a daily basis. This is why risk management is extremely important to producers.

According to Strydom and Grové (2012), the risk in terms of production risk between the two channels is the same for both. Both channels are potatoes and both need the same growing standards (moisture, heat units, etc.). However, in terms of price risk there are large differences. The table potato market is subject to a spot market, meaning high variability in prices as mentioned earlier, whereas the processing industry has a fixed price contract with possible price deduction.

This is important to contract producers as they do not want a maximum price with deductions for quality, sizes, and so on. They prefer a minimum price with possible price premiums for quality as confirmed by studies. In terms of obtaining the best prices over time, the CDF (used as explained in Figure 8.2 above) indicates that processing potatoes have the highest probability of obtaining higher prices. The question remains as to what the producers' contract price should be in order for producers to be indifferent between the two channels. This is resolved by means of calculating utility-weighted break-even contract prices. According to the utility-weighted break-even processing contract prices, a risk-neutral producer will be indifferent between the two marketing channels at a price of R1 618/ton. As the producers become more risk averse, they become more willing to receive a lower price for processing potatoes in order to be indifferent. This means that producers are willing to receive less on their contract price, but the utility is satisfied in term of risk aversion.

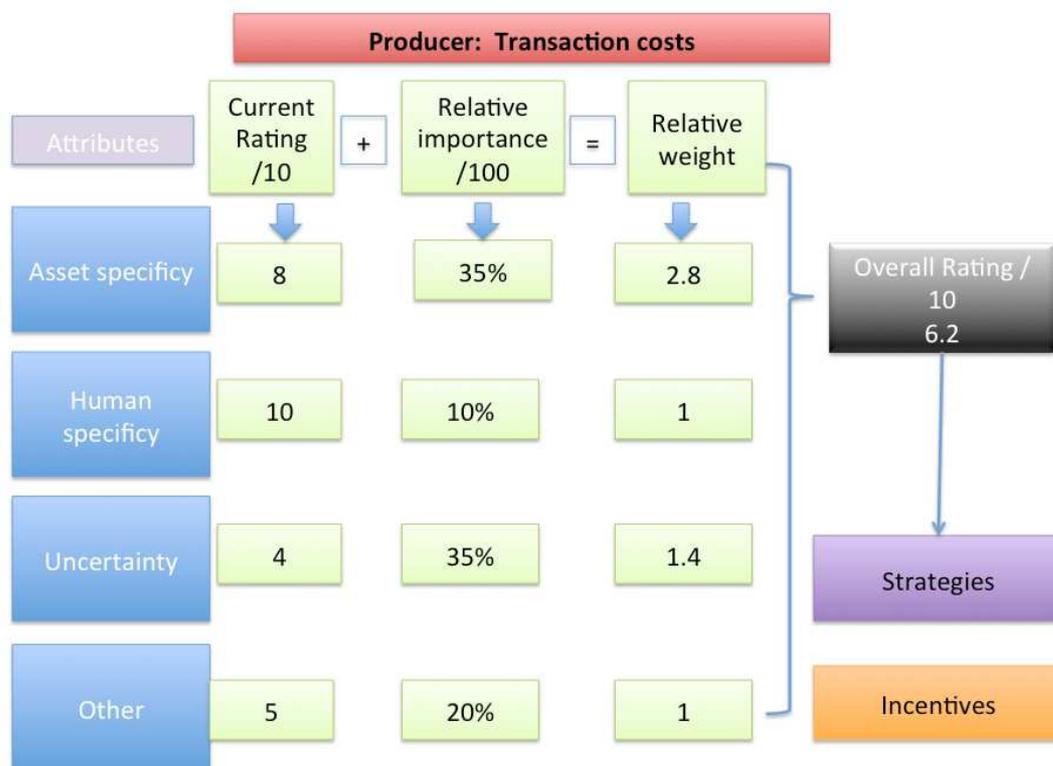
8.4. Procurement marketing framework

8.4.1 Transaction costs

Figure 8.3 below is a graphical explanation of the procurement marketing framework in terms of transaction costs. Each type of transaction cost is evaluated by means of giving it a current (status quo) rating. This rating ranges from 1 to 10 with 1 = very poor and 10 = very good, relevant to the table potato market. Also included in the framework is relative importance

(%), ranging from 0% to 100%, with 0% = not important and 100% = very important. This indicates, in terms of the processing companies' overall objectives, how important this specific attribute is. The relative weight is then calculated by multiplying the importance with the current rating. The relative weights of all the transaction costs must add up to 100%. From the evaluation of the example it is clear that there is a need to re-evaluate the procurement strategies that influence: uncertainty, other (negotiation) and human specificity. The next indicator is the overall weight of the specific procurement framework, which is a sum of all the indexes within transaction costs. This index will be used in the main framework (as discussed later in the paper).

Figure 8.3: Procurement marketing framework – Transaction costs



After the quantifying of the framework, strategies must be developed in order to improve the specific framework. However, it is important to mention that the processing industry also has high transaction costs in certain categories. This gives an opportunity to processing companies to identify and evaluate these high transaction costs and then to decrease them with new strategies. New incentives are needed in order to facilitate the negotiating process. Furthermore, uncertainty also poses a problem: this must be corrected by means of re-evaluating the contractual agreements and, as stated previously, by providing producers with a minimum price with premium options, rather than a maximum price with deductions.

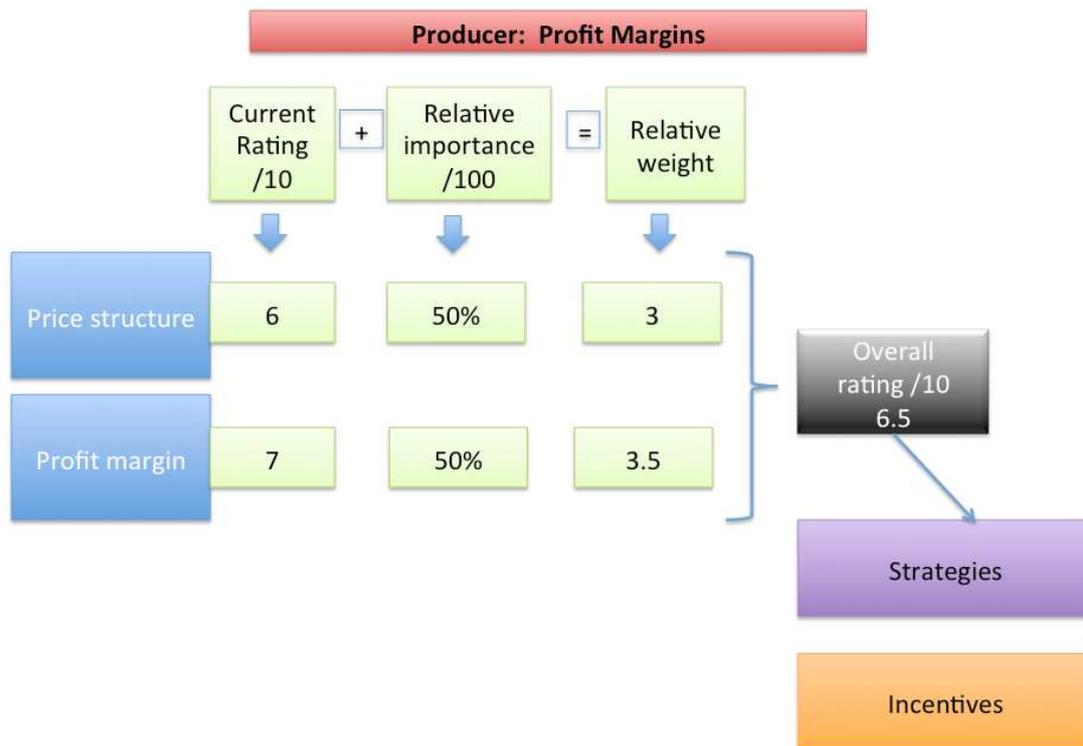
To summarize this, the following strategies must be used:

- Incentives: develop a price-setting model that reduces negotiating time and reduces uncertainties. Within this model, risk probabilities can be calculated (not covering direct allocatable costs), and the change in risk probabilities owing to a change in quality premiums can be observed. This means that the price-setting model reduces negotiating time and reduces uncertainty regarding price premiums and probabilities.
- The forming of alliances between producers (group negotiating) can assist producers with the negotiating process. However, this must be done according to the rules and regulations of the Competition Act 89 of 1998.
- The processing company must start with a marketing campaign emphasising the low transaction costs of producing potatoes for processing and attract new producers with this strategy.

8.4.2. Profit margins

Figure 8.4 below explains the procurement marketing framework in terms of profit margins for producers. The same methodology as for the transaction costs was used in order to set up a framework. The price structure received a relative weight of 3 and the profit margins a relative weight of 3.5, both of these sub-headings need some improvements.

Figure 8.4: Procurement marketing framework – Profit Margins



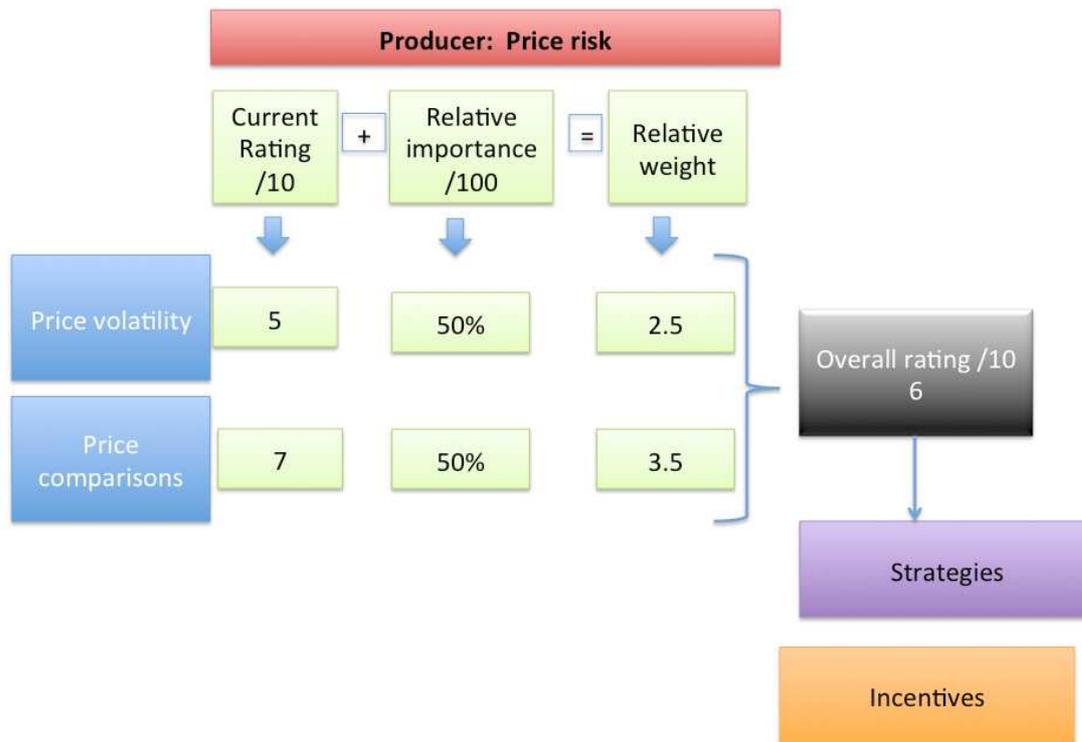
- Develop a decision-support model: within this model the producers can compare the two channels' profit margins according to the producers' specific conditions and risk appetites. This will assist the producers with decision-making regarding the different marketing channels and it will also assist the processing company with procurement marketing, price negotiation and contracting.
- In terms of strategies, the processing companies can make use of price premiums in the contract, and not deductions, to attract new producers.
- The processing companies already provide the farmers with better seed prices, meaning the processing companies buy the right quality seed in bulk and sell it to the different producers at a discounted price. The processing companies can examine the possibility of applying this method to other inputs, such as fertilizers and chemicals.

8.4.3. Price risk

The price risk framework was based on price volatility and price comparisons between the different marketing channels. In terms of price volatility, table potatoes have a high volatility whereas the processing industry does not have a quantifiable volatility (Du Preez & Van Zyl, 2010; Du Preez & Grové, 2011; Strydom & Grové, 2012). However, there are small changes in prices owing to quality penalties in contract prices. There is a need to evaluate price volatility within the framework. This example clearly explains the relevance of the framework. If the processing industry was evaluated in terms of price risk, the conclusion would have been that the processing industry is better off compared to the table potato sector in terms of price volatility owing to the fact that it makes use of a purchase contract, which is a fixed price mechanism and is not subject to spot price movements. However, this is untrue because of the fact that quality penalties exist, and these penalties constitute one of the categories of contributors increasing transaction costs (Strydom *et al.*, 2012c).

- In terms of incentives, a Decision Support Model (DSM) can be used as explained previously. This DSM calculates the probability of the processing industry obtaining higher prices, as well as the break-even utility for various risk-aversion levels. Not only does it assist the producers with their decision-making, it also reduces their transaction costs in terms of negotiating, marketing time and uncertainty.
- Processing companies can use the DSM as an assisting tool for producers and can be used as part of the negotiating process. The DSM can also be used as a marketing initiative, indicating to producers the benefits of producing processing potatoes.

Figure 8.5: Procurement marketing framework – Price risk



- The utility break-even yields will also assist processing companies in explaining the differences in yields. For example: the yield difference might be up to 10.7 ton/ha and it would still be worthwhile for a risk-averse person to produce processing potatoes.

8.4.4. Proposed Procurement marketing framework

After the completion of the elements of the main framework, the framework itself can be completed. The main framework makes use of the same methodology as the previously evaluated frameworks (8.4.1 – 8.4.3), although there is a purchase agreement focus (contract) within the main proposed framework as well. In this framework it is clear that much of the procurement marketing focus should be on the benefits of profit margins (index of 2.6). However, the other two pillars, transaction costs and price risk, must improve in order to gain importance. The strategies and incentives of the previous framework must be combined into a procurement marketing strategy. The importance of the main framework is in the purchase agreements (contracts), since these constitute the chosen governance structure used by processing companies and serve as the link between producers and processing companies.

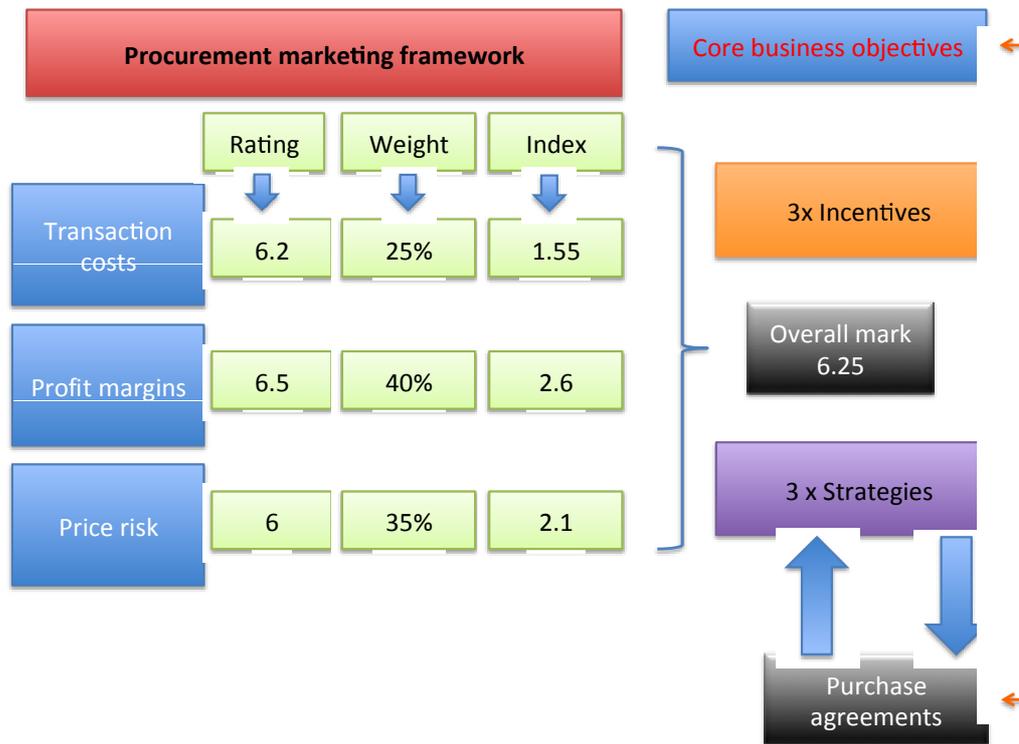
The strategies decided on must reflect the needs of the producers. This is why it is important to evaluate the target market (contract producers). If the processing companies know the characteristics of the contract producers, they can develop their contracts according to the needs of the company and the producer. It is also important to keep in mind that the strategies must satisfy the contract specification, and concomitantly, the contract must also facilitate new strategies.

It is essential to keep in mind that the procurement marketing process is not all about the producers: the processing companies also have certain core business objectives that must be satisfied. This means that the business objectives must be in line with the contractual agreements and the strategies developed.

The following strategies and adjustments are recommended for purchase agreements:

- Employ a third party grading company outside the processing company to create trust in grading and which will determine the price premiums. The producers and the processing company must then remunerate this grading company on a 50/50 basis. This is mainly done to share the advantage and to build trust.
- Another strategy could be to obtain a second opinion. If a producer's freight is rejected, a sample of the freight should be couriered to an independent grader in order to confirm the results. If the results are the same and the load is rejected, then the producer would pay the costs associated with this second opinion. This method can lead to a hold-up of a minimum of three hours, since the sample must be couriered. In the transaction cost section, contact and negotiation were identified as low transaction costs and this strategy could increase some of the transaction costs, although it could also reduce the uncertainty attribute of transaction costs.

Figure 8.6: Procurement marketing framework for potato processing companies



- Another step would be for the processing companies to be more informative as to their grading procedures. Processing companies, most of the time, have measures in place to ensure that there is no above-normal variation in the grading of a producer’s product. The producers do not know details of these procedures and should be informed. All of the above-mentioned factors will increase trust. This will also satisfy the characteristic of market information and reduce the uncertainty attribute in terms of transaction costs.
- In terms of long-term contracts with producers experiencing quality problems, the processing plant should attempt to find an alternative use for the problem potatoes instead of rejecting them. This could be in the form of using them; if not for frozen fries, but then for potato pieces in one of their other products, such as mixed vegetables or wedges.

The cultivar specification mentioned by Strydom *et al.* (2012a) might be a problem for the reason that some of the cultivars less preferred by processing companies are highly specific to the fresh produce market (for example ‘Up-to-date’). Two scenarios can be examined:

Scenario 1 – *High prices in the table potato market (at the time of harvesting) relative to processing contract prices, and the producer has planted a multi cultivar, such as ‘Up-to-date’.*

Since the producer has already signed a contract, the producer cannot benefit from these high prices in the fresh market. Accordingly, producers will try to get the contract terminated, which creates a procurement risk for processing companies.

- Processing companies can structure minimum price contracts entailing that the price can increase as the fresh produce market price increases. This implies that the processing company can make use of a formula price setting model (Rhodes *et al.*, 2007). Thus, if a producer delivers the produce, the producer receives the fresh produce market price, calculated relative to the processing industry. The problem is that it increases the risks of the processing company, such as price risk and variability. In order to do this, processing companies should only implement this strategy with long-term contracts.

Scenario 2 – *The prices at the fresh produce market are not that high and a producer has planted a cultivar only used in the processing industry.*

If the producer has grading problems and the potato load is rejected by the processor, then the producer must sell the potatoes on the fresh produce market, which is the alternative market. The specific cultivar is not that popular in the fresh produce market, resulting in an unattractive price to producers, along with the costs such as bagging and transport (mostly on contract bases). If the producer had planted the multi cultivar, the risk would be much lower owing to the higher popularity of the multi cultivar.

- If processors want to establish long-term contracts, they must prevent or decrease these risks for the producer. If producers have grading difficulties with their produce the processing company must try to use the potatoes and not simply reject the freight on delivery at the plant, as explained above.
- In terms of the negotiation of contracts, it is suggested that processing companies use the example of the USA as explained by Larson (2009), namely to establish a farmer producers’ association that elects a president representing them who negotiates prices with the processors. This will decrease transaction cost in terms of negotiation.

In terms of procurement marketing, the processing companies must evaluate the disadvantages and make use of the above-mentioned strategies in order to enhance contracting, which will have a direct effect on the procurement marketing.

8.5. Conclusion

The potato industry in South Africa is important to the agricultural processing sector. The last decade saw a substantial increase in the volume of potatoes that was processed into frozen fries – from 70 000 tons in 1997 to 170 000 tons in 2007, which reflects a growth of 143 % (Potato SA, 2009). Thus, frozen fries are becoming increasingly important as a final product within the potato industry of South Africa. South African potato producers have two main marketing channels. Firstly, the normal fresh market which is defined as the spot market. The second channel is the processing market, which can be divided into two sub-sectors, namely frozen fries and crisps. This channel is known as the contract market.

The problem is that processing companies do not get enough potatoes from producers in order to satisfy the demand for the final product. This means that procurement marketing (backwards marketing) is struggling. In agri-businesses, procurement marketing is extremely important, mainly because if the company does not receive the raw material (commodities), it cannot produce the final product and run the processing plant at optimizing levels.

In an agricultural environment, procurement marketing is based on four pillars: transaction costs, risk, profit margins and contractual agreements. These four variables are the most important variables when producers choose between two marketing channels. The question is how the two channels compare regarding each variable from the perspective of producers and what possible strategies can be developed from these variables in order to compile a procurement framework for processors.

The procurement marketing framework assists processing companies with these answers; the companies can also on a regular basis evaluate the current state of business according to the framework. The processing companies should make use of the incentives (models) created in order to launch marketing campaigns for procurement contracts of potatoes. These incentives should also be used in order to satisfy strategies and targets set out in the framework. They

can also make use of the framework developed in this research as a blueprint for developing a marketing procurement plan. The framework has various advantages, including:

- Better quantification of focus areas.
- Set of guidelines to assist with strategy formulation and strategy reevaluation.
- Efficient tool to capture progress on procurement marketing.
- Flexible in terms of developing new incentives and strategies.
- Alignment of producers and processing company objectives.

However, it is important to keep in mind that a processing company has certain core business objectives that must be satisfied as well. The framework with the strategies must be in line with the core business objectives. The framework will also only be successful with proper research and an efficient implementation plan. The implementation plan must have targets, objectives and evaluations that are measurable. Thus, there is a need for a properly developed implementation plan for this specific framework.

9.1. Conclusion

The potato processing industry has increased intensively over the last few years, as mentioned earlier, and together with this there has also been high growth in frozen fries imports. This puts indirect pressure on the processing companies to procure good quality potatoes at reasonable prices. Given this, the producers on the other hand have different marketing channels to choose from, namely table potatoes and processing potatoes. The table potato sector has a spot market governance structure where the prices for the potatoes are set on the fresh produce market. The processing potato sector has a contract governance structure where the prices are negotiated between the processing company and the producer. This means that table potatoes (spot market) have a variable price and processing potatoes (contract market) have a fixed price. Given all of this, and notwithstanding that the potato processing market is a fast growing industry, processors are struggling to procure sufficient quantity and quality potatoes from producers.

This means that procurement marketing (backwards marketing) is struggling. Procurement marketing is becoming increasingly important, even more so than sales marketing. In agri-business, procurement marketing is very important, mainly because if the company does not receive the raw material (commodities) it cannot produce the final product.

In an agricultural environment, procurement marketing is based on four legs: transaction costs, risk, profit margins and contractual agreements. These four variables are the most important variables when producers choose between two marketing channels. The question

is how the two channels compare regarding each variable from the perspective of producers and what possible strategies can be developed from these variables in order to compile a procurement framework for processors.

9.1.1. Purchase agreements

Producers are the clients of the processing companies, thus it is important to understand what the disadvantages are and also what the producers identify as advantages within the processing industry. In view of this objective, strategies were identified in order to develop longer-term contracts. The advantages, disadvantages and strategies were collected by means of using focus group interviews with both producers and processors. In order to quantify the advantages and disadvantages, a matrix is developed. According to the matrix, the main disadvantages were grading systems, harvesting teams and cultivars. The main advantages were extension officers, processing capacity of plants and bulk transport.

In order to attract more producers, the contract should be amended according to the characteristics of contract producers. The results obtained from the questionnaire were analysed by means of combining a Principal Component Regression (PCR) and a Tobit model. The most significant characteristic was that producers are in favour of lower risk. Together with this, contract producers prefer a minimum price. Accordingly, one can conclude that contract producers want to manage risk. The producers also wanted a governance structure which is transaction costs minimizing. These characteristics can be used to identify the target producers who the processing companies should approach.

9.1.2. Transaction costs

Transaction costs are very important for producers and the magnitude of these for each marketing channel was determined by means of using a questionnaire according to the Transaction Cost Economic theory. The data were analysed and confirmed by means of using Anova tables and the Fisher exact test. The different attributes of transaction costs were evaluated, namely physical asset specificity, human asset specificity, uncertainty, frequency and other proxies that represent transaction costs. All of these attributes had a transaction cost with a statistical significant difference except for human asset specificity. Overall, the contract market had the lowest transaction costs in terms of these attributes, although there were some attributes where the spot market had lower costs than the contract market.

It was concluded that the spot market has the highest transaction costs, which makes the contract market the transaction cost-minimising governance structure. These results obtained can assist processing companies in identifying the attributes where there are high levels of transaction costs. The strategies in this section are developed in order to reduce transaction costs.

9.1.3. Profit margins

The table potato sector makes use of a Fresh Produce Market (FPM) in order to determine prices and the processing potato sector makes use of contracts. Normally table potatoes have higher prices than processing potatoes, although this is subject to price variability, whereas processing potatoes have a fixed contract price. However, table potatoes have larger marketing costs (transport, packaging, commission fees etc.), which makes it difficult to determine the best marketing channel in terms of prices. Processing potatoes also have a lower yield than table potatoes and this has a direct influence on the Gross Production Value (GPV) which in turn has a direct impact on the profitability. In order to determine which marketing channel had the highest profits, a CDF was drawn on historical data. According to the data, the processing market channel had obtained the highest prices over a period of seven years.

9.1.4. Risk

The CDF was also used to quantify the yield and price risk on a historical basis. In terms of yield risks, the risks were more or less the same, although the table had a longer minimum tail, which, however, was very small. In terms of price risk, the prices were amended up to a farmgate price and then in terms of a GPV on a historical basis. Thus, over the long term the contract market channel obtained higher prices than the spot market, meaning that processing potatoes were less risky. In the short term (production season) the spot potatoes had a high variability as explained by various authors. In terms of contract potatoes, there is no variability in prices except for quality penalties.

9.2. Procurement marketing framework

After the evaluation of the four legs (contractual agreements, profit margin, transaction costs, risk), frameworks were developed for risk, profit margins and transaction costs in order to quantify the magnitude of each leg with its different sub-headings. The framework calculates

an index according to a rating and weight and this will assist a processing company in correcting some of the problems within each leg.

A main procurement framework was calculated according to the same methodology as with the different legs. However, with the main framework contractual agreements are included, together with strategies and incentives. The importance of the main framework is in purchase agreements (contracts), since this is the chosen governance structure used by processing companies and serves as the link between producers and processing companies.

The strategies decided on must reflect the needs of the producers. This is why it is important to evaluate the target market (contract producers). If the processing companies know the characteristics of the contract producers, they can develop their contracts according to the needs of the company and the producers. It is also important to keep in mind that the strategies must satisfy the contract specification, and concomitantly, the contract must also facilitate new strategies. It is essential to keep in mind that the procurement marketing process is not all about the producers and that the processing company also have certain core business objectives that must be satisfied. This means that the business objectives must be in line with the contractual agreements and the strategies developed.

The framework has various advantages, amongst others:

- Better quantification of focus areas.
- Set of guidelines to assist with strategy formulation and strategy reevaluation.
- Efficient tool to capture progress on procurement marketing.
- Flexible in terms of developing new incentives and strategies.
- Alignment of producers and processing company objectives.

9.3. Incentives

Various incentives, together with strategies, were created for each leg, including a minimum price model, a marketing cost model and a breakeven contract price DSS model. These models were created in order to assist processing companies with contractual agreements and procurement strategies.

9.3.1. Minimum price model

The minimum price model calculates a minimum price according to the producers' specific production costs and profit margins. Furthermore, the model calculates the risk of not being able to cover the direct allocatable costs, together with a premium increase. Thus, producers can receive a minimum price according to their specific scenario and if they produce better quality potatoes, they can decrease their risk.

9.3.2. Marketing cost model

The two marketing costs channels have the same production costs, although table potatoes have higher marketing costs (washing, packaging, commission, etc.) This model calculates a farm-level price for a producer, given the yield for each channel, and the producer can calculate which channel would provide the best prices at that specific time.

9.3.3. Breakeven contract price DDS model

If the producer has the current prices of both channels, the DDS model should assist the producer in choosing a channel at that specific moment. By calculating the certainty equivalent for both channels, based on the historical data, one can calculate a utility breakeven contract price for various risk aversion levels. The utility breakeven contract price is the specific level where the producer is indifferent between the two channels. This gives producers the ability to choose between two channels, given the current price.

9.4. Recommendations

Procurement marketing is seen as a new concept and something companies do not use on a regular basis. However various companies already applied this theory by having good communication between the procurement departments and marketing departments within a company. Processing companies must use this framework, strategies and incentives to develop a generic communication and align the marketing and procurement departments in order to procure good quality and an efficient amount of potatoes.

9.4.1. Procurement marketing

As explained in Chapter 1 procurement marketing must be seen as a holistic picture as well as a strategic tool. This means that each potato processing company must evaluate its own situation according to the methods explained within this thesis. It is also very important to market the good attributes of the company; it is imperative that processing companies

promote the benefits of their marketing channels. Due to that fact that the producer is a supplier of products, however the producer is also the client in terms of backward marketing.

9.4.2. Contractual agreements

After the evaluation of the processing companies it is important that the characteristics of contract producers must be evaluated and then models, contracts and marketing strategies must be developed that compliment these characteristics. This will ensure higher quality and quantities since the processing companies will attract more producers and there are incentives in place to produce higher quality potatoes. This thesis was merely written from the view of producers and not a lot of focus were on processors. However additional research is needed in terms of the cost/benefit implications for processors along with the impact of change regarding competitiveness.

9.4.3. Transaction costs, price risk and profit margins

Every processing company must evaluate transaction costs, price risks and profit margins on its own. Every company will have different results, which can be either negative or positive. The different identified strategies must then be used to improve these negatives and create a competitive advantage with the positives. It is also important for processing companies to realise that these strategies are only guidelines, each company must be creative and must use the incentive/requirement model in order to set up new strategies.

It is important to keep in mind that the processing company has certain core business objectives that must be satisfied as well. The framework with the strategies must be in line with the core business objectives. The framework will also only be successful with proper research and an efficient implementation plan. The implementation plan must have targets, objectives and evaluations that is measurable. Thus, there is a need for a proper developed implementation plan for this specific framework.

9.4.4. Further research

Further research is needed in the following areas:

- If processing companies implement the procurement strategies what would be the positive and negative impact? Thus experimental research is needed, in order to determine the main effects with and benefit cost analysis.

- Determine if the procurement framework can be used in other industries
- Develop new purchase agreements that would assist longer term contracts and create a more stable market.
- Investigate the impact of formal price determination and hedging mechanism such as a commodity derivatives market.

Annexure

 DEPARTMENT AGRICULTURAL ECONOMICS UNIVERSITY OF THE FREE STATE	 
QUESTIONNAIRE: 2010	

TO BE COMPLETED BY THE RESEARCHER ON BEHALF OF THE PRINCIPAL DECISION MAKER ON THE FARM.
 INFORMATION WILL BE STRICTLY CONFIDENTIAL

Respondent number _____ Date of _____

1 Farmer Characteristics

- 1,1 Farmers gender
- | | |
|---|--------|
| 1 | Male |
| 2 | Female |
- 1,2 Age _____ years
- 1,3 Years of formal education (Matric = 12 years, 3 year Diploma=15 years) _____ years
- 1,4 Years in farming as occupation _____ years
- 1,5 Do you need credit for potato production?
- | | |
|---|-----|
| 1 | Yes |
| 2 | No |
- 1,6 If yes how much of direct inputs? _____ %
- 1,7 What proportion of your production do you sell to the following?
- | | | |
|---|-----------------------------|---------|
| 1 | Contractor (processing) | _____ % |
| 2 | Fresh market (table potato) | _____ % |

Please indicate the level to which the following reasons influence your decision to participate in the dominant channel as mentioned in 1.7?

Reasons	No clearcut answer					Main reason	
	Not at all						
I obtain higher profit margin	1	2	3	4	5		a <input type="checkbox"/>
I incur lower marketing costs	1	2	3	4	5		b <input type="checkbox"/>
I obtain more market information	1	2	3	4	5		c <input type="checkbox"/>
It is more convenient than other alternatives	1	2	3	4	5		d <input type="checkbox"/>
It is the only available marketing channel that I can use	1	2	3	4	5		e <input type="checkbox"/>
The specific channel is less risky than the other	1	2	3	4	5		f <input type="checkbox"/>
I have less quality penalties	1	2	3	4	5		g <input type="checkbox"/>
The buyer provide me with credit options	1	2	3	4	5		h <input type="checkbox"/>
Other (Specify)	1	2	3	4	5		i <input type="checkbox"/>

- 1,8 How risk averse are you as person?
- | | | |
|------------|---------|-------------|
| Risk-taker | Neutral | Risk averse |
| 1 | 2 | 3 |
| 4 | 5 | |

- 1,9 Please indicate the following levels of yield for a production season
- Minimum _____
- Most likely _____
- Maximum _____

2 Farm characteristics

- 2,1 Farm size (potatoes) _____ hectare
- 2,2 Distance from nearest market/plant (market or contractor) _____ km
- 2,3 Farm ownership
- | | |
|---|-------|
| 1 | Own |
| 2 | Rent |
| 3 | Other |
- 2,4 Dominant cultivar planted (1) _____
- | | | | |
|---|--------------|---|---------------|
| 1 | Up- to-date | 5 | Shepody |
| 2 | Mondial | 6 | Pentland Dell |
| 3 | BP1 | 7 | Fianna |
| 4 | Lady Rosetta | 8 | Herta |
| 9 | Other | | |
- 2,6 Average yield _____ ton/ha
- 2,7 Cultivar planted (2)
- | | | | |
|---|--------------|---|---------------|
| 1 | Up-to-date | 5 | Shepody |
| 2 | Mondial | 6 | Pentland Dell |
| 3 | BP1 | 7 | Fianna |
| 4 | Lady Rosetta | 8 | Herta |
| 9 | Other | | |
- 2,8 Average yield _____ ton/ha
- 2,9 Average production costs for last production season _____ Rand/ha

If you sell to a contractor fill in this section if not go to section 4

3 Buyer - Contractors (Processor)

- 3,1 What is the average price received for the last production season? _____ Rand/ton
- 3,2 In order to produce for the contract market do you need any extra/additional equipment relevant to producing for the fresh market?
- | | |
|---|-----|
| 1 | Yes |
| 2 | No |
- Specify: _____
- 3,3 In order to produce for the contract market do you need any extra/additional packing materials relevant to producing for the fresh market?
- | | |
|---|-----|
| 1 | Yes |
| 2 | No |
- Specify _____
- 3,4 In order to produce for the contract market do you need to do any extra/additional processes relevant to producing for the fresh market (etc. washing, sorting)?
- | | |
|---|-----|
| 1 | Yes |
| 2 | No |
- Specify _____
- 3,5 Choose the most appropriate answer?
- | | |
|---|--|
| 1 | You deliver the produce by means of using your own transport |
| 2 | You deliver the produce by means of using a transport contractor |
| 3 | The buyer collects the produce on farm |
- 3,6 What is the scale of uncertainty regarding prices at plant time?
- | | |
|---|---------------------|
| 1 | I am very uncertain |
| 2 | I am uncertain |
| 3 | Can not say |
| 4 | Certain |
| 5 | Very certain |

3.7 What is the scale of risk comparing to the fresh market?

1	Very low
2	Low
3	Average
4	High
5	Very high

3.8 When do you receive your payment?

1	Immediately	4	End of two weeks
2	The next day	5	End of month
3	End of week	6	Longer

3.9 How long did it take you to bargain a price?

1	Less than a hour	4	Less than a week
2	Within 3 hours	5	Less than a month
3	One day	6	More than a month

3.10 How much contact do you have with the contractor?

1	Only once
2	Daily
3	Monthly
4	Weekly

3.11 Buyers manipulate the grading of produce

Disagree Agree

1	2	3	4	5
---	---	---	---	---

3.12 How much of your loads are rejected in a production season?

1	<10%
2	10%>30%
3	30%>60%
4	60%>

If you sell to the fresh market complete this part

4 Buyer - Fresh market (Table potatoes)

4.1 What is the average price you received during the last production season? _____ Rand/ton

4.2 In order to produce for the fresh market do you need any extra/additional equipment relevant to producing for the contract market?

1	Yes
2	No

Specify: _____

4.3 In order to produce for the fresh market do you need any extra/additional packing materials relevant to producing for the contract market?

1	Yes
2	No

Specify: _____

4.4 In order to produce for the fresh market do you need to do any extra/additional processes relevant to producing for the contract market (e.g. washing, sorting)?

1	Yes
2	No

Specify: _____

4.5 Choose the most appropriate answer?

1	You delivery the produce by means of using your own transport
2	You deliver the produce by means of using a transport contractor
3	The buyer collects the produce on farm

4.6 What is the scale of uncertainty regarding prices at plant time?

1	I am very uncertain
2	I am uncertain
3	Can not say
4	Certain
5	Very certain

4.7 What is the scale of risk comparing to the contract market?

1	Very low
2	Low
3	Average
4	High
5	Very high

4.8 When do you receive your payment?

1	Immediately	4	End of two weeks
2	The next day	5	End of month
3	End of week	6	Longer

4.9 How long did it take you to bargain a price?

1	Less than a hour	4	Less than a week
2	Within 3 hours	5	Less than a month
3	One day	6	More than a month

4.10 How much contact do you have with the market agent?

1	Only once
2	Daily
3	Weekly
4	Monthly

5 Transaction characteristics

5.1 Do you experience conflict with the buyer on a regular bases (e.g. price or grade disputes)?

1	Yes
2	No

5.2 Do you experience delayed payments on a regular bases?

1	Yes
2	No

5.3 According to the following scale what is your knowledge of potato prices

1	Very low
2	Low
3	Medium
4	High
5	Very high

5.4 Do you travel to the market to obtain prices?

1	Yes
2	No

5.5 Do you agree that contractors/market agents tend to withhold important transaction information?

1	Yes
2	No

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