

Assessing the need of financial products by pecan nut producers

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Mini-dissertation submitted in partial fulfilment of the requirements for the degree *Master of Business Administration* at the North-West University

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SOLEMN DECLARATION



NORTH-WEST UNIVERSITY
YUNIBESITHI YA BOKONE-BOPHIRIMA
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ABSTRACT

The pecan nut industry in South Africa is relatively underdeveloped, yet it shows potential for financial growth for South Africa when considering that it accumulated \$1 585 in exports to the United States from January 2017 to July 2017 (United States Department of Agriculture, 2017). Moreover, the main importer of South African pecan nuts is China. In light thereof is evident that the pecan nut industry is a vastly growing industry with great potential. To this effect, this study was conducted to generate a clear perspective of the pecan nut industry in South Africa.

Limited information is available on the pecan nut cycle, its associated insurance, and the financing of products. Various stages of plantation can be found in different provinces, but in the Hartswater region, the majority of farmers are pecan nut farmers. Therefore, well-established pecan nut plantations were visited in the Hartswater region. The combined experience of these pioneering farmers was used to establish pecan nut cycle requirements for optimal production within South Africa. The South African farmers are utilising practices and guidelines in accordance with Texas. Therefore relevant South African information was researched since conditions between these countries are not identical.

A major gap in the pecan nut industry can be attributed to the lack of insurance and financing products available. These critical aspects were evaluated in accordance to the pecan nut farmers' challenges, needs and recommendations were suggested to address these shortcomings.

KEY TERMS: Pecan nut, insurance, financing, South African agriculture, agricultural challenges and pecan nut cycle.

LIST OF ABBREVIATIONS

C	Celsius
cm	Centimetre
DCHP	Hedged trees
GFI	Gross Financial Income
IBM	International business machines
kg	Kilogram
km ²	Square kilometres
m ³	Cubic meter
m ²	Square meters
MBA	Master of Business Administration
mm	millimetre
MMT	Million metric tonnes
MT	Metric tonnes
n.d.	No date
OT	After tree removal
POPI	Protection of personal information act.
Pty Ltd	Proprietary private ownership
REM	Risk enterprise management
SA	South Africa
USA	United States of America

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CHAPTER 1 NATURE AND SCOPE OF THE STUDY

1.1 Introduction

A modern farmer faces many challenges, the most significant of which are climate conditions” according to Johan van den Berg (2017), specialised crop insurance manager at Santam Agriculture.

Due to changing weather conditions and uncertainty, farmers must have an option to mitigate their risks to protect their production. However, there are various crop insurance products available on the market specialising in grain, fruit, vegetables, tobacco, fibre, crops, maize, soybeans, sunflower, and sorghum production but limited products are available for farmers producing pecan nuts (Santam, 2017). The limited products available do not cater for the specific requirements of pecan nut production.

This study will determine the need for insurance and finance products to produce pecan nuts specifically considering the lifetime of the pecan nut tree. Attaining the desired long term effects of the optimal production of pecan nuts requires additional research to be conducted to create a suitable product for these farmers.

1.2 Background of the study

China is also a major producer of tree nuts. Its output, mainly walnuts and Chinese-type chestnuts, is estimated at 3.8 mmt. Production of imported nuts, such as almonds and pistachios, is relatively small and cannot keep up with consumer demand. (Yang, Z & Gale, F. 2015.) According to Chen (2015), Chinese authorities were persuaded to reduce tariffs for pecans, pistachios, and cashews because increased imports could not compete with domestic production.

The demand for nuts in China is rapidly growing; therefore, import tariffs have been reduced in an attempt to meet the demand. This is a drastic measure for ensuring that the demands are met considering that China also produces various other nuts.

The demand identified in China created opportunities for South African pecan nut farmers to fill the gap in the pecan nut market.

The United States imported \$373 196 of pecan nuts during 2016 of which South Africa exported 0.97% of the total imported pecan nuts, and the demand for pecan nuts has grown since 2012 in the United States. (United States Department of Agriculture, 2017).

In South Africa specifically Hartswater has the optimal weather conditions for producing pecan nuts. Therefore opportunities arise for the exporting of pecan nuts. The statistics are illustrated in Figure 1:

Area/Partners of Origin And General Commodities Imported			January - December Cumulative To Date Values in Thousands of dollars							Period/Period % Change (Value)
Partner	Product		2012 Value	2013 Value	2014 Value	2015 Value	2016 Value	Jan - Jul 2016 Value	Jan - Jul 2017 Value	
1 + World Total	1 - Tree Nuts		1,750,057	1,871,499	2,250,401	2,650,537	2,751,332	1,373,514	1,683,169	23
1 + World Total	1.1 0801320000 - CASHEW NUT,SHL		804,096	911,487	940,702	1,148,283	1,215,762	612,948	854,891	39
1 - World Total	1.2 0802901500 - PECAN,FR.DR.SHLD		192,967	168,866	262,435	304,277	373,196	193,349	252,436	31
1.1 Mexico	1 0802901500 - PECAN,FR.DR.SHLD		192,778	168,456	259,809	300,407	366,072	191,099	252,321	32
1.2 South Africa	1 0802901500 - PECAN,FR.DR.SHLD		0	204	238	1,925	3,635	1,585	0	--
1.3 + Australia(*)	1 0802901500 - PECAN,FR.DR.SHLD		0	185	2,373	1,944	3,398	646	0	--
1.4 Vietnam	1 0802901500 - PECAN,FR.DR.SHLD		0	0	0	0	63	0	0	--
1.5 Thailand	1 0802901500 - PECAN,FR.DR.SHLD		0	0	0	0	17	17	0	--
1.6 Canada	1 0802901500 - PECAN,FR.DR.SHLD		0	4	15	0	9	0	96	--
1.7 + Israel(*)	1 0802901500 - PECAN,FR.DR.SHLD		0	0	0	0	2	2	0	--
1.8 China	1 0802901500 - PECAN,FR.DR.SHLD		67	16	0	0	0	0	0	--
1.9 Hong Kong	1 0802901500 - PECAN,FR.DR.SHLD		0	0	0	0	0	0	19	--
1.10 Peru	1 0802901500 - PECAN,FR.DR.SHLD		28	0	0	0	0	0	0	--
1.11 Spain	1 0802901500 - PECAN,FR.DR.SHLD		94	0	0	0	0	0	0	--

Figure 1: US pecan nut imports

(United States Department of Agriculture, 2017)

South African farmers have the opportunity to supply and improve South Africa's economy; therefore measures should be taken to supply the ongoing need while creating additional access to a growing market. As depicted in Figure 1, there was an increase in pecan nut imports in the USA from 2012 to 2016, which calculates to a 47% increase whereby South Africa only contributes a small scale. There is a relationship between the USA and South Africa regarding pecan nut imports and exports – South Africa should capitalize on this market. (United States Department of Agriculture, 2017) Farmers' requirements for assistance in pecan nut farming

The main differentiating factor of farming is the dependency on nature; there are various risks involved with farming which has to be taken into consideration such as weather conditions, diseases, flooding, drought and fire hazards, these elements are not necessarily prevalent in other industries. (Ray, 2011) According to P.K Ray, 2011 "Normally the greatest impact of these factors is on crop production. The uncertainty of crop yield is thus one of the basic risks that every farmer has to face. Unfortunately, a great majority of farmers in most countries, due to insufficient means and resources, are seldom able to stand such risks, especially when these involve disastrous losses"(Ray, 2011)

The gross value of pecan nut production in 2015/2016 accumulated to R2 86 billion (Department of Agriculture, Forestry and Fisheries, 2017). Considering the drought and weather conditions in South Africa, it can be assumed that an R2 86 billion agricultural industry in South Africa requires insurance and financing products to reduce external risks.

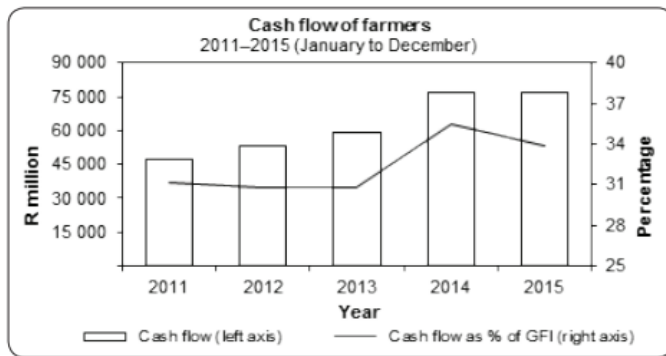


Figure 2: Cash flow of farmers

(Source: Directorate: Statistics and Economic Analysis, 2017)

As depicted in Figure 2, the cash flow of farmers amounted to R76 714 million in 2015, compared with R77 293 million in 2014, resulting in a slight decrease of 0.7%. The decrease is attributed mainly to the increased expenditure. Financing products could assist upcoming farmers to ease the production process and encourage expansion to enlarge their footprint in the market.

Cashflow enables farmers to expand their farming activities, but however, a reduction in the available cash flow will hamper expansion of existing farmland. The gross financial income (GFI%) indicates the gross cash of farmers are decreasing.

In considering the cashflow situation of farmers when interpreting the nut industry in South Africa, insurance products and financial products are found to be beneficial to farmers, especially upcoming farmers.

1.3 Insurance and financing products requirements for the insurer

“An estimated 20% of the total summer grain area in South Africa is covered under multi-risk crop insurance. It plays an important role as security for producers who use input financing. Multi-risk crop insurance has always played an important role in ensuring that producers can farm sustainably, especially in the past few years of drought.” (Santam, 2017)

With multi-risk insurance, more than one risk is covered, which results in more expensive coverage than other available products.

The farmer is measured against the guaranteed crop versus the harvested crop and the goal of multi-risk insurance is to ensure that the farmer can continue production sustainably.

Large multi-risk claims as a result of drought damage in three of the past four years had a significant impact on the long term results of multi-risk insurance. This led to limits being introduced on this type of insurance in recent seasons (Santam, 2017).

Multi-risk crop insurance should not be evaluated in the short term, but over the long term on account of the changes in weather conditions yearly, thus production conditions can be divided into drought years and rainier years. In Figure 3 the rainfall is depicted as a deviation from the mean. The drought was experienced in the following years: 1964-1967, 1982-1987, 1991-1996, and 2001-2007. When determining insurance products for farmers, these deviations will impact the premium amount due to the greater risks involved.

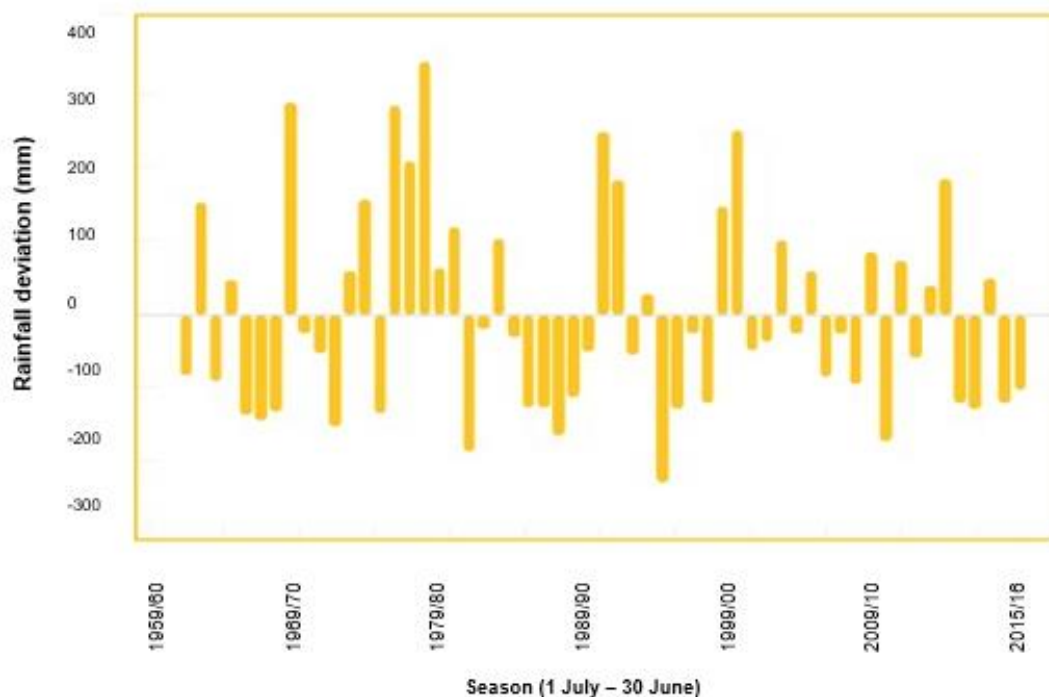


Figure 3: Rainfall from 1959 until 2016 North West Province

(Source: World Weather Online, 2017)

Drought occurs over large areas, concomitant with substantial claim amounts, and not sporadically as in the case of hail, for instance. The cost of keeping this capital available is high as it cannot be used for something else. Capital of at least six times the premium income must be reserved. In the case of hail insurance, it is a fraction of this (Santam, 2017).

Because drought cover is more expensive than other covers, this will have a great impact for pecan nut farmers as pecan nut trees require 3.7 litres of water per young tree and between 378 litres and 567 litres for fully grown trees per day. (Sammis, 1999).

Since drought cover is more expensive than other covers, this will have a great effect on pecan nut farmers, as pecan nut trees require 3.7 litres of water per young tree and between 378 and 567 litres for fully grown trees per day (Sammis, 1999). Tests can be conducted on experimental farms to mitigate the risks for the insurer by setting standards and requirements gathered from the obtained test results.

1.4 Availability of financing and insurance products to pecan nut farmers

Various funding options are available to assist farmers in the production process; these funding options vary from short cycle crops, medium-term crop or instalment sale loans. The Landbank has been providing agricultural finance since 1912 (Land Bank, 2017).

The Risk enterprise management () loan is not available for long term crops such as citrus. The banks prefer to fund crops that turn over two or three times a year, such as vegetables; this allows for several complete cycles of training in a year and quick compilation of balance sheets. Ideally, the loan is repayable within five years before moving up to the commercial level of the bank (Land Bank, 2017).

Other financing institutions offer loans, but these loans are repayable within five years; therefore, these financing options are not suitable for pecan nut farmers starting plantations due to the long time it takes to achieve optimal production.

The fact that the Land Bank and other service providers do not offer financing products to long term crop farmers indicates that there is a gap in the market to provide products according to the requirements of the farmer.

1.5 Problem statement

The primary problem researched in this study is: Which type of finance and insurance products can be developed to assist the pecan nut farmers financially and insurance-wise while determining the risks for the insurer and finance house?

Risk characterises life for many of the world's poorest households. When this risk is uninsured, it imposes a considerable cost on current and future welfare when unforeseen events cause reduced consumption and asset loss.

Additionally, without insurance, households take action to limit their exposure to risk and in so doing may pass up profitable opportunities that are considered too risky. They diversify the types of economic activities pursued or keep as many assets as possible in easily disposable forms; and as a result considerably lower their average income (Dercon *et al.*, 2011).

The value of these finance and insurance products can ultimately be determined to enlarge the farmers' footprint in the pecan nut market.

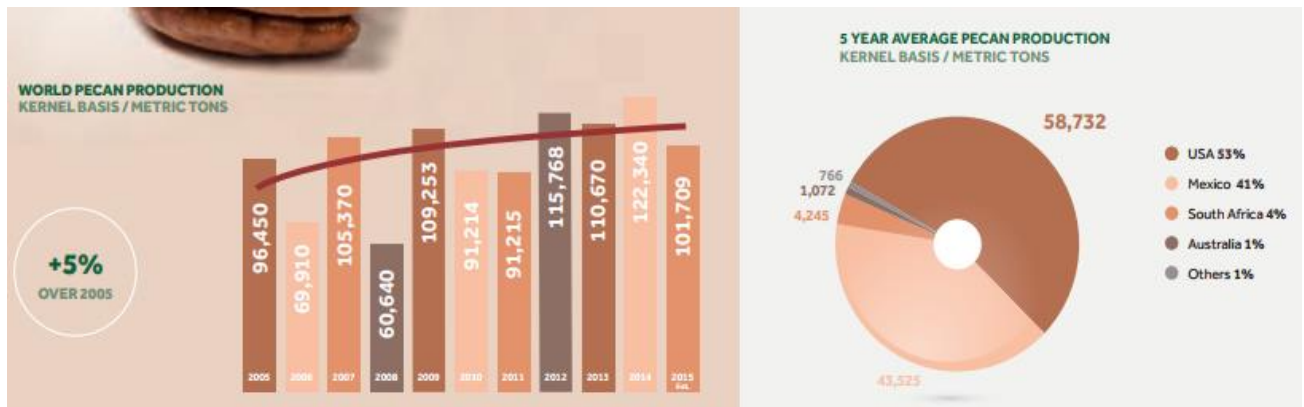


Figure 4: World pecan nut production

(Source: International Nuts & Dried Fruit Statistical review, 2016)

The demand for pecan nuts in 2014 totalled 135 506 MT, while the total world production was 101709 MT, resulting in the demand exceeding the supply.

This shortage/demand can be used as an opportunity seeing that South Africa has the perfect weather conditions for producing pecan nuts. This study addresses the shortcoming that lies in insufficient insurance and financing products for farmers to mitigate their risks when perusing this opportunity (Macaskill, 2017).

This study will expand on these opportunities and evaluate the insurance and financing products available to capitalise on the deficit supply to meet the required demand by understanding the required basic farming practices.

1.6 Research aim

1.6.1 Primary research objective

The primary objective is to determine the need for insurance and financing products for pecan nut farmers. The research conducted in South Africa is limited, and this study will contribute relevant information based on South African conditions.

1.7 Secondary research objectives

The secondary objectives will be investigated to support the primary objectives. These research questions are summarised as follow:

- What are the challenges experienced by the pecan nut farmers in South Africa?
- What are the recommendations for a productive pecan nut production?
- Why do pecan nut farmers require insurance or financing products?
- What are the specific organisations that help farmers financing their products and to insure their plantations?

Key drivers have been identified to analyse these questions in consideration of the importance of risk mitigation for the insurer and finance house. Insurers and finance houses will only be able to provide coverage products once risks and key requirements have been identified and researched. These drivers are summarised::

- Cycle of trees from planting up to harvesting.
- Required ground conditions.
- Climate requirements including weather conditions.
- Technological advancements.
- Hedging requirements and occurrence.

1.8 Research methodology

Research methodology is described as the specific procedures or techniques used to identify, select, process, and analyse information about a topic. In a research paper, the methodology section allows the reader to critically evaluate a study's overall validity and reliability (University of Witwatersrand, 2018).

1.8.1 Study context

Research focusing on the pecan nut industry in South Africa is limited, and farmers should use international research material to expand their knowledge by interviewing experts in the pecan nut industry of South Africa, farming practices, and relevant information can be published to assist other farmers.

1.8.2 Study design

Data were collected through semi-structured interviews and qualitative research. The financial figures gathered from the system will represent the quantitative data for which data was measured, and for which findings will be reported. The data collection process should ideally be repeated to ensure accurate data. The interview questions are available in Appendix A.

1.8.3 Target population

The population will consist of the following participants:

- Farmers with pecan nut plantations of more than five years of age
- Experts in the pecan nut farming industry
- Process and export companies
- Insurers specialising in crop insurance
- The Senwes team researching pecan nut plantations
- Senwes employees employed at Senwes Credit (Financing department), Certisure (Insurance) and corporate level. These employees must have the required agricultural skills and knowledge to contribute towards the research.
- Certisure brokers specialising in crop insurance. These identified brokers are experts in the agricultural insurance industry.
- Current farming clients of Senwes Credit (Financing department) and Certisure (Insurance).

All participants selected in this population group provided accurate and instructive information regarding this study.

1.8.4 Sample

Probability sampling will be used following an evaluation of the different types of probability sampling. Cluster sampling was selected to represent the Hartswater area. Seven interviews will be conducted, and snowball sampling will be used until saturation has been achieved and for data richness purposes.

1.8.5 Data collection

Certisure is a brokerage firm from which clients were contacted to arranging interviews. Employees who researched the pecan nut industry agreed to share information to assist in the study's completion.

Two non-probability sampling strategies will be used namely convenience and snowball sampling (Bryman *et al.*, 2014). Convenience sampling will be used because it is not possible to reach all the pecan nut farmers in the selected geographical area. Snowballing entailed interviews with experts in the field will lead to contact with other units with knowledge in the pecan nut industry.

1.8.6 Data analysis

Qualitative data must be turned into fragments and coded according to importance and relevance. Miles, Huberman and Saldana see analysis as “three concurrent flows of activity: 1) data condensation, 2) data display, and 3) conclusion. Data condensation refers to the process of selecting, focusing, simplifying, abstracting, and/or transforming the data that appear in the full corpus (body) of written-up field notes, interview transcripts, documents, and other empirical materials. By condensing, we are making data stronger” (Miles, Huberman & Saldana, 2014).

The NVivo 11 software program will be used to code interviews into usable information. Coding the qualitative data is a process and should be revised to ensure accurate results for inclusion in the research. The process should be less complex after the data has been simplified, selected and ranked according to relevance.

A thematic analysis method will be applied to accommodate the flexibility of this method (Bryman *et al.*, 2014). Six phases will be applied namely:

- Familiarise self with data;
- generate codes;
- sort codes according to themes;
- check whether themes can be applied;
- name the selected themes; and
- finally, analyse and report on findings.

1.9 Limitations of the study

Experts in this industry were interviewed to accumulate accurate and relevant information, and all interviews were conducted only with participants in the Klerksdorp and Hartswater area. Farmers in or from other provinces were interviewed for this study. However the South African Pecan Nut Association can provide information on the other provinces in South Africa.

Another limitation is the availability of South African pecan nut farming information; therefore, international information with older South African available research was used as references.

1.10 Inclusion criteria

The delimitation section will indicate the criteria of participants in the study and the geographical region in which the study was conducted. Studies were conducted in the North-West, Free State and Northern Cape provinces, and the pecan nut farmers in the Hartswater were identified for the interviews that would be conducted.

1.11 Assumptions

According to Leedy and Ormrod (2010), “assumptions are so basic that, without them, the research problem itself could not exist”.

The current need for pecan nuts was assumed to continue increasing as it has over the past years (International Nuts & Dried Fruit Statistical Review, 2016). The sample assumptions were that all participants would answer all questions truthfully and that these participants would have the required expertise to contribute to the study.

1.12 Contribution of the study

The study will add value to South African farmers of the pecan nut industry and upcoming or new farmers planning to enter this industry. Current farming activities and strategies are based on international research because available information and research on South African weather and ground conditions are limited. Publishing relevant research can improve and optimise farming activities in the pecan nut industry of South Africa.

1.13 Chapter layout

The chapters will provide a structure for this study and will be divided as follows:

Chapter 1: Introduction and problem statement

Chapter 1 will provide a background to the study. The problem statement and the core research question will be presented along with the context within which the problem should be viewed. The importance of insurance products will be depicted together with the demand for pecan nuts in the current market.

Chapter 2: Literature review

Chapter 2 will be a literature review on the following aspects:

- Overview of planting pecan nut trees to achieve optimal production.
- The current market for pecan nuts to establish opportunities for farmers.
- Farmers requirements regarding assistance in pecan nut farming.
- Insurance and financing products requirements for the insurer.
- Availability of financing and insurance products to pecan nut farmers.

Chapter 3: Research methodology

Chapter 3 will analyse the research to complete the study, during which the data collection process and with the interpretation of findings will be presented.

Chapter 4: Conclusion and recommendations

In the final chapter, the literature study together with the research methodology and findings will be concluded. The results will be analysed by the core research question and problems identified. This chapter will offer a solution to pecan nut farmers as well as insurers if plausible.

1.14 Ethical consideration

The specific principals relating to this study are low-risk for the following reasons:

- The topic is uncontroversial.
- The study population consists of adults over the age of 18 years.
- All findings, interviews and questionnaires will be kept confidential.
- The interviews are open-ended and based upon a non-sensitive topic.
- The population utilised in this study will be experts in their field.
- The questions were designed to minimise personal information.

The researcher has received the approval from their employer to use their systems and database with the understanding that activities would remain in line with the POPI act (see Appendix B).

1.15 Summary

Chapter one has provided an overview and background of the problem statement that was derived from a literature study; various objectives were identified to create the foundation of the study. The research questions were analysed with use of various research methodological techniques and tools that resulted in an empirical study that comprised a population, sample, collection methods, and analysis tools. Limitations were identified, and the study conducted in accordance with the limitations and framework set out in this chapter. The next chapter will discuss the process of pecan nut production in the form of a Literature review to establish relevant South African pecan nut farming requirements and practices.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to establish the required key elements that should be adhered to, to ensure optimal production of pecan nuts. Understanding these requirements within South Africa specifically can facilitate insurers and finance houses in offering these farmers sustainable insurance and finance products that will benefit both parties involved. The insurer and finance house will only be able to determine all relevant risks once adequate and reliable information is available and products can be structured according to specific requirements to protect them. Currently, South African farmers are following Texan guidelines due to the limited available information, which is concerning because climate and conditions vary from one geographical location to another (Meier, 2013).

2.2 Cultivation process

Pecan nuts development can be divided into two main phases, namely blossoming and kernel development (De Villiers & Joubert, 2009:3-5). The first phase begins when the trees start to produce blossoms and endures until February once the nuts have formed and expanded to the maximum size, after which the shell will start to harden. Within the first phase, the content of the nut is still in a fluid form, also known as endosperm. After that, phase two continues from February until May where kernel development takes place together with the ripening of the nut. The kernel development process is a crucial factor in the cultivation of pecan nuts since the quality and size will be determined at this very early stage. Various factors can influence this process, but drought and illness are the main elements. If there is drought during the first phase, smaller nuts will form than the norm, and if this shortage occurs in the second phase poor kernel development will occur, resulting in a lower quality product (De Villiers & Joubert, 2009:3-5)

The average amount of nuts per kilogram has been documented to determine the kernel percentage of various cultivars these figures can be used to benchmark actual results to establish poor or good kernel development.

2.3 Types of cultivars

2.3.1 Cultivar characteristics

According to De Villiers & Joubert (2009:10), various types of cultivars are available and can be distinguished by the nut size and weight. The market for exporting pecan nuts varies, and the target market will influence the decision to establish certain cultivars.

The classification of the size falls into four main categories, namely: extra-large, large, medium, and small. The determining factor to classify nuts is the number of nuts per kilogram. Extra-large nuts will accumulate to less than 100 nuts per kilogram, large nuts average between 101 and 120 nuts per kilogram, medium nuts average between 121 and 165 nuts per kilogram, and small nuts average between 166 and 200 per kilogram. The shape of the nut can also influence the probability of exports due to the easiness of cracking the shell; round nuts would rather be exported as shelled nuts than in the unshelled form (De Villiers & Joubert, 2009:10).





As previously mentioned kernel development is a critical aspect of the quality of the nut, the primary value of the nut is the kernel. The average percentage kernel about total weight varies from one cultivar to another and can be classified as a determining factor when choosing a cultivar, since a nut with a kernel percentage of more than 50% is preferred. There is a benchmark available to evaluate the quality of the kernel development ranging from very poor to excellent. The kernel percentage in relation to the total weight of the nut will be classified accordingly: very poor (less than 42%), poor (between 43% and 47%), acceptable (between 48% and 51%), high (between 52% and 59%), and excellent (minimum 60%). Other factors should be evaluated after the quality of the kernel development has been determined, such as texture, taste, and appearance; these aspects also vary per cultivar. The shell must be hard, the kernel must have a cream colour and without spots, and the two grooves should be straight with a soft septum between the two halves in the middle (De Villiers & Joubert, 2009:11).





2.3.2 Cultivar types






Pecan nut tree varieties have been developed by selecting the specific seedling trees for customer requirements and demands. Trees are budded to achieve the specific pecan nut tree required to prevent diseases in areas with high humidity and weak air circulation. Young buds are grafted onto existing strong trees to enhance growth and to form the perfect pecan nut tree with a strong root system and a high-quality pecan nut yield (De Villiers & Joubert, 2009:11).

Descriptions of pecan cultivars per size, shell thickness, and kernel percentage quality:

Table 1: Description of pecan cultivar

Stuart	<p>The high quality large nut</p> <p>Thick shell</p> <p>Moderate bearer</p>	
Desirable	<p>Large nut</p> <p>Semi-thin shell</p> <p>Regular bearer</p> <p>Pollinator</p>	
Mahan	<p>High volume bearer</p> <p>Extra-large nuts</p> <p>Thin shell</p> <p>Poor kernel filling</p>	
Western	<p>Medium size nut</p> <p>Thin shell</p> <p>Good kernel quality</p> <p>High volume bearer</p>	

Wichita	<p>Medium size nut</p> <p>High kernel quality</p> <p>Good appearance</p> <p>High volume bearer</p>	
Mohawk	<p>Long shape nut</p> <p>Good appearance</p> <p>Thin shell</p> <p>High-quality kernel</p>	
Burkett	<p>Large round nut</p> <p>Semi-thin shell</p> <p>Difficult to separate kernel from the shell</p>	
Elliot	<p>Small round nut</p> <p>Medium thick shell</p> <p>Regular bearer</p> <p>Good flavour</p>	

Curtis	<p>Small nut</p> <p>Thin shell</p> <p>High-quality kernel</p>	
Pawnee Orchard	<p>Good size</p> <p>Excellent kernel quality and percentage</p> <p>Good appearance</p>	
Cape Fear	<p>Large nut</p> <p>High quality</p> <p>Shell breaks easily</p>	
Ukulinga	<p>Large nut</p> <p>Medium thick shell</p> <p>Average kernel percentage</p>	
Choctaw	<p>Large nut</p> <p>High-quality kernel percentage</p>	

(Pecans South Africa Pecan Nut Cultivars, 2018.)

2.4 Cycle

When starting a pecan nut farm, specific steps should be followed to predict a perfect crop after careful planning and performing the tasks over a one-year cycle. There is a high initial capital investment before reaping the results after a seven-year cycle. The following tasks as per schedule are critical elements for promoting capital investment returns (De Villiers & Joubert, 2009:54-55).

Table 2: Pecan nut cycle

Task	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Ground preparation	●								●	●	●	●
Planting	●	●										
<i>Fertilisation</i>												
Nitrogen		●		●								
Phosphate		●										
Potassium				●								
Zinc			●	●	●	●	●					
Irrigation		●	●	●	●	●	●	●	●	●		
Weeding			●	●	●	●	●	●	●	●		
Hedging	●	●			●	●						
Harvesting	●								●	●	●	●
Plague management	●	●	●	●	●	●	●	●	●	●	●	●

Soil must be thoroughly prepared beforehand so that the ground conditions will be suitable for pecan nut farming (refer to division 2.3.5). The pecan nut tree is a deciduous tree by nature and

is best planted in winter months. Newly planted nursery trees must be watered immediately to promote root anchorage and the new trees must be thoroughly inspected and cared for in the first growing season to ensure sustainable growth. (De Villiers & Joubert, 2009:54-55). Additional additives should not be administered to newly planted trees; preferably they should grow naturally to establish a strong root system and fertiliser should only be added in the successive cycle as depicted on the table. Fertiliser should be integrated with the irrigation schedule to ensure correct coverage. The inconsistent rainfall in South Africa has left it with a need for irrigation to stimulate the growth of the pecan nut trees, especially during critical stages such as budding, blossoming, and kernel development. (De Villiers & Joubert, 2009:54-55).

Since the root system of the pecan nut tree is extensive, at least one meter of soil in depth should be moist for optimal growth stimulation. Various products and services are available to farmers to ensure accurate and timely application and to meet the production and operational requirements. Weeds use as much water as the trees and are detrimental to the growth of the trees. (De Villiers & Joubert, 2009:54-55). The weeds should be controlled on a regular basis by using weed killer chemicals or mechanically destroying them. Registered environmentally acceptable chemicals should be used with proper instructions, keeping in mind the advantages and disadvantages of the chemicals. Registered chemicals include Focus Ultra (for grass one year or older and should be applied in the ratio 0.8 to 4 litres per hectare), and Touchdown Plus (for one or more year old grass and should be applied in the ratio 0.5 to 9 litres per hectare). (De Villiers & Joubert, 2009:54-55).

Pecan nut trees must be pruned for the first three to four seasons to establish the shape and strengthen the branches; this will give the tree a better chance of withstanding excessive storms and high winds. There are three types of pruning, namely: shaping, rejuvenating and reducing density (refer to section 2.3.8). The pecan nuts cannot be harvested until the nuts ripen; the green husk dries out and cracks open, which allows the nut to drop. Nuts that did not drop from the tree must be harvested by shaking the tree and after that collecting the nuts from the ground during March until July. (De Villiers & Joubert, 2009:54-55). In South Africa, the major sickness on the pecan nut tree is a scab, which forms on the underside of the leaf. It appears as black spots which eventually dry out the leaf. It also attacks the green husk and could lead to damaged nuts. (De Villiers & Joubert, 2009:54-55).

2.4.1 Water

Rainfall in South Africa is not always sufficient to adhere to the requirements of pecan nut trees for optimal production. Therefore additional irrigation will be required especially during the first and second phase of development to ensure optimal production at the end of the cycle (Pecans South Africa, 2018).

2.4.2 Water Requirements

Water requirements will vary according to the age of the trees and the time of the year. During warmer months, the trees will need more water and systems should be developed to enable the farmer to provide the correct amount of water while considering the amount of rainfall received. The average monthly water requirements (in millimetres) by the trees' trunk diameter (d) in centimetres and amount of trees (N) is depicted in Table 3 below.

Table 3: Water requirements

Month	dN 1 000	= dN 1 500	= dN 2 000	= dN 2 500	= dN 3 000	= dN 3 500	= dN 4 000
Aug	23	0	0	0	0	0	0
Sep	27	32	0	0	0	0	0
Oct	33	40	47	54	61	62	63
Nov	40	54	68	82	95	102	107
Dec	54	83	111	141	162	183	203
Jan	60	100	140	178	215	233	250
Feb	68	109	150	194	226	243	261
Mar	59	91	123	154	186	201	215
Apr	20	31	42	54	66	84	101

Adapted from: (De Villiers & Joubert, 2009:45-48)

The water requirement for 100 trees with an average trunk diameter of 30 cm in February within a 33 m² watering area can be calculated as follows:

$$dN = 30 \times 100$$

$$dN = 3\,000$$

$$0.226 \text{ m} \times 33 \text{ m}^2 = 7.458 \text{ m}^3 \text{ per month}$$

$$100 \times 7.458 \div 28 = 26.63 \text{ m}^3 \text{ per day}$$

Each tree would, therefore, need approximately 266 litres of water per day during February. The figures in the table should be used as a guideline and can vary due to soil conditions, humidity, and climate variations. This table can be used to ensure that enough water is available and to plan for future water uncertainties.

2.5 Products and services available

Irrigation products should be designed with the capability to provide the trees with the maximum litres of water required. These systems will not always run on the maximum capacity but can be adjusted according to demand and requirements. Since the roots are as big as the canopy, water should be distributed in a bigger area to promote growth and the overall health of the tree. (De Villiers & Joubert, 2009: 45-48) Suggested areas per tree age are set out in the table:

Table 4: Recommended planting distance

Age (years)	Area (meters) ²
1-2	3
3-5	7
6-10	16
11-15	33
15+	50

Adapted from: (De Villiers & Joubert, 2009: 45-48)

2.5.1 Probes

Monitoring devices known as probes are used to monitor the moisture in the soil. The probes gather data from which information is generated and made available on the electronic data logger to adjust the water usage of the irrigation system. Rainfall affects the use, and drier or wetter sections will be encountered. Therefore a series of probes must be planted in strategic places to obtain the happy medium and to be as close as possible to the mean. The probes can be planted at different depths or in different areas (Nolz & Loiskandl, 2017:152-160).

2.5.2 Drip irrigation

Drip irrigation is a cost saving system of wetting, during which the roots are directly watered, and the water wastage as a result of wind causing evaporation is kept to a minimum due to wind causing evaporation and fertilisation is easily administered. This system will improve the probability of optimal production by increasing crop yield in an effortless manner. Advantages of the system include low labour requirements, it is easily automated, and operations are simplified. However, disadvantages should be considered which includes high initial capital costs and requiring clean water for the system to operate efficiently (Nolz & Loiskandl, 2017:152-160).

2.5.3 Micro-sprinkler irrigation

Micro-sprinkler irrigation is very much the same as drip irrigation and operate at low pressure. The micro-sprinkler system covers a radius under the canopy of the tree using only one nozzle per tree which will lead to longer watering times. The micro-sprinkler system is used where drip irrigation is not possible. Again, there are certain advantages such as low labour requirements, being easily automated, and larger area coverage. However, certain disadvantages should be considered such as high initial capital costs will occur and due to the wind, higher evaporation could occur.

Each product has its benefits and shortfalls, but by using the irrigation products with probes, the farmer will be able to keep a record of irrigation and averages. This is an important key factor for insurers and finance houses since risk can be mitigated by setting certain requirements (Irritech, 2018).

2.6 Soil conditions

The pecan nut tree develops a strong taproot that grows deep into the ground, extending to a distance of three to four times the diameter of the crown (top). Therefore optimal soil conditions would be classified as deep, fertile, and well-drained soil. Pecan nut trees are native to soil conditions where the soil is rich and dense but well-drained to accommodate the taproot

development and should preferably be planted at a depth of 3 cm to 6cm or just above the non-fluctuation water table of the ground (De Villiers & Joubert, 2009:7).

The most suitable soil types can be classified as Oak Leave, Hutton, Clovelly, Griffin, and Inanda due to the sandy type and limited clay content (less than 10% to 35%). (De Villiers & Joubert, 2009:8). Medium standard soil includes Glenrosa, Longlands, Avalon, and Bainsvlei due to the limiting draining layer that occurs in these soil types. These challenges can be overcome with irrigation. Types of soil not suitable for pecan nut trees include Bonheim, Arcadia, Swartland, and Escourt due to limiting layers regularly occurring together with a high percentage of clay content. It is not always possible to overcome natural limitations and farmers should evaluate the soil profile before attempting to establish a plantation (De Villiers & Joubert, 2009:8).

2.7 Weather conditions

Subtropical conditions are ideal for this type of farming since pecan nut trees require short cold winters combined with long warm summer temperatures. During the first phase from June to August the tree will pollinate, then blossoms will form, low temperatures will optimise this process and even frost will be beneficial in this early stage. To promote kernel development in phase two, high temperatures will be required from October to April for optimal quality nuts (De Villiers & Joubert, 2009:5-6).

The average temperature during summer months must exceed 28°C and reach a minimum of 23°C, while an average temperature must exceed 16°C with a minimum of 8°C during winter months. (De Villiers & Joubert, 2009:5-6). These average temperatures were derived from research gathered from Texas, Mexico, and the USA to determine the standard temperature requirements. From 15 September to 15 May, no frost may occur to ensure optimal kernel development. During the greater part of the cycle, pecan nut production areas with a humidity of less than 55% are preferred. These factors can be seen as the minimum requirements to ensure sustainable farming with optimal results in this industry, and farmers should consider these factors before establishing a plantation. Insurers and finance houses can use this information to determine which areas will have more risk compared with other geographical locations, especially when considering optimal production (De Villiers & Joubert, 2009:5-6).

2.8 Planting distances

There is no set standard for the ideal distance when planting pecan nut trees, but there are various standards available and will depend on the farmer. Density will have a certain advantage in the short term due to the increased amount of trees planted per hectare. However, these trees will require more hedging and additives to counter plagues and illness.

The likeliness of trees having to be removed at a later stage is another factor to consider. The rainfall average in the geographical area will have an impact on the original plantation plan. Areas with a higher average rainfall will result in trees growing faster and will require trees to be planted further from each other to decrease maintenance requirements. In Mexico the standard is 10m by 10m with an average rainfall of 275 mm per year, in Texas trees are planted according to an 11m by 11 m standard with an average rainfall of 700 mm per year, and Georgia uses a 12 m by 12 m standard with an average rainfall of 2 000 mm per year. Due to the strong and expansive root system of a pecan nut tree, it is preferred that pecan nut trees are planted at 10m by the 10m radius to ensure enough space for development. Poor nut conditions and overall health can be a result of planting pecan nuts trees nearby (De Villiers & Joubert, 2009:29-30).

2.8.1 Hedging

Three things all trees need are water, food, and sunlight. Water can be provided through irrigation, food can be produced by fertilisation, and the extraction of natural resources using hedging to manage the sunlight. Trees start to compete against each other for the available sunlight once the canopies are tall and start overlapping. There are two main options available to address this problem: 1) remove trees, but then there will be fewer trees per hectare, or 2) hedge the existing trees into a smaller more compact tree, this process will affect the next harvest, but will yield better results in the following season.

Hedged trees outperformed other non-hedged trees thanks to the improvement in strength of the hedged trees and these trees regrow and rejuvenate in the long term. The direction of hedging can vary from the side, the top or all sides of the tree can be hedged. Rows of trees should be pruned each year alternatively to protect the harvest yield if the farmer cannot afford to wait another season. The hedging process allows the sunlight to reach all the trees, and all the way to the bottom resulting in increased production of the entire plantation. Keep in mind that larger trees are not economical because large trees need more water, fertiliser, and additives to keep the trees healthy (Botha, 2018).

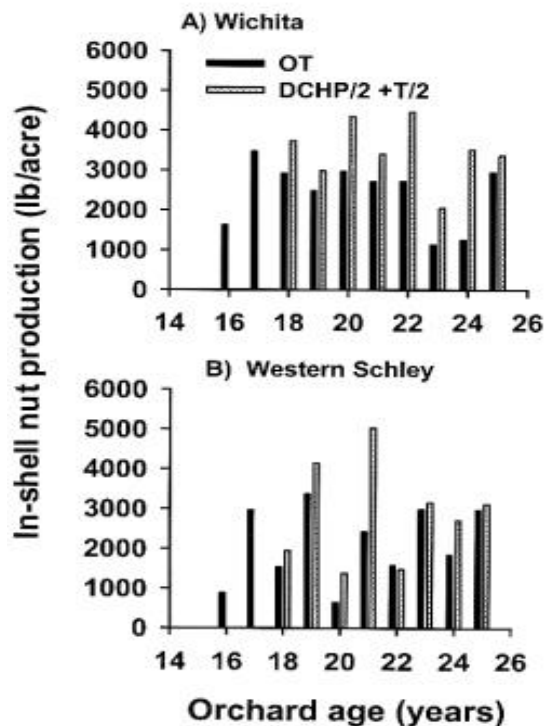


Figure 5: Comparison between hedged Wichita and Western Schley

Adapted from: (Wood & Stahmann, 2014)

In-shell pecan nut yields after tree removal (OT) compared with trees whose canopies had been hedged in an alternative cycle (DCHP/2) are the two hedging methods that were applied to the different cultivars, namely Wichita and the Western Schley, to ensure relevant findings on how and why yield and bearing volumes vary from one cultivar to another. The graph indicates that the DCHP/2 was on average higher than the OT method for both cultivars. There was a 144% improvement with the Wichita and in-shell production yield and a 113% improvement with the Western Schley in-shell production yield from the tree removal method to the canopy hedging method (Wood & Stahmann, 2014).

2.8.2 Mechanisation

Productivity can be improved through mechanisation in the three major areas of pecan nut production, harvesting, administering additives, and overall tree care management to promote high-quality yields. It is of utmost importance to improve the process to achieve optimal production as soon as possible to recover the cost from the initial investment (Spencer, 2016).

Mechanisation can be used in the harvesting process. The process can be divided into three steps, namely the shaking of trees, sweeping and blowing, and collection of the pecan nuts.

The machine used for shaking the trees produces a quick removal of pecan nuts off from the tree, with sweepers in the front and back of each wheel which will reduce possible damage to the pecan nuts on the ground. The second step in the process is to do a sweep and blow with tractor mounted machines that sweep into the middle of the rows and blow a radius around the trees. The third step is the collection of pecan nuts by using a harvester with a slow speed and a high-velocity fan with a three-step cleaning process. This entails the removal of stones, dirt, and sand through the conveyor chain, and grass and leaves through the suction process. This results in less wear and tear on working parts and leaves the farmer with the product. For tree care management, a hedging machine can be operated to improve the structure of the tree using a machine with 5-meter-long cutting blades with the ability to cut up to 6.5 meters in height (Spencer, 2016).

2.8.3 Processing

The process of processing the pecan nuts can be divided into receiving and sampling the nuts, and then concluded with payment terms. The harvested pecan nuts arrive at the processing plant, these nuts are weighed, and the accumulated total is attached to a grading document. A representative sample is selected after the total received is divided into crates and 10 kg per one tonne received is selected from the different crates to represent the producer's entire pecan nut yield. All foreign materials received in the selected sample will be deducted from the 10 kg total, the remaining sample will go through an aspirator to determine the kernel percentage of the pecan nuts during the grading process. The inadequate percentage determined through this process will be deducted from the entire total received. Grading will continue by determining the edible kernel percentage. From the remaining clean 10 kg sample, 500 g will be selected to determine the pecan nut size by using a grading screen; the weight will then be allotted according to the classified size of the pecan nut. From the 500 g sample, the nuts are cracked, and the kernel is checked for edibility. The weight of the edible kernels and the weight of the inedible kernels are documented. The moisture content is measured by breaking the edible pecan nut kernel into smaller pieces and documented at an average percentage. After all the information is gathered throughout the process, the farmer will be offered a certain amount per kilogram (PC Pecan SA, 2018).

After the acceptance of the offer, a full payment is made to the farmer within a certain period. The processing plant should market the product to the international market and only after the sale is finalised, can shipping be arranged to the third party. Due to the delivery time, the processing

plant could incur cash flow difficulties because they pay upfront for their product but generate international sales over a longer period due to distance and shipment delivery time (GPC Pecan SA, 2018)

2.9 Geographical location

There are three key factors to consider when determining the optimal location for planting pecan nut trees: climate requirements, soil conditions, and the availability of water. These pecan nut trees thrive in summer with high temperatures and short winters with very low temperatures. Deep sandy soil promotes root development and results in ideal growth, but only if large volumes of water is readily available (Coetzee, 2016).

Pecan nut trees were mainly planted in subtropical regions in two of South Africa's provinces, KwaZulu-Natal and Mpumalanga. Over the years the Northern Cape was identified as the best region for pecan nut trees to reach their optimal production needed to supply the demand due to the ideal climate, soil condition and the availability of water. The Northern Cape can be classified as an arid central based region and can provide the near perfect climate temperature required for growing pecan nut trees. As a result of the climate requirements, the Northern Cape is the largest pecan nut producer in South Africa (Coetzee, 2016).

Table 5: The ideal locations for planting pecan nut trees

Ideal ecological locations		
Prieska		
<u>Upington</u>		
Hopetown		
Semi ideal ecological locations		
Rustenburg		
Hartswater		
Roodeplaat		
Zebedelia		

Ladysmith
Average ecological locations
Nelspruit
Tzaneen
Witrivier
Louis Trichardt
Non-suitable ecological locations
Middelburg
Komatipoort
Port Shepstone

Adapted from: (De Villiers & Joubert, 2009: 2)

The focus of this study is in the Hartswater area, which is a semi-arid valley, and the Vaalharts irrigation scheme enables this unique environment to become an ideal tree rich oasis resulting in optimal production of pecan nut trees.

2.10 South African pecan nut exports

The South African pecan nut processors' export their pecan nut crop mainly to China. South Africa managed to surpass Mexico in 2017 to become the second largest exporter of pecan nuts to China, with a total of 13 330 tonnes consisting of 81% of the total production within South Africa. The USA supplied 35 000 tonnes in the 2017 season to China. Export volumes are expected to increase in the future to meet the growing demand of China, because South Africa can export at a lower production cost, thereby resulting in higher profits. The production cost of pecan nuts in South Africa is estimated to be 60% less than the production cost in the USA and 75% less than the cost in Mexico. The production cost within South Africa is not only lower, but South African pecan nuts are of a higher quality compared to the competitors. To ensure top quality at all times South Africa has strict rules and regulations; containers are inspected before the load is exported

for broken shells, possible chemical residue, quality and nut sizes, diseases and expected conditions of the shell . (Department of agriculture, forestry and fisheries, 2016.)

Another factor beneficial to South Africa is the small-scale farming, approximately 89% of the farmers produce less than 25 tonnes annually, providing an opportunity to ensure optimal production at the highest quality possible. The total production of pecan nuts is, therefore, an accumulation of smaller farms, resulting in the mitigation of risk for zero production due to unforeseen catastrophic events. The main competitive advantage for South Africa can be attributed to the seasonal period. Harvesting occurs from May to September, equivalent to the peak demand period of China, compared to the limited available pecan nuts from Mexico and the USA during the specific time (Produce China roots, global research, 2018).

For the 2018 season, South African pecan nut production resulted in a 12% crop increase when compared with 2017, this year can be classified as the first year that South Africa experienced a major off-season when comparing the 2017 crop increase of 32% with 2016. However, exports to China will continue to remain high at the expected volume. During this off-season, the quality of the South African pecan nuts resulted in 26% large nuts, 34% extra-large nuts, and 27% oversized nuts. This exceeded the quality and size grading of Mexico and other producers indicating that South African farmers can produce at a constant high quality (Produce China roots, global research, 2018).

The prices of pecan nuts in Hong Kong were 22% less than the previous season at \$5.44/kg due to the trade war uncertainties between USA and China. Even with this price drop, production is expected to double within the next three years and triple within the next six years. This expectation is grounded on the evidence that only 36% of the planted hectares are currently in production since trees are maturing and yielding more nuts. It is inevitable that hectare production will increase between 50% and 60% by 2021. South Africa will be able to produce 110 000 tonnes by 2027 allowing enlargement of the current export market to China (Produce China Roots, global research, 2018).

The focus in the South African market is to export pecan nuts in-shell, with a small percentage of nuts exported in the kernel form whereas the local market consumes less than 10% of the total production. In-shell export is the highest market due to the low processing costs associated with the product preparation. China imports in-shell pecan nuts, while other markets prefer the kernel form. If South Africa wants to enlarge their footprint, requirements and expectations should be evaluated to determine the target markets' need. Asia and India have shown interest in the pecan nut industry, and this provides an opportunity for expansion to these markets (Botha, 2018).

2.11 Insurance products

2.11.1 Risk mitigation for insurers

Farmers want to pay a premium for the protection against any losses incurred either because of risky or unknown situations but the insurer cannot devise insurance to remove these risks and unknown conditions. The insurer has come up with a plan to mitigate risks by pooling some policyholders together to share the economic, financial burden of the unknown conditions, especially when many policyholders are affected by the catastrophic event. It is critical for the insurer that all policyholders are not affected by the risks within the same period, the reason being that other policyholders should be able to carry the effect of some policyholders during this period (Tiwari, Coble, Harri & Barnett, 2017).

Therefore, systematic risks are not covered by the insurer for sustainability, economic growth and profitability of the insurance company, the exception to the rule is that crop insurance is systematic due to collective risks and price inconsistency. Revenue insurance products will be designed in accordance with the highly spatially land, weather implications, and disease probabilities, for example, sub-tropical areas are prone to more diseases and the proximity of farms could lead to loss for various policy holders during hail, storms, and excessive windy conditions at the same time (Tiwari, Coble, Harri & Barnett, 2017).

2.12 Weather conditions in South Africa

For the greater region in South Africa that is suitable for pecan nut farming, significant rainfall and temperature patterns covering larger regions identified in South Africa are depicted in Figure 7.

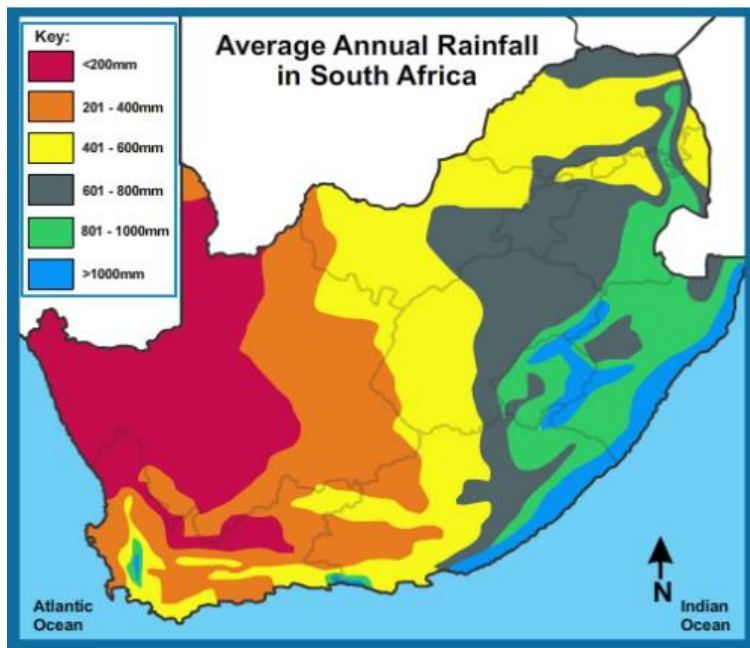


Figure 6: Average rainfall in South Africa

Adapted from: Van der Stoep & Prins, 2017

South African regions are not receiving enough rain to ensure optimal crop yield; therefore, irrigation schemes should be established in 65% of the deficient rainfall regions to simulate crop production. The rainfall in South Africa varies from 100mm to an excess of 1 000 mm annually. Inadequate rainfall necessitates irrigation, as confirmed by the South African Agricultural Baseline (BFAP, 2011). 1.6 million hectares have irrigation systems to account for the rainfall deficiency, but the available infrastructure and capacity will only be able to supply an additional 707 000 hectares of land (Van der Stoep & Prins, 2017)

Another option to curb this shortcoming is to increase the groundwater availability because Middleton and Bailey (2008) estimate that 60% of groundwater resources are unused, and the available 707 000 hectares could be increased by 270 000 hectares (Van der Stoep & Prins, 2017.).

Climates are importance to the farmers to enhance the product during the growth of the pecan nut trees for harvesting to result in optimal yield. Therefore, the farmer must understand the relationships between the climate and the land and how it affects the growth. Climate methodology and knowledge are essential to the farmer and the insurer, especially when evaluating risk and the chances of thunderstorms within a specific area. Thunderstorms can be classified as meco-scale systems and can vary in size from a few kilometres to 200 kilometres within a period that can vary from a few hours to several hours with catastrophic effects, such as heavy downpours that result in flooding, hail-storms and excessive wind. Hail is often known to

be present during thunderstorms, especially during weather changing facades. Due to the large area, the thunderstorms can cover, the insurer must opt for more clients in different regions to diversify and mitigate risks. (Bal *et al.*, 2014.)

Insurers have moved away from just providing products and handling claims – since information is readily available, products can be evaluated to ensure the insurer and client of sufficient risk coverage. With new innovative technology, clients can be alerted of dangerous weather conditions beforehand to act proactively. Historical weather information can be monitored with the assistance of IBM for weather risk assessment and management to improve organisational performance (Holmes, 2018).

2.13 Insurance products available

2.13.1 International insurance entails:

Trees that are insured have to produce at least 272kg of in-shell pecan nuts per 0.405 hectares at least once in a four-year cycle and some states lower minimum production is allowable through special provisions. Various risks covered include the following: weather conditions such as hail, wind, drought, and flooding, failure of irrigation systems, price volatility, fire in cases of controlled undergrowth, insects, pests and plant diseases if controllable measures are in place, uncontrolled wildlife in a fenced area (United States Department of Agriculture, 2015).

The duration of a minimum two-year cycle is insurable, after the land has been inspected and approval is granted, and the premium will remain constant over the two-year cycle. The revenue history for the last four to six years will determine the average revenue covered and based on the approved revenue; policy holders can choose coverage of between 50% and 75% or 27,5% of the approved income for catastrophic events. Record keeping is a pre-requisite before and during the insured policy life (United States Department of Agriculture, 2015).

Varies cultivars may be excluded due to unproductive results and insufficient pollinator qualities, farmers that are not contracted and supply to direct markets will not be insurable. Hedged pecan nut trees are only covered under special provisions. The market price as determined by the buyers will be used to calculate the losses (United States Department of Agriculture, 2015).

2.14 Financing

2.14.1 Financing requirements for the farmer

Agricultural finance can be classified as a more risky investment than other sectors since optimal production relies on rain, climate conditions, and uncontrollable forces that can affect the crop

yield. As a result of these uncontrollable uncertainties, finance houses tend to deviate from long term lending and would rather provide funding on a short term cycle to mitigate risk in unforeseen circumstances. However, the agricultural industry is dominated by long term financing requirements with seasonal payments to ensure sustainable operations and financial health. The miss-match between these parties results in insufficient development and production opportunities (Manuel, 2017).

Table 6: Financial requirements per year

Time Period	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Total	Trend
Total production (kg/hectar)	-	-	-	-	100	400	1,000	1,500	2,000	2,500	2,500	2,500	12,500	
Price R / kg	65	65	65	65	65	65	65	65	65	65	65	65	780	
Average income per year	-	-	-	-	6,500	26,000	65,000	97,500	130,000	162,500	162,500	162,500	812,500	
Establishment	22,000	2,200	1,100	-	-	-	-	-	-	-	-	-	25,300	
Irrigation system	32,000	-	-	-	5,175	-	-	-	-	-	-	-	37,175	
Maintenance	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	16,200	
Weed control	576	576	576	576	576	576	576	576	576	576	576	576	6,912	
Labour	-	-	-	-	150	600	1,500	2,250	3,000	3,750	3,750	3,750	18,750	
Hedging	731	732	732	-	-	-	1,500	1,500	1,500	2,500	2,500	2,500	14,196	
Bemesting	555	1,216	2,408	2,857	3,306	3,755	4,203	4,652	5,101	5,550	5,550	5,550	44,703	
Fuel	2,415	84	84	84	275	275	275	275	275	275	275	275	4,868	
Maintenance of equipment	6,437	136	136	136	488	488	488	488	488	488	488	488	10,752	
Electricity	1,644	1,644	1,644	1,644	1,971	1,971	1,971	2,272	4,110	4,110	4,110	4,110	31,204	
Water	910	910	910	910	351	1,404	3,510	5,265	2,275	2,275	2,275	2,275	23,268	
Insurance @ 5.4%	-	-	-	-	351	1,404	3,510	5,265	7,020	8,775	8,775	8,775	43,875	
Total Direct costs	68,618	8,848	8,940	7,557	13,994	11,823	18,884	23,893	25,696	29,650	29,650	29,650	277,202	
Total Profit / Loss	(68,618)	(8,848)	(8,940)	(7,557)	(7,494)	14,177	46,116	73,607	104,304	132,850	132,850	132,850	535,298	

Adapted from: GWK Koste Gids, May 2018

The financial implications for the farmer should be evaluated by the period required to reach optimal production. The table compiled by GWK indicates the financial estimates per hectare per year. The farmer can earn an income for five years after establishing the pecan nut trees, after which rapid increases in income can be expected during the following four years until a relatively constant income can be expected. High initial cost per hectare, combined with no pecan nut yields, will result in a loss of income for the first five years, but from year six the farmer can expect to make a profit enabling partial recuperation of the initial capital investment. Finance products offered to pecan nut farmers must be designed with a delay of expected income in mind.

2.15 Chapter summary

All production activities should be based upon these requirements as discussed in this chapter, especially during the first and second phase of the development to achieve optimal results and a quality product that can be exported to other countries. An opportunity exists for South Africans to enter and grow this market with an established competitive advantage from our timeframe in which the demand can be satisfied.

CHAPTER 3 EMPIRICAL STUDY

3.1 Introduction

The data analysis of the interviews was conducted by Osmoz Consulting using the NVivo 11 program to determine the need for financial products by pecan nut producers. Four main objectives were identified:

- What are the challenges experienced by the pecan nut farmers in South Africa?
- What are the recommendations for a productive pecan nut production?
- Why do pecan nut farmers require insurance or financing products?
- What are the specific organisations that help farmers finance their products and to insure their plantations?

This chapter determines the significance of the gathered data in relation to the research questions, primary and secondary objectives, literature review, and the conceptual models used as the basis of the analysis.

3.2 Profile of participants

Seven interviews were conducted with seven farmers specialising in pecan nut farming based in the Hartswater region in South Africa. Of the seven interviewed participants, 42.8% have an excess of twenty years' experience in the pecan nut industry. One of the participants specialises in the processing of the pecan nut cycle who has twelve years' experience.

The participants equally participated in the research study contributing information outlined in **Error! Reference source not found..** The column with the heading "Number codes" indicates the coded number from the interview conducted with each participant. The column with the heading "Number of reference" accumulates the number of quotes derived from each participant.

Table 7: Codes and quotations per participant

Name	Number codes	Number of reference
Participant 1	21	54
Participant 2	6	14

Name	Number codes	Number of reference
Participant 3	15	37
Participant 4	4	4
Participant5	9	16
Participant 6	3	6
Participant 7	12	23

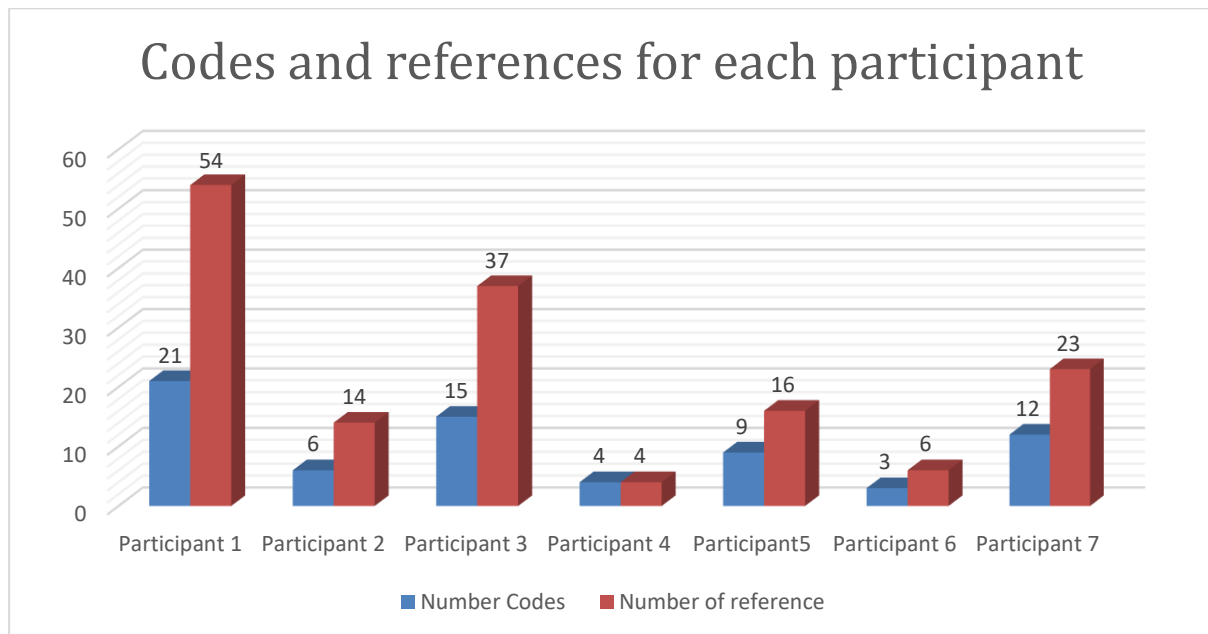


Figure 7: Codes and references per participant

As seen in the graph in Figure 8, the information derived as stated by Participant 1, 21 codes and 54 quotes were gathered from the interview. It is therefore clear, Participant 1 portrayed more insight than the other participants and can be ascribed to extensive knowledge gained over twelve years in the pecan nut industry. Information retrieved for Participants 3, 5 and 7, respectively illustrated more insight into the research study, and their quotes ranged between 16 and 37. With four quotes retrieved, Participant 4 had the least impact in the research study, followed by Participant 6 with six quotes. These low quotes retrieved can be attributed to the fact that these participants did not answer all the questions.

3.3 Process of data analysis

Themes were identified through the data analysis process from the interviews conducted and will be described accordingly.

This research study followed an interpretive model that employed a qualitative research design. The interviews were conducted with pecan nut farmers with extensive knowledge and experience in the pecan nut industry. The interviews were transcribed precisely to capture the full meaning of what the participants had to say. After transliterating the information, the interviews were reviewed, and a useable data format was obtained to ease the data analysis process.

A thematic analysis methodology of data analysis was used to analyse the data retrieved from the seven interviews following Braun and Clarke's (2006) thematic analysis model. The thematic analysis is a complicated set of procedures with the intended goal of identifying and examining themes identified from usable data in a transparent manner (MacQueen & Namey, 2011:15). The thematic analysis procedure was followed, interviews were transcribed, data was sorted and prepared, coded and categorised, themes were identified, refined and finalised. The thematic analysis was used to make sense of the data and provide relevant themes that address the research questions and objectives of the research study. The next followed Braun & Clarke's (2006) process of thematic analysis. The process is described below.

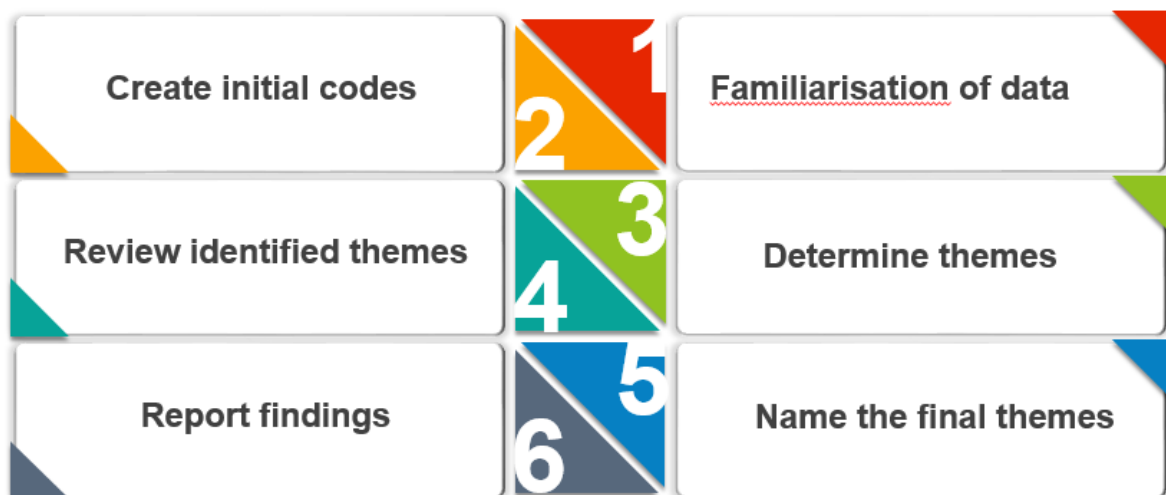


Figure 8: Thematical analysis process

Adapted from: Thematic analysis (Braun & Clarke, 2006)

The preparation of the data collected for coding was completed after the research of the topic had been investigated. Relevant paragraphs were highlighted, as suggested by Creswell, (2013:205).

Using NVivo 11, the interview transcripts were studied with lexical queries such as word frequency and text search queries to enhance the coding.

The coding process followed Saldana's (2009) coding manual. To ensure credibility, accuracy and transparency, the researcher involved two qualitative data analysis experts in the coding process because, according to Bazeley and Jackson (2013:93) these kinds of checks are sometimes seen as indicators of trustworthiness of the coding process, and they contribute to the validity of the conclusions drawn from the codes. Although elements of subjectivity can be evident in the coding process, coding is a tool used for reducing bias in qualitative data analysis through set elements that assist in the interpretation of data (Saldana, 2009:27; Guest *et al.*, 2011). For a more accurate data analysis with more depth, a computer-assisted qualitative data analysis software (CAQDAS) NVivo version 11 Pro was used.

Units of analysis consisted of open coding by using initial codes. Codes are tags or labels for assigning units of meaning to the descriptive or inferential information compiled during a study (Fereday & Muir-Cochrane, 2006). Following Saldana's (2009) cycle coding, various coding methods such as descriptive coding, NVivo coding and process coding were applied. These codes (30) were sorted into a codebook by per category, type, and relationship. The relevancy of these codes was determined after merging and removing irrelevant codes, resulting in 24 codes remaining for the analysis. After that six themes were titled and refined by the research questions and objectives of this research study.

Table 8: Themes identified

Main themes	Number of quotations
Availability of financial products for farmers	5
Farmers financial requirements	13
Challenges for pecan nut farmers	33
Pecan nut farming practices	23
Pecan nut production	29

Main themes	Number of quotations
Recommendations for pecan nut production	16

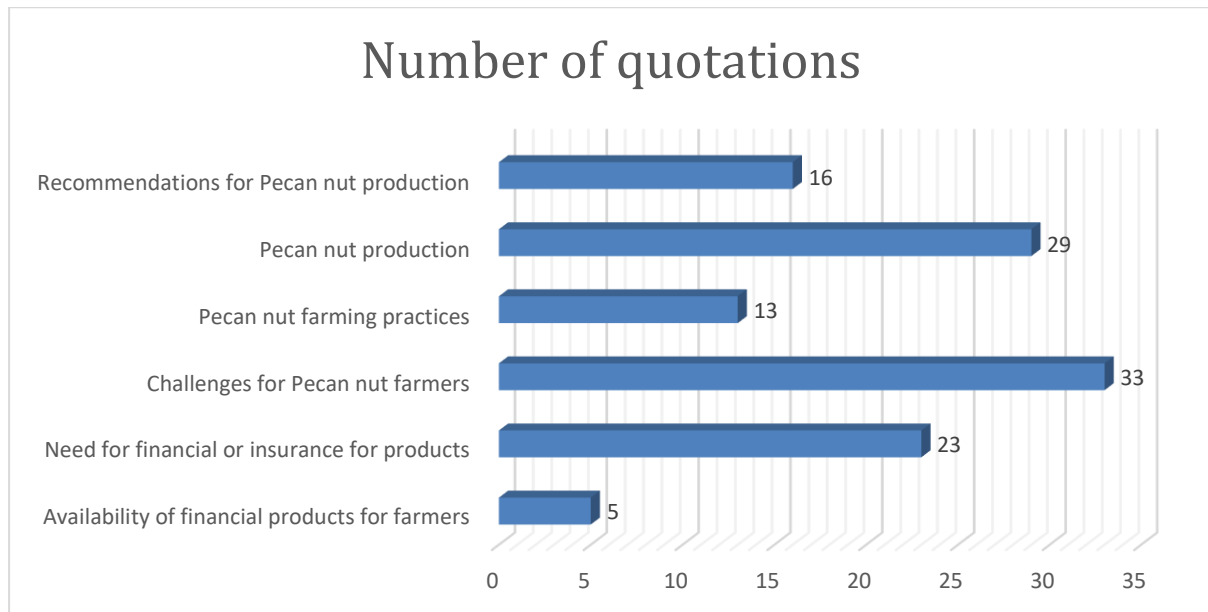


Figure 9: Total quotes per theme

3.4 Summary of the themes

3.4.1 What are the challenges experienced by the Pecan nut farmers?

The analysis of the themes identified various challenges that pecan nut farmers experience. These challenges had to be identified and evaluated to assist insurers and finance houses in creating and developing products to address this gap in the market. The identified key elements are depicted in Figure 10:

Challenges for pecan nut farmers

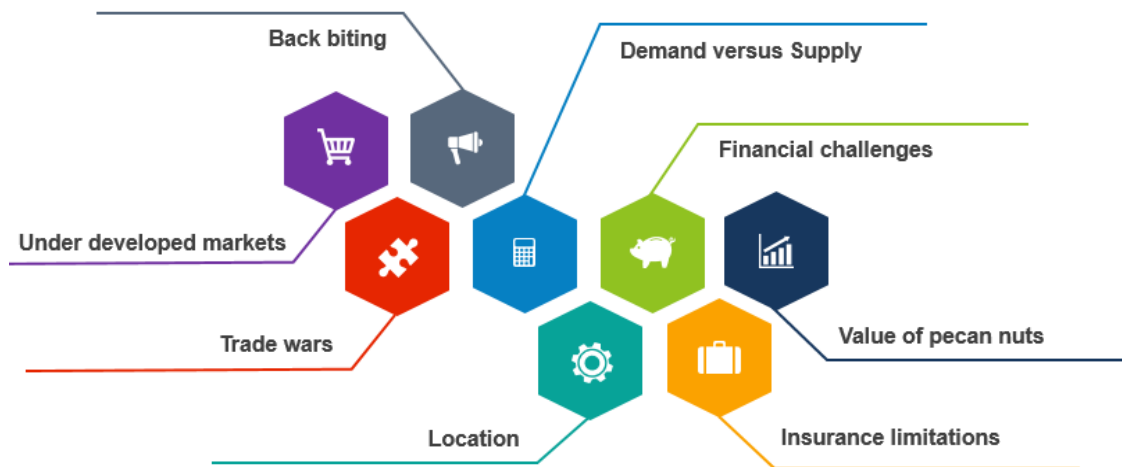


Figure 10: Challenges that pecan nut farmers face

3.5 Financial challenges

Agricultural produce is a source of income nationally and internationally, however access to finance is a major challenge for farmers in developing countries. This obstacle is preventing farmers from developing opportunities and technological innovation. This statement is seconded by the pecan nut experts who participated in the research study. From the data analysis participants argue that financial challenges are affecting the production of pecan nut farming in South Africa. Participant 1 stated that “a severe challenge to our industry, for both the farmer and the processor, is financing because four months turnover equals R200 million. Obtaining adequate financing to this scale can be prohibitively expensive if at all available”. To support the above argument, Participant 3 asserts that:

3.5.1 Value of pecan nuts

In addition, the Rand / Dollar exchange rate influences pricing. All pricing is based on US Dollar and when the Rand loses value it will decrease the fixed contractual price as determined by the hedging contract. Fixed pricing is contracted based on figures obtained at a specific point in time. This can prove to be either to one’s advantage or disadvantage as the case may be as the farmer will have to deliver at the priced fixed previously. It is mostly managed based on instinct and is becoming more and more popular amongst farmers especially when the exchange rates undergo significant changes.”

The participants were more concerned about the Rand / Dollar exchange rate as they argue that the exchange rate is causing major fluctuations in the price hence affecting the production of pecan nut farming. Participant 7 supported the above comment by saying: *“Pecan nuts are a product of which the price varies each year according to demand, and also, the farmer is paid in US Dollar, the product being linked to the US Dollar. Rand / Dollar exchange rate fluctuations largely affect the price. Last year, I price-hedged 25 tons of my harvested product at R14.87, but the next 25 tonnes were fixed at R12.10. The difference in the two transactions amounted to R400 000 purely due to the difference in exchange rate. The nut price also showed a downward trend during the last year.”*

3.5.2 Insurance limitations

Through the data analysis process, participants highlighted that the pecan nut industry is mostly affected by insurance limitations. Pecan nut farmers and experts in the industry comment that as far as insurance is concerned, most of them do not trust the insurance product as they have incurred some losses. *“Processing is not covered”* echoed participant 1. From the data analysis, participant 6 contends that: *“When considering insurance in the pecan nut industry the focus is on the nut production, not the tree itself. From my opinion and experience, it would be difficult to arrange cover on the tree itself.”* Participant 3 contends that: *“Insurance coverage centres on insuring the nut, not the tree itself. Companies such as Santam and Mutual & Federal have provided some cover, but it proved to be unfeasible. Present insurance, where applicable, mostly involves a high (20-30%) excess payment.”* From the information provided, insurances are not playing a part in helping the farmers as they can only insure the damaged nuts rather than the trees. The participant 3 goes on to comment that, in the Vaalharts where he is based, the likelihood of hail damage is very low, but their main challenge *“is a significant lack of data about risk insurance as applicable to the pecan nut industry.”*

3.5.3 Demand versus supply

Another challenge that the participants highlighted was the issue of demand versus supply. One participant argued: *“Also, the demand for South African pecan nuts is more than the available product supply.”* Financing assistance can enable pecan nut farmers to expand and develop to increase the supply of pecan nuts.

3.5.4 Trade wars

The issue of the trade wars was central in the analysis as the majority of the participants expressed their fear that their businesses will be affected to a larger extent. Participant 7 claims that *“Most of the South African production is exported to China. The recent so-called Trade War*

between America and China is somewhat disruptive at present, and it remains to be seen what the total effect would be. The trade levies and shipping taxes can be high, but it is safer to keep to legal ways of delivering the product to China”.

3.5.5 Underdeveloped markets

The issue of the trade wars was central in the analysis as the majority of the participants expressed their fear that their businesses will be affected to a larger extent. Participant 7 claims: *“Most of the South African production is exported to China. The recent so-called trade war between America and China is somewhat disruptive at present, and it remains to be seen what the total effect would be. The trade levies and shipping taxes can be high, but it is safer to keep to legal ways of delivering the product to China.”* The participants in the research study highlighted that the market footprint of pecan nut exports is underutilised and additional market segments could alleviate the effect of such a trade war. Participant 5 contends: *“Enormous opportunities are possible with many markets still largely underdeveloped and there are other markets and opportunities that are awaiting discovery and exploration.”*

From the information provided by the experts and farmers in the pecan nut industry, it is clear to note that the above-mentioned challenges pose as threats that affect the financial stability of pecan nut farmers in South Africa.

3.5.6 Location

Agricultural land available in South Africa is fairly minimal even though a large quantity of agricultural land is available due to various limitations like rainfall, soil quality, and climate conditions. Figure 11 depicts the South African land capability on a scale of 1 to 8, with 1 representing prime agricultural land, and 8 indicating land unsuitable for agrarian activities (Van der Stoep, & Prins, 2017).

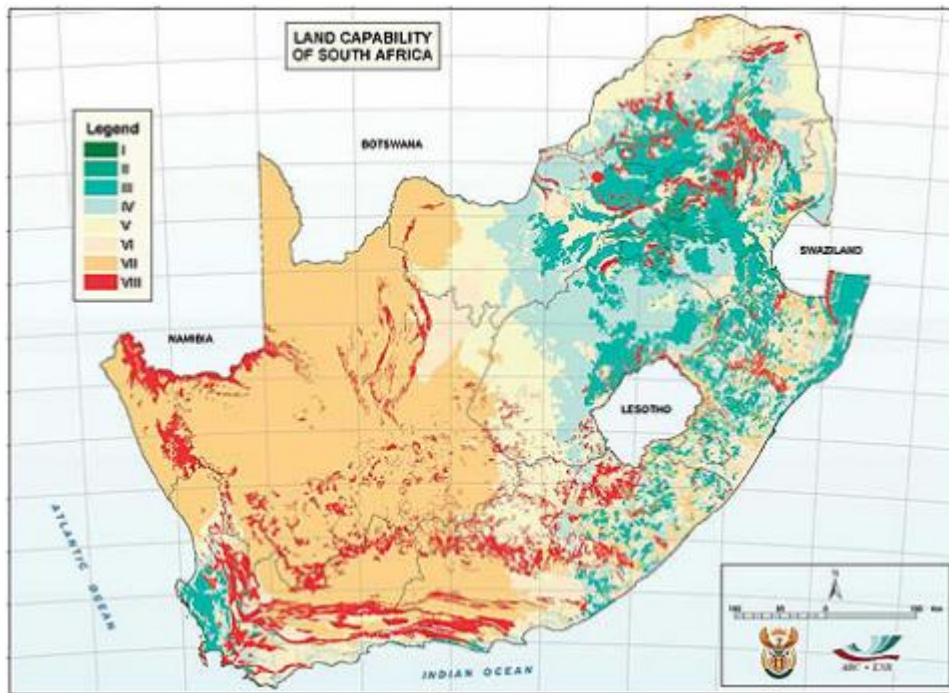


Figure 11: South African land capacity

Adapted from: (Van der Stoep, & Prins, 2017)

The water availability, as affected by rainfall and groundwater resources, is a constraint to the agricultural sector operating in South Africa. Approximately 15.3 million hectares of South African land can be used for agricultural activities; this estimation remained relatively stable since 1994 (Van der Stoep & Prins, 2017).

3.6 Why do pecan nut farmers require insurance or financing products?

It was essential to not only identify the need for insurance and finance products, but also the reason for the existing need. Various aspects were identified through the analysis process, and these elements are captured in Figure 12.

Need for financial and insurance products

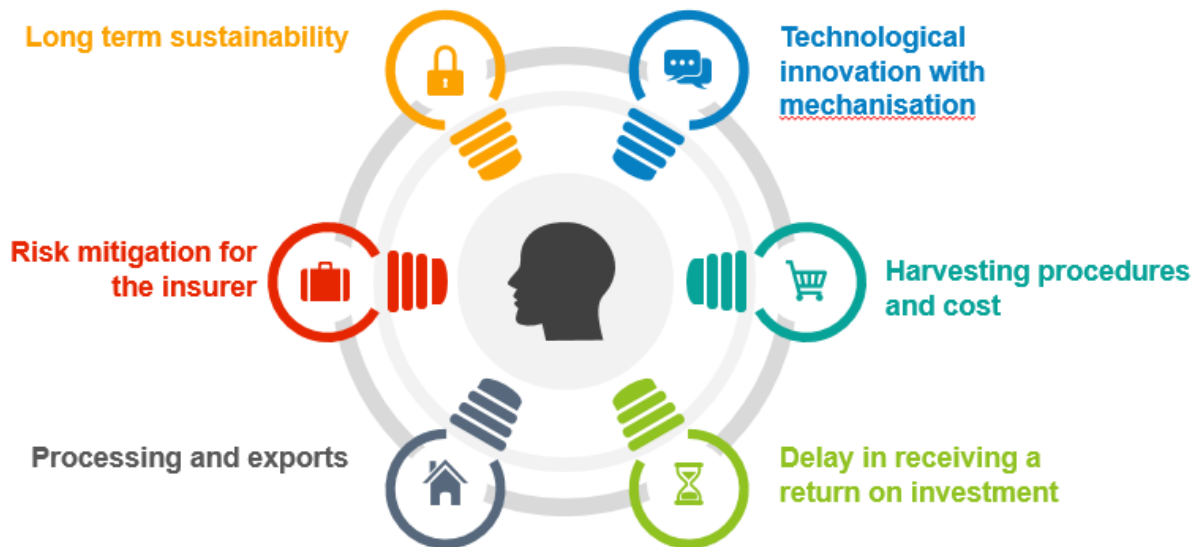


Figure 12: The need for financing and Insurance products

3.6.1 Delay in receiving a return on investment

It is imperative to note that one of the biggest challenges facing potential pecan nut farmers is the period before a return on investment can be achieved. It takes more than six years for a tree to start producing. Thus agriculture finance and insurance products empower the farmers to improve their wealth and production. Therefore, any work in agriculture finance must help provide clients with market-based security nets, and long term support to enable sustainable economic growth.

3.6.2 Technological innovation with mechanisation

From the data analysis process, participants emphasised that the need for financial or insurance products will enable development, expansion, and technological innovation. Participant 2 stated that, for a pecan nut farmer to start farming there is a need for good soil and approximately 25 hectares will be needed for profitable production.

On top of that, the farmer should be able to access enough money to prepare the soil and participant 2 also states: *“To establish the seedlings, an adequate water supply to support the enterprise and sound business practices to underpin the business. Some implements are required. The reality: it is not easy.”* Therefore, it is important to note that pecan nut farmers need financial assistance to kick start the farming process.

3.6.3 Harvesting procedures and cost

Improved mechanisation was regarded as another major reason why pecan nut farmers need financial and insurance products. From the information provided by the participants, productivity can be improved through mechanisation in the three major areas of pecan nut production, harvesting, administering additives, and overall tree care management to promote high-quality yields. It is of utmost importance to improve the process to achieve optimal production as soon as possible to recover the cost from the initial investment. Participant 7 highlighted that pecan nut farmers need financial assistance to be able to buy machines that will be used in the pecan nut process which is usually divided into three phases. Participant 7 contends: *“The machine used for shaking the trees produces a quick removal of pecan nuts from the tree, with sweepers in the front and back of each wheel which will reduce possible damage to the pecan nuts on the ground and these are very expensive, you need to get a loan, but you can be productive”*.

3.6.4 Risk mitigation for the insurer

The results from the analysis show that farmers need financing products so that they will be able to mitigate the risk associated with their insurer. The farmers need new innovative technology that can alert them of dangerous weather conditions so that they will be able to act proactively for them to be able to improve their performance in the pecan nut industry. Participant 4 contends: *“Assessments should be realistic and based on actual figures – farmers being insured should be able to present adequate record-keeping data and provide proof of sound farming practices. An assessor should make unexpected visits to farms to ensure that best practices are followed and that the insured assets (the trees) are being maintained as well as possible.”*

Promotion of sustainability in the pecan nut industry was also discussed by the participants as a significant reason for farmers needing finance or insurance for their products. Participant 3 argued: *“Agricultural finance can be classified as a riskier investment compared to other sectors since optimal production is reliant on rain, climate conditions, as they are uncontrollable forces that can affect the crop yield.”* Therefore, from the information provided, the financial and insurance products will be able to mitigate risks in unforeseen circumstances on a shorter-term basis even though the agricultural pecan nut industry is dominated by long term financing requirements.

Participants emphasised that the need for financial and insurance products *“help us to curb insufficient development and production opportunities,”* according to participant 1.

3.6.5 Long-term sustainability

Promotion of sustainability in the pecan nut industry was also discussed by the participants as a major reason for farmers needing financial or insurance for their products. Participant 3 argued that *“Agricultural finance can be classified as a riskier investment compared to other sectors since optimal production is reliant on rain, climate conditions, as they are uncontrollable forces that can affect the crop yield”*. Therefore, from the information provided, the financial and insurance products will be able to mitigate risks in unforeseen circumstances on a shorter-term basis even though the agricultural pecan nut industry is dominated by long term financing requirements.

Participants emphasised that the need for financial and insurance products *“help us to curb insufficient development and production opportunities”* according to Participant 1.

3.7 What are the specific organisations that help farmers to finance their plantations?

The remaining issue was identified, financing channels and the suppliers of these services were analysed with the information provided from the participants. Three types of financing houses were identified, depicted in Figure 11.

Availability of finance products for pecan nut farmers.

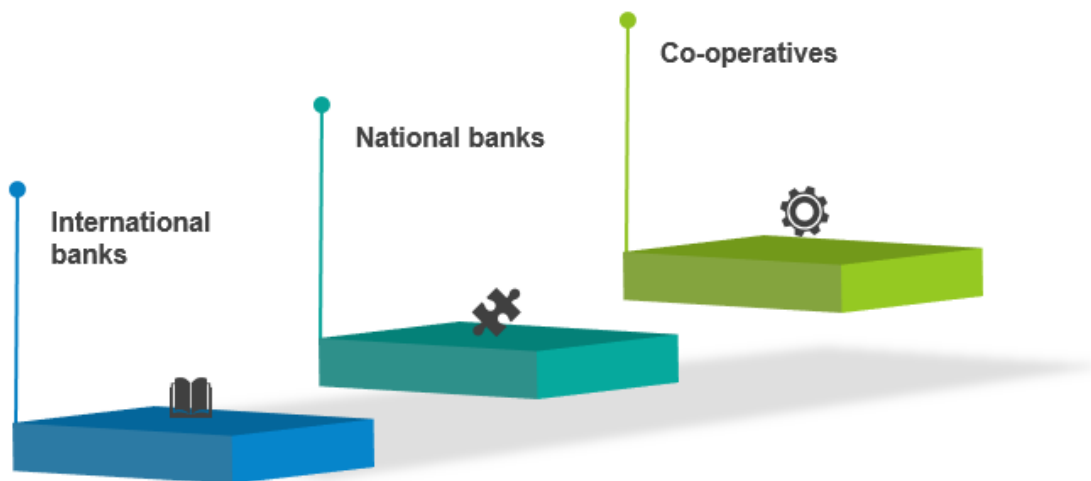


Figure 13: Availability of finance products for pecan nut farmers

From the data analysis process, the participants highlighted that the financing products for farmers are usually available at international banks, national banks, and co-operatives. Some of the experts and farmers in the pecan nut industry claimed that financing of the pecan nut products is available at banks, but sometimes it is difficult to obtain with insufficient information and

documentation. Participant 1 argues: *“Financing is available from banks. In my case, I am financed through Swiss banks, arranged by a Swiss buyer who takes up some of my product.”* Participant 3 echoes the above sentiment by claiming: *“Financing can be from banks but not easily obtained. Often, a 5-year plan with varying repayment options is implemented.”*

Though international banks are helping with financing products for pecan nut farmers, it is not easy to get the funding or loans. Participant 1 contends: *“Here are so many variables that may be brought into play. A farmer should be able to produce records for at least the previous five years of his farming enterprise, reflecting every single thing that contributes to making him a successful pecan nut farmer. Regrettably, there are always those who are dishonest who will try to obtain an unfair or unearned advantage. One may not be able to measure the income, but it is possible to measure production.”*

Some of the participants highlighted that co-operatives are there to help pecan nut farmers with financing their products, but the process is not easy and is normally accompanied by various requirements such as equity partnerships. The farmer will have to declare a percentage of his revenue as equity to the co-operatives. Participant 4 argued: *“Financing can be from the co-operatives but not easily obtained.”*

3.8 Chapter summary

Pecan nut farmers face many challenges concerning insurance and financing products available in the South African market to enable long-term sustainability. There is a need for insurance and finance products to produce pecan nuts specifically considering the lifetime of the pecan nut tree as highlighted by the experts in the field. In light of the changing weather conditions and doubt in the industry, farmers must have an option to mitigate their risks to protect their production and revenue. However, there are various crop insurance products available on the market that specialise in grain, fruit, vegetables, tobacco, fibre, crops, maize, soya beans, sunflower and sorghum production, but only limited products are available for farmers producing pecan nuts. The limited products available do not cater for the specific requirements for pecan nut production and the insurance guaranteed are at most covering the nuts and not the trees.

CHAPTER 4 CONCLUSION AND RECOMMENDATIONS

4.1 Introduction

This chapter seeks to strengthen and summarise the results of the study leading to various recommendations derived from the main findings gathered from the research. These main findings will be addressed to overcome the shortcomings identified. These issues will be combined in order to conclude.

4.2 Main findings from the study

Various findings were identified and classified, the major findings will be discussed to enable feasible recommendations to address the issues raised. Numerous agricultural industries have several tailor made products to suit the farmers' need, but suitable insurance and financing products are lacking for pecan nut farmers. The research and information available regarding the production cycle of pecan nuts specifically in South Africa is limited and out dated. From the interviews, it became evident that South African pecan nut farming activities are based upon international requirements and standards, a clear understanding of the climate and farming practices in South African are deficient. The export opportunities and markets are under exploited since marketing activities are focussed on existing current importing countries.

4.3 Recommendations

The empirical study enabled recommendations to be made based on the various findings. The crafted recommendations pivot the key research questions identified in this study. These recommendations are depicted in figure 14.

Recommendations



Figure 14: Recommendations for insurance and financing.

4.4 Suitable insurance and financing products

Finding ways to curb the challenges that farmers face regarding financing and insurance throughout the pecan nut cycle is central among the pecan nut farmers in South Africa. The data indicated that most participants claim that for the pecan nut industry to be productive, farmers should be insured for their loss. Participant 1 contends that, *“possibly, package deals could be designed according to say location, risk or whatever may come to mind. It might be better to insure loss of income to ensure that farmers survive”*.

To support the above information, Participant 5 argued that “assessments should be realistic and based on actual figures – farmers being insured should be able to present adequate record-keeping data and provide proof of sound farming practices. An assessor should make unexpected visits to farms to ensure that best practices are followed and that the insured assets (the trees) are being maintained as well as possible”. Insurance coverage should not only insure the nut but the tree as well. Companies such as AgriSeker, Santam and Mutual & Federal should provide feasible and affordable multi-risk products for catastrophic and minor uncertainties.

The pecan nut industry should be able to develop successful strategies enabling existing and upcoming farmers to benefit, as the industry is a high-value opportunity with high-profit margins.

Insurance and financing companies should collaborate in providing products for the farmers because this industry requires a high initial capital investment that is followed by a period of delay in return on investment. Participant 1 reinforced that “There is considerable growth potential for farmers, buyers and other participants” if the products are financed and insured. Pecan nut experts and farmers who participated in the research study argued that there is a potential for growth in the pecan nut industry. Some of the participants emphasised that markets need to be developed so that the farmers will be able to secure finance from the banks and other agriculture-related co-operatives.

4.5 Understand the pecan nut cycle

Only by understanding the entire pecan nut process as depicted in the literature review can essential requirements for optimal pecan nut production be identified. These requirements will enable the insurer and the finance house to design relevant products in line with their risk appetite. The handling of risk will be equally divided between the farmer and the insurer or financing house because the insurer and financing house can determine whether the requirements were adhered to in the event of claims for non-optimal production. Set policies and procedures can be used as a guideline for all parties involved. Products cannot be implemented and designed if the main focus is not based on industry knowledge and processes.

4.6 Expand growth potential of the industry

The pecan nut industry is a high-value industry, although existing export channels are focused on exporting to China. The processors must expand and infiltrate into other market segments such as the European markets and India. These unexploited market segments could provide South African pecan nut farmers with additional revenue streams and opportunities.

4.7 Market the health benefits of pecan nuts

Various health benefits can be derived from pecan nut consumption; pecan nuts contain a high level of vitamin E, enabling the unsaturated fat percentage to be self-protective, thereby reducing various risks like cancer and heart disease. A study was conducted at the Loma Linda University, of which the results indicated that pecan nut consumption decreases cholesterol levels. These health benefits identified should be communicated to the potential end users to stimulate the demand for pecan nuts (Pecans South Africa, 2018).

4.8 Involve farmers in the product development phase

Lastly, the importance of involving farmers in financing and insurance product development is a critical factor because they are the experts in knowing what their needs are in the industry.

The farmers are more concerned about lack of opportunities for all parties involved in the financing and insurance industry of the pecan nut production as gathered from the empirical study. The results, therefore, reinforce the need for balanced opportunities. As a recommendation, most farmers are calling for long term sustainability and assistance in pecan nut production and should, therefore, be included in the insurers' and finance houses' development processes.

4.9 Chapter summary

The aim of this research study was to establish the process of the pecan nut farming industry in South Africa by conducting a literature review on the process to identify key requirements of optimal pecan nut farming because the farmers are currently using International farming practises in this industry which is not necessarily consistent with South African conditions. An empirical study was conducted to address the limited South African information available; the experts provided insight into relevant South African conditions and challenges that they are facing. These challenges together with the research conducted on the process of optimal pecan nut production can be used to develop suitable insurance and financing products and to address the problems and the gap in the market.

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ANNEXURE A INTERVIEW QUESTIONS

Interview

MBA Dissertation research:

Assessing the need of financial and insurance products for pecan nut producers.

The interview will take approximately one hour. We don't anticipate that there are any risks associated with your participation, but you have the right to stop the interview or withdraw from the research at any time.

Thank you for agreeing to be interviewed as part of the above research project. Ethical procedures for academic research undertaken require that interviewees explicitly agree to being interviewed and how the information contained in their interview will be used. It is necessary to ensure that you understand the purpose of your involvement and that you agree to the conditions of your participation. The interview will be recorded and a transcript will be produced to you in order to correct any factual errors.

If you have any complaints or concerns about the study, please contact:

Researcher: Anuschka Terreblanche

Tel: 0768318686

You can also contact the supervisor of this study:

Researchers' supervisor: Professor Ronnie Lotriet

Tel: 018 299 1415.

Acceptance of terms:

- Please introduce yourself? What is your experience in the Pecan Nut industry?
- Which type of cultivar do you farm with?

- Please explain the climate requirements for optimal Pecan nut farming?
- Approximately how many kgs does a Pecan nut tree produce in the optimal production phase?
- How long does it take for Pecan nut trees to start producing nuts?
- Can you please expand on the water requirements for optimal productions?
- What is the standard plan for planting trees per hectare?
- Please explain the cycle of the Pecan nut tree from planting up to harvesting?
- Do you know of any financial products available for farmers in this industry?
- Can you please expand on the financial farming requirements in this Industry?
- How do farmers start a plantation in this industry financially?
- Can you please explain the assessment process to determine damage relating to Insurance products?
- How do Insurers determine the “Monster” trees?
- What is the Insurance limitations in the Industry?
- When is the premium payable to Insurance? Specifically referring to cash flow.
- Can you expand on the reinsurance value specifically referring to this industry?
- What is the shortcomings and problems in this industry?
- What is limiting new farmers to enter this industry?
- Do you have any additional information to contribute to this study?

APPENDIX B INFORMED CONSENT

04/10/2017

Hugo Calitz
Financial Manager
Certisure
Klerksdorp Head office

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

Dear Hugo Calitz,

My name is Anuschka Terreblanche, and I am a MBA student at the North West University in Potchefstroom. The research I wish to conduct for my Master's dissertation involves **"Assessing the need of financial and insurance products for pecan nut producers"**. This project will be conducted under the supervision of Professor Ronnie Lotriet (Potchefstroom Campus, South Africa).

I am hereby seeking your consent to utilize the database of clients and Insurance / Financing products available to identify trends and additional needs in order to conclude my study. All information will be kept confidential according to the Protection of Personal Information act (POPI).

Upon completion of the study, I undertake to provide Certisure with a bound copy of the full research report. If you require any further information, please do not hesitate to contact me on 082 045 9343. Thank you for your time and consideration in this matter.

Yours sincerely,
Anuschka Terreblanche
North-West University

Hugo Calitz
Designation: Financial Manager
Certisure

Date: 04/10/2017

Daan Hugo
Designation: Managing Director
Certisure

Date: 04/10/2017