UNIVERSITY OF KWAZULU-NATAL

An Analyses of Fresh Produce Market Trends in KwaZulu-Natal to Enhance Decision Making

Student Name: Sylvia Zodwa Mazibuko
Student Number: 202523742

A dissertation submitted in partial fulfilment of the
requirements for the degree of
Master of Business Administration

College of Law and Management Studies
Graduate School of Business & Leadership

Supervisor: Dr. Mihalis Chasomeris

2018

DECLARATION

I, Sylvia Zodwa Mazibuko declare that:

- The research reported in this thesis, except where otherwise indicated, is my original work.

- This thesis has not been submitted for any degree or examination at any other university.

- This thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.

- This thesis does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:

a) their words have been re-written but the general information attributed to them has been referenced;

b) where their exact words have been used, their writing has been placed inside quotation marks, and referenced.

c) Where I have reproduced a publication of which I am author, co-author or editor, I have indicated in detail which part of the publication was actually written by myself alone and have fully referenced such publications.

d) This thesis does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the thesis and in the References sections.

Signed:

ACKNOWLEDGEMENTS

I would like to acknowledge the support, patience and understanding received throughout the journey of this dissertation from my family, friends and especially my children. A special thank you to my husband, Zimele Mahlobo for his relentless encouragement, support and inspiration without which this work would not have been possible.

My greatest acknowledgement is extended to my supervisor Dr. Mihalis Chasomeris for his patience with me, support and academic guidance which gave me strength on this journey

ABSTRACT

A lack of access to market information remains one of the key contributors to higher costs of transacting that are faced by small-scale farmers in South Africa. Access and participation in formal agricultural markets remains low amongst this group of farmers, despite government's investment in marketing infrastructure through establishment and refurbishment of national fresh produce markets in various regions of the country. There are two national fresh produce markets located in the KwaZulu-Natal province, these are the Pietermaritzburg fresh produce market and the Durban fresh produce Market. The aim of this study was to analyze trends in KwaZulu-Natal Fresh Produce Markets (KZN FPMs) over the period of five years from 2012 to 2016. From these trends the study will calculate and present simple price elasticity of supply for both fruits and vegetables traded in these markets. This research will also propose ways in which the quarterly fresh produce market bulletins that are produced and published by the KwaZulu-Natal Department of Agriculture and Rural Development (KZN DARD) can be improved in both content and ways of distribution of information.

This research used a quantitative approach for data analysis, utilizing descriptive statistics on fresh produce market volumes and price records that are obtainable from the KZN Department of Agriculture and Rural Development on a monthly basis. Descriptive statistics provided trends for the markets' data and the annual price elasticity of supply for the top five traded fruits and vegetables for both markets was calculated for the five year period 2012 to 2016.

The results show that vegetables in both markets are largely price inelastic except for tomatoes which were price elastic with respect to supply. Majority of the top five traded fruits in both markets also show price inelasticity of supply except for apples and pears in the Durban market and organs and peaches in the Pietermaritzburg market which were estimated to be price elastic. The recommendation from the study is that the KZN Department of Agriculture and Rural Development can enhance its market information services by including the calculated price elasticities of supply in their quarterly fresh produce market information bulletins. It is further recommended that the department of agriculture considers other means of market information distribution such as using information and communication technology tools like cellular phones and visual media.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

1. INTRODUCTION AND BACKGROUND

1.1 Introduction

The South African agricultural sector is characterized by dual subsectors within comprised of mainly white, largely well organized and commercialized agriculture and a group of black, fragmented and smaller-scale agriculture practiced by subsistence and emerging commercial farmers who are concentrated in the former homelands (Kirsten & van Zyl 1998).Over the years as the industry evolved, these two subsectors have come to face various challenges jointly and separately to varying degrees of intensity as a consequence of structure of the industry as well as market imperfections created by past policies of segregation mainly on land rights and ownership as well as access to input and output markets, infrastructure and skills development (Makhura 2001). With the advent of democracy in 1994, the government committed to a land reform process for purposes of redress and adopted a positive stance towards smallholder agriculture support. At the same time, South Africa deregulated all agricultural markets from within the country by abolishing marketing boards for agricultural products and became part of the World Trade Organization (WTO), thus opening up domestic markets and becoming party to a range of international trade cooperation agreements (National Agricultural Marketing Council 2013). This deregulated environment imposed a new set of possibilities and challenges to mainly the commercialized sector of agriculture, hence there has been widespread restructuring and re-orientation to overcome challenges and harness the opportunities as presented by globalization.

While commercial farmers repositioned themselves through farm consolidation, farm rental options and vertical integration in a bid to increase farm size, capture economies of scale and improve efficiency, their smaller–scale counterparts have been grappling with structural challenges related to access to input and product markets (Makhura 2001; Baloyi 2010; Liebenberg & Pardey 2012). The South African government has supported and promoted small to medium and micro enterprises (SMMEs) including agricultural cooperatives in agriculture and other sectors of the economy as vehicles for moving small-holder subsistence agriculture into the mainstream commercial agriculture while creating jobs for ensuring food security as well as reducing poverty (Republic of South Africa 2015). In contrast to the earlier mentioned picture of South African agriculture where small-scale agriculture is minimal and less organized, the trend in the world is that of a domination by small scale agriculture of mixed and varying size farming as well as support for small-scale agriculture and the rural areas being the hope for conservation of earths dwindling natural resources as well as reduction of poverty (Delagado 1999; Machete 2004; Giller, Witter, Corbeels & Titoonell 2009)

Ortman and King (2007) examined the possibilities of agricultural cooperatives from the communal areas of KwaZulu-Natal in promoting access to inputs and products markets and found that progress of agribusiness in the rural areas is stifled by the existence of high transaction costs emanating from farmers' lack of market information, low levels of education and literacy, insecure property rights, poor infrastructure as well as long distances to markets. Various studies that have looked at transactions costs and factors influencing market participation by farmers in rural areas have also noted the importance of availability of market information amongst other factors as an important determinant of meaningful participation in markets (Schwalabach, Groenewald & Marfo 2001; Matungul, Lyne & Ortman 2001; Jari & Fraser 2009; Kgosikoma & Malope 2016; Hlongwane & Ledwaba 2016; Montshwe 2006 and Ortman & King 2007). Chapter 3, 5 and 6 of the National Development Plan (NDP) puts agriculture at the center of economic growth, job creation, rural development and food security (Republic of South Africa 2015). This plan further states that by 2030, about 1, 000, 000 jobs are expected to be created from agriculture through a focus on rural development and graduation of small scale farmers to fully fledged commercial farmers that support and sustain not only their livelihoods but also provide employment for others.

The KwaZulu-Natal provincial government has since translated the NDP objectives into a provincial growth and development strategy and plan that has one of its objectives being that of developing and promoting agriculture to reach its full potential in the province (Provincial Planning Commission 2016). In this regard the provincial Department of Agriculture and Rural Development (KZN DARD) is the leading coordinating body and has since put in place a range of interventions to assist small-scale farmers graduate into commercial farmers (Department of Agriculture and Rural Development 2015).

One of the key indicators for smallholder farmer support and development is the facilitation of market linkages and provision of market information for informed decisions in agribusiness

(Department of Agriculture and Rural Development 2015). The department provides market information through walk in clients that consult and seek advice on markets to supply, market prices as well as market linkages and drafting of market contracts. The departmental agricultural economists and production specialist also provide ongoing counsel through short courses, workshops and on site consultations with farmers to ensure that their business can grow in a sustainable manner as they stick to agribusiness fundamentals. Some of the market information is compiled and made readily available on the department's website in a form of quarterly bulletins on the provincial Fresh Produce Markets which are in Durban and Pietermaritzburg. These bulletins summarise and compare trends in volumes and prices in the two markets over time, making useful market information available for farmers and other stakeholders to make informed decisions as far as these markets are concerned.

This research aims to analyse trends in the KwaZulu-Natal Fresh Produce Markets (FPMs) with respect to prices and volumes of vegetables and fruits traded over the period of five years from 2012 to 2016. From these trends the research also aims to propose ways in which the quarterly fresh produce market bulletins that are produced and published by the KwaZulu-Natal Department of Agriculture and Rural Development (KZN DARD) can be improved in both content and ways of distribution of this market information. Findings of the study might provide improved quality of contents of market information services as well as methods and perspectives on the provision of market information for all stakeholders. Literature already identifies market information as one of the important factors in determining successful participation of small-scale farmers in agricultural markets as well as high-value markets (Baloyi 2010; Sikwela 2013; Khaphayi & Celliers 2016; Mkhabela 2016 and Gqwambi 2017). There are various aspects to market information and its lack thereof which makes it a pre-determinant for market participation for small-scale farmers in South Africa. The nature of market information as well as how the information is delivered to intended users is important to rural resource-poor producers with lower levels of education and in most common cases illiterate. The inability to interpret information coupled with its insufficiency leads to mounting transactions costs for small-scale farmers which in turn makes decisions on marketing difficult and inefficient (Matungul, Lyne & Ortman 2001). This chapter of the research will focus on providing background to the study, problem statement, the purpose and objectives of the study, the theoretical framework, research methodology as well as expected outcomes and limitation of the study.

1.2 Background

Most developing nations have relied on agriculture as the primary sector of the economy for reduction in poverty, food sovereignty, employment creation as well as economic growth in general (Mellor 1976 and Aliber, Baipethi & Jacobs 2007). Though the contribution of agriculture as the primary sector of the economy is expected to decline with time as countries become more industrialized and manufacturing and services sectors take over, there remains an important role for agriculture's contribution to the economy. Similar to the rest of developed economies of the world, the South African agricultural sector growth and development has followed the same trend of diminishing contribution to gross domestic product and overall employment (Hall 2009).

The South African agricultural sector is reported to have shrunk by an estimated 7.5% over the period 1960 to 2015 from 10% of Gross Domestic Product (GDP) to about 2.5% contribution to national GDP (Department of Agriculture, Forestry and Fisheries 2010 and Greyling 2012). However, agriculture as a primary sector remains important to the national economy as an uptaker for agricultural inputs industry products and services (fertilizers, seeds and agro-chemicals), it produces food and contributes to national and household food security, earns foreign exchange through trade as well as providing inputs to the manufacturing sectors for food and beverages as well as wood and timber products (Department of Agriculture, Forestry and Fisheries 2010; Karaam, 2016 and AgriSA 2017). These forward and backward linkages make the sector an important player in the economy and its indirect contribution is estimated at 14% of national GDP (Department of Agriculture, Forestry and Fisheries 2010 and AgriSA 2017).

The observation that South African agriculture has undergone some level of industrialization over time due to technological advances and innovation indicate that this sector should be part of the country's industrialization strategy (Karaam 2016). Due to the recent drought, South African agriculture experienced a reduction in the number of hectares planted under maize from 2,65 million hectares in 2015 to 2,55 million hectares in 2016, a contraction to levels below the five year (2011 to 2015) average of 2.7 million hectares (Mokhema 2015). However, in the very same year of where less land was allocate to maize production the country recorded its highest maize harvest of all times, this shows that some yield improving technologies are being adopted by farmers (Agbiz 2017). Innovation in the sector has not been limited to yield improvement technologies but the main players in the inputs, production as well as retail segments of the food value chain have also been re-organizing and repositioning themselves for the changes brought by globalization and the requirements for survival in the current and future economic environment. Farms have been consolidating through more land acquisition and rental arrangements in a bid to increase scale of operation and benefit from economies of scale and efficiency in production (Liebenberg & Pardey 2012).

On the inputs side, the main players in the industry have started merging in other parts of the world like Europe, while South Africa is awaiting decision from the Competition Commission as it regards the merger of major seed and agro-chemical producing/retail multinational corporations Dow-DuPont, ChemChina-Syngenta and Bayer-Monsanto (African Centre for Biodiversity 2017). There has also been the trend of rising supermarket chains in the food value chain, as more and more people buy their food supplies from these stores as a consequence of urbanization and the reduction of agricultural activities in rural areas (Satterthwaite, McGranahan, & Tacoli 2010 and Weatherspoon & Reardon 2003). Over the past 2-3 decades, supermarkets have made their presence more prominent in the food value chain as evidenced by an increased market share of more than 50% as well as changing food (fresh food and processed food) regimes which favor high specialization and innovation for enhanced food quality and safety standards (Ruben, Slingerland & Nijhoff 2006; Chikazunga, Deal, Loue, & van Deventer 2008 and Metelerkamp 2012). Furthermore, to enhance efficiency and consolidate market power, food retailers have increasingly invested in the downstream segments of the value chain controlling own primary production as well as exclusive producer farm sub-contracting. Ruben et al. (2006) notes that this integration trend in the agro-food value chain can be considered both a threat and a challenge to rural development due to the implications it has for smaller-scale farmers' access to markets. This is the same observation and concern that has been raised by the South African National Agricultural Marketing Council (NAMC) stating that the government has to intervene to curb the curve of squeezing small-scale farmers out of the markets as supermarkets consolidate power and position in the agro-food chain in the country (Chikazunga et al, 2008).

In a study on the role of National Fresh Produce Markets (NFPMs) in their current form, the NAMC notes that the 16 fresh produce markets in the country have a very specific role to play which is that of bringing buyers and producers together in an equitable platform for trade that does not discriminate amongst producers. However, small-scale farmers continue to face challenges/barriers in accessing these markets, one of them being transportation due to poor road infrastructure in the rural areas as well as long distances to regional markets (Ortman & King 2007). These regional markets (Johannesburg, Durban, Tshwane and Cape Town) are the preferred markets for the diverse consumer profile they seem to attract as well as the infrastructure development they have since enjoyed due to economies of scale associated with centralized buying and distribution**.** The NAMC (2012) also highlights the declining market share of fresh produce markets in South Africa due to the rise of supermarkets and their new procurement strategies, direct marketing channels that have been made possible by the improved road networks and associated on-road logistics as opposed to rail transportation. Consumer preferences for convenience shopping, quality and safety of fresh produce have also driven market share away from National Fresh Produce Markets in favor of supermarkets.

As noted earlier, the government of South Africa believes in agriculture as an impetus for economic growth and employment creation (Republic of South Africa 2012 and Pienaar 2013). KwaZulu-Natal has recently invested in upgrades and renovation of the Pietermaritzburg Fresh Produce Market in Mkondeni to improve its cold storage facilities aimed at helping the market attract more clients and compete at the level of quality and food safety as expected by most buyers (Public Eye 2015). A range of other grant and loan facilities targeted at improving the business of small-scale farmers have also been implemented by the government through the provincial agriculture and rural development department over the years (Department of Agriculture and Rural Development 2015). These are the Comprehensive Agricultural Support Programme (CASP). Micro Agricultural Financial Institutions of South Africa (MAFISA), AgriBEE fund, iLima Letsema and others (AgriAfrica 2015).

With rural development taking a central focus in the KZN Department of Agriculture and Rural Development's vision and mission, it is therefore not surprising that its main clients are the rural, resource-poor small-scale farmers to whom most of services are directed (Kirsten and van Zyl 1998). Amongst other services that the provincial department of agriculture provide is market information and market linkages through its agricultural economics specialists at head office and in the district offices. The core of this information is in a form of bulletins on fresh produce markets trends and weekly prices for various agricultural produce. Other information provided as far as marketing is concerned are in a form of advice on client enquiries as well as capacity building presentations and workshops that usually take place on farmers' days in the communities as well on individual basis as requested by walk in or telephonic clients (Department of Agriculture and Rural Development 2017). The national Department of Agriculture, Forestry and Fisheries (DAFF) also collates and distributes fresh produce market information through the online market information system called the MIS (Department of Agriculture, Forestry and Fisheries 2018). This system is available for use by all users who have access to internet including departmental officials and farmers. The MIS also contained commodity level based analysis and province specific market information as fed into by the various provinces through the economics and statistics wings of each province in the departments responsible for agriculture and rural development (Department of Agriculture, Forestry and Fisheries 2018).

Market information facilitates decision making in choice of market to supply, choice of time of year to produce, quantities to produce as well as market participation decisions by farmers (Shepherd 1997). Market information also gives farmers bargaining power with buyers of produce as well as facilitates distribution of products from remote to urban areas (Shepherd 1997). Historic data, such as market trends for prices, volumes, participation statistics and other indicators serve as a good tool for making investment decisions and assessing viability of such in between agribusiness cycles and seasons. Various case studies in South Africa and other developing countries show that access to market information is amongst the factors that have been proven to have a positive and significant effect on farmers' decisions to participate in a market (Matungul et al. 2001; Randela, Alemu, & Groenewald 2008; Makhura et al. 2008; Montshwe 2006 and Kgosikoma & Malope 2016). Information costs incurred while searching for trading partners, deciding which markets to patronise and the cost of incorrect decisions taken often lead to accumulating transactions costs in small scale agribusiness which is largely the make or break factor in these areas (Ortman 2006). The aim of this study is to analyse the market information provided by the KZN Department of Agriculture and Rural Development through the KZN Fresh Produce Market (FPM) trends with respect to prices and volumes to see the extent to which this information can address farmer information challenges as it relates to market access relevant to literature in this field. Chapter two will provide a deeper understanding of transactions costs theories and the situation of smallholder access to market information and product markets in South Africa broadly as well as specifically in KwaZulu-Natal.

1.3 Problem Statement and Rationale for the Study

The province of KwaZulu-Natal has not yet reached it maximum agricultural potential especially in the rural areas where vast tracts of high potential agricultural land remain underutilized (Hall 2009). One of the ways to bring agribusiness to life in the rural areas is to have functional input and output markets. Ortman and King (2007) investigated the feasibility of cooperatives in agriculture to bring about the required impetus in agribusiness for the small-scale farmers in the former homelands and concluded that the inherent problems of cooperatives, lack of market information and consequential high level of transactions costs associated with farming in rural areas will hinder success of any agribusiness in these areas. One of the ways that government has used to address that challenge of market access was to develop and strengthen the national fresh produce markets in various regions of the country. These markets are currently facing declining market share as a result of rife competition in the food value chain, they continue to be promoted by the government as one of the common channels to bring produce from rural areas formal markets. When smaller-scale farmers are able to market their produce, this linkage creates income for rural farmers (Chikazunga et al. 2008). Investment to improve the status of these markets has been made by the government over the past few years to bolster the image and competitiveness of these facilities nationally. According to the National Development Plan of South Africa, agriculture as a sector is expected to contribute about 1 million jobs by year 2030 (Republic of South Africa 2015). In alignment with this job creation objective of the NDP, the mission and vision of the KZN Department of Agriculture and Rural Development is the promotion of agriculture as tool for rural development and food security. The KZN Department of Agriculture and Rural Development further offers as part of its extension and advisory services some market information on which farmers can rely to make decisions as they engage in their agribusiness operations. Given the centrality of market information in market access as well as the nature of the smallholder farmer client whom the KZN Department of Agriculture and Rural Development targets in the main, there is room for improvement in the quality and content of market information provided as well as channels of delivery of such information to the clients so that it can be utilized effectively. Fresh produce market trends can help stakeholders to understand the effects and

changes in supply determining factors for fresh produce as well as full utilization of available market data on volumes and prices in the provincial markets. This can further help in farmers' decision making, guide policy and future interventions in agri-business development at large.
Results from the study will add value to the understanding of the provincial fresh produce markets trends and associated statistics as well as the implications of changes in price for agricultural produce supply. The more relevant and accurate information that is available to users and clients of the KZN Department of Agriculture and Rural Development the better the decisions that can be taken by the sector as a whole.

1.4 Aims and Objectives of the Study

1.4.1 Aims

The aim of this study is to analyze trends in KwaZulu-Natal Fresh Produce Markets (KZN FPMs) over the period of five years from 2012 to 2016. From these trends the study will calculate and present simple price elasticity of supply for both fruits and vegetables traded in these markets. The monthly fresh produce market data on prices and volumes traded in the markets will be used to understand the major trends in the markets that may be relevant for decision making and improving the status of the current quarterly fresh produce market analysis reports that the KwaZulu-Natal Department of Agriculture and Rural Development currently provides.

This research will also propose ways in which the quarterly fresh produce market bulletins that are produced and published by the KwaZulu-Natal Department of Agriculture and Rural Development can be improved in both content and ways of distribution of information. Literature on the subject of small-scale farming as well as agricultural market access will used to determine better ways of market information dissemination and improving the services of agricultural extension.

1.4.2 Objectives

The following will be the objectives of the study:

1. To analyze trends in the Fresh Produce Markets of KwaZulu-Natal over the past five years (2012-2016) for fresh produce (fruits and vegetables).

2. To calculate and present simple annual price elasticity of supply estimation for the top five trades fruits and vegetables in both provincial fresh produce markets over the five year period 2012 to 2016.

3. To propose ways in which Fresh Produce Market statistics and reports published by the KwaZulu-Natal Department of Agriculture and Rural Development can be improved and disseminated-to enhance decision making for interested stakeholders.

1.4.3. Research Questions

The following will be the guiding questions for the research:

1. What are the trends in fruit and vegetable volumes and prices in the KwaZulu-Natal Fresh Produce Markets for the past five years from 2012 to 2016?

2. How sensitive has been supply to prices of the top five traded fruits and vegetables in the KwaZulu-Natal Fresh Produce Markets for the past five years from 2012 to 2016?

3. What other means of market information dissemination can the KwaZulu-Natal Department of Agriculture and Rural Development utilize to enhance decision making for its stakeholders and users of market information?

Fresh produce markets are seen as an important trading platform for agricultural fresh produce and it is expected that they will continue to play an important role in improving market access for emerging farmers. The results from the study will add value to the understanding of the provincial fresh produce markets trends and associated statistics as well as the implications of changes in price for agricultural produce supply. The more relevant and accurate information that is available to users and clients of the KZN Department of Agriculture and Rural Development the better the decisions that can be taken by the sector as a whole.

- **Market Information services of the KZN Department of Agriculture and Rural Development**

The KZN Department of Agriculture and Rural Development in the provincial government of KwaZulu-Natal is responsible for services to the community with respect to agriculture and rural development. Part of these services include market information and market access through linking a farmers with local and international markets. These marketing services are provided at the Department of Agriculture and Rural Development through agricultural economics and marketing specialists placed at the head office in Cedara as well as various district offices in the 11 districts of the province of KwaZulu-Natal. The following sections details the nature and way of dissemination of market information by the KZN Department of Agriculture and Rural Development.

- **KwaZulu-Natal Fresh Produce Market (FPM)**

This is a quarterly publication which provides the user with trends in volumes and process at the two national fresh produce markets located in the KwaZulu-Natal province being Durban and Pietermaritzburg Fresh Produce Markets. The same bulletins are also forwarded to the national department of agriculture, Department of Agriculture, Forestry and Fisheries for publication in the national agricultural marketing information system called MIS hosted by the Department of Agriculture, Forestry and Fisheries' website.

- **Annual Trends in Fresh Produce Markets**

This is an annual bulletin that is prepared during the first quarter of each new year to capture the changes in prices and volumes of fresh produce traded at the Durban and Pietermaritzburg fresh produce markets. The trend covers five years for all produce sold at the fresh produce markets. This bulletin is provided n request by its users who are usually official in planning, extension and advise as well as agri-business consultancies.

- **Weekly Price Bulletins**

These bulletins are prepared at the head office by agricultural economists to cover a selected few crops and livestock products in the province on a weekly basis. These are disseminated to clients and users through requests on emails/ walk-in/ telephone inquiries or at farmers' days and workshops when these are convened.

- **Workshops and presentations**

These are informal training and information sharing sessions usually organized by the extension officers in districts and wards where farmers are found. It is in these sessions where hard copies of the above mentioned bulletins can be shared as well any other non-bulletin information on markets is provided to farmers and clients present.

- **The Marketing Information System (MIS)**

The MIS is an internationally available tool for market information through the internet which is a responsibility of the Department of Agriculture, Forestry and Fisheries, but provincial officials also provide marketing information relevant to KZN for dissemination and display at this portal.

1.5 Research Methodology

The study will commence with a comprehensive literature review on the South African agricultural sector, smallholder farmers and their access to markets as well as the critical role of market information in the success of this category of farmers. Review of literature will set the scene for the contemporary issues on the topic and the significance of market information to the success of smallholder farmers in the country. KZN Fresh Produce Markets quarterly bulletins as obtainable from the KZN Department of Agriculture and Rural Development website will provide basis for the status of information provided and areas of improvement that can be identified. The nature of research will be descriptive aiming to identify trends in volumes and prices of the national fresh produce markets of KwaZulu- Natal. A descriptive approach to this research is relevant because the aim is to analyze recorded observations of fresh produce prices and volumes as they have been observed and recorded over the years included in the study. The intention is to make the information available to clients of the Department of Agriculture and Rural Development and other stakeholders whom can then use further for their decision making in agribusiness or as part of further research. The study will not attempt to ascertain why things are as they are (Given 2007).Unlike an empirical study investigating cause and effect between dependent and independent variables and hypothesis testing (Brewer & Kubn 2010), this study uses a simple approach which does not attempt to account for any causality relationship between the volumes and prices of fresh produce market.

The study will estimate and present the annual price elasticity of supply for produce in the Durban and Pietermaritzburg fresh produce markets. The results from the analysis will add value to the current market information services that the KZN Department of Agriculture and Rural

Development is providing to its clients who are mainly small-scale farmers through published quarterly fresh produce market bulletins as well as market information capacity development through workshops and farmers' day presentations in the communities.

1.6 Research Design

In order to respond to the key questions posed by the study a literature review will be done with an aim highlighting the background of the national and provincial agricultural sector, the role of national fresh produce markets as well as pertinent issues as it relates to market access and market information for small scale farmers. Thereafter, trend analysis and estimation of elasticity of supply will be done using the simple elasticity of supply formulae as well as highlighting any trends as apparent from data analysis. A further look into extension and advisory methodologies for developing agriculture literature will assist in coming up with ways in which the developed market information can be disseminated to farmers for effective use.

1.7 Data Collection and Analysis

The provincial Department of Agriculture and Rural Development keeps and maintains daily records of prices and volumes for the various fresh produce traded in the KZN fresh produce markets. This data is then consolidated into monthly and annual records that are regularly shared with stakeholders and used to develop the market trend bulletins that published in the department's website. This research will use this data from the monthly release of national fresh produce markets volumes and prices for KwaZulu-Natal over the past 5 years, 2012 to 2016. Further data, information and views will be collected via industry body websites as well as literature.

There is about 150 products traded on the fresh produce markets of KZN at various volumes and times of the year. Top five traded fruits and vegetables in terms of volumes will be utilized for the price elasticity of supply estimations. Data will be analyzed using quantitative data analysis methods through performing simple descriptive statistics on the data reporting means, correlation, frequencies, proportions as well as graphs.

1.8 Expected Outcomes

This study will examine existing price and volume data for fresh produce looking at the KwaZulu-Natal fresh produce markets. The study will also draw from rich background of transactions cost economics and the impact of these on small-scale farmers' access and participation in markets from the perspective of lack (inadequacy) of market information. The results from the study will highlight ways in which the current services of the KZN Department of Agriculture and Rural Development as far as market information is concerned can be improved in order to enhance farmers' decision making.

The study will cover only the KZN Fresh Produce Markets and market information service only provided by the KZN Department of Agriculture and Rural Development to its clients. The period selected for the study will be five years starting from 2012 to 2016. Since this is a descriptive study, the aim is to analyze recorded observations of fresh produce prices and volumes as they have been observed and recorded over the years included in the study. The intention is to make the information available to clients of the Department of Agriculture and Rural Development and other stakeholders whom can then use further for their decision making in agribusiness or as part of further research. The study will not attempt to ascertain why things are as they are (Given 2007) since it will use a simple approach to calculations and analysis which does not attempt to account for any causality relationship between the volumes and prices of fresh produce market.

1.9 Structure of Dissertation

The study will follow the framework as set out herein:

- **Chapter One**

Chapter one introduces the study and gives background to the research topic and discusses the reasons for the research, the research aims and objectives and questions as well as the layout of the research document.

- **Chapter Two**

This chapter will provide literature review on topics related to the study such as the overall background of the national agricultural sector, issues affecting small-scale farmers' access to markets, transactions costs, as well as the importance of market information to the success of small scale agriculture in the global and South African context.

- **Chapter Three**

This chapter will present and discuss the methodology and research design for the study. Data will also be presented and described in this chapter.

- **Chapter Four**

This is the chapter which will be presenting results from data analysis exercise and interpretation of such results.

- **Chapter Five**

The study will conclude with recommendations and highlights areas for improvement in the current market information as provided by the KZN Department of Agriculture and Rural Development to its clients, mainly the smallholder farmers.

1.10 Conclusion

This was an introductory chapter of the study which was an effort to provide a background to the research, introduce key issues in literature as it relates to the small-scale farmers and their access to formal markets in the agricultural sector broadly. The chapter also presented the aims and objectives as well as rationale for the study together with an intended research methodology, design and research document outline. The following sections of the dissertation will provide literature review, in depth research methods, data analysis and presentation as well as concluding remarks as detailed in the structure of dissertation.

CHAPTER 2

2. LITERATURE REVIEW

2.1 Introduction

This chapter of the research will look at relevant literature on the state of agriculture in the province in general highlighting various trends in the sector in terms of economic contribution and employment. The chapter will also look at the small-scale farmer as a focus and target of the policies and interventions of the KZN DARD as well as the key challenges faced by these farmers of which access to markets and market information is paramount.

2.2 The State of Agriculture in KwaZulu-Natal Province

Statistics South Africa 2016 community survey report indicates that agricultural activity at household level in the country as a whole has declined (Stats SA 2016). The decline was partly due to the 2015-16 drought which saw the year 2015 being declared the driest year in South Africa since 1904 (Stoddard 2015). The national average rainfall received was 403mm for the year 2015, which was the lowest since 1904, compared to the long-term average of the 112 years at 608mm (De Jager 2016). Farmers reacted by cutting back maize production in 2016, which resulted in the country recording the lowest number of hectares planted to maize since 1928 (Department of Agriculture, Forestry and Fisheries 2016). Even though the area planted to maize reduced over the past decade, average national output has remained steady at 10.5 million tons per annum for the period 2006 to 2016 (Department of Agriculture, Forestry and Fisheries 2016). This is indicative of improvements and efficiencies in production and input technologies over time that has enabled yields to increase and sustain this trend even through the hard times in the industry (Mqadi 2007 and Department of Agriculture, Forestry and Fisheries 2016). Latin America and Asia have experienced growth in agricultural output over the same period owing to their early adoption of the green revolution technologies as well as sustained investment in agricultural research and development (Patel 2013).

Compared to other provinces, KwaZulu-Natal has the highest percentage of households who are actively involved in agriculture at 23% of total households in the province. Stats SA (2016) community survey on agricultural households shows that though KZN has lost about 1.1% of its agriculturally active households from 2011 to 2016, it remains one of the most agriculturally active provinces in the nation as a whole. The recent drought is believed to have been the main cause of the decline in agricultural activity in the province which has had devastating effects on food security for those households who grow their own food mainly for consumption. Other reasons for households to engage in agriculture are leisure, strictly commercial agriculture, extra source of income/food as well as main source of food for the household (Stats SA 2016).

A farming business should aim at income generation for profitability and to sustain livelihoods out of agriculture activities beyond subsistence levels associated with household food security. Of the 536, 225 agriculturally active households in the KZN province, 82% of these households are in it either for household food security as the main source of food or as supplementary source of food (Berdegue & Fuentealba 2011). Only about 4, 826 (0.9%) KwaZulu-Natal households are in agriculture on a full commercial basis meaning that they sustain their livelihoods through agriculture as main source of income (Stats SA 2016). The other income oriented category of agricultural households are those who supplement agricultural income with off farm income, meaning they are in between subsistence and commercial agriculture comprise about 3.8% (Stats SA 2016). This is the critical group that government efforts are expected to lift out of emerging/smallholder state of agriculture into fully commercial agriculture. As it is, the KwaZulu-Natal Provincial Growth and Development Plan (KZN PGDP) proposes that by 2020 the emerging farmer cohort will have increased by 10% and the commercial farmer group is targeted to increase by 5% in line with the National Development Plan (NDP) vison 2030 (KZN Provincial Planning Commission 2016).

The category of households who are reportedly active in agriculture as a supplementary source of income as well as those who are in it for a supplementary source of food have been the subject of much debate and policy direction the world over (Sutherland, Madureira, Dirimanova, Bogusz, Kaina, Vinohradnik, Creaney, Duckett, Koehnen & Knierim 2017). The actual number of these farmers in the country is elusive, 250 000 has been reported by Aliber and Hall (2012) while from latest Statistics South Africa community survey results, KZN alone accounts for well over 250, 000 of these farmers without accounting for the contribution of other provinces (Stats SA 2016). This weakness in measure may inform the apparent lack of attention to this group of farmers from policy makers in terms of ensuring increased food productivity for household food security purposes and minimizing the impact of rising food prices on poor households (Altman, Hart &

Jacobs 2010 and Von Loeper et al. 2016). Eckestein (2017) proposes an approach similar to the one developed by the Department of Agriculture, Forestry and Fisheries (2016) when he distinguishes between three categories within the smallholder farmer groups as being professional smallholders, developing/emerging farmers and subsistence smallholders.

Murphy (2012) has argued that because of the obvious overlap in characteristics and definition between the farmer groups, intended developmental policy impacts may have been less tangible. Cousins (2010) also share the same observation when he notes that the tendency by policy makers to generalize and speak to these two groups as one "smallholder farmers", failing to distinguish between the two groups in terms of their business orientation as well as objectives for engaging in agriculture. This is a stance that has often led to misguided policy direction in agricultural development support especially as associated with land reform and rural development in South Africa (Cousins 2010 and Pienaar 2013).

Food and Agriculture Organization (FAO) (2012) highlights the importance and share of smallholder agriculture in Sub-Saharan Africa agriculture by noting that smallholders work and manage about 80% of farmland in Sub-Saharan Africa and Asia mainly in family farms of up to 10 hectares (Quan 2011). The important role currently played by smallholder farmers in developing economies and their potential for the future global food security has been well narrated in literature. Von Loeper et al. (2016) argues that there is significant untapped potential for economic growth and food security that is yet to be realized with smallholder farmers in South Africa (Eckstein 2017). Delgado (1999) also asserted that small-scale agriculture is an important source of employment, human welfare and political stability in Sub-Saharan Africa and hence this is too important a sector be ignored by policy makers. Challenging the negative perceptions around small-scale farming in South Africa, Kirsten & van Zyl (1998) argued that small-scale farming can be viable and profitable at a level of the common commercial farming units, if the major factors fueling higher transactions costs for these farmers were to be addressed.

On the other hand, there has been much disagreement about who or what a smallholder farmer is, and characteristics of such, which has for a long time served to create negative perceptions about smaller-scale farmers especially in the South African context (Kirsten & van Zyl 1998). This is especially owing to the imperfections in the credit markets for agriculture in the past where legislation had determined a commercially viable size for a farm in favor of larger farming units, hence farms below this benchmark would not be eligible for funding (Kirsten and van Zyl 1998).

2.2.1. Contribution of Agriculture to the Provincial Economy

Agriculture is one of the key primary sectors in the province and is considered to still have a lot of potential to expand and reach full capacity once the vast tracts of land and other resources in the communal areas can be brought to production (KZN Department of Agriculture and Rural Development 2002). Though agriculture is believed to make a small contribution to the income of rural households, it remains an important tactic for livelihood in these areas in supplement of needs accommodated by wages obtained from towns and cities or commercial farms May (2000, p. 24). Provincial output from all sectors was estimated at R582, 4 billion in the third quarter of 2016 and the commercial agricultural sector contributed about 4.4% to provincial gross domestic product (Kaplan & Zitzer 2016).

It is reported that smallholder agriculture in Brazil has a potential to create 1 job per 8 hectares as opposed to 1 job per 67 hectares from larger scale mono-cropping operations, which supports the notion that agriculture can be a key driver for employment creation and rural development in developing countries (Food and Agriculture Organisation 2012; Fritsche, Epper & Iriatre 2015 and Mutero, Munapo & Seaketso 2016). On the role of agricultural employment in reducing poverty in rural areas, Machete (2004) notes that agriculture alone is not the panacea to the socio-economic challenges facing rural areas and emphasizes that agricultural activity is but one aspect of an integrated system of rural socio-economic development that involves other non-agricultural activities and social services. In KZN, the agricultural sector's contribution to provincial employment has been declining over the past five years, from 10% in 2006 to about 6% at the end of 2016 (KZN Treasury 2016).

2.2.2. Defining a Small-Scale Farmer

The FAO (2012: 1) proposes a definition of smallholders as "small-scale farmers, pastoralists, forest keepers, fishers who manage areas of varying sizes from less than one hectare to 10 hectares". While Kirsten and van Zyl (1998, p. 564) define a small-scale farmer as "one whose scale of operation is too small to attract the provision of the services he/she needs to be able to significantly increase his/her productivity". The FAO definition, which mainly considers farm size or the size of enterprise (livestock herd units), is the most common definition and has been widely criticized in literature (Hildebrand 1986; Kirsten & van Zyl 1998; Murphy 2012 and Pienaar 2013). The second definition by Kirsten and van Zyl (1998) features the issue of size but as a relative term, in that it does not put a value on how small is small (Calcaterra 2013).

Alternative and more inclusive approaches to defining small-scale farmers have been proposed through considering a multi-characteristic approach (Hildebrand, 1986 and Calcaterra 2013) as well as livelihood strategies (Pienaar 2013) employed by the rural poor that lend them into farming. The multi-characteristic approach includes looking at indicators like the objective of farming/production, market orientation of production, ratio of family to hired labour, land size holding, location (rural versus urban) farming systems (technology, irrigation versus dryland), capital intensity, mechanization levels and contribution of farming income to total household income (Cousins 2010; Cousins & Chikazunga 2013, Pienaar 2013; Calcaterra 2013 and Department of Agriculture, Forestry and Fisheries 2016). A livelihood strategy for the rural poor would then be a combination of the various indicators found in an agriculturally active household that would guide categorization on whether a household is subsistence oriented or commercially oriented (Piennar, 2013 and Department of Agriculture, Forestry and Fisheries 2016). The National Department of Agriculture, Forestry and Fisheries has come up with a guideline (Table 2.1.) for categorization of farmers in order to guide policy and interventions that would aid agriculture and rural development while reducing poverty, inequality and unemployment.

Table 2.2. : Smallholder Farmer Typology

CATEGORIES	1. Subsistence	2. Smallholder		3. Commercial
Indicators/ Characteristics	**A. Subsistence-oriented smallholders**	**B. Market-oriented smallholders/ informal (loose) value chains**	**C. Market-oriented smallholders/ formal (tight) value chains**	**D. Small-scale commercial farmers**
Objective of production	Household consumption	Household consumption + cash income	Cash income + some home consumption	Profit
Proportion of marketed output	None or insignificant	50% or >	75% or >	100%

CATEGORIES	1. Subsistence	2. Smallholder		3. Commercial
Indicators/ Characteristics	**A. Subsistence-oriented smallholders**	**B. Market-oriented smallholders/ informal (loose) value chains**	**C. Market-oriented smallholders/ formal (tight) value chains**	**D. Small-scale commercial farmers**
Contribution to household income	Reduces expenditure on food	Variable – from small to significant	Significant	Very significant
Labour	Family	Family + some hired	Family + significant numbers hired	Hired
Mechanisation	Very low	Low	Medium to high	High
Capital intensity	Very low	Low	Medium to high	High
Access to finance	Absent	Some	Significant	Very significant
Example	Indigent producers/ with backyard plots or homestead gardens, and/or small herds/ flocks	Smallholders who sell surplus livestock or fresh produce to bakkie traders, hawkers, neighbours or others nearby	Smallholders who are in a commodity-linked supply chain such as sugarcane or cotton	Able to farm independently. May be in a supply chain, or not by choice

Source: Department of Agriculture, Forestry and Fisheries (2016, p. 4)

With all definitions and approaches considered herein, one can say that a small-scale farmer is a survivalist entrepreneur and bread winner who mostly consumes part of own production and sell off the surplus to a market (formal or informal), hence a combination of livelihood strategy within agriculture plays a central role as proposed by Piennar (2013). Most people in rural areas supplement their incomes with wage labour over and above farming, while it is the women who mainly practice farming, men often commute to areas outside rural areas of residence for wages from off-farm activities.

There has notably been a renewal of interest on smallholder farming and the question of an efficient farm size in agriculture as brought into the spotlight by the plight of poor people in under-developed nations of the world (Deininger & Byerlee 2012). While on one hand, the Brazilian large-scale mechanized farm model of agricultural development has been a resounding success in transforming and modernizing the agricultural sector of that country, there has been equally convincing arguments and examples where small-scale farming has made success and transformed agriculture in a poverty stricken countries like Asia through its green revolution (Hazell 2009 and Murphy 2012).

Higher costs of transacting that are faced by smallholder farmers in most developing countries are the main source of their inefficiencies and the recessive state of farming at this scale which keeps this type of farming at subsistence to hobbyist levels with low income generating capacity (Ortman & King 2007; Mmbengwa, Nyhodo, Myeki, Ngethu & van Schalkwyk 2015). Beyond this subsistence nature of agriculture smallholder farmers in rural areas have lower levels of education, limited access to information and technology and poor infrastructure for transportation and communication which are factors that serve to increase costs of farming in these areas (Ortman & King 2007). Most smallholder farmers still employ primitive methods and approaches to farming as a result of low levels of education and exposure to new information, knowledge as well as technologies (Mahlobo, 2015). For instance, livestock farmers in KwaZulu-Natal associate their ownership of cattle and small stock with sentimental value and for use in traditional ceremonies as opposed to commercial farming and income generation (Mahlobo, 2015). Education level of a farmer has been found to be a key determining factor in the adoption of new technologies that enhance yields in farming as well as access to credit which further enables investment in farming activities (Salazar & Rand 2016 and Mutero et al, 2016). Alemu and Negash (2015) considered the low levels of adoption of mobile market information systems by farmers in Ethiopia and concluded that social influence as well as expected benefits of adoption of technology were key determinants for smallholder farmer to use the Market Information System.

The general expectation is that farms would have to expand overtime in order to achieve economies of scale. There are sharply diverging views on the most efficient size of a farming enterprise from small to large farms, it is however evident that both modes and scales of farming have co-existed globally. While larger-scale and more intensive farms face pressure from the consequent negative environmental impacts of their operations, small-scale farmers remain resource poor and unable to access modern technologies and other farming requisites to improve their farming incomes. There are efforts globally to curb environmental degradation due to agricultural activities as well as a rising trend of health and environmentally conscious consumers who demand goods of high standard and quality of food that is produced responsibly. For small-scale farmers, most developing countries are hard at work in efforts to drive down transactions costs for these farming operations through various forms of programmes at various levels. What is also apparent is that due to the larger proportion of poor people being in rural areas, agriculture remains a relevant primary activity for both food security and income generation, hence the pervasive emphasis on agriculture as a sunrise sector for most developing countries. The KwaZulu-Natal Department of Agriculture and Rural Development has in its vision and mission key elements of bringing out agriculture from subsistence to commercial though a range of services mostly targeting small-scale farmers.

2.2.3. Constraints and Prospects for Small-scale Farmers

KwaZulu-Natal is no exception to the dichotomous nature of agriculture and its development in the country (Kirsten & van Zyl, 2008). The provincial agricultural suitability and potential indicates that KZN is largely suitable for forestry and grazing, with pockets of land of high-medium arability for agricultural cropping (KZN DARD, 2017). Climate change is a global reality and a threat to agriculture sustainability and by implication food security for the growing population of the world. It is predicted that for agriculture to feed the world's population in the next few decades, current food production will have to double, at the same time the effects of climate change are expected to reduce agriculture output by about 10-15% and up to 50% in the drier parts of Africa (Von Loeper, Musango, Brent & Drimie, 2016). KwaZulu-Natal province is expected to have more erratic weather patterns with already dry parts of the province becoming even drier and others wetter with more intense rainfall and frequent heat episodes as well as a rising sea level for coastal areas like Durban (eThekwini Municipality, 2014).

Climate change is but one common challenge that already affects the way in which business at large operates, agriculture is highly dependent on natural resources and climate and as a result this sector is vulnerable to the effects of the ongoing changes. Nonetheless, agro-food value chain actors experience various challenges at varying degrees based on their positions, strategies and abilities to adapt to changes in the longer term. The following subtopics will discuss constraints and possibilities for agriculture in general with a specific focus on smallholder farmers.

2.2.4. Access to Markets

Various studies have found that there is a multitude of factors limiting access of smallholder farmers to formal markets, some have to do with the farmers themselves and others are structural and industry related (Baloyi, 2010). Though there are fresh produce markets in most big cities in South Africa, a proliferation of retail outlets in most rural towns has been a recent trend, there are shopping centers and a large range of marketing points where agricultural products are sold and demanded. Small-scale farmers are still struggling to access these due to depressed volumes and erratic patterns of production which makes them unable to provide large volumes and consistent supply often required by formal markets (Barret 2008 and FAO 2012).

Small scale farmers also do not have sufficient access to market information in order for them to effectively decide on what to plant, how much to grow and where to sell it at what price, small-scale farmers need up to date and usable market information at their disposal. However, the case is that smallholder farmers do not have adequate access to market information and sometimes they have to rely on friends and networking with other stakeholders in the commodity value chain for market information, of which sometimes is not accurate and can lead to incorrect decisions being taken bay farmers (Baloyi 2010).

These market access-limiting factors sustain high transactions costs and force smallholder farmers to sell their products to informal markets (spot markets, farm stalls, bakkie traders, family/friends) at prices below what the formal markets could offer (Makhura 2001; Department of Agriculture, Forestry and Fisheries 2012; Mayo, 2012; Mpandeli & Maponya 2014 and Mutero et al. 2016). Though informal markets offer some relief for small-scale farmers as last or most available resort to salvage any value from their produce, often-unhygienic market conditions, poor infrastructure maintenance and resulting low food safety standards tend to drive the middle-income consumer away in the longer term (Ferris et al. 2014).

There also needs to be viable and effective ways of disseminating marketing information to farmers and an improved access to extension services for farmers so they might gains more confidence in their operations and improve yields (Montshwe 2006).

2.3. Ways in which Farmers Access Market Information

Technological advancement in agriculture continues to foster globalization at a pace unprecedented, however, there are concerns that African small-scale famers are not in a position to benefit from positive effects of globalization in business because of poor access to technology and related information (Aina 2007). Use of low-level technology has been identified as one of the key challenges in developing small-scale agriculture to its full potential in the former-homelands (communal areas) of South Africa (Obi & Seleka 2011). Poor infrastructure, lack of knowledge and experience in farming constrain the adoption of newer technologies in farming (Van Schalkwyk et al. 2004). Most small-scale farmers across Sub-Saharan Africa are making do with the indigenous knowledge and farming techniques that have been inherited from generation to generation (International Fund for Agricultural Development (IFAD) 2011). The challenge with this system of farming technologies and information is that the world is changing much faster than the peasant farmers are able to adapt and sustain their operations. The issues of climate change cast a bleak future for resource poor farmers who have limited ability to access modern seed and irrigation technology for better productivity. Without improved yields, small-scale farmers remain trapped in lower and inconsistent volumes and inadequate surpluses that can pave way for regular marketing of produce and sustainable income streams (Murphy 2012). The modern food hygiene and safety requirements as well as other voluntary standards in marketing of fresh produce such as Global GAP place pressure on a small-scale farmers to be well versed with the trade of farming as well as techno savvy in order to receive and transmit relevant information throughout the farm business management exercise. In addition, sophisticated global consumer requires a larger range of product at specified quality, which means that storage and transportation infrastructure, must also be in line with that of global standards (Machethe 2004 and Makhura 2001).

2.3.1. Effective use of Market Information

Access to relevant and accurate information is a precursor for agricultural development since this can help small-scale farmers improve their production capacity and facilitate access to formal and better paying markets (Masuki et al. 2010 and Siyao 2012). Access to agricultural production and marketing information is a necessary but not sufficient condition for market participation and improved business prospects for smallholder farmers (Montshwe 2006). Once made available, information has to be disseminated, accessed and interpreted by the intended users who are smallholder farmers. Though information is sometimes available, the low technology environment coupled with high levels of illiteracy amongst smallholder farmers in Africa makes effective utilisation of such information impossible if not largely ineffective (Aina 2007 and Ortman & King 2010). Also smallholders farmers have limited earnings on which it is difficult to prioritize access to telecommunication devices such as cellular phones, radio or television in order to make access to information easier (Aina 2007).

2.3.2. Use of Information Centres

Development of information centers throughout rural Africa is one of the proposals put forward in effort to curb the limited access to agricultural production and market information for smallholder farmers in these remote areas (Aina 2007). These centers should be internet linked and be in a position to translate information to a format useable for locals for their own needs in agriculture. Cellular phones also offer a promising platform for transfer of agricultural information for all players along the commodity value chains the world over. Masuki et al. (2007) found that farmers in South Western Uganda preferred receiving information on their cellular phones rather than other means of communication and the highest priority for agricultural information from these was market information, which helps farmers take critical decisions on which market to supply and expected prices. Vodafone and Accenture (2011) have developed a report indicating the potential role of mobile telephone devices in enhancing sustainability and efficiency in the global food and agriculture value chain. One of the proposed ways for improving agricultural information and market access is though mobile trading platforms, bartering and tendering, where farmers and buyers of produce can interact and exchange products and services. This platform can expand possibilities for marketing for remote area based farmers who often have to sell their produce at farm gate prices without accessing higher value markets (Kirk, Steele, Delhe, Crow, Keeble, Frickle, Myerscough & Bulloch 2011).

2.4. Marketing of Agricultural Products in South Africa

Deregulation of agricultural markets post 1994 in South Africa together with liberalisation of trade in line with the country signing up for World Trade Organisation membership (Sandrey & Vink, 2008 and World Trade Organisation, 2017) signified some of the key policy changes that affected the agriculture industry in a major way (Kirsten and van Zyl, 1996). The Marketing of Agricultural Products Act of 1996 (Act. No. 47) was promulgated with the objectives of broadening market access for all participants in the sector, promoting efficient marketing of agricultural products and promoting overall prosperity for the agricultural sector locally and abroad (National Agricultural Marketing Council 2006 and Mutero et al. 2016). Opening of South African boarders to freer trade meant intensified competition for local industries and this may have induced the undesired outcomes of a largely consolidated and monopolised agricultural input and output industry in South Africa (Satgar 2011). Smaller-scale farmers who are not as organised as their commercial counterparts have faced deteriorating prospects of formal market access in light of industry consolidation and heightened competition in the food value chain (Sandrey & Vink 2008 and Van Schalkwyk et al. 2012). To this end, access to formal and sustainable market by small-scale farmers remains one of the biggest inhibiting factors to agricultural incomes for agricultural active households in South Africa. Farmers are constrained by a range of issues internally to their organisations as well as externally in the operating environment all of which leads to mounting transactions costs that makes small-scale farming activities close to unviable and subsistence in the main for rural households (Ortman & King 2007).

2.4.1. Marketing Channels for Fresh Produce

The national Department of Agriculture, Forestry and Fisheries has provided a basis for categorisation of markets in the public sector and within the country for purposes of policy and decision making (Nobandla 2014). The three types of markets that have been determined are the farmers markets, wholesale markets and commission market and each will be describes briefly below (Nobandla 2014).

- **Farmers Markets:** these are markets where local famers and producers of fresh produce gather to sell their produce directly to the public.

- **Wholesale Markets:** These are largely profit driven markets where produce is sourced from the farmer directly for resale to other bulk buyers who can sometimes be the final consumer or the intermediaries for resale of produce to the various markets and outlets

- **Commission Markets:** Commission market are similar to wholesale markets except that produce in these market is handled by registered agents who act on behalf of farmers and sell their produce at a commission based on quantities sold at certain price at point in time in the market floor. This is the benchmarking market for pricing of fresh produce in South

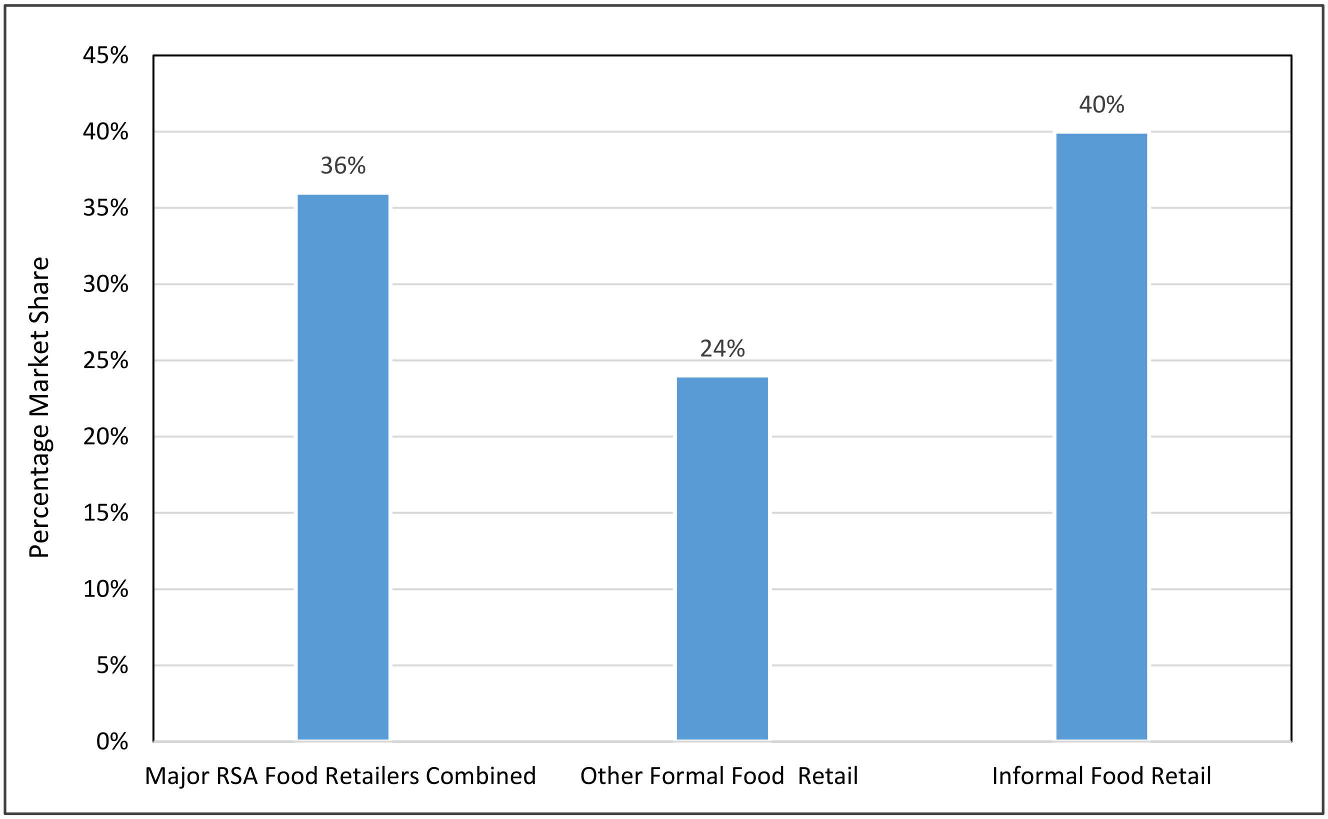
Africa centred in the many national fresh produce markets across all provinces in the country.

2.4.2. Informal Markets

The markets categorised above can further be defined as informal (loose value chains) or formal (closed/ tight value chains) based on the nature of the markets and its activities (Department of Agriculture, Forestry and Fisheries 2016). Informal markets are largely driven by on site cash based exchanges between the farmer/producer and the final consumer. There are also intermediary buyers and sellers of agricultural produce, those who buy at wholesale centres like the fresh produce markets for the purposes of reselling at mark-up in convenient places like the taxi ranks and street sides where there is abundant demand from daily commuters (Nobandla 2014). Informal trade transactions are largely undocumented, without any regulation, taxation or utilisation of modern information and technology system in the actual business operations (Anbarci, Gormes-Porqueras & Pivato 2012 and Dhewa 2016). These informal transactions are mostly prevalent in African agriculture due to a range of factors, such as the nature of farming which in largely small-scale and family based farming units which primarily support food security and marketing of any surplus production generated. The small quantities, infrequency and sometimes quality of these surpluses is one of the leading causes of the prevalence of informal trade in agriculture for smaller scale farmers (Defiat 2018).

In Sub-Saharan Africa, informal markets account for the largest proportion of markets in agricultural trade (Skinner & Haysom 2016). It is estimated that about 43% of the African population, most of whom are women, get their income from cross-border informal market transactions (Afrika & Ajumbo 2012 and Dookie & Defait 2018). Wills (2009) estimated that the informal sector contributed about 7% to gross domestic product of South Africa as well as employment through private households, agricultural sector and construction (Wills, 2009). The United Nations (UN) estimates that the informal sector contributes between 20% and 70% of employment in Sub-Saharan African countries (Food and Agriculture Organization 2017). The South African informal sector contributes about 28% to total employment nationally (Skinner 2014). Agriculture is the second largest contributor to informal employment in South Africa after private households and then followed the construction sector (Wills 2009). Bhana (2018) reports that the informal food sector of South Africa is flourishing, accounting for 40% of trade in the retail sector. The estimated value of the informal sector retail trade is 176 billion in South Africa as reported by Trade Intelligence (2017). Major retail companies (Spar, MassMart, Woolworths Shoprite and Pick ‘n Pay) in South Africa account for 36% and the rest of the market share goes to other formal food retailers at 24%. Figure 2.1 indicates the various market shares per sector in the South African food retail business.

Figure 2.1. South African Food Retail Market Share (2018).

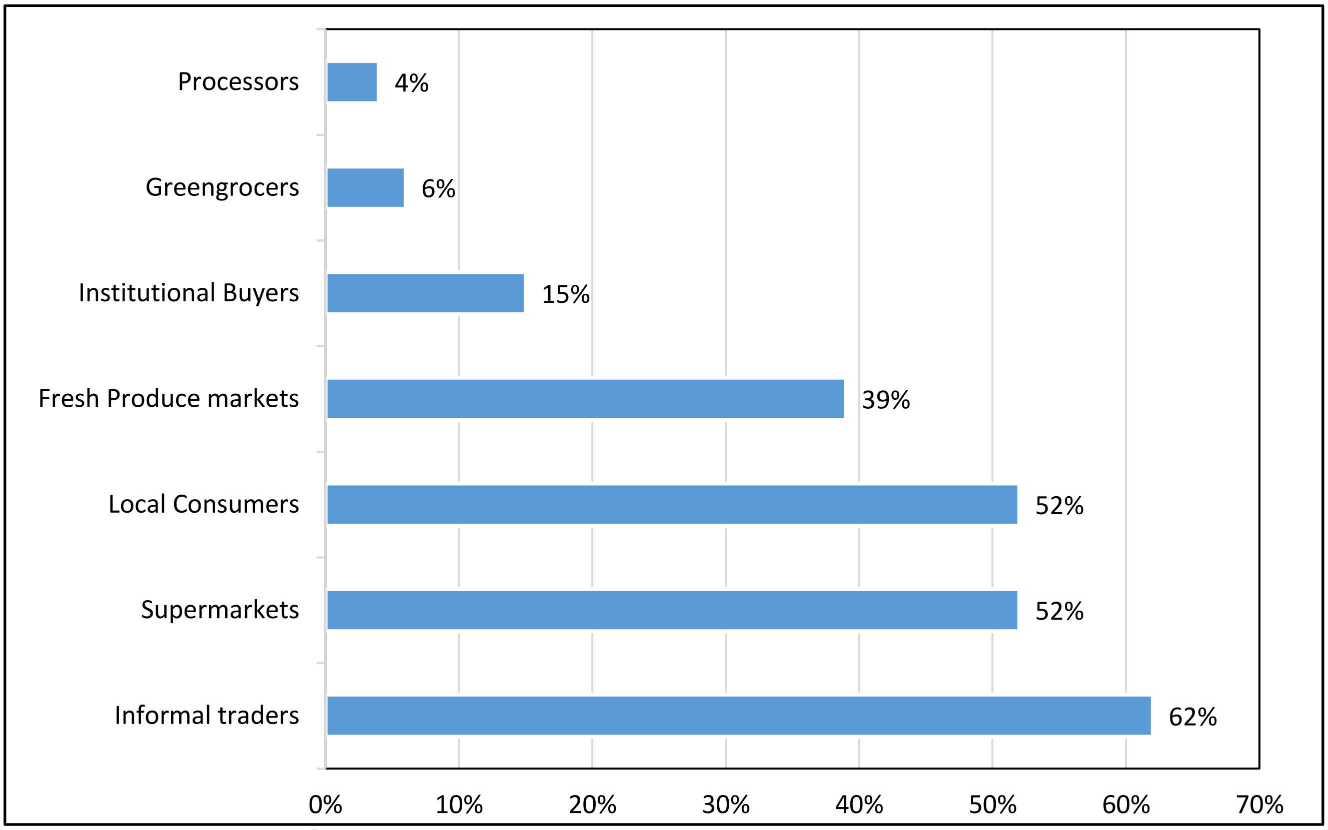


Source: Moneyweb 2018

This picture is consistent with the manner in which fresh produce is moved across various marketing channels in South Africa which also indicates that the informal traders are the most preferred buyers of fresh produce for resale in the informal markets that are a striking phenomenon of the informal agricultural trade in South Africa. Looking at small-scale farmers of Gauteng and the supply chain risks they are confronted with, Louw and Jordaan (2016) concluded that informal traders were the most utilized distribution channel for fresh produce followed by supermarkets.

Figure 2.2. shows the percentage of small-scale farmers in Gauteng utilizing the various marketing channels for their fresh produce. Most small-scale farmers sell their produce to informal traders though they use a combination of channels in order to reduce cost and risk as well as fetch best price for their produce (Louw & Jordaan 2016).

Figure 2.2. Fresh Produce Distribution Channels.



Source: Louw & Jordaan 2016

Fresh Produce Markets in Gauteng only accounted for 39% of fresh produce sales form the small-scale farmers while direct sales (local consumers) and supermarkets accounted for 52% each. Informal marketing channels constitutes the bulk of market share and preferred method of moving product by small-scale farmers of Gauteng. This observation and finding by Low and Jordan (2016) is in line with the view in literature that indicates that small-scale farmers do not have full or desired access to the more formal markets due to arrange of constraints including distance form markets, price information as well as compliance with food safety and hygiene standards.

A large component of the food retail market share that is controlled by the informal sector is made up of fresh produce and other perishable products. These products are largely moved within rural and peri-urban areas through informal markets through the informal traders, direct sales through farmers markets and farm gate sales (Louw & Jordaan 2016). The type of buyer that patronizes these channels ranges from the actual end user of the fresh produce as well as largely the intermediary buyers and sellers who seek bulk and discount buying for their own resale. These latter are operators of spaza shops, bakkie traders, street-side hawkers, taxi rank stall operators and other forms of small businesses located mainly where there is convenience for foot traffic and daily purchases and demand for single items of fresh produce (Tracey-White 1999 and Nobandla 2014).

The informal markets also take the form of organized farmers markets occurring at set dates of the month in designated areas and sometime linked to some event that brings people together such as pension payouts in rural areas and traditional community events. An advantage of these primary rural markets, adding to their resilience is their offering on quality and freshness that consumers prefer (Yue & Tong 2009). Most consumers would rather buy locally produced foods that have maximum freshness and they can access as and when required without the need to stockpile, quality and freshness of locally produced goods has comparative advantage over imported or long travelled processed food stuffs including some fresh produce that might end up having shorter shelf life once purchased (Yue & Tong 2009). There are also larger rural assembly markets where fresh produce is collected for purposes of distribution amongst the smaller regional or village traders as well as other forms of bulk buying. Sometimes these markets coincide with the primary markets where smaller vendors can buy at a discount for resale (Tracey-White 1999). In a study done by Pitts et al. (2014) it was concluded that these types of markets face limited consumer demand due to issues such a location, weather and odd hours of the day or week when the markets are operating, these markets are nonetheless one of the common ways for local traders to get fresh produce at discount rates for resale.

2.4.3. Formal Markets

Formal markets are the most lucrative and higher paying markets for commercial agriculture and larger scale farming. These markets are composed of a range of formations from wholesalers, national fresh produce markets, public service markets (institutional buyers), processors, Greengrocers and supermarkets (retailers) (Simelane 2015). This includes wholesalers that are privately owned and run outside the commission system that govern the agent based national fresh produce markets which will be reviewed in more details below.

The distinguishing feature of the more formal distribution channels for fresh produce is their offering of higher prices and the stringent requirement on quality, volumes as well as consistency of supply (NAMC 2000). The privately run supermarket and retailers usually have their own sophisticated supply chains where there is an increasing level of vertical integration and centralized collection/distribution hubs as well as procuring directly from farmers through an out-grower contract (Louw & Jordaan 2016). As a consequence, small-scale farmers are also not a major supplier to these formal markets due to the stringent requirement on quality and volumes as well as consistency of supply that a retail contract would require over a determined period (Baloyi 2010).

2.4.4. National Fresh Produce Markets (NFPMs)

The National Fresh Produce Markets (NFPMs) are commission based, public marketing infrastructure for fresh fruit and vegetables that have played a pivotal role in the distribution of fresh produce in the South African agricultural marketing system (Department of Agriculture, Forestry and Fisheries 2016). These are a form of wholesale markets which started off as informal assembly markets for collective distribution of fresh produce around specific areas in the various regions of the country around farming towns and peri-urban areas until formalization through separation of national and local markets for agriculture (Chikazunga et al. 2008 and Nobandla 2014). Fresh produce price is determined through a commission system where marketing agents act on behalf of producers in the sale transaction and are paid a commission on produce sold. The marketing agents are in turn governed under Agricultural Produce Agents Council (APAC) which is a body for the regulation of operation of market agents in this sector (Department of Agriculture, Forestry and Fisheries 2016). It is through the price setting mechanism of NFPMs that the benchmarks and price signals are provided for the rest of fresh produce trade in the country (Department of Agriculture, Forestry and Fisheries 2016 and Swart 2016).

There are currently 19 registered NFPMs located in various provinces and regions across South Africa with various sizes in terms of volumes and demand as well as regional or local significance (Simelane 2015).

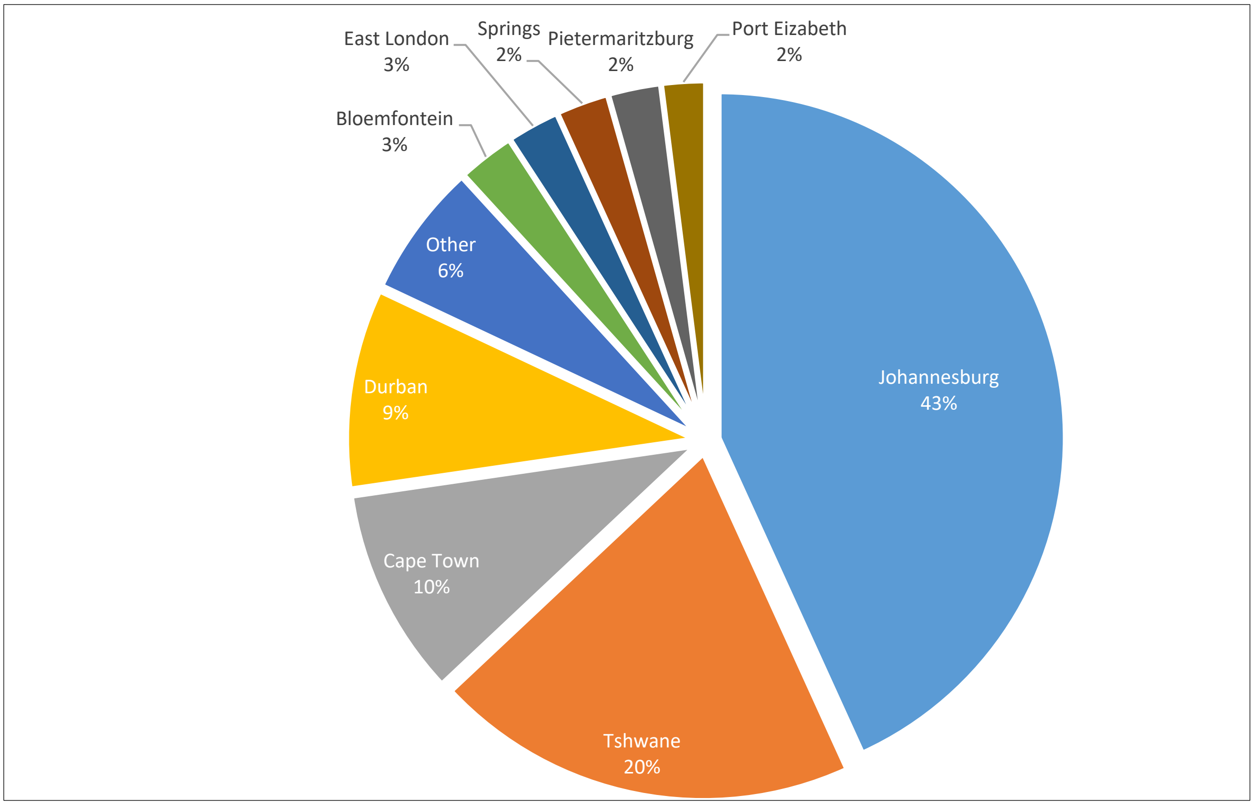
Table 2.2. National Fresh Produce Markets of South Africa

1. Johannesburg	2. Durban
3. Tshwane	4. Bloemfontein
5. Cape Town	6. East London
7. Vereeniging	8. Nelspruit
9. Uitenhage	10. Springs
11. Witbank	12. Pietermaritzburg
13. Mpumalanga	14. Port Elizabeth
15. Kei	16. George
17. Kimberly	18. Welkom
19. Klerksdorp	

Source: Department of Agriculture, Forestry & Fisheries 2016

The overall share of fresh produce marketed through the National Fresh Produce Markets has been decreasing over time in South Africa due to intensifying consolidation in the fresh produce food value chain and growth in the food retail sector (Chikazunga et al. 2008). Another stated reason for the decline in market share for the NFPMs is the aging infrastructure that was poorly maintained and improved over the past three decades (Department of Agriculture, Forestry and Fisheries 2016). The National Department of Agriculture Forestry and Fisheries has since 2013 embarked on project rebirth which is an effort to revive all the fresh produce markets in the country through investment in infrastructure improvements as well as strengthening governance, hygiene and quality control measures (Department of Agriculture, Forestry and Fisheries 2016).

Figure 2.3. National Fresh Produce Market Share in South Africa 2015.



Source: *Department of Agriculture, Forestry and Fisheries* ***2016***

Figure 2.3. shows that the Johannesburg Fresh Produce Market is the leading NFPM in terms of market share though there was a slight decline from 48% in 2011 to about 43% in 2015 (Department of Agriculture, Forestry and Fisheries 2016 and NAMC 2006). Other key markets are Tshwane (20%), Cape Town (10%) and Durban (9%), which combined with the Johannesburg market have increased their market share in terms of turnover from 74% in 2011 to 82% in 2015 (Department of Agriculture, Forestry and Fisheries 2016 and Louw & Jordan 2016).

The KwaZulu-Natal based NFPMs are the Durban (10%) and Pietermaritzburg (2%) fresh produce markets and these have shown a decline in market share overall between 2015 to 2016 with the Durban market registering no growth over the period while the Pietermaritzburg market has lost about 4% in market share. Though NFPMs were designed to accommodate all farmers, large scale and small-scale, the small-scale and previously disadvantaged farmers remain a small player in these NFPMs. In the Johannesburg NFPM, the market share of small-scale farmers account for 3%

of total business of the market and the rest of the share goes to large scale commercial farmers (Louw & Jordaan 2016). Overall in the country's NFPMs it is estimated that small scale farmers supply only up to 10% of the volumes due to the variability in nature of their produce and supply as well as a plethora of other limiting factors to access to these very markets by small scale farmers (Chikazunga et al. 2008). One of these limiting factors to market access that has been common throughout literature is the lack of access to market information for small-scale farmers to make informed decisions about accessing these formal markets (Baloyi 2010). The government at both national and provincial departments have put in place some measures to provide market information to all farmers including small-scale farmers. The contention of the study is that such measures are not adequate and not suitable for small-scale farmers for various reasons. The next sections will provide background on the nature of market information service on NFPMs provided by the KwaZulu-Natal Department of Agriculture and Rural Development (KZN DARD) as well as the National Department of Agriculture, Forestry and Fisheries (DAFF).

2.5. NFPM Market Information Services by KZN Department of Agriculture and Rural Development

KZN Department of Agriculture and Rural Development is the main public sector stakeholder for smallholder farmer development in the province. The department has a range of services offered in its ten district municipal areas as well as central coordination and support available at head office in Cedara, Pietermaritzburg. The vision of the department is to create "an inclusive, sustainable and radically transformed agricultural sector that builds thriving communities in balance with nature through advanced sound agricultural practices that stimulate comprehensive economic growth, food security and advancement of rural communities (KZN Department of Agriculture and Rural Development (2018, p.10). There is clear alignment in the departmental sector strategic goals and those of the province at large as outlined for the economic growth through agriculture in the Provincial Growth and Development Plan 2016-2020 (KZN Planning Commission 2017). The most relevant strategic goal which is of interest to this study is that of provision of "timely and relevant agricultural economic services to the sector in support of sustainable agricultural and agri-business development to increase economic growth" (KZN Department of Agriculture and Rural Development (2018, p.27). This services are provided through a dedicated team of agricultural economists based throughout the districts and the head office which is where information is collated, analysed and distributed to farmers and other clients of the department for various reasons in line with the strategic objective of the department on agricultural economic services.

The nature of service that the provincial department of agriculture offers is linked to the national/transversal indicators and targets for this nature of service throughout the country. The strategic objectives in this regard are briefly outlined below as well as the type of services and information dissemination that is currently utilised and available at the KZN Department of Agriculture and Rural Development as far as market information is concerned.

Strategic Objective 1: Agri-business Support and Development

The main aim of this sub-programme goal is to provide agri-business (including small-scale farmers) with support through entrepreneurial development, marketing services, and value adding advice, and production and resource economics. This goal is also aligned to the national strategy for marketing as developed and promoted by the national department of agriculture (DAFF).

Indicator 1: Support with agricultural economic services to access markets

- **Farm Business Planning and Advice**

These services are also provided in the form of advice at the stage of business or enterprise plan development where it is common sound principle and practice in agri-business to be aware of which markets the intended crops are being grown and at what prices are likely to sell. This exercise is usually confirmed through a letter of intent or an offtake agreement for the famer that can be used to source funding as well as to inform the cash flow projection for the foreseeable operation of the agribusiness enterprise.

- **Market Linkages**

These services may assist a farmer to locate markets where they can sell their produce. For example, in a locality a departmental official can either target famers to assist or be contacted through walk-in or telephonic enquiry by a farmers about which markets to sell their produce to. Given the importance of fresh produce compliance with the required markets standards, the national department also works with the provinces and the Perishable Products Export Control

Board (PPECB) in putting suitable farmers though a programme for South African Good Agricultural Practices (SA-GAP) certification. The programme includes pre-screening and addressing of non-conformances of the farm, training the farmer on the importance of SA GAP and how to stay certified as well as annual renewal of certificates where they are issued.

2.6. Market Research, Intelligence and Market Information

This is the key component of agri-business development support service that the government offers which relate directly to the development and dissemination of market information for the purposes of farmer development. In this regard, the DARD develops two types of information bulletins on market information that are made available through various means to the public and smallholder farmers.

- *Quarterly Fresh Produce Market Bulletin*

This is a NFPM (KZN) market information bulletin which collates price and volume information from the two fresh produce markets in the province being the Pietermaritzburg and Durban fresh produce markets. The information bulletin is a critical source of market information giving historical trends in both volumes and prices of fresh produce in the two markets. The trends are also contrasted on an annual basis per quarter to determine market position based on the environment that the province is operating in. This information is largely disseminated through publishing on the national MIS website which is maintained by DAFF as well as on the provincial departmental website. There are some requests for this information by walk in clients and the same information is sometimes distributed through farmers' information days that are usually held in the districts where farmers operate. From the data provided by the National Department of Agriculture (DAFF) on monthly averages for prices and volumes of all traded commodities in NFPMs, the KZN NFPM quarterly bulletin is developed. This bulletin basically covers about 10 vegetables that are traded in the Pietermaritzburg and Durban Fresh Produce Markets looking at the following aspects:

- *Volumes*

The bulletin covers aspects such as total volumes traded over a three month (for instance, January to March 2017) period of the previous year and then comparing these to the current year same period (for instance, January to March 2018) by computing percentage changes in volumes traded per market per product and highlighting highest and lowest months of volumes.

Figure 2.4. Excerpt of the KZN DARD Market Information Quarterly Bulletin for Quarter 2 of 2017.

2.4. CABBAGE

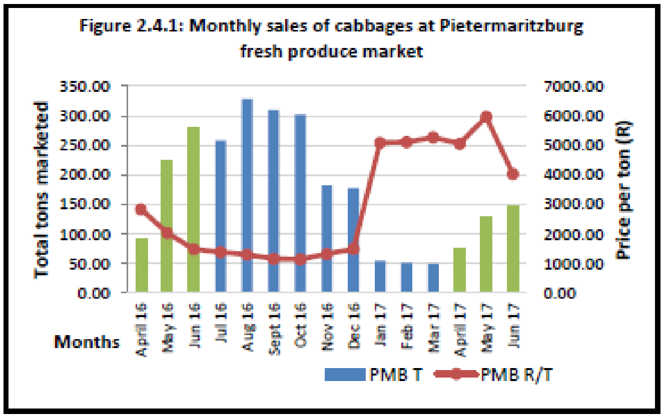


Figure 2.4.1. depicts monthly volumes and prices of cabbages marketed at Pietermaritzburg FPM. Quantities supplied show 41.6% decline from 594t Q2 of 2016 to 353t in Q2 of 2017. Volumes have largely declined from third quarter of 2016 where highest volume was recorded at 328t in Aug 2016 and lowest volume was at 54t in Mar 2017. The response in price seems to have been more drastic with over 2 times increase on average from R2, 118/t in Q2 of 2016 to R5, 015/t in Q2 of 2017. Opposite to the volume trend as expected price of cabbage in this market has generally increased with highest price at R5, 963 recorded in May 2017.

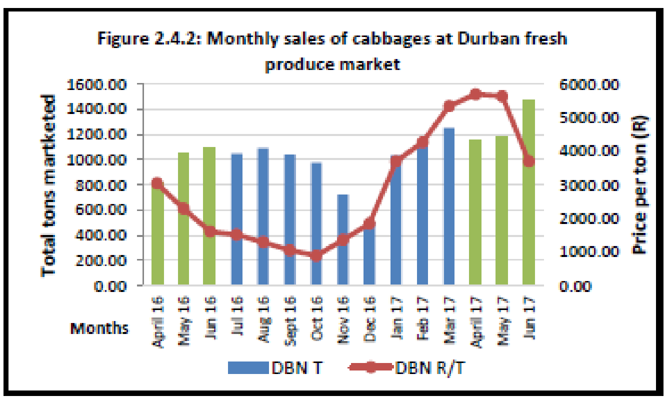


Figure 2.4.2 illustrates the monthly volumes and prices of cabbages marketed at Durban FPM. Quantities supplied increased by 29% comparing Q2 of 2016 at 2, 943t to Q2 of 2017 at 3, 808t. Volumes supplied in this market have generally fluctuated from quarter to quarter with lowest volume recorded in Dec 2016 at 500t. Prices have more than doubled in the two quarters from an average price of R2, 312/t in Q2 of 2016 to R5, 003/t in Q2 of 2017.

Prices have not seemed to move opposite to the price especially in Q1 of 2017, volumes were increasing in the market so was the price up to its highest point in May of 2017 at R5,689/t after which it drops in June 2017.

Source: KZN Department of Agriculture and Rural Development 2018

- *Prices*

The bulletin also covers the price of fresh produce in the similar intervals and fashion as the volumes. Prices are then computed for percentage changes over a period of time as well as to underscore prices that have been seen as most stable or volatile over a certain period of time. The example of a quarterly analysis for the Durban and Pietermaritzburg Market is indicated below.

- **Limited Market Information**

Figure 2.6 shows the format of information for cabbage from both the Durban and Pietermaritzburg fresh produce markets as found in one of the quarterly fresh produce market bulletins on the KZN DARD website as published. The information contained in the bulletin and analysis provided does not adequately cover all aspects of trend movement in both volumes and prices as well as possible reasons this might be the case. The bulletin does reports unexpected movements in price and volume trends that sometimes defy the supply and demand theoretical logic of economics but rarely an explanation or investigations in this regard. By computing sensitivity analysis as indicated by price elasticity of supply over time, this research will make available an expanded scope of information that all actors including small-scale farmers can utilize in decision making especially for the purposes of marketing of fresh produce in the two markets of the province.

From the data provided by the national department, the provincial department can also make available longer term considerations and tracking of the trends in the fresh produce markets in the province. Understanding these can aid a better understanding of the agricultural industry of the province in the traded commodities. The longer term information can also be useful in examination of impacts of supply shocks, periodic events and natural disasters such at the recent drought as well as inform decision making and inputs by policy makers with regards to market subsidies, and other government aid instruments to the agricultural sector.

- **Limited Utilisation and Access**

As it stands only farmers and other clients who have access to the internet or are closer to Cedara (Head Office) can readily access this information. Access to information and technology is not yet that easy for small-scale farmers who are sometimes far from the head office as well as do to have reliable access to the internet and the ability to sift through information for this relevant bulletin.

- *Weekly Price Bulletins*

This type of information is a summary of prices for a set of a few traded vegetables, fruits, and livestock commodities in the province. The information is made available weekly for utilisation by staff in the main so that they are able to advice the farmers who do not have access to websites and to have on hand information to inform decision making where relevant. The most common way of dissemination for this information is through emails to agricultural economists and advisory staff in the districts away from head office. This information is also distributed on request by telephonic and walk-in clients as well as in farmers' information sharing days where staff are invited to talk.

2.7. Conclusion

Agriculture as a primary sector has a considerable contribution to make to the economy of KwaZulu-Natal which is largely rural in nature and still has potential to bring the vast tracts of underutilized land and other resources into production for farming purposes. Smallholder agriculture is the dominant economic activity by the rural poor for both income generation as well as household food security. The provincial government sets itself objectives to graduate some of the farmers in the smallholder categories to fulltime commercial farmers by 2035 in order to improve economic growth as well as create jobs in upstream sectors such as agro-processing (KZN Planning Commission 2017).

Smallholder farmers, in turn are inundated by a wide range of constraints stemming largely from the high costs of doing business in the rural areas. One of the resulting obstacles from these transactions costs is the inability of small-scale farmers to access formal markets and improve their incomes from farming. Smallholder farmers utilize the informal marketing channels and have potentials to access formal markets including the public National Fresh Produce Markets. Agricultural market information that can be utilized effectively by smallholder farmers remains an important contributing factor to the success of agribusiness in the rural areas which can lead to sustained job creation and economic growth. The current state of service regarding the NFPM market information as provided by the Department for the two provincial NFPMs is useful but insufficient for the needs of its clients considering the depth of information provided as well as means of distribution of this information which is largely on the interment.

The next chapter will introduce the materials and methods that are going to be used for this study as well provide philosophical grounding for the chosen approach to data collection and analysis. The succeeding chapters 4 and 5 will cover the results from data analysis as well as recommendations and conclusions for the improvement of market information provided by the KZN Department of Agriculture and Rural Development and dissemination of such information.

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Introduction

This chapter will introduce and discuss the methodology and analytical framework that will be followed in carrying out this research. Business research can be defined as a "critical and objective investigation of data or facts in order to resolve a specific problem and to inform decision making" (Sekaram & Bougie (2013, p.3). The approach to research can be shaped by four determined philosophical worldviews being: positivism, constructivism, transformative and pragmatic research approaches (Creswell 2014). Positivism is a world view where deductive reasoning is used to develop theories and laws in which things are believed/proven to operate based on experiments or natural observations (Sekaram & Bougie 2013). This way positivists can provide answers to problems through determining causality relationships between variables or present situations as they have been found to be as objectively as possible since the researcher distances themselves from the subject (Saunders, Lewis & Thornhill 2009 and Sekaram & Bougie 2013). The approach that this study will take is that of a positivist view in the sense that observations and recordings of prices and traded volumes for various products of fresh produce at the Durban and Pietermaritzburg NFPMs will be analyzed for further information with an aim to enhance decision making by all relevant actors and users of such information (Sekaram & Bougie 2013 and Creswell 2014).

This chapter will look at the quantitative approach to research, data collection and data sampling, data analysis approaches, limitations to the study and generalization of findings as well as a concluding remark on the chapter as a whole.

3.2. Quantitative Approach

Quantitative research is concerned about what is (the present state) as opposed what should be (futuristic view), other words defining the situations as they are (Cohen & Manion 1980). This approach is in line with the positivist view that the world facts already exist and what research does is to bring knowledge to the fore by answering research questions and expanding scope for inquiry and further probing. Quantitative approaches to data collection and analysis are best suited to positivist claims on knowledge and experiments as researchers seek to provide solutions to problems (Creswell 2014). Quantitative research methods are good for generation of numeric characteristics of data for subject populations such as trends, similarities and causality among dependent and independent variables through sampling and experiments (Sekaram & Bougie 2013 and Creswell 2014). A quantitative research is useful when the answers we seek are numeric in nature and they also indicate a numeric change in one variable as compared to another (Sukamolson 2007). Quantitative approach is therefore suitable for this study since the results seek a numeric estimation of supply responses of various fresh produce to price fluctuations in the national fresh produce markets of KwaZulu-Natal. This information as statistics will then assist farmers and industry actors alike to make more informed decisions as they engage in their agribusiness.

Quantitative analysis will be used on numerical observations to describe and analyze the characteristics of the products traded in the KZN fresh produce markets. Descriptive studies can either be qualitative or quantitative in nature which may include collection and analysis of quantitative data such as sales and production figures or data that explains demographic characteristics such as behaviour which may be collected through interviews (Sekaram & Bougie 2013). This research will utilize secondary data from fresh produce market records of prices and volumes to estimate, analyze and interpret the price elasticity of supply for fresh produce in the fresh produce markets within KZN.

3.3. Data Collection

Data for the study will be sourced from secondary sources using literature review as well as existing data from statistics of fresh produce markets that are maintained by the national department of agriculture. This data will be observations from an uncontrolled environment (daily recordings for volumes and prices) that have been compiled into monthly averages for prices and volumes of a range of fresh produce products traded at the Durban and Pietermaritzburg fresh produce markets of KwaZulu-Natal. The data will be a longitudinal selection of data collected by the national department of agriculture over a period of five years from 2012 to 2016. Further data, information and views will be collected through literature review in the subject of the study, agricultural industry organizations websites and documented opinions from industry experts.

3.4. Data Sampling

Since the study will be utilising mostly secondary data, the method of sampling that has been chosen is that of convenience sampling in order to account for data availability as well as completeness of data for the two fresh produce markets as well as product selection within the two markets based in KZN. Convenience sampling has been chosen for its ease of creation of a sample as well as cost effectiveness because the study utilises data which is already available. One of the disadvantages of using convenience sampling as described by Sekaram and Bougie (2013) is that the results from such a study are not generalizable at all. This will not be a problem for the current study since the aim is to investigate the characteristics and trends of the products sold at the Durban and Pietermaritzburg Fresh Produce Markets over the determined period.

There is about 200 products traded on the fresh produce markets of KZN at various volumes and times of the year. Top five traded fruit and vegetables in each market in terms of volumes will be utilized for the research based on their reasonable importance to the markets and traders. This is to ensure that there is enough and complete data for the frequently traded fruits and vegetables as opposed to seasonal and lower volume products that are traded in the market. These prices and volumes will be looked at for over a period of five years from 2012 to 2016 in order to account for the major shocks in supply that have affected the agricultural industry over the five year period including the drought of 2014 to 2015.

3.5. Data Analysis

This sections of the methodology chapter presents how data will be analysed in the study in order to answer the key questions of the research and fulfil the objectives of the research. These key questions will be answered from the broad literature review on the agriculture industry and small scale farmers as well as the nature of market information services at the department of agriculture at the moment which is the key foundation of the data collected as well as analysis and expected end user for the recommendations of this study.

3.5.1. Literature Review

Literature is the body of knowledge that is available to the researcher at the time of decision on a topic to pursue (Sekaram & Bougie 2013). A review of this information and knowledge is an important aspect of research since it gives the reader a feel of the ongoing discourse around the topics of interest as well as shares the results of ongoing research on the topic (Creswell 2014). In order to respond to the key questions posed by this study, a literature review will provide the basis from which the background to the study will be premised, give an overview of the provincial agricultural sector as well as the constraints faced by small-scale farmers in accessing markets of which access to market information is one. Then a brief insight into the agricultural market information services provided by the KZN Department of Agriculture and Rural Development to its clients will be provided. It is this agricultural market information services that the study seeks to provide ways to improve in order to enhance decision making by farmers and agri-business at large.

3.5.2. Price Elasticity of Supply

Elasticity of supply measures the responsiveness of quantity supplied of a good or service to a change in any of the factors affecting supply of the good or service (Parkin, Powell & Matthews 2008). Price of a product or service is one of the supply influencing factors, when other factors such as seasonality and availability of substitutes are assumed not to change, a measure of responsiveness of supply to price fluctuations can be defined as the price elasticity of supply (Parkin et al. 2008). The expected relationship between prices and quantities of goods and services supplied is positive, meaning that the two variables move together (Parkin et al. 2008). This relationship between prices and quantity supplied is underpinned by the innate expectation that all producers seek to make profit, and for profit to be realised prices of output have to be as high as possible and that of inputs to production be as low as possible as both these variables are key components of the production function (Rodriguez, 1986 and Gosalamang 2010).

The product supply response can either be elastic, inelastic or unitary elastic (Parkin et al. 2008). An elastic supply response suggest that a smaller percentage change in price is likely to induce a larger percentage change in volumes of the product supplied, in this case the measured elasticity of supply is greater than one (1) but not infinitely large (Parkin et al. 2008). An inelastic supply response is observed when a larger percentage change in price induces a smaller percentage change in quantity supplied for the good/service and this figure greater than zero (0) but not larger than one (1) (Parkin et al. 2008). Unitary elastic supply suggests that the price and quantity of the goods or service are equal in percentage changes and the elasticity measure equals one (1) (Parkin et al.

2008). General descriptive statistical analysis will be used to analyze data characteristics through the generation of averages, trends, frequencies as well as proportions and graphs. The sensitivity of quantity supplied of the top five traded fruits and vegetable products at the two KwaZulu-Natal based fresh produce markets will be estimated using the simple price elasticity of supply formula:

$$\textbf{Price Elasticity of Supply } (\mathbf{P_{ES}}) = \frac{\textbf{\% } \Delta \textbf{ Quantity Supplied}}{\textbf{\% } \Delta \textbf{ in Price of Product}}$$

It is important to note that soliciting a perfect supply response to price and other non-price factors is complex since producer decisions are affected by many variables before the product reaches the markets (Rao 1989 and Gosalamang 2010). Most studies that have looked at elasticities for agricultural commodities have employed the Nerlove model of elasticity estimation for agricultural commodities which looks at the scale of production as a response variable and the other supply influencing factors as independent variables (Diebold & Lamb 1996). These other factors are natural resources availability such as drought or floods, production subsidies and other incentives for agriculture, the price of inputs, technological advancements and others (Gosalamang 2010).

Though the Nerlove Model of agricultural supply response estimation has been widely used there have been varying results for the same crop in different regions as well over different time horizons in its application (Diebold & Lamb 1996). Due to limitations on data availability, this study will not use the Nerlovean model but will do a simple estimation of the price elasticity of supply in the KZN Fresh Produce Markets assuming that all other factors are kept constant and looking only at the variations in volumes and prices in the markets over the period 2012 to 2016. This approach to the study adds to the limitations in use and interpretation of results as well as inadequacies in the estimation of the probable supply response should other factors be considered and controlled for through dynamic economic modelling techniques such as the Nerlovean model and its many variations. A brief review of some applications of the Nerlovean model is provided below:

Rao (1989) completed a survey of agricultural commodities supply response to both economic and non-economic factors. This study revealed the complexities of objectively determining supply response for agricultural commodities since they are affected by factors beyond one at the same time and since observed data is already in the past, the ability for prediction and generalizations of results and estimates is very difficult. The study also offered a vigorous critic of the Nerlovean Model and proposed some reasonable adjustments for various factor consideration.

Price and non-price elasticity of supply for maize production in South Africa was estimated by Shoko, Belete and Chaminuka (2016) using the Nerlovean technique. The study found that maize production as measured in hectares dedicated to the production of maize was less responsive to price changes than it was to non-price factors such as rainfall and technology adoption and changes.

Gosalamang (2010) used the Nerlovean partial adjustment model to estimate the supply response among beef farmers in Botswana considering both price and non-price incentives to supply. This study found that beef farmers of Botswana were positively influenced by price changes for beef and negatively affected by other variables such as consumption of substitutes, rainfall and total size of their beef herd.

Other vigorous studies in the estimation of own-prices elasticities for food and fresh produce utilized the Almost Ideal Demand System (AIDS) model coupled with a variation of multi-stage budget system and logarithmic functions to estimate both income and demand elasticities that were able to give more insight into the behavior of consumption, supply as well as preferences of consumers under conditions of affluence in terms of income (Hayward-Butt & Ortmann 1994; Agbola, Maitra & McLaren 2002 and Mkhabela 2016).

3.6. Limitations of study

The study will not consider the full supply response of various commodities at the two fresh produce market. The results therefore will only indicate the supply response in the market for the few selected products based only on price of the product with no effective control or accounting for the supply and other supply elasticity influencing factors. As such, the generalisation of the results from this study will be limited. As was indicated above, most empirical studies on agricultural commodities supply response have considered a wider range of time series data and also employed the Nerlovean Model and an adaptation of this model in order to effectively account for the effects of the external environment and other nuances that affect the numerical estimates of the elasticity of supply.

3.7. Conclusion

Chapter three has presented the basis for the methodology followed by this research as well as consideration for other studies in the similar area of research including limitations of the study and generalisation of results. The philosophical foundation of the study is that of a positivist view to the world and existing knowledge with an aim mainly to describe the state of market information services at the KwaZulu-Natal Department of Agriculture and Rural development and how these services can be improved departing from historical information obtained from the national fresh produce markets based on KwaZulu-Natal.

Chapter four will describe, analyse and interpret results from data analysis process as well as provide conclusion and lessons from both the study and literature review in the topic. The ensuing chapters will presents results from data analysis as well as conclusions and recommendations.

CHAPTER 4

4. DATA ANALYSIS AND INTERPRETATION OF RESULTS

4.1. Introduction

This chapter will present, analyse and interpret results of data collected from the KwaZulu-Natal Fresh Produce Markets. Data for both markets, fruit and vegetables volumes and prices over the period 2012 to 2016 will be presented and analysed through simple excel spreadsheet formulae, functions and graphs. Graphs will be used to present general observations of summarised and consolidated statistics and trends as may emerge from the data. The data analysis exercise will conclude by presenting and interpreting the elasticity of supply of the top five traded commodities for both categories of fresh produce in both markets over the period 2012 to 2016.

The key objectives of the study will be addressed by analysing price and volume trends overall in the two fresh produce markets of KwaZulu-Natal, estimating price elasticity of supply for the top five traded fresh produce (fruits and vegetables) for both markets as well as proposing ways in which the provincial Department of Agriculture's market information services can be enhanced for improved decision making by all its users and clients.

1. To analyze trends in the Fresh Produce Markets of KwaZulu-Natal over the past five years (2012-2016) for fresh produce (fruits and vegetables).

2. To calculate and present simple annual price elasticity of supply estimation for the top five trades fruits and vegetables in both provincial fresh produce markets over the five year period 2012 to 2016.

3. To propose ways in which Fresh Produce Market statistics and reports published by the KwaZulu-Natal Department of Agriculture and Rural Development can be improved and disseminated to enhance decision making for interested stakeholders

4.2. Trend Analysis in the Fresh Produce Markets

Fresh produce market data from the National Department of Agriculture (DAFF) has been collected through information request using a gatekeeper's authorisation provided by the head of department's office based at Cedara in the Provincial Department of Agriculture and Rural Development. This is data freely available on request as kept for information and research purposes by the government in order to monitor various objectives and indicators in the national fresh produce markets. This data is presented in Excel format spreadsheets containing a full set of monthly and annual observations of prices, volumes and gross income per product for well over 100 types of fresh produce in both fruits and vegetables depending on the availability as well as tradability/demand of fresh produce per region and location of the fresh produce market.

4.2.1. Data Presentation

National Fresh Produce Market data is available for all fresh produce markets in the country and is summarized from daily price and volume observations to monthly totals and annual averages. Table 4.1 below presents a snapshot of a set of monthly and annual volume (tons) and price per ton for potatoes in the Durban Fresh Produce Market for the year 2016.

Table 4.1. A Representation of Price and Volume Data for Potatoes in the Durban Fresh Produce Market (2016)

POTATOES		Jan	Feb	Mar	Apr	May
	Volumes (Tons)	12 240,8	11 278,8	12 497,9	15 915,5	15 950,6
	Total Income	R65 874 970,0	R68 640 199,1	R80 545 271,4	R79 992 721,1	R71 805 312,2
	Average Price (Rand/Ton)	R5 381,6	R6 085,8	R6 444,7	R5 026,1	R4 501,7

POTATOES		Jun	Jul	Aug	Sep	Oct
	Volumes (Tons)	15 400,5	14 849,8	15 100,5	15 460,6	14 702,3
	Total Income	R70 629 166,4	R63 348 222,2	R61 995 710,9	R64 613 800,1	R71 197 381,5
	Average Price (Rand/Ton)	R4 586,2	R4 265,9	R4 105,6	R4 179,2	R4 842,6

POTATOES		Nov	Dec	2016	2015
	Volumes (Tons)	16 552,4	17 999,2	177 948,8	214 409,2
	Total Income	R75 506 462,7	R82 828 239,1	R856 977 456,6	R625 991 398,0
	Average Price (Rand/Ton)	R4 561,7	R4 601,8	R4 815,9	R2 919,6

Source: Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

Similar information as in the annual table presented above for potatoes in the Durban Fresh Produce Market is available for a year for all markets and all products. Each year's data is concluded with a summary of totals from the previous year for that line item such as in the example of potatoes above where the excel document was for 2016 observations, and 2015 totals and averages are provided as an additional column for a quick comparison. The data were then sorted to isolate only the Durban and Pietermaritzburg Fresh Produce Markets relevant information for all the five years annual documents containing data for all the 19 national fresh produce markets in the country. Within the KwaZulu-Natal relevant data, further cleaning and sorting of data was done to remove line items where there had not been produce for over a 12 month period. For example the Pietermaritzburg Fresh Produce Market rarely had any recordings for the product "stir-fry" under vegetables, yet this was a commonly traded item in the Durban Fresh Produce Market.

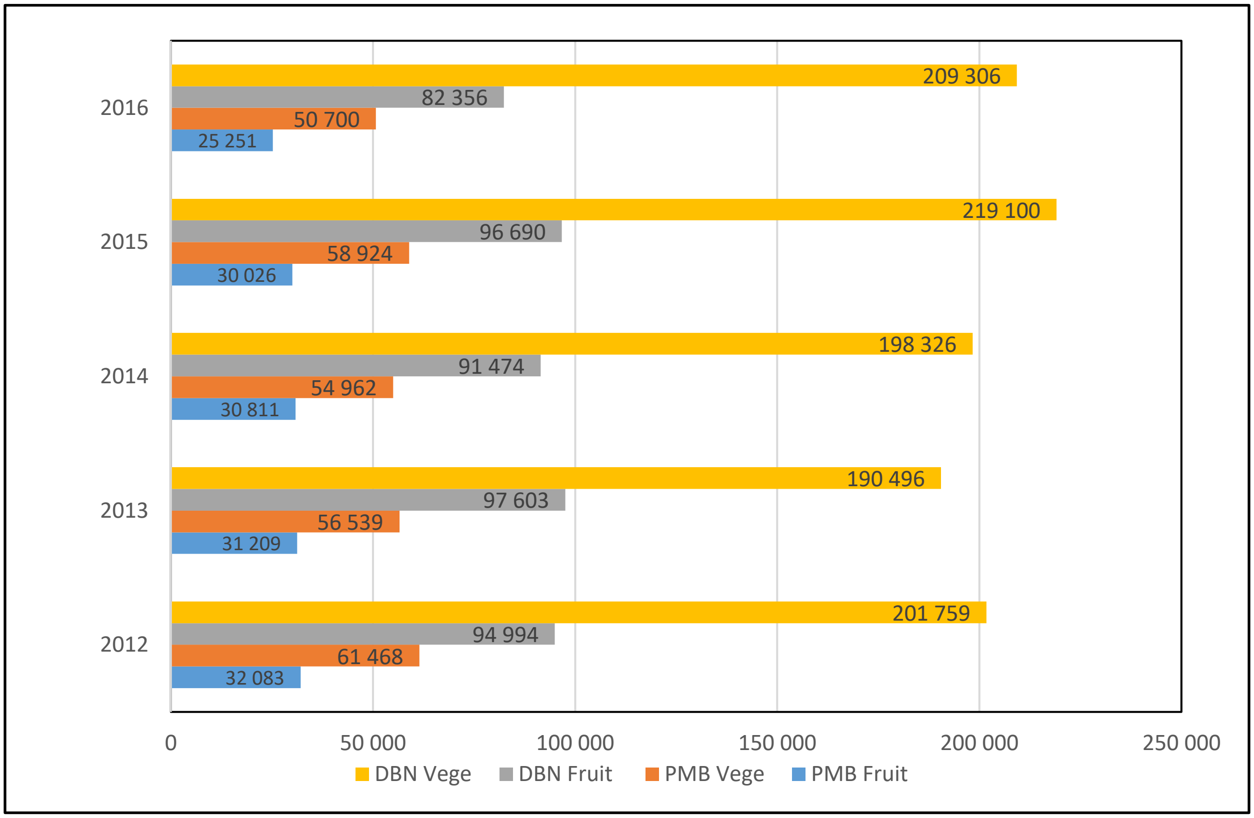
4.2.2. Diversity of Fresh Produce in the Markets

There is about 152 products traded in the fresh produce markets of KwaZulu-Natal with 92 vegetables and 60 fruits. Fruits include deciduous fruits, nuts, citrus and subtropical fruits. Some vegetable varieties include minimal value addition such as stir-fry preparations, broccoli-cauliflower mix, salads as well as seed potatoes. A list of fresh produce traded in both markets is available in table A1 in annexure A.

4.2.3. Traded Volumes Trend of Fresh Produce

Figure 4.1 shows the performance of KZN Fresh Produce Markets in terms of volumes for both fruit and vegetables in total trade over the period 2012 to 2016. The Durban market is consistently larger in terms of volumes for both vegetables and fruits over the years. The highest annual volumes traded in the markets occurred in 2015 at 219 100 tons for vegetables supplied and sold at the Durban Fresh Produce Market. Pietermaritzburg vegetable supply has been declining over the period from a highest of 61 468 tons in 2012 reaching lowest in 2016 at 50 700 tons. Fruit supply to the Durban Fresh Produce Market has been at most sporadic, with alternating direction of change in terms of increases and decreases annually since 2012. The highest volumes were observed in 2013 at 97 603 tons and the lowest volumes occurred in 2016 at 82 356 tons. Fruit traded in the Pietermaritzburg Fresh Produce Market seems to be consistently declining over the period which is an opposite trend to the quantities supplied to the Durban Fresh Produce Market where though there was a decline in 2014, volumes have picked up in 2015 and onto 2016. The lowest volumes for fruit supply in the Pietermaritzburg market were observed in 2016 at 25 251 tons declining steadily per annum from a high of 32 083 tons in 2012.

Figure 4.1: Annual Volumes (tons) of Fruit and Vegetables in the KZN National Fresh Produce Markets, 2012 to 2016.

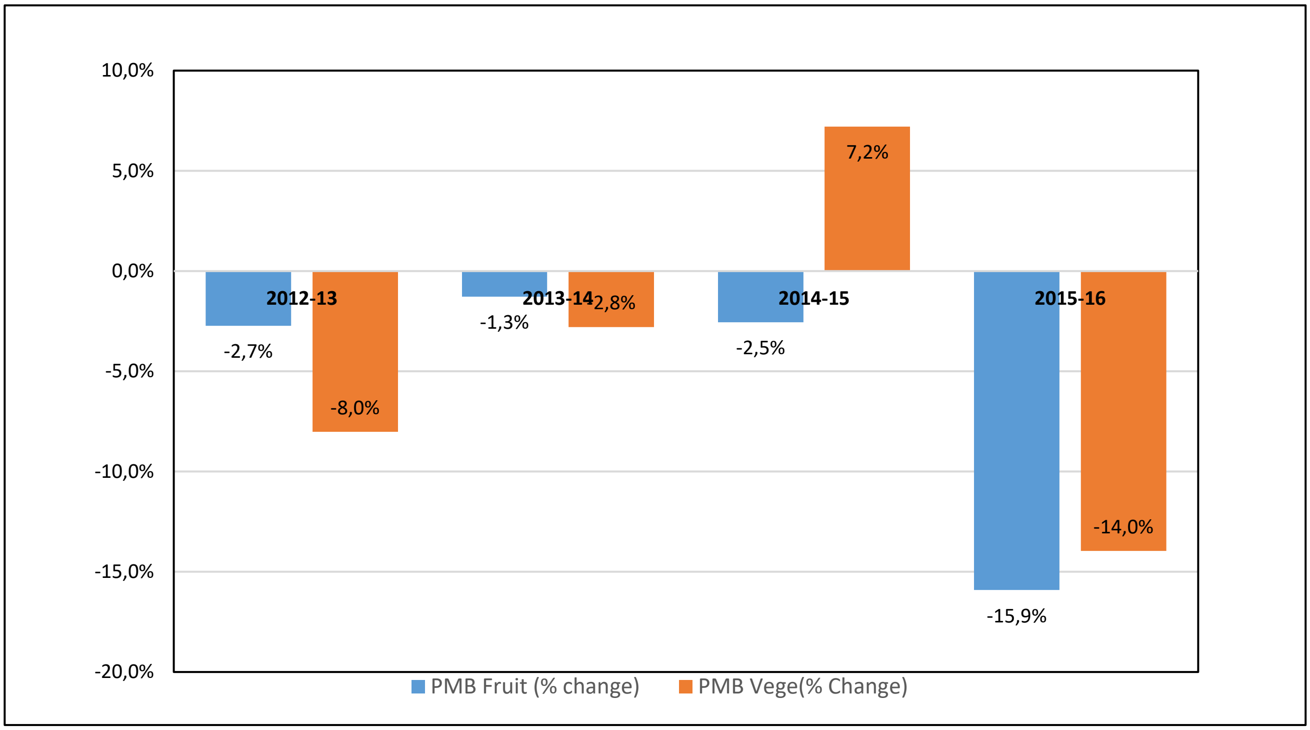


Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

4.2.4. Trend in Annual Changes in Fresh Produce Supply

Figure 4.2 presents the annual percentage change in quantities of fruit and vegetables supplied to the Pietermaritzburg Fresh Produce Market from 2012 to 2016. Fruit supply in this market has been continuously declining over the five year period in consideration with the highest decline recorded between 2015 and 2016 at 15,9%. This is possibly owing to the effect of the drought which affected KwaZulu-Natal and other parts of the country which was eventually declared a national disaster in late 2015 by the national minister of the Department of Cooperative Governance and Traditional Affairs (Singh, 2015).Vegetable supply likewise has also been largely declining except for a slight annual increase of about 7,2% between 2014 and 2015 after which volumes supplied decline dramatically with a percentage decline of 14% from 2015 to 2016 also due to drought conditions in the province.

Figure 4.2: Annual Percentage Change in Supply for Fruits and Vegetables in the Pietermaritzburg FPM, 2012 to 2016.



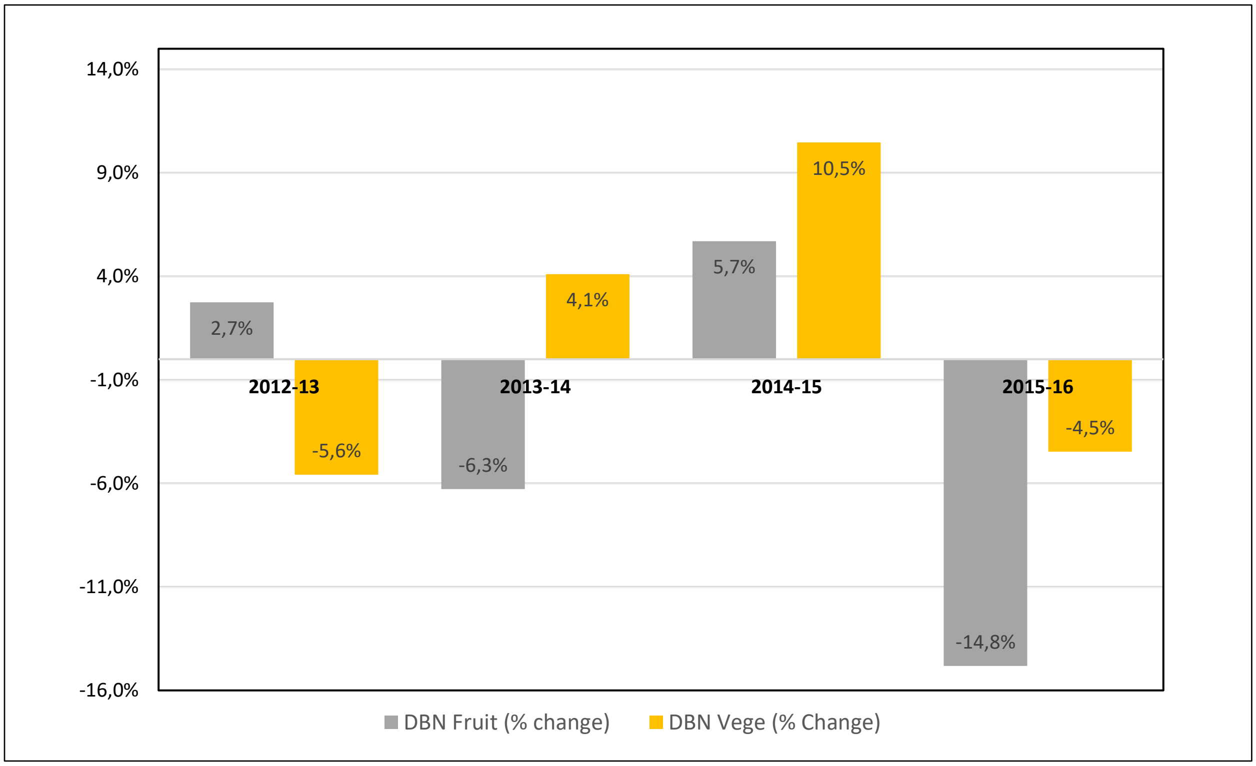
Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

In the Durban Fresh Produce Market, vegetable supply improved from a 5,6% decline of 2012-13 to reach a peak percentage increase of 10,5% in 2104-15 which was followed by a sharp decline of about 4,5% recorded for the 2015-16 period. Percentage change in fruit volumes have been rather sporadic with largest annual percentage change decline of 14,8% recorded between 2015 and 2016. The decline in volumes for both fruits and vegetables in this market can also be attributed to the drought of 2015 to 2016 that occurred in the province. Figure 4.3 presents the annual percentage change in quantities of fruit and vegetables supplied to the Durban Fresh Produce Market from 2012 to 2016.

4.2.5. Price Trend in the KZN Fresh Produce Markets

Figure 4.4 depicts average annual prices for fruit and vegetables supplied to both the Pietermaritzburg and Durban Fresh Produce Markets over the period 2012 to 2016. Prices for all commodities have on average been increasing in both markets over the five year period 2012 to 2016.

Figure 4.3: Annual Percentage Change in Supply for Fruits and Vegetables in the Durban FPM, 2012 to 2016

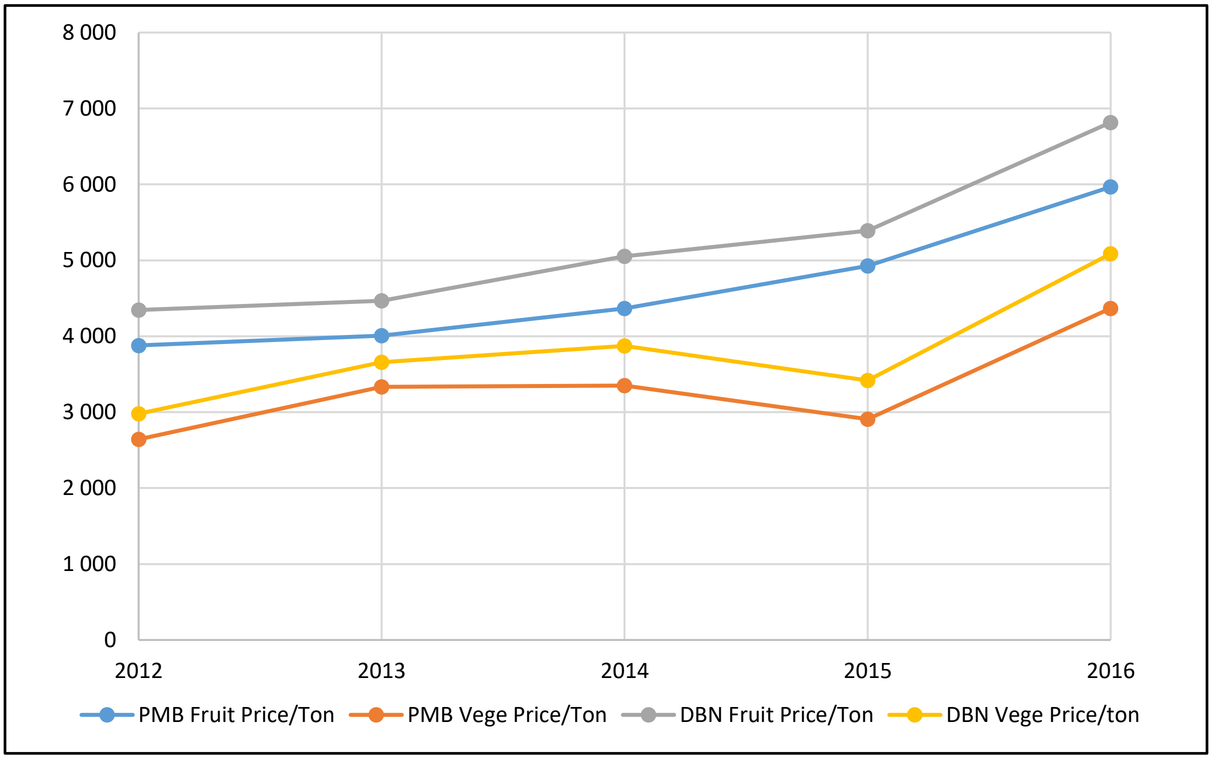


Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

Fruit prices are on average higher than vegetable prices though volumes for fruit are consistently lower than those of vegetables throughout the markets over the period under consideration. This observation is consistent with all other major fresh produce markets in the country, fruit volumes are consistently lower in supply but prices are higher than those of vegetables (Department of Agriculture, Forestry and Fisheries 2017). This is also consistent with economic theory of demand which states a negative relationship between price and quantity demanded (Parkin et al. 2008).

Durban Fresh Produce Market vegetable prices per ton are about 27% percent lower than fruit prices per ton over the five year period on average and in the Pietermaritzburg Fresh Produce Market vegetable prices per ton have been on average 28% lower than fruit prices over the period 2012 to 2016. Vegetable prices seem to have declined from 2014 to 2015 in both markets while fruit prices have increased over that two year period. All prices have risen sharply from 2015 to 2016 to all-time highs for all fresh produce in both markets.

Figure 4.4: Average Annual Prices (R/ton) for Fruit and Vegetables in the KZN National FPM, 2012 to 2016.



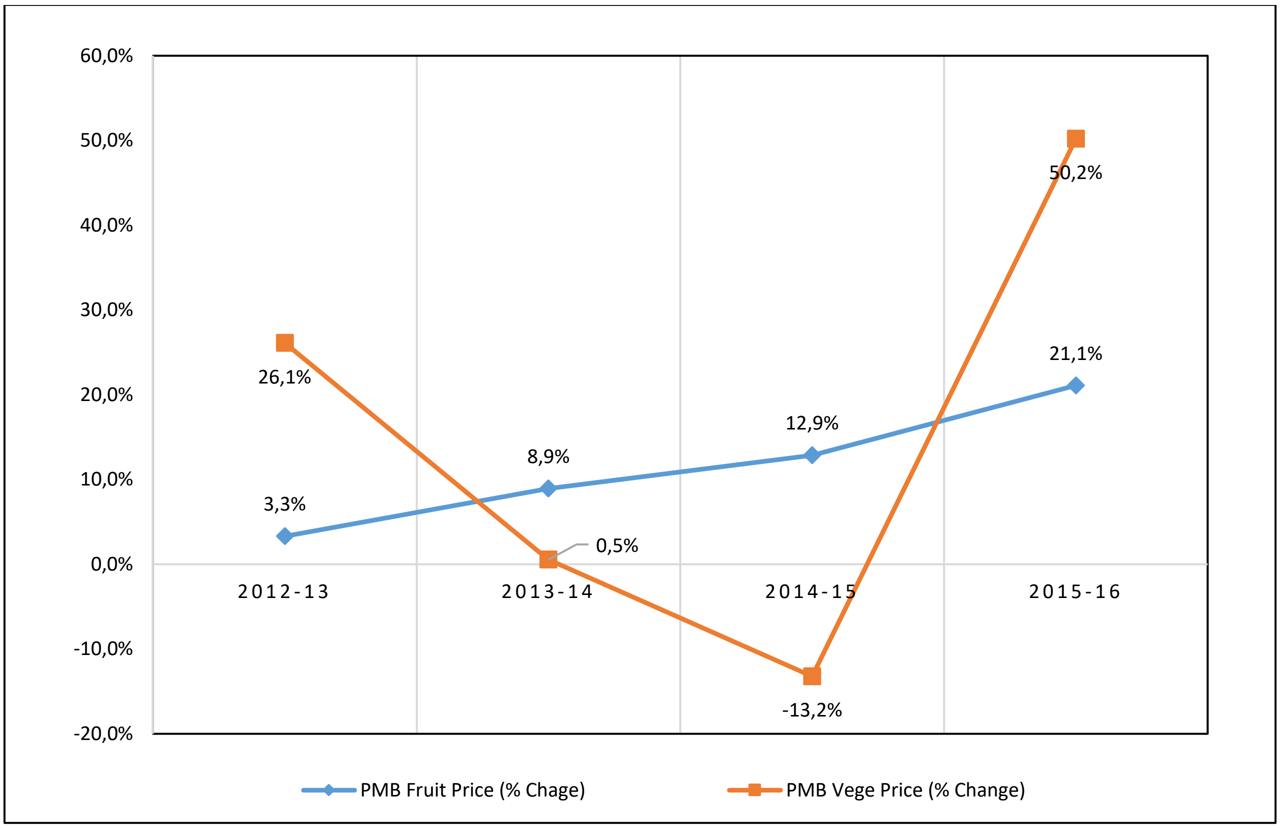
Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

4.2.6. Trend in the Annual Changes in Fresh Produce Prices

Figure 4.5 presents the annual percentage change in price for both fruits and vegetables in the Pietermaritzburg Fresh Produce Market from 2012 to 2016.Vegetable prices have exhibited the most dramatic percentage changes over the five years in consideration with percentage changes downwards or upwards consistently larger than that of fruits. There was a major drop in prices of vegetables over the years 2014 to 2015 and over 50% increase in price in the next season of 2015 to 2016. While vegetable prices have declined by 13% during period 2014 to 2015, fruit prices have consistently climbed with largest annual percentage change of 21,1% observed between years 2015 to 2016.

Figure 4.6 presents the annual percentage change in price for both fruits and vegetables in the Durban Fresh Produce Market from 2012 to 2016. Similar to the Pietermaritzburg market, vegetable prices showed a decline over the period 2014 to 2015. This decline was followed by a sharp increase of 48,9% in the period 2015 to 2016.

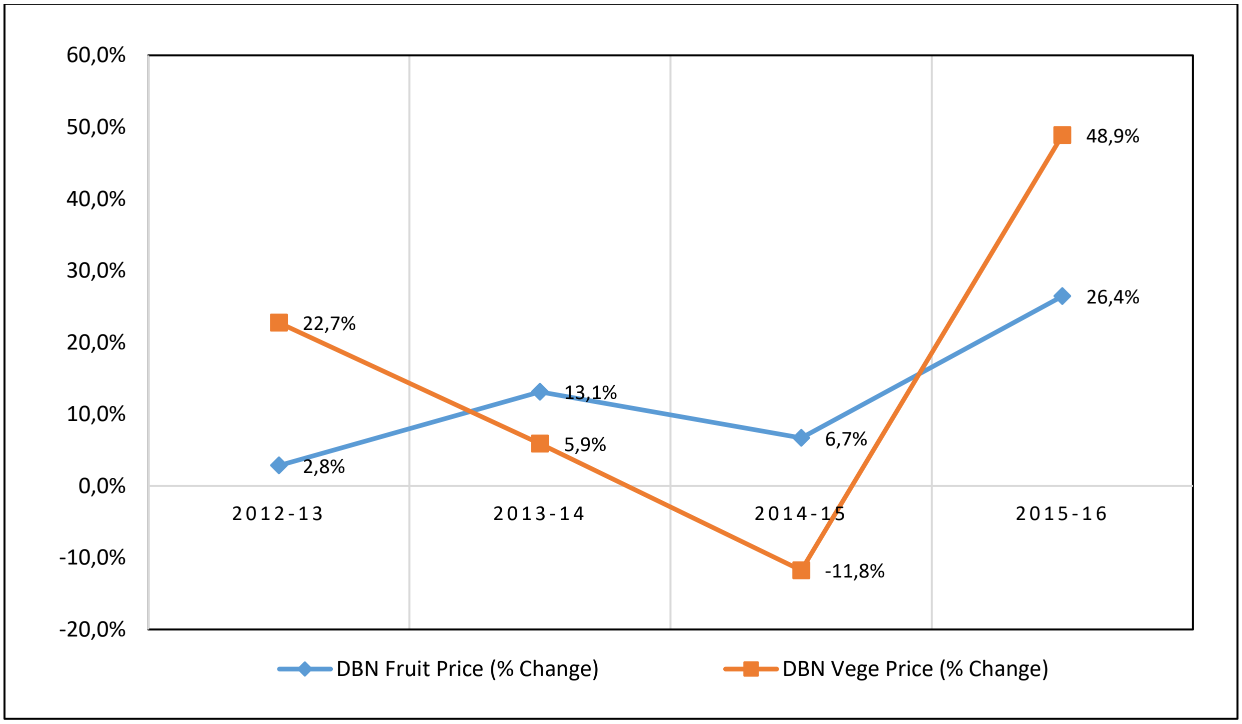
Figure 4.5: Annual Percentage Change in Price for Fruits and Vegetables in the Pietermaritzburg FPM, 2012 to 2016.



Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

This shows the impact of limited supply that has been observed in the market from 2015 to 2016 as a result of the worst drought that the province had experienced in over 20 years since 1982 (Kaplan & Zitzer 2016). Consistent with growing volumes of vegetables supplied to the Durban market as evident in the annual percentage growth in supply of 4,1% in 2013-14 and 10,5% in year 2014-15, prices of the vegetable products have been declining over these periods in this market. Fruit prices in this market have been on the incline overall, though there was a decline slightly in the period from 2014-15, which is not the same as consistent increase as observed in the Pietermaritzburg fresh produce market. The largest annual percentage change in prices in this market was also observed in 2015-16 at 26,4%.

Figure 4.6: Annual Percentage Change in Price for Fruits and Vegetables in the Durban FPM, 2012 to 2016



Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

4.3. Presenting the High Value Fresh Produce Crops in the KZN Fresh Produce Markets

For the purposes of this study, only the top five traded fruits and vegetables per market over the five year period have been selected for estimation of price elasticity. The top five traded products have a fuller set of data with recordings and deliveries monthly and reasonable variations over the year. This selection provides a complete set of data that can enable accuracy in the estimation of price elasticity of supply in these markets since the study is using a simple estimation method and not a dynamic model that attempts to account for non-price factors as well. From the data it was also observed that at lower levels of supply prices are much higher because of limited volumes for some high value products. These are for rarely traded fresh produce such as various types of berries and cherries in the Pietermaritzburg fresh produce markets looking at the 2016 records. Table 4.2 shows a ranking of fresh produce by price per ton for 2016 fruits traded in the Pietermaritzburg Fresh Produce Market. Peanuts are part of the listed products under the fruits category in the FPM data for all markets.

Table 4.2 Ranking of Fruits by Price per Ton in the Pietermaritzburg FPM (2016)

Fruit	Tons	Price/Ton
Mulberries	0,01	R128 000
Raspberries	0,3	R59 889
Cherries	2,00	R50 350
Prickly Pears	0,57	R40 628
Peanuts	0,14	R17 929

Produce in this low volumes-high price category are usually supplied on only one month of the year, and from the data it is not possible to establish if these are locally produces fruits or these are imported from other regions into the province due to such higher prices and issues relating to seasonality. There is an important observation and lesson from these low volume high crops that farmers can utilise to diversify their production and supply where possible and improve cash flow. For these types of crops, a ranking of trade by price per ton (R/ton) has been provided in the annexure tables (tables 4.3 a) to d)) per market per annum in order to indicate the high value crops in the fresh produce markets of KwaZulu-Natal.

In the Pietermaritzburg fresh produce the consistently high value vegetables are ginger and garlic in order of annual appearance in the highest price ranking from 2012 to 2016. Ginger has fetched over the years a price per ton range of R17, 000 to R60, 000 while garlic has fetched prices ranging from R18, 000 to R41, 000 over the period under consideration in the Pietermaritzburg Fresh produce market.

Table 4.3: High Value Fresh Produce in the Pietermaritzburg FPM

Vegetables										
	2012		2013		2014		2015		2016	
	Tons	Price/Ton	Tons	Price/ton	Tons	Price/Ton	Tons	Price/ton	Tons	Price/ton
Garlic	47	R20 903	53	R18 069	30	R28 565	36	R23 560	25	R41 585
Ginger	24	R17 044	17	R27 243	10	R60 063	15	R34 136	8	R38 921

Fruits										
	2012		2013		2014		2015		2016	
	Tons	Price/Ton	Tons	Price/ton	Tons	Price/Ton	Tons	Price/ton	Tons	Price/ton
Cherries	7,0	18 234	0,06	R24 531	3	R19 762	0,6	R100 682	2	R50 350
Pecan Nuts	2,0	14 134	2,00	R27 825	0,7	R27 349	0,3	R20 518	0,23	R9 209

Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

High value fruits are represented by cherries and peacan nuts in order of appearance in the top priced fruits in the market over the period 2012 to 2016. Cherries have fetched a price per ton in the range of R18, 000 to R100, 000 while peacan nuts have been priced between R 9, 000 and R28, 000 per ton over the 2012 to 2016 period.

Table 4.4: High Value Fresh Produce in the Durban FPM

Vegetables										
	2012		2013		2014		2015		2016	
	Tons	Price/ton	Tons	Price /Ton	Tons	Price/ton	Tons	Price/Ton	Tons	Price/ton
Patty Pans	17	R22 868	13	R27 816	18	R22 713,00	-	-	-	-
Garlic	420	R15 044	476	R16 845	345	R18 499,00	-	-	423,5	R33 319,0
Parsnips	6	R14 880	-	-	8	R25 753,00	5,5	R38 176	4,0	R42 923,0
Fruits										
	2012		2013		2014		2015		2016	
	Tons	Price/ton	Tons	Price /Ton	Tons	Price/ton	Tons	Price/Ton	Tons	Price/ton
Pecan Nuts	0,99	R34 347	2	R31 273	1	R33 368	0,03	R31 818	-	-
Cherries	30	R28 717	-	-	39	R24 882	32,0	R43 242	51	R40 268
Gooseberries	0,18	R25 183	-	-	-	-	0,3	R37 054	1	R22 967
Kiwi Fruit	68	R22 752	107	R26 901	78	R34 082	-	-	169	R29 629

Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

Table 4.4 shows frequent high value products in the Durban Fresh Produce Market. These are products that appear on the top of the ranking by price per ton consistently over the years. Unlike in the Pietermaritzburg market, there is little consistency in terms of maintenance of top spot by various vegetables. Garlic which was a consistent top five item in the Pietermaritzburg market appears four times over the years and ginger only once in the Durban market. The high priced vegetables other than garlic in the Durban Fresh Produce Market are pattypans and parsnips. Garlic price ranged between R15, 000/ton and R33, 000/ton, parsnips prices ranged between R14, 000/ton and R42, 000/ton and patty pans price ranged between R22, 000/ton and R28, 000/ton over the period 2012 to 2016.

Looking at high paying fruit products in the Durban Fresh Produce Market, peacan nuts, cherries and kiwi fruit are equally popular amongst the top five traded fruits which fetch the highest price of all fruits in this market annually. These fruits appear four times in the period under consideration while the other fruit making it to the top paying list is gooseberries which is less frequent and appeared only three out of five years on the top. Cherries and pecan nuts are a common high value fruits for both the Pietermaritzburg and Durban Fresh Produce Markets over the past five years from 2012 to 2016. In terms of price ranges, pecan nuts ranged from R31, 000/ton to R33, 000/ton, cherries prices ranged between R24, 000/ton and R43, 000/ton, kiwi fruit paid anything between R22, 000/ton and R34, 000/ton while gooseberries fetched prices between R23, 000/ton and R37, 000/ton over the period 2012 to 2016.

4.4. Top Ten Traded Fresh Produce in the KZN Fresh Produce Markets

In the Pietermaritzburg Fresh Produce Market, top ten vegetables ranked in terms of highest quantities supplied (tons) for the years 2012 to 2016 are as presented in table 4.5.

Table 4.5: Top Ten Traded Vegetables in the Pietermaritzburg FPM (2012-2016)

Vegetable (tons)	2012	2013	2014	2015	2016
Potatoes	37 632	35 131	34 913	37 504	29 633
Onions	9 712	8 541	9 026	9 710	8 563
Tomatoes	4 837	4 612	2 660	3 229	3 470
Butternut Squashes	2 503	1 880	2 311	2 172	1 944
Carrots	1 508	1 252	1 116	1 302	1 447
Cabbages	1 239	1 381	1 483	1 565	2 380
Lettuce	564	546	445	520	402
Peppers	436	376	338	409	412
Spinach	418	481	438	486	434
English Cucumber	380	399	307	352	310

Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

For the purposes of calculating the elasticity of supply (P_{ES}) for fresh produce annually, the top five traded fruits and vegetables per market per annum have been selected based on quantities sold as presented in tons. Table 4.5 shows that potatoes are the leading traded vegetable products in this fresh produce market. The two next most supplied vegetables to the Pietermaritzburg Fresh Produce Market are onions and tomatoes respectively.

Table 4.6 shows the top ten traded fruits in the Pietermaritzburg Fresh Produce Market for the period 2012 to 2016. The year 2012 has been used as a base year, as such though the ranking in terms of highest tonnages supplied per product have varied over the years, the top ten fruit items have remained more or less the same in the top ten schedule.

Table 4.6: Top Ten Traded Fruits in the Pietermaritzburg FPM (2012-2016)

Fruit	2012	2013	2014	2015	2016
Bananas	11 131	11 587	12 849	11 509	8 270
Apples	6 312	6 436	5 834	6 994	6 842
Oranges	6 290	4 215	4 741	4 890	3 419
Pears	2 358	2 307	2 153	2 079	2 036
Peaches	1 606	1 345	1 004	869	788
Plums	827	900	837	807	844
Grapes	544	391	375	503	561
Nectarines	481	408	425	341	311
Mangoes	380	306	242	226	180
Exotic Fruits	354	301	418	328	359

Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

For instance grapes, nectarines and exotic fruit in 2014 do not appear in order of largest to smallest tonnages because these have been re-arranged to the ranking of 2012. In line with the declining trend in volumes from 2015 to 2016, most fruits in this market declined considerably in volumes except for plums and exotic fruit which increased marginally by 37 tons and 31 tons respectively.

Table 4.7 presents the top ten traded vegetables in the Durban Fresh Produce Market over the period 2012 to 2016. The top three traded vegetables as ranked by tons supplied to the Durban market mimic the line-up of the Pietermaritzburg market with potatoes, onions and tomatoes being the top three supplied vegetables throughout the years.

Table 4.7: Top Ten Traded Vegetables in the Durban FPM (2012-2016)

Vegetables (tons)	2012	2013	2014	2015	2016
Potatoes	99 695	94 154	99 044	108 950	95 135
Onions	41 758	37 256	40 917	45 909	46 274
Tomatoes	19 967	19 490	17 031	18 507	21 570
Carrots	13 066	13 605	14 280	16 908	15 983
Butternut Squashes	6 942	5 319	5 245	5 363	5 239
Cabbage	6 565	6 276	6 461	7 957	9 986
Lettuce	2 519	2 693	2 874	3 014	2 985
Cocktail Tomatoes	1 592	1 505	1 204	485	586
Peppers	1 292	1 471	1 382	1 617	1 544
English Cucumbers	988	838	953	1 014	1 068
Beetroot	894	1 017	1 278	2 124	1 298

Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

The year 2012 has been used as base year, as such the years from 2013 onwards have been arranged to conform to the 2012 initial list, and therefore it is noticeable that some low tonnage products are ranked higher than other higher volume items in some years. For example, cocktail tomatoes in both 2015 and 2016 have volumes 485 tons and 586 tons respectively but are ranked higher than beetroot which has 2,124 tons in 2015 and 1,298 tons in 2016.

Table 4.8: Top Ten Traded Fruits in the Durban FPM (2012-2016)

Fruit	2012	2013	2014	2015	2016
Bananas	28 322	31 961	31 567	31 074	22 487
Apples	21 895	21 679	20 272	23 647	21 886
Oranges	14 967	13 538	13 212	13 318	10 842
Pears	5 356	4 351	4 882	5 400	5 362
Water Melons	3 538	5 088	1 976	2 034	2 005
Peaches	2 863	2 292	2 273	2 230	1 926
Grapes	2 468	1 833	1 976	2 727	2 669
Pineapples	2 405	2 390	2 319	2 533	1 858
Plums	2 313	2 887	2 638	2 554	2 782
Exotic Citrus	2 288	1 999	2 442	2 579	1 950

Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

Table 4.8 presents the top ten traded fruits in the Durban Fresh Produce Market over the period 2012 to 2016. The top traded fruits in the Durban market are bananas, apples, and oranges which have consistently registered quantities supplied of more than 10 000 tons over the five year period from 2012 to 2016. These top three fruits are the same as noticed from the Pietermaritzburg market's top three traded fruits. All of the top ten fruits in this market seem to have recorded a slight decline from 2015 to 2016 except for plums which have increased slightly by 228 tons.

4.5. Estimated Price Elasticity of Supply (P_{ES}) for Fruits (Pietermaritzburg)

Annual elasticities for the top five fruits in the Pietermaritzburg Fresh Produce Market have been estimated as presented table 4.9. Mean and median annual elasticity of supply have been calculated and presented. Notably, estimates of P_{ES} for these top five traded fruits in this market has come out above 1 and elastic for the period 2013-14 with bananas having the highest estimate of P_{ES}=6,8. Another anomaly is that while all fruits in this category seemed to increase in sensitivity of supply to own price, oranges remained the same at P_{ES}=1,4. The 2013-14 calculated estimates for P_{ES} for these products have a potential to skew the mean P_{ES} over the period.

Table 4.9: Estimated Price Elasticity of Supply for the Top Five Traded Fruits in the PMB FPM (2012-2016)

Fruit	2012-13	2013-14	2014-15	2015-16	Mean	Median	
Bananas	0,5	6,8	0,4	1,0	2,2	0,75	P_{ES} < 1 inelastic
Apples	0,3	1,1	4,2	0,2	1,5	0,70	P_{ES} < 1 inelastic
Oranges	1,4	1,4	0,3	0,8	1,0	1,1	P_{ES} > 1 elastic
Pears	0,1	2,2	0,4	0,3	0,8	0,35	P_{ES} < 1 inelastic
Peaches	1,0	1,4	1,1	0,5	1,0	1,05	P_{ES} >1 elastic

Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

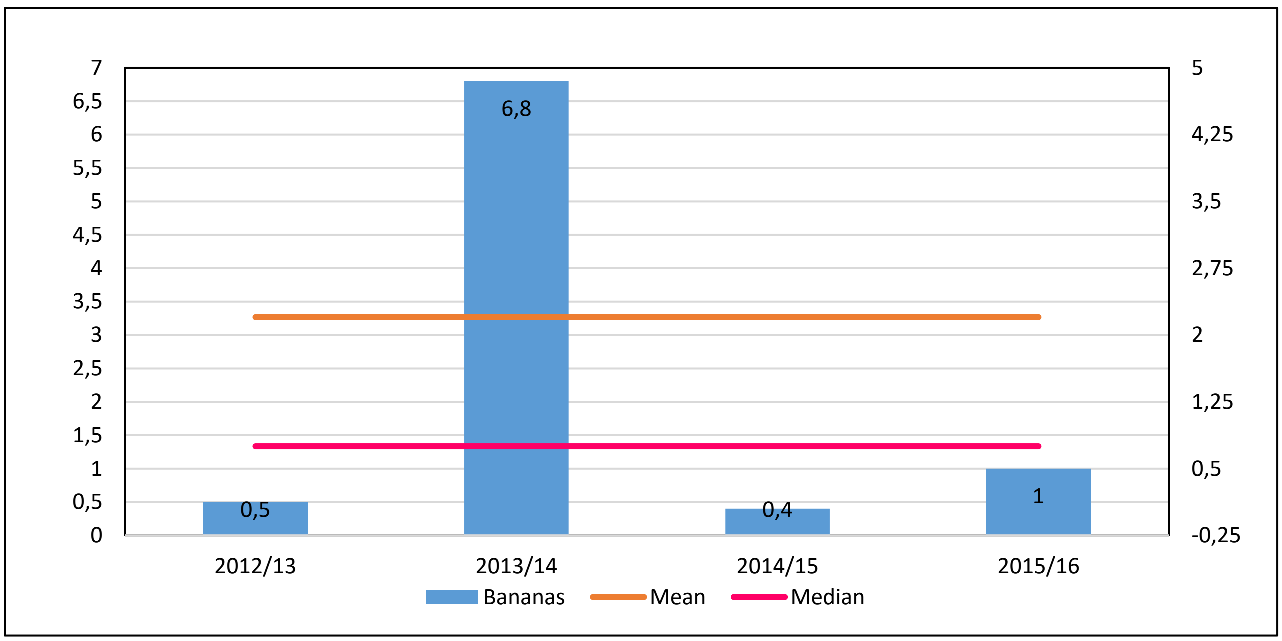
The results show that the P_{ES} estimates are highly susceptible to bias as a result of some outlying estimates of P_{ES} estimated largely for the year 2013-14 across all the top five crops. This makes the mean annual elasticity if supply to be not suitable for the conclusion on the sensitivity of supply for these top five traded fruits in this market. The median estimate however presents a more stabilized estimate for P_{ES} for the fruits over the period in consideration. The median estimate is going to be used for final interpretation of results since it is a better measure of central tendency for all the calculated annual price elasticity of supply estimates for fresh produce in this study. The results for estimated median P_{ES} indicates that 60% of the top five traded fruits in the

Pietermaritzburg Fresh Produce Market are price inelastic with respect to supply while the 40% is slightly price elastic with P_{ES} between 1,05 and 1,1. A brief product specific analysis will be presented with an aim of highlighting annual changes and comparisons within the five year mean and median estimates of price sensitivity of supply for the selected fruits in this market.

4.5.1. Bananas in the Pietermaritzburg FPM

As presented in figure 4.7 banana supply has had a dynamic response to price over the five years in consideration, mimicking a cyclical adjustment of supply to a change in price. For two periods 2012/13 and 2014/15 supply response has been inelastic, the mid period between the two years seem to have been an adjustment from the higher jump in price of 2012/13 which was 8% and supply increased by 10,9% the following year inducing and adjustment in price down to only 1,6% which led to a dramatic response of 6,8% which is the highest for the five year period.

Figure 4.7: Estimated Price Elasticity of Supply for Bananas sold at the Pietermaritzburg FPM (2012-2016*)*



Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

The year 2013/14 observed percentage changes in prices were notably the lowest of all the annual changes while changes for quantities supplied were somewhat in line with other annual changes in the range of years under observation. This could have been due to error in data recording for prices and quantity changes in this market or an unusually large supply of bananas to the

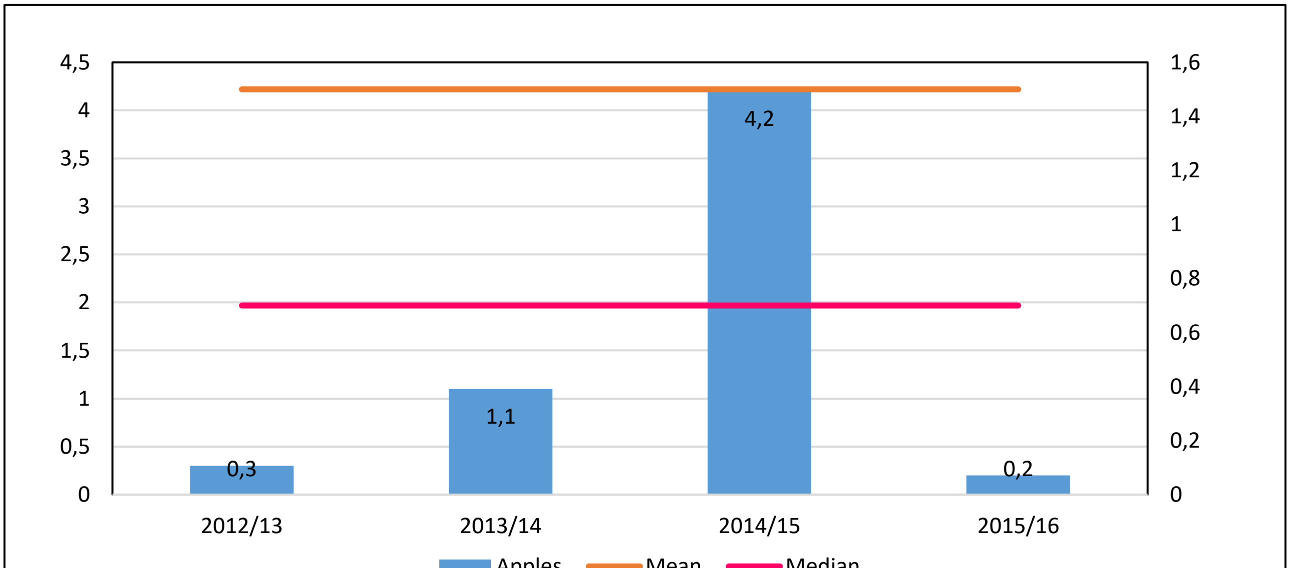
Pietermaritzburg Fresh Produce Market resulting from a transference of supply from the Durban Fresh Produce Market which experienced an unusual drop in annual quantities of bananas supplied in 2013/14 compared high increase in the previous 2012/13 period.

As prices adjusted back in 2014 to 2015 output dropped by 10,4% with a price adjustment of 24,8% which was a huge jump from the 1,6% of the previous period and the last period 2015/16 witnessed a normalizing of the situation where change in price almost caught up with changes in quantity resulting in a unitary price elasticity of supply indicating a one-to-one response proportional change in price and volumes of bananas supplied. The period 2015/16 was also the first year of observation of the impact of drought which also affected the reduction in quantities of produce supplied overall in the markets. The mean annual elasticity of supply for bananas overestimates the P_{ES} which leads to a conclusion of P_{ES}=2,2 (elastic) while a more suitable estimate of the compiled median suggest that the supply of bananas like most fruits in this market is price inelastic with respect to own price with P_{ES} =0,75.

4.5.2. Apples in the Pietermaritzburg FPM

Figure 4.8 presents the estimated own price elasticities of supply for apples in the Pietermaritzburg Fresh Produce Market for the period 2012 to 2016.

Figure 4.8: Estimated Price Elasticity of Supply for Apples sold at the Pietermaritzburg FPM (2012-2016)



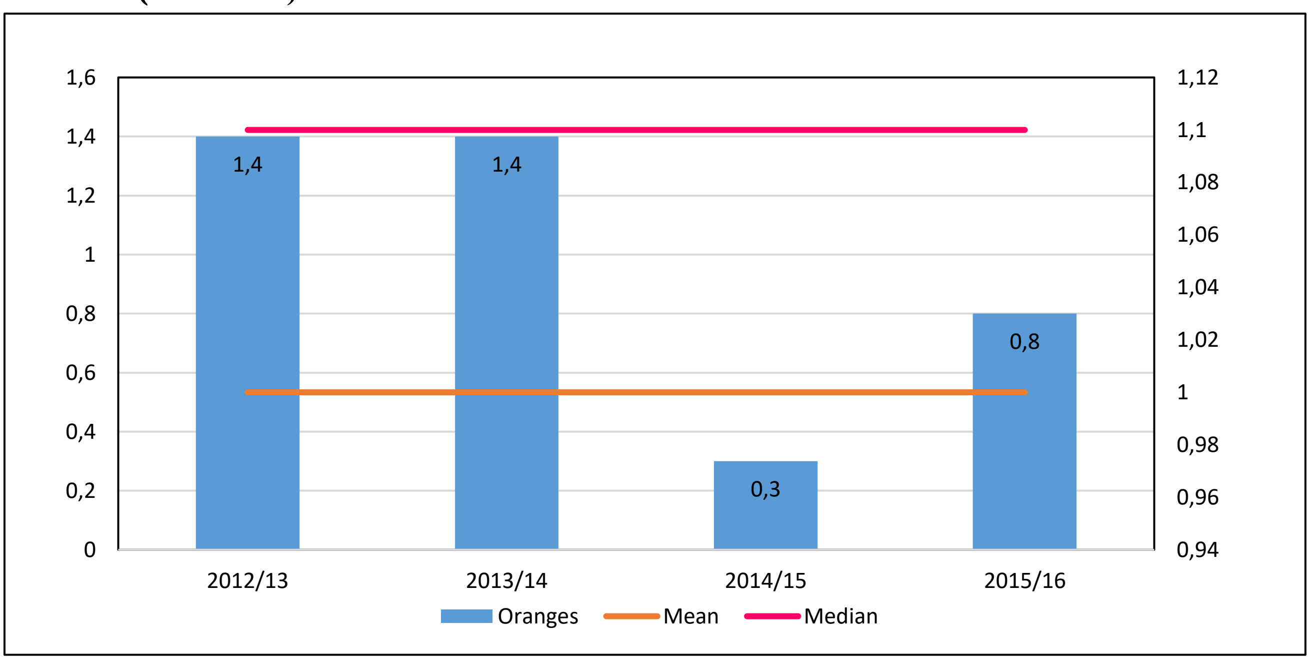
Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

The supply of apples in this market also has exhibited a mixed response to price movements, from a gradually increasing elastic response starting from an inelastic P_{ES}=0,3 in 2012/13 reaching a highest point in 2014/15 at P_{ES}=4,2. This was followed by a dramatic change to an inelastic response of P_{ES} = 0,2 in period 2015/16. The largest change in quantity supplied over the five year period was observed in 2015/16 which was a positive 19,9% and price declined by 4,7% which resulted in an estimated P_{ES}= 4,2. The mean annual elasticity of supply for apples overestimates sensitivity at elastic P_{ES}=1,5 while the more realistic estimate of the median P_{ES} suggests that the supply of apples like most fruits in this market is price inelastic with respect to own price with P_{ES} =0,70. This means that over the past five years the sensitivity of apple supply to own has been inelastic with 1% change in price apples likely to induce a 0,75% change in quantities of apples supplied to this market.

4.5.3. Oranges in the Pietermaritzburg FPM

The annual responsiveness of oranges supply to own price in the Pietermaritzburg Fresh Produce Market appears to be split in half over the five years 2012 to 2016, noting that the first two annual changes have been estimated price elastic while the last two inelastic.

Figure 4.9: Estimated Price Elasticity of Supply for Oranges sold at the Pietermaritzburg FPM (2012-2016)



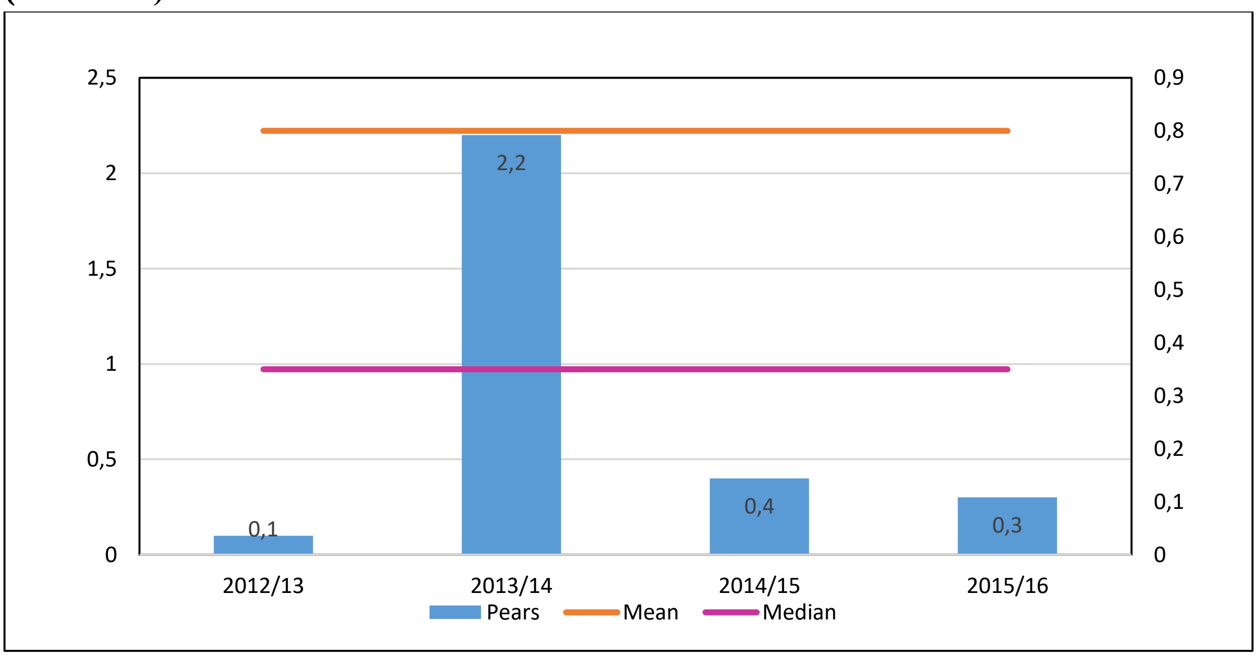
Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

The largest percentage change in quantities supplied was a decline of 33% in supply from 2012 to 2013, whereas the largest response in price was observed in 2015/16 with an increase of 37,8% in prices. For 2012/13 and 2013/14 the estimated sensitivity was elastic at P_{ES}=1,4 while sensitivity declined to an inelasticity P_{ES}=0,3 in 2014/15 and improved slightly to P_{ES} =0,8 in 2015/16 though remaining in the inelastic range over 2014/15 to 2015/16. As a result, the mean response over the five year period came out at unitary elastic response of supply to prices changes. However, the median estimate of PES is slightly more than unitary at P_{ES}=1,1 which is decisively elastic. This suggests that contrary to an underestimated mean response of supply of oranges to price as indicates by the mean P_{ES} supply response to own price for oranges in this market is actually elastic where a 1% change in price of oranges can be expected to induce a 1,1% change in quantities supplied.

4.5.4. Pears in the Pietermaritzburg FPM

Figure 4.10 shows the price elastic of supply for pears supplied to the Pietermaritzburg Fresh Produce Market over the period 2012 to 20126 as well as the mean and median P_{ES} over this five year period.

Figure 4.10: Estimated Price Elasticity of Supply for Pears sold at the Pietermaritzburg FPM (2012-2016)



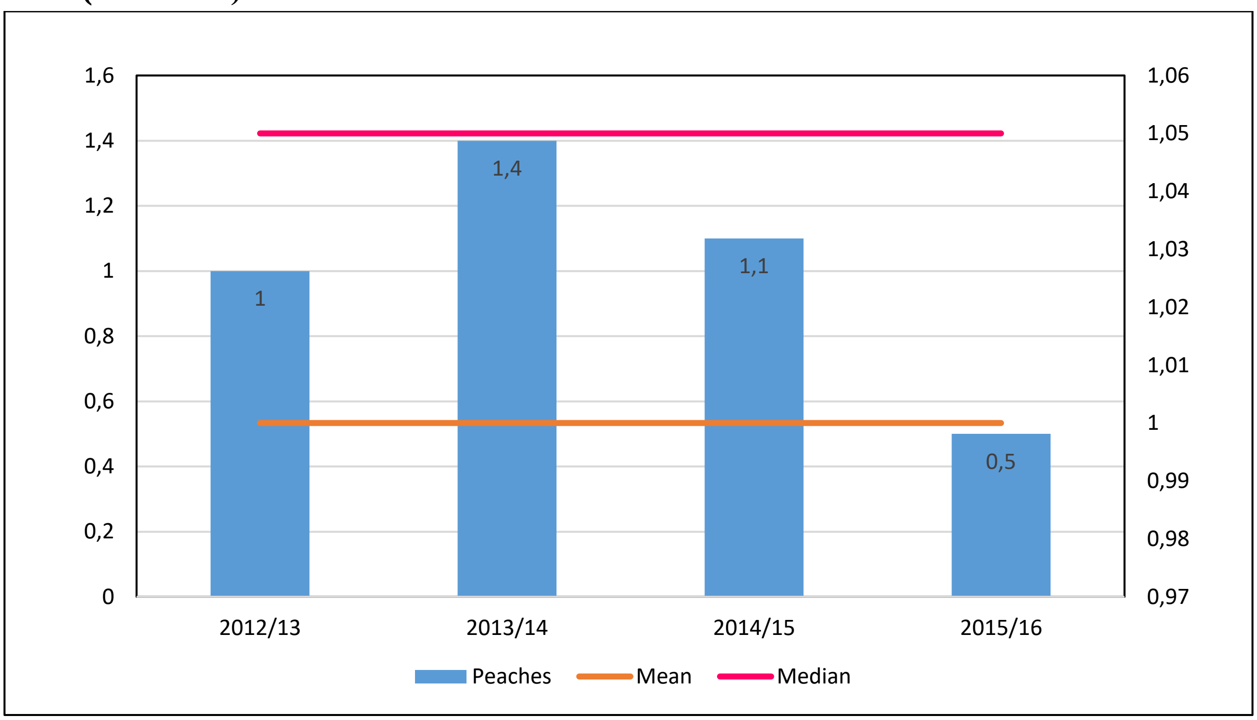
Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

Based on the median estimated P_{ES}=0,35 the responsiveness of supply of pears in this market has been generally inelastic indicating that pears are not that sensitive to price changes in the market. This result is the same in terms of direction of sensitivity as that one estimated by the mean P_{ES} = 0,8 however, the magnitude of inelasticity is more defined in the median estimate once the outlier influence of annual changes of 2013/14 have been discounted for. The annual trends shows a noticeable constant decline the supply of pears to this market while prices have been in constant climb in line with supply and demand theories. The spikes in trends were observed in 2013/14 for supply with a 6,7% decline and 2012/13 for prices with an increase of 28,9%.

4.5.5. Peaches in the Pietermaritzburg FPM

Figure 4.11 shows that the average sensitivity of supply of peaches to price changes in the Pietermaritzburg Fresh Produce Market has been proportionately equal to a change in price over the five years 2012 to 2016 as represented by average estimated annual P_{ES} = 1.

Figure 4.11: Estimated Price Elasticity of Supply for Peaches sold at the Pietermaritzburg FPM (2012-2016)



Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

However, for the two years 2013/14 and 2014/15 price elasticity of supply estimates were positive and larger than 1 indicating an elastic response while for 2012/13 and 2015/16 the response was unitary elastic and inelastic, respectively. Of these estimated annual P_{ES} the 2013/14 and 2015/16 P_{ES} represent outlying figures which has possibly introduced bias to the mean P_{ES}=1 estimate, which is why the median P_{ES} estimate of 1,05 is a better representation of the general tendency of sensitivity of supply of peaches to prices in the Pietermaritzburg market over the five years under consideration. Therefore, the estimated annual PES for peaches supplied to the PMB market is PES=1,05 indicating a slightly elastic response to prices wherein a 1% change in price of peaches can be expected to induce about 1,05% change in quantities supplied.

4.6. Estimated Price Elasticity of Supply (P_{ES}) for Vegetables (Pietermaritzburg)

Annual elasticities for the top five vegetables in the Pietermaritzburg Fresh Produce Market have been estimated as presented table 4.10. Mean and median annual elasticity of supply have been calculated and presented. Notably, estimates of P_{ES} for tomatoes came our elastic for all of the years but the 2012/13 annual change. Tomatoes is also the only crop in the top five traded produce under "vegetables category in the market" that has exhibited an elastic response to own prices overall considering the five years from 2012 to 2016.

Table 4.10: Estimated Price Elasticity of Supply for the Top Five Traded Vegetables in the Pietermaritzburg FPM (2012-2016)

Vegetables	2012-13	2013-14	2014-15	2015-16	Mean	Median	
Potatoes	0,2	0,5	0,4	0,3	0,4	0,35	P_{ES} < 1 inelastic
Onions	0,4	1,8	0,5	0,2	0,7	0,45	P_{ES} < 1 inelastic
Tomatoes	0,4	1,6	56,0	1,4	14,9	1,50	P_{ES} > 1 elastic
Butternut Squashes	0,9	2,1	0,6	0,2	0,9	0,75	P_{ES} < 1 inelastic
Carrots	1,0	0,4	0,6	0,5	0,6	0,55	P_{ES} <1 inelastic

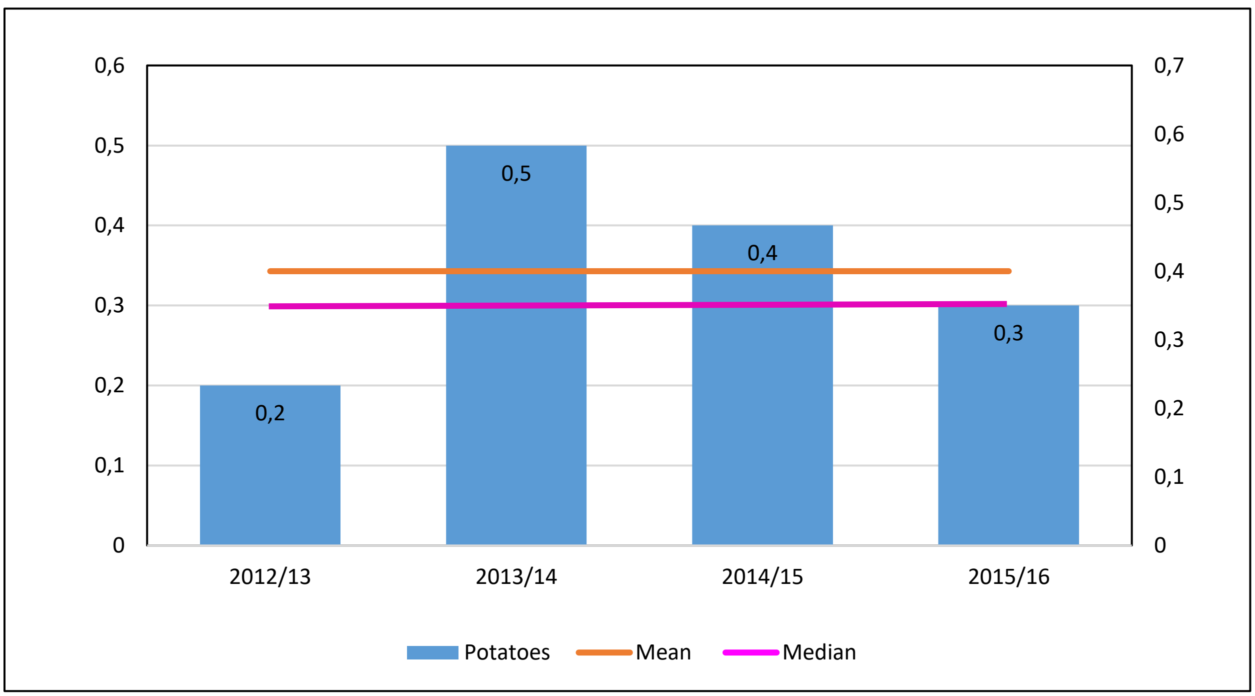
Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

Those vegetables that had an inelastic response of supply to own price as expected from findings of prior research in literature can be split into two halves with potatoes and onions having P_{ES} inelastic greater than zero (0) but less than 0,50 while butternut squashes and carrots are also inelastic in response but more responsive than the bottom two at P_{ES} less than one (1) but greater than 0,50. Compared to the price elasticity of supply estimates for fruits in this markets the annual P_{ES} estimates were less dramatic per produce and over the period except for tomatoes which produced the highest estimated P_{ES} for the study in the period 2014/15. Nonetheless median estimates of P_{ES} have given a better insight into the realistic estimates of P_{ES} over and above the mean estimations that have been provided. A brief product specific analysis will be presented with an aim of highlighting annual changes and comparisons within the five year mean and median estimates of price sensitivity of supply for the selected top five vegetables in this market.

4.6.1. Potatoes in the Pietermaritzburg FPM

Potatoes in the Pietermaritzburg Fresh Produce Market have an estimated annual median P_{ES} =0,35 which indicates a less than proportional response of supply to a proportional change in price over the years 2012 to 2016. This suggest that taking the five years combined the response of quantity supplied of potatoes to a 1% change in price of potatoes sold at this market has been 0,35% which is less than unitary response and indicates an inelastic supply response.

Figure 4.12: Estimated Price Elasticity of Supply for Potatoes sold at the Pietermaritzburg FPM (2012-2016)



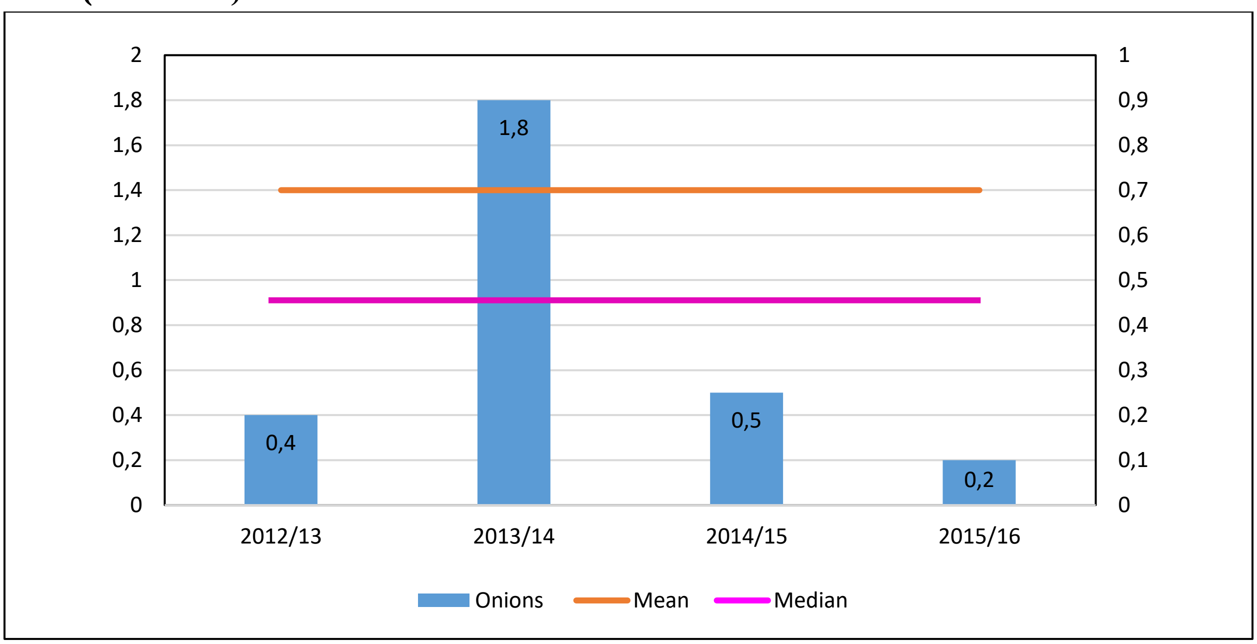
Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

This result is slightly magnified as compared to the mean estimated P_{ES}=0,40 for the same period which though it was inelastic, it was slightly higher. In this instance the mean estimate was not a large bias estimation of the responsiveness of supply of potatoes to the changes on prices of potatoes on this market. Throughout all the annual changes in consideration from 2012/13 to 2015/16 the estimated P_{ES} for potatoes in this market has been price inelastic. Considering year on year changes in percentages for both quantities and prices it is apparent that prices have been changing but much bigger percentages as opposed to quantity supplied changes from year to year. The largest of these changes were observed in 2015/16 where percentage change in quantities was a 21% decline which was accompanied by a massive 71,8% increase in prices.

4.6.2. Onions in the Pietermaritzburg FPM

Onions in the Pietermaritzburg Fresh Produce Market have an estimated annual P_{ES} =0,45 which indicates a less than proportional response of supply to a proportional change in price over the years 2012 to 2016.

Figure 4.13: Estimated Price Elasticity of Supply for Onions sold at the Pietermaritzburg FPM (2012-2016)



Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

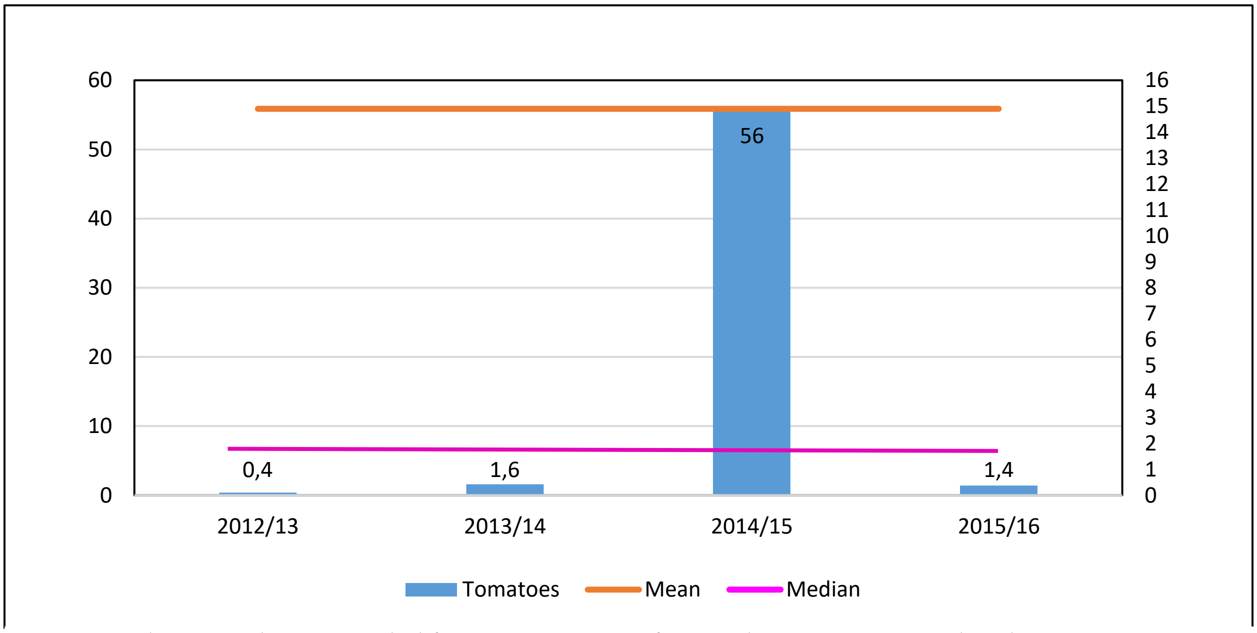
This suggest that taking the five years, a combined response of quantity supplied of onions to a 1% change in price in this market has been 0,45% based on the median estimation of central tendency, indicating an inelastic response to price changes. The median estimate of P_{ES} is slightly magnified compared to the mean estimated P_{ES}=0,70 for the same period which though it was inelastic, it was slightly higher in terms of responsiveness.

As presented in Figure 4.13, the trend for annual own price elasticity estimates for onions has been largely inelastic for three out of four annual changes except for 2013/14 where an elastic P_{ES} =1,8 was estimated. Most of the years the percentage price changes have exceeded percentage changes in quantities with the highest percentage change in price observed in 2015/16 as an increase of 54%. The highest percentage change in quantity was observed in years 2012/13 with a decline of 12,1%. There has been a balance in terms of quantity movements over the four year changes where two years exhibit an increase in supply while the other two years show a decrease in supply, with the net result being a decrease in quantity supplied over the period while the net result for prices has largely been an increase in terms of direction as well as the magnitude of the change, hence the inelastic response overall.

4.6.3. Tomatoes in the Pietermaritzburg FPM

Own price elasticity of tomatoes supplied to the Pietermaritzburg Fresh Produce Market for the years 2012 to 2016 has been the only vegetable whose response has been estimated elastic of the top five vegetables sold in this market.

Figure 4.14: Estimated Price Elasticity of Supply for Tomatoes sold at the Pietermaritzburg FPM (2012-2016)



Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

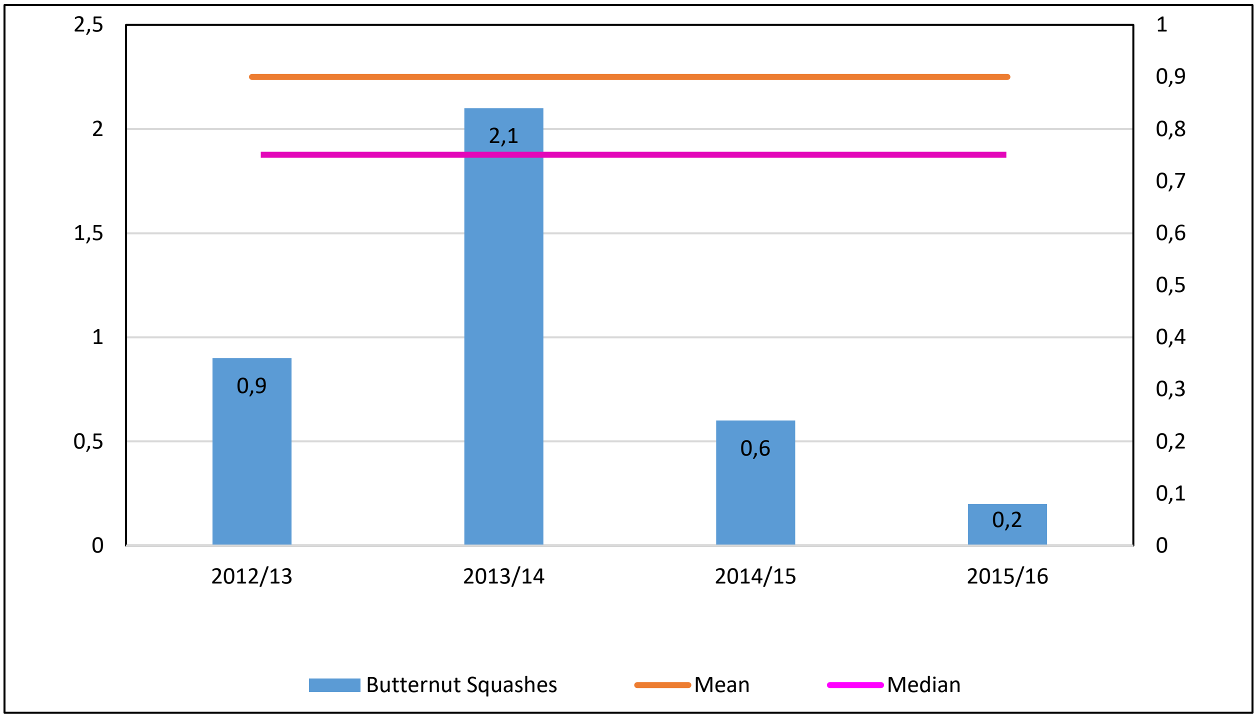
The median estimate of annual P_{ES}=1,5 implying that a 1% change in prices for tomatoes in this market would induce a 1,5% change in the quantities of tomatoes supplied to this market. Though the direction of responsiveness was the same for both mean and median estimates of annual P_{ES}, the mean estimates was a gross overestimation of P_{ES} as affected by the outlying estimate of P_{ES}=56 for the annual change 2014/15.The annual P_{ES} trend depicted in Figure 4.14 indicates that tomatoes are generally highly responsive to price changes in this market while the only time that supply response was inelastic in this market was in 2012/13 when estimated P_{ES} = 0,4. The highest responsiveness of supply of tomatoes in this market was observed in the annual changes from 2014/15 where P_{ES}=56 was estimated due to a percentage increase in prices of 0,4 while the percentage change in quantity of tomatoes supplied was an increase of 21,4% which resulted in a very dramatic response in supply.

Though quantities supplied to the market continued to increase into 2015/16 the rate of increase was a bit slower than the previous period at 7,5% of 2014/15 and prices responded as expected in terms of direction of change by adjusting downwards by 5,3% giving a moderately elastic response in line with the median P_{ES} estimate of 1,5.

4.6.4. Butternut Squashes in the Pietermaritzburg FPM

Butternut squashes sold to the Pietermaritzburg Fresh Produce Market over the period 2012 to 2016 have shown an inelastic response to own price over the period. The median estimated P_{ES}=0,75 suggests that a 1% change in price of butternut squashes in this market is expected to lead to a 0,75% change in quantities of butternut squashes supplied. The median estimate is in the same direction of responsiveness as the mean estimate, however, the mean estimate of P_{ES}=0,9 appears to underestimate the magnitude of inelasticity due to the influence of outliers such as P_{ES} =2,1 estimated for period 2013/14. The only time that the sensitivity of butternut squashes supply to own price was estimated elastic was in year 2013/14 where an increase of 61,8% in prices outstripped the decline in quantities supplied of 24,9 leading to an elastic P_{ES}=2,1. The range of P_{ES} for the rest of the period from 2012/13, 2014/15 and 2015/16 has been between 0,2 and 0,9.

Figure 4.15: Estimated Price Elasticity of Supply for Butternut Squashes sold at the Pietermaritzburg FPM (2012



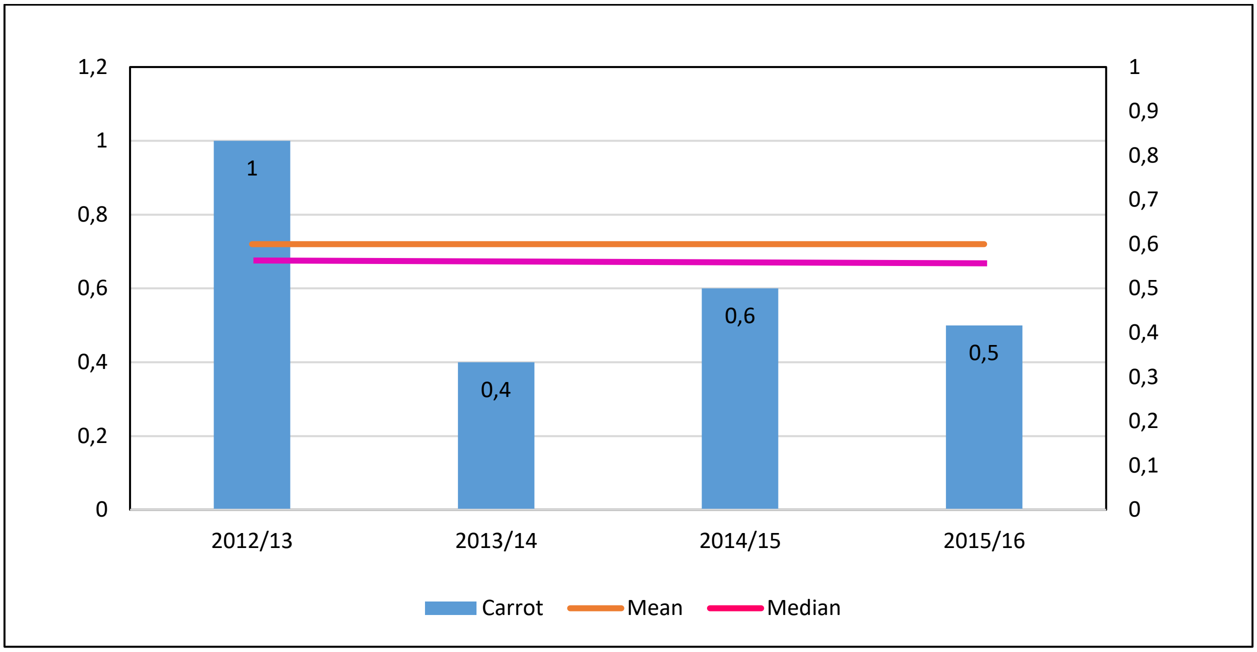
Source*: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017*

4.6.5. Carrot in the Pietermaritzburg FPM

Carrot supplied to the Pietermaritzburg Fresh Produce Market over the period 2012 to 2016 has shown an overall inelastic response to own price. The median estimated P_{ES}= 0,55 slightly stronger than a similarly inelastic but higher estimate of P_{ES}=0,6 based on the mean calculation for the period. This elastic response of quantity supplied to price changes suggests that for every 1% change in prices of carrots in this market, carrots supplied can be expected to by only about 0,55% in response.

Generally, the own price sensitivity (P_{ES}) trend shown in figure 4.16 indicates that carrot supply is generally non-responsive to prices changes in the market with P_{ES} estimates in the range 0,4 to 0,6 for the years 2013/14 to 2015/16. The only time PES was not inelastic was in 2012/13 where a unitary P_{ES} =1 was estimated.

Figure 4.16: Estimated Price Elasticity of Supply for Carrots sold at the Pietermaritzburg FPM (2012-2016)



Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

The highest recorded percentage change in quantities supplied was in 2012/13 where supply of carrots to the market declined by 17% and the largest percentage change in price was in 2013/14 where the steady decline in quantities supplied induced a price increase of 30%.

4.7. Estimated Price Elasticity of Supply (P_{ES}) for Fruits (Durban)

As done for the Pietermaritzburg Fresh Produce Market, annual own price elasticities of supply for the top five fruit and vegetables in the Durban Fresh Produce Market have been estimated and presented in this study. Table 4.11 presents these results for fruit in the Durban Fresh Produce Market while vegetables estimated results in the same market will be presented an a section that follows the discussion on fruits. Both the mean and median annual elasticity of supply with respect to own price have been calculated and presented. The results indicate that the majority of top five fruits in this markets are price inelastic with respect to supply with three out of five giving the inelastic response and only two giving the elastic response overall.

Table 4.11: Estimated Price Elasticity of Supply for the Top Five Traded Fruits in the Durban FPM (2012-2016)

Fruits	2012-13	2013-14	2014-15	2015-16	Mean	Median	
Bananas	4,4	0,2	0,1	0,7	1,4	0,45	P_{ES} < 1 inelastic
Apples	0,2	1,9	5,7	0,5	2,1	1,20	P_{ES} > 1 elastic
Oranges	0,6	0,4	0,1	0,4	0,4	0,40	P_{ES} < 1 inelastic
Pears	1,8	1,4	3,0	0,1	1,6	1,60	P_{ES} > 1 elastic
Water Melons	2,0	0,3	0,2	0,04	0,6	0,25	P_{ES} <1 inelastic

Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

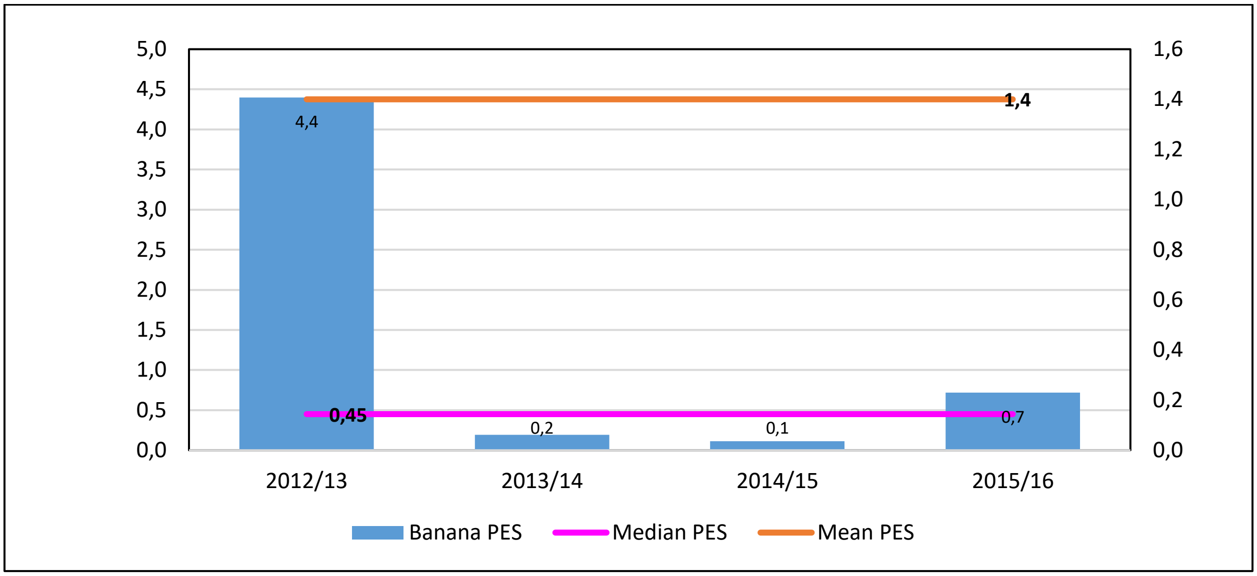
The mean and median for the top five fruits sold in Durban FPM over the years 2012 to 2016 gave similar results in terms of direction of responsiveness except for bananas where the mean estimated high responsiveness (elastic) and the median estimates the opposite responsiveness which was inelastic overall. Estimating both measures of central tendency has helped in reducing the impact of outliers on the mean through the median which provides a better measure of central tendency. A brief product specific analysis will be presented with an aim of highlighting annual changes and comparisons with the five year average of price sensitivity of supply for the selected fruits in the Durban Fresh Produce Market.

4.7.1. Bananas in the Durban FPM

Bananas supply responsiveness to prices changes in the Durban Fresh Produce Market has been relatively price inelastic as indicated in figure 4.17 where of the four annual changes considered the only period when supply response was elastic was in 2012/13 and P_{ES} has been inelastic for the rest of the years from 2013/14 to 2015/16.

The primary axis presents both the bananas and median P_{ES} while the secondary axis measure the mean P_{ES}. The mean price elasticity of supply however has been estimated to be positive and elastic at P_{ES}=1,4 influenced mostly by the highly sensitive P_{ES} estimate of 4,4 in 2012/13. The median P_{ES} provides a better estimation of at P_{ES}=0,45 and inelastic response for the five year period.

Figure 4.17: Estimated Price Elasticity of Supply for Bananas sold at the Durban FPM (2012-2016)



Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

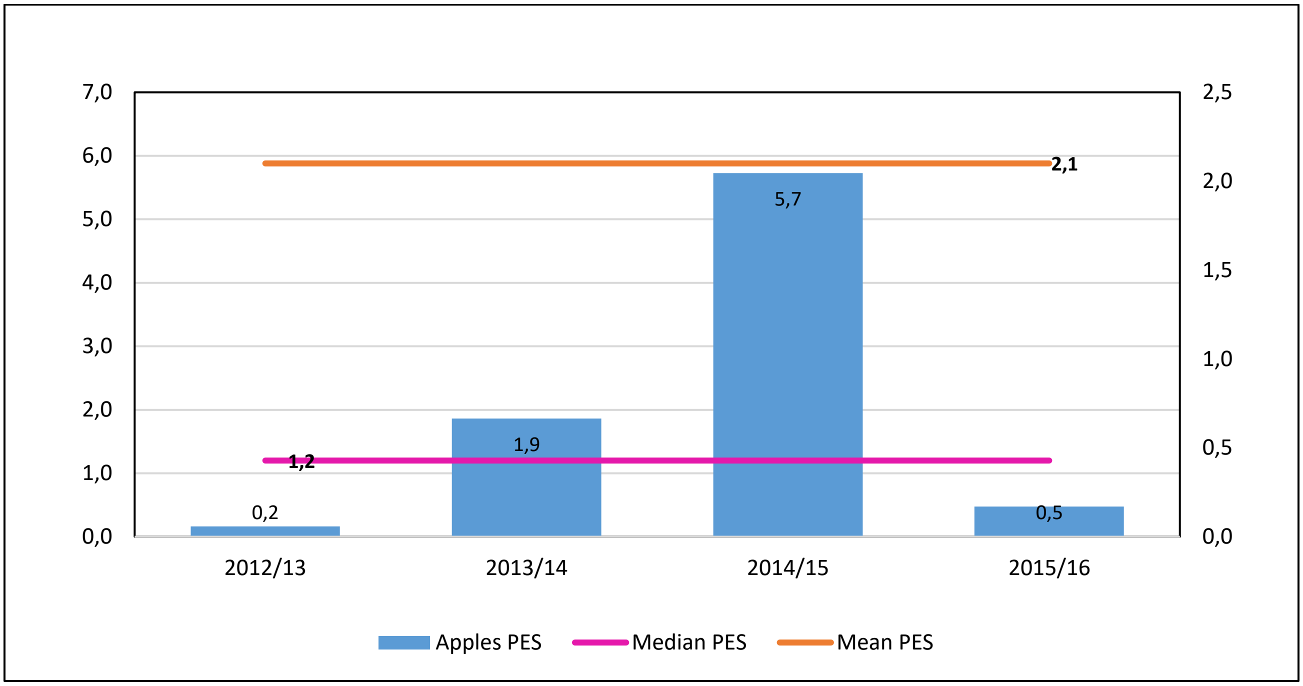
This median inelastic supply responsiveness to price for bananas in this market suggests that a change in price is likely to induce a smaller proportional change in quantity supplied of bananas. The highest percentage change in quantity supplied was a decline of 27,6% recorded in years from 2015/16 while the same period also experienced the highest increase in price of 38,5%.

4.7.2. Apples in the Durban FPM

Apples supplied to the Durban Fresh Produce Markets have exhibited an elastic response to price changes on average over the five years from 2012 to 2016 with both the mean and median P_{ES} estimates being P_{ES}= 2,1 and P_{ES} =1,20 respectively. The primary axis presents both the apples and median P_{ES} while the secondary axis measure the mean P_{ES}.

Though the supply response over the five years have been inelastic and elastic half the annual changes, it is the two middle annual estimates of 2013/14 and 2014/15 that were high and elastic that have influenced the final outcome of the overall response for both mean and median. This elastic own price response for apples supplied to the Durban Fresh Produce Market indicates that on average for every 1% change in price , a 1,2% change in quantity of apples supplied would be induced.

Figure 4.18: Estimated Price Elasticity of Supply for Apples sold at the Durban FPM (2012-2016)



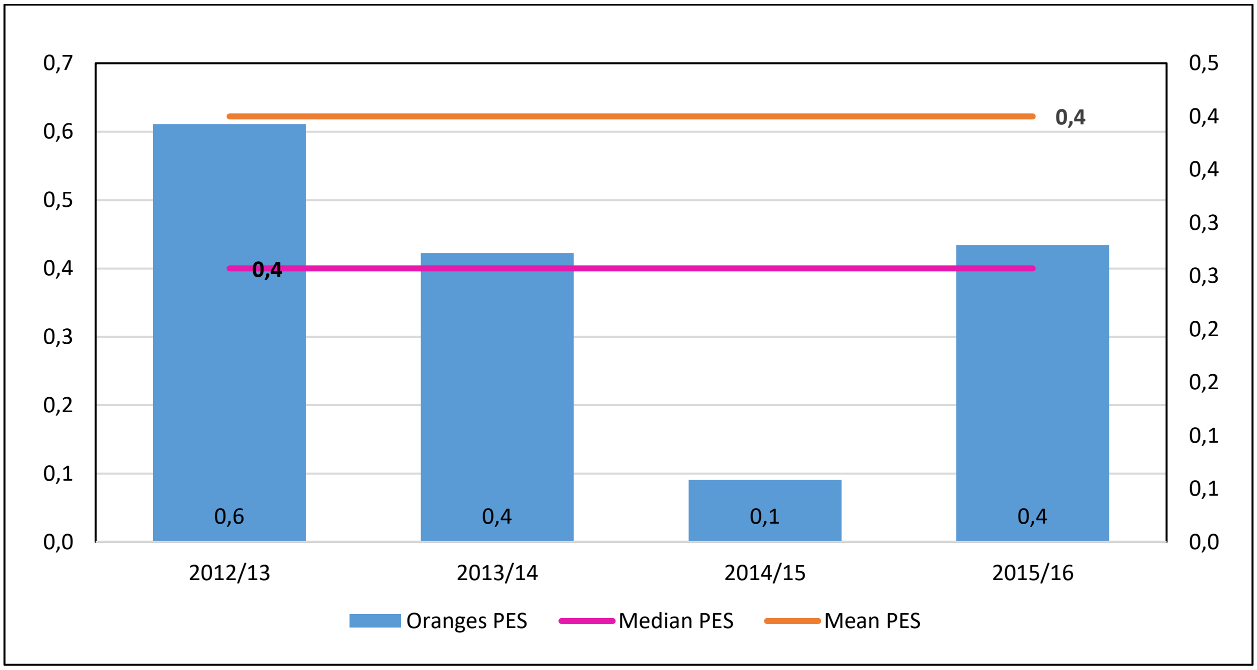
Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

Looking at the actual percentage changes for both quantity and prices in the period, records show that quantity supplied had increased by 16,6% while prices dropped by 2,9%. Over the 2015/16 annual change, prices increased by an unprecedented 15,7 percent while supply dropped by 7,4% inducing the inelastic response of P_{ES}= 0,5.

4.7.3. Oranges in the Durban FPM

Oranges in the Durban Fresh Produce Market exhibit an inelastic price elasticity of supply throughout the five year period from 2012 to 2016, as evident from the consistent observation of less than 1 (P_{ES}<1) estimate for 2012/13 to 2015/16 as well as equal mean and median estimates of P_{ES}=0,40. The primary axis presents both the bananas and median P_{ES} while the secondary axis measure the mean $P_{ES.}$ The expectation is that for every 1% change in price of oranges there will be a 0,4% change in quantity of oranges supplied to this market overall.

Figure 4.19: Estimated Price Elasticity of Supply for Oranges sold at the Durban FPM (2012-2016)



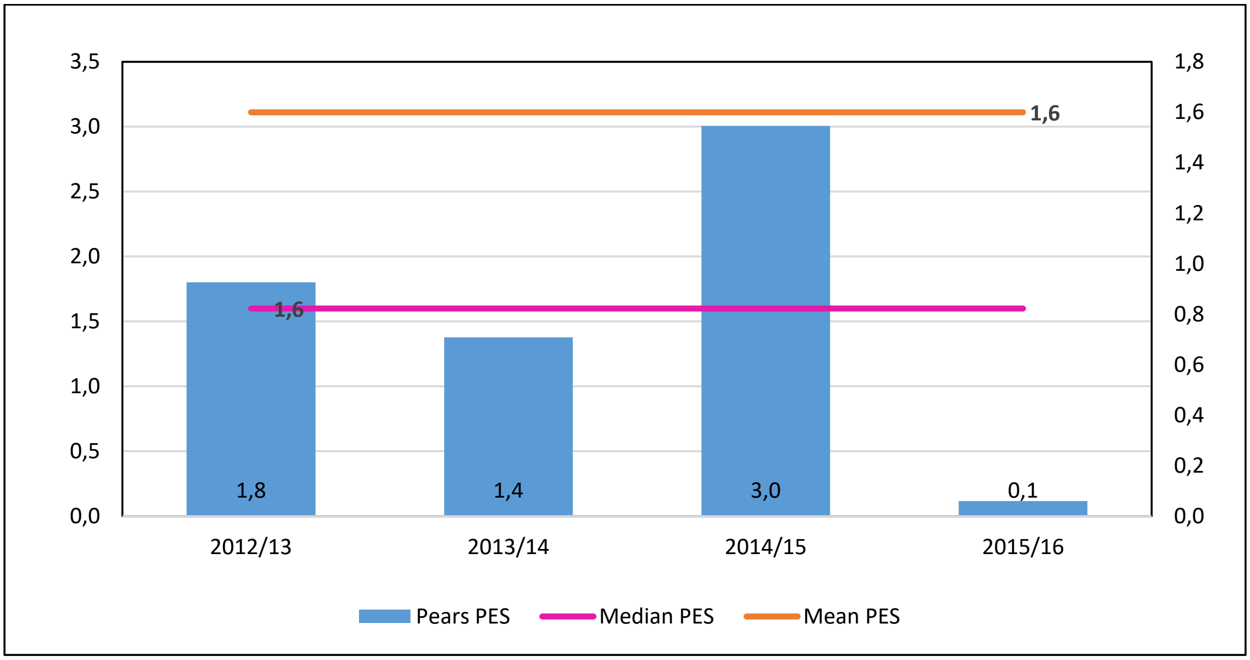
Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

The largest percentage movements in both quantities and prices was observed in the period 2015/16 where percentage change in quantity of oranges supplied was a decline of 18,6% and a percentage increase in price of 42,8%. This led to a P_{ES} estimate of 0,4 for the period similar to that of 2013/14 which was also in line with the estimated average P_{ES} for the five year period.

4.7.4. Pears in the Durban FPM

An estimated median P_{ES} =1,6 shows that the price sensitivity of pears supplied to the Durban Fresh Produce Market has been elastic over the past five year period from 2012 to 2016. Figure 4.20 presents the trends for apples, mean and median PES where the primary axis presents both the pears and median P_{ES} while the secondary axis measure the mean $P_{ES.}$ Mean and median elasticities have been estimated equal and in the same direction of responsiveness. This elastic response suggests that for every 1% change in price of pears in the Durban market a 1,6% change in quantity of pears supplied can be expected.

Figure 4.20: Estimated Price Elasticity of Supply for Pears sold at the Durban FPM (2012-2016)



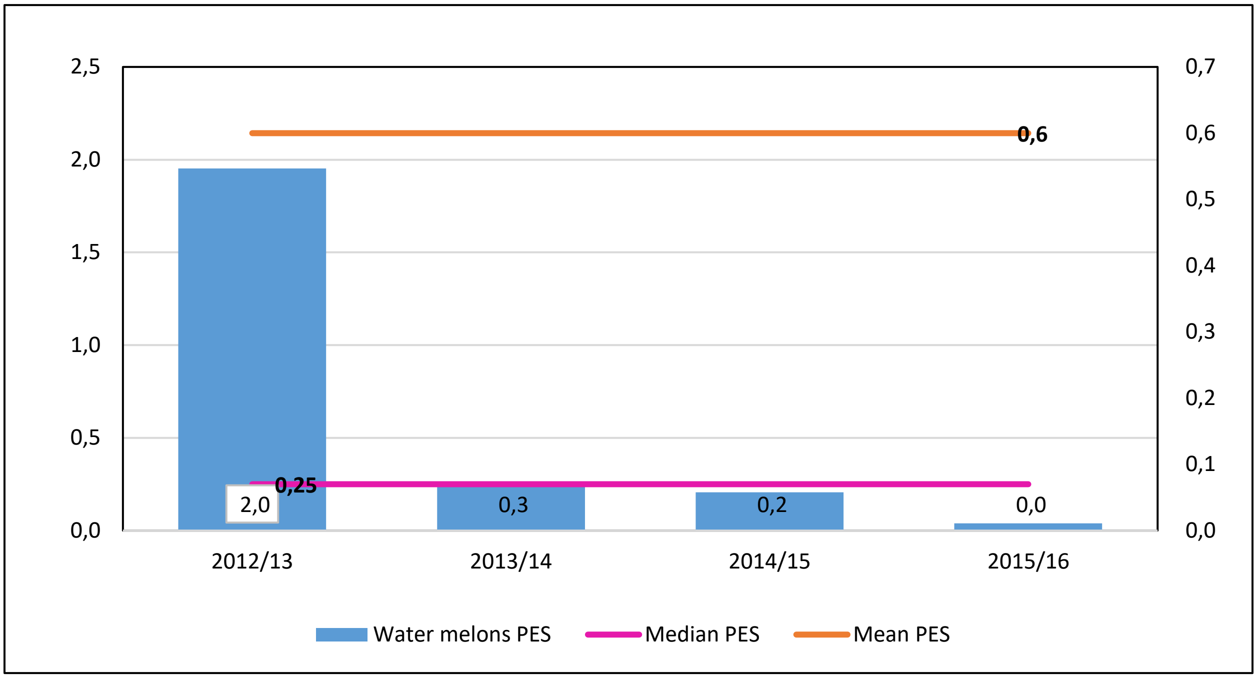
Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

From 2012/13 to 2014/15 price elasticity of supply for pears has been elastic and increased from P_{ES}=1,8 in 2012/13 to P_{ES}=3,0 in 2014/15. However, in the drought years 2015/16 there was a 0,7% decline in quantity supplied which was overshadowed by the 6% increase in prices inducing an inelastic supply response of P_{ES}=0,1. The biggest percentage movements in both quantities and prices for pears were observed in the period 2012/13 where percentage change in quantity supplied was a decline of 18,8% and a percentage increase in price of 10,4%. This led to an elastic P_{ES} estimate of 1,8 which was slightly higher than the average P_{ES} of 1,6.

4.7.5. Water Melons in the Durban FPM

Water melons have exhibited the most dramatic movements in terms of percentage changes for both quantity supplied and prices. Quantities supplied increased by almost half the size of supply from 2012 to 2013 registering a 43,8% increase in between these years, however this increase in supply was not to be sustained since the very subsequent year (2014) supply decreased by a staggering 61,2% and price increased by massive 244% leading to an inelastic P_{ES} =0,3 in 2013/14.

Figure 4.21: Estimated Price Elasticity of Supply for Water Melons sold at the Durban FPM (2012-2016)



Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

Annual percentage change in prices continued to outstrip percentage change in quantity culminating into a 0,04 inelastic response in 2015/16 period. As such , it is no surprise that the median response to price changes over the five years has been P_{ES}= 0,25 which is inelastic concluding that a 1% price change for water melons is likely to lead to a lesser percentage change in quantity of water melons supplied of 0,25%.

4.8. Estimated Price Elasticity of Supply (P_{ES}) for Vegetables (Durban)

Table 4.12 presents the annual own price elasticities for the top five traded vegetables in the Durban Fresh Produce market over the period 2012 to 2016. Both the mean and median annual elasticity of supply with respect to own price have been calculated and presented. These estimates gave similar results in terms of direction of responsiveness except for potatoes and onions in which case both the magnitude and the direction of responsive was different for the mean and median. Estimating both measures of central tendency has helped in reducing the impact of outliers on the mean through the median which provides a better measure of central tendency. The results indicate that the majority of top five vegetables in this markets are price inelastic with respect to supply with four out of five vegetables giving the inelastic response and only one vegetable giving the elastic response overall.

The graphs that follow will present a product specific analysis with an aim of highlighting annual changes and comparisons with the five year average of price sensitivity of supply per product for the selected vegetables in the Durban Fresh Produce Market.

Table 4.12: Estimated Price Elasticity of Supply for the Top Five Traded Vegetables in the Durban FPM (2012-2016)

Vegetables	2012-13	2013-14	2014-15	2015-16	Mean	Median	
Potatoes	0,2	2,9	0,6	0,2	1,0	0,40	$P_{ES} < 1$ inelastic
Onions	0,3	17,6	0,7	0,004	4,7	0,50	$P_{ES} < 1$ inelastic
Tomatoes	0,5	0,5	5,9	1,7	2,2	1,10	$P_{ES} > 1$ elastic
Carrots	0,3	0,3	1,2	0,2	0,5	0,30	$P_{ES} < 1$ inelastic
Butternut Squashes	1,3	0,3	0,2	0,1	0,5	0,25	$P_{ES} <1$ inelastic

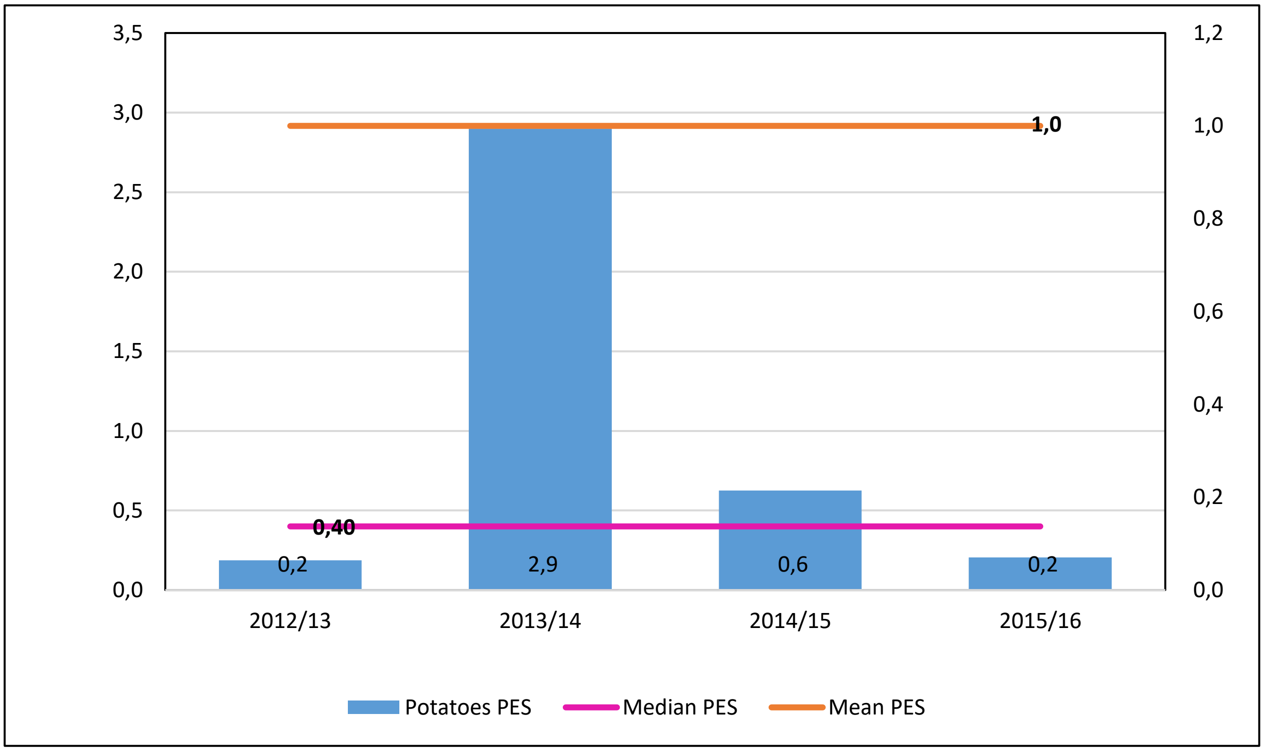
Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

4.8.1. Potatoes in the Durban Market

Figure 4.22 presents the annual estimates of P_{ES} as well as the mean and median price elasticity of supply for potatoes in the Durban Fresh Produce Market over the period 2012 to 2016. The mean P_{ES} gave a result that is unitary elastic while the median estimated P_{ES} gave a result which is inelastic, the median estimate is more reliable and realistic since it does not suffer bias of outlying P_{ES} estimates such that of 2013/14 (P_{ES}=2,90) which was the only elastic annual P_{ES} of all the years in consideration. The trend of potatoes PES indicates that only one period exhibited an elastic price elasticity of supply while the rest of the years 2012/13, 2014/15 and 2015/16 price elasticity of supply of the product was estimated to be less than 1 which is inelastic.

Prices have generally risen proportionally faster than any increase in quantities of potatoes supplied to the Durban Fresh Produce Market. The highest percentage change in potato prices sold at this market was observed in 2015/16 where annual percentage change in price was 61,9% and the highest percentage change in quantity supplied was also in the same year 2015/16 as a decline of 12,7%. The steep rise in prices accompanied by a moderately declining supply of potatoes to the market over the period has given a combined result of an inelastic estimate of P_{ES}. This means that on average, for every 1% change in price there can be expected a 0,4% change in quantities of potatoes supplied to the Durban Fresh Produce Market.

Figure 4.22: Estimated Price Elasticity of Supply for Potatoes sold at the Durban FPM (2012-2016)

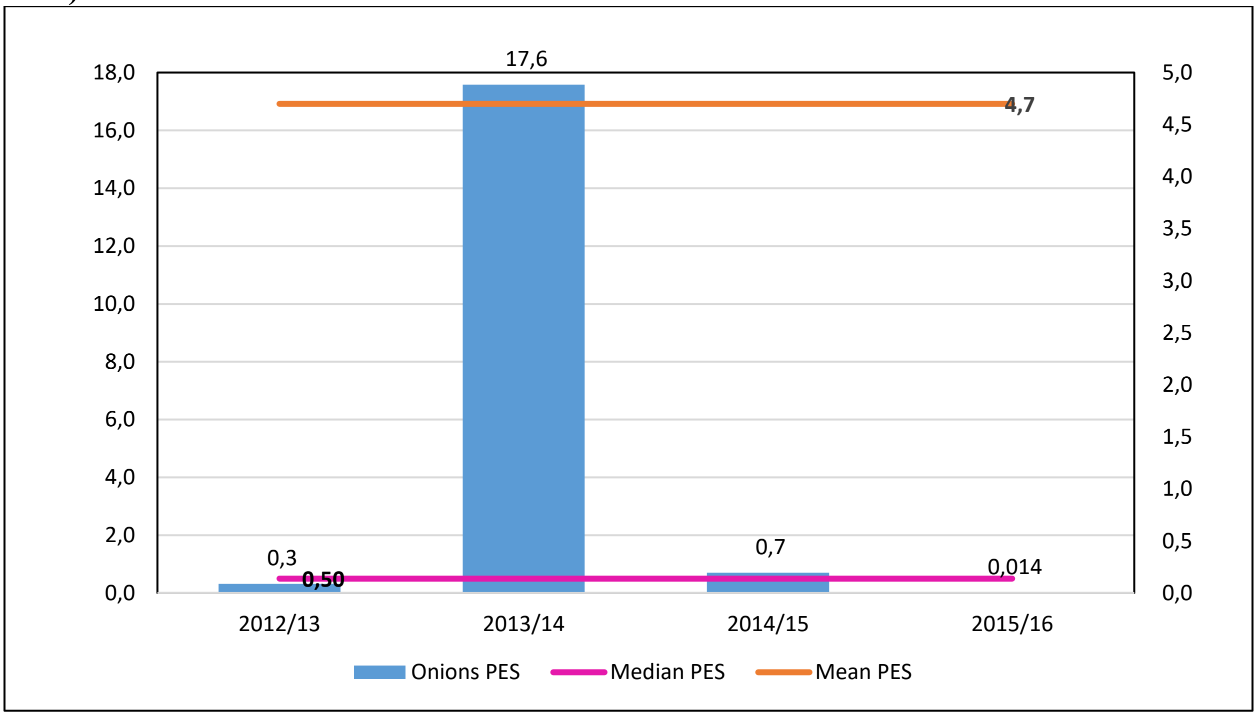


Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

4.8.2. Onions in the Durban Market

Onions sold to the Durban Fresh Produce Market over the years 2012 to 2016 have exhibited an inelastic response of supply to own price with a median estimated P_{ES}=0,50. This is in contrast to the overly biased estimate of the mean P_{ES}=4,7 which was heavily influenced by an outliers annual P_{ES}=17,6 estimated for the period 2013/14. An overall P_{ES}=0,50 suggests that for every 1% change in the price of onions in this market, quantities of onions supplied can be expected to respond by a lesser than proportional change in price of 0,5%.

Figure 4.23: Estimated Price Elasticity of Supply for Onions sold at the Durban FPM (2012-2016)



Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

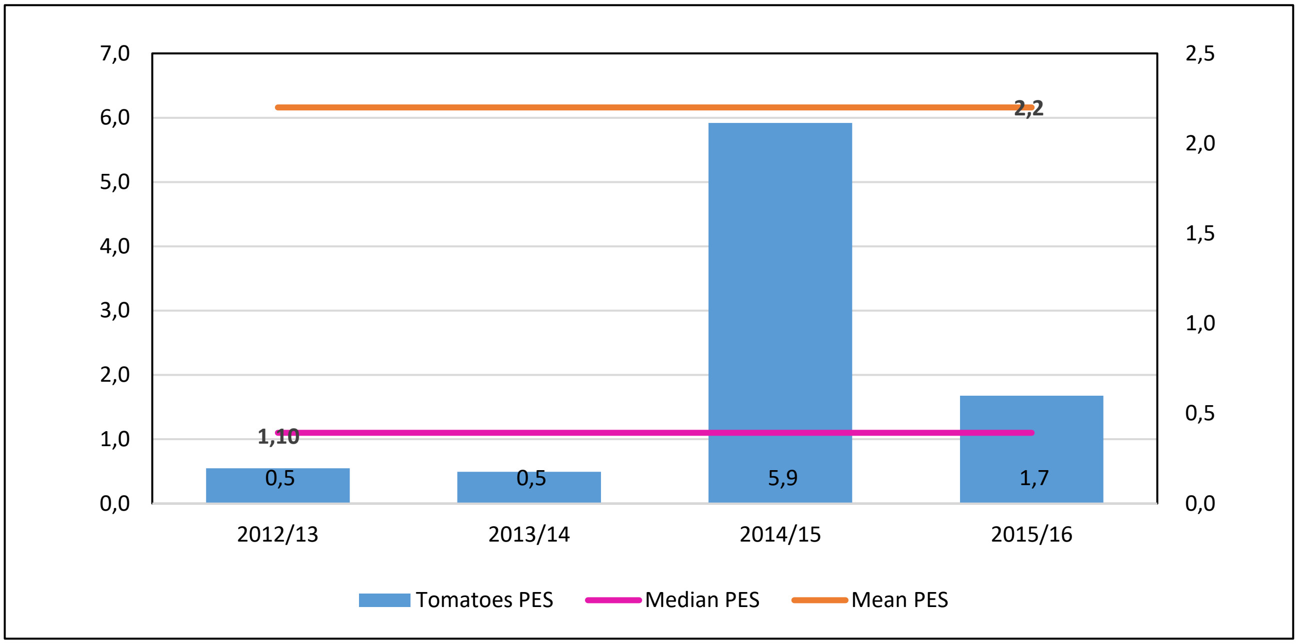
Peak percentage changes in prices were observed in the period 205/16 when prices rose by 56,4% and the highest percentage change for quantities supplied was observed over the period 2014/15 with an increase in supply of 12.2%

4.8.3. Tomatoes in the Durban Market

Tomatoes are the only price elastic product in the top five traded vegetables in the Durban Fresh Produce Market with a median annual P_{ES}=1,10 over the five years from 2012 to 2016. An elastic response higher than 1 indicates that a change in price induces and even greater change in quantity supplied.

For tomatoes in this market a 1% change in the price of tomatoes is expected to cause quantity supplied of tomatoes to change by 1,1%. Tomatoes annual and median P_{ES} are presented on the primary y-axis and the mean P_{ES} is presented on the secondary y-axis. The mean and median were both elastic, but the mean was a bit overestimated due to bias introduced by the highest estimate of P_{ES}=5,9 for period 2014/15.

Figure 4.24: Estimated Price Elasticity of Supply for Tomatoes sold at the Durban FPM (2012-2016)



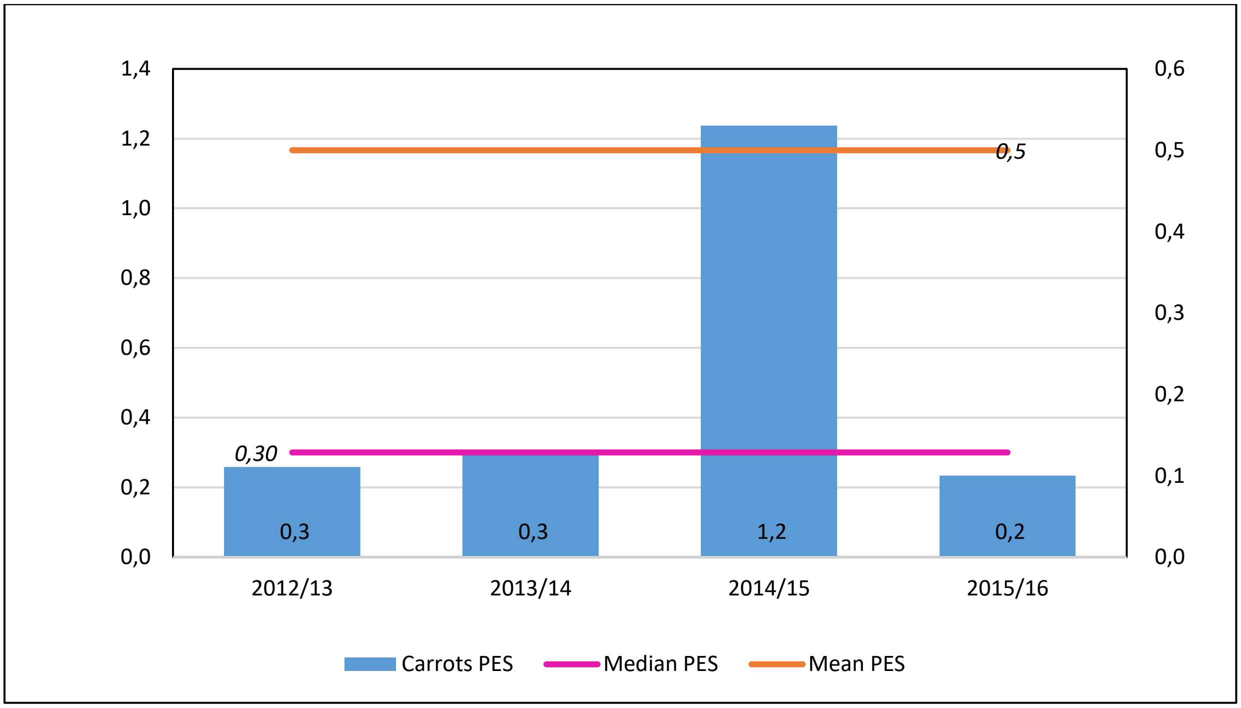
Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

Inconsistent with the expectation of declining supply of vegetables because of the drought of years 2015/16, for tomatoes supplied in the Durban Fresh Produce Market this period experienced the highest annual change in supply of tomatoes which was an increase of 16,6% while prices dropped by 9,9%. The highest change in price was an increase of 25,5% experienced over the period 2013/14.

4.8.4. Carrots in the Durban Market

Carrots in the Durban Fresh Produce Market have an inelastic annual median P_{ES} =0,30 which indicates that on average over the period 2012 to 2016 price changes were greater than the accompanying response in quantity of carrots supplied at each time in this market. An estimated P_{ES} =0,30 suggests that on average over the past five year the combined effect of a 1% change in prices of carrots is expected to induce a 0,30% change in quantities of carrot supplied to this market.

Figure 4.25: Estimated Price Elasticity of Supply for Carrots sold at the Durban FPM (2012-2016)



Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

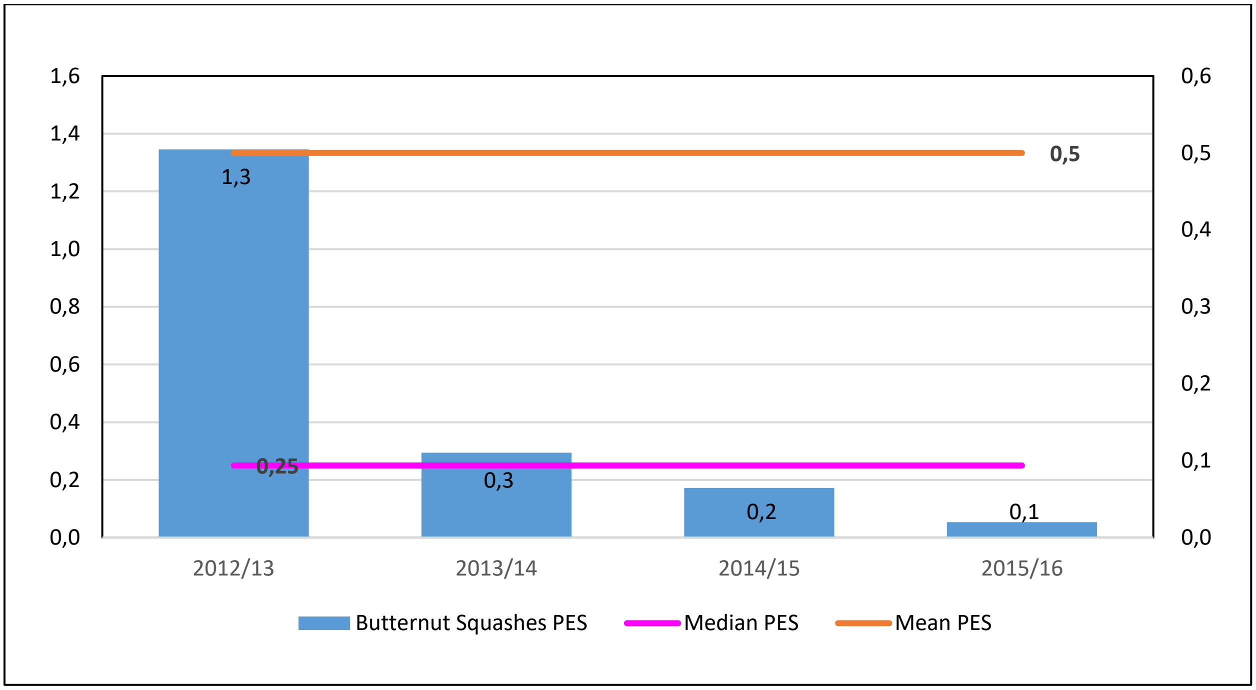
Over the five year period, only in 2014/15 was the year when responsiveness of supply to price changes was elastic with a P_{ES}=1,2, the rest of the periods showed an inelastic with response with P_{ES}<1. The mean and median estimates of PES gave similar outcomes in terms of direction of responsiveness for the elasticity of carrots supply to own price, though the median P_{ES} =0,30 magnified the outcomes and responsiveness in this regard.

While the net movement in the quantities supplied of carrots to this market over the five years has been upwards, the highest change in quantities supplies was an increase of 18,4% observed over the period 2014/15. Contrary to the expectation of a net downward movement in prices due to increasing quantities supplied, prices have generally increased for carrots in this market with the largest increase in price observed over the period 2015/16 at 23,4% associated with a decline of 5,5% in supply hence an inelastic response by carrots supply to own price.

4.8.5. Butternut Squashes in the Durban FPM

Like carrot, butternut squashes in the Durban Fresh Produce Market have an inelastic annual overall P_{ES}=0,25 as estimated by the median. This indicates that the percentage changes in price are greater than the proportional response in quantity supplied at each time in this market.

Figure 4.26: Estimated Price Elasticity of Supply for Butternut Squashes sold at the Durban FPM (2012-2016)



Source: Author's analysis compiled from Department of Agriculture, Forestry and Fisheries NFPM Statistics 2017

Own price elasticity of supply response of butternut squashes supplied to the Durban market has been declining throughout the period from 2012/13 to 2015/16. The P_{ES} started off elastic and declined to inelastic levels from 1,3 in 2012/13 to an almost perfectly inelastic estimate in 2015/16 at P_{ES}=0,1. Judging from the recorded annual percentage changes in quantities supplied, the trend has been a downward and decreasing supply of butternut squashes to this market. The highest percentage decline in quantities supplied was observed over the period 2012/13 at 23,4%. Net price response has been upwards in direction as expected and in line the theory of supply for a product and price relationship. The highest price movement in percentage change was an increase of 43,1% observed over the period 2015/16.

4.9. Public Agricultural Extension and Advisory Services

Working with small scale farmers in agriculture and agribusiness development has often required heavy reliance on extension services as a way of information sharing, technology and skills transfer as well as capacity building (Sebeho, 2016). The most common definition of agricultural extension is that which views the practice as a method of delivery of agricultural information to farmers through technology transfer, advise and facilitation (Anderson & Feder, 2003). Recently, there has been an emerging need for distinguishing between rural extension as well as agricultural extension since most commentators have discredited government extension advisors and practitioners due to a range of apparent shortcomings in the service and lack of desired impacts in areas of intervention (Rivera, 2003). These areas of intervention when it comes to small-scale farmers are inevitably based in the rural areas, and literature points out that that agriculture as an economic activity, though highly practiced and praised for its prevalence and potential for poverty eradication, this primary economic activity is not a panacea to all problems facing rural households (Machete, 2004). The KZN community survey of 2016 indicate that the bulk of those households in the province who are active in agriculture are either doing it as a primary source of food or as an additional source of food, putting income generation from agriculture as a secondary objective for the rural poor (Stats SA, 2016). This overlapping nature of the target market for agricultural and rural development has been a cause for concern and a source of complexity when it comes to bringing about policy and implementing sustainable and integrated solutions for rural areas (Cousins, 2010).

Most developing nations have been reviewing their extension services in line with skills of the extension agents and providers, the technologically advancing field of operations as well as the demanding needs of rural households for integrated approach to development (Rivera, 2003; Sebeho, 2016). The main challenge in the South African context has been the lack of coherent and result driven programme for extension services, partly due to poor resourcefulness of extension officers themselves as well as larger organisational management incapacity to guide, implement, monitor and evaluate efficient extension service delivery (Duvel, 2000). South Africa has at the beginning of the last decade adopted an Extension Recovery Plan (ERP) as part of the Comprehensive Agricultural Support Program (CASP) which seeks to improve the efficiency of national extension services to farmers as provided by provincial Departments of Agriculture and

Rural Development (Sebeho, 2016). As defined by the national Department of Agriculture, Forestry and Fisheries in South Africa (DAFF), extension services are services relating to "information, knowledge and skills development to enhance the adoption of improved agricultural technologies and facilitation of linkages with other institutional support services such as input supply, product marketing, and credit" (DAFF, 2008:7). These services are augmented by advisory services which have a more commercial orientation that are offered by subject matter specialists, private organizations and firms to support commercial interests of the agricultural sector at large. The extension recovery plan has been a strategy by government to revitalize the state of agricultural extension and advisory services in the country.

Services offered by agricultural economists of the South African public services as located in the various spheres of government from the national department of agriculture down to the provincial and district offices of agriculture have a component of both advisory and extension, in a sense that the agricultural economists personnel collate, analyse and develop market information and also disseminate such information to the clients of the department at various levels of operation with an aim of aiding sound agribusiness principles for economic growth (KZN DARD, 2017).

One of the key objectives of this study is to propose ways in which the provincial Department of Agriculture's (KZN DARD) market information services can be enhanced for improved decision making by all its users and clients. Extension and advisory services offered by the public institutions of agriculture have often been criticized for limited accessibility by small-scale farmers, use of inefficient methods of service delivery as well as inadequacy of information being delivered in order to address needs within and sometimes outside agriculture when it includes the broader rural development mandate and aspirations of small-scale famers and the rural poor (Rivera 2003 and Akpalu, 2013). However, there is an indication of good service from KZN government extension services where 90% of the uThungulu District small-scale farmers in a survey reported that they receive adequate extension services, private sector extension and advisory services are far more advanced and up to date with industry developments through investment in research and development as well as provision of dedicated commodity specific extension service to keep the farmers informed with the latest industry information and technology (Jacobs, 2003 and Nkosi, 2017).

4.10. Agricultural Extension and Advisory Services at the KZN DARD

Agricultural economic advice and market information in the KZN DARD is offered in various modes of distribution including demand driven as well as a proactive approach that is informed by needs analysis of the department in line with its aims and objectives of the time. The proactive approach, for example, relates to information that is disseminated to farmers by the department as a way of advice or alert in times of natural disasters or in cases where the issue affects the farming community at large. The information and update provided by the departments in all spheres during the times of the outbreak of the fall army worm in most parts of the country. These alerts are usually provided by DAFF and provincial department offer on the ground support in terms of identification and advice to farmers as well as control of the pest.

4.10.1. Demand Driven Approach

The demand driven approach is a response based method of extension advisory services where farmers and other departmental clients request services which is then provided by officials in the relevant form. Among indicators that the department has to perform on in this regard is an annual performance plan transversal indicator on the following.

- **Telephonic and electronic requests**

These types of requests for information and advice can either be responded to at the time of the call through advice and guidance, or the official may need to seek further information and revert to the caller. Market information is largely disseminated through this way, where farmers and clients can call in inquiring about location of markets near to them as well as weekly process of a product such as vegetables or requesting a meeting or workshop on a certain topic of relevance to their agribusiness activities, including requests for business plans and farm assessment.

- **Walk-in requests**

These request are from clients and farmers who report physically to the offices of the department of agriculture mainly in the local offices where these facilities are closest to the communities, requesting service, information and advice. The localized veterinary stations in the departmental office where communities can bring their livestock including pets for immunization and other diseases are some of examples of these requests. The walk –in request mode is also popular when the department is rolling out a support programme through supply of free services and inputs such as weedicides, seeds and pesticides in attempts to support household food security farmers as well as control some outbreak of disease or pest, as well as drought relief and other natural disasters that threaten food security in a region.

4.10.2. Proactive/Needs Driven Approach

In line with governmental mandate and the strategy for service delivery at any given time, public service has needs based objectives to implement through agricultural extension and advisory services. These relate to direction in the type of research and development agenda to be pursued by the government through its departmental scientific services as well as needs based interventions based on skills assessment for clients/farmers and in response to an urgent situations that might arise and require control such as diseases outbreak, control of veldt fires as well as response to droughts and other devastating natural disasters that may occur from time to time (KZN DARD, 2017).

- **Media usage**

In instances where the department wants to advance its programmes in extension and advisory media such as newspapers, television, radio, departmental websites, sector magazine interviews and opinions are utilized in order to disseminate information to all relevant stakeholders. The government plans for drought relief were announced on national television through SABC News as well as various websites and sector based organization magazines (Gateway news, 2016; SAPeople.com, 2018 and SABC News, 2018). Through these announcements and general media coverage the government is able to disseminate much needed information to the public at large.

Another use of the media for purposes of extension and advise is when certain topics relating to crop or animal production are aired through radio at designated times by the departmental officials. There is currently an ongoing radio programme that disseminates information and skills development in this regard that the KZN DARD coordinates with provincial and local radio stations. The departmental website is also a useful resource for information on various topics on agriculture through publications of research articles on livestock and crop production, production economics and marketing, diseases prevention and control as well as services offered by the departments (KZN DARD, 2018).

- **Research and Development**

The department has dedicated research and technology development centers that offer new information and research for various purposes targeting relevant issues in the agricultural sector. Information generated from these centers is then utilized for advice and dissemination of technology and new ways of doing things through advisory and extension services. The research centers also serve training centers for various issues in the agricultural development service. The agenda for research is often determined by the department in line with the country's outlook and national plans in economic development as well as provincial relevant needs for research and development. The department's scientists also collaborate in great deal with institutions of higher learning through memoranda of understanding as well as other cooperative agreements that involve funding for research as well as bursaries for students of agriculture (KZN DARD, 2018).

- **Farmers' Days**

Farmer's days are an important part of the extension officer's annual diary since these are important workshops and information sharing sessions where information can be imparted to farmers in groups according to their various commodities. For instance there are maize farmers' days, potato growers days, vegetable farmers' days and other sessions that are organized as deemed relevant at a local level by extension officers of the KZN DARD (KZN DARD, 2017). It is in these sessions and workshops that very often agricultural economists are called upon to be part of the programme to present and share information with farmers on commodity specific marketing issues.

4.11. Ways of disseminating Market Information

Marketing information can be distributed in one of many ways by the KZN DARD, two of these methods of distribution as currently used are discussed below.

- **Printed Material**

Market information is often disseminated in a form of PowerPoint slides presentation that contains market prices, trends and other relevant topics pertaining to the market of a commodity in question. These slides are often printed and distributed to farmers in attendance. Historic information from the weekly and quarterly bulletins is also disseminated through hard copies in these gatherings for farmers to consume and be informed.

- **The Market Information System (MIS)**

The MIS is a national department of agriculture developed and maintained agricultural commodity web-based market information resource for a range of commodities which provides market information collated from various sources into one hub making it easier for farmers and other users to retrieve information (Sishuba, 2016). The web-based service is augmented by a mobile-based service (USSD) which can be accessed on any cellphone by dialing a central number and following the various prompts to inquire and get desired information for various crops at various markets and sources that are part of the MIS. Since its launching in 2007, there has been a slow uptake in terms of use of the MIS especially by resource poor smaller-scale farmers due to poor access to internet resources as well as general awareness of the information provided by the resource. The DAFF has attempted to avert the problem by user education campaigns in collaboration with provincial departments of agriculture of which the farmers' days have been a common platform on which where conditions allow, the local agricultural economists have taken the opportunity to educate farmers in how to utilize the market information system.

However, a recent survey conducted by the national department agricultural economists under the wing agricultural marketing has indicated that the MIS is generally accurate in the information it provides but lacks the modern appeal of a website of its nature in comparison with other countries and similar websites (DAFF, 2017). This user survey was conducted amongst officials in the provincial departments of agriculture and presented at the forum of agricultural economists of marketing in November 2017. One of the issues raised at this meeting, though not apparent in the survey, was the inaccessibility of this platform to most small scale farmers who are largely illiterate and did not have access to internet.

- **Potential for ICT in Agriculture**

Various studies conducted in agriculture in the developing world indicate that there is largely an untapped potential role for ICT in improving the way in which agribusiness is done in the developing world amongst smaller scale farmers (Milovanovic, 2014; Singh et al., 2015 and Pandey, 2017). About two thirds of the 7,6 billion global population is already using a mobile phone and half of that uses a smart phone and the trend is expected to rise in the coming years with the largest growth expected from the developing world nations (Kemp, 2018 and Panda Security, 2017). This global observation is corroborated by South African General Household Survey (GHS) of 2017 which reported that 88,2% of households were avid users of cellular phones access nationwide and the rise in ICT access and connectivity was expected to rise (Gilbert, 2018). Cell phones were a major gateway to internet access for rural households who rarely had access to internet at home but rather through connection away from home in public places or at work (Gilbert, 2018).

Saudi et al (2017) looked at the potential for Information and Communication Technology (ICT) in advancing agriculture and economic development for developing countries and proposed that market information is one of the critical areas of success to farmers in developing countries that have been enhanced by ICT. Lack of proper infrastructure in many areas as a key stumbling block, lack of local language usage in many agricultural related applications made these less attractive to small scale farmers and the negative perceptions that are sometimes associated with technologies mainly form limited information. An internet and mobile device usage survey that was conducted by Simpson and Calitz (2014) amongst South African commercial farmers indicated that usage of internet was high (70%) amongst commercial farmers and that the internet was used mainly to access agricultural business information. The study recommended that agricultural service institutions such as the KZN DARD can benefit from usage of interactive applications and internet services for their farming clientele.

Traditional modes of communication such as newspapers, word of mouth, television and radio remain prevalent in advancing access to agribusiness main market information for farmers in the developing countries (Pandey, 2017). Though ICT usage is not yet wide spread in rural areas, rising access to mobile phones can be used as a launching pad for extension services of agricultural market information to a large group of rural and resource poor farmers. In India about 88% of surveyed farming populations indicated having access to at least a normal mobile phone which is generally utilized as a tool of communication and accessibility of farmers in moving their products through the marketing value chain in cross border trade of agri-produce (Pandey, 2017).

4.12. Conclusion

The aim of this chapter was to present, analyze and interpret results of data collected from the KwaZulu-Natal Fresh Produce Markets for the period 2012 to 2016. Trends in volumes, prices, diversification, high value crops and top ten trades crops based on quantiles sold were presented in the chapter.

Secondly, the chapter aimed to estimate the simple price elasticities of supply for top five traded fruits and vegetables in both markets of KwaZulu-Natal. This was done through annual changes in both supply and prices for various crops (fruits and vegetables) over the period of five years from 2012 to 2016 in the KwaZulu-Natal Fresh produce Markets. Estimated results were then interpreted in line with economic theory as well as natural observations relevant to both markets and products over the period.

The Chapter ended by looking at ways in which the KwaZulu-Natal Department of Agriculture and Rural Development can enhance its market information services as well as exploring and representing other improved ways utilised around the works in extension and advisory services which can assist in the effective dissemination market information to the clients and stakeholders of the KZN DARD.

The next chapter will summarise the key findings from study and give concluding remarks and recommendations on the both the contests /nature of market information that is provided by the KZN DARD as well as modes/approaches in delivery/dissemination of this information in order to enhance decision making by the departments' clients particular small-scale farmers.

CHAPTER FIVE

5. CONCLUSION AND RECOMMNDATIONS

5.1. Introduction

This chapter will consolidate the discussion from the foregoing chapters through drawing relevant conclusions from the key objectives of the study, the literature reviewed in the topic area, as well as the data analysis and interpretation exercise that was undertaken. The results from data analysis will be highlighted to draw conclusions and relevant implications for the key questions of the study as well as the broader agricultural sector, more specially the KwaZulu-Natal Department of Agriculture and Rural Development and its market information services. This chapter will conclude by giving recommendations for further implementation and or consideration in the topic and related field of study.

5.2. Summary of Key Results from the Study

This section will present key findings from the study's literature review as well as the data analysed.

5.2.1. Trends in the Fresh Produce Markets

The first objective of the study was to analyse trends in the Fresh Produce Markets of KwaZulu-Natal over the past five years (2012-2016) for all traded fresh produce (fruits and vegetables). The price and volume key findings are presented in the following sections.

5.2.1.1. Volumes Trends

There is a total of 152 products traded in the Fresh Produce Markets of KwaZulu-Natal with 92 vegetables and 60 fruits in each market. The trend in total volumes for both markets has been generally decreasing from a total of 390 304 tons in 2012 to 367 613 tons in 2017. Though there was an increase in total volumes from year 2014 to 2015, all the other annual changes is total volumes have been negative and the largest decline in quantities for all categories of fresh produce in both markets was observed between years 2015 to 2016 due to the drought.

The Durban market is consistently larger in terms of volumes for both vegetables and fruits over the years compared to the Pietermaritzburg market. The top five traded vegetables ranked by volumes supplied annually are potatoes, onions, tomatoes, butternut squashes and carrots in both markets. Top five traded fruits in both marks are bananas, apples, oranges, pears, with the exception of the fifth place where it is watermelons for Durban Fresh Produce Market and peaches for the Pietermaritzburg Fresh Produce Market. Watermelons are notably not even featured in the top ten fruits for the Pietermaritzburg market while peaches do make an appearance at the number six spot in the Durban market.

5.2.1.2. Price Trends

The price trend in both KZN Fresh Produce Markets for all products has generally been upwards with the steepest rise observed from year 2015 to 2016. Vegetable price trends in both markets have followed a similar pattern, rising steadily from 2012 to 2014, dropping in 2015 and then rising sharply in 2016. Fruit price trends have been less dramatic exhibiting a steady increase throughout the years in consideration. In both markets the trend for fruits has been less dramatic as compared to that of vegetables where annual percentage changes exceeded 50% and was a mixture of positive and negative annual changes. The Durban market price trend has been consistently above the Pietermaritzburg market for both fruits and vegetables, validating the observation that 9% national fresh produce market share of the Durban Fresh Produce Market is considerably larger than that of the Pietermaritzburg Fresh Produce Market at 2% market share for all South African fresh produce markets as ranked by DAFF (2016).

5.2.1.3. High Value Fresh Produce

Consistent with economic theory of demand the lower supply products in the KZN Fresh Produce Markets were the most highly priced, confirming the law of demand that there is a negative relationship between price and quantities demanded. Lower volumes in the markets induced higher prices for products such as a range of berries, prickly pears and peanuts and on the vegetables side it has been mostly patty pans, ginger and garlic. Conversely the high volume product such as cabbages and green mealies were frequently among the lowest prices products, while for fruits the lower prices produce were interchanging between grape fruit, oranges and watermelons over the years.

5.2.2. Price Elasticity of Supply for Fresh Produce (P_{ES})

The second objective of the study was to estimate the price elasticity of supply (P_{ES}) for the top five traded fruits and vegetables in the KwaZulu-Natal Fresh Produce Markets for the period 2012 to 2016. As a result there are four annual own price elasticities of supply in consideration from 2012/13, 2103/14, 2014/15 and 2015/16. Key findings from estimations of price elasticity of supply for fresh produce in the KZN markets are presented below.

5.2.2.1. Price Elasticity of Supply for the Pietermaritzburg Fresh Produce Market

a) Fruits

Of the top five traded fruits ranked by volume in the Pietermaritzburg Fresh Produce Market for the years 2012 to 2016, the key findings from estimated P_{ES} has been that three out of five fruits are supply inelastic (P_{ES}<1) with respect to own price while the other two in the top five were found to be elastic (P_{ES}>1) in response to own price. Mean estimates of P_{ES} for four fruits in this market were an understatement in terms of both magnitude as well as direction of elasticity of supply in response to price. For example, bananas and apples were both estimated to be elastic based on the mean P_{ES}, however, the median unaffected by bias of outlier resulted in an inelastic response and corrected magnitudes for each fruit. Median estimated P_{ES} ranges from 0,35 to 1,10, in this range, the most responsive fruit is oranges with the highest P_{ES}=1,10 and the least responsive fruit is pears with P_{ES}=0,35.

b) Vegetables

A similar trend to the one observed for fruits is true for vegetables own price elasticity of supply in the Pietermaritzburg market for the top five traded vegetables over the period 2012 to 2016. Out of five vegetables that are mostly traded in this market only one was estimated to be elastic (P_{ES}>1) in supply response to changes in own price, the majority of the vegetables in this category were found to be inelastic (P_{ES}<1) in repose of supply to own price in this market. Mean estimates of P_{ES} had resulted in the same direction in terms of elasticity of supply for these vegetables, however the magnitude for each was highly overestimated in all respects. Median estimates have been useful in correcting the bias and overestimation of P_{ES} for all these vegetables in the top five for this market. Median estimated P_{ES} ranges from 0,35 to 1,50, in this range, the most responsive vegetable supply to own price is tomatoes with the highest P_{ES}=1,50 and the least responsive vegetable supply to own price is potatoes with P_{ES}=0,35.

5.2.2.2.Price Elasticity of Supply for the Durban FPM

a) Fruits

Of the top five traded fruits ranked by volume in the Durban Fresh Produce Market for the years 2012 to 2016, the key findings from estimated median P_{ES} has been that the majority (three out of five) of the fruits in the top five are price inelastic (P_{ES}<1) with the other two fruits having an estimated annual P_{ES}>1 which indicates a price elastic supply for apples and pears in this market. Mean and Median estimates of P_{ES} for the fruits in this market were on two out of five occasions equal in terms of both magnitude and level of responsiveness of supply to own price. This was the case for oranges and pears, where oranges were found to be price inelastic and P_{ES}=0,40 (both mean and median) and pears were found to be elastic with P_{ES}= 1,6 (both mean and median). Similar to the Pietermaritzburg market mean P_{ES} for bananas was an overstatement of the response for the fruit's supply to own price in this market, median P_{ES} estimate was found to be inelastic. Median estimates of Pes ranged from 0,25 to 1,6 with the least responsive fruit supply to own price changes being water melons at P_{ES}=0,25 and the most responsive fruit supply to own price changes is pears with P_{ES}=1,6.

b) Vegetables

Estimates for the annual average P_{ES} for vegetables in the Durban Fresh Produce Market have come out similar to those of vegetables in the Pietermaritzburg Fresh Produce Market the result are the same for the same line up of vegetables in the top five traded in terms of four out five vegetables being inelastic (P_{ES} <1) and only one which is tomatoes being elastic (P_{ES} >1). There is a big difference in the mean and median estimate of P_{ES} both in magnitude and direction of sensitivity of supply to own price. For example, onion were estimated by mean P_{ES}= 4,70 while median P_{ES}=0,5 was found. The most price sensitive supply in the Durban market's vegetables is that of tomatoes at P_{ES}=1,1 and the least responsive to price is the supply of butternut squashes with P_{ES}=0,25.

5.2.2.3. Implications for Estimated Price Elasticity of Supply (P_{ES})

The key findings of this study is that vegetables in both markets are largely inelastic with respect to changes in prices, meaning that a 1% change in price of vegetables is likely to induce a less than 1% change in the quantity of vegetables supplied. This with the exception of tomatoes which were found to be elastic in both markets. For fruits, the majority of items in the top five traded fruits for both market was estimated to less responsive to price changes meaning that supply of fruits in the two fresh produce markets of KZN are price inelastic. As such a 1% change in the price of fruits in these markets is likely to induce a less than 1% change in the supply of fruits for both markets as estimated over the period 2012 to 2016. These inelastic trend is similar for both fruits and vegetables however, vegetables were more inelastic compared to fruits since 80% of the top five traded vegetables were inelastic and for fruits only 60% were found to be inelastic and there was a variation in the types of fruits that were elastic. It was apples and pears for Durban market and oranges and peaches for the Pietermaritzburg market.

5.3. Findings from Comparable Studies

Popular studies on the subject of elasticity have been largely on demand and income elasticities as it relates to fresh fruit and vegetables. No studies specific to fruits and vegetables and own price elasticity of supply have been found in literature. A brief discussion on these findings on the estimated price elasticity of supply (P_{ES}) of income and demand are presented briefly below.

Mkhabela (2016) estimated the Marshallian own-price elasticities for selected eight vegetables in South Africa and found that price elasticities of demand were inelastic ranging between 0,01 to 0,68. Other studies combined both fruits and vegetables and found that fruits were viewed by consumers as more a luxury food items as opposed to vegetables given the estimated own price elasticities which indicate that fruits were more sensitive to price changes compared to vegetables in South African markets (Ortman & Hayward-Butt 1994 and Agbola, Maitra &McLaren 2002).

From other countries, results of fresh produce and food price elasticities with respect to income were above unitary elastic which indicated that consumers are likely to increase their consumption of fruits and vegetables as their incomes rises (Durham & Eales 2006; Anwarul Huq & Arshad 2010; Weatherspoon et al. 2012 and Mkhabela 2016). Poor households are expected to spend more of their income on food since such is deemed a bare necessity until incomes rises to a level where household is able to afford luxuries and reduce food allocation on the household income in favour of more expensive items that become affordable (PACSA 2014 and Mkhabela 2016).

A review of over 160 studies globally on price elasticities for food with respect to demand revealed that food items were largely inelastic ranging between 0,27 and 0,81 with demand for convenient foods though still inelastic they were more responsive to price at 0,7 to 0,8 (Andreyeva et al. 2010). Weatherspoon et al. (2012) concluded a study on suburban populations access to fruit and vegetables in Detroit (an urban desert), and found that fruits were price inelastic with respect to demand where estimates were between 0,33 to 0,54 for fruits such as bananas, apples, oranges and lemons. Durham & Eales (2006) estimated price elasticities for fruit at a retail level with respect to demand and concluded that fruit prices elasticities of demand were more elastic than previously estimates with elasticities ranging from 0,21 to 1,32 for fruits n various retail shops in the United States.

Awal, Sabur & Mia (2008) estimated an inelastic national demand for vegetables at 0,4 and advised that price interventionist policies would not be ideal for the economy of Bangladesh. A revisit to the fruit and vegetable elasticity estimates using the Almost Ideal Demand System (AIDS) model with corrected Stone Price Index by Anwarul Huq & Arshad (2010) came to similar conclusion for vegetables price elasticity with respect to demand. Uncompensated own price elasticity of demand estimations for the same products were estimated to be inelastic at 0,3 for vegetables and 0,6 for fruits. This corroborates observations and conclusions form economic theory that fruits are more of a luxury items and their consumption increases with income (Krugman & Wells 2012).

5.3. Factors affecting Price Elasticity of Supply

Economic theory suggests that the price elastic of supply for a good or service is affected by many factors including the time and availability of inputs utilised by producers in the production process (Krugman & Wells 2012).

a) Availability of Inputs

The more readily available inputs to production are m the more responsive PES will be since suppliers can effectively adjust production accordingly in response to price changes in the market. One of the key inputs to agricultural production is land and capital for farm development and operational costs. While South Africa is said to be well endowed with arable land, such resources have been declining in productivity as well as availability since reports point to the fact that due to urban development and industrialisation more and more agricultural land has been converted to non-agricultural use (Niemand 2011 and Badienzelle 2013). Over and above this diminishing availability of land, the country small-scale farmers are trapped in unworkable land tenure systems in the communal areas that does not promote access to funding for agricultural development since rights to land are not private and exclusive (Ortmann 2007). As such in the face of these challenges to inputs availability it is not surprising that price elasticity of supply for vegetables mainly are price inelastic as have been estimated in this study as well as other studies include food items in general.

b) Number of Farmers in Fresh Produce

Amir (2015) proposes that supply of a good or service is likely to be price elastic when the number of producers is high. In terms of the number of producers in the agribusiness sector of South Africa for fresh produce, the number might be high however, due to the mentioned challenges with market access by small-scale farmers to these national fresh produce markets the elasticities of fresh produce might be pushed to lower levels as indicated in this study findings.

c) Time and Perishability of Products

Another key factor influencing the responses of supply of a product to its own price is the time which is available for producers to respond to price changes in the market (Krugman & Wells 2012). Agricultural produce in KwaZulu-Natal, especially vegetables is largely seasonal with feasibility to grow certain crops varying from area to area depending on location within the province. Some seasons are shorter than others with the longest being a year, while other areas are suitable for production of some crops all year round in various cycles. The implication of a longer period of adjustment is that producers can adjust production and supply decisions with respect to price changes well in time. However, with shorter production seasons supply may not be able to adjust as easily to prices. As such this might explain the mixed reaction observed especially for fruits in the Durban Fresh Produce Market which were both elastic and inelastic and the more elastic response of tomatoes in both markets. Another factor to consider with time for adjustment is the possibilities presented by ability to produce in hydroponic systems which allow for longer production season and transportation of produce to supply to areas of scarcity.

Another element of fresh produce that contribute to the inelasticity of fresh produce with respect to own price is the perishability of fresh produce making it impossible to stock and replenish in the markets (Amir 2015). Fruits and vegetables and other non-processed foods have a relatively short span of life adding to the inability of supply to respond timeously to price signals in the markets as producer do not really have the liberty of changing supply decisions (Amir 2015). This observation is also in line with the results of this study which indicates to the inelasticity of supply of vegetables and fruits to own prices.

5.4. Ways to Improve Market Information Services

The third and final objective of the study was to propose ways in which the agricultural market information services offered by the KwaZulu-Natal Department of Agriculture and Rural Development can be improved in order to enhance decision making by small-scale farmers and other interested stakeholders. From literature that has been reviewed in the subject of agricultural market information and ways of information dissemination to small-scale farmers through extension and advice, there are two areas of improvement that can be proposed for the market information services as offered by the KZN Department of Agriculture and Rural Development. Firstly, in terms of content and the nature of market information that is provided and secondly, the methods and ways of distribution and dissemination through relevant and effective approaches to extension and advisory for small-scale farmers.

5.5. The Nature of Market Information Publications

The KZN Department of Agriculture and Rural Development market information publication currently comprise of the weekly and quarterly price and market publications which deliver different information at different times. The weekly price bulletin is a simple statement and announcement of historic price information of the previous week for a few livestock, grains and vegetable products which does include information from more than just the Fresh Produce Markets such as the SAFEX grain feeds and livestock auction and abattoir information from various sources. The quarterly bulletin focuses exclusively on the National Fresh Produce Market of KwaZulu-Natal. The quarterly bulletin further include only a price and volume trend which is consolidated into annual quarter to quarter comparison to give a picture of movement in terms of volumes and prices for selected vegetables in the Pietermaritzburg and Durban markets. The following are areas of content improvement with regards to information published on the websites as well as distributed to farmers and clients in various ways.

a) Expanding Scope of Markets

The current marketing services would benefit immensely from the inclusion of marketing information from marketing channels other than the National Fresh Produce Markets in the DKZN Department of Agriculture and Rural Development's weekly, quarterly and annual publications. A study by Louw and Jordaan (2016) indicated that the informal market was the most preferred channel by small-scale farmers in marketing their fresh produce yet there is very limited information and support for these markets and its users. Understanding how the informal market functions can aid effective development of interventions for assistance of small-scale farmers and other value chain actors who are small businesses in the distribution of fresh produce in the province and the country at large. Paying attention to these channels can also improve health and safety standards for produce that is marketed through these channels and reduce food wastage that is often a characteristic of the affluent and formal food chains due to stringent quality compliance controls.

b) Expanding Depth of Information

The published bulletins of market information by the KZN Department of Agriculture and Rural Development currently do not include any information about high paying fresh produce items for both fruits and vegetables in the Fresh Produce Markets. This deprives farmers who have commercial intent and ability to grow these crops an opportunity to get information and capitalise on the income generation potential from the Nation Fresh Produce Markets. One of the key prohibiting factors for small-scale farmers to participate in the NFPMs has been identified as the distance to these markets as well as the bulkiness of the fresh produce and the requirements of large volumes to be supplied which also ties with economies of scale for costs such as transportation (Mpandeli & Maponya 2014). Volumes of high value vegetables such as garlic, ginger and parsnips in the fresh produce market indicate that these products are amongst the lower volume crops that are supplied on irregular months of the year, adding to the shortages in the market most of the year which is a space for more suppliers to produce and supply the market up to the equilibrium quantities and prices.

c) Estimation of Price Elasticity

KZN Department of Agriculture and Rural Development agricultural market information service can benefit a great deal from the occasional calculation of price elasticities for fresh produce in the provincial fresh produce markets in relation to both supply and demand. Food items elasticities are very useful information for policy development in line with the departments own interventions in supply and demand influencing factors as it aims to reduce poverty and improve economic growth through agriculture. A global study into the epidemic of obesity revealed that about 70% of South African women were either overweight or obese and that the prevalence of obesity among children was 8%, above the global average of 5% (Green 2017). Childhood obesity is a growing concern globally and has been linked with a rising trend of development of chronic diseases later on in life as well as impotence in male children (Flynn et al. 2006). In a study by Willet et al. (2006) regular consumption of fruit and vegetables is recommended as one of the ways in which developing nations populations can adopt in order to reduce the risk of Coronary Artery Diseases (CAD) and stroke.

Price elasticity of supply has a direct impact on the price elasticity of demand hence consumption and production decisions by all actors in the market (Lumen Learning 2017). Food items have been found to be inelastic between 0,27 and 0,81 in a consolidated review of price elasticities of demand for food and non-alcoholic beverage items globally (Andreyeva, Long & Brownell 2010). Estimates of price elasticities of demand for food can assist in understanding consumer behavior and the factors influencing substitution effects from healthier to non-healthy food alternatives for at risk populations like children around the world (Durham & Eales 2008).

5.6. Agricultural Extension Services

South African government extension and advisory services are one of the key means at the disposal of provincial and national department to aid delivery of agricultural marketing information services. This happens at various levels and spheres of influence among interlinking objectives with a central objective to help the small-scale farmer improve their farming business and agricultural practices for integrated rural development and sustainable use of resources (KZN Department of Agriculture and Rural Development 2017). These services have been subject to much criticism for their ineffectiveness throughout the past decade and there have been efforts to bring about improvement from all fronts including the governments' own strategy for revitalisation of exertion and advisory services through the Extension Recovery Plan (ERP) (Sebeho 2016). In this regard there has been some areas of improvement though a lot remains to be done in order to parallel the services offers by private sector in commodities such as citrus or sugar cane in KwaZulu-Natal.

a) Information and Communication Technology (ICT)

Integration of information and communication technology in the delivery of extension and advisory services has been proposed as one of the key ways to effectively deliver market information and other agricultural development services to famers because of the potential that ICT holds for growth in the development countries (Aina 2007). Though most studies found that traditional media of communication such a word of mouth, television, newspapers and radio were the most prevalent ways in which most developing nation's farmers access information on markets, there is a huge promise for improvement through ICT (Sain et al. 2017). Access and usage of cellular phone (both normal mobile phones and smart phones) is growing globally and developing countries are areas of faster growth in this regard (Stats SA 2017 and Kemp 2018). Developing applications that are user friendly for local farmers can improve access to information services. User friendliness of applications suggest compatibility with local ICT infrastructure and translatability of information into local languages as well as graphical design and presentation of information in an interactive manner that can engage illiterate and resource poor farmers without additional costs of transacting.

- **Success factors for ICT in agriculture**

To enable benefits from the ICT wave by small-scale farmers in developing countries, the government and private sector alike have to invest in improved ICT infrastructure, education and capacity building and improved partnerships and collaborations that encourage trust and demystify the complexities of new technologies that often feed negative perception form illiterate farmers (Aina 2007).

b) Farmers Days

One of the challenges identified in the literature was that in cases where some information was available, there was not sufficient ability to utilise by small-scale farmers due to information being on websites that are inaccessible by technologically challenged and illiterate farmers (Maponya 2014). In these cases, the farmers' days and information distribution centres and other gatherings still have a role to play in extension that enables effective distribution of market information.

- **Success Factors for Farmers Days**

With regard to information centres and farmers days, these need to be encouraged to be more interactive interlinked with the farmers daily lives and surroundings. For instance, information needs to be delivered to farmers in a language that they understand at times that are convenient for all of them to attend to receive the information as well as in an interactive manner where visual presentation of information and display or print media encourages interaction and learning by doing so that the information can resonate with farmers even after the training sessions.

5.7. Recommendations

KwaZulu-Natal fresh Produce Markets data on prices and volumes was used to estimate own price elasticity of supply for top five traded fruits and vegetables ranked by volumes traded in the Pietermaritzburg and Durban Fresh Produce Markets for the period 2012 to 2016. Estimated sensitivity of supply for vegetables was largely inelastic based on the median estimate with P_{ES} ranging from 0,25 to 0,75 with an exception of tomatoes which were found to be elastic in both markets with P_{ES}=1,5 in Pietermaritzburg and P_{ES}=1,1 in Durban. Estimated annual average price elasticity of supply for fruits was also largely inelastic with median estimates of annual own price elasticities of supply ranging from 0,25 to 0,75. The 40% of fruits that were estimated price elastic in both markets had median PES between 1,05 and 1,6. From a producer decision perspective inelastic own price elasticities of supply for these types of fresh produce indicate the producers are largely constrained in terms of reviewing their production decision to increase or reduce supply in effort to maximize profits guided by price signals in the market. Factors involved in these constraints include the high perishability of fresh fruit and vegetables, the time period it takes to adjust supply decisions and seasonality of production, as well as inflexibility of inputs and difficulties to access fresh produce markets faced by a large number of small-scale producers.

Over and above the price elasticity of supply estimates, results indicate that there are some areas of improvement in the KZN Department of Agriculture and Rural Development market information publications through content and manner of distribution. The weekly and quarterly market information bulletins that are published and distributed by the KZN Department of Agriculture and Rural Development can be improved to include more markets such as retail markets and informal markets price and volume information as well as related analysis.

It is also recommended that some of this information from the fresh produce markets such as high value products for both fruits and vegetables be collated, analysed and published in order to assist commercially orientated small-scale farmers to make decisions of high paying crops that can enhance income generation where feasible.

To enhance use of agricultural market information provided, the department can consider utilising the latest technologies in information communication and technologies (ICT) especially cellular phone and other visual media that is rising in terms of access and usage in the country. It is important that information is delivered timely and in a language that farmers can understand in order to inform their decision.

Recommendation for further research is to consider supply and demand sensitivity of fresh produce with respect to income as well as utilising more vigorous methods of estimation such as the Almost Ideal Demand System (AIDS) as used in other studies to inform market identification for farmers.

6. REFERENCES

African Centre for Biodiversity 2017, *The Three Agricultural Input Mega-Mergers: Grim Reapers of South Africa's Food and Farming Systems (Summary Report April 2017)*, viewed 25 September 2017 < https://acbio.org.za/wp-content/.../2017/.../Mega-Mergers-Summary-Bayer-Monsanto >.

Afrika, JK & Ajumbo, G 2012, 'Informal Cross Border Trade in Africa: Implications and Policy Recommendations', *Africa Economic Brief: Chief Economist Complex,* vol. 3, no. 10, pp. 1-13.

Agbola, FW, Maitra, P & McLaren, K 2002, 'The Analysis of Consumer Demand for Food in South Africa Using and Almost Ideals Demand System', Proceedings of the Conference of the Australian Agricultural Economics Society. 13-15 Feb 2002. Canberra, Australia. 1-13.

AgriAfrica 2015, 'Grants, funding and incentives for agriculture in South Africa', *Farming Portal*, 19 November, viewed 21 April 2018, <http://www.farmingportal.co.za/index.php/whats-new-in-agriculture/item/5679-grants-funding-and-incentives-for-agriculture-in-south-africa >.

AgriSA 2017, *Role of Agriculture in South Africa*, viewed 23 September 2017, <https://www.agrisa.co.za/about-us/role-of-agriculture-in-sa/ >.

Aina, LO 2007, 'Globalization and Small-Scale Farming in Africa: What Role for Information Centres?', Proceedings of the World Library and Information Congress: 73rd Ifla General Conference and Council. 19-23 August 2007, Durban, South Africa.

Akpalu, DA 2013, 'Agriculture Extension Service Delivery in a Semi-Arid Rural Area in South Africa: The Case Study of Thorndale in the Limpopo Province', *African Journal of Food, Agriculture, Nutrition and Development,* vol. 13, no. 4, pp. 8034-8057.

Anbarci, N, Gomis-Porqueras, P & Pivato, M 2012, 'Formal and Informal Markets: A strategic and Evolutionary Perspective', *Munich Personal RePEc Archive*, pp.1-30.

Anderson, J & Feder, G 2003, 'Rural extension services', *World Bank Policy Research Working Paper, no.* 2976, Washington DC: World Bank.

Anderson, JR & Gershon, F 2007, 'Chapter 44: Agricultural Extension', *Handbook of Agricultural Economics*, vol. 3, pp. 2343-2378.

Andreyeva, T, Long, MW & Brownell, KD 2010, 'The impact of Food Prices on Consumption: A systematic Review of Research on the Price Elasticity of Demand for Food', *American Journal of Public Health*, vol. 100, no. 2, pp. 216-213.

Anwarul Huq, ASM & Arshad, FM 2010, 'Demand Elasticities for Different Food Items in Bangladesh', *Journal of Applied Sciences,* vol. 10, no. 20, pp.2369-2378, viewed 7 October 2018, < https://scialert.net/fulltextmobile/?doi=jas.2010.2369.2378 >.

Awal, MA, Sabur, SA & Mia, MIA 2008, 'Estimation of Vegetable demand elasticities in Bangladesh: Application of almost Ideal Demand System Model', *Bangladesh Journal of Agricultural Economics*, vol 31, no. 1, pp. 35-60.

Baiyegunhi, LJS & Fraser, GC 2014, , Smallholder Farmers' Access to Credit in the Amathole District Municipality, Eastern Cape Province, South Africa', *Journal of Agriculture and Rural Development in* *the Tropics and Subtropics (JARTS)*, vol. 115, no. 2, pp. 79-89, viewed 5 November 2017, < http://jarts.info/index.php/jarts/article/view/2014121946870 >.

Baloyi, JK 2010, 'An analysis of constraints facing smallholder farmers in the Agribusiness value chain: A case study of farmers in the Limpopo Province', MSc. Thesis, University of Pretoria. South Africa.

Barrett, CB 2008, 'Smallholder Market Participation: Concepts and Evidence from Eastern and Southern Africa.', *Food Policy*, vol 33, no. 4, pp. 299-317.

Beynon, J, Akroys, S, Duncan, A & Jones, S 1998. *Financing the Future: Options for Research and Extension in Sub-Saharan Africa*, Oxford Policy Management, Oxford.

Bhana, A 2018, 'The Flourishing Informal Food Sector', *Moneyweb*. 30 April, viewed 4 June 2018, < https://www.moneyweb.co.za/news/economy/the-flourishing-informal-food-sector/ >.

Bienabe, F & Vermeulen, H 2011, 'Improving Small-Scale Farmers Market Participation: Insights from a Business Scheme for Maize in Limpopo Province, South Africa', *Development South Africa*, vol 28, no. 4, pp. 493-507

Binswanger, HP, Deininger, K & Feder, G 1993, *Power, Distortions, Revolt and Reform in Agricultural Land Relations.* Discussion Paper. World Bank, Washington DC.

Brewer, EW& Kubn, J 2010, 'Causal-Comparative Design', In *Encyclopedia of Research Design*. Neil J, Salkind, editor. (Thousand Oaks, CA: Sage, 2010), pp. 125-132

Calcaterra, E 2013, *Defining Smallholders: Suggestions for RSB Smallholder Definitions. EPFL – Ecole Polytechnique Fédérale de Lausanne. Discussion Paper*, viewed 4 November 2017, <http://energycenter.epfl.ch/files/content/sites/energycenter/files/projets/Bioenergy%20Team/Defining%20smallholders_v30102013.pdf >

Chikazunga, D, Deall, S, Loue, A & van Deventer, J 2008, *Regoverning Markets: The role of Fresh Produce Markets in South Africa*, Policy Brief No.4, Pretoria, South Africa.

Chisasa, J 2014, 'A Diagnosis of Rural Agricultural Credit Markets in South Africa: Empirical Evidence from North West and Mpumalanga Provinces', *Banks and Bank Systems (open-access)*, vol 9, no. 2, pp.100-111

'City Targets Business for Growth', 2015, *Public Eye*, 29 April, viewed 23 September 2017, <http://publiceyemaritzburg.co.za/18955/city-targets-business-for-growth/ >.

Coetzee, G & Machethe, C 2011, *The Status of Agricultural and Rural Finance in Southern Africa,* viewed 28 December 2017, <http://www.up.ac.za/media/shared/Legacy/sitefiles/file/1/3841/20110726fmtruralfinance.pdf>.

Cohen, L & Manion, L 1980, *Research Methods in Education*. London, United Kingdom: Groom Helm, Ltd.

Cousins, B & Chikazunga, D 2013, ‘Supporting Smallholders into Commercial Agriculture: A Social Dialogue and Learning Project’, Discussion Paper. South African Food Lab, Pretoria, South Africa.

Cousins, B 2010, ‘What is a “smallholder”? : Class-analytic Perspectives on Small-scale farming and Agrarian reform in South Africa’, *PLAAS*, working paper no. 16, viewed 4 November 2017, <www.plaas.org.za/sites/default/files/publications-pdf/WP16.pdf >.

Cousins, B 2013, ‘Small holder Irrigation Schemes, Agrarian Reform and 'Accumulation from Above and from Below' in South Africa.’, *Journal of Agrarian Change*, vol 13, no. 1, pp. 116-139.

Creswell, JW 2014, *Research design: Qualitative, Quantitative and Mixed Methods Approaches.* Fourth Edition. London, United Kingdom: SAGE Publications, Inc.

De Jager, E 2016, ‘SA rainfall in 2015 the lowest on record – SAWS’, viewed 28 December 2018, < http://www.politicsweb.co.za/documents/sa-rainfall-in-2015-the-lowest-on-record--saws >.

Defiat, V 2018, ‘The ups and Downs for agriculture’, *Spore Magazine No. 188*, March-May 2018, pp. 22-26.

Delagado, CL 1999, ‘Sources of Growth in Smallholder Agriculture in Sub-Saharan Africa: The Role of Vertical Integration of Smallholders with Processors and Marketers of High Value-Added Items’, *Agrekon*, vol. 38, pp.165-189

Delgado, CL & Siamwalla, A 1997, ‘Rural economy and farm income diversification in developing countries’, paper presented at a plenary session of the XXIII International Conference of Agricultural Economists, August 10-16, Sacramento, CA, USA.

Delgado, CL 1999, ‘Sources of Growth in Smallholder Agriculture Integration of Smallholders with Economy Alternative in South Africa’, *Working USA*, vol. 14, no. 2,, viewed 3 April 2017, <http://onlinelibrary.wiley.com/doi/>.

Deninger, K & Byerlee, D 2012, ‘The Rise of Large Farms in Land Abundant Countries: Do they have a Future?’, *World Development*, vol. 40, no. 4, pp. 701-714.

Department of Agriculture and Rural Development 2002, *Provincial Report on Education and Training for Agriculture and Rural Development in Kwa-Zulu Natal (KZN)*, viewed 16 October 2017, < http://www.nda.agric.za/doadev/sidemenu/educationandtraining/kzn.pdf >.

Department of Agriculture, Forestry & Fisheries 2016, *Statistics on Fresh Produce Markets. Report No. 54. Directorate: Statistics and Economic Analyses*, Pretoria, South Africa, viewed 10 June 2018, < http://www.daff.gov.za/daffweb3/Home/Crop-Estimates/Statistical-Information/Fresh-Produce>.

Department of Agriculture, Forestry and Fisheries 2010, *Directorate: Economic Services. Estimate Of The Contribution Of The Agriculture Sector To Employment In The South African Economy*, viewed 23 September 2017, <http://www.daff.gov.za/docs/Economic_analysis/Contribution_agriculture_sectorSAeconomy.pdf.

Department of Agriculture, Forestry and Fisheries 2012, *A Framework for the development of smallholder farmers through cooperative development*, viewed 28 December 2017, http://www.nda.agric.za/doaDev/sideMenu/cooperativeandenterprisedevelopment/docs/FRAMEWORK-%20OF%20SMALL%20FARMERS%20(2).pdf >.

Department of Agriculture, Forestry and Fisheries 2016, *Summary Report of Diagnostic Evaluation of the Government - Supported Smallholder Farmer Sector: (Diagnostic Evaluation of Smallholder Farmer Sector).* Pretoria, South Africa.

Department of Agriculture, Forestry and Fisheries 2016, '*2015/16 Report on Project Rebirth for the Revival of National Fresh Produce Markets'*, Pretoria, South Africa.

Department of Agriculture, Forestry and Fisheries 2016, *Conference on the Integrated Agriculture Development Finance Policy (IADFP)*, Boksburg, 17-18 November 2016. Gauteng: South Africa

Department of Agriculture, Forestry and Fisheries 2016, *Impact of Drought on Crop Production and the Food Value Chain. Branch: Policy, Planning, Monitoring and Evaluation*, Pretoria, South Africa, viewed 15 October 2017, < http://www.nda.agric.za/doaDev/sideMenu/others/CCDM/docs/Impact%20of%20drought%20on%20crop%20production%20and%20food%20value%20chain%208%20July%202016.pdf >.

Department of Agriculture, Forestry and Fisheries 2016, *Summary Report of Diagnostic Evaluation of the Government - Supported Smallholder Farmer Sector. Diagnostic Evaluation of Smallholder Farmer Sector Report 16 May 2016*, Pretoria, South Africa. Khulisa Management Services.

Dhewa, C 2016, 'Knowledge in Informal African Markets: A Case study of three informal markets in Zimbabwe', Masters Thesis, University of Stellenbosch, viewed 1 June 2018, < http://scholar.sun.ac.za/handle/10019.1/98563 >.

Diebold, FX & Lamb, RL 1996, 'Why are Estimates of Agricultural Supply Response so Variable?', Viewed 22 July 2018< http://www.fedaralreserve.gov >.

Dookie, N & Defait, V 2018, 'The informal economy: the ups and downs for agriculture', *Spore Magazine No 188*. 4 December, viewed 11 June 2018, <http://spore.cta.int/en/dossiers/article/agricultural-trade-transforming-the-informal-economy.html>.

Durham, C & Eales, J 2006, 'Demand Elasticities for Fresh Fruit at the Retail Level', Phd Thesis, Oregon State University Food Innovation Centre and Purdue University, viewed 7 October 2018, <http://www.agecon.purdue.edu/news/seminarfiles/Durham_Eales.pdf >.

Düvel, GH 2005, 'Principles, realities and challenges regarding institutional linkages for participatory extension and rural development in South Africa', *South African Journal of Agricultural Extension, vol.* 34, no. 2, pp. 188-200.

Eckstein, K 2017, ‘Transforming the Agricultural Sector: The potential of smallholder farmers needs to be unlocked’, viewed 28 December 2017, <https://www.moneyweb.co.za/moneyweb-opinion/soapbox/transforming-agricultural-sector-by-unlocking-the-potential-of-smallholder-farmers/ >.

EThekwini Municipality 2014, *Durban Climate Change Strategy*, Environmental Planning and Climate Protection Department, viewed 19 November 2018, < http://www.durban.gov.za/City_Services/energyoffice/Documents/DCCS_Final-Draft%20(4).pdf >.

Ferris, S, Robbins, P, Best, R, Seville, D, Buxton, A., Shriver, J & Wei, E 2014, ‘Linking Smallholder Farmers to Markets and the Implications for Extension and Advisory Services’, viewed 13 December 2017, <https://agrilinks.org/sites/default/files/resource/files/MEAS%20Discussion%20Paper%204%20-%20Linking%20Farmers%20To%20Markets%20-%20May%202014.pdf>.

Flynn, MAT, McNeil, DA, Maloff, B, Mutasingwa, D, Wu, M., Ford, C & Tough, SC 2006, ‘Reducing Obesity and Related Chronic Diseases Risk in Children and Youth: A Synthesis of Evidence with “Best Practise Recommendation’, *Obesity Reviews,* vol 7, no. 1, pp.7-66

Food and Agriculture Organisation 2017, *Formalization of informal trade in Africa: Trends, experiences and socio-economic impacts*, viewed 9 June 2018, < https://www.tralac.org/images/docs/11665/formalization-of-informal-trade-in-africa-fao-cuts-may-2017.pdf. >.

Food and Agriculture Organization 2012, *Smallholders and Family Farms: Sustainability Pathways,* viewed 4 November 2017, <http://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/Factsheet_SMALLHOLDERS.pdf .>.

Giller, KE, Witter, E, Corbeels, M & Tittonell, P 2009, ‘Conservation agriculture and smallholder farming in Africa: The heretics’ view’, *Field Crops Research*, vol 114, no. 1, pp. 23-34

Given, LM 2007, ‘Descriptive Research’, In *Encyclopaedia of Measurement and Statistics*. Neil JS, Kristin R, editors. (Thousand Oaks, CA: Sage, 2007), pp. 251-254

Gosalamang, DS 2010, ‘Econometric Analysis of Supply Response among Beef Farmers in Botswana’, Masters Thesis. University of Limpopo. South Africa

Green, A 2017, ‘Shocking Findings for SA in Global Obesity Study’, *Health 24*, 20 June, viewed 6 October 2018, <https://www.health24.com/Diet-and-nutrition/News/nejm-obesity-study-shocking-results-20170612 >.

Greyling, JC 2012, ‘The Role of the Agricultural Sector in the South African Economy’, viewed 23 September 2017, <https://agbiz.co.za/uploads/documents/careers/13_04-thesis_jan_c_greyling_published.pdf >.

Grwambi, B 2017, *Adoption of a Resource Based View Theory to Study Participation of Smallholder Producers in High Value Markets: Empirical Evidence from South Africa [Presentation]*, 20 September, Western Cape Department of Agriculture, viewed 29 October 2017, <https://c.ymcdn.com/sites/www.aeasa.org.za/resource/collection/61138FC8-9C60-46BD-A96B-B7F23C566964/Wed%20Grwambi.pdf >.

Hall, R 2009, 'Another Country Side? Policy Options for Land and Agrarian Reform in South Africa', *Institute for Poverty, Land and Agrarian Studies, School of Government*, University of the Western Cape. Viewed 23 September 2017, <www.plaas.org.za/sites/default/files/publications-pdf/another%20countryside.pdf >.

Haysom, G & Skinner, C 2016, 'The informal sector's role in food security: A missing link in policy debates?', *Institute For Poverty, Land and Agrarian STUDIES (PLAAS). Working paper 44*, Cape Town: PLAAS, UWC and Centre of Excellence on Food Security.

Hayward-Butt, PRN & Ortmann, GF 1994, 'Demand Analysis for Oranges in South Africa', *Agrekon*, vol. 33, no. 3, pp. 141-145

Hazel, PBR 2009, 'The Asian Green Revolution', IFPRI Discussion Paper 0091. The International Food Policy Research Institute, viewed 10 April 2018, < www.ifpri.or.millionfed >.

Hildebrand, PE 1986, 'Economic Characteristics of Small-scale, Limited Resource Family Farms', viewed 4 November 2017, < http://ufdcimages.uflib.ufl.edu/IR/00/00/09/81/00001/Economic_characteristics_of_small-scale_farms.pdf >.

Hlongwane, JJ, Ledwaba, LJ & Belete, A 2014, 'Analyzing the factors affecting the market participation of maize farmers: A case study of small scale farmers in greater Giyani Local Municipality of the Mopani District, Limpopo Province', *African Journal of Agricultural Research*, vol. 9, no. 10, pp. 895-899.

Inequality 2015, 'The land grabs in Africa you don't hear about - Africa is a Country', viewed 10 April 2018, < https://africasacountry.com/2015/11/the-land-grabs-in-africa-you-dont-hear-about/ >.

International Fund for Agricultural Development. 2011, 'Conference on new Directions for small-scale agriculture', viewed 28 December 2018, < http://www.ifad.org/events/agriculture/pdf. >.

Jacobs, P 2003, Evaluating Land and Agrarian Reform in South Africa: Support for Agricultural Development', *Programme for Land and Agrarian Studies (PLAAS)*, School of Governance in the University of Western Cape. Viewed 12 March 2018, <www.plaas.org.za/sites/default/files/publications-pdf/ELARSA%2004.pdf >.

Jari, B & Fraser, G 2009, 'Influence of Institutional and technical Factors on market Choices of smallholder farmers in the Kat River Valley', *MAUSHOLT*, vol. 10, pp: 59-89

Jari, B & Fraser, GCG 2009, 'An analysis of institutional and technical factors influencing agricultural marketing amongst smallholder farmers in the Kat River Valley, Eastern Cape Province, South Africa', *African Journal of Agricultural Research*, vol. 4, no. 11, pp. 1129-1137, viewed 20 December 2017, <http://www.academicjournals.org/ajar>.

Karaam, M 2016, 'Why Agriculture Is Vital For South Africa's Economic Future', viewed 23 September 2017, < Http://Www.Engineeringnews.Co.Za/Article/Why-Agriculture-Is-Vital-For-South-Africas-Economic-Future-2016-07-12 >.

Kgosikoma, K & Malope, P 2016, 'Derteminants of market participation and institurional constraints: case Study of Kweneng West, Botswana', *Journal of Agricultural Extension and Rural Development, vol.* 18, no. 9, pp.178-186.

Khaphayi, M & Celliers, PR 2016, 'Factors Limiting and Preventing Emerging Farmers to Progress to Commercial Agricultural Farming in the King William's Town Area of the Eastern Cape Province, South Africa', *South African Journal of Agricultural Extension,* vol 44, no. 1, pp. 25-41, viewed < http://www.scielo.org.za/pdf/sajae/v44n1/03.pdf >.

Khrerallah, M & Kirsten, JF 2002, 'The New Institutional Economics: Applications for Agricultural Policy Research in Developing Countries', *Agrekon,* vol 41, no. 2, pp. 110-133

Kirk, M, Steele, J, Delbe, C, Crow, L, Keeble, J, Fickle, C, Myerscough, R & Bulloch, G 2011, 'Connected Agriculture: The role of mobile in driving efficiency and sustainability in the food and agriculture value chain', viewed 28 December 2017, <https://policy-practice.oxfam.org.uk/publications/connected-agriculture-the-role-of-mobile-in-driving-efficiency-and-sustainabili-145251 >.

Kirsten, J 2004, 'The SADC Counties and the Uruguay Round Agreement on Agriculture: A Review of Progress and Challenges', Working Prepared for the World Bank, viewed 16 October 2017, < http://www.up.ac.za/academic/ecoagric/>.

Kirsten, JF & Van Zyl, J 1996, 'The contemporary agricultural policy environment: Undoing the legacy of the past', In: Van Zyl, J, Kirsten, J.F. & Binswanger, H.P. (eds) *Agricultural Land Reform in South Africa: Policies, Markets and Mechanisms*. Oxford University Press, Cape Town.

Kirsten, JF & van Zyl, J 1998, 'Defining Small-Scale Farmers in the South African Context', *Agrekon, vol* 37, no. 4, pp. 560-571

Kirsten, JF & van Zyl, J 1998, Defining small-scale farmers in the South African context', *Routledge Taylor & Francis*, vol 37, no. 4, pp.551-562.

Klein, PG 1999, 'New Institutional Economics. Department of Economics, university of Georgia', viewed 28 September 2017, <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.124.3849&rep=rep1&type=pdf >.

Krugman, P & Well, R 2012, *Economics and Microeconomics 3rd Edition*. Worth Publishers.

KwaZulu-Natal Department of Agriculture and Rural Development 2015, S*trategy for Agrarian Transformation in KwaZulu-Natal,* viewed 25 September 2017, <http://www.kzndard.gov.za/>.

KwaZulu-Natal Department of Agriculture and Rural Development 2018, *Annual Performance Plan 2018-19 Financial Year*, viewed 22 July 218, < https://www.kzndard.gov.za/images/Documents/Strategic-documents/Annual-Performance_Plan_2018_19.pdf >.

KwaZulu-Natal Provincial Planning Commission 2016, *2035 Provincial Growth and development Plan: Building a Better Future Together*, Pietermaritzburg, South Africa, viewed 29 October 2017, <http://www.kznppc.gov.za/images/downloads/PGDP%202016-17.pdf >.

KwaZulu-Natal Provincial Planning Commission 2016, *2035 Provincial Growth and Development Plan: Building a Brighter Future Together*, Pietermaritzburg, South Africa viewed 4 November 2017,< http://www.kznppc.gov.za/images/downloads/PGDP%202016-17.pdf >.

KwaZulu-Natal Treasury 2016, *Provincial-Economic Review and Outlook 2016/2017*, KwaZulu-Natal Provincial Government. Pietermaritzburg, South Africa, viewed16 October 2017, <http://www.kzntreasury.gov.za/ResourceCenter/Publications/16%20November%20FINAL%20PERO%202016_17.pdf >.

Liebenberg, F & Pardey, PG 2012, 'A long-run view of South African Agricultural Production and Productivity', *African Journal of Agricultural Resource Economics*, vol 7, no. 1, pp. 14 -38

Louw, A & Jordaan, D 2016, 'Supply chain risks and smallholder fresh produce farmers in the Gauteng province of South Africa', *Southern African Business Review*, vol. 20, pp. 286-312, viewed 10 June 2018, < https://www.ajol.info/index.php/sabr/article/viewFile/136580/126088 >.

Lumen Learning 2018, 'Price Elasticity of Supply', viewed 6 October 2018, < https://courses.lumenlearning.com/boundless-economics/.../price-elasticity-of-supply/ >.

Lyne, MC, Thomson, DN & Ortman, GF 1996, 'Advantages of a Rental Market for Land in the Developing Regions of Southern Africa and Institutions Necessary for its Operation', *Agrekon, vol.* 35, no. 1, pp.12-19.

Machete, C 2004, 'Agriculture And Poverty In South Africa: Can Agriculture Reduce Poverty?', viewed 28 September 2017, < citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.476.1551&rep=rep1...pdf >.

Makhura, MT 2001, 'Overcoming Transaction Costs Barriers to Market Participation of Smallholder Farmers in the Northern Province of South Africa', PhD thesis, University of Pretoria, Pretoria

Masuki, KF, Kamugisha, R, Mowo, JG, Tanui, J, Tukahirwa, J, Mogoi, J & Adera, EO 2010, 'Role of Mobile Phones in Improving Communication and Information Delivery for Agricultural Development', Lessons from South Western Uganda. *Workshop at Makerere University, Uganda* , pp. 22-23.

Matungul, P, Lyne, MC & Ortmann, GF 2001, 'Transaction costs and crop marketing in the communal areas of Impendle and Swayimana, KwaZulu-Natal', *Journal of Development Southern Africa*, vol 18, no. 3, pp. 347-363

May, J 2000, ‘The structure and composition of rural poverty and livelihoods in South Africa‟, in Cousins (ed), At the crossroads: Land and Agrarian Reform in South Africa into the 21st century’, *Institute for Land and Agrarian Studies (PLAAS) and National Land Coalition (NLC)*, University of the Western Cape: Bellville.

Mayo, E 2012, ‘Global business ownership 2012 members and shareholders across the world’, viewed 28 December 2018, < https://ica.coop/sites/default/files/publication-files/global-business-ownership-2012-563946706.pdf >.

Mellor, J 1976, *The new economics of growth*. Ithacam, NY: Cornell University Press.

Metelerkamp, L 2012, ‘Fresh Produce Markets Could Help Shape Sa’s Farming Future’, viewed 25 September 2017, < www.sustainabilityinstitute.net/research/research-publications?task=download...> .

Mkhabela, T 2016, ‘Demand-led Market Opportunities for Farmers in the High Value Product Sector in South Africa: Demand Elasticities for Selected Vegetables’, *International Journal of Agricultural Marketing*, vol. 3, no. 1, pp. 111-118

Mokhema, T 2015, ‘SA Farmers Reduce 2016 Corn Plantings’, *IOL Business Report*, 28 October, viewed 17 April 2017, < https://www.iol.co.za/business-report/economy/sa-farmers-reduce-2016-corn-plantings-193703 > .

Montshwe, BD 2006, ‘Factors affecting participation in mainstream cattle markets by small-scale cattle farmers in South Africa’, MSc Thesis. University of Free State. South Africa.

Mpandeli, S & Maponya, P 2014, ‘Constraints and Challenges Facing the Small Scale Farmers in Limpopo Province, South Africa’, *Journal of Agricultural Science*, vol. 6, no. 4, pp. 135-143.

Mqadi, L 2007, ‘Production Function Analysis of the Sensitivity of Maize Production to Climate Change in South Africa’, MSc Thesis. University of Pretoria, viewed 15 October 2017, <https://repository.up.ac.za/bitstream/handle/2263/28380/dissertation.pdf?sequence>.

Mukwevho, R & Amin, FD 2014, ‘Factors Affecting Small Scale Farmers in Accessing Markets: A Case Study of Cabbage Producers in the Vhembe District, Limpopo Province of South Africa’, *Journal of Human Ecology*, vol. 48, no. 2, pp. 219-225.

Murphy, S 2012, ‘Changing Perspectives: Small-scale farmers, markets and globalization. Knowledge Programme: Small Producer Agency in the Globalised Market’, viewed 28 December 2017, <https://www.ictsd.org/downloads/2012/08/changing-perspectives-small-scale-farmers-markets-and-globalisation-murphy-iied.pdf >.

Museli, BME 2017, ‘Understanding Socio-economic Challenges Facing Smallholder Farmers in Gondokoro, Central Equatoria State (South Sudan)’, Master’s Thesis, Norwegian University of Life Science, viewed 18 November 2018, < https://brage.bibsys.no/xmlui/handle/11250/2448996 >.

Mutero, J, Munapo, E & Seaketso, P 2016, 'Operational challenges faced by smallholder farmers: a case of EThekwini Metropolitan in South Africa', *Environmental Economics*, vol. 7, no. 2, pp. 40-52.
National Agricultural Marketing Council 2006, *Agricultural Marketing*, viewed 28 December 2017, < http://www.daff.gov.za/doaDev/sideMenu/links/Digest6.htm >.

National Agricultural Marketing Council 2013, South *Africa's Agricultural Trade Competitiveness: desktop Diagnostics. Pretoria: National Agricultural Marketing Council*, viewed 25 October 2017, < http://www.namc.co.za/upload/SA%20Agricultural%20Trade%20Competitiveness%20-%20Desktop%20Diagnostic.pdf >.

Nkosi, NZ 2107, 'Level of Access to Agricultural Extension and Advisory Services by Emerging Livestock Farmers in uThungulu District Municipality of KwaZulu-Natal', Masters Thesis. University of South Africa, viewed 10 March 2018, <http://uir.unisa.ac.za/bitstream/handle/10500/22946/disseration_nkosi_nz.pdf?sequence=1>.

Nobandla, ZC 2014, 'The practice of Marketing Strategies by national Fresh Produce Markets in South Africa', Masters Dissertation, University of KwaZulu-Natal. South Africa.

Obi, A & Seleka, T 2011, 'Institutional constraints inhibiting small farmer development in Southern Africa', viewed 28 December 2017, < https://books.google.co.za/books>.
Organization for Economic Co-Operation and Development 2006, *South Africa: Highlights and Policy Recommendations. OECD Review of Agricultural Policies.*

Ortman, GF & King, RP 2007, ' Agricultural cooperatives II: Can they facilitate access of small-scale farmers in South Africa to input and product markets?', *Agrekon*, vol 46, no. 2, pp. 219-244

Ortman, GF & King, RP 2007. Agricultural Cooperatives I: History, Theory and Problems. *Agrekon*, vol 46, no. 1, pp. 46-67

Parkin, M, Powell, M & Matthews, K, 2008, *Economicss.* 7 ed. Harlow: Addison-Wesley.

Patel, R. 2013, 'The Long Green Revolution', *The Journal of Peasant Studies*, vol. 40 no. 1, pp. 1-63, viewed 10 July 2018,< https://doi.org/10.1080/03066150.2012.719224>.

Peterson, L 2005, 'Export Diversification and Intra-Industry Trade In South Africa', *South African Journal of Economics*, vol. 73, no. 4, pp.785-802.

Phakathi, B 2017, 'Poultry association seeks import protection to save industry', viewed 28 December 2018, <https://www.businesslive.co.za/bd/companies/retail-and-consumer/2017-03-03-poultry-association-seeks-import-protection-to-save-industry/ >.

Pienaar, PL 2013, 'Typology of Smallholder Farming in South Africa's Former Homelands: Towards an Appropriate Classification System', Masters Thesis. University of Stellenbosch, South Africa.

Pietermaritzburg Agency for Community Social Action 2014, 'Proportion of Income Spent on Food by Poor Households is not an Accurate Indicator for Rand Value Poor Households should be spending on Food', *PACSA Monthly Food Price Barometer*, viewed 7 October 2018, < https://www.pacsa.org.za/images/food_barometer/PACSA_Monthly_Food_Price_Barometer_August_2014.pdf >.

Pitso, R 2017, 'Record maize harvest will be more than 100% higher than in 2016', *Business Live*, 26 May, viewed 16 October 2017, <https://www.businesslive.co.za/bd/companies/land-and-agriculture/2017-05-26-record-maize-harvest-will-be-more-than-100-higher-than-in-2016/ >.

Pitts, SB, Gustafson, A, Wu, Q, Mayo, ML, Ward, RK, McGuirt, T Rafferty, A, Lancaster, F, Evenson, T,

Ammerman, A 2014, 'Farmers' market use is associated with fruit and vegetable consumption in diverse southern rural communities', *Nutrition Journal*, vol. 13, no.3, pp. 1-11.

Quan, J 2011, 'A future for Small-Scale Farming: Foresight project on global food and farming futures', Science Report 25, viewed 18 November 2-17, < https://www.nri.org/images/documents/news2011/11-570-sr25-future-for-small-scale-farming.pdf >.

Qwabe, N 2014, 'Lending to Small Scale Farmers in South Africa: A Case for Best Practice in Formal Institutions', Master's Thesis, University of Pretoria, viewed 28 December 2017, < https://repository.up.ac.za/handle/2263/43227 >.

Randela, R, Alemu, ZG & Groenewald, JA 2008, 'Factors enhancing market participation by small-scale cotton farmers', *Agrekon*, vol. 47, no. 4, pp. 451-469

Rao, J 1988, 'Agricultural Supply Response: A Survey', Agricultural *Economics Journal*, vol. 3, pp. 1-22

Reinecke, MK 2007, 'The nature and invasion of riparian vegetation zones in the South Western Cape', WRC report; no. 1407/1/07, Gezina, South Africa: Water Research Commission.

Republic of South Africa 2015, *Nine Point Plan. 2015. South African Government*, *viewed 25 September 2017*, <https://www.gov.za/issues/nine-point-plan>.

Ruben, R, Slingerland, M & Nijhoff, H 2006, *Agro-Food Chains and Networks for Development*, viewed 25 September 2017, < www.springer.com/productFlyer_978-1-4020-4600-1.pdf?SGWID=0-0-1297...0 >.

Sandery, R & Vink, N 2008, 'Case Study 4: Deregulation, Trade Reform and Innovation in the South African Agriculture Sector', *OECD Trade Policy Working paper No. 76*, viewed 25 October 2017, <http://www.oecd.org/southafrica/41091441.pdf >.

Satgar, V 2011, 'Challenging the globalised agro-food complex: Farming cooperatives and the emerging solidarity economy alternative in South Africa', *Working USA*, vol. 14, no. 2, viewed 28 December 2017, < http://onlinelibrary.wiley.com/doi/10.1111/j.1743-4580.2011.00331.x/full>.

Satterthwaite, D, McGranahan G & Tacoli, C 2010, ‘Urbanization and its implications for food and farming’, *Journal of Philosophical Transactions of the Royal Society B: Biological Sciences.*, vol. 365, no. 1554, pp. 2809-2820.

Saunders, D 2018, ‘China’s African Land Grab’, *The Globe and Mail*, 28 March, viewed 10 April 2018, < https://www.theglobeandmail.com/opinion/chinas-african-land-grab/article1367342/ >.

Saunders, M & Lewis, PTA 2012, *Research Methods for Business Students*, In: D. Wayhumi, ed. *The reasearch Design mase: Understandung Paradigms. Cases, Methods and Methodologies.* London: Pearson Education, p. 69.

Schwalabach, LM, Groenewald, IB & Marfo, CB 2001, ‘A survey of small-scale cattle farming systems in the North West Province of South Africa’, *South African Journal of Animal Science*, vol. 13, no. 3, pp. 200-204

Sekaram, U & Bougie, R 2013, *Research Methods for Business: a Skill-building Approach. Sixth Edition.* Chennai, India: Wiley

Shepherd, A 1997, *Market Information Services: Theory and Practice,* viewed 25 September 2017, < https://books.google.co.za/books? >.

Shoko, RR, Belete, A & Chaminuka, P 2016, ‘Estimating the Supply Response of maize in South Africa.: A nerlovian Partila Adjustment Approach’, *Agrekon,* vol. 55, no. 3, pp. 237-253.

Sihlobo, W 2015, *The Youth are Agriculture’s Future*, viewed 28 December 2018, <https://mg.co.za/article/2015-06-18-the-youth-are-agricultures-future >.

Sikwela, MM 2013, ‘The Impact of Farmer Support Programmes on Market Access of Smallholder Farmers in the Eastern Cape and Kwazulu-Natal Provinces, South Africa’, Ph. D Thesis. University of Fort Hare. South Africa.

Simelane, M 2015, ‘The Role of Market Agents in Linking Black Commercial Farmers to Fresh Produce Markets in South Africa’, Masters Dissertation, University of Pretoria South Africa.

Singh, K 2015, ‘Drought-stricken KZN declares a disaster area’, *News 24*, 30 October, viewed 17 August 2018, < https://www.news24.com/SouthAfrica/News/Drought-stricken-KZN-declared-disaster-area-20151030 >.

Siyao, PO 2012, ‘Barriers in Accessing Agricultural Information in Tanzania with a Gender Perspective: The Case Study of Small-Scale Sugar Cane Growers in Kilombero District’, *The Electronic Journal of Information Systems in Developing Countries*, vol. 51, viewed 28 December 2017 < http://www.ejisdc.org/ojs2/index.php/ejisdc/article/view/818 >.

Skjöldevald, M 2012, *Small Scale Farmers’ Access to and Participation in Markets: The Case of the P4P Program in Western Kenya.* Master’s Thesis. Stockholm University, viewed 10 Aril 2018 < 0.1111/j.1743-4580.2011.00331.x/full>.

Smith, N. 2014, 'Boosting the Informal Sector', *Farmers Weekly*, 8 December, viewed 9 June 2018, <https://www.farmersweekly.co.za >.

Standard Bank South Africa Limited 2005, *Finance and Farmers: A financial Management Guide for Farmers*, Johannesburg, the Agricultural Segment of Standard Bank.

Statistics South Africa 2016, *Community Survey 2016: Agricultural households,* CS Report No. 03-01-05, Pretoria South Africa, Statistics South Africa.

Stoddard, E 2016, 'South Africa suffers driest year on record in 2015', *Reuters*, 14 Jan, viewed 16 October 2017, < http://www.reuters.com/article/us-safrica-drought/south-africa-suffers-driest-year-on-record-in-2015-idUSKCN0US14T20160114 >.

Sukamolson, S 2007, 'Fundamentals of Quantitative Research', Language Institute Chulalongkorn University, viewed 23 July 2018, < http://www.culi.chula.ac.th/Research/e-Journal/bod/Suphat%20Sukamolson.pdf >.

Sutherland, L, Madureira, L, Dirimanova, V, Bogusz, M, Kania, J, Vinohradnik, K, Creaney, R, Duckett, D, Koehnen, T & Knierim, A 2017, 'New knowledge networks of small-scale farmers in Europe'speriphery', *Land Use Policy, vol* 63, pp.428-439, viewed 5 November 2017, < https://ac.els-cdn.com/S0264837716311280/1-s2.0-S0264837716311280-main.pdf?_tid=0c1cb4a2-c18a-11e7-9701-00000aacb361&acdnat=1509818611_5fce0c78bed676065743385d5cff3386 >.

Swart, L 2016, 'Higher Volumes: Curse or Blessing?', *Chips*. January/ February 2016. Potato South Africa.

Tracey-White, J 1999, 'Understanding the Marketing System. In Market Infrastructure Planning. A Guide for Decision Makers', *Food and Agriculture Organization Agricultural Services*, Bulletin No.141, viewed 10 June 2018, < http://www.fao.org/docrep/003/x4026e/x4026e03.htm >.

Triple A Learning, n.d. *Topic pack - Microeconomics – Introduction*, viewed 22 July 2018, <http://www.sanandres.esc.edu.ar/secondary/economics%20packs/microeconomics/printview.htm>.

Uwe R. Fritsche, U.R., Epper, U. & Iriarte, L. 2015, '*Global Sustainable Land Use: Concept and Examples for Systemic Indicators', GLOBALANDS Working Paper*, vol. 3, no. 3, viewed on 4 November 2017. < http://globalands.ecologic.eu/sites/default/files/IINAS%20(2015)%20GLOBALANDS%20WP%203%203%20Systemic%20Indicators-1.pdf >.

Van Schalkwyk, HD, Groenewald, JA, Fraser, GCG, Obi A & van Tilburg, A 2012, *Unlocking Markets for smallholder in South Africa*, Wageningen Academic Publishers: Wageningen.

Van Schalkwyk, HD, Nel, E, & Obi, A 2004, *Factors inhibiting agricultural development in the former homelands of South Africa*, Bloemfontein, University of Free State.

Van Zyl, J, Townsend, RF & Vink, N 1997, ‘Economic Effects of Market and Trade Liberalization on Agriculture in the Western Cape Province of South Africa’, *Agrekon*, vol. 36, no. 4, pp. 461-473.

Von Loeper, W, Musango, J, Brent, A & Drimie, S 2016, ‘Analyzing Challenges Facing Smallholder Farmers and Conservation Agriculture in South Africa: A System Dynamics Approach’ *SAJEMS Asset Research*, Vol. 5, pp. 747-773, viewed 28 December 2017,< http://www.scielo.org.za/pdf/sajems/v19n5/05.pdf >.

Weatherspoon, D, Oehmke, J, Dembélé, A, Coleman, M, Satimanon, T & Weatherspoon, L 2012, ‘Price and Expenditure Elasticities for Fresh Fruits in an Urban Dessert’ *Urban Studies,* Vol. 50, no 1, pp. 88-106

Weatherspoon, DD & Reardon, T 2003, ‘The Rise of Supermarkets in Africa: Implications for Agrifood Systems and the Rural Poor’, *Development Policy review*, Vol. 21, no. 3, pp. 333-355.

Willet, WC, Koplan, JP, Nugent, R, Dursenbury, C, Puska, P & Gaziano, TA 2006. *Prevention of Chronic Diseases by Means of Diet and Lifestyle Changes.* In *Disease Control Priorities in Developing Countries*, Edition 2. Jamison, DT, Breman, JG & Measham, AR, Ed. New York. Oxford University Press.

Williamson, E 1991. *Economic Institutions: Spontaneous and Intentional Governance*, New York.

Wills, G 2009, *South Africa's Informal Economy: A Statistical Profile. Urban Policies Research Report. No.7. Women in Informal Employment Globalising and Organising, October 2009*, viewed 1 June 2018, < https://www.africancentreforcities.net/wp-content/uploads/2013/09/rr7_wills-1.pdf >.

World Trade Organisation 2017, *South Africa –Member Information,* viewed 19 November 2017, < https://www.wto.org/english/thewto_e/countries_e/south_africa_e.htm >.

Yue, C & Tong, C 2009, ‘Organic or Local? Investigating Consumer Preferences for Fresh produce using a Choice Experiment with Real Economic Incentives’, *HortScience*, vol. 44, no. 2, pp. 366-371.