

ADOPTION AND WILLINGNESS TO PAY FOR AGRICULTURE E-COMMERCE  
MARKET SERVICES: CASE STUDY OF FRESH PRODUCE SMALLHOLDER  
FARMERS IN GAUTENG PROVINCE, SOUTH AFRICA

by

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## **ABSTRACT**

The process of buying and selling agricultural goods and services on the e-commerce is a phenomenon that is experiencing an increment and is also becoming a common place for conducting business. The e-commerce has become valuable for the growth of businesses in almost all sectors of the economy and agriculture is no exception. However, despite the obvious potential of new technology-based interventions and innovation in the agricultural sector, there is still inadequate research on agriculture e-commerce in South Africa.

The aim of the study was to gain an understanding of the adoption, willingness to pay for agriculture e-commerce platform services and factors influencing the willingness to adopt agriculture e-commerce. The study was conducted in three municipalities in the Gauteng province, namely, City of Tshwane Metropolitan Municipality, City of Johannesburg Metropolitan Municipality, and Sedibeng District Municipality. Multi-stage sampling procedure was used to select 120 fresh produce smallholder farmers. The collected data was captured on Statistical Package for Social Science (SPSS) version 28. Several analytical tools were employed to run the analysis. For instance, descriptive statistics was used to identify and describe the socio-economic characteristics of fresh produce smallholder farmers. The Binary Logistics Regression model was employed in the study to identify factors affecting the willingness to adopt agriculture e-commerce platform among the sampled farmers.

The findings of the study infer that male fresh produce smallholder farmers are most likely to adopt agriculture e-commerce than their counterparts. Furthermore, the study found that farmers who are aware of agriculture e-commerce, had access to market

information from a certain source and whose main occupation is farming were more likely to adopt and to be willing to pay for agriculture e-commerce platform services. The results of the study revealed that 69% of sampled farmers were willing to adopt agriculture e-commerce while those who were not willing to adopt was 31%. From the results of willingness to adopt agriculture e-commerce the study further established whether the sampled fresh produce smallholder farmers had already adopted agriculture e-commerce, either the farmers sold their produce or had bought agricultural inputs on the e-commerce platform. The results indicate that, 59% of sampled farmers already sold their produce or had bought agricultural inputs on the e-commerce platform and 41% had never sold their produce or bought any agricultural input on the e-commerce platform. The study further revealed that 79% of farmers who were willing to adopt agriculture e-commerce were also willing to pay a premium to access such services and only 21% were not willing to pay a premium. Although the farmers were willing to pay for agriculture e-commerce platform services, the study found that farmers were only willing to pay low premiums (less than 10% premiums). The Binary Logistics Regression model results indicated that gender was significant at 10% significance level and had a negative relationship with willingness to adopt agriculture e-commerce. Furthermore, marital status, occupation, source of market information, source of transport, and willingness to pay for e-commerce platform services were found to be statistically significant at 10% significance level and had a positive relationship with willingness to adopt agriculture e-commerce platform. Moreover, agriculture e-commerce awareness was found to have a positive statistically significant influence on the willingness to adopt agriculture e-commerce platform at 5% significance level.

Based on the findings, the study recommends that there should be an improvement on the dissemination of market information through extension services so that farmers will have access to reliable market information, dissemination of market information through social media by relevant stakeholders to enable access to reliable market information as most farmers get their market information on social media platforms. Furthermore, the study recommends the provision of reliable subsidised transport that can be used by a group of farmers in their respective areas at a fixed fee. Lastly, the regulation of agricultural trading on the social commerce (social media platforms).

Key words: Adoption, Agriculture e-commerce, Fresh produce, Smallholder farmer, Willingness to pay.

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- Most importantly, I wish to acknowledge the guidance and wisdom I received from the Almighty God.

## DECLARATION

I declare that the full dissertation hereby submitted to the University of Limpopo, for the degree of Master of Agricultural Management (Agricultural Economics) has not previously been submitted by me for the degree at this or any other university; that it is my own work in design and execution, and that all material contained herein has been duly acknowledged.

Ms Sithole DN

10 July 2024

Surname, Initials (title)

Date

## DEDICATION

I dedicate this research project to my parents and to my younger brothers.

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## LIST OF ACRONYMS

AE	Agriculture e-commerce
B2B	Business to business
B2C	Business to consumer
C2B	Consumer to business
C2C	Consumer to consumer
CAGR	Compound Annual Growth Rate
COE	City of Ekurhuleni
COGTA	Cooperate Governance and Traditional Affairs
COJ	City of Johannesburg
COT	City of Tshwane
CVM	Contingent Valuation Method
DAFF	Department of Agriculture Forestry and Fisheries
DTIC	Department of Trade Industry and Competition
FAO	Food and Agriculture Organisation
FPM	Fresh Produce Market
GDARDE	Gauteng Department of Agriculture, Rural Development and Environment
GSMA	Global System for Mobile Communications Association
ICT	Information communication and technology
IG	Instagram
SDM	Sedibeng District Municipality
WIBC	Wouldn't it be cool
WTA	Willingness to adopt
WTP	Willingness to pay

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of the study

Introduction of the 4th industrial revolution through the use of mobile phones and internet technology have significantly affected practically all sectors of the economy, and agriculture is no exception. According to Banerjee *et al.*, (2019), the internet has led to a drastic change in society across the world. The development of technology, the increment in internet access and its usage have transformed the facilitation of goods and services exchange across all sectors of the economy (Tabatabaei, 2009).

The global advancement of information and communication technology (ICT) has resulted in the generation of a new agricultural development model (e-commerce) that has the potential to modify the performance of the agricultural sector and improve the rural livelihoods in most developing countries. According to Zou (2019) and Zeng *et al.*, (2017), the popularisation of mobile internet technology has led to the distribution of fresh agricultural products on the e-commerce platform in developed countries such as China. With change being an unavoidable part of life, the development of e-commerce has now moderately moved into the field of fresh agricultural products globally. Therefore, resulting in the globalised and interconnected agricultural marketplace.

The terms agriculture e-commerce and agriculture e-business are often used interchangeably in the agricultural business industry. It is reasonable to say agriculture

e-commerce is the kind of trading model where buying and selling of agricultural products and services are carried out electronically with the use of computer systems linked together over the internet (Cloete and Doens, 2008). According to Nayak *et al.*, (2008) and Qwerty Digital (2017) the process of buying and selling goods and services on the website is a phenomenon that is experiencing an increment and is also becoming a common place for conducting business. E-commerce has become valuable for the growth of businesses in almost all sectors of the economy and renders vast opportunities for consumers and businesses (Mupemhi *et al.*, 2011). However, due to relatively new state of e-commerce in agriculture, its impact has not been fully realised, widely measured, and documented, especially in South Africa.

## 1.2 Problem statement

The profitability of farms is vital for the development of the South African economy. However, smallholder farmers in South Africa still face various challenges that limit their growth and ability to effectively generate high profits. Aguera and Comninos (2020) reported that high costs of agriculture inputs and limited access to market play a major role in limiting the growth of smallholder farmers in South Africa.

The insufficient exploration and omission on the awareness of an alternative method of selling and buying agricultural products in the country creates a barrier of possibly effective intervention of transforming the agricultural sector and possible expansion of smallholder farmers' production. Therefore, understanding early initiatives in the practical use of ICT will help both current and future generations to devise new and better ways to transform agricultural development using modern technologies. Regardless of the obvious potential of new technology-based interventions, innovation

in the agricultural sector and e-commerce studies constituting a significant area of research within the information systems domain, there is still inadequate research on e-commerce market in the field of agriculture, especially in South Africa and on how farmers can be linked to e-commerce market to improve their market access and livelihoods.

### 1.3 Motivation of the study

The modern economy has become an ever-changing environment, thus creating a need for businesses to adapt to maintain competitive advantages and secure profits. The dispersal and adoption of modern technologies, which began in developed countries has now spread to developing countries. The use of digital technologies has penetrated and spread even in the poorest developing countries (Deichmann, 2016).

The rapid growth of ICT utilisation, specifically mobile phones and the internet, has significantly encouraged an exponential growth rate of online interaction among a large and growing share of the world's population. According to the Global Digital Report (2020), there are more than 4.5 billion people using the internet across the globe. The ability of the internet to connect distant parts of the world in a borderless electronic marketplace and information exchange has the potential to benefit developing economies (Ndayizigamiye, 2013).

According to Masedek and Safari (2015), e-commerce renders businesses, producers and consumers with the opportunity to interact on a global, borderless platform that is not complicated and it is just a click away. In addition, Maman and Sugiarti (2016), stated that the e-commerce system usually shortens the distance between companies

and consumers. Moreover, agriculture e-commerce provides farmers with the opportunity to sell their produce to a wide range of buyers such as, agri-businesses, retailers, restaurants, and consumers.

Harris (2018) opine that agriculture e-commerce enhances farmers' access to new markets and adds transparency to the distribution chain. Zeng *et al.*, (2017) in agreement with Harris (2018), opine that the adoption of e-commerce provides farmers with the privilege of bypassing several intermediaries involved in the distribution chain of fresh produce, resulting in a higher income for farmers, reduced wastage, and the potential to deliver fresher produce to consumers. It is increasingly clear that e-commerce has become a new and effective way of assisting smallholders to gain access to the market. According to Polytechnic *et al.*, (2015), the correct use of e-commerce and internet for development can be instruments for ensuring future sustainable economic growth. Furthermore, Wanyoike and Waititu (2012) states that due to the catalytic effect of e-commerce, small enterprises that have adopted e-commerce performed better than those that did not adopt.

The agricultural sector is an important component and plays a vital role in the economic and social development of most developing countries (Milovanović, 2014). According to Greyling (2019), the South African agriculture is naturally dualistic and consists of mainly two categories of agriculture namely, commercial and smallholder agriculture. Smallholder farmers play a valuable role in the development of the economy and are responsible for food security and job creation (Barends, 2016). According to DAFF (2019) smallholder farmers are regarded as the drivers of Africa's numerous economies. Generally, the term smallholder is only used to reference their

limited resource endowments in relation to other farmers within the sector. According to Chikazunga (2013), a key emerging strand in the development of South African smallholder agriculture is the effort to integrate smallholders into corporate food retail value chains.

According to E-Agriculture (2017), e-commerce was considered as a potential answer to the “where to sell” question for smallholder farmers with a limited to zero bargaining power. Linking farmers to a high profitable market should be a priority for any agricultural programme that aims at poverty reduction and the commercialisation of smallholder farmers. It is therefore important that smallholder farmers are supported by creating opportunities to operate at a commercial farming level and to modernise their operations to grow viable commercial business enterprises that can generate enough income to sustain and improve their livelihoods.

For this reason, the study aimed to understand the willingness to adopt, willingness to pay for agriculture e-commerce platform services and factors affecting the willingness to adopt e-commerce in agriculture so that future intervention programmes and policy responses could be crafted to encourage farmers to adopt and use e-commerce. The efforts to promote the use of e-commerce in agriculture need to be directed by the results of such studies.

#### 1.4 Aim of study

The study aimed to gain an understanding of the willingness to adopt, willingness to pay for agriculture e-commerce platform services and factors influencing the

willingness to adopt agriculture e-commerce by fresh produce smallholder farmers in Gauteng Province of South Africa.

### 1.5 Objectives of study

- i. Identify and describe socio-economic characteristics of agricultural fresh produce smallholder farmers in the Gauteng Province.
- ii. To assess the awareness and use of agricultural e-commerce platform among fresh produce smallholder farmers in the Gauteng Province.
- iii. To determine willingness to adopt and to assess agriculture e-commerce market platform extend of adoption among fresh produce smallholder farmers in the Gauteng Province.
- iv. To determine the willingness to pay and the premium (amount) the fresh produce smallholder farmers are willing to pay for agriculture e-commerce platform services.
- v. To analyse the factors influencing the willingness to adopt agriculture e-commerce by fresh produce smallholder farmers in the Gauteng Province.

### 1.6 Research hypotheses

There are no factors significantly influencing the willingness to adopt agricultural e-commerce platform among fresh produce smallholder farmers in the Gauteng Province of South Africa.

### 1.7 Limitations of the study

This study was limited to e-commerce, within the specific context of agriculture. Furthermore, this study was limited to the willingness to adopt and willingness to pay

for agricultural e-commerce services by fresh produce smallholder farmers based in the Gauteng Province of South Africa. The data collected was focused on primary data collection, where farmers were interviewed individually using structured questionnaires.

### 1.8 Scientific contribution of the study

The study explored, described, and provided insights on the state of agriculture e-commerce focused on the awareness, willingness to adopt, willingness to pay for the platform services and factors influencing the willingness to adopt agriculture e-commerce. Thus, the study contributes to the body of knowledge in this regard by highlighting the efforts that need to be addressed within the agriculture e-commerce field. The findings of this research will provide relevant information to policy makers, industries, government, academic researchers and implementing agents in crafting policies, developing future interventions and strategies to encourage the efforts made to enhance the agricultural sector in South Africa by using this technology. Furthermore, direction and historical comparison for future studies has also been provided in the study.

### 1.9 Dissertation structure

Chapter 1: This chapter includes the introduction, background of the study, problem statement, research aim, research objectives, research hypothesis, limitations of the research, the contribution of the research and the dissertation layout.

Chapter 2: This chapter presents the literature review in view of the research topic.



Chapter 3: The includes the research design and methodologies used by the researcher to conduct the study. The chapter explores the research aim and its appropriateness to the study. The chapter further provides a discussion on the research approach used as well as the appropriateness of this approach. Moreover, the chapter elucidates the research model used its appropriateness.

Chapter 4: This chapter reports and discusses the research results on the status of agriculture e-commerce adoption, awareness, and willingness to pay for the platform services and the factors affecting the adoption of the agriculture e-commerce by fresh produce smallholder farmers in the Gauteng Province of South Africa.

Chapter 5: This chapter presents the conclusion and recommendations of the study in line with the findings.

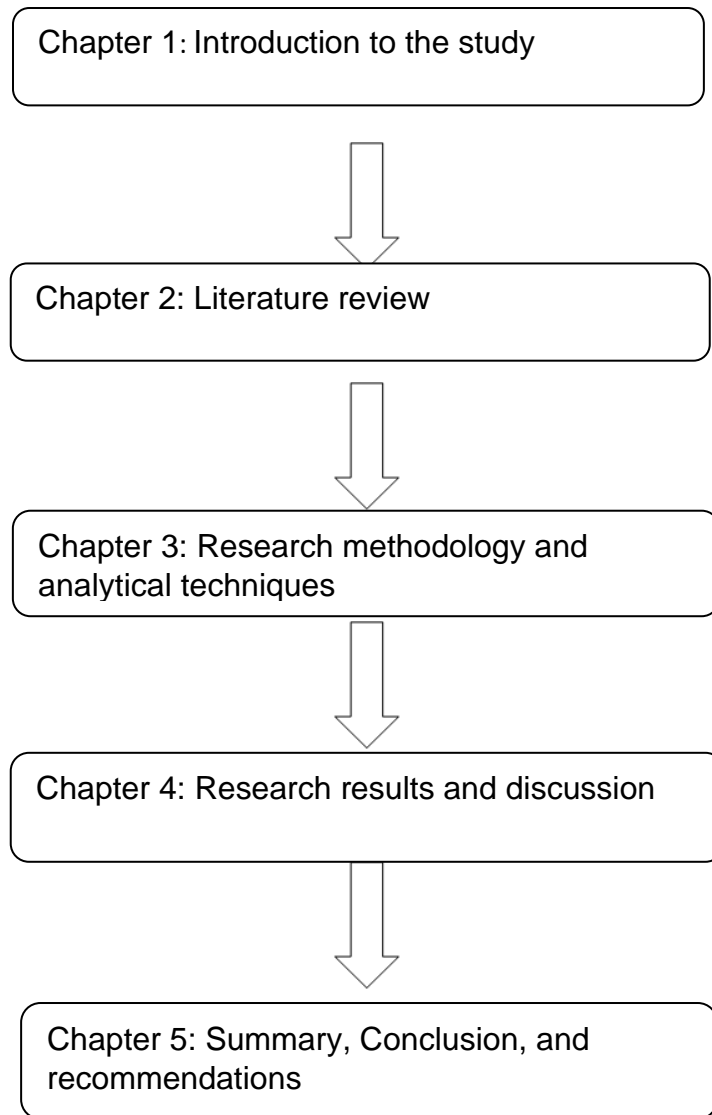


Figure1.1: Dissertation layout

Source: Own compilation (2022)

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

This chapter presents reviews of previous studies that were done both in South Africa and other countries. The chapter covers the internet penetration in South Africa, e-commerce models, an overview of the South African e-commerce, background of e-commerce in other countries, background of the agriculture e-commerce, an overview of e-commerce in other countries e-commerce adoption in the South African agriculture sector, the significance of e-commerce in the agriculture sector and willingness to pay for agriculture e-commerce platform services. Lastly, the chapter reviews the findings of the previous studies on the factors influencing the willingness to adopt agriculture e-commerce market.

#### 2.2 Definitions of key words

##### 2.2.1 Adoption

According to Renaud *et al.*, (2008) as cited by Nadal *et al.*, (2019), adoption is a multi-phase process starting with deciding to adopt, selecting, purchasing or committing to use and then achieving persistent use.

##### 2.2.2 Agriculture e-commerce

E-commerce is a market platform where the purchasing of goods and services is done online (Qwerty Digital, 2017). Mueller (2000, p. 1) indicates that whether agricultural or not, e-commerce is simply defined as business transactions conducted over the internet.

### 2.2.3 Fresh produce

Fresh produce includes unprocessed products such as fruit and vegetables, and forms an important part of South Africa's wider agriculture industry (DTIC, 2023).

### 2.2.4 Smallholder farmer

According to Kirsten (2014), smallholder farmers are farmers who produce for household consumption and markets, subsequently earning an ongoing revenue from their farming businesses, which forms a source of income for the family. Smallholder farmers are defined as small-scale farmers who manage areas that range from less than one hectare to 10 hectares (FAO, 2012). There are various ways of defining smallholder farmers. For the purpose of this research, a smallholder farmer is one whose farm operation occupies a land or space of less than 1 hectare to 10 hectares and produces to sell.

### 2.2.5 Willingness to Pay

Jedidi and Jagpal (n.d) define willingness to pay (WTP) as the maximum amount of money a customer is willing to pay for a product or service. Furthermore, Brown *et al.*, (1999) define willingness to pay as the maximum monetary amount that an individual would pay to obtain a good. The WTP measures are widely used to provide information to policy makers regarding the economic value of nonmarket, or non-pecuniary, environmental assets, for example as inputs to cost-benefit analyses or as part of resource damage studies. An economic measure of what the maximum amount in monetary terms an individual is willing to forego in other goods and services to obtain a good, (Asmamaw *et al.*, 2016).

### 2.3 Internet penetration in South Africa

Internet access and its use have become prevalent among many communities globally over the years. Relatively, the internet has become a new medium of communication and information dissemination that currently forms part of our daily lives. As a result, internet invention has also created a fundamental change in the way people used to shop for goods and services.

According to Saleh (2022), in 2022, it was documented that almost 47 million South Africans accessed the internet through various kind of mobile devices, and this figure is projected to increase to 57 million internet users by the year 2027, which is an increase of 20.77% from the year 2022. Furthermore, the study indicated that as of January 2022, there were 41.9 million active internet users in South Africa and 28 million were social media users, which accounts for a total of 46% of the overall population. Figure 2.1 indicates that the South African internet penetration was 78.66% in 2022 and it is projected to increase up to 90.05% in 2027.

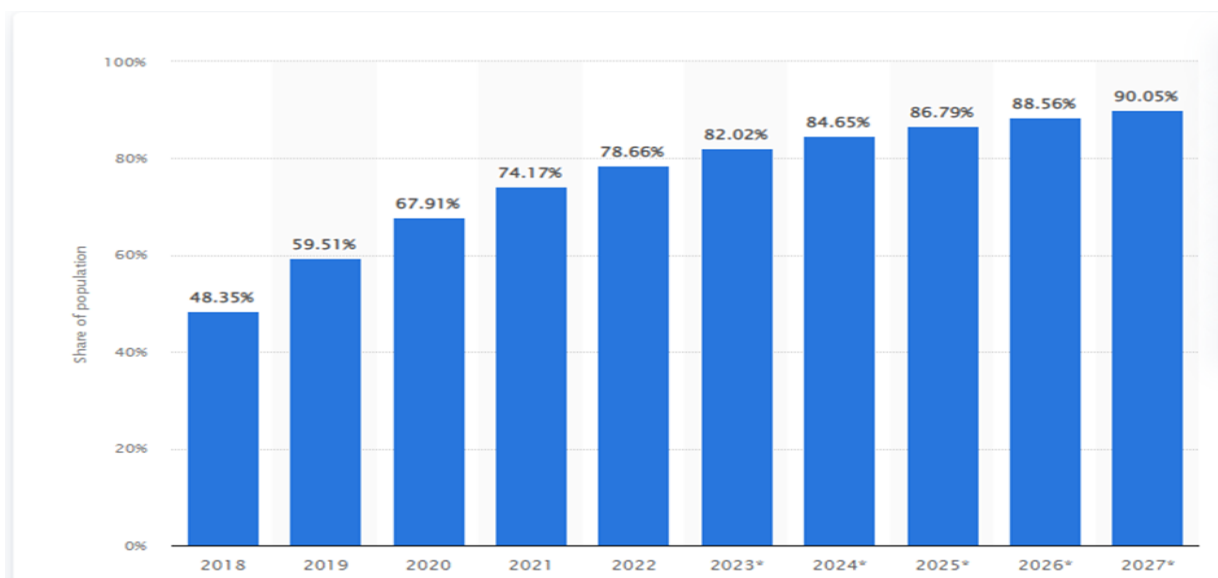


Figure 2.1: Internet penetration in South Africa (2018-2027)

Source: Statista (2022)

## 2.4 E-commerce models

Every business has and operates on a business model of its own. A business model defines how a company, or a business runs its operations and generates income. The e-commerce transactions are frequently grouped according to the partners involved, such as consumers, business, and government. According to Mueller (2000), there are six possible combinations of the three types of partners involved in the e-commerce. However, e-commerce includes four traditional business models and only two are currently regarded as crucial, and these are business-to-consumer (B2C) and business-to-business (B2B).

### 2.4.1 Business to Consumer (B2C) model

Business to Consumer model is the direct trade between the company and consumers. It provides direct selling through online portals. In addition, the B2C has the marketplace model, which refers to an intermediary website where a number of sellers list their products. Moreover, the e-commerce market consists of the sale of physical goods through a digital platform to a private end consumer (B2C) (Statista, 2023).

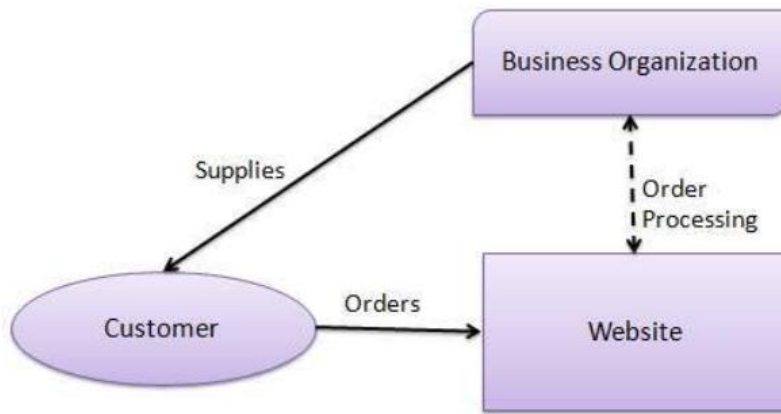


Figure 2.2: B2C e-commerce model

Source: Tutorialspoint (2023)

In the B2C model, a consumer goes to the website, selects a catalogue, orders the catalogue, and an email is sent to the business organisation. After receiving the order, goods are dispatched to the customer (Figure 2.4).

#### 2.4.2 Business to Business (B2B) model

Business to Business model is the exchange of products, services, or information between businesses, and it consists of largest form of e-commerce (Nagaty, 2010). This model reveals that the buyer and the seller are two different entities. A website following a B2B business model sells its products to an intermediate buyer who then sells the product to an end consumer. It is similar to manufacturer issuing goods to the retailer or wholesaler.

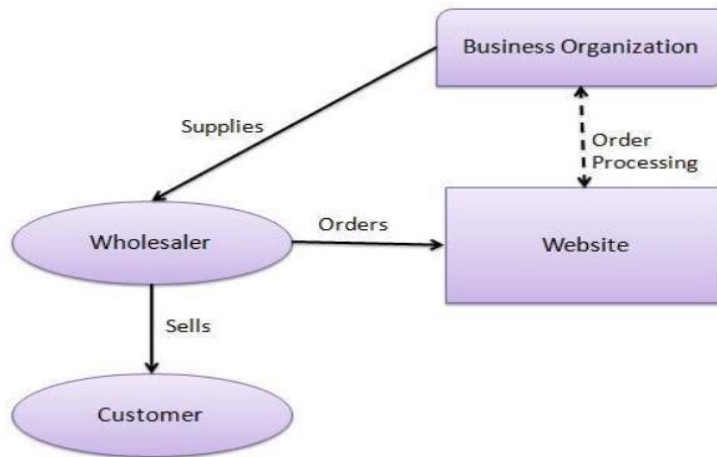


Figure 2.3: B2B e-commerce model

Source: Tutorialspoint (2023)

#### 2.4.3 Consumer-to-business (C2B) model

C2B is a business model in which consumers (individuals) create value and businesses consume that value. Another form of C2B is the electronic commerce business model in which consumers can offer products and services to companies, and the companies pay the consumer. According to Nagaty (2010), C2B model is rare in practice but in theory, it means a customer wants to sell a product or a service to a business.

#### 2.4.4 Consumer to Consumer (C2C) model

Customer to Customer (C2C) is a business model, where customers can trade with each other, typically, through an online third-party platform (Kiran *et al.*, 2020). Under this model, both the buyer and the seller are regarded as consumers.

### 2.5 Overview of the South African E-commerce



South Africa is one of the digital economy leaders on the African continent (World bank, 2019). According to ecommerceDB (2022), South Africa was rated the 42<sup>nd</sup> largest market for e-commerce with a predicted revenue of US\$7,217.8 million by 2023. Moreover, the revenue is expected to exhibit a compound annual growth rate (CAGR 2023-2027) of 12.5%, resulting in a projected market volume of US\$11,577.2 million by 2027. In addition, it is indicated that electronics and the media constitute the largest market and account for 24.8% of the South African e-commerce revenue, followed by Food and Personal Care with 23.0%, Toys, Hobby and DIY with 18.5%, Furniture and Appliances with 18.0%, and Fashion with the remaining 15.8%. In South Africa, there is approximately 17.1 million e-commerce users spending \$2.3 billion annually, which represents 31% of the population with an average expenditure of \$136 (R2 055.16) (Qwerty, 2017).

According to ecommerceDB (2022), Takealot.com is the biggest company in the South African e-commerce market and had a revenue of US\$556.6 million in 2022. Takealot.com is followed by Superbalist.com and Woolworths.co.za as the second- and third-largest stores with US\$263.8 million and US\$145.3 million, respectively. The top three stores altogether account for 45.7% of the top 100 online stores' revenue in South Africa.

In response to the Covid-19 pandemic, the Shoprite group expanded the Checkers Sixty60 on-demand grocery delivery to 233 sites, which offered customers convenient and seamless digital products to support their daily needs (Shoprite Checkers Group, 2021). In addition, various retail stores in South Africa also took their businesses

online; for instance, Pick and pay, Dischem, Spar, Mr Price, Hifi Corporation, H&M, Truworths and many others.

According to Makhitha (2014), the South African e-commerce was in its infancy stage in 2014 when compared to other countries. It is further noted that of all the goods and services purchased online, only 38% comprised food or groceries. However, Kibuacha (2021) states that the South African e-commerce sector experienced an exponential growth in 2020, the sector grew by 66% compared to 2019 and the increase was mainly encouraged by the Covid-19 pandemic. According to Stats SA, as cited by Kibuacha (2021), the market share of online retail in South Africa grew by 2.8% in 2020, which is double the percentage in 2018.

## 2.6 Overview of e-commerce in other countries

According to Mupemhi *et al.*, (2011), it is difficult to conclude the exact period in which the e-commerce began, although the common parlance is that it was between the early 1970s and the late 1970s. Hence, Wigand (1997) indicates that electronic commerce was a relatively new concept and had crawled into the business vocabulary no sooner than the 1970s. According to Statista (2023a), the global e-commerce market is projected to cross the two trillion US\$ threshold in the year 2023. Furthermore, it is reported that China is number one in the e-commerce market with US\$1,649.4 billion in sales in 2023, and it is projected that it will lead through 2027.

Africa's e-commerce journey began when South African platforms - Kalahari.com and Bidorbuy.com began in 1998 and 1999, respectively, at the height of the dotcom boom. Since those early days, e-commerce on the continent has grown exponentially.

According to Gopaldas (2023), currently, there are over 264 active e-commerce sites across 23 countries in Africa. In the African continent, South Africa, Nigeria and Kenya are regarded as the most advanced countries in terms of e-commerce. Furthermore, as indicated in Table 2.3, South Africa is the leading country in terms of the number of e-commerce market platforms, which is over 105, while Kenya and Nigeria have 60 and 58, respectively (Dupoux *et al.*, 2019).

Table 2.1: E-commerce statistics for South Africa, Nigeria, and Kenya

Country	Population	Internet penetration	Online shoppers	E-commerce penetration	Number of e-commerce market platforms
South Africa	58.6 million	56%	55 million	37%	105
Nigeria	206 million	46%	77 million	37%	58
Kenya	52 million	31%	13 million	25%	60

Source: United States Trade Department (n.d)

According to Figure 2.4 below, Africa's biggest e-commerce website is Nigeria-based Jumia, which attracts an average of over 32 million visitors a month, followed by South Africa's Takealot and Egypt's Souq with 10 million unique visitors per month each.

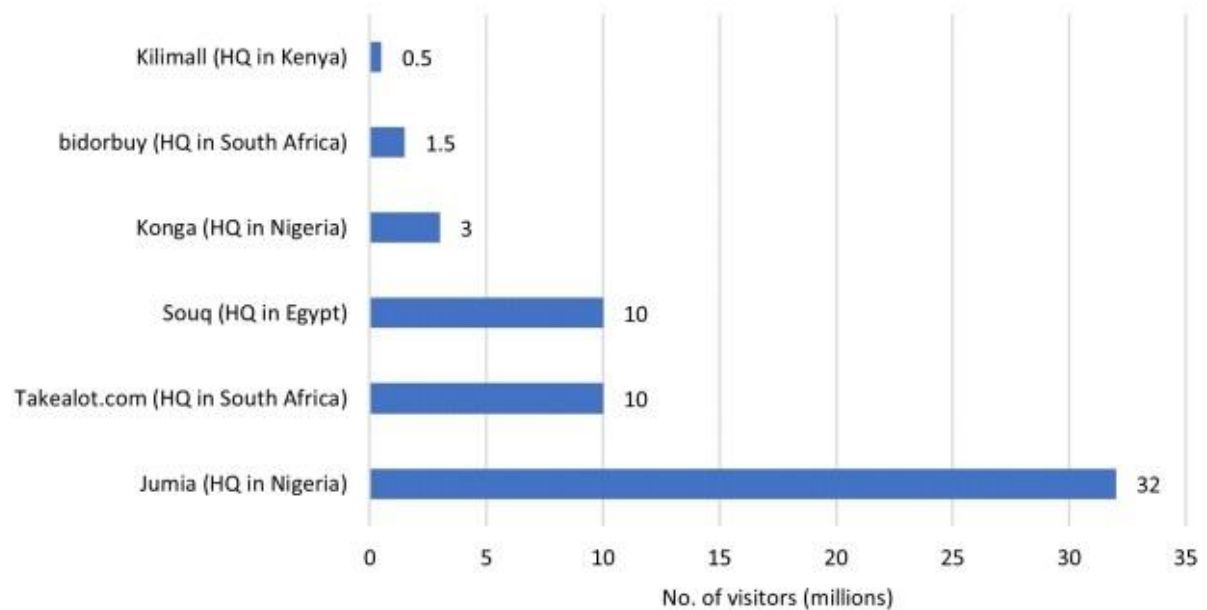


Figure 2.4: Africa's top 6 e-commerce market platforms

Source: Statista (2022)

## 2.7 Background of South African agriculture e-commerce

Agriculture plays a significant role in the South African economy by contributing to food production, job creation, and export-driven foreign exchange income (DTIC, 2023). It is clear that the agriculture sector plays a vital role in the development of South African economy and therefore, its effectiveness has always been of paramount importance. The efficiency of the agricultural sector is possible only with the optimal functioning of all its constituent elements. In this regard, Nezamova and Olentsova (2021) state that product distribution for agricultural products deserves special attention.

The South African agricultural sector has shown an outstanding and rapid change over the past few years by introducing new approaches and developments to amend its potential and construct well-grounded foundations for more growth (News24, 2022). Furthermore, it is indicated that the agricultural sector's value chain developed

gradually to adapt to the unique circumstances of the Covid-19 pandemic by introducing the 'from farm to fork', which refers to the direct digital trading of farm produce.

According to Tregurtha and Vink (2002, p. 29), in 1998, the biggest South African print media group Naspers launched an e-commerce journey that contained information and lifestyle portals that were linked to their media products. The report further stated that South African Farmers Union (AgriSA) later came on board as a minority shareholder with the plan to auction agriculture produce and fresh produce was set to be sold online first. Regrettably, Agri24 failed to get off the ground due to the complexity of the agriculture market; slow adoption to change and low levels of connectivity, among other factors.

## 2.8 Overview of agriculture e-commerce in other countries

Liu and Walsh (2019) indicate that the United States of America was the first country that initiated the e-commerce of fresh agricultural produce. According to Ministry of Agriculture of China, China launched its first agriculture e-commerce website on 17 August 2000 (Zhang and Xiaofang, 2004, p. 1). However, Liu and Walsh (2019) note that China only began to sell their fresh agricultural produce online in 2012, and that the industry has since experienced a rapid growth and has become the fourth largest category of products sold online in the country after books, electronic products and clothing. Jordan (2012) mentions that food products account for 10% of the total online shopping in China, and 51% of shoppers purchase fruits while 38% purchase vegetables.

According to Mueller (2000), by the year 2000, 1 in 25 United States of America's farms had already bought or sold agricultural products on the internet. The Direct Sales Software Platform (2020) notes that great interest was expressed by more farms across the United States of America to sell agricultural produce directly to their consumers on software platforms and this interest was inspired by the recent Covid-19 pandemic.

### 2.9 E-commerce adoption in the South African agriculture sector

In a study conducted by the International Society for Horticultural Science (2004), it is stated that among all sectors in South African business, the rate of e-commerce adoption was found to be 76.7% (during the period the study was conducted), thus indicating that the percentage of the average of all sectors in South African business is higher than e-commerce adopters in South African agriculture. However, although several non-adopters of ecommerce were not yet informed about the opportunities that e-commerce could provide, approximately 80% of them were planning to use e-commerce in agriculture in the future (Cloete and Doens, 2008).

E-commerce has made South African agriculture a technologically advanced and more modernised industry worldwide today (Breytenbach, 2015b). Furthermore, e-commerce helped in improving and facilitating the South African market exchange. According to Masiwa (2020) and Netshaulu (2022), the Covid-19 pandemic played a vital role in the emergence of e-commerce platforms targeted at the agriculture sector.

Furthermore, it is stated that farms across the country expressed an interest in using software platforms that reinforce direct sales to consumers in their respective communities. This great interest was significantly influenced by the recent pandemic (Covid-19) in 2020, which forced the reduction in operations of markets, restaurants, and other food distribution channels.

The Covid-19 pandemic encouraged many farmers to sell their produce directly to their online consumers using software platforms such as Facebook (Masiwa, 2020). For instance, farmers created a Facebook page called “koop direk van boer,” which simply means ‘buy directly from the farmer’. The Facebook group hosts both commercial and small-holder farmers and has gained attraction rapidly, as it accumulated over 46 000 members within two weeks of existence. Notably, during the advent of the Covid-19 pandemic, Nedbank developed and launched its e-commerce platform ‘Avo’ in the B2C market and was set to introduce B2B in 2022, which is inclusive of selected agriculture sectors.

According to Netshaulu (2022), there are about ten e-commerce platforms in South Africa, and these platforms are gaining adoption traction by farmers and buyers, which is evidenced by the volumes moving through them. Moreover, anecdotal evidence also acknowledges the existence of this market in South Africa, and they are [farmfreshdirect.co.za](http://farmfreshdirect.co.za), [famousfresh.co.za](http://famousfresh.co.za), [locallygrown.co.za](http://locallygrown.co.za) and [marketchef.co.za](http://marketchef.co.za), to mention a few.

Table 2.2 below indicates some of the agriculture e-commerce platforms in the Gauteng Province of South Africa. The listed online retailers offer consumers with the

flexibility of purchasing fresh produce on digital platforms 24 hours a day, 7 days a week. It also offers online payment and the delivery of goods purchased from the comfort of ones' home or office. Various e-commerce platforms listed on the table render farmers with the marketplace, which is an intermediary website where farmers can list their products. This is a platform to sell their produce on the e-commerce market at a certain fee.

Table 2.2: Online agricultural produce retailers in Gauteng Province

Business Name	Products sold	Location and website
Evergreens	fresh fruit and vegetables, daily baked breads, bulk foods, non-food items	Pretoria <a href="https://www.evergreens.co.za">https://www.evergreens.co.za</a>
De'Farmer	Fresh fruits and vegetables, cut vegetables, Herbs, Groceries Healthy juice	Johannesburg <a href="https://www.defarmer.co.za">https://www.defarmer.co.za</a>
Ferreira fresh	Fresh fruits and vegetables, Herbs, Salads, Frozen foods and eggs	Sandton <a href="https://www.ferreirafresh.co.za">https://www.ferreirafresh.co.za</a>
Fresh stores online	Fresh organic fruits and vegetables	Johannesburg <a href="https://www.freshstoreonline.co.za">https://www.freshstoreonline.co.za</a>
Island fresh	The pantry (sauces, lentils and legumes), Fresh fruits and vegetables and Fresh herbs	Midrand <a href="https://islandfresh.co.za">https://islandfresh.co.za</a>
Farm fresh online	Fruits and vegetables, milk, eggs, olive oil and rusks	Johannesburg <a href="https://farmfreshonline.co.za">https://farmfreshonline.co.za</a>
Market chef	Fresh fruits and vegetables, Meat and Dairy	Johannesburg <a href="https://www.marketchef.co.za">https://www.marketchef.co.za</a>
Moses fresh produce	Fresh fruits and vegetables	Johannesburg <a href="https://www.mosesfreshproduce.co.za">https://www.mosesfreshproduce.co.za</a>
Fresh online	Fresh fruits and vegetables, cut vegetables and fresh herbs	Johannesburg <a href="https://www.freshonline.co.za">https://www.freshonline.co.za</a>

Source: Evergreens ,2021; De' farmer, 2023; Ferreira fresh, 2022; Fresh stores online, 2021; Island, 2023; Farm fresh online, 2015; Market chef, 2023; Moses fresh produce, 2018; Fresh online, 2023



## 2.10 Significance of e-commerce in the agricultural sector

E-commerce redefines the rules of shopping and product distribution through transformation and upgrading of traditional ways, which people used to shop for goods and services and how businesses used to distribute their products and services. The overall e-commerce shopping environment provides consumers with an appropriate platform to search for information, interact with businesses and purchase goods and services online (Cloete and Doens, 2008).

E-commerce has emerged as a viable option for connecting agribusinesses and consumers within the food marketing system (Carpio and Lange, 2015). Information technology and the internet are increasingly being used in agribusiness. E-commerce has a tangible impact on the way business is conducted and the structure of markets (Strzebicka, 2015). It helps consumers, regulators, transporters, retailers, processors, producers, growers, and wholesalers to coordinate, cooperate, and communicate. Moreover, it has resulted in the development of new business relationships and enabled new markets, new business, and new marketing models to be introduced.

### 2.10.1 Easy access

E-commerce is a key component of the digital economy, allowing buyers and sellers to interact and transact online regardless of time and location (GSMA, 2021). In addition, it promotes the global borderless interaction between producers, vendors, and consumers through the internet. The interaction is not bound to complicated procedures and saves time, as it is just a click away and serves consumers with the flexibility of instantly purchasing desired goods.

Bowls (2008) concurs with GSMA (2021) by indicating that e-commerce is conducted daily, not limited by time and place. Furthermore, e-commerce provides better access to global markets and business can be conducted with anyone connected to the internet. According to Maman and Sugiarti (2016) in agreement with Folorunso *et al.*, (2006), the e-commerce system blurs the physical existence of brick and mortar stores, and distance does not exist between businesses and consumers. Furthermore, the e-commerce techniques permit small farms to have access to the same markets as larger farms.

#### 2.10.2 Cost reduction

The use of agriculture e-commerce is associated with the reduction or elimination of transaction costs (Cornelise, 2023). Furthermore, it is indicated that agriculture e-commerce is a method for reducing administrative cost and cycle time, re-organising farm processes and improving relationships between both business partners and customers. In addition, when transactions involve goods that can be digitised, such as money and information products, transfer costs are saved on top of trading costs. Furthermore, the Internet has the most profound impact on trading costs when information is digitised.

According to Muller (2000), a transaction consists of flows of information, of merchandise, and of money. In e-commerce, however, all information, money, and sometimes the merchandise, are transformed into binary digits or bits, which can be sent through the Internet over long distances at the speed of light and at a zero marginal cost.

### 2.10.3 Expanded Customer Base

Through e-commerce, small farms can grow faster and take on larger farms as they are able to provide personalised services to individuals who visit the site more easily than larger farms (Cornelise, 2023). Furthermore, it is indicated that with the use of agriculture e-commerce techniques and technology, smallholder farmers are more likely to attract additional customers because of a higher level of customer service and this will lead to better customer relations and increase the number of customers.

### 2.10.4 Customer Convenience

Molla (2007) indicates that e-commerce is a user-friendly system that is cost effective for both the consumers and businesses. Furthermore, the e-commerce market platform offers consumers the convenience to purchase goods and services when their ability allows. Consumers are not limited to busy work or home schedules that could prevent them from purchasing their desired goods and services.

### 2.10.5 Data

The e-commerce market platforms render businesses the flexibility of collecting data on the product sale and customers (GSMA, 2019). In addition, businesses can track the pages and products visitors look at, how long they stay on pages, how they navigate through pages, the type(s) of devices being used, and so on through website analytics. Businesses can also use data obtained from the website analytics to improve the online experience of their customers.

### 2.10.6 Financial inclusion

According to World Bank (2014), farmers can build the digital history of their business transactions through mobile money and other digital solutions. Therefore, this could enable farmers to demonstrate their credit worthiness to financial institutions and other financial service providers. Through this investment, farmers can gain access to credit and other financial products that can enable investment in farming inputs and equipment to improve productivity.

#### 2.10.7 Improved income

Smallholder farmers are most susceptible to middlemen, and more likely to suffer price squeeze from intermediaries involved in the agricultural value chain (Zeng *et al.*, 2017). According to Banerjee *et al.*, (2019), online platforms provide greater transparency and visibility of market prices to farmers, resulting in fairer prices compared to those offered by a typical middleman. This is often achieved by eliminating intermediaries in the value chain as well as improving the efficiency of the distribution system.

Ranjan (2021) concurs with Banerjee *et al.*, (2019) by stating that middlemen involved in the trading of agricultural products tend to make more profits from the trade than farmers. The overall value chain process is not explicit to farmers, as there is no way to know about the deal and the precise amount at which their products were sold.

#### 2.10.8 Reduced wastage

Reducing post-harvest loss is one of the most effective and economic ways to increase production to meet the growing global demand for food. According to Oelofse (2019), a total of 4500 tonnes of fruits and vegetables is lost each year. Furthermore, it is

reported that this loss occurs in the field during production, post-harvest handling and storage, processing and packaging, distribution and consumption. Globally, in 2019, 931 million tonnes of food waste was generated (Clementine *et al.*, 2021). Agriculture e-commerce services reduce post-harvest wastage by improving market efficiency. With agriculture e-commerce, farmers are not forced to choose between accepting low prices offered by middlemen or searching for a last-minute buyer and increasing the risk of post-harvest losses. The direct digital sale of farmers' produce shortens the time it takes for the produce to reach the customer, leading to a lower risk of postharvest wastage and preservation of fresher produce.

#### 2.10.9 Product details

On the e-commerce platform, businesses can provide detailed descriptions and photos of their products. The e-commerce websites permit many uses that can be combined in many ways. For instance, displays may be static or animated, searches for specific products may be assisted by a search function and sound may be added (Molla, 2007).

#### 2.10.10 Increased productivity

Economic benefits of agriculture e-commerce to farmers, such as improved incomes, reduced wastage and access to financial services, have the potential to serve as an incentive for farmers to increase their on-farm investments and productivity. An effective agriculture e-commerce solution can extend business by increasing opportunities with customers, suppliers, and other farms.

## 2.11 Social Commerce

E-commerce is the buying and selling of information, products, goods and services, or the transmission of funds or data, over an electronic network, primarily the internet (Barends-Jones, 2020), and this includes purchases through desktop computers as well as purchases through mobile devices such as smartphones and tablets. According to Statista (2023), social media also play a vital role in the total e-commerce revenue. This is referred to as social commerce and is defined as the sale of goods and services through social media platforms such as Instagram, Facebook, Pinterest, YouTube, TikTok and Twitter.

Social commerce is part of e-commerce. It is the combination of social media and shopping that allows a transactional relationship to take place between customers and sellers, enabled by social media. According to Lowes (2021), in South Africa, there is currently Facebook Pay, also known as Meta Pay, which provides people with a convenient, secure, and consistent payment experience across its cluster of applications namely, Facebook, Messenger, Instagram and WhatsApp. Furthermore, it is reported that IG Shop is currently available in South Africa. However, it is also reported that IG does not contain the check-out functionality, which is currently only available in the United States of America. Moreover, it is stated that social commerce is being recognised as a crucial tool for businesses growth. Figure 2.5 below indicates that Facebook is the mostly used social media platform in the sale of goods and services with 92%, followed by Instagram and Tik Tok with 76% and 6%, respectively.

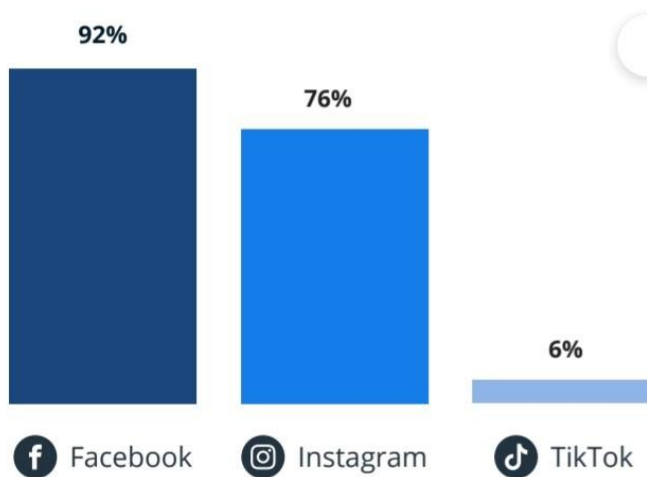


Figure 2.5: Top three social media platforms used by merchants to sell goods and services

Source: PayFast (2021)

## 2.12 Willingness To Pay for e-commerce market services

Jedidi and Jagpal, (n.d) defines Willingness to pay (WTP) as the price at which a consumer is indifferent between buying and not buying a product or service. Furthermore, it is reported that knowledge and the accurate measure of consumers' willingness to pay studies are central to any pricing decision. Formally, consider a consumer with income  $y$ , who is considering whether to buy one unit of product priced at  $p$  or to keep their money.

Willingness to pay is a strong research approach that involves the targeted clients for potential services in establishing the preferences of the services proposed and the value the respondents are ready to pay. According to Mwaura *et al.*, (2010), these studies are widely used in the assessment of markets, goods, services by planners, entrepreneurs and for environmental valuation.

E-commerce has a marketplace model that serves as an intermediary website, where several sellers list their products, and are charged a certain fee. Businesses use this as their marketplace instead of having their own website. Therefore, it is valuable for e-commerce businesses to identify the behavioural differences of those who are willing to pay for online services and those who are not, as such, they may design their marketing strategies and business models accordingly (Ye *et al.*, 2004).

### 2.13 Factors influencing the willingness to adopt and use of agriculture e-commerce

The probability of businesses investing money to use e-commerce ultimately depends on demographic features, experience with e-commerce from a buyer and a seller's perspective, technological expertise, knowledge of e-commerce opportunities and challenges (Watson *et al.*, 2005).

#### 2.13.1 Socio-economic characteristics

According to Statista (2022), Africa's e-commerce growth is encouraged by several factors. For instance, it is reported that Africa has the youngest and second largest population in the world. Therefore, there is potential for an expansion of the digital audience. Siyal *et al.*, (2006) state that income level, education level and exposure to the internet are significant factors in the e-commerce adoption.

Poor socio-economic factors play a vital role on e-commerce adoption and the use of online services in developing countries (Ling, 2001; Lawrence and Usman, 2010). According to Adejuwon and Tijani (2012), a poor socio-economic situation includes, amongst others, unemployment, and a low-income salary.



### 2.13.2 Individual ICT adoption and use

Statista (2022) says that the rise in internet penetration results from the expansion of smartphones and mobile devices use. Therefore, this indicates that the more businesses use the smartphones and mobile devices, the more likely they are to adopt and use e-commerce. According to Oluoyinka *et al.*, (2013), poor technology infrastructure serves as a barrier of e-commerce adoption, and it is the most contributing factor hindering e-commerce adoption. However, Bauboniene and Guleviciute (2015) assert that the internet users' experience affect the approach of the user towards the internet.

South Africa's digital skills are a key weakness for the development of a South African digital economy (World Bank, 2019). The development of an active, dynamic, and inclusive digital economy requires skilled digital entrepreneurs to build new businesses that are technologically equipped. Furthermore, poor digital skills derive from quality lags of South Africa's education system; thus, indicating that the South African education system should be equipped with strong digital skills programmes.

According to Olatokun and Kebonye (2010), the lack of knowledge of e-commerce-related technologies such as online shopping, hinders the adoption of e-commerce. Furthermore, there is a need for an increased awareness about e-commerce, adequate training and skills upgrading for SMMEs to better benefit from e-commerce technologies. Looi (2005) in agreement with Olatokun and Kebonye (2010) states that the computer literacy of the small business owner and lack of knowledge of benefits derived from IT significantly affect the IT adoption of the business. Moreover, Engel

and Barends-jones (2020) opine that farmers must stay up to date with the latest technology to ensure that the farm operates or is managed efficiently and effectively.

### 2.13.3 Abrupt circumstances (Covid-19)

In the late 2019 and early 2020, the Coronavirus Disease (Covid-19) swiftly occurred across the globe, seriously threatening the public health. The world went into a devastating situation and countries were put under lockdown. Strict traffic control and social distancing measures were implemented. Restrictions included not going out of homes, being part of crowded gatherings, not going to markets and almost every business was shut down. Chang and Meyerhoefer (2020) indicate that the novel pandemic created extraordinary challenges for the agri-food industry.

Due to difficulties faced by consumers as the result of the pandemic, such as limitation of public transportation, reduced operation hours of food stores and fear of infections, businesses resorted to selling goods and services online (E-shopping, 2020). The South African Digital Customer Experience Report (2020), indicated that e-commerce in South Africa received a “shot in the arm” with large numbers of businesses taking their business online and consumers making online purchases for the first time. The Covid-19 incident proves that businesses will adjust their operations to align with the situation or the circumstances they are faced with at a point in time.

### 2.13.4 Government policy and support

South African organisations, mainly small and medium-sized enterprises (SMEs), can benefit from the local and international exposure that e-commerce provides. The full exploitation of e-commerce benefits can be realised with an increased collaboration of

the government and the industry by defining the future e-commerce policy and legislative environment (Budree, 2017). Notwithstanding, the South African legislation on e-commerce is currently progressive. However, there is a need for an urgent implementation of policies and regulatory interventions to address challenges such as data costs, online safety, internet accessibility, education and training is required by the South African government (Budree, 2017).

According to Efendioglu and Yip (2004); Mutula and Brakel (2006); Lawrence and Usman (2010), the lack of government policies and support inhibit the adoption of e-commerce. This indicates that government policies and support are very important in e-commerce adoption and usage of other ICT in general. Furthermore, the reach of e-commerce in Africa is mainly hindered by inadequate regulation, education, and infrastructure. However, a study conducted by Garg and Choeu (2015), on the adoption of e-commerce by SMEs in Tshwane, South Africa, found that most of the surveyed Small and Medium-sized Enterprises (SMEs) still adopted e-commerce regardless of the level of government support they received.

#### 2.14 Chapter summary

This chapter reviewed literature on the internet penetration in South Africa. It further provided an overview of the South African e-commerce, social commerce, background of the South African agriculture e-commerce, e-commerce adoption in the South African agriculture sector, the e-commerce of other countries, e-commerce models, the significance of e-commerce in the agriculture sector, Willingness To Pay (WTP) for goods and services and lastly the factors affecting the adoption and use of e-commerce.

## CHAPTER 3

### RESEARCH METHODOLOGY AND ANALYTICAL TECHNIQUES

#### 3.1 Introduction

This chapter outlines the description of the study area and the research methods employed when conducting the study. It also explains how and where this study was conducted, the sample size, sampling approaches and the data analysis technique employed in the study. The chapter also describes the measures of the dependent variable and independent variables.

#### 3.2 Study area

The study was conducted in the Gauteng Province of South Africa, in two metropolitan municipalities and one district municipality, namely; City of Tshwane, City of Johannesburg Metropolitan Municipality and Sedibeng District Municipality, respectively. Gauteng province was chosen based on the fact that it has the highest mobile phone network population coverage of 99% (Point *et al.*, 2020). The main agricultural economic activities in the study area are live stock and vegetable production.

##### 3.2.1 City of Tshwane Metropolitan Municipality

The City of Tshwane as shown on figure 3.1, is one of the three metropolitan municipalities in the Gauteng Province and it is located in the northern part of the Gauteng Province (City of Tshwane, 2017). The metropolitan municipality is by far the largest metropolitan municipality compared to City of Johannesburg and City of

Ekurhuleni and it is the fourth biggest municipality of the total eight metropolitan municipalities in South Africa.

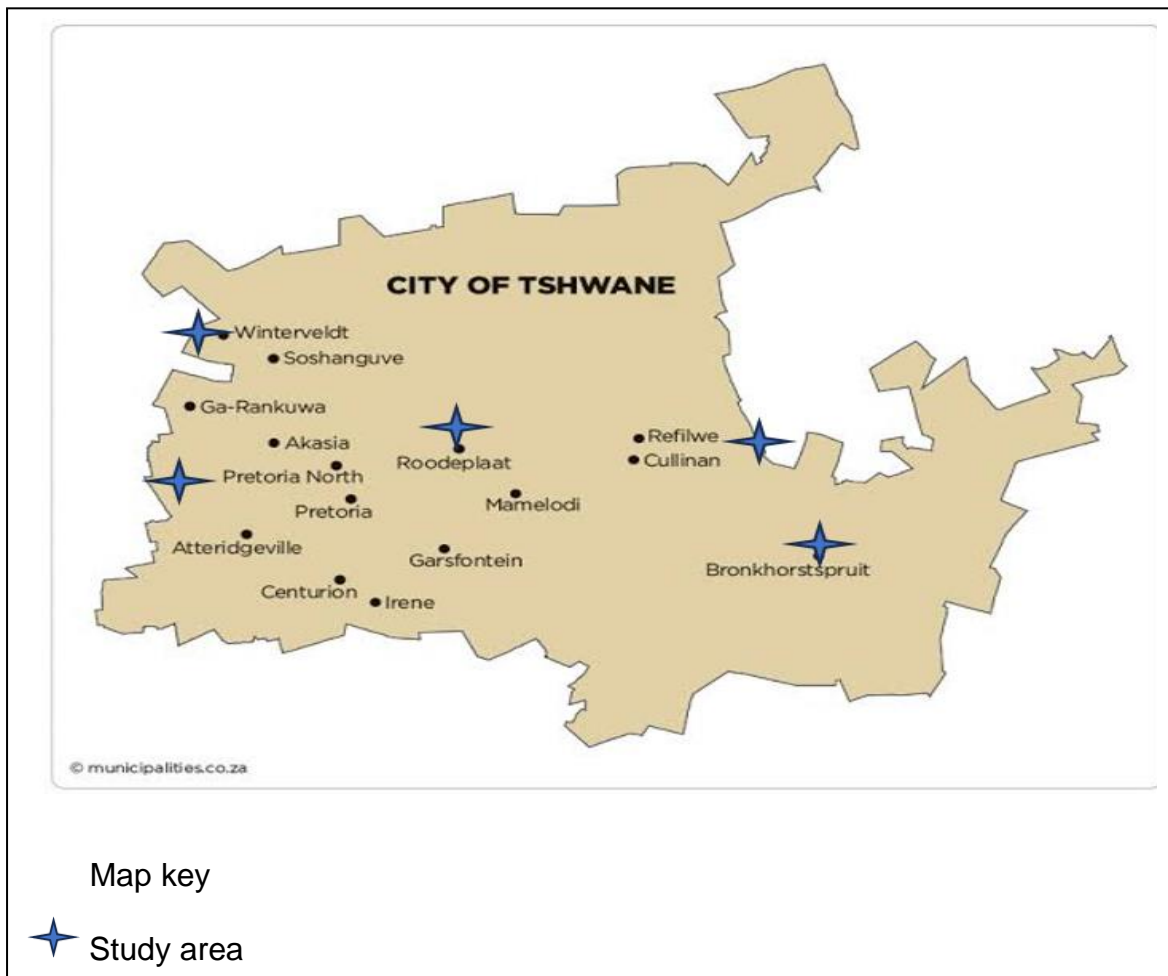


Figure 3.1: Map of City of Tshwane Metropolitan Municipality

Source: <https://municipalities.co.za/map/3/city-of-tshwane-metropolitan-municipality>.

### 3.2.2 City of Johannesburg Metropolitan Municipality

The City of Johannesburg is a vibrant and culturally rich city, located at the centre of South Africa's economic heartland: Gauteng Province. The municipality as shown on figure 3.2, shares boundaries with two other metropolitan municipalities, to its north, the City of Tshwane and to its east, the City of Ekurhuleni. To its west, it shares boundaries with Mogale City and other parts of the Westrand District Municipality. To

its South are the Emfuleni and Midvaal Local Municipalities, which form part of the Sedibeng District Municipality (COGTA, 2020b).

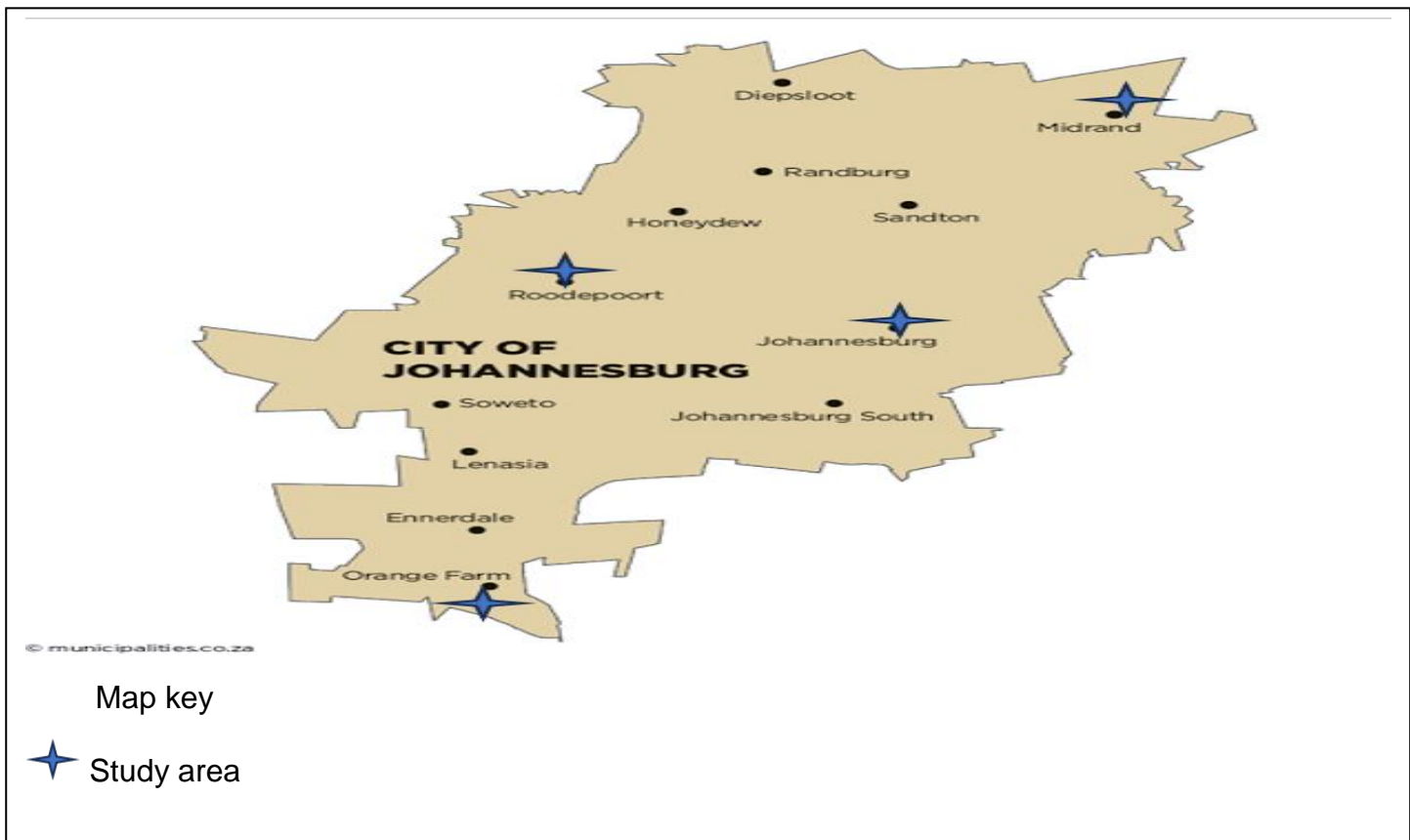


Figure 3.2: Map of City of Johannesburg Metropolitan Municipality

Source: <https://municipalities.co.za/map/2/city-of-johannesburg-metropolitan-municipality>.

### 3.2.3 Sedibeng District Municipality

The Sedibeng District Municipality is in the southern parts of the Gauteng Province. The district covers 4 173 km<sup>2</sup> and is Gauteng's Southern Corridor. It consists of three local municipalities: Emfuleni, Midvaal and Lesedi. As shown on figure 3.3, the municipality is surrounded by three provinces: Free State Province to the south, Mpumalanga to the east and North West to the western part (COGTA,2020c).

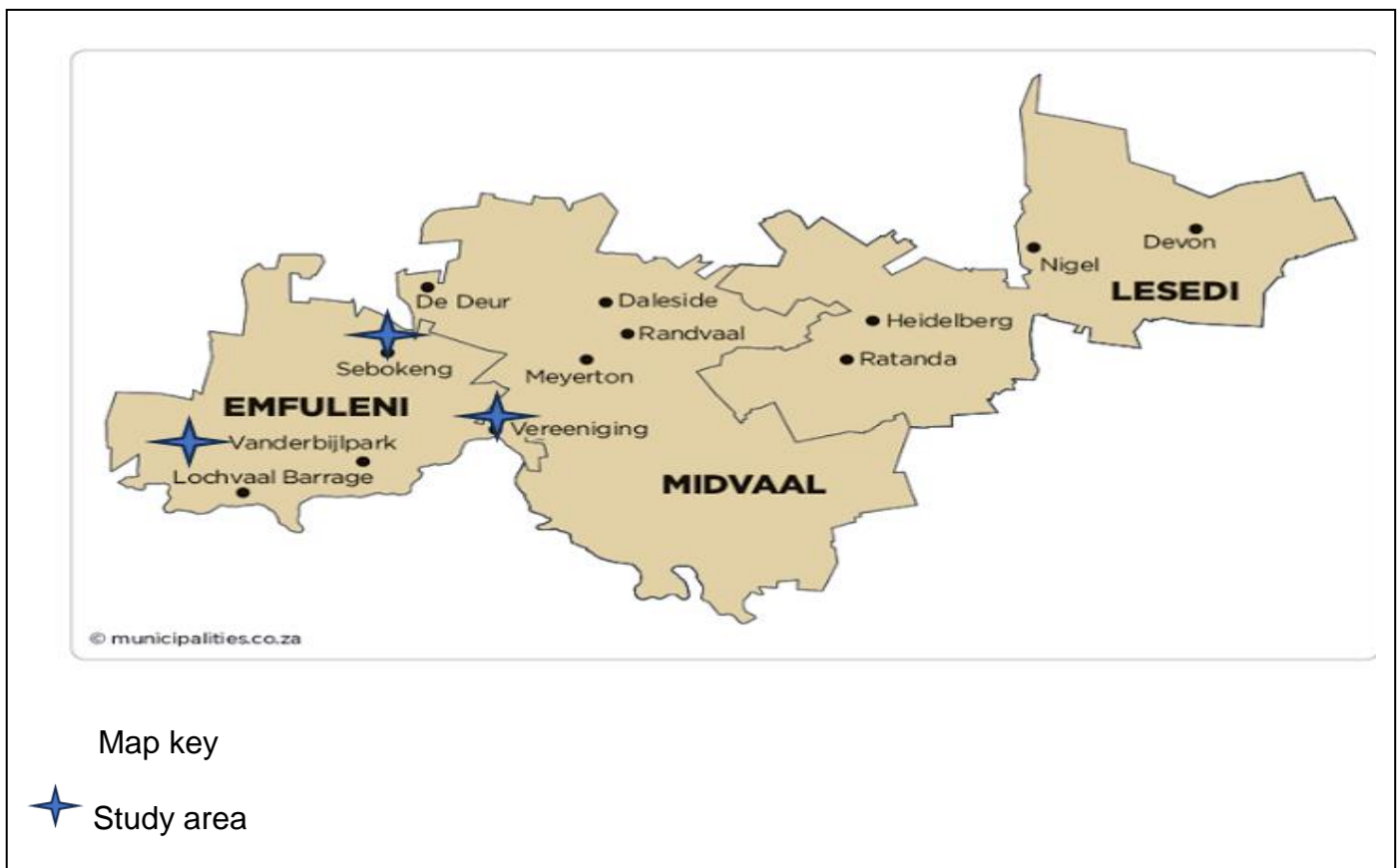


Figure 3.3: Map of Sedibeng District Municipality

Source: <https://municipalities.co.za/map/114/sedibeng-district-municipality>

### 3.3 Research methodology and analytical procedures

#### 3.3.1 Research design

Research designs are plans and procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis and consist of three approaches, which are qualitative, quantitative and mixed method approaches (Durrheim, 2004). A research design can be defined as a strategic framework for action that serves as a bridge between research questions and the execution, or implementation of the research strategy. The study used cross-sectional data to capture information regarding the willingness to adopt and willingness to pay for

agriculture e-commerce platform services among fresh produce smallholder farmers in the Gauteng Province.

### 3.3.2 Sampling frame

Data was collected from both the adopters and non-adopters of agriculture e-commerce. This was done to obtain information on the overall willingness to adopt and willingness to pay for agriculture e-commerce platform services of sampled famers.

### 3.3.3 Sampling techniques

A sample of 120 fresh produce smallholder farmers was used in this study. The study targeted the areas of City of Tshwane, City of Johannesburg and Sedibeng District Municipality. The researcher with the assistance of agricultural advisors or extension officers in the Gauteng Department of Agriculture, Rural Development and Environment (GDARDE) in the City of Tshwane, City of Johannesburg and Sedibeng District Municipality identified fresh produce smallholder farmers around the study area.

The study employed multi-stage sampling to identify samples from the study population and the collection of data. Multi-stage involves two or more stages of random sampling that consist of selecting a cluster and randomly selecting a specified number of units from each selected cluster (Sedgwick, 2015). In the first stage, three municipalities in the Gauteng Province were selected, based on the availability of the information from the Department of Agriculture and proximity. In the second stage, 120 fresh produce smallholder farmers were randomly selected after determining the required sample size following Yamane (1967) sample size determination formula.



$$n = N / 1 + N (e)^2$$

Where: n = sample size of fresh produce smallholder farmers

N = total number of fresh produce smallholder farmers in the selected region

e = level of precision defined at 95% confidence.

Table 3.1: Distribution of sample size in selected regions

Municipality	Number of fresh produce smallholder farmers	Number of fresh produce farmers interviewed
City of Johannesburg	48	30
City of Tshwane	104	60
Sedibeng	45	30
Total	197	120

Source: DAFF (2017)

Table 3.1 presents the distribution of the sample size in selected municipalities. These include City of Tshwane Metropolitan Municipality, City of Johannesburg Metropolitan Municipality and Sedibeng District Municipality. The municipalities were chosen because they consisted of more fresh produce smallholder farmers than the other municipalities, guided by the Provincial Department of Agriculture.

### 3.3.4 Data collection

The study used structured questionnaires to collect primary data through face-to-face interviews. The structured questionnaire was designed to collect information on the fresh produce smallholder farmers' socio-economic characteristics, agriculture e-commerce awareness, willingness to adopt and willingness to pay for agriculture e-

commerce platform services. Lastly, to collect information on the factors influencing the willingness to adopt agriculture e-commerce. Data was collected from September 2022 to March 2023 by the researcher as per appointment with the farmer and consent forms were signed by the respondents.

### 3.4 Data analysis and analytical procedures

This section presents the analytical techniques used in the study.

Table 3.2: Framework data analysis

Objectives	Data source	Method of analysis
1. Identify and describe socio-economic characteristics of agricultural fresh produce among smallholder farmers in the Gauteng Province.	Primary data	Descriptive statistics
2. To assess the awareness of agricultural e-commerce platform among fresh produce smallholder farmers in the Gauteng Province.	Primary data	Descriptive statistics
3. To determine willingness to adopt and to assess the extend of adoption of agriculture e-commerce platform among fresh produce smallholder farmers in the Gauteng Province.	Primary data	Descriptive statistics
4. To determine the willingness to pay and the premium (amount) the fresh produce smallholder farmers are willing to pay for agriculture e-commerce platform services.	Primary data	Descriptive statistics
5. To analyse the factors influencing the willingness to adopt agriculture e-commerce by fresh produce smallholder farmers in the Gauteng Province.	Primary data	Binary logistic regression

Source: Own compilation (2022)

The study made use of SPSS (Statistical Package for Social Sciences) version 28.

#### 3.4.1. Descriptive statistics

Profile the socio-economic characteristics of fresh produce smallholder farmers in the Gauteng Province

To achieve the first objective of this study, descriptive statistics such as the mean, frequency and percentages were used to describe the socio-economic characteristics of the fresh produce smallholder farmers in the study area. To further elicit the demographics and description of the sampled farmers, the study used pie charts, bar graphs as well as frequency tables.

#### 3.4.2. Likert scale and descriptive statistics

Fresh produce smallholder farmers' agriculture e-commerce platform awareness

To address the second objective, the study made use of the Likert scale. Likert-scale questionnaires are the most commonly used type of instrument for measuring affective variables such as motivation and self-efficacy, given that they allow researchers to gather large amounts of data with relative ease (Beglar, 2014). From the data collection tool (questionnaire), the question to farmers was: Are you aware of agriculture e-commerce platform? A Likert-scale (1= fully not aware, 2= not aware, 3= neither aware or not aware, 4= aware, 5= fully aware).

#### 3.4.3. Likert scale and descriptive statistics

Fresh produce smallholder farmers' willingness to adopt agriculture e-commerce and willingness to adopt level.

With respect to the third objective for this study, Likert-scale was employed to determine the farmers' willingness to adopt agriculture e-commerce platform. on the scale of 1 to 5, farmers were asked to rate their likelihood of willingness to adopt agriculture e-commerce platform. For instance, (1= not willing to adopt, 2= somewhat not willing to adopt, 3= neutral, 4= somewhat willing to adopt, 5= willing to adopt).

#### 3.4.4 Contingent Valuation Method and descriptive statistics

Willingness to pay and the premium (amount) the fresh produce smallholder farmers are willing to pay for agriculture e-commerce platform services.

The fourth objective was addressed using Contingent Valuation Method (CVM) to investigate the willingness to pay for agriculture e-commerce platform services among the fresh produce smallholder farmers in the study area. Willingness to pay is generally analysed using the contingent valuation method and it helps to estimate the value an individual places on a good, usually an intangible good. According to Oduniyi *et al.*, (2020a) the contingent valuation method technique is a direct approach to measuring the willingness to pay (WTP) that many researchers have produced tangible results and predictions in relation to non-market goods. Contingent Valuation Method is often referred to as a stated preference model, in contrast to a price-based revealed preference model. Typically, the survey asks how much money people would be willing to pay (or willing to accept) to use (or be compensated for the loss of) organic food product features, such as environmental benefits. Indeed, CVM permits a direct estimation of WTP by means of different elicitation techniques (Boccaletti and Nardella

2000). Consumers simply indicate their WTP without purchasing the hypothetical product or service.

From the data collection tool (questionnaire), the question to farmers was: if agriculture e-commerce platform was introduced to enable you to have access to market to sell your produce, would you pay for such services? Yes [ ] or No [ ]. Furthermore, on the scale of 1 to 5, farmers who were willing to pay for the agriculture e-commerce platform services were asked to choose the premium (amount) they were willing to pay to use such services.

#### 3.4.5 Binary logistic regression

The binary logistic regression model was employed in the study to address objective five. Binary logistic regression is a type of regression analysis that is used to estimate the relationship between a dichotomous dependent variable and dichotomous, interval, and ratio level independent variables. Dichotomous or dummy variables are usually coded 1, indicating “success” or “yes,” and 0, indicating “failure” or “no.” The mean of a dichotomous variable coded 1 and 0 is equal to the proportion of cases coded as 1, which can also be interpreted as a probability (Horowitz and Savin, 2001). Logistic regression was thus necessary to estimate the probability that smallholder fresh produce farmers will adopt agriculture e-commerce.

The general logistic regression model equation:

$$\text{Log} = [P/1-P] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + U_i$$

Where: P = Predicted probability that Y equals to one (dependent variables)

X<sub>1</sub>...X<sub>n</sub> = explanatory variables

$\beta_0 \dots \beta_n$  = Estimated parameters

$U_i$  = Disturbance term

Variables in the model

$WTA = [P/1-P] = \beta_0 + \beta_1 (\text{GEN}) + \beta_2 (\text{Age}) + \beta_3 (\text{Marital status}) + \beta_4 (\text{Education level}) + \beta_5 (\text{Occupation}) + \beta_6 (\text{Market information access}) + \beta_7 (\text{Condition of the roads}) + \beta_8 (\text{Access to market}) + \beta_9 (\text{Distance to market}) + \beta_{10} (\text{Transport access}) + \beta_{11} (\text{transport costs}) + \beta_{12} (\text{Technological gadget ownership}) + \beta_{13} (\text{Internet access}) + \beta_{14} (\text{Internet use frequency}) + \beta_{15} (\text{AE awareness}) + \beta_{16} (\text{Willingness to pay for AE platform services}).$

Table 3.3: Description of variables included in the Binary logistic model

		Variable	Variable description	Unit of measurement
Dependent variable (Y)				
Y <sub>1</sub>	WTA	Willingness to adopt agriculture e-commerce by fresh produce smallholder farmer	1 if farmer is willing to adopt agriculture e-commerce, 0 if otherwise	Dummy
Independent variables (Xi)				
X <sub>1</sub>	GEND	Gender	1 if the respondent is male and 0 otherwise	Dummy
X <sub>2</sub>	AGE	Age	Age of the respondent	Years
X <sub>3</sub>	MAST	Marital status	1 if the respondent is married and 0 otherwise	Dummy
X <sub>4</sub>	EDU	Level of education	1 if the farmer has formal education and 0 otherwise	Dummy
X <sub>5</sub>	OCCP	Occupation	1 if the farmer is a full-time farmer and 0 otherwise	Dummy
Market related variable				
X <sub>6</sub>	SMI	Market information access	If the farmer has a source of market information, 0 otherwise	Dummy
X <sub>7</sub>	CR	Condition of roads	1 if the condition of the road is good, 0 otherwise	Dummy
X <sub>8</sub>	MA	Market Access	1 if the farmer has access to market, 0 otherwise	Dummy
X <sub>9</sub>	DSTM	Distance to market	Farmers' distance to nearest fresh produce	Kilometre
X <sub>10</sub>	MOT	Access to transport	1 if the farmer has own transport, 0 otherwise	Dummy
X <sub>11</sub>	TCM	Transportation costs to market	1. R0 -R100, 2. R 101-300, 3. R 301 – R 500, 4. > R500	Rands
X <sub>12</sub>	AEA	Agriculture e-commerce awareness	1 if the farmer is aware of AE,0 otherwise	Dummy
X <sub>13</sub>	TGO	Technological garget ownership	1 if the farmer does not have a technological garget, 0 otherwise	Dummy
X <sub>14</sub>	IA	Internet access	1 If the farmer has access to internet, 0 otherwise	Dummy
X <sub>15</sub>	IUF	Internet use frequency	The number of times the respondent access internet	Weekly
X <sub>16</sub>	WTPEP	Willingness to pay for e-commerce platforms services	1 if the farmer is willing to pay a premium for e-commerce platform services, 0 otherwise	Dummy
X <sup>17</sup>	PWTP	Premium (amount) the farmer is willing to pay)	1.Not willing to pay a premium, 2. Willing to pay less than 10% premium, 3. Willing to pay 11% to 30% premium, 4. Willing to pay 31% to 50% premium, 5. Willing to pay more than 50% premium	Rands

Source: Own compilation (2022)

Y= 1 if, the fresh produce smallholder farmer is willing to adopt agriculture e-commerce, 0 if the fresh produce smallholder farmer is not willing to adopt agriculture e-commerce.

### 3.5 Ethical Consideration

This study adhered to the Turfloop Research Ethics Committee (TREC)'s rules and regulations. This study was not harmful to the respondents and considered ethical issues such as confidentiality, permission, informed consent, respect and danger or risk involved in participating during data collection. Respondents were not forced by any means to participate in this study but voluntarily participated and were informed of their right/willingness to participate in this study or not.

### 3.6 Confidentiality and anonymity

In this study, the confidentiality and anonymity of the respondents were taken into consideration. Respondents' real names were not mentioned in the study and the information they provided was used for the study only.

### 3.7 Chapter summary

This chapter indicated the study area where the data were collected, the data set and the analytical procedures that were used to analyse the data. The data were analysed using the Descriptive statistics. The aspects analysed included the socio-economic characteristics, awareness, willingness to adopt and willingness to pay for agriculture e-commerce platform services by fresh produce smallholder farmers. Furthermore, the binary logistics regression was employed to determine the factors influencing the farmer's willingness to adopt agriculture e-commerce platform.



## CHAPTER 4

### RESEARCH RESULTS AND DISCUSSION

#### 4.1 Introduction

The results and discussion of the study are presented in this chapter. The chapter begins with the presentation of socio-economic analysis of respondent farmers, which covers demographic characteristics, market related variables and individual farmers' ICT use. Furthermore, the descriptive results of the fresh produce farmers' willingness to adopt and willingness to pay for agriculture e-commerce platform services. Lastly, the result of the logistic regression model in accordance with the research objectives was then presented.

#### 4.2 Socio-economic characteristics of fresh produce smallholder farmers

Table 4.1: Descriptive results of continuous variables for socio-economic characteristics of fresh produce farmers (n=120)

Variables	Minimum	Maximum	Mean	Standard deviation
Age (Years)	20	74	42.11	13.65
Farm size (Ha)	0.5	10	3.68	2.23
Distance to market (Km)	5	50	30.22	12.03

Source: From survey data (2022)

Table 4.1 shows continuous variables linked to socio-economic features of fresh produce smallholder farmers in the City of Tshwane Municipality, City of Johannesburg Municipality and Sedibeng District Municipality. It consists of the socio-economic

characteristics of both the sampled adopters and non-adopters of agriculture e-commerce in the study area.

#### 4.2.1 Age

The total number of sampled farmers in the study area is 120. The average age of all sampled fresh produce smallholder farmers in the study area was 42, thus indicating that most of the farmers are still in their working years. The result of the study indicates that the respondents' ages ranged between the age of 20 years (minimum age) and 74 years (maximum age) and a standard deviation of 13.65 years.

#### 4.2.2 Farm size

The amount of land or operation area available to farmers differs from one farmer to other. The study found that the minimum size of the farm of sampled fresh produce smallholder farmers was 0.5 hectares and the maximum farm size was 10 hectares. On average the sampled farmers farm on a land size of 3.68 hectares.

#### 4.2.3 Distance to market

Distance to the market is vital and influences the extent to which farmers participate in different types of markets. According to Ogunleye and Oladeji (2007), the distance to markets has a negative impact on market access and market participation as it increases the costs of transportation and marketing among farmers. The maximum distance the fresh produce smallholder farmers travelled to the market was 50km and the minimum distanced travelled to the nearest fresh produce market was 5km. On average the, the fresh produce smallholder farmers are likely to travel 30.22 km to get to the nearest fresh produce market.

#### 4.2.4 Gender

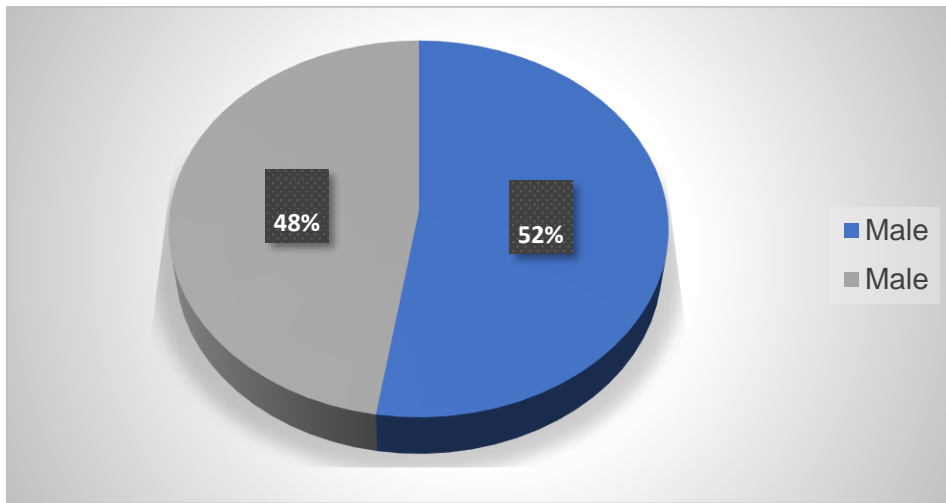


Figure 4.1: Gender of the farmers

Source: From survey data (2022)

According to figure 4.1 majority 52% of the respondents from the sampled fresh produce smallholder farmers were male and 48% were females. Therefore, the results suggest that most fresh produce smallholder farmers in the study area are males. Similarly, Okoedo-Okojie (2015) found that agriculture is dominated by men.

#### 4.2.5 Marital status

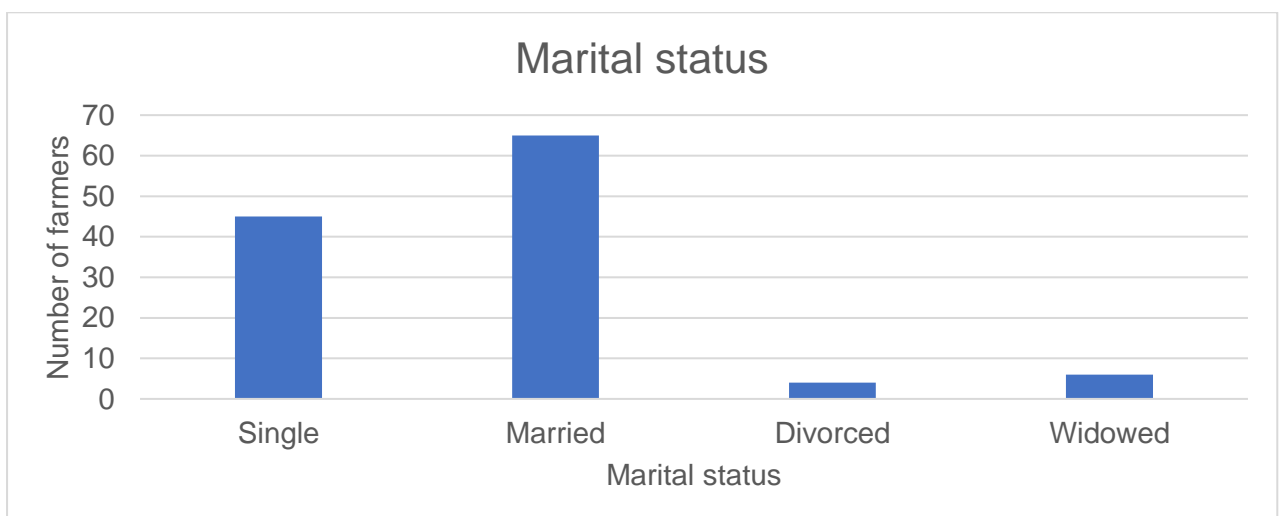


Figure 4.2: Marital status of the farmers

Source: From survey data (2022)

Figure 4.2 indicate the marital status of the sampled farmers. The results also indicated that a large proportion of the sample were married, which was accounted for by 65 fresh produce smallholder farmers with 54 %, the remaining percentage 46% of the respondents fell into either the single, widowed, divorced groups with 38%, 5% and 3% respectively. The findings of the study concur with the findings of Mumba *et al.*, (2012) found similar results that a majority of farmers were married.

#### 4.2.6 Farmers' education

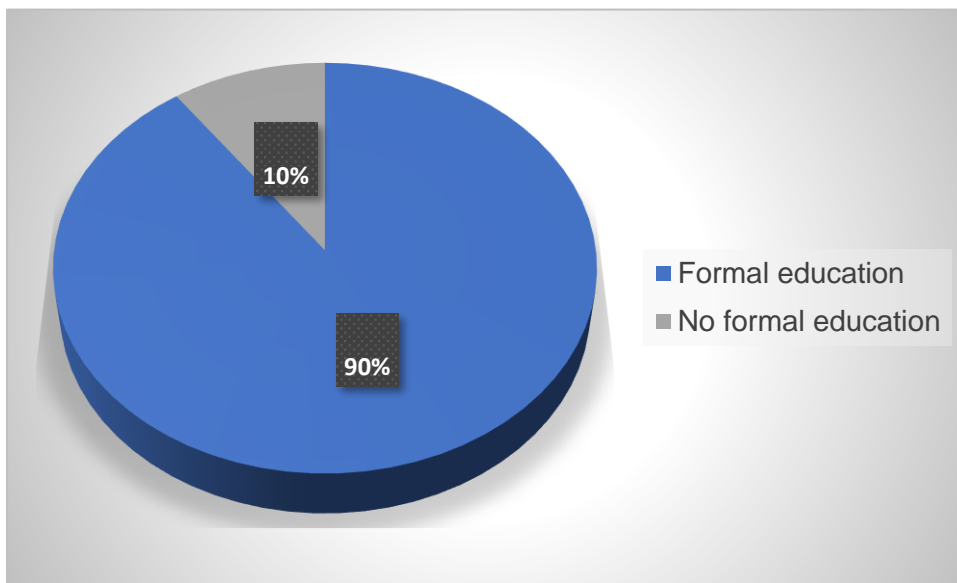


Figure 4.3: Education of farmers

Source: From survey data (2022)

Education and training give vital knowledge to farmers. The results of the study indicate that 90% of the farmers had formal education, namely, primary, secondary, and tertiary education whereas 10% of the farmers had no formal education. According

to Contò *et al.*, (2013) as cited Sharghi *et al.*, (2010), both formal and informal education systems serve the promotion of knowledge and motivate human resources. The results of the study suggest that fresh produce smallholder farmers in the Gauteng Province are more likely to be willing to adopt agriculture e-commerce as majority of the sampled farmers had formal education, therefore the assumption is that the farmers are literate and will be able to operate or engage on the e-commerce platforms.

#### 4.2.7 Occupation and source of income

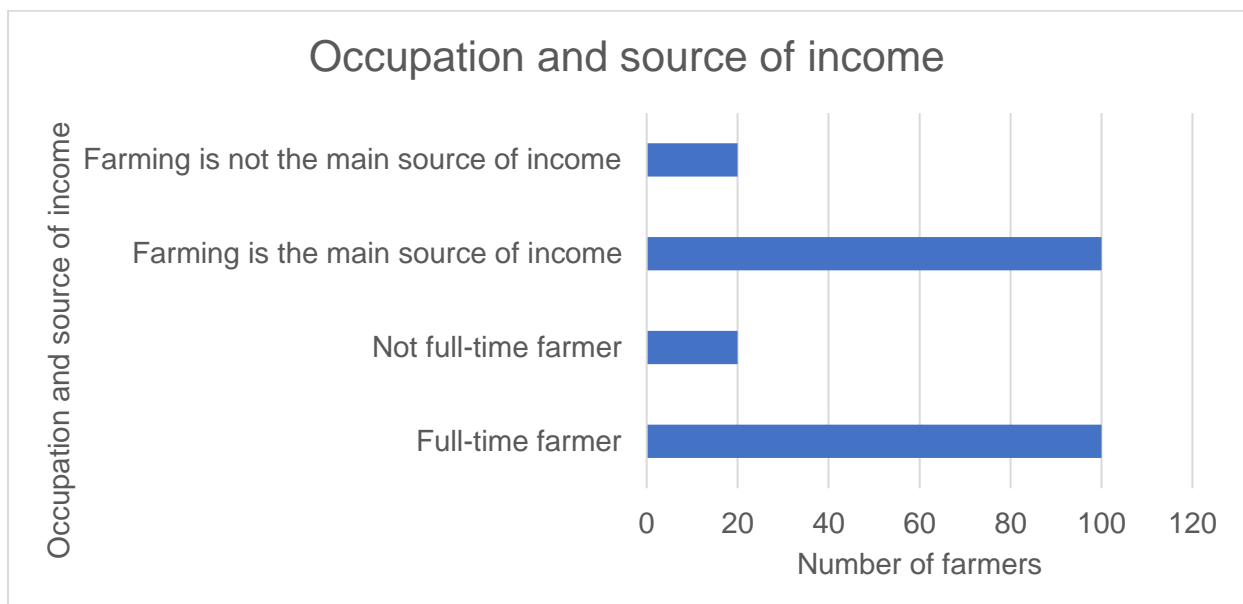


Figure 4.4: Occupation and source of income of farmers

Source: From survey data (2022)

According to figure 4.4, the study found that 83% of the farmers were full-time farmers and only 17% were not farming on a full-time basis. Moreover, 83% of the full-time farmers indicated that farming was their main source of income while 17% indicated that they had another source of income, mainly being employed. The findings of the study suggest that fresh produce smallholder farmers who are farming full time and

farming is their main source of income are more likely to be willing to adopt agriculture e-commerce to sell their produce with the intension of generating more profits and to attract a wide range of customers.

#### 4.2.8 Type of farmer and farming method

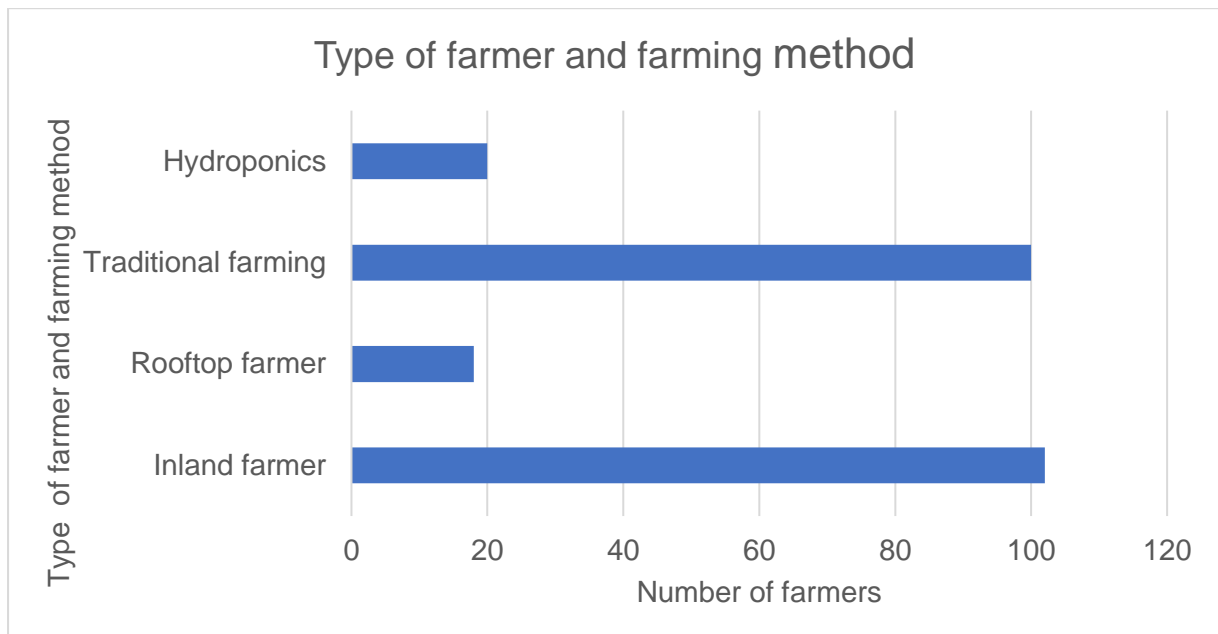


Figure 4.5: Type of farmer and farming method

Source: From survey data (2022)

The study consisted of 85% inland farmers and 15% rooftop farmers. 83% of the farmers indicated that they were using old traditional farming methods on their farm. Traditional farming methods involve soil cultivation, inland planting etc., and 17% of the farmers indicated that they used hydroponic systems for their production.

### 4.3 Descriptive results for market related variables discussion

#### 4.3.1 Source of market information

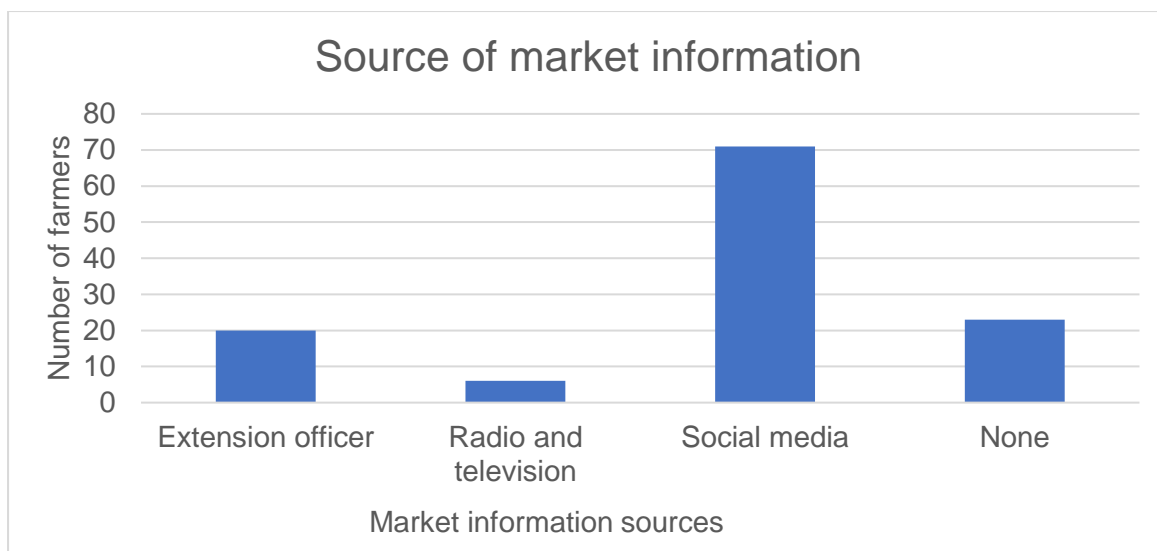


Figure 4.6: Source of market information

Source: From survey data (2022)

According to Bates (2012), information sources are mediums in which knowledge or information is stored. Information sources may be formal or informal. Koyenikan (2011) indicates that the formal sources include radio, print media, and workshops, while informal sources may include family, friends, co-farmers and other colleagues. In South Africa, market information sources available to farmers include radio stations (national or local), television, mobile phones, newspapers, and extension officials.

According to Ouma *et al.*, (2010), lack of market information is the primary cause of limited market access and market participation among smallholder farmers. Moreover, Engel and Barends-jones (2020) state that farmers must stay up to date with the latest technology to ensure that the farm operates or is managed efficiently and effectively.

According to figure 4.6, 59% farmers obtained market information from social media platforms, 19% had no source of market information, whereas those who obtained

their market information from extension officers was 17%. Lastly, 5% of farmers got market information from radio or television.

The result of this study contrasts with the findings of Shao *et al.*, (2004) who found that farmers lacked market information. The result of the study indicates that only 19% of the respondents had no source of market information. The contrast might be because of limited market information disseminators in the past, for instance the study's findings indicate that most farmers get the market information from social media platform, however social media platforms were not predominant or popular as market information disseminator in the past.

#### 4.3.2 Conditions of the roads

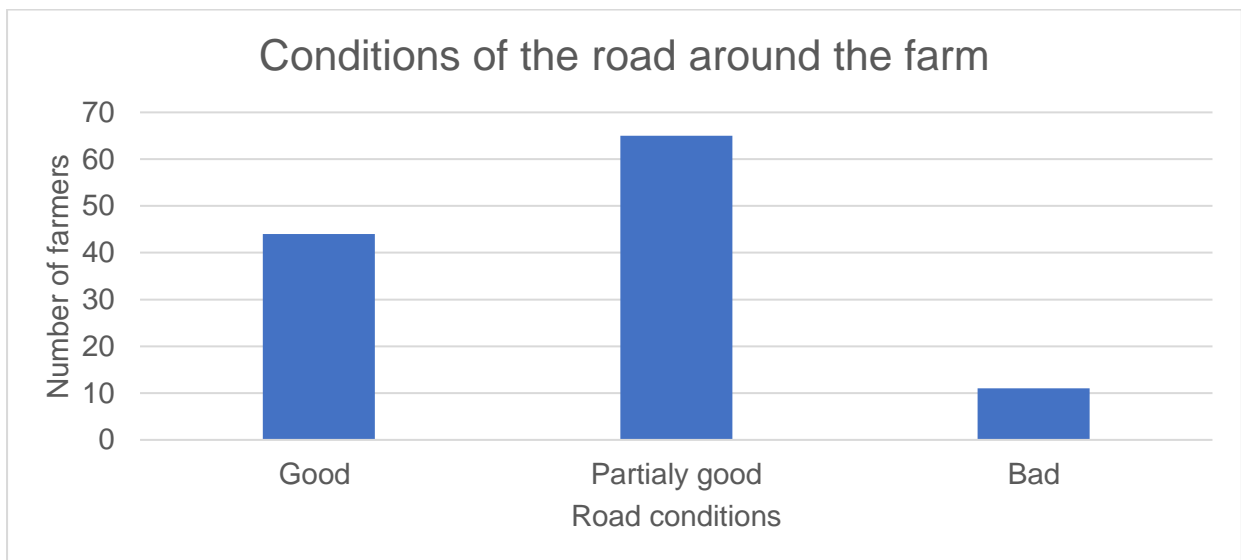


Figure 4.7: Conditions of the road around the farm

Source: From survey data (2022)

The sampled farmers were asked to rate the conditions of their roads. As shown in figure 4.7, 54% indicated that the roads around their farms were partially good, 37% indicated that the roads around their farms were good and only 9% indicated that the



roads were in a bad state. Although most of the roads around the farms were gravel roads, farmers indicated that the roads were in a condition that permitted an easy flow of transport.

#### 4.3.3 Access to extension services

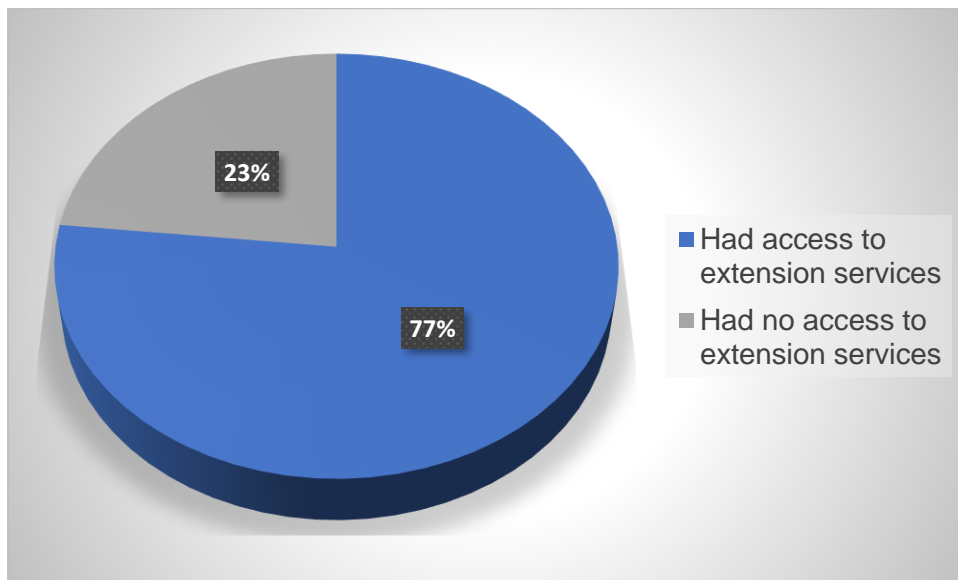


Figure 4.8: Farmers' access to extension services

Source: From survey data (2022)

Extension services assist farmers to access information on technologies, markets, inputs, and finances and upgrade their farming and managerial skills. These services are compatible to the development of new technologies as they support their uptake. The result of the study indicates that 77% of the farmers had access to agricultural extension services whereas 23% did not have access to agricultural extension services. The result of the study suggests that the agriculture e-commerce market information dissemination through the extension services would be effortless as most of the sampled farmers had access to extension services, therefore promoting the adoption of agriculture e-commerce platform.

#### 4.3.4 Access to formal markets

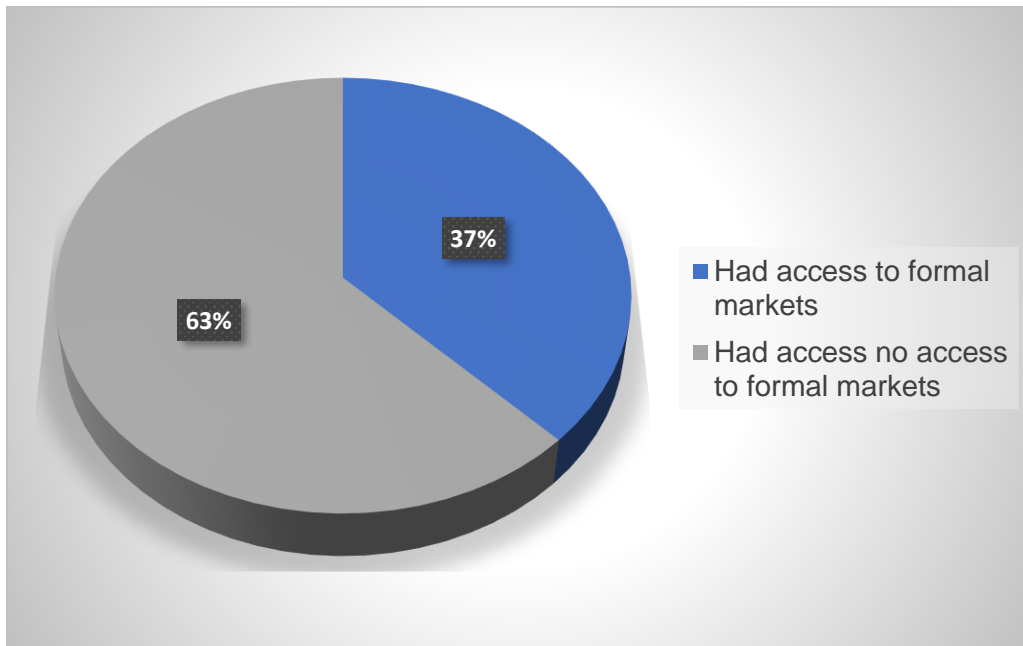


Figure 4.9: Farmers' access to formal markets

Source: From survey data (2022)

The Gauteng Province is home to a few national fresh produce markets (FPMs) namely: Tshwane fresh produce market, Joburg fresh produce market, Springs fresh produce market and Vereeniging fresh produce market. Farmers were asked if they had access to formal markets. The study found that only 38% of sampled farmers had access to formal markets and 62% did not have access to formal markets; thus, farmers sold their produce at the farm gates, to hawkers etc.

The findings of the study harmonise with those of Cousins (2012) who found that Tugela Ferry Farmers were also selling to roadside hawkers and to local consumers from surrounding areas. Although farmers in the study had access to market information, a majority of them did not sell their produce in formal markets. The study suggests that the less access to formal market of fresh produce smallholder farmers

might be due to the inability of farmers to supply the formal markets effectively and consistently with their produce whereas the formal markets require consistent supply.

#### 4.3.5 Source of transport

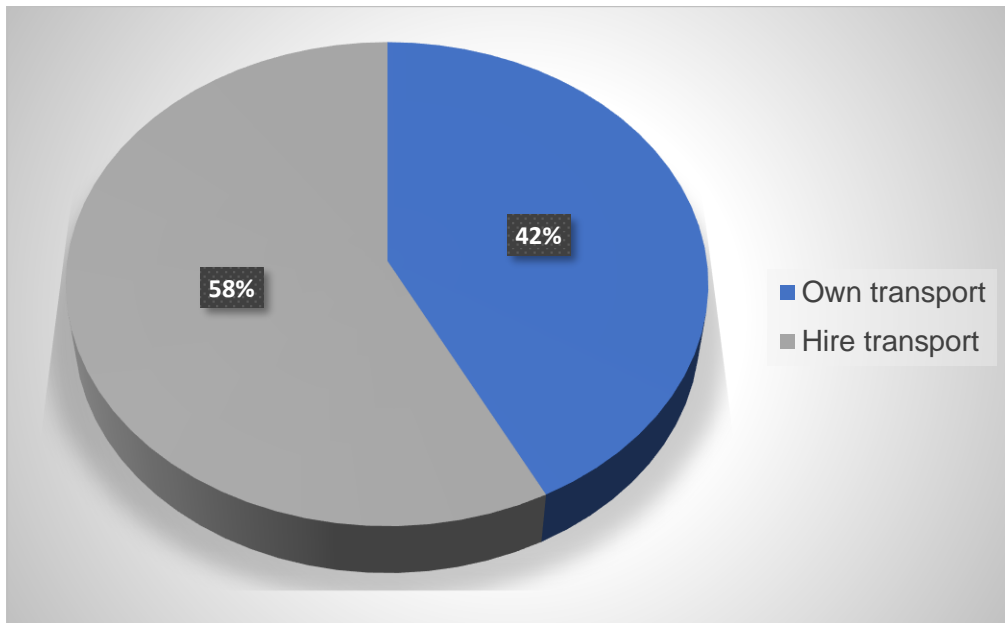


Figure 4.10: Farmers' source of transport

Source: From survey data (2022)

South African smallholder farmers are geographically spread and distant to markets, thus making it difficult to reach the markets (Matoti *et al.*, 2007). Therefore, transport plays a critical role as it links the farmer to the consumer and determines if the produce can be delivered on time. The availability of reliable transport is vital because unreliable transport can lead to delays in the transportation of the produce. The study found that 57% of the respondents hired transport to move their produce to their respective markets, 43% used their own transport and none of the farmers had no access to transport.

#### 4.3.6 Transport costs

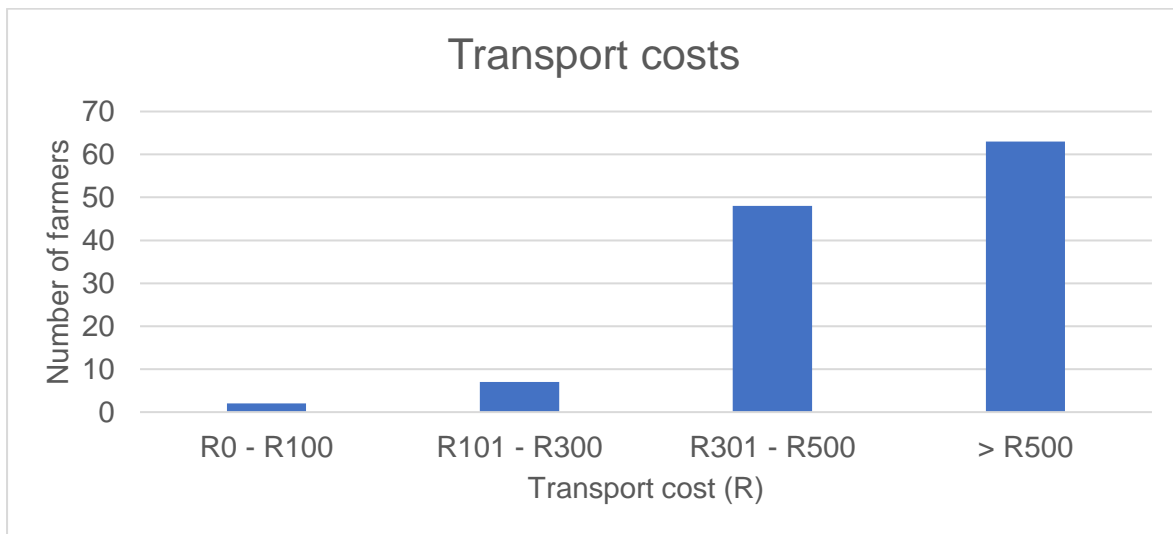


Figure 4.11: Transport costs

Source: From survey data (2022)

The respondents were asked the amount they paid to transport their produce to the market, and the results indicate that 53% of the farmers paid over R 500 to transport their produce to the market per load. 40% of the farmers paid between R 301 – R 500, 6% paid between R 101 – R 300 and 1% paid between R 0 – R 100. Respondents indicated that the rates that they were charged for transportation of their produce was not fixed, as the transporters charged any amount they felt like charging at that time.

#### 4.4 Descriptive results of individual ICT use variables discussion

##### 4.4.1 Farmers' technological gadget ownership

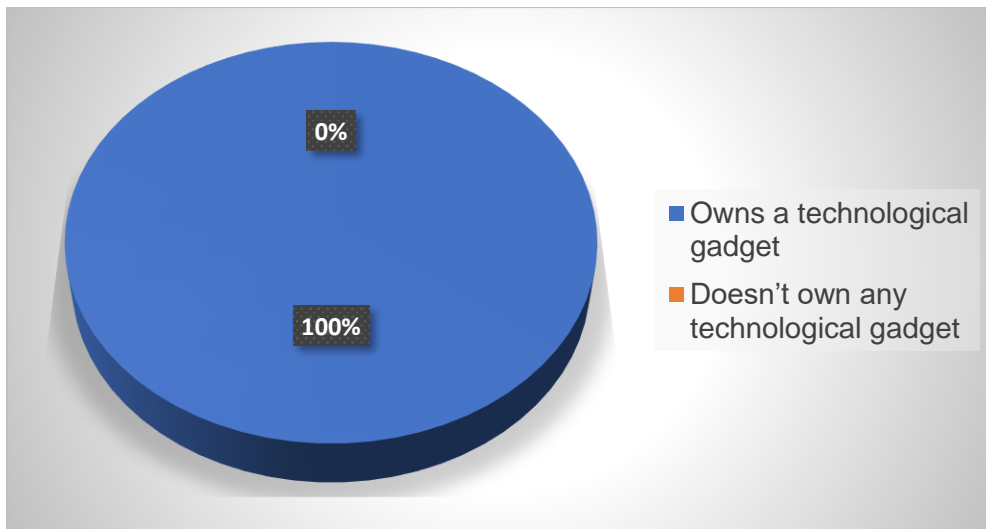


Figure 4.12: Farmers' technological gadget ownership

Source: From survey data (2022)

The probability of businesses investing money to use e-commerce ultimately depends on demographic features, experience with e-commerce from a buyer and a seller's perspective, technological expertise, knowledge of e-commerce opportunities and challenges (Watson *et al.*, 2005). The study assessed the farmers' information and communication technology use. According to figure 4.12 above 100% of sampled fresh produce farmers in the study were found to have their own technological gadget, be it a cell phone, a laptop or both.

#### 4.4.2 Internet access

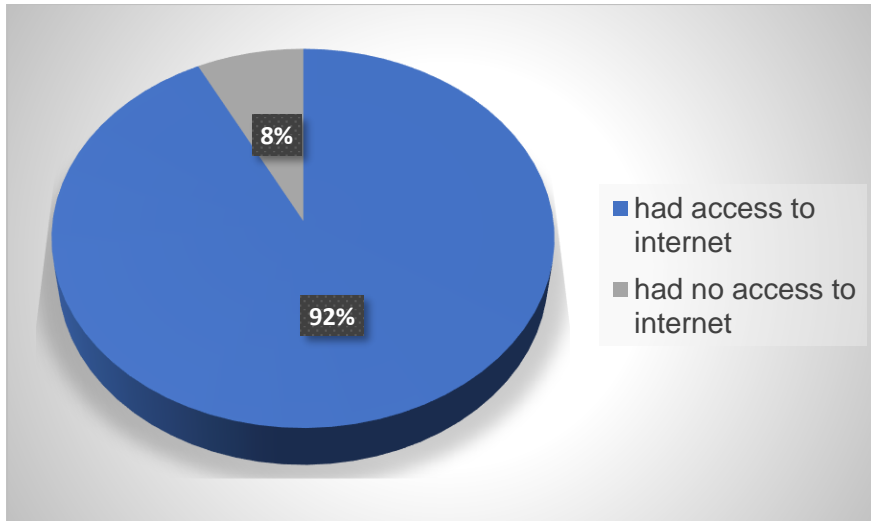


Figure 4.13: Farmers' internet access

Source: From survey data (2022)

The internet plays a huge role in the effective adoption of the overall e-commerce. According to the results of the study 93% of the respondents indicated that they had access to the internet and only 7% did not have access to the internet. The result of this study concurs with that of Saleh (2022) who indicated that a majority (over 78%) of South African citizens have access to the internet, which is approximately 47 million of the South African population.

#### 4.4.3 Internet use frequency

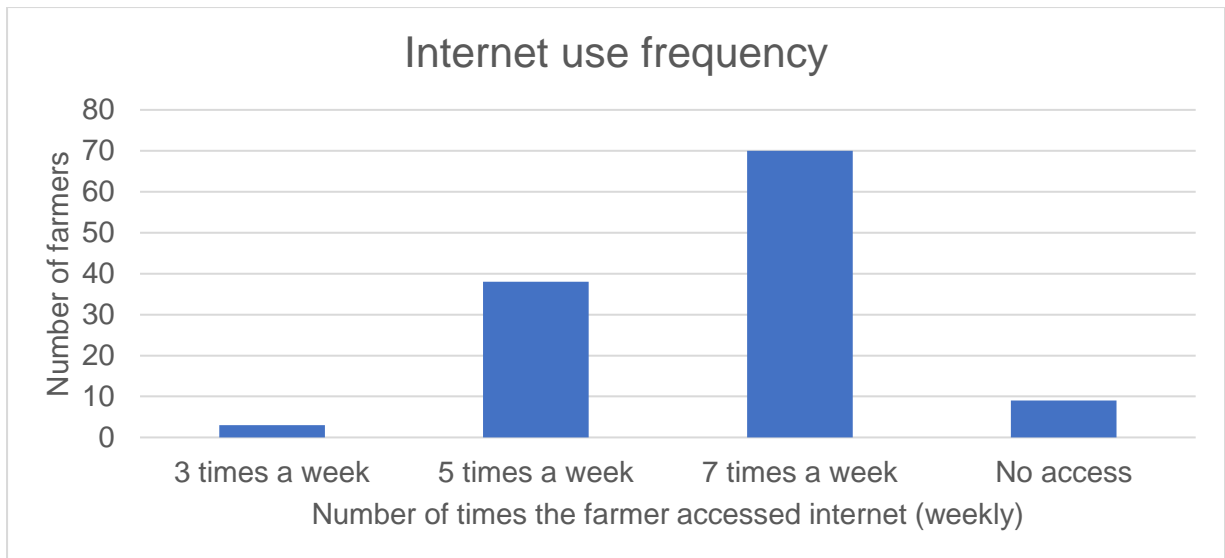


Figure 4.14: Farmers' internet use frequency

Source: From survey data (2022)

The internet users' experience affects their approach towards the internet (Bauboniene and Guleviciute ,2015). The study assessed the sampled farmers' internet use frequency. The result of the study indicates that 58% of the farmers accessed the internet the whole week (7 days) while 32% indicated that they only had access to the internet 5 days a week, 3% accessed the internet 3 times a week and those who had no access to the internet was 7%. The findings of the study suggests that the fresh produce smallholder farmers in the Gauteng Province are in a good position to effectively adopt agriculture e-commerce as the have reliable internet access most of the time.

#### 4.4.4 Farmers' ICT use

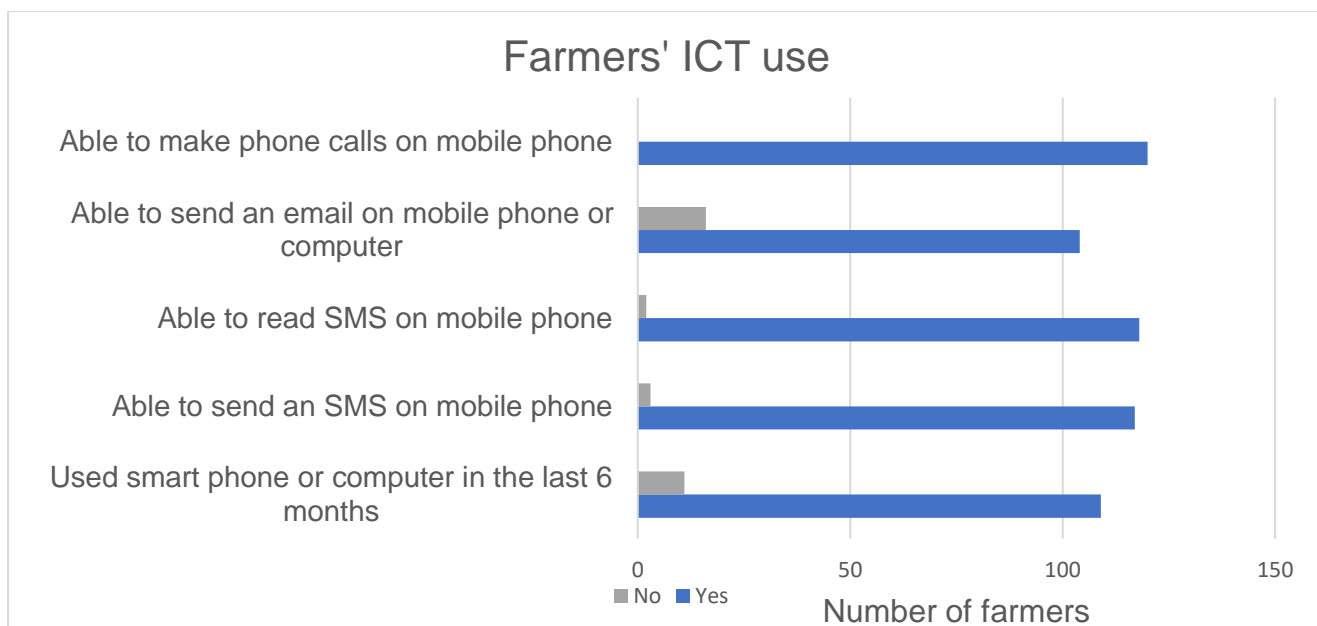


Figure 4.15: Farmers Information Communication and Technology (ICT) use

Source: From survey data (2022)

The sampled farmers were accessed on their information communication technology use (ICT). The study found that 91% of the respondents had used a smart phone or laptop in the past 6 months whereas 9% indicated that they did not have access to a smart phone or laptop in the past 6 months. The outcome of the study agrees with Statista (2022) who reported that the rise in internet penetration results from the expansion of smartphones and mobile devices use. Therefore, this indicates that the more businesses use smartphones and mobile devices, the more likely they are to adopt and use e-commerce.

Poor technology infrastructure serves as a barrier of e-commerce adoption, and it is the most contributing factor hindering e-commerce adoption (Oluyinka *et al.*, 2013). The result of the study further revealed that 97% of the farmers indicated that they could send an SMS on their phones and only 3% could not send an SMS on their



phones. Furthermore, 98% were able to read an SMS on their phone while 2% could not read at all. Moreover, farmers who were able to send an email on their phone or computer was 87% whereas those who were not able to send emails was 13%. Lastly, the study found that 100% of the farmers were able to make calls using their cell phones. The findings of the study indicate that majority of fresh produce smallholder farmers in the Gauteng Province had access to internet, smart phones, laptops and were computer literate (can operate either a computer, mobile phone, or both), therefore these farmers were found to be more likely to adopt agriculture e-commerce.

#### 4.5 Agriculture e-commerce awareness

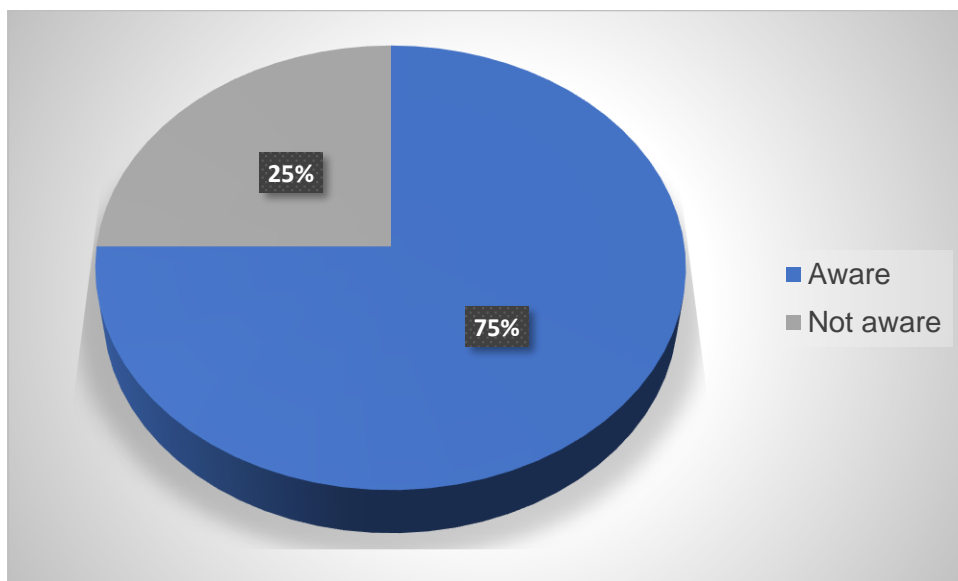


Figure 4.16: Agriculture e-commerce awareness

Source: From survey data (2022)

According to Olatokun and Kebonye (2010), the lack of awareness of e-commerce-related technologies, such as online shopping, hinders the adoption of e-commerce. Furthermore, there is a need for increased awareness about e-commerce, adequate training and skills upgrading for Small, Medium and Micro Enterprises (SMMEs) to

better benefit from e-commerce technologies. Looi (2005) in agreement with Olatokun and Kebonye (2010) states that the computer literacy of the small business owner and lack of knowledge of the benefits derived from information technology significantly affect the information technology (IT) adoption of the business. Farmers' awareness of agriculture e-commerce was explored. According to figure 4.16, 75% of the sampled farmers were found to be aware of agriculture e-commerce whereas 25% were not aware.

#### 4.6 Willingness to adopt agriculture e-commerce

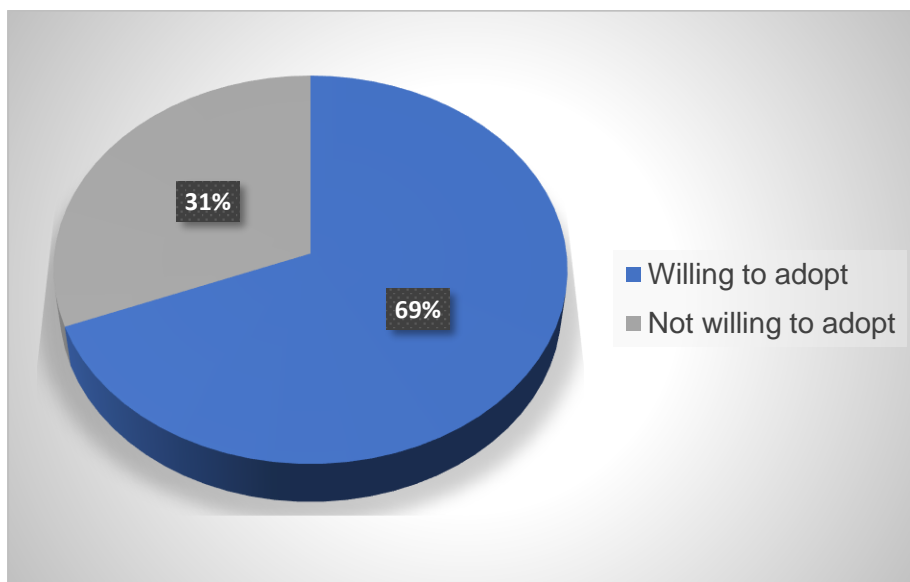


Figure 4.17: Willingness to adopt agriculture e-commerce (n=120)

Source: From survey data (2022)

Adoption is the user's initial acceptance of an object, idea, or practice, and is regarded as the utilisation of the object, idea, or practice in a certain context (Kim and Crowston, 2011). Sampled farmers were assessed on their willingness to adopt agriculture e-commerce platform.

The study employed the five-point likert scale which was classified into 5 categories, namely, 1= not willing to adopt, 2= somewhat not willing to adopt, 3= neutral, 4= somewhat willing to adopt, 5= willing to adopt. Furthermore, these categories were then reduced to two options, which were willing to adopt and not willing to adopt. The farmers who indicated that they were not willing to adopt, somewhat not willing to adopt and those who were neutral were regarded as not willing to adopt agriculture e-commerce while those who were willing to adopt and somewhat willing to adopt were regarded to be willing to adopt agriculture e-commerce. According to figure 4.17, 69% of the farmers were willing to adopt agriculture e-commerce while those who were not willing to adopt was 31%.

In an open-ended question sampled farmers were asked to state the reason for their choice for willingness to adopt for agriculture e-commerce. The study found that farmers who were likely to adopt agriculture e-commerce perceived that the adoption of the e-commerce platform would assist their farm business to generate more profit and to reach more customers. The farmers' perception affirms Cornelise's (2023) finding that with the use of agriculture e-commerce techniques and technology, smallholder farmers are more likely to attract additional customers because of a higher level of customer service and this will lead to better customer relations and increase the number of customers the business had.

#### 4.7 Agriculture e-commerce adoption

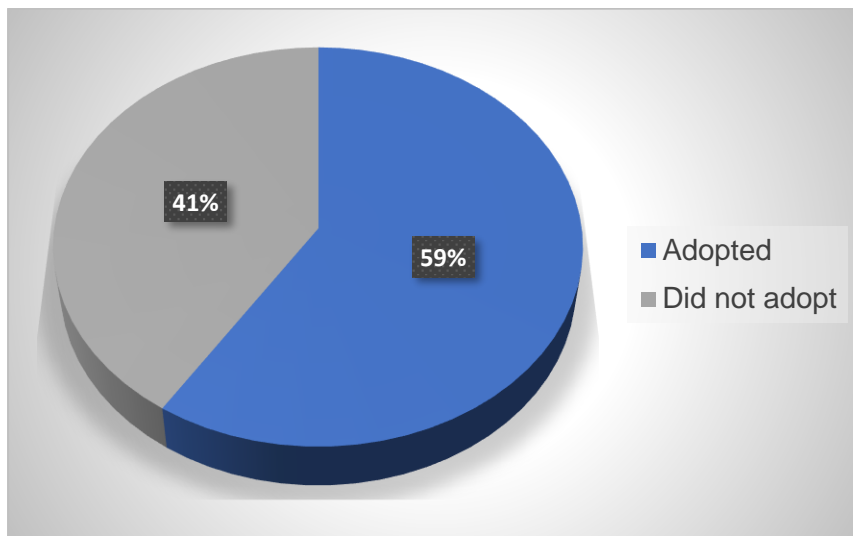


Figure 4.18: Agriculture e-commerce adoption (n=81)

Source: From survey data (2022)

From the results of willingness to adopt agriculture e-commerce the study further established whether the sampled fresh produce smallholder farmers had already adopted agriculture e-commerce, either the farmers sold their produce or had bought agricultural inputs on the e-commerce platform. According to figure, 59% of the sampled farmers already sold their produce or had bought agricultural inputs on the e-commerce platform (adopted e-commerce) and 41% had never sold their produce or bought any agricultural input on the e-commerce platform.

Initially farmers who were willing to adopt agriculture e-commerce accounted for 69% of the sample, however the study found that only 59% farmers had already adopted and were using agriculture e-commerce. Therefore, the result of the study concurs with the findings of the study conducted by Cloete and Doens (2008) who indicated that, although several non-adopters of ecommerce had not adopted e-commerce and

were not yet informed about the opportunities that the platform can provide, approximately 80% of them were planning to use agriculture e-commerce in the future.

In an open-ended question farmer were further asked when they first engaged in the use of agriculture e-commerce platform, and a majority of the farmers indicated that they began to use the agriculture e-commerce platform during the advent of the Covid-19 pandemic. The statement supports Masiwa (2020) and Netshaulu (2022) who indicated that farms across the country expressed an interest to use software platforms that reinforce direct sales to consumers in their respective communities.

#### 4.8 E-commerce platforms adopted by farmers

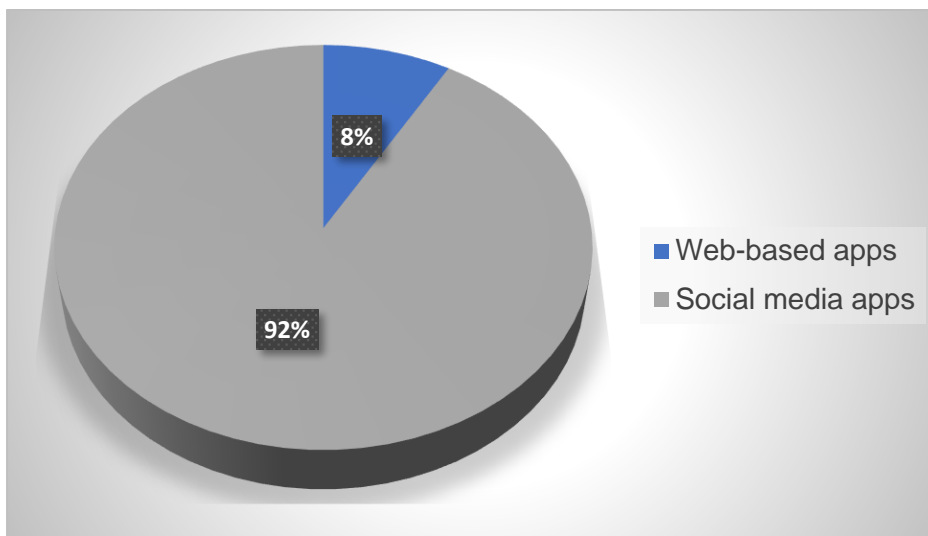


Figure 4.19: E-commerce platforms adopted by farmers (n=71)

Source: From survey data (2022)

According to World bank (2019) South Africa is one of the digital economy leaders on the African continent. From the sampled 71 farmers who adopted agriculture e-commerce platform, the study further assessed the e-commerce platforms used by fresh produce smallholder farmers. The findings of the study indicate that 92% used

social media applications to either sell their produce or to buy agricultural products, the social media platforms include WhatsApp, Facebook, Instagram and Tick Tok and 8% adopted the web-based applications.

The results of the study concur with the findings of Statista (2023), which indicate that social media play a vital role in the e-commerce industry. The use of social media applications is referred to as social commerce and is defined as the sale of goods and services through social media platforms such as Instagram, Facebook, Pinterest, YouTube, TikTok and Twitter. The study suggest that the effective adoption of the agriculture e-commerce can be achieved through the social commerce as majority of sampled farmers had smart phones, laptops and already adopted the use of social media applications to sell their produce and to buy other agricultural products.

#### 4.9 Adoption level

From the sampled size of 71 (59%) fresh produce smallholder farmers who had adopted agriculture e-commerce platform, the study went further to assess the adoption level. According to Achudhan *et al.*, (2019) Adoption of technology can be quantified by constructing a technology adoption index, which is categorized as follows:

- i. Less adoption level - (> 50%)
- ii. Medium adoption level - (50 – 70%)
- iii. High adoption level - - (< 70%)

According to figure 4.18, 59% farmers adopted agriculture e-commerce while those who did not adopt e-commerce was 31%. The result of this study indicates that the

agriculture e-commerce platform adoption of fresh is medium adoption, thus indicating that moderate adoption.

#### 4.10 Willingness to pay for agriculture e-commerce platform services

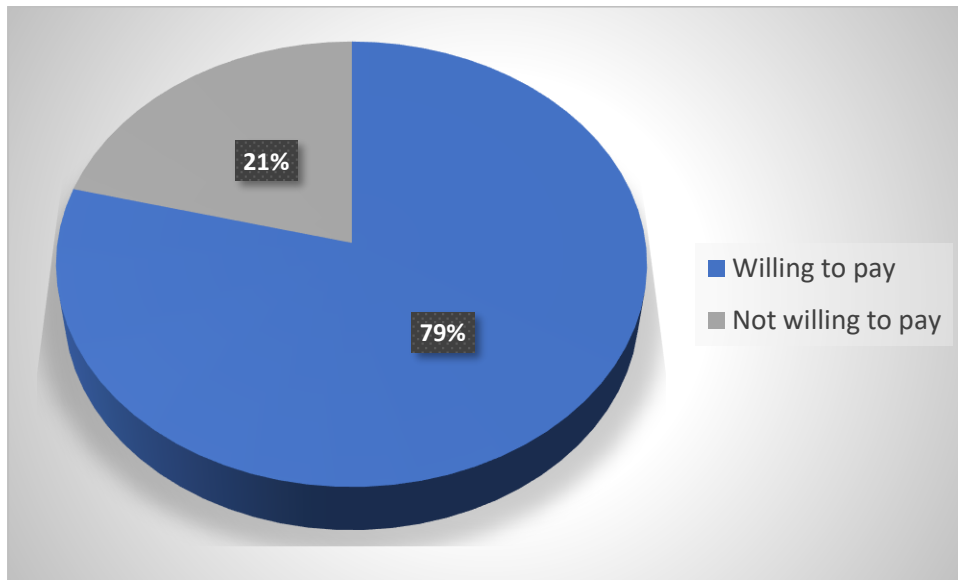


Figure 4.20: Farmers' willingness to pay for agriculture e-commerce platform services (n=81)

Source: From survey data (2022)

Willingness to pay (WTP) is a strong research approach that involves the targeted clients for potential services in establishing the preferences of the services proposed and the value the respondents are ready to pay. According to Mwaura *et al.*, (2010), willingness to pay studies are widely used in the assessment of markets, goods, services by planners, entrepreneurs and for environmental valuation. Farmers were asked whether they were willing to pay a premium to use agriculture e-commerce platform or not.

The study assumes that fresh produce smallholder farmers who are willing to adopt are more likely to be willing to pay for agriculture e-commerce. From the results of willingness to adopt agriculture e-commerce, the study further went to assess willingness to pay for the platform services. According to figure 4.20, the study found that from the 81 farmers who were willing to adopt agriculture e-commerce, 79% of the respondents were willing to pay for the agriculture e-commerce platform services and 21% were not willing to pay a premium for the agriculture e-commerce platform services.

#### 4.11 Premium (amount) the farmer is willing to pay for agriculture e-commerce platform services

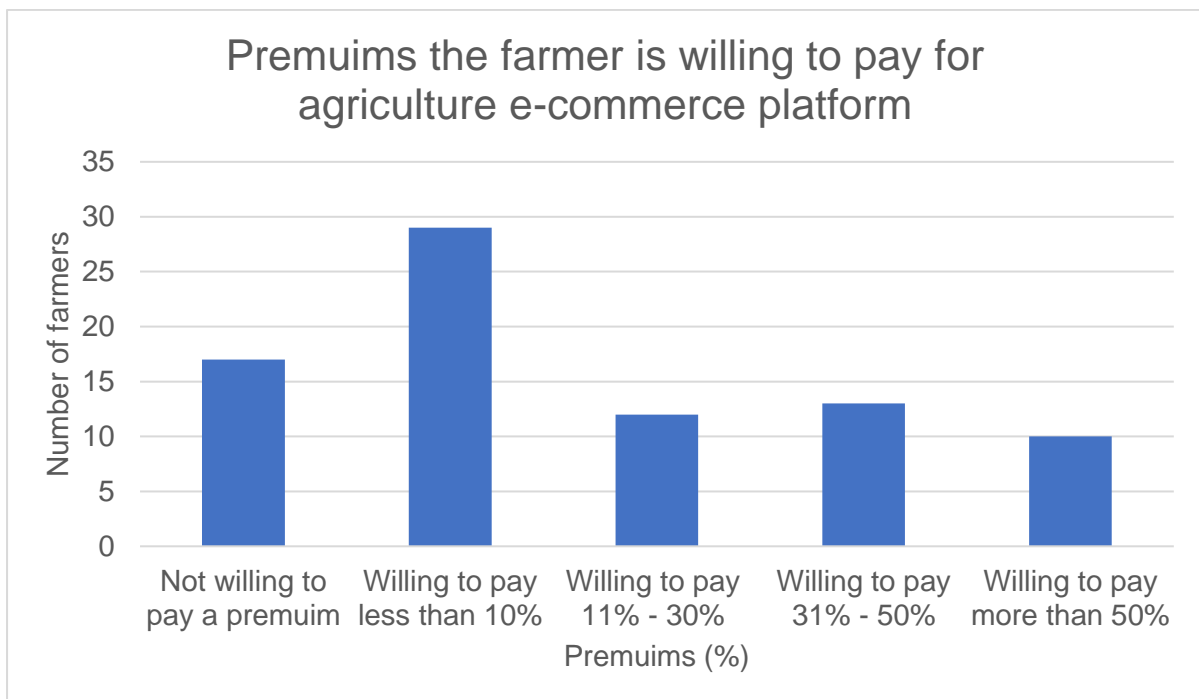


Figure 4.21: Premium (amount) the farmer is willing to pay for agriculture e-commerce platform services (n=81)

Source: From survey data (2022)



From the willingness to pay sampled farmers the study further determined the premium (amount) the fresh produce smallholder farmers were willing to pay. The minimum fees (R 300) of e-commerce were obtained, and the premiums were categorised as follows:

Table 4.2: Willingness to pay premiums

WTP category	Premium in rands (R)
Not willing to pay a premium	R 0
Willing to pay less than 10% premium	> R 270
Willing to pay 11% to 30% premium	R 330 - R 390
Willing to pay 31% to 50% premium	R 393 – R 600
Willing to pay more than 50% premium	< R 600

Source: Own compilation

According to figure 4.21, 36% farmers were willing to pay less than 10% of the premium, whereas 21% farmers were not willing to pay any premium, 16% farmers were willing to pay premiums between 31% and 50%, 15% farmers were willing to pay premiums between 11% and 30% and lastly farmers who were willing to pay premiums above 50% was 12%. The findings of the study suggest that the fresh produce smallholder farmers in the Gauteng Province are willing to pay low premiums for agriculture e-commerce platform services, the study suggests that this might be as a result of farmers selling their produce on the social media platforms.

#### 4.12 Empirical results of the binary logistics regression of factors influencing the willingness to adopt agriculture e-commerce

A binary logistic regression analysis was employed to analyse the factors affecting the willingness to adopt agriculture e-commerce platform among fresh produce smallholder farmers in the Gauteng Province of South Africa. The willingness to adopt variable was a dummy variable coded as 1 willingness to adopt agriculture e-commerce and 0 not willing to adopt agriculture e-commerce. Results of the regression estimates are presented in Table 4.3.

According to Montshwe *et al.*, (2007), the estimated coefficients of the different variables show the change in the predicted logged odds associated with a unit change in independent variables. The sign of the coefficient indicates the type of influence of the variable on the logit (whether positive or negative). If the coefficient value is positive, it means that there is a positive relationship between the dependent and independent variable. The opposite is true if the coefficient value is negative.

The significance values (p-values) show whether a change in the independent variable significantly influences the logit at a given level. If the significance level of the variable is small (less than 0.10), then the parameter is useful to the model. This means, if the significance value is equal to or less than 0.10, then it suggests that there is sufficient evidence to support a claim presented by the coefficient value. If the significance value is greater than 0.10 (10% significant), then it shows that there is insufficient evidence to support a claim presented by the coefficient value.

The odds ratio  $EXP(B)$  value indicates the increase in odds from a one unit increase in the selected variable. It represents the ratio-change in the odds of the event of

interest for a one-unit change in the predictor. When the dependent ( $y$ ) and independent variables ( $x$ ) are both dichotomous, the odds ratio is the probability that  $Y$  is 1 when  $X$  is 1 compared to the probability that  $Y$  is 1 when  $X$  is 0. If the odd ratio is less than one, then a change in the variable is less likely to influence the dependent variable, and if the odd ratio is greater than one, a change in the variable is more likely to influence the dependent variable (Statistics Solutions, 2015).

The standard error measures the accuracy with which a sample represents a population. The success of the logistic regression can be assessed by considering the goodness-of-fit tests, such as model chi-square, as indicators of model appropriateness.

Table 4.3: Binary logistics regression results

Parameter	Coefficient (B)	Std Error	Wald	P-value
Constant	-25.888	40192.986	.000	0.999
Gender	-15.657	8.172	3.670	0.055 *
Age	0.79	0.110	0.511	0.475
Marital status	9.326	5.112	3.328	0.068 *
Education	0.433	1.966	0.049	0.826
Occupation	7.709	4.556	2.863	0.091 *
Source of market information	19.252	10.848	3.149	0.076 *
Condition of roads	-2.795	3.159	0.783	0.376
Access to market	3.653	2.925	1.560	0.212
Distance to market	-0.268	0.197	1.850	0.174
Source of transport	12.165	6.690	3.306	0.069 *
Transport cost	0.000	0.002	0.000	0.993
Technological gadget ownership	17.787	40192.982	0.000	1.000
Internet access	-11.351	7.863	2.084	0.149
Internet use frequency	-0.201	3.407	0.003	0.953
Agriculture-commerce awareness	9.966	5.138	3.762	0.052 **
Willingness to pay for e-commerce platform services	27.100	15.209	3.175	0.075 *
Goodness of fit				
		Chi-Square	Df	Sig
Omnibus test of model coefficients		126.982	16	<0.001
Hosmer and Lemeshow test		0.054	8	1.000
Cox & Snell R Square (R <sup>2</sup> )				0.65
Nagelkerke R Square (Adjusted R <sup>2</sup> )				0.92

Dependent variable: Willingness to adopt agriculture e-commerce

\*\* = significant at the 5% level; \* = significant at the 10% level

The suitability of the logistic regression model was measured using the goodness-of-fit test, namely, the Omnibus test of model coefficients and the Hosmer-Lemeshow goodness of fit test. The Omnibus tests of model coefficients gives us an overall indication of how well the model performs. The Sig. value or P-value should therefore be less than .05 for the model to be of good fit. For the Hosmer-Lemeshow goodness of fit test the Sig. value should be greater than .05 for the model to be regarded to be of good fit.

The results indicate that the logistic regression model fits the data well. The chi-square value for the Omnibus test of model coefficients is 126.982 with 16 degrees of freedom and significance level of  $<0.001$ . Furthermore, the result indicates that for Hosmer-Lemeshow goodness of fit test, the chi-square is 0.054 with 8 degrees of freedom and significance level of 1.000.

The Cox & Snell R Square and the Nagelkerke R Square values provide an indication of the amount of variation in the dependent variable explained by the model (from a minimum value of 0 to a maximum of approximately 1). The result of the model shows that the two values are 0.65 and 0.92 respectively; therefore, suggesting that between 65% and 92%, the variability is explained by a set of variables included in the model. Moreover, this indicates a strong relationship of 92% between the predictors and the prediction.

Discussion of the model results

In the study, significant variables refer to those variables that are found to have an influence on the willingness to adopt agriculture e-commerce of fresh produce farmers. As shown in Table 4.3, of the sixteen independent variables used in the model, seven variables were found to be significant; namely, gender, marital status, occupation, source of market information, source of transport, agriculture e-commerce awareness and willingness to pay for e-commerce platform services.

#### 4.12.1 Gender

The result of the study indicate that the estimated coefficient of gender was negative and statistically significant at a level of 10% significance. This implies an inverse relationship with the willingness to adopt agriculture e-commerce which stands to infer that the willingness to adopt agriculture e-commerce platform declines with a change in gender. This indicate that female farmers are less likely to adopt agriculture e-commerce. The result of the study conforms with the findings of Watson *et al.*, (2005) which indicated that the probability of businesses investing money to use e-commerce ultimately depends on amongst others the demographic factors.

#### 4.12.2 Marital status

Empirical evidence from the results shows a positive sign of the coefficient for the variable marital status. The variable was found to be statistically significant at 10% level of significance. The statistical significance of this variable provides enough evidence to suggest that marital status influences fresh produce smallholder farmers' willingness to adopt agriculture e-commerce. The positive association implies that the sampled farmers who are married were more likely to adopt the agriculture e-commerce to sell their produce or buy agricultural product as opposed to non-married

sampled farmers. Furthermore, the results revealed that the probability of married farmers' adopting agriculture e-commerce increases by 9.326 as compared to their counterparts.

#### 4.12.3 Occupation

A positive and significant relationship was found between the occupation of the respondent and willingness to adopt agriculture e-commerce at 10% significance level. The result of the study suggests that full-time farmers are more likely to be willing to adopt agriculture e-commerce than the respondents that indicated that they did not farm on a full-time basis. The results of this study concur with those of Siyal *et al.*, (2006) who state that socio-economic characteristics and exposure to the internet play a significant role in the adoption of e-commerce. The results of the study further revealed that farmers whose main occupation is farming probability of adopting agriculture e-commerce increases by 7.709 as compared to farmers who are farming part-time.

#### 4.12.4 Source of market information

Access to market information is important as it allows farmers to be informed about the predominant market conditions and, therefore, be more likely to participate in markets. Access to market information was found to be significant in the study. The study found the relationship between access to market information and willingness to adopt agriculture e-commerce to be positive. The positive relationship implies that when farmers have reliable sources of market information the more, they are likely to adopt agriculture e-commerce platform. Moreover, the study found that farmers who has sources of market information probability of adopting agriculture e-commerce

increases by 19.252 as compared farmers who don't have source of market information.

#### 4.12.5 Source of transportation

South African smallholder farmers are geographically spread and distant to markets thus, making it difficult to reach the markets (Matoti *et al.*, 2007). Therefore, transport plays a critical role as it links the farmer to the consumer and determines if the produce can be delivered on time. The variable mode of transport was found to be significant at 10% significance level and had a positive relationship with the willingness to adopt agriculture e-commerce. The significant and positive relationship between access to transportation and willingness to adopt agriculture e-commerce implies that farmers are more likely to adopt agriculture e-commerce when they have access to reliable transport. Furthermore, the results of the study indicated that farmers who hire transport to move their produce probability of adopting agriculture e-commerce increases by 12.165 as compared to farmers who uses their own transport.

#### 4.12.6 Agriculture e-commerce awareness

The lack of awareness of e-commerce-related technologies, such as online shopping, hinders the adoption of e-commerce (Olatokun and Kebonye, 2010). The results of the study indicate that the variable agriculture e-commerce awareness was found to be statistically significant at 5% significance level and had a positive relationship with the farmers' willingness to adopt agriculture e-commerce. The positive relationship suggests that farmers are more likely to adopt agriculture e-commerce platform when they are aware of it. Moreover, the results revealed that farmers who were aware of



agriculture e-commerce probability of adopting this innovation increases by 9.966 units as compared to farmers who were not aware.

#### 4.12.7 Willingness to pay for agriculture e-commerce platform services

The variable willingness to pay for the e-commerce services platform was found to be statistically significant at 10% significance level. The variable had a positive relationship with the farmers' willingness to adopt agriculture e-commerce platform. The positive relationship implies that farmers who are willing to adopt agriculture e-commerce are more likely to be willing to pay for the platform services. Furthermore, the study found that farmers who are willing to pay for agriculture e-commerce platform services probability of adopting agriculture e-commerce increases by 27.100 units as compared to farmers who are not willing to pay for the services.

#### 4.13 Chapter summary

This chapter presented and discussed the results of the descriptive analysis and factors influencing the willingness to adopt agriculture e-commerce, which were defined and tested using the binary logistic regression model. The variables that were found to significantly influence the probability of willingness to adopt agriculture e-commerce were gender, marital status; occupation, source of market information, access to transport, agriculture e-commerce awareness and willingness to pay for e-commerce platform services.

## CHAPTER 5

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter presents the summary, conclusion, and recommendations of the study. It presents the main findings of the study, summarizes the discussion on the findings and draws a conclusion based on the findings from the descriptive statistics analysis and empirical analysis of the study. This chapter also makes recommendations based on the findings of the study.

#### 5.2 Summary

Agriculture e-commerce is a phenomenon that is gaining greater importance, and its development is notable globally. This phenomenon is becoming a fundamental part and norm of today's life. Inevitably, the farm businesses cannot ignore any invention that can ease the farm operation, permit instant transitions, saves time and money, and offers uttermost benefits. Purchasing agricultural inputs and selling agricultural fresh produce online defeats the inefficiencies linked with traditional channels.

The study aimed to gain a deeper understanding of the willingness to adopt and willingness to pay for agriculture e-commerce platform services and factors affecting the adoption agriculture e-commerce by fresh produce among smallholder farmers in the Gauteng Province of South Africa. The study was conducted in the Gauteng Province of South Africa, in two metropolitan municipalities and one district municipality, namely; City of Tshwane, City of Johannesburg Metropolitan Municipality and Sedibeng District Municipality, respectively.

The study employed multi-stage sampling to identify samples from the study population and for the collection of data. In the first stage, three municipalities in the Gauteng Province were selected, based on the availability of the information from the Department of Agriculture and proximity. In the second stage, 120 fresh produce smallholder farmers were randomly selected.

In collecting the data, a questionnaire was designed, and the data collection process involved administered (face-to-face) interviews. For data analysis, descriptive statistics and the logistic regression model were used. Descriptive statistics made use of frequency, percentages, charts, and graphs in analysing the data. The binary logistic regression model tested the factors influencing the willingness to adopt agriculture e-commerce platform in the study area.

The independent variables used in the study were gender, age, marital status, education, occupation, source of market information, condition of roads, access to formal market, distance to the market, source of transport, transport costs, technological gadget ownership, internet access, internet use frequency, agriculture e-commerce awareness and willingness to pay for e-commerce platform services. Seven variables out of the initial sixteen were found to be significant, namely, gender, marital status, occupation, source of market information, source of transport, agriculture e-commerce awareness and willingness to pay e-commerce platform services.

### 5.3 Conclusion

There are no significant factors influencing the willingness to adopt agricultural e-commerce platform among fresh produce smallholder farmers in the Gauteng Province of South Africa. The hypothesis was rejected because the study found variables that had relatively high probabilities of influencing the study area's smallholder farmers' willingness to adopt and use agriculture e-commerce.

The variables that were found to have a significant influence on the smallholder farmers' willingness to adopt agriculture e-commerce platform were gender, marital status, occupation; source of market information, source of transport, agriculture e-commerce awareness and willingness to pay e-commerce platform services. These results implies that an improvement of the significant variables in this study can equally influence the willingness to adopt agriculture e-commerce of farmers.

#### 5.4 Policy recommendations

This section suggests the following policy recommendations based on the empirical results of the study to help fresh produce smallholder farmers improve their agriculture e-commerce adoption:

- i. Improvement of market information dissemination through extension officers to smallholder farmers who lack market information to avoid farmers being exploited by buyers who are more informed about the market. The study found that although most surveyed farmers had access to extension services 59% of the farmers accessed market information from the social media platform. Only 17% of the sampled farmers received market information from the extension officers.

Extension officers need to be equipped with market information so that they will be able to disseminate market information to farmers.

- ii. Alternatively, since most farmers get their market information from the social media, the Department of Agriculture and relevant stakeholders can use social media platforms to disseminate proper and reliable market information to farmers.
- iii. Reliable transport plays a vital role in the moving of produce from the farm to the markets. Majority of the sampled farmers indicated that they hire transport to move their produce and encounter challenges of transportation costs that are not fixed, as transport owners charge transportation prices based on how they feel at that time. Therefore, the study recommend that the government introduce subsidised transport that can be used by a group of farmers in their respective areas. That way, farmers can book the transport in advance when they want to transport their produce to the market and be charged a subsidised fixed fee.
- iv. Since several farmers use social media platforms (Social commerce) to sell their produce, the study recommends that the social commerce should therefore be regulated to protect the interest of farmers as well as those of consumers.
- v. An improvement of significant factors will significantly encourage the adoption of agriculture e-commerce

## 5.5 Future research

- i. This study is limited to the fresh produce smallholder farmers in the Gauteng Province. Therefore, similar studies similar can be conducted in other provinces of the country.
- ii. Future research can explore the factors influencing smallholder farmers' willingness to pay for agriculture e-commerce platform services.
- iii. This study established that social media play a huge role as a source of market information and as a marketplace for farmers to sell their produce. Therefore, studies should be conducted to establish how farmers can be linked to markets using social media and social commerce. Moreover, studies can be conducted to examine the challenges and constraints linked to the adoption of digital agriculture market platform.

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APPENDIX A: Editor's Letter

# UNIVERSITY OF LIMPOPO

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## TO WHOM IT MAY CONCERN

This letter serves to certify that I have edited a research dissertation titled: **ADOPTION AND**

**2.1WILLINGNESS TO PAY FOR AGRICULTURE E-COMMERCE SERVICES:  
CASE STUDY OF FRESH PRODUCE SMALLHOLDER FARMERS IN  
GAUTENG PROVINCE, SOUTH AFRICA** by **SITHOLE DESIREE NALA**.

I am an Associate Member of the Professional Editors' Guild in South Africa.

I trust you will find the editing quality in order.

Best regards

*Sebola, M*

\_\_\_\_\_  
**DR. MOFFAT SEBOLA**



**University of Limpopo**

**CONSENT TO PARTICIPATE IN RESEARCH**

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**TITLE OF RESEARCH PROJECT:** ADOPTION AND WILLINGNESS TO PAY FOR  
AGRICULTURE E-COMMERCE SERVICES: CASE STUDY OF FRESH PRODUCE SMALLHOLDER  
FARMERS IN GAUTENG PROVINCE, SOUTH AFRICA

Dear Participant

You are requested to participate in above mentioned research study conducted by SITHOLE DESIREE NALA (Department of Agricultural Economics and Animal production, University of Limpopo). You were selected as a participant in this study because you are a fresh produce smallholder farmer within one of the following regions (City of Tshwane, City of Johannesburg and Sedibeng).

**1.PURPOSE OF THE STUDY**

This research project aims to gain a deeper understanding on the adoption and willingness to pay for agriculture e-commerce platform services and factors affecting



the adoption of agriculture e-commerce by fresh produce smallholder farmers in Gauteng Province of South Africa

## **2.PROCEDURES**

As the investigator I would like you to voluntarily participate in this study. You are kindly requested to be interviewed and to respond to questions on socio-economic characteristics, awareness on agriculture e-commerce, adoption of agriculture e-commerce and willingness to pay for the agriculture e-commerce platform services.

## **3.POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

The results of this research are expected to assist policy makers, implementing agents and scholars in the agricultural development sector in crafting policies, developing future intervention programmes and strategies associated with beneficial and tangible outcomes for fresh produce smallholder farmers. Benefits may include support (from relevant institutions) for smallholder farmers to modernise their operations to grow viable commercial business enterprises that can generate enough income to sustain and improve their livelihoods by linking smallholder farmers to a high profitable market. Your cooperation will be highly appreciated.

## **4.CONFIDENTIALITY**

Information obtained from the participants during the study will remain confidential and will be disclosed only with your permission. Confidentiality of all the research data will be maintained by the investigator and identity of the respondents will not be revealed in the research report.

## **5.PARTICIPATION AND WITHDRAWAL**

You can choose whether to participate in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigators may withdraw you from this research if circumstances arise which warrant doing so.

## **6.IDENTIFICATION OF INVESTIGATORS**

In situation where you have any questions or concerns about the research, please feel free to contact the project leader:

**Project leader:** DR L.S Gidi

**E-mail:** Lungile.gidi@ul.ac.za

**Contacts:** 0739658088

## **7.RIGHTS OF RESEARCH SUBJECTS**

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights, or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact: Mr Abdul Maluleke [Abdul.Maluleke@ul.ac.za]; 015 268 2306 at the University of Limpopo Research office.

**SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE**

The information above was described to me by .....  
(Enumerator) I was given the opportunity to ask questions and these questions were

answered to my satisfaction. I hereby consent voluntarily to participate in this study. I have been given a copy of this form.

\_\_\_\_\_

\_\_\_\_\_

**Signature of Subject/Participant**

**Date:**

**SIGNATURE OF INVESTIGATOR**

I declare that I explained the information given in this document to \_\_\_\_\_ [name of the subject/participant. He/she was encouraged and given ample time to ask me any questions.

**Signature of Investigator:**  **Date:** \_\_\_\_\_

## APPENDIX C: Farmers' questionnaire



<b>Department of Agricultural Economics and Animal Production, School of Agriculture and Environmental Sciences, Faculty of Science and Agriculture, University of Limpopo South Africa</b>	Mobile: 071 255 3712 Email: <a href="mailto:dezrytjie.sithole@gmail.com">dezrytjie.sithole@gmail.com</a> Telephone and email of supervisor: 0739658088; <a href="mailto:Lungile.gidi@ul.ac.za">Lungile.gidi@ul.ac.za</a>
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My name is Desiree Sithole, a student studying towards the Master of Agricultural Management degree in the Department of Agricultural Economics and Animal Production, School of Agriculture and environmental Sciences, Faculty of Science at the University of Limpopo and as part of the requirement for above mentioned course, I will be conducting a research project titled, Adoption and willingness to pay for agriculture e-commerce platform services : case study of fresh produce smallholder farmers in Gauteng province of South Africa.

The study aims to gain a deeper understanding on the adoption and willingness to pay for agriculture e-commerce platform services and factors affecting the adoption

agriculture e-commerce by fresh produce smallholder farmers in Gauteng Province of South Africa

This research will be conducted in line with the TREC (Turfloop Research Ethic Committee) of the University of Limpopo. Consequently, smallholder farmers will only be involved in the study out of their own will, their rights and privacy will be respected as required by the TREC of the University of Limpopo, and therefore the responses given during this research will be treated as confidential and the information obtained will only be used for the purpose of research only.

Questionnaire number	
Name of Researcher	Sithole Desiree
Province	Gauteng
Region	
Date	

**SECTION A: DEMOGRAPHIC INFORMATION AND FARMING PRACTICES**

For the following questions please mark with x or √

1. Gender:

1. Male		0. Female	
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2. Age .....

3. Marital status

1. Single		2. Married		3. Divorced		0. Widowed	
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4. Educational level

1.		2.		3.		0.	
Primary		Secondary		Tertiary		No formal education	

5. Occupation

1. Employed		0. Full-time farmer	
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7. Is farming the main source of your income?

0. Yes		0. No	
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6. Size of the farm (Ha) or operation

.....

7. Given the following options, what type of farmer are you?

1. In land farmer	
0. Rooftop farmer	

8. Given the following, what kind of method do you use in your farm or operation?

9. Traditional farming method	
10. Aquaponic system	
11. Hydroponic system	
0. Other	

**SECTION B: MARKET RELATED**

1. Given the following, what is your source of market information?

1. Radio/ television		2. Extension officer		3. Social media		0. None	
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2. How are the conditions of the road around your farm?

1. Good		2. Partially good		0. Bad	
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3. Do you have access to extension services?

1. Yes		0. No	
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4. Do you have access to market? (To sell your products)

1. Yes		0. No	
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5. How do you transport your produce?

1. Own transport		2. Hire transport		0. None of the above	
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6. What are the transportation costs?

1. R0 – R100		2. R101 – R3000		3. R301 – R5000		0. > R500	
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7. Distance to the fresh produce market (km)

.....  
.....

**SECTION C: INDIVIDUAL ICT USE**

8. Which of the technological garget do you own?

1. Cellphone		2. Computer		3. None	
--------------	--	-------------	--	---------	--

9. Do you have access to internet?

1. Yes		2. No	
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10. How many times do you access internet a week?

.....

11. Have you used a smart mobile phone or a computer in the last six months?

1. Yes		0. No	
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12. Are you able to send SMS using your mobile phone?

1. Yes		0. No	
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13. Can you read SMS messages on your mobile phone?

1. Yes		0. No	
--------	--	-------	--

15. can you send an email on your phone or your computer?



1. Yes		0. No	
--------	--	-------	--

14. Do you use your mobile phone to make calls?

1. Yes		0. No	
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**SECTION D: AGRICULTURAL E-COMMERCE AWARENESS AND ADOPTION**

15. Are you aware of agriculture e-commerce platform?

1. fully not aware		2. Not aware		3. Not sure		4. Aware		5. Fully aware	
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16. If agriculture e-commerce platform (market) was introduced in your area to enable market access, how likely are you willing to adopt the platform?

1. Not willing to adopt		2. Somewhat not willing to adopt		3. Not sure		4. Somewhat willing to adopt		5. Willing to adopt	
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17. If the answer in question 16 is somewhat willing to adopt or willing to adopt, have you sold any of your produce using the e-commerce platform?

0. Yes		0. No	
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18. If the above answer is yes, how long have you been using it?

.....

19. If the answer in question 17 is yes, which of the following platforms have you used to sell your products?

1. Web based app	
2. Whatsapp	
3. Facebook	
4. Instagram	
5. Tick Tok	

**SECTION E: WILLINGNESS TO PAY FOR AGRICULTURE E-COMMERCE PLATFORM SERVICES**

20. If agriculture e-commerce platform services were to be introduced in your area to enable market access to sell your produce, would you pay for such services?

1. Yes		2. No	
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21. If agriculture e-commerce platform services fees were R300 minimum, given the following options how much would you be willing to pay to access such services?

1. Not willing to pay a premium	2. Willing to pay less than 10%	3. Willing to pay 11% to 30%	4. Willing to pay 31% to 50%	5. Willing to pay more than 50%
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22. Provide reason for the above answer

.....

23. Given the recent Covid-19 pandemic situation, what is your view on the selling and purchasing of goods and services online?

.....

24. State any suggestions, Comments and Questions

.....

.....

.....

.....

.....

.....

**THANK YOU FOR TAKING YOUR TIME TO PARTICIPATE IN THIS STUDY**

## APPENDIX D: Ethical clearance



**University of Limpopo**  
Department of Research Administration and Development  
Private Bag X1106, Sovenga, 0727, South Africa  
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: [anastasia.ngobe@ul.ac.za](mailto:anastasia.ngobe@ul.ac.za)

**TURFLOOP RESEARCH ETHICS COMMITTEE**  
**ETHICS CLEARANCE CERTIFICATE**

**MEETING:** 22 August 2022

**PROJECT NUMBER:** TREC/363/2022: PG

**PROJECT:**

**Title:** Adoption And Willingness To Pay For Agriculture E-Commerce Services: Case Study Of Fresh Produce Smallholder Farmers In Gauteng Province, South Africa  
**Researcher:** DN Sithole  
**Supervisor:** Dr LS Gidl  
**Co-Supervisor/s:** Prof JJ Hlongwane  
**School:** Agricultural and Environmental Sciences  
**Degree:** Master of Agricultural Management (Agricultural Economics)

**PROF D MAPOSA**  
**CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE**

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: REC-0310111-031

**Note:**

- i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
- ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
- iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

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