FARMERS' PERCEPTIONS OF COMMUNITY-BASED SEED PRODUCTION SCHEMES IN POLOKWANE AND LEPELLE-NKUMPI LOCAL MUNICIPALITIES, LIMPOPO PROVINCE

by

Mahlatse Phala

A MINI- DISSERTATION submitted in partial fulfilment of the requirements for the degree

of

Master of Agricultural Management

in

(Agricultural Extension)

in the

Faculty of Science and Agriculture

(School of Agriculture and Environmental Science)

at the

UNIVERSITY OF LIMPOPO

South Africa

Supervisor: Prof DB Afful

Co-supervisor: Dr P Chaminuka

2019

DECLARATION

I Mahlatse Phala hereby declare that the mini-dissertation “Farmers’ perceptions of community-based seed production schemes in Polokwane and Lepelle-Nkumpi local municipalities, Limpopo province” hereby submitted to the University of Limpopo for the degree of Master of Agricultural Management (Agricultural Extension) has not previously been submitted by me for a degree at this or any other university; that it is my work in design and in execution, and that all material contained herein has been duly acknowledged.

_____ _____

Mahlatse Phala Date

_____ _____

Supervisor: Prof DB Afful Date

_____ _____

Co-Supervisor: Dr P Chaminuka Date

ACKNOWLEDGEMENTS

I would like to start by thanking God, the creator of heaven and earth for his mercies and protection.

My deepest gratitude goes to my supervisor Dr. D.B Afful for helping in shaping my thoughts, guiding me and supporting me from the beginning of writing my proposal until the final writing of this thesis. I also like to thank Dr. P Chaminuka for stepping in and provide valuable insight. Special thanks to Mr. E.M Letsoalo and Mr. C.K Mphahlele for their motivation, encouragements and undoubted support.

I am thankful to Mr. M.M Makgato from the Limpopo Department of Agriculture (LDA) for providing valuable information about the Community-Based Seed Production Scheme (CBSPS) and its participants in the Limpopo province. To the farmers and farming communities who actively participated in this study, thank you for your cooperation, patience and honestly responding to the questionnaire. Without you this research would have not been possible.

I am specially indebted to my sponsor Agricultural Research Council (ARC) and staff for generously providing financial assistance and supporting my dream. Special thanks to Dr. Y Pakela-Jezile (ARC) for the invaluable support and patience. Without you this dream would have not turned into a reality.

No words can match my profound gratitude to my husband Mr. M.T Phala, my parents: Mr S.F and Mrs M.A Moremi and lastly but not least my siblings for the emotional support and guidance throughout my studies at the University of Limpopo.

DEDICATION

This work is dedicated to my daughter Karabo Piletsi Phala. I want her to grow up knowing that she can achieve anything she set her mind to. All that is needed is to have a dream and work towards it.

LIST OF ACRONYMS

ACB	African Center for Biodiversity
ARC	Agricultural Research Council
ASS	Agricultural Support Service
CBSPS	Community-Based Seed Production Scheme
CBSP	Community-Based Seed Production
CPSI	Center for Public Service Innovation
CSP	Community Seed Production
DAFF	Department of Agriculture, Forestry and Fisheries
DARD	Department of Agriculture and Rural Development
FANRPAN	Food, Agriculture and National Resources Policy Analysis Network
GDP	Gross Domestic Product
IITA	International Institute of Tropical Agriculture
LDA	Limpopo Department of Agriculture
LDARD	Limpopo Department of Agriculture and Rural Department
NARS	National Agriculture Research Systems
NCRC	North Central Rural Committee
NDA	National Department of Agriculture
NGO	Non-Government Organization
OPV	Open-Pollinated Varieties
SANSOR	South African National Seed Organization
TASAI	The African Seed Access Index
VIF	Variance Inflationary Factor
WECAMAC	West and Central African Collaboration Maize Research Network

ABSTRACT

Smallholder farmers' need for regular supply of adequate, quality and affordable seed led to the establishments of Community-Based Maize Seed Production Schemes (CBSPSs) in most developing countries, including South Africa. In view of the important influence of perception on the adoption and continued use of an innovation, this study was undertaken to evaluate farmers' perceptions of CBSPSs in Polokwane and Lepelle-Nkumpi Local Municipalities of Limpopo province. The conceptualization of perception used in this study was based on the Düvel (1991) framework. The evaluation focused on whether planting the scheme's main product, improved Open-Pollinated Varieties (improved OPV maize) seed meets farmers' needs based on their perceptions and the extent of farmers' planting of improved OPV maize. A census approach was used in view of the small numbers of seed producers in the schemes; all scheme members (50) were, therefore, interviewed between 27 March and 21 April 2017. To allow for comparison, an equal number of farmers (50) who were not members of the scheme were also interviewed. Data was collected from farmers using a semi-structured questionnaire. Descriptive and inferential statistics were applied to analyze the data using SPSS software. A binary logistic model was used to analyze factors that influence farmer perceptions on OPV benefits. The study findings showed that there is a significant relationship between awareness knowledge of improved OPV maize and planting of improved OPV maize. Furthermore, the results showed that farmers perceptions of the advantages and disadvantages of improved OPV maize seed were not different among scheme and non-scheme members as they were all in agreement that improved OPV maize have more benefits than their own previously recycled seeds. Finally, findings showed that respondents municipality and scheme membership had a significant, effect on the positive perception of planting improved OPV maize seeds. Other explanatory variables such as sex, farming experience, years of

schooling, farm size, income and age of participants had no significant effect on farmer perceptions. It is therefore recommended that improved OPV maize be made widely available and promoted based on its advantages to enhance its adoption. Future studies on these seed schemes could look into the production and financial analysis of CBSPSs to ascertain their profitability and sustainability.

Keywords: Community-based seed production scheme, perception, adoption, improved open-pollinated seed.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1.1. Background of the study

Smallholder subsistence farmers in many developing countries, including South Africa, lack agricultural infrastructure and farming inputs including adequate, quality planting seed (Baloyi, 2010; Nandi, Das and Sable, 2013). To overcome this challenge in South Africa, the Limpopo Department of Agriculture together with their stakeholders embarked on the Community-Based Seed Production Scheme (CBSPS) initiative for maize and sorghum in the year 2000 (Shargie, 2015).

Like many initiatives, the CBSP has not been evaluated on its successes and failures. Therefore, this study was undertaken to evaluate farmers' perceptions of community-based maize seed production schemes in Polokwane and Lepelle-Nkumpi Municipalities, of Limpopo Province. This evaluation of the schemes is focused on whether planting the scheme's main product, improved open-pollinated maize (improved OPV maize) seed meets farmers' needs based on their perceptions and the extent of farmers' planting of improved OPV maize (adoption).

1.2. Problem statement

According to Mywish, Juli, Duncan, Anwar, Mariah and Kei (1999), given optimum environmental factors and sufficient agricultural inputs, quality seed can play a very crucial role in ensuring improved production and food security among smallholder farmers. Under the prevailing conditions of climate variability and associated incidence of pests and diseases, the yield of farmer-saved seed is minimal. There is also evidence that the non-availability of improved and good quality seed reduces the profitability and increases production risk (Mastenbroek, 2013).

To overcome the problem of shortage of adequate, quality planting seed among smallholder and subsistence farmers, governments have embarked on various initiatives amongst which are CBSPSs. Against this backdrop, investigating how community-based maize seed scheme in Limpopo has fared considering its main aim and, how farmers perceive its services in light of their needs and aspirations, will provide valuable answers to its relevance; it will also be an essential measure of the usefulness of the services rendered. Furthermore, this type of performance

evaluation can give insight into possible areas to improve the sustainability of the scheme in light of the concern by Setimela (2006) that most of the CBSPSs started in Southern Africa have become unsustainable. The literature on CBSPS shows that scientists have evaluated the performance of CBSP schemes at the field level based on the multiplication production process, purity and germination for quality assessment and profitability (Assaye, Melak, Ayalew, Teshale, and Mazengia, 2015; Bishaw and Niane, 2013). The evaluation of CBSP based on its main product, which in this study is, improved OPV maize using a conceptual framework from behaviour adoption literature, to assess farmers' awareness knowledge and other perception-related issues of improved OPV maize, however, seems not to have received research

1.3. Rationale

In South Africa, like the rest of Africa, smallholder farmers often struggle to get quality seed for planting (Nandi, Das and Sable, 2013) and still rely on farmer-saved seed for planting (Setimela,2006). The process of producing and selecting open-pollinated seeds for replanting most of the time, falls short of standards leading to poor quality seed stock and therefore, low yields. Furthermore, smallholder farmers generally rely on their food production system for household food security and, therefore, consume most of their production. There is, therefore, very little produce left for sale, let alone enough seed for planting in the next season.

The growing trend over the years, has been towards the better use of evaluation to understand and improve practice. Furthermore, there has been a systematic use of evaluation to solve many problems and help countless community-based organizations do what they do better (Nagy and Fawcett, 2016). Farmers' perceptions of agricultural innovations play a larger role in their adoption (Afful, Obi and Lategan, 2013). The Düvel (1991) model for adoption behaviour analysis, was therefore, used to evaluate and to understand the farmers' perceptions of planting improved OPV maize and the state its adoption. This is essential because this model provides the

important variables that are deemed through numerous studies to be the precursors for innovation adoption.

1.4. Purpose of the study

The purpose of the study was to investigate farmers' perceptions and adoption of improved OPV maize varieties released by the CBSPSs in Limpopo province.

1.5. Objectives of the study

The specific objectives of the study were to:

i. Determine respondents' awareness, knowledge and planting of improved OPV maize.

ii. Assess farmers' (planters and non-planters of improved maize OPVs) views on the advantages, disadvantages of improved maize OPVs between Scheme and Non-Scheme members.

iii. Analyse the socio-economic variables that influences farmers' perceptions on the benefits of improved OPV maize.

1.6. Research hypothesis

The following research hypotheses were tested to address the main aim of the study:

i. Respondents' awareness and knowledge of improved OPV maize is not significantly related to actual planting of improved OPV maize.

ii. Farmers' views on the advantages and disadvantages of improved OPV maize are not significantly different between Scheme members and Non-Scheme members.

iii. Farmers' characteristics such as respondent's municipality, scheme membership, respondents sex, farming experience, years of schooling, farm size, income and age of participant do not significantly influence their perceptions on the benefits of improved OPV maize.

1.7. Definition of terms

Community-Based Seed Production Scheme: In view of the fact that there is no clearly stated definition of the concept in the literature, the author used information from the literature to define it as a seed production and supply system at the community level managed by farmers to help to make high quality and genetically

true-to-type, improved OPV seeds commercially available, especially to smallholder and subsistence farmers.

Improved OPV maize seed: Is an open-pollinated maize seed which has been produced from breeder's seed and finally certified to meet quality and purity standards (Setimela, Mhike, MacRobert and Muungani, 2006).

Adoption: The study used Rogers' (2003) definition of adoption as being a decision of full use of an innovation as the best course of action available. In this study full use was when a farmer planted more than two-thirds of the cropping land to improved OPV maize.

Awareness and knowledge: In the view that there is no clear definition of the words used together in the literature, the author used the information from the dictionary to define it as the state of a farmer having heard and having some level of understanding about improve OPV maize seeds.

Perception: Was defined using Walters et al (1989) as the entire process by which an individual becomes aware of the environment and interprets it so that it will fit into his or her frame of reference.

1.8. Limitations of the study

The limitation of the study was the small number of farmers (scheme members) that were planting improved OPV maize, and the lack of available data on non-scheme members who were planting OPV maize. However, this limitation does not invalidate the results because of the use of appropriate and robust statistical methods of analysis. As with other survey methods, the study relied on cooperation of the farmers in the survey, and the accuracy of the responses to the survey questions posed.

Another limitation of the study was that the study was conducted in one season (Time limitation), which does not allow the capturing of the changes in perception of the population over two or more seasons. Therefore, two or more surveys may still need to be done at different points in time. This is therefore, a motivation that more studies still need to be done to evaluate the changes over time.

Likert scale was not used to measure the positive and negative perception of farmers on maize. However, a binary logistic model was used to recode the data to identify the positive and negative perceptions based on the number of advantages mentioned by the farmers. It is therefore important that other researchers revise and align their questionnaires properly before collecting and analysing data.

1.9. Significance of the study

The awareness of an innovation and its proven ability to solve a problem is significant for its adoption. Findings from the study about farmers' unawareness of the advantages of improved open-pollinated maize seed as well its prominence over own recycled seed are positive forces that can be promoted through mass media campaigns to improve its adoption. Any negative forces emanating from the study about farmers' awareness of disadvantages of the improved maize and why farmers say it does not meet their expectations become issues for research to look into to ensure that farmers' needs are met and therefore, ensure the sustainability of the scheme. The identified essential psychological factors influencing views on goal achievement as a result of planting OPV maize will help extension practitioners to understand the dynamics of adoption of improved maize OPV and therefore, improve participation in similar schemes. Finally, the study will also provide information on respondents' awareness and knowledge of improved OPV maize and its relationship to their planting it. This information is critical to promoting improved OPV maize in the province and the nation as a whole.

The specific findings mentioned above will enrich the science of communication of innovations and adoption research in extension.

1.10. Organization of the study

This dissertation is divided into five chapters. The first chapter provides the background of and contextualizes the study. The second chapter focuses on the literature review which explores other studies that have been done on various issues about CBSPS and provides a critical analysis of the technology adoption literature to generate a conceptual framework for the study. The third chapter focused on the research methodology that was adopted for the fulfilment of the objectives of this

study. The results were discussed and interpreted in the fourth chapter which highlight

the most important findings in relation to the hypotheses set for the study. The fifth and last chapter focused on the summary of the major findings on the study and recommendations based on the findings of study.

CHAPTER 2

LITERATURE REVIEW

2.1. Introduction

This study evaluates farmers' perceptions of community-based seed production schemes in terms of their awareness knowledge of the improved OPV maize released by the schemes, the advantages and disadvantages of planting improved OPV maize released by the schemes and the influence of farmers' psychological factors on whether or not planting improved OPV maize helps in achieving one's goal. In order to address these issues, the literature review by search engines such as scholargoogle, EbscoHost, etc. dates back to the year 2000 thereabouts when the practice of CBSP appears to have started. The review therefore, addresses important topics that have a bearing on testing research hypotheses related to these issues. The review, covers sections on the importance of maize seed in the South African economy and of improved seed in crop production; seed supply systems and their advantages as well as disadvantages; community-based seed production schemes generally and establishment of CBSPS in Limpopo province. Furthermore, the review critically assessed various adoption behaviour models with a view to arriving at a conceptual framework for the study which formed the basis for questionnaire construction for the study.

2.2. Importance of maize in South African Economy

Agriculture is the mainstay in most Sub-Saharan African economies, contributing 70% of employment, 33% of gross domestic product, and 40% of export earnings (Mabaya, 2016 citing World Bank, 2014). Comparatively, cereal yields since the 1960s in Africa (one ton per hectare) has lagged behind yields in South Asia (2.5 tons per ha) and in East Asia (4.5 tons per ha) respectively (Hunt and Lipton, 2011).

According to Monela, (2014) and Lyimo, (2005) maize ranks number three as the most important cereal in the world. In South Africa, it is the most important grain crop in

terms of being the major feed grain and the staple food for the majority of the population (Department of Agriculture, Forestry and Fisheries (DAFF), 2017). Maize

production in the non-commercial sector approximates 6% of the total national production and includes smallholder and subsistence farmers who cultivate mainly for own use (DAFF, 2017). Agriculture contributed 2% to the total Gross Domestic Product (GDP) of the South African economy in 2015 (DAFF, 2017). In South Africa, maize is produced by subsistence, smallholder and commercial farmers in many parts of the country under different agro-ecological conditions. Maize is produced for different reasons, serving as both cash and food crop; it is among four grain crops including soya bean, sunflower and wheat important for food security in South Africa (The African Seed Access Index (TASAI), 2015). According to Mabaya (2016) maize was by far was the crop with the most seed varieties released by breeders in South Africa between 2010 and 2013. These statistics show the importance of the crop in the South African economy. Hunt and Lipton's (2011) also stated that cereal yields in Africa have been stagnant since 1960 at roughly 1 ton per ha.

The ready availability of improved maize planting seed at affordable prices in sub-Saharan Africa is, therefore, very important to promote maize production, improve farmers' income, reduce poverty, and to achieve food security both at national and household level.

Maize is regarded as the most important crop in agriculture for various reasons. These include the fact that it is highly productive as compared to other cereals; it can be used to prepare many different types of dishes. Maize stover is used for livestock feed. Furthermore, surplus maize is sold to generate household income and as cash crop providing input into the manufacture of many industrial products (Abakemal, Hussein, Derera and Laing, 2013).

- **Importance of Quality/Improved Seeds in Crop Production**

Any viable agricultural system depends on a diverse and stable supply of seed. (Tripp 2001 in Badu-Apraku, Asuboah, Fakorede, and Asafo-Adjei, 2014). Seed is a key input for improving crop production and productivity. Furthermore, seeds of improved crop varieties are said to be the most important input in agriculture (Astatike, Yimam, Tsegaye, Kefale, and Mewa, 2012). Farmers' access to quality seed ensures seed security and therefore, food security (Monela, 2014). Abundant research testifies to

the fact that farmers' productivity can increase by 20-32% using good quality seeds with good genetic and physical purity, health standards, high germination and moisture percentage (Mula, Saxena, Gaur and Upadhyaya, 2013 citing Mula, 2012; Luis and Welchez *et al*., 2013).

2.3. Seed systems and seed delivery

Van Amstel et al., (1996) as cited in Badu-Apraku *et al*., (2014) defined a seed system as the totality of the physical, organizational, and institutional components that determine seed supply and use in quantitative and qualitative terms. A seed system therefore, encompasses all activities beginning from selection and breeding to marketing and the use of seeds by farmers for growing crops; it is closely linked to the research and extension systems (Venkatesan ,1994 in Badu-Apraku *et al*., 2014).

In the seed systems of most countries, the public sector appears to be more involved in plant breeding and in some aspects of regulations; the private sector however, plays a bigger role in seed multiplication, processing, and its distribution (Minot, 2008 in Badu-Apraku *et al*., 2014).

2.3.1. Types of seed delivery systems: informal and formal seed sectors

Generally, seeds used worldwide for crop production come from one of three delivery methods or systems: formal, informal, or a combination of both (Badu-Apraku *et al*., 2014).

- **Formal Seed Sector**

The formal seed delivery system consists of chains of interlinked activities, starting from genetic resource management, variety breeding research and crop improvement, variety testing and release through seed multiplication, conditioning and storage, quality control, marketing and distribution to the final use of the seeds by farmers.

This seed system usually involves public and private institutions or a combination of the two, depending on the level of agricultural development in the country. Seed production under this system is monitored by an independent external certifying

authority to ensure that true-to-type, high quality, and genetically pure seeds are offered to farmers for planting. The end-product is generally, the hybrid and genetically modified seed which mainly serves the needs of commercial agriculture

In South Africa, there are 72 registered seed companies that are full members of the South African National Seed Organization (SANSOR). Amongst the institutions involved in seed research, breeding and foundation seed production are the Agricultural Research Council, private seed companies such as Pannar seed, Pioneer seed etc., Universities etc. (TASAI, 2015). However, the breeding programs in the formal seed sector in South Africa is dominated by private companies (Mabaya, 2016). SANSOR, a non-profit organization is the contracted licensing agent in charge of the variety release process (in close collaboration with ARC) and seed variety registration and regulation (TASAI, 2015).

- **Advantages of seed from the formal seed sector**

1. Have identity, a name and genetic purity.
2. Have known purity and germination capacity.

- **Disadvantages of seeds from the formal sector**

1. The retail cost of the seeds is relatively high.
2. The seeds from the formal sector are not easily available and accessible, especially to subsistence and smallholder producers.

- **Informal Seed Sector**

The informal seed sector is the main source of seed (about 60-85%) for most farmers in developing countries. The seed is generally saved on-farm from the farmers' previous harvest and the remainder comes from off-farm sources of the formal seed sector and other local sources (Badu-Apraku *et al*., 2014 citing Franzen *et al*., 1996; Setimela *et al*., 2006).

The maize mostly sold and planted in the informal seed system comes from open-pollinated varieties (OPVs). These varieties show greater variability than hybrids. However, they have the advantage that unlike hybrids, their seed may be saved for re-planting without much yield loss (Setimela *et al*., 2006).

The seeds in this seed system are local varieties that have a long history in the community, or land races or that were introduced from other communities and their

genetic descriptors are therefore, not known (Badu-Apraku *et al*., 2014 citing Franzen *et al*., 1996).

- **Advantages of Farmer-Saved Seeds**

Badu-Apraku *et al*., (2014) mention the following advantages of the informal seed system:

1. The planting seed is generally more available and accessible to subsistence and smallholder farmers. This is a big advantage for farmers who plant on soils of marginal quality and also depend on rainfall. These farmers have to plant on time because any delay in planting will negatively affect their crop yields. Besides, subsistence and smallholder farmers do not have the money to tie up their meagre income to buy and store up planting seed before the planting season.

This sector also has several local varieties from which farmers can choose to plant their preferred varieties considering their specific agro-ecological climate and farming systems.

2. The seed from this seed system is cheaper compared to the formal system.

The problem facing subsistence and smallholder farmers who mostly depend on the informal seed sector, is that their crop production suffers because these local seed varieties perform poorly, especially, the yield, under the current condition of climate change and variability. These farmers also cannot afford the more expensive seed in the formal sector, which may not be easily available and accessible to them. Subsistence and smallholder producers, therefore, lack of access to preferred quality planting seed at affordable price which is easily and readily available to them.

It can be said that farmers who depend on this seed system for planting seed have seed security problem; the latter was narrowly defined for this study as either having the seed already in hand or being unable to access their preferred seed with some certainty (though purchase, barter, gift, or other). It has been realised that to address these problems, there is a strong need and opportunity to professionalize and strengthen seed production in the informal seed sector. Local community and farmer groups (and individual entrepreneurs) therefore, require enhanced capacity in the techniques of seed production and support to ensure good quality seed supplies. Efforts to address this seed security problem led government institutions and non-governmental organizations (NGOs) to initiate the CBSPS concept.

The CBSPSs are informal in the sense that seed quality standards required in seed production are not as stringently enforced as in the formal seed sector (Setimela *et al*., 2006).

2.3.2. Community based seed production schemes

The literature review on the implementation of CBSPs in many places in Africa indicates that the CBSP scheme idea appears to have been implemented in the early 2000. In their review of Community Seed Production (CSP) implementation in Africa, Walsh, Remington, Kugbei and Ojiewol (2013) used five case studies based on a literature review dating back a decade. This implies that these CSP schemes in Africa might have been in existence in 2003 or earlier. The implementation dates of the schemes in Africa referenced in the review by Walsh *et al*., (2013) range between 2002 and 2008 from Tanzania, Uganda, Sudan, Kenya to Ethiopia in that order. According to Mkhari, Matlebjane, Dlomu, Mudau and Mashingaidze (2006) CBSPs were initiated in 2000 in Vhembe and Capricorn districts by the Limpopo department of Agriculture.

Badu-Apraku *et al*., (2014) citing Almekinder and Louwaars (1990) indicated that community seed production has two objectives: to increase farmer access to varieties (often but not always new) and to increase quality of local and improved varieties through variety maintenance, selection, handling, and storage. The CBSP approach is thus widely used to deliver seeds to smallholder farmers; there is, however, no clear definition of the concept and neither are there criteria for assessing success.

The CBSPSs are meant to address smallholder and subsistence producers' seed need considering their socio-economic and agro-ecological conditions. The newness of the concept is that the seed production scheme involves farmers who are trained in seed production as well as seed certification agents, extension specialists, and seed production specialists. The production of seed in this seed system may be done outside certification or with certification, but improved seeds are multiplied, processed, stored, and sold by the communities themselves (Badu-Apraku *et al*., 2014).

In the report by Walsh, Remington, Kugbei and Ojiewo, (2013) on the lessons from the five case studies, the authors indicated that the five case studies took different approaches to CSP which reflect the operating environment, socio-political systems, norms and cropping systems. CSP in the case studies show that seed production was employed differently as a function of the local situation.

CBSP has been reported to cover crops such as maize, sorghum, legumes, traditional vegetables etc. (African Centre for Biodiversity (ACB), 2016; Afari-Sefa, 2013; Mula, Saxena, Gaur and Upadhyaya 2013). According to Badu-Apraku *et al*., (2014) seven CBSPS models proposed by the International Institute of Tropical Agriculture (IITA) are being used in the West and Central Africa Collaborative Maize Research Network (WECAMAN).

Model 1

In this model, the WECAMAN works with the National Agricultural Research Systems (NARS) to produce breeder and foundation seeds. The researchers provide the foundation seeds and other inputs to selected farmers through the extension services. Farmers produce and sell the certified seeds after which they reimburse the input costs to the extension services. This model is in use in Burkina Faso, Mali, Bénin, and Cameroon.

Model 2

In this model, the national extension services conduct an initial survey to identify the resource capabilities of farmers who are then contracted as seed growers. These farmers are then provided with foundation seeds to produce certified seeds. The certified seed are sold directly to the extension service, which then deducts input costs. This method is being used in Burkina Faso, Mali, and Bénin.

Model 3

Researchers identify and provide a once-off supply of foundation seed to farmers to produce certified seeds. These farmers are responsible for the purchase and application of inputs in the production of certified seeds and the national scientists provide technical assistance. This model is also used in Burkina Faso.

Model 4

NGOs organize and supply farmers with improved seeds and other inputs for the production of certified seeds. After seeds are sold, 50% of the initial funds are deducted and provided to the extension services for the encouragement of seed production by other farmers. This model was used in Burkina Faso.

Model 5

This model, which is used in Ghana is a formal seed production system, and not a CBSPS as such. It will thus not be discussed further here.

Model 6

This model operates in Nigeria where the National Maize program scientists produce breeder and foundation seeds for CBSPs to produce certified seed. The CBSPSs are linked to seed companies and seed inspectors to ensure production of quality seed, credit, needed inputs and marketing opportunities.

Model 7

This approach encourages the use of a maximum of two seed varieties, probably with different maturities, over a wide area, thus combining maize cultivation with seed production. This model is said to be very flexible to accommodate the participation of commercial seed companies, NGOs, and any seed outlet in the pilot community. This model is also used in Nigeria.

The literature on the success of CBSPSs is varied depending on the focus of assessment. In terms of sustainability of the Schemes, Setimela *et al.*, (2006) has expressed the concern that most of the CBSPSs started in Southern Africa have become unsustainable. However, evaluations based on farmers' access to quality seed of desired varieties yield success stories in many places such as Uganda, Tanzania, Sudan, Kenya and Ethiopia (Walsh *et al*., 2013).

- **Establishment of CBSPS in Limpopo Province**

Subsistence and smallholder farmers in South Africa like similar farmers in most places in Africa and the developing countries, often face the challenge of access to quality and preferred planting seed (Nandi, Das and Sable, 2013).

Smallholder and subsistence farmers experience quality seed problems because even though the hybrid seed produced by the formal seed sector, is of excellent quality, cost, remote locations of smallholder farmers and a number of factors make it inaccessible to smallholder farmers (Monyo, Mgonja and Rohrbach, 2004).

The CBSPSs in the Limpopo Province were started by the Department of Agriculture in 2000 in Vhembe and Capricorn districts (Mkhari *et al*., 2006). The scheme idea aimed to expose farmers to different seed varieties; enable them to identify preferred varieties according to their own criteria; and assist them to multiply preferred varieties of seed in order to guarantee local seed security and make seed production profitable (Centre for Public Service Innovation (CPSI), 2007, cited by African Centre for Biodiversity (ACB), 2016). The Capricorn District is home to six projects; three of them namely, Mashushu, Kodumela and Gemini in Lepelle-Nkumpi local municipality and another three, Jack Mafarane, Mapeu and Phela ke Phele located in the Polokwane local municipality.

Production of improved OPV seed involves the following stages: A seed breeder produces a breeder's seed from the OPV seed. From the breeder's seed is produced the foundation or basic seed; this may be done by the breeder or a seed company. In the Limpopo CBSPS, ARC provides basic seed for multiplication. The seed companies then sell the foundation seed or give it to selected farmers to produce certified seed under contract. In the case of Limpopo province, farmer groups receive the basic seed to multiply to produce the certified seed. This certified seed is processed and packaged for sale to farmers to produce grain (Stimela *et al*., 2006). In Limpopo province, this stage is handled by the Madzivhandila College of Agriculture which was registered with the National Department of Agriculture (NDA) as a seed establishment, authorized to carry out seed cleaning and packaging.

Farmers were trained in multiplying the seed of their preferred varieties, for local seed security and income-generation. SANSOR has been involved in the seed certification of ZM 521 since 2002. Farmers in Vhembe district selected two OPVs, ZM 521 and
Grace, in 2000/2001. In 2002/2003 farmers in Mashushu community of Capricorn district however, selected ZM 421, an open pollinated variety.

Four officials from the Department of Agriculture Limpopo Province (DALP) were trained in seed inspection by SANSOR. The first certified seed was produced in 2003. Seed units in Capricorn and Vhembe district have been registered and certified. At the beginning of the project the farmers were given basic seed for free, but this was found to be unsustainable. The farmers were then asked to buy the basic seed at R8.00 (1US$ = R 6.20) per kilogram (Mkhari *et al*., 2006).

The CBSPS approach used in the Limpopo province is in some way similar to model 1 (Badu-Apraku *et al*., 2014) as described under section 2.3.2 except for the fact that after production and selling of the seeds, the farmers do not reimburse input costs to the extension officers. Farmers are provided seed for multiplication for free every season and all the profits made from selling the seeds is the farmers. However, the initial plan by the LDA was to provide the farmers with the basic seed produced by ARC just once and from there on the farmers were expected to produce and sell the seeds and use the profit to reinvest back into buying their own seed (M Makgato 2016, personal communication, 5 July). Farmers in the study areas are provided with either one of these varieties, ZM 1423, ZM 1421 and ZM 1523 each season depending on the availability of the variety.

An improved OPV seed is developed from local varieties to be drought tolerant, disease resistant and well adapted to the areas for which they are recommended. They are supposed to be as good as any hybrid and can be retained, which is a big advantage for the farmer (Lenksjö and Nordzel, 2014 citing Gaia Movement Trust, 2012). Improved OPV maize released by CBSPs have to be adopted by farmers for the schemes to be sustainable, and therefore, successful.

- **Advantages of Improved OPV Maize**

Pixley and Bänziger (2004) conducted experiments to quantify the relative genetic advantage of hybrids over OPVs under a range of growing conditions typical for farmers in southern and eastern Africa, both when first-or second-generation ("recycled") seed was used to investigate scenarios under which hybrids or OPVs are the more profitable option for farmers. The authors concluded that improved OPV maize gives highest return on investment and are an economical option for

marginal areas where yield levels are low (e.g. below 1.5 t ha-1) and hybrid seed and fertilizer prices are high relative to grain.

It is mentioned that the improved OPV maize variety, ZM521 yields between 30% and 50% more than traditional varieties during conditions of drought and low soil fertility, two problems that lead to low yields when the local, unimproved OPV maize varieties are planted. Is also indicated that farmers like Grace, another improved OPV variety, because of its early maturity, better resistance to maize streak virus, its suitability for green maize production (Centre for Public Service Innovation (CPSI), 2007).

2.4. Adoption of agricultural innovations: A conceptual framework

The adoption of innovations depends on many factors including personal, social, cultural institutional and economic factors, as well as on characteristics of the innovation itself. For example, a study of some of these factors by Tornatzky, Louis, Katherine and Klein, (1982) listed 30 characteristics that pertain to the innovation alone. When other factors are considered alongside these, the issue of adoption behaviour becomes complex. In other words, behaviour change becomes dependent on an interplay of many inter-dependent factors rather than a single factor.

Knowler and Bradshaw (2007) indicated in their review and synthesis of recent research on adoption of conservation agriculture that four important contextual variables seemed to lead to differences in findings on the factors that influence the innovation adoption issue. These include statistical method of analysis, locale of investigation, quality of the publication venue of the analysis and the technology under investigation. In their summary of the review of factors influencing adoption of conservation agricultural practices, Knowler and Bradshaw (2007) indicated that the aggregated analysis of 31 farmer and farm household distinct analyses of conservation agriculture adoption factors revealed few if any, universally significant independent variables. They found that only seven variables revealed consistent results across all studies while just two, awareness and environmental threats and high productivity soil displayed a consistent impact on adoption.

For many years' agricultural extension practitioners have been preoccupied with trying to understand what makes farmers adopt or reject innovations tagged as

capable to solve farmers' farm management problems. Among the earliest investigations into these adoption issues was that by Ryan and Gross (1943). Since this classical rural sociology study by Ryan and Gross, many models of innovation adoption and behaviour change have been developed over the years.

Among the earlier models of the innovation adoption process which are more useful for extension work is the classical 5-stadia concept by the North Central Rural Committee (NCRC), (1961). The model identifies the process nature of adoption but has faced a number of criticisms by others such as Albrecht (1964), Rogers and Shoemaker (1971) as cited by Düvel (1991). These criticisms include the assumption that the adoption process always begins with awareness knowledge of the innovation but is silent on the fact that it could be triggered by a problem situation (Campbell, 1966 in Düvel, 1991). The Campbell model of adoption (1966) built on the classical model by proposing four paths to explain the adoption process but failed to show how to bring about change. Dissatisfaction with earlier models gave birth to the innovation decision-making process model by Rogers and Shoemaker (1971) and revised by (Rogers, 1983). A problem with this model is that perception, which has been identified as critical for adoption, is relegated as 'prior conditions'.

The Field theory of Lewin (1951) provides a number of useful concepts including explaining change as well as non-change and the situation specificity of change. A major drawback it its practical use in the field by the change agent (Düvel, 1991). Tolman (1961) provided an adoption model with differentiated parts as independent, intervening and dependent factors or variables and identified the intervening variables as the more immediate causes of behaviour. The intervening variables are consistent with Lewin's (1951) "life space". The problems with the model is the many variables associated with the intervening variables and their accurate measurement (Düvel,1991). The attitudinal determinants of behaviour model by Fishbein and Ajzen (1975) makes a case for a link between attitudes and behaviour. The model assumes human behaviour is rational and considers intentions as immediate determinants of behaviour. However, it is questionable whether mere positive attitude provides sufficient motivation for adoption without an underlying need situation (Düvel, 1991).

Düvel (1991) built on the earlier adoption theoretical models, especially the Tolman (1961) and Lewin (1951) to reduce the many intervening variables identified by Tolman as the immediate precursors of behaviour. He proposed the mediating variable concept as comprising needs, perception and knowledge to replace Tolman's intervening variables but kept the independent and dependent variable proposition of Tolman (Düvel, 1991). The independent variables represent the personal and environment variables that affect innovation adoption. The dependent variable on the other hand is the innovation to be adopted.

In this way, the Düvel (1991) framework of adoption behavior analysis becomes more practical for the field-level extension practitioner because of the reduced number of variables which are comprehensive enough to explain adoption. It also explains change and how to bring about change. However, there are concepts in the framework which could be confusing; for example, the concepts 'needs' and 'goals' are used interchangeably and are seen as synonymous.

The Düvel framework for adoption behavior analysis has been tested widely in which the mediating variables have been found to consistently remain more important determinants of adoption behavior (Msuya, 2016; Afful, 2012; Habtermariam, 2004; Koch, 1987; Düvel, 1975) and shows that needs and perceptions are the more critical mediating factors influencing adoption of agricultural innovations than the independent variables. In a meta-analysis of drivers of intention and behaviour, Arts, Frambachand and Bijmott (2011) found that triability and observability of innovation characteristics had limited effect on innovation adoption. They explained this by saying their influence on adoption may be mediated by other innovation characteristics. In another meta-analysis of innovation characteristics and innovation adoption, Tornatzky and Klein (1982) found the relative advantage of the innovation has a stronger positive effect on adoption behaviour. All these findings are consistent with the mediating variable categorization of Düvel (1991) as the more important precursors of adoption behaviour than the independent variables.

Existing studies on CBSPs indicate that scientists have evaluated the performance of CBSP schemes at the field level based on the multiplication production process, purity and germination for quality assessment and profitability (Assaye, Melak, Ayalew, Teshale, and Mazengia, 2015; Bishaw and Niane, 2013). There are

however, no studies that have been conducted in South Africa to evaluate CBSP using a conceptual framework from behaviour adoption literature as conceptualized and operationalized by the Düvel, (1991). For the Limpopo CBSP the written documents only explain how the Scheme idea came into being, the purpose, the process of maize variety release and some of the improved open-pollinated maize varieties released by the scheme (CPSI, 2007; Mkhari *et al*., 2006). Considering the knowledge gaps in the literature, there is scope for studies that can contribute to the body of knowledge on farmer knowledge and awareness of CBSP and OPVs.

Adoption of innovations occurs when the landholder perceives that the innovation in question will enhance the achievement of their personal goals, which may be economic, social and environmental. Time and financial limitations do not allow all these variables to be investigated in most studies. Knowler and Bradshaw (2007) mentioned that future adoption research should probably aim to produce results that are meaningful for local management rather than for universal understanding, because this is unlikely. It is for these reasons, that this study was undertaken to investigate farmers' perceptions and how they influence the adoption of improved OPV maize released by community-based seed production schemes in Polokwane and Lepelle-Nkumpi Municipalities, of Limpopo province. The conceptualization of perception used in this study was based on the Düvel (1991) framework.

- **Conceptual Framework for the Study**

The release of improved OPV maize varieties takes us one step forward in the quest to improve agricultural productivity. The critical and decisive issue is that they will have to be adopted by the farmers otherwise the improved OPV maize varieties serve no purpose. This brings to the fore another important dimension in the adoption process; the role of the human being, and the challenge to understand and influence his/her adoption behavior.

Based on a review of the adoption models, Düvel's (1991) framework for adoption behavior analysis can be used to evaluate farmers' perceptions of CBSPS regarding the adoption of improved OPV maize. In simple terms, the framework indicates the farmers' adoption or non-adoption of improved OPV maize can be traced back to two human causes. One is the farmers' unwillingness to adopt the innovation; this has a

need and perception dimension. The other is that the farmer is unable to adopt the innovation; this factor relates to the independent variables and find a home under the

broad category of personal and environmental factors that influence adoption behaviour. The perception variable is operationally defined in terms of the farmers' unawareness of the disadvantages (revised as awareness in this study) of OPV maize, awareness of the disadvantages of OPV maize, the prominence of OPV maize and the incompatibility of OPV maize with the farmers' situation; the latter are the personal and environmental factors which influence the farmers' adoption behaviour.

2.5. Summary

The literature review has shown that maize is a very important commodity in the South African economy. The use of improved maize seed in farmers' production is critical for improved production, especially, for smallholder farmers to ensure household food security. The main source of supply of planting seed for this group of farmers is the informal seed sector which has not been able to supply adequate and quality planting seed for farmers.

These problems led to the establishment of CBSPS in many countries in Africa more than a decade ago. Their main objectives include but not limited to increasing small holder farmers' access to adequate, quality seed which is suitable for the socio-economic and agro-ecological situation of smallholder farmers. In the Capricorn district of Limpopo province, the CBSP was initiated in the early 2000. The literature review did not identify any empirical assessment of farmer's perceptions of the improved OPV maize produced by the Schemes in the district. In view of the critical role played by perception in the use of innovations, the study will apply the Düvel (1991) framework for adoption behaviour analysis to evaluate farmers' perceptions of CBSPS regarding the adoption of improved OPV maize.

The next chapter describes the methodology used for the study.

CHAPTER 3

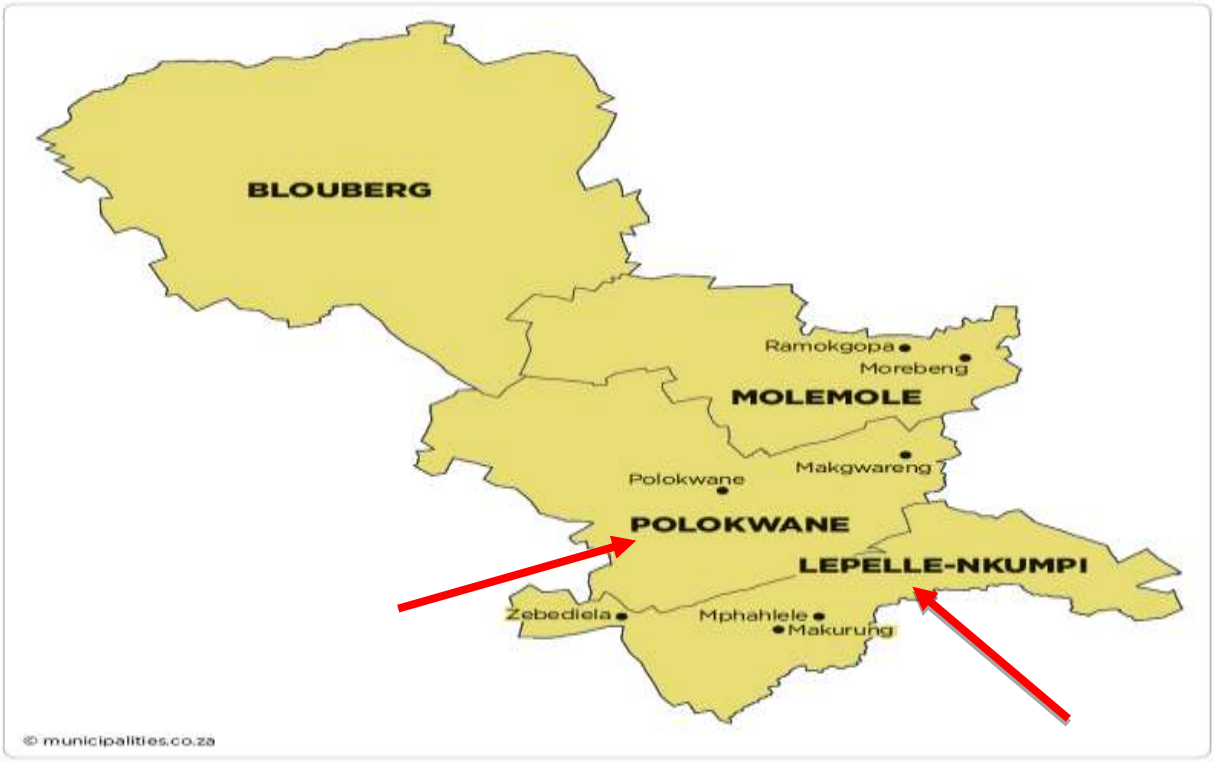
RESEARCH METHODOLOGY

3.1. Introduction

This chapter presents the research methods used in this study that enabled the research hypotheses to be tested and the objectives of the study to be realised.

3.2. The study area

The study was conducted in the two local municipalities of the Limpopo province namely, Lepelle-Nkumpi and Polokwane (Figure 3.1).



Source: Google Maps, 2017

Figure 3.1: Study area map

Six projects from both municipalities formed part of the study. Lepelle-Nkumpi local municipality seed projects are located ±103 km from Polokwane city. The three seed projects namely, Mashushu, Kodumela and Gemini in Lepelle-Nkumpi formed part of the study. Mashushu and Kodumela are located in Mafefe, Ga-Mampa and Gemini in Mafefe (Google Maps, 2017). The other three projects that formed part of the study were Jack Mafarane, Mapeu and Phela ke Phele located in the Polokwane local

municipality. Jack Mafarane seed project is located ±40km from Polokwane city in the mountains of Mamabolo in a village called Spitzkop. The second project, Mapeu is located ±53 KM from Polokwane City in deep villages of Molepo, Ga-Thaba. The third project named Phela ke Phele is located ±44 km from Polokwane City in the village of Dikgale, Mogabane (Google Map, 2017).

3.3. Population

The study population comprised (of delete) farmers who are part of the Limpopo province CBSPs (Scheme members) and Non-Scheme members from the same farming communities who plant maize.

3.4. Sample selection process

3.4.1. Sampling criteria

There are only eight CBSP schemes in the Limpopo province; six are in Polokwane and Lepelle-Nkumpi local municipalities of Capricorn district. The other two schemes are found in Vhembe district (M. Makgato 2016 , personal communication, 5 July; Mkhari et al., 2006). Time and logistical constraints permitted work only in Capricorn district.

In view of the small number of CBSPSs in Capricorn district, the total population of all growers of improved OPV maize of CBSPSs in Polokwane (30) and Lepelle-Nkumpi (20) municipalities were included in the study. To ensure comparative analysis, an equal number of non-scheme members to scheme members in each village were selected. Extension officers and scheme members were asked to identify community members who planted maize, from which a list of non-scheme members was created and farmers randomly selected.

The list from which simple random sampling was done in Ga-Mampa village (Lepelle-Nkumpi local municipality) to select farmers who plant maize consisted of 3524 households (E Mahlatjie 2017, personal communication, 16 March).

In Plolokwane local municipality the lists from which simple random sampling was done in to select farmers who plant maize consisted of: the following estimated numbers of households: 1250 (Mamabolo village) (M Makwela 2017, personal communication, 20 March); 1080 (Molepo ga-thaba village): (J Thaba 2017, personal

communication, 20 March) and 1862 (Dikgale village) (M Dikgale 2017, personal communication, 20 March).

3.5 Data collection methods

Data was obtained from individual farmers by means of personal, face to face interviews from 27 March 2017 to 21 April 2017. The interviews were conducted by the researcher in the local Sepedi language.

3.5.1 Data collection instruments

A semi-structured questionnaire was used to collect the data from farmer respondents. The questionnaire was designed based on perception issues as conceptualized in the Düvel (1991) model. The traits used to assess improved OPV maize in comparison with farmers own previously recycled maize seed was informed by literature (Mkhari, Matlebjane, Dlomu, Mudau and Mashingaidze, 2004; Abdi, 2013).

3.6 The pilot study

Five members of Jack Mafarane project in Polokwane and another five of non-scheme members in that community were randomly selected and interviewed for the pilot study to test the questionnaire for clarity; length of time for the interviews and improve its reliability. This test also gave the researcher the opportunity to test her interviewing skills since the main interviews were to be conducted by the researcher herself. These 10 farmers were, subsequently excluded from the main interviews. The pilot test indicated the need for minor adjustments to the questionnaire which were effected before the actual survey took place.

3.7. Research design

The study used a cross-sectional survey method which is commonly used in studies that involve perceptions to examine human subjectivity (Barry and Proops 1999).

3.8 Measurement of variables

Awareness and lack of thereof of advantages and disadvantages of improved OPV maize compared with own recycled seed

Perception issues were analysed using the Düvel (1991) model which conceptualizes perceptions of innovations in terms of their advantages, disadvantages, prominence and compatibility with farmers' situation. These factors

fall under what Düvel (1991), calls farmers' psychological factors that influence the adoption of agricultural innovations.

Awareness of the disadvantages of improved OPV maize over own recycled maize seed will lead to their non-adoption of the innovation, in this case not plant improved OPV maize. An assessment of this awareness was made by asking respondents to a simple overall comparison to indicate whether they saw more disadvantages with improved OPV maize compared with their own recycled maize seed. Respondents who see more disadvantages were classified as 1= high disadvantage group; the opposite is the case, and such respondents were classified as 0= low disadvantage group. Düvel (1991) used the term unawareness of advantages; this has been modified to read awareness of advantages in this study for easier understanding. With this modification, respondents were similarly asked to indicate whether they saw more advantages with improved OPV maize compared with own recycled maize seed. Respondents who saw more advantages with improved OPV maize were classified as 1= high advantage group who are expected to adopt the innovation. The opposite was the case and such respondents were classified as 0= low advantage group.

The other aspect of the farmers' psychological factors investigated in this study relate to the perception concept called situational incompatibility (Düvel, 1991). These are constraints on the way to decision-making or the adoption decision of an innovation and usually or commonly referred to as personal and environmental or independent variables.

Much has been written about farmers' perceptions and adoption of agricultural innovations (Afful, Obi and Lategan, 2013; Ajayi, 2006). Knowler and Bradshaw's (2007) review of factors that influence the adoption of conservation agricultural practices and Habtemariam's (2004) compilation of various studies regarding the influence of farmer and farm-related variables on the adoption of farm innovations show inconclusive findings from these variables. Other studies that show similar inconclusive findings on the farmer and farm-related variables in relation to the adoption of agricultural innovations include Annor-Frempong (2013), Benin, Nkonya, Okecho, Randriamamonjy, Kato, Lubadde, Kyotalimye and Byekwaso, (2011). With this background the researcher therefore, selected some independent variables to

be investigated in this study deemed to influence farmers' perceptions on whether planting improved OPV maize, and farmer socio-economic characteristics influence their perception of benefits of improved OPV maize.

- **Scheme performance**

Scheme respondents' views were elicited on various aspects of the performance of the Scheme which were measured as: seed security (1= seed secure; 0= otherwise); desirable seed traits index (6 sub-variables each measured as 1= yes; 0=otherwise), general profitability of seed production (1= generally profitable; 0= otherwise) and availability of more than one improved OPV to choose from (1= generally more than one variety available; 0= otherwise).

- **Awareness knowledge of OPV maize**

The knowledge issue investigated in this study is a mediating variable within the broad concept of the psychological factors influencing farmers' adoption of agricultural innovation (Düvel, 1991). Respondents' awareness knowledge of improved OPV maize was measured as 1= Yes (aware of existence of improved OPV maize), 0 = otherwise; Adoption was assessed in terms of planting improved OPV maize was measured as 1= Yes (planting improved OPV maize), 0 = otherwise.

- **Planting of OPV maize and goal achievement**

Respondents' (Scheme and Non-Scheme members) views on a comparison of improved OPV maize with own recycled maize seed to achieve one's goal were assessed and based on respondents' responses to the statement that improved OPV

maize is generally better than own recycled seeds in helping to achieve personal goal; responses were measured as 1= Yes i.e. helps to achieve one's goal; 0= otherwise.

3.9. Data analysis

3.9.1. Data preparation and capturing

After collection of all the data, the data was organized and sorted in order to summarize and synthesize the finding of the study. Excel spreadsheet was used to

group the data according to variables to give the questions identity, labels to briefly describe the questions, values to give identification values to the responds and lastly Value-Label to further describe the values in terms of the labels respectively.

3.9.2. Statistical analysis

The data was subjected to both descriptive and inferential analyses using SPSS software. Descriptive analysis was used to describe respondents' personal and environmental factors (i.e. compatibility of improved OPV maize with farmers' situation); their awareness and knowledge of improved OPV maize, views on the advantages, disadvantages of improved OPV maize and the performance traits of improved OPV maize (Düvel, 1991). The inferential analysis included the use of a Chi-square test for independence to test for relationships between respondents' awareness knowledge and planting improved OPV maize (hypothesis i). b) Chi-square test for independence to test any significant differences between the views of Scheme and Non-Scheme members on the awareness of the disadvantages and awareness of the advantages of improve OPV maize (hypothesis ii).

Each respondent was asked to mention things they viewed as advantages about improved OPV maize. Overall the advantages that were mentioned by respondents were ten. Respondent's entries with five advantages from the total of ten were rated as positive perception and those with less than five as negative perceptions. A statistical technique called binary logit model was used to predict the relationship between independent and dependent variables, wherein the dependent variable, which is dichotomous in nature, was employed to determine whether farmers' demographic and socio-economic characteristics influenced their perception of improved OPV maize (hypothesis iii).

The simplified logistic regression equation can be written as follows:

$$\ln[Y/(1-Y)] = a + B1X1 + B2X2 + \ldots\ldots\ldots B5X5 \ldots\ldots ei \ldots\ldots.$$

Where Y is the predicted value on the dependent variable, (Perceptions: Positive Perception=1, otherwise=0); a= constant, b= regression coefficients, ei = the error term corresponding to all variables that could affect Y but not included in the model

and the X"s represent the various predictor variables (independent variables) described as follow: X1=Years of Schooling, X2=Respondents Sex, X3=Farm Size, X4=Respondents Municipality, X5=Scheme Membership, X6=Farming Experience, X7= Income and X8=Age of participant. Unlike in linear regression Y is not measured directly, but it is rather the probability of obtaining a particular value for the dummy perception variable.

Decision making, adoption and behaviour change is dependent on an interplay of many inter-dependent factors rather than a single factor. It is thus not surprising that many researchers have found a lack of consistent results associated with the commonly called socio-economic variables such as respondents' age, sex, experience, farm size education regarding innovation adoption etc. (Knowler and Bradshaw, 2007). The expected influence of these variables could only be written as positive or negative. On the other hand, the consistent findings associated with the relative advantages and adoption prompted their definitive prior expectations. The variables used in the regression analysis are further described in Table 3.1.

Table 3.1: Variables used in the binary logistic regression model for positive perception by respondents

Variable name	Definition	Type and unit of measurement	Prior expectations (+/-)
Dependent variable			
Perception	Farmer perceptions on the benefits of improved OPV maize.	Nominal; Dummy (1=Positive 0=otherwise)	
Independent Variables			
Years of Schooling	Number of years of formal schooling	Years	+/-
Respondent Sex	Whether a household member is male or female	Nominal; Dummy (1 = male, 0 =otherwise	+/-
Farm size	Actual land area planted to improved OPV maize	Ratio; Ha (continuous)	+/-

Respondents Municipality	Municipality in which the respondent is farming	Dummy (Lepelle-Nkumpi=1, 0 =otherwise)	+
Scheme Membership	Does respondent belong in a scheme	Nominal; Dummy (1=Yes, 0=otherwise)	-
Farming Experience	Number of years farming	Ratio; Number of Years	+/-
Age of Participant	Respondent's age at last birthday	Ratio; Years	+/-
Income	Respondents income per annum	Nominal; Dummy (1= More than 1000, 0=otherwise)	+/-

3.10. Ethical consideration

3.10.1 Permission

Permission to carry out the study was sought from the Turfloop Research Ethics Committee (TREC) prior its commencement. Refer to Appendix F for the Research Ethics Clearance Certificate.

3.10.2 Inform consent

The researcher informed the interviewees that the participation is voluntary and that they are free to withdraw from participation at any time if they don't feel comfortable. The interviewees were asked to sign a consent form to show that they agreed to partake in the study.

3.10.3 Confidentiality and anonymity

In this study confidentiality and anonymity of the participants was taken into consideration. The participant's real names will not be mentioned in the study and the information provided will only be used for research or study purposes. The researcher informed the participants before agreeing to participate in the study.

3.10.4 Protection from harm

The researcher protected the identities and privacy of the participants through anonymity.

3.10.5 Respect

The researcher therefore respected all participants including Indigenous health practitioners' secrets traits. (APPENDIX F).

3.11. Summary

This chapter provided a description of the research methods used in the study. It started with the research process followed and finally data analysis techniques employed to test research hypotheses.

The next chapter reports the results and discussion of the results of the empirical investigation.

CHAPTER 4

PRESENTATION AND INTERPRETATION OF FINDINGS

4.1. Introduction

The main aim of the study was to investigate farmers' perceptions and adoption of improved OPV maize varieties released by the CBSPSs in Limpopo province. The data from field interviews were subjected to descriptive and inferential analyses using SPSS software.

The presentation of the findings begins with present situation in the study areas in which descriptive analysis were used to describe respondents' personal and environmental factors, their views on the advantages, disadvantages and various aspects of the performance of the scheme. This description provides the researcher with a better insight into, and an understanding of the nature and type of respondents in the study, and therefore, their actions and reactions regarding the issue under study.

This is followed by the use of inferential analyses to test any significant differences in the views of respondents on various issues stated in the hypotheses and also study the relationships to predict respondents' views on whether or not planting improved maize OPV helps in achieving one's long-term goals based on predictor variables.

The findings are assessed in relation to literature and the chapter ends with a summary to explain what the study has identified.

4.2. Present situation in the study area

In this section, the study findings regarding the present situation, scheme membership-related issues as well as respondents' socio-economic characteristics in the two local municipalities of the Limpopo Province namely, Lepelle-Nkumpi and Polokwane local municipality where the CBSPSs are presented in this section.

4.2.1. Respondents socio-economic characteristics

A summary of some continuous variables related to all 100 respondents in the survey is presented in Table 4.1. The age and years of schooling distribution among the respondents shows a negative skewness; this means a few respondents were

younger and had no schooling at all respectively. The distribution of farm sizes on the other hand shows a positive skewness to indicate a few respondents had bigger farms. The description of the variables in this table is expanded on in the next paragraphs.

Table 4.1: Descriptive statistics of respondents (N= 100)

Variable	N Statistic	Minimum Statistic	Maximum Statistic	Median Statistic	Skewness	
					Statistic	Std. Error
Age of Participant (Years)	100	22	87	60.95	-.702	.241
Years of schooling	100	0	12	7.03	-.456	.241
Farm size (ha)	100	.1	2	.500	.697	.241

- **Farm size**

Figure 4.1 depicts the farm sizes of all survey respondents. There is a clear indication that a vast majority of respondents (99%) had only up to 1 ha size of farm land of which 64% had between 0.5 and 1 ha. These findings concur with Oni, Nesamvumi, Odhiambo and Dagada, (2003) study who found that small holder farmers in Limpopo province are characterized by small size holding of approximately 1.5 ha per farmer. However, there have been different views on the relationship between the size of land farmers occupy to adoption of innovations. According to Diederen, Van Meijl, Wolters and Bijak, (2002) there is a positive relationship between farm size and adoption. However, Hategekimana and Trant (2002) question this result with the believe that farmers with small land holding may be more willing to take part in farming because they are always looking for ways to make more out of the small land size. Monela

(2014) also found that farm size does not significantly influence adoption of improved maize and rice seeds.

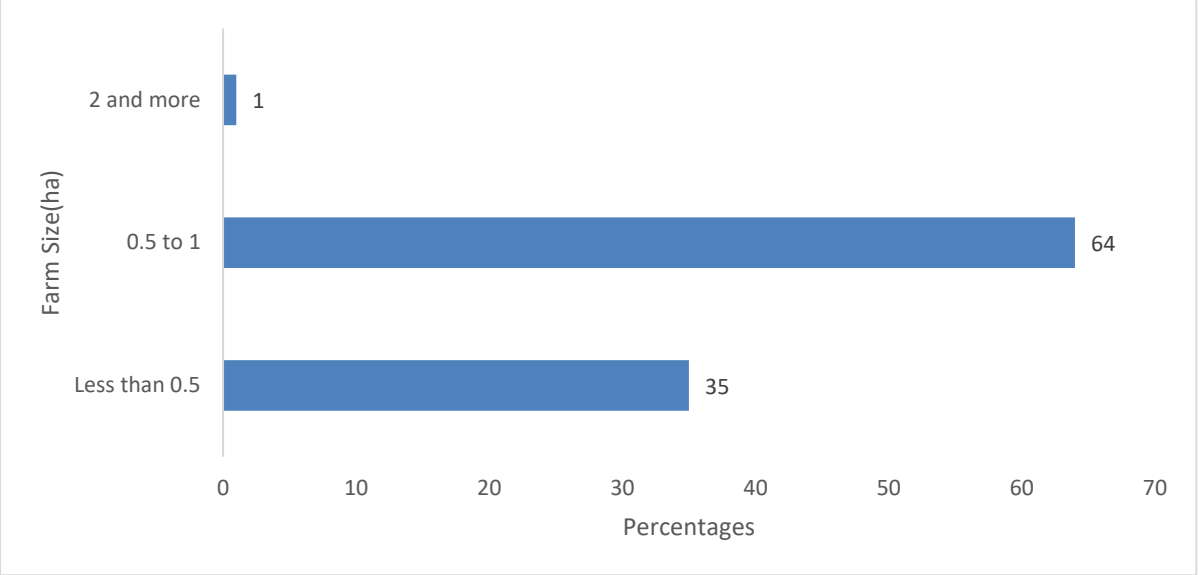


Figure 4.1: Respondents' farm size (N=100)

- **Age of participants**

There are indications that the farming population in South Africa is ageing. According to Sihlobo, (2015) AgriSA estimates that the average age of a farmer in South Africa is 62 while countries that lead in food production, such as the United States, have an average farmer age of 55. The median age of 60 years found amongst respondents in this study is thus a good reflection of national trend.

The youth in South Africa is in the age group 18-35 years (Food, Agriculture and National Resource Policy Analysis Network (FANRPAN), n.d). It is estimated that there are about 200 million people aged 15-24 in Africa (Bafana, 2015). However, opportunities for them in agriculture are hampered by a combination of factors such as limited access to land, financial credit and improved technologies etc. (Bafana, 2015).

Respondents were asked to give their actual age at the last birthday. The data were then re-coded into groups and analysed. Figure 4.2 provides a summary of the responses. Our findings indicate that the youth are almost not represented in farming (7%). There is also a clear indication that many of the farmer respondents are old, in the 61-80 age bracket (51%). Again, our results mirror the national picture of the average age of the South African farming population. The age finding in this study also

orroborates Mafsikaneng (2015) finding amongst smallholder farmers in Gauteng province of South Africa in which he found that most of the respondents were 40 years and above.

To get more young people to participate in planting OPV maize, incentives are needed to attract them since the future of farming, and therefore, achieving food security lies in more young people going into farming.

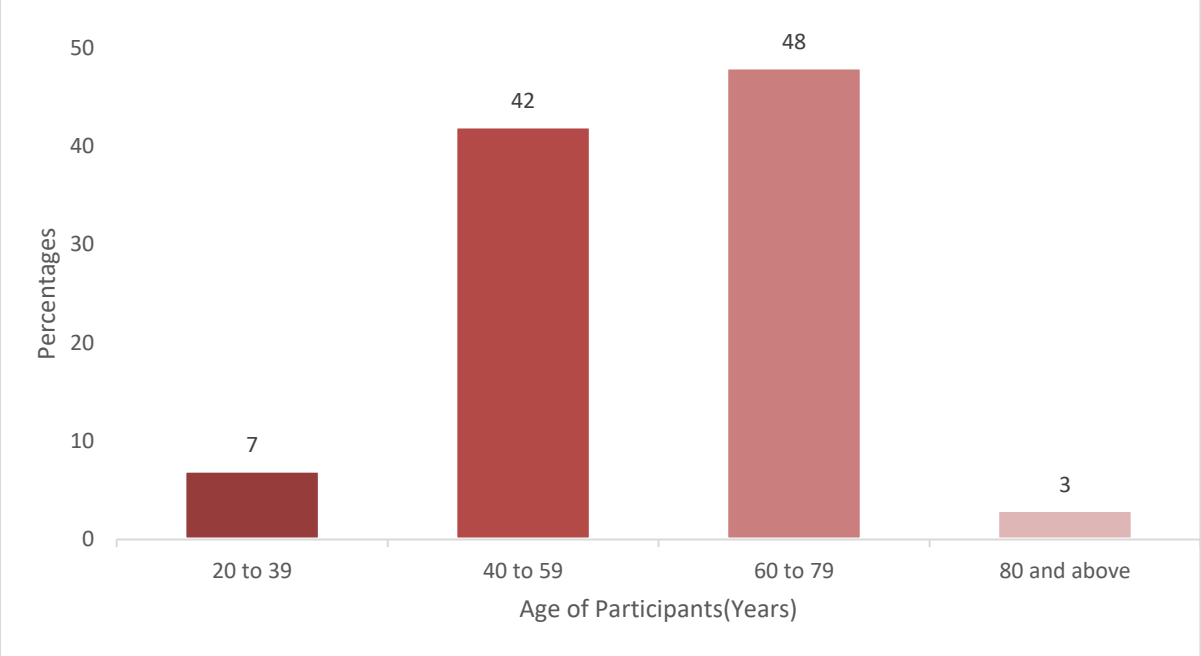


Figure 4.2: Age of Participants (N= 100)

- **Years of schooling**

This assumed link between education and knowledge may lead to the proposition that education positively relates to adoption. According to the views of many researchers, education also has an impact in adoption of innovations; it is expected that the more educated farmers will adopt innovations sooner than non-educated farmers (Nkonya, Schroeder, and Norman, 1997). This may be because farmers with more education are more likely to have enhanced access to new technological information than poorly educated farmers (Norris and Batie, 1987).

Knowler and Bradshaw (2007) however, pointed out that many studies on conservation agriculture adoption have found a significant and positive impact of

‘education’ on the adoption of conservation tillage, whereas ‘education’ was also found

to be insignificant or indeed to negatively correlate with adoption of no-till and other practices.

To get a picture of the situation amongst the respondents in the survey, they were asked to indicate the actual number of years of formal schooling they had attained. These data were then re-coded and the results are summarized in Figure 4. 3. There is a clear indication that most of the respondents (70%) had up to 11 years of schooling. Only a small percentage (14%) had not attended formal schooling and close to this number had 12 years of schooling. These figures mirror the Limpopo provincial, agricultural household statistics which indicate 13% of household heads had no formal schooling, 71.4% had up to grade 11 and 15.3% had attained 12 years of schooling (Stats SA, 2013).

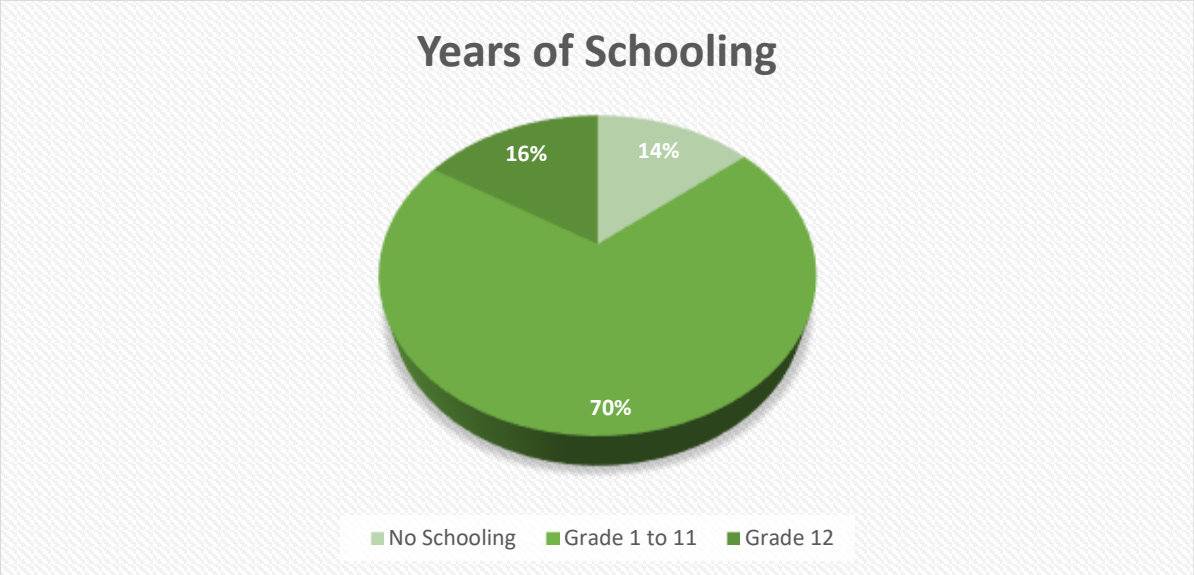


Figure 4.3: Respondents years of schooling attained (N= 100)

Frost (1996) defines functional literacy as the ability to read, write and speak with understanding, at a level that enables one to participate effectively in the community and the workplace. Frost (1996) broadly defines functional literacy as equivalent to eight years of formal schooling in the South African context. Similarly, Swanepeol, Erasmus and Schenk, (2008) citing Erasmus *et al*., (2006) indicate that illiteracy in South Africa is educational level lower than grade seven level of education.

Farmers' ability to read and write (literacy) and also apply simple numerical concepts (numeracy), such as addition, multiplication, division and subtraction were assessed by the number of years of formal schooling. The findings in this study indicate that an

overwhelming majority of respondents (86%) have up to 12 years of formal schooling. This means that they are able to ability to read, write and speak with understanding, at a level that enables one to participate effectively in the farming workplace regarding the OPV maize seed multiplication, production and the business side of it.

- **Respondents sex**

Figure 4.4 shows the sex of all respondents in the survey. The findings indicate most of the farmers (70%) are female and only 30 % are male. Oni *et al*., (2003), also made a similar finding that female farmers constitute 80% of the smallholder farmers in the Limpopo province. Our finding is also in line with the South African Agricultural Household Survey report which indicated there are more female farmers in Limpopo province (52.4%) than men (Stats SA, 2013).

This is a clear indication that more women than men are involved in crop farming in the province. Asfaw and Admassie (2004) found that males are more likely to adopt new technologies whereas Nhemachena and Hassan (2007) have differed with the results above stating that females are more likely to adopt agricultural innovations than males. These different findings appear to depend on the roles of males and females in farming systems in different cultures. In South Africa, males traditionally tend to keep cattle, goat and sheep than get involved with crop production especially, vegetables. The Agricultural Household Statistics indicate that 53.3% of males in Limpopo province are engaged in livestock production (Stats SA, 2013). This information from our study has implications for planning agricultural programmes in the province.

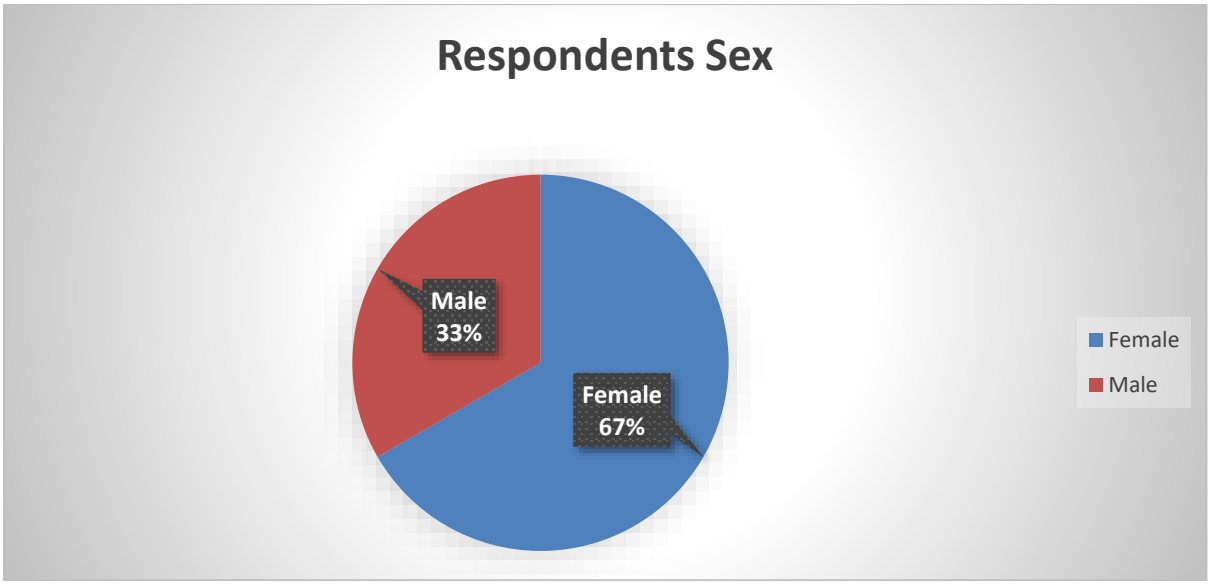


Figure 4.4: Distribution of respondents according to sex (N= 100)

- **Farming experience**

Figure 4.5 shows that the vast majority of respondents (82%) have been farming for over 16 years. These findings are similar to Annor-Frempong (2013) who indicated that most farmers in South Africa and Lesotho have over 10 years farming experience. These findings are not too different from average farming experiences of smallholder farmers and homestead food gardeners in the Eastern Cape province which were approximately 11 years and 13 years respectively (Kibirige, 2013).

These findings however, contrast what Afful (2012) found in Free State of South Africa among small-scale farmers. Most of these farmers had 1-5 years of farming experience. These different findings may be explained by the fact that the findings in the Free State were among farmers who had just acquired land under the government Land Redistribution Programme. If more farming experience produces a wealth of farming knowledge and skills, leading to more farming success than inexperienced farmers, then effort should be put in place to support such farmers to mentor new entrants into CBSP schemes.

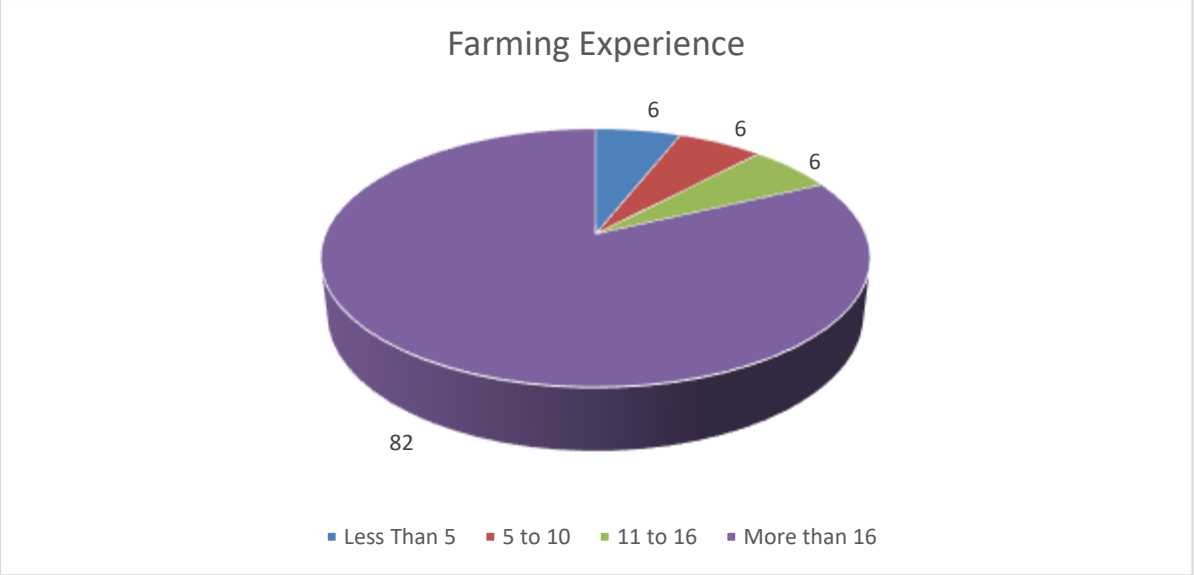


Figure 4.5: Distribution of respondents according to farming experience (N=100)

- **Respondents' membership of community-based maize scheme**

The participants (Scheme members, N=50 and Non-scheme members, N=50) in the study were drawn from two municipalities in Limpopo province (Figure 4.6). Members of the CBSPS in Polokwane local municipality comprise a slightly higher percentage (60%) than Lepelle-Nkumpi. Attempts to secure an equal number of Scheme participants in the latter municipality were futile; this signifies the fact even though the Limpopo Department of Agriculture Fintroduced this innovative idea in 2000, the idea of belonging to CBSP scheme has not caught on well with the farmers in the province. There is thus need for more extension effort to promote the scheme idea.

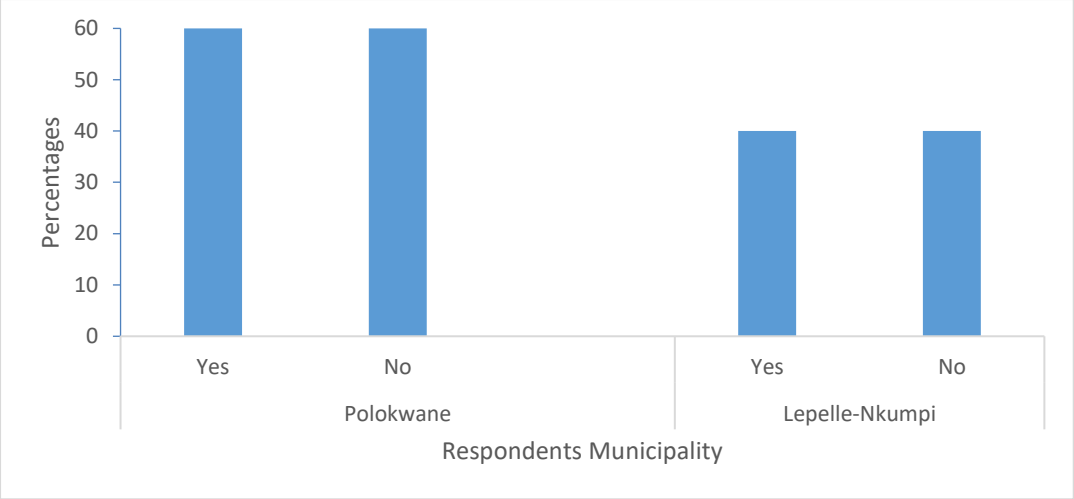


Figure 4.6: Percentage distribution of respondents' municipality according to scheme membership (N=100)

- **Farm management extension support: Extension Contact**

To understand the level of extension support for farmers' crop production, respondents were asked to mention the frequency of contact with the extension agent in their area. The results show that Scheme members had better contact, with 30% having two meetings a week with the agents throughout the planting season while non-scheme members received no contact at all (Table 4.2). This clearly shows that being in the seed scheme gives an advantage in terms of extension contact and therefore, with the added possibility of receiving better farm management support.

Table 4.2: Distribution of scheme membership according to extension contact during planting season (N=100)

			Scheme membership		Total
			No	Yes	
Frequency of extension contact during planting season	Once in a week	No.	0	5	5
		%	0	10	5
	Once during whole planting season	No.	0	11	11
		%	0	22	11
	Twice a week	No.	0	15	15
		%	0	30	15
	Three times (seed delivery, planting and harvesting)	No.	0	19	19
		%	0	38	19
	No contact	No.	50	0	50
		%	100	0	50
Total		No.	50	50	100

	%	100	100	100

On the issue of contact with the extension agent after the planting season, the picture that emerges from the survey is that after harvesting till the next planting season, scheme members had only one contact with the extension agent when he or she came to collect multiplied seed from the farmers to be sent to Madzivhandila Agricultural College for seed cleaning and packaging (Table 4.3). Again, non-scheme farmers had no contact with extension agents at all during this period.

The few number of public extension visits to farmers' farms seems to be a systemic problem in developing countries. In Namibia, Jona and Terblanché (2015) found over half of the farmers had no contact with an Agricultural Support Services (ASS) provider for over a year while Shabangu (2015) also found in Mpumalanga province of South Africa, that 53.3% of farmers interviewed indicated that they had no visits from Extension Officers.

The literature shows that farmers, crop or livestock producers desire to receive 2-3 visits per month (Afful, 2012; Gautam, 2000; Budak, Budak, and Kaçira, 2010). The few number of visits received by respondents during and after planting therefore, does not bode well for farmers' production. This is because there is evidence that visits from the public extension officers improve farmers' production efficiency (yields, profit) and management practices (Afful, 2012) and that farm yields rise as the number of extension staff per farm increases (Evenson and Nwabu, 1998). Such an increase in

extension staff invariably leads to an increase in the number of extension contacts with farmers.

Table 4.3: Distribution of scheme membership according to extension contact after planting season (N=100)

			Scheme membership		Total
			No	Yes	
Frequency of extension contact after planting season	Collection of seed (for processing at Madzivhandila)	No.	0	50	50
		%	0	100	50
	No contact	No.	50	0	50
		%	100	0	50
Total		No.	50	50	100
		%	100	100	100

- **Years in seed scheme and respondents' involvement in multiplication of improved OPV maize seed and their views on its profitability**

The number of years' respondents have been involved in the Scheme is summarized in Figure 4.7. A vast majority of members (80%) have been in the scheme between 5-16 years. This period goes back to the introduction of the scheme in the year 2000. The 20% that have been in the scheme for less than 5 years are new members who have been called to replace some of the older members that are no longer in the scheme due to old age and death. According to the members of the scheme, they are not able to allow more farmers to join the scheme due to limited availability of farming land. However, some non-scheme members mentioned that they would like to be part of the scheme but when they want to join they are told to pay contributions (money) equivalent to the money spent by old scheme members ever since the initiation of the project/scheme.

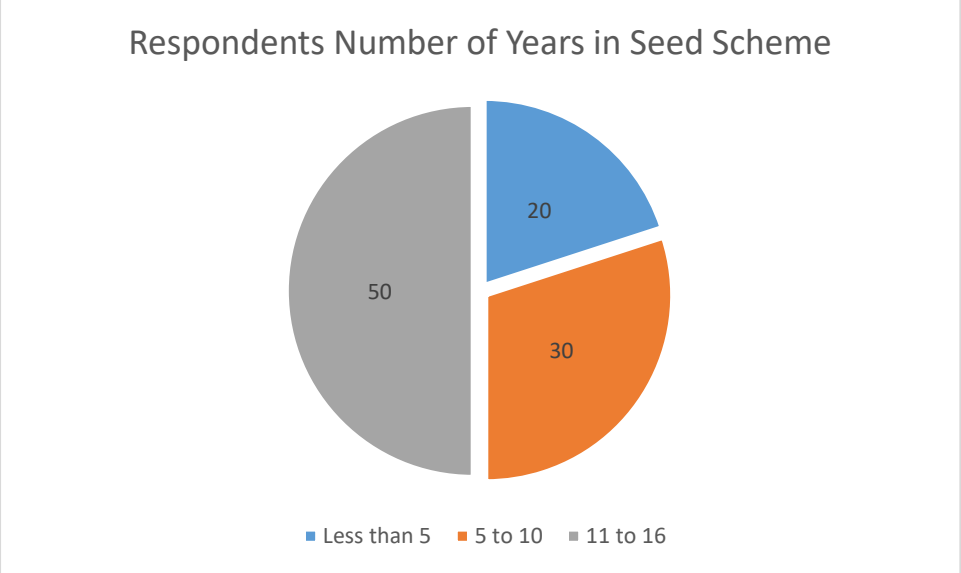


Figure 4.7: Respondents and number of years in the seed scheme (N=50)

- **Profitability of the seed multiplication business (N=50)**

As part of the seed production process farmers were trained in producing the seed of their preferred varieties, for local seed security and income-generation (seed multiplication) (Mkhari *et al*., 2004). Scheme members were requested to indicate their involvement in seed multiplication and their views on its profitability. All the scheme members indicated that they were involved in multiplying seed for sale to other farmers; all of them also said the business was profitable. These findings

suggest that the OPV maize seed multiplication business is general profitable which can help improve the welfare of communities and need to be supported.

- **Farm management support: training on agronomic and business side of seed multiplication**

From the inception of the conceptualization of the Scheme idea, it was indicated that the purposes of CBSPSs were usually to increase farmers' access to improved and preferred varieties in order to generate income, or to achieve better seed security (Setimela and Kosina, 2006). To achieve any of these purposes, training is paramount. This training is expected to be provided by the provincial Department of Agriculture in Limpopo province. Scheme members in the survey were thus asked to indicate the number of times they received training on agronomic issues on seed multiplication since they became members of the CBSPSs. Their responses are summarized in

Figure 4.8. It is clear that at the time of the interviews, 76% had only been trained once or two times. A few claimed being trained three times and small percentage had not been trained at all, the latter group representing mostly those that recently joined the Scheme. These numbers of training Scheme members have received in the last 10 years are low; this situation certainly has serious repercussions on scheme members' crop production.

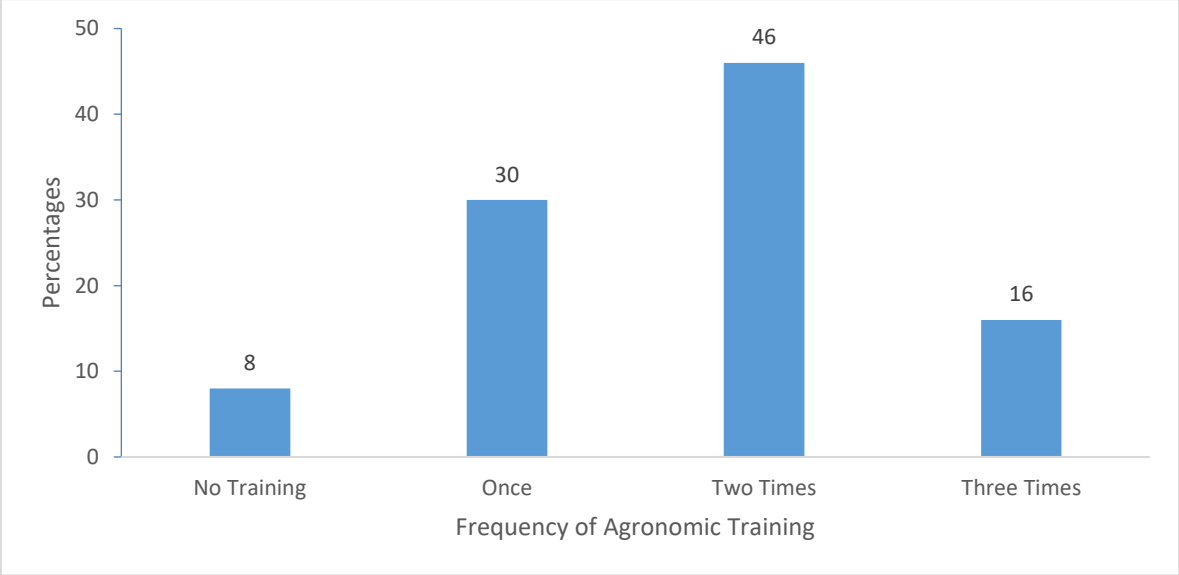


Figure 4.8: Frequency of training on agronomic issues about seed multiplication (N= 50)

On the business side of seed multiplication, the picture is even worse. Most Scheme members (78%) had not received any training at all; less than 30% claimed being trained once though (Figure 4.9). This is a clear indication that more emphasis is not being put into making sure that the farmers are able to generate an income from

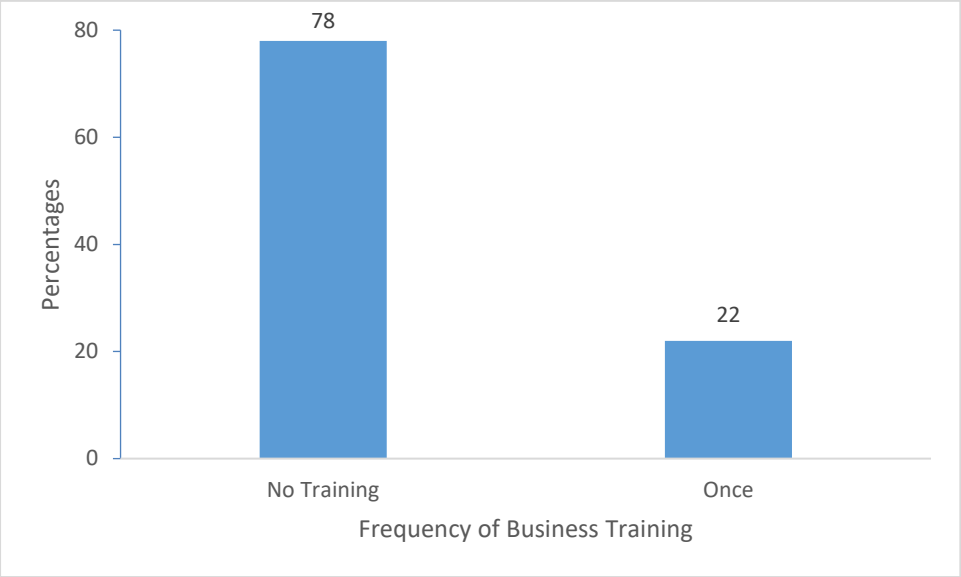


Figure 4.9: Frequency of training on seed multiplication business issues (N= 50)

4.3. Awareness knowledge of improved OPV maize among respondents and related issues

- **Respondents' awareness knowledge of improved OPV maize**

The knowledge issue investigated in this study is a mediating variable within the broad concept of the psychological factors influencing farmers' decision making or adoption of agricultural innovations (Düvel, 1991). It is viewed as knowledge of relative advantages or knowledge of the existence of the innovation and therefore, intricate part of perception.

According to Roger's innovation decision process (1983), the adoption of an innovation is preceded by an awareness knowledge of an individual or a decision-making unit regarding the existence of an innovation. This reasoning prompted the need to ask respondents whether or not they were aware of the existence of the improved OPV maize. The responses indicated that in addition to the large majority

of respondents in Polokwane municipality (98%) who were aware of the existence of the improved OPV maize, all respondents in Lepelle-Nkumpi municipality (100%) were also aware of its existence (Table 4. 4). Monela's (2014) study in Tanzania found that 66% of her study respondents were aware of the existence of improved maize and rice seeds. More importantly, her study showed that farmers' awareness of the existence of improved maize and rice seed significantly contributed to farmers' adoption of improved maize and rice seeds. Similarly, Monyo, Mgonja and Rohrbach, (2016) findings on the potential adoption of pigeon pea in Malawi indicated that once all farmers are aware of a variety, 45% can be expected to actually adopt it when the seed is made available as compared to the 10% who were found to have adopted the improved varieties.

Our finding bodes well for putting measures in place to increase awareness of improved OPV maize and removing constraints to make the seed more available in order to enhance its adoption.

Table 4.4: Percentage distribution of respondents in the municipalities according awareness knowledge of improved OPV maize (N= 100)

			Respondent Municipality		
			POLOKWANE	LEPELLE-NKUMPI	Total
Knowledge on IM OPV maize seed	No	No.	1	0	1
		%	1.7	0.0	1.0
	Yes	No.	59	40	99
		%	98.3	100	99
Total		No.	60	40	100
		%	100	100	100

- **Respondents' sources of planting seed and related issues**

The members of the seed scheme obtained the improved OPV maize seed from the ARC through the LDA. It was necessary therefore, to find out the sources of the maize seed planted by non-scheme members. Their responses indicated that 60% of non-scheme members obtained their planting seed from scheme members (Figure 4.10). This invariably shows that even though they were not registered as members of the seed scheme, they nevertheless, planted improved OPV maize seed. These responses reveal that 40% of non-scheme members received their planting seed from other sources.

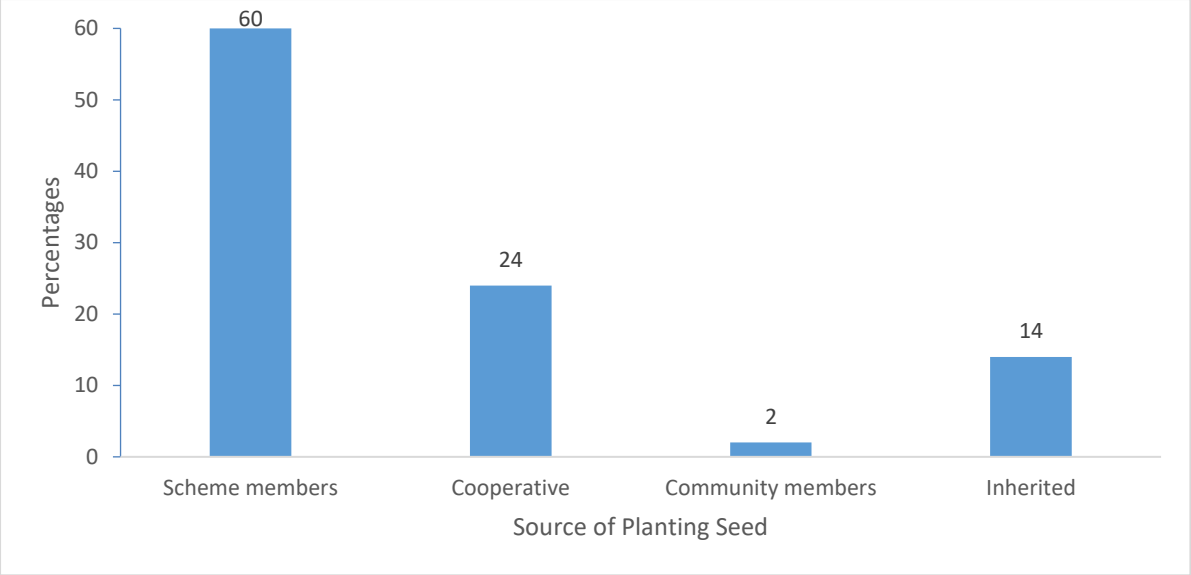


Figure 4.10: Non-scheme farmers' sources of planting seed (N= 50)

- **Duration of time non-scheme members have been receiving the seed from the Scheme members(n=30)**

Non-scheme members who received planting seed from scheme members (n= 30) also indicated for how long they had been receiving improved OPV maize planting seed. The longest time some had been receiving maize planting seed from scheme members' dates back more than 10 years. Table 4.5 further shows that as far back as 2004 a small percentage of farmers (3%) were receiving planting seed from their counterparts in the scheme and therefore, their knowledge of improved OPV maize. This trend has continued till now; in fact, in the last four years of this study, the number had reached 83%.

Table 4.5: Percentage distribution of non-scheme members and number of years of receiving planting seed from scheme farmers (N= 30)

Number of years	Number of respondents	Percentage
1	13	43
2	4	13
3	5	17
4	3	10
5	1	3.3
7	1	3.3
9	1	3.3
11	1	3.3
13	1	3.3
Total	30	99.5

- **Current status of respondents regarding planting of improved OPV maize and reasons for not planting OPV Maize**

Of the 50 non-scheme members that were interviewed on planting of improved OPV maize seeds, 60% of them got their maize planting seed from the scheme members. This indicates that in all, 80% of all respondents interviewed in this study planted improved OPV maize (Figure 4.11). The remaining 40% of non-scheme members who were not planting OPV seeds mentioned different reasons why they are not currently planting improved OPV maize (Table 4.6). One of the dominant reasons provided by respondents (67%) was that, the seed was not available from the scheme members during the planting season.

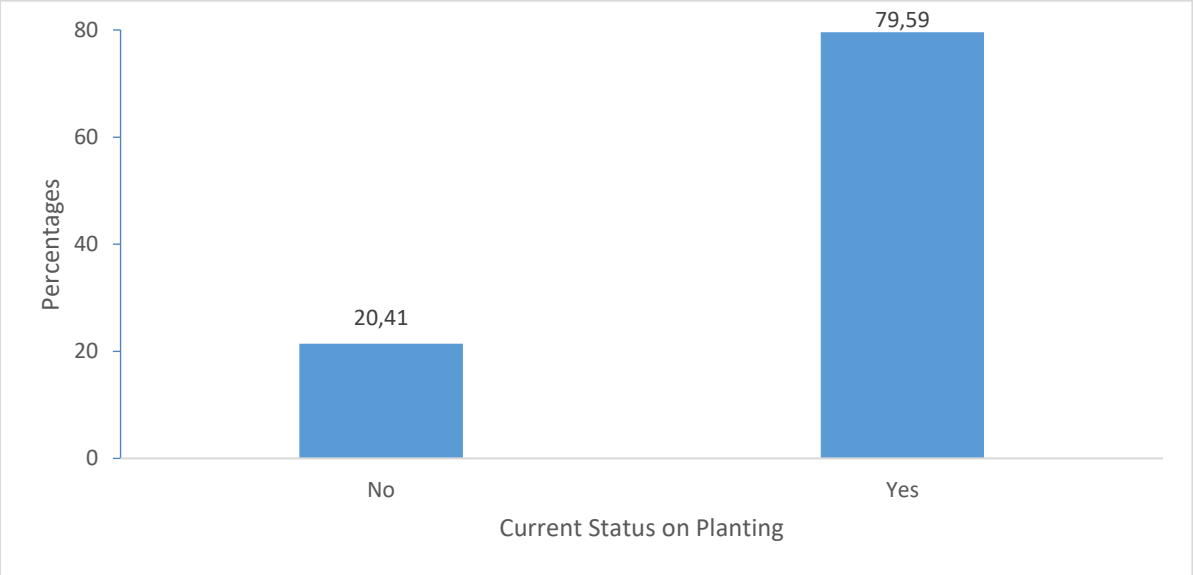


Figure 4.11: Distribution of respondents' current status regarding planting improved OPV maize (N= 100)

This showed that should the seed be available more farmers would plant it. There is therefore, a need for LDA to make the seed available to all the farmers. The other reasons provided were a clear indication that there was still more work to be done by LDA to educate non-scheme members about improved OPV maize.

Table 4.6: Percentage distribution of members and reasons for not planting improved OPV maize (N=20)

Reasons	No.	%
Seed not available when needed from scheme members	14	67
Do not like seed, requires too much work	3	14
Do not know about improved OPV maize	3	14
Do not know where to buy improved OPV maize seed	4	19
Satisfied with my seed	3	14
High cost of improved OPV maize seed, cannot afford	2	10
I heard improved OPV maize seed cannot be recycled	1	5

Note: Multiple response/reasons permitted

- **Relationship between respondents' awareness knowledge and planting of improved OPV maize**

The Null hypothesis that respondents' awareness knowledge of improved OPV maize is not significantly related to planting of improved OPV maize (Hypothesis ii) was tested by means of Chi-square test for independence.

The N-1 Chi-Square Test and its value provided by Linear-by-Linear Association was used instead of the Pearson Chi-Square because some expected cell counts fell below one (Sauro, 2013; Weaver, (2013) citing Campbell, 2007). The results of the test are summarised in Table 4.7.

The significant difference in the results indicates that awareness knowledge of improved OPV maize has a positive influence on their planting of improved OPV maize. The Null hypothesis is therefore, not supported by that data, and hence not accepted, thus leading us to accept the alternate hypothesis of a relationship between the variables tested. This finding corroborated the findings of Monyo *et al*., (2016) in Malawi and Monela (2014) in Tanzania.

Table 4.7: Distribution of respondents' awareness knowledge of improved OPV maize and planting of improved OPV maize (N= 100)

Currently planting IM OPV maize	Awareness Knowledge				Total	
	No	%	Yes	%	No	%
No	1	100	19	19.2	20	20
Yes	0	0	80	80.2	80	80
Total	1	100	99	100	100	100

X^2 = 4.000 p= .046 df= 1

4.4. Relative advantages of improved OPV maize

The concept ‘relative advantages’ derives from Düvel’s (1991) modification and reclassification of Rogers (1983) innovation attribute ‘relative advantage’. This was necessary according to Düvel, (1991), to provide for all causes of adoption behavior and cause identification. The relative advantages associated with an innovation comprise the positive forces which enhance adoption and refer to the advantages of the innovation; the negative forces which hinder adoption refer to the disadvantages of the innovation (Düvel, 1991).

- **Respondents’ awareness of disadvantages associated with OPV maize (N=80)**

To begin the discussion on this issue, respondents (scheme members and non-scheme members who received planting seed from scheme members) were requested to make an overall, simple comparison of the improved OPV maize with their previous recycled maize and to state whether they saw more disadvantages with the improved OPV maize. Respondents who indicated seeing more disadvantage were classified as a high disadvantage group; the opposite was the case and respondents were classified as a low disadvantage group.

All respondents (n= 80; 100%) indicated that OPV maize had no disadvantages compared with their previous recycled maize seed. All scheme members (n= 50; 100%) however, indicated that in some planting seasons, the ARC released only one improved OPV maize variety that all scheme members had to multiply and plant. This situation does not give them room to select from what was released by the ARC to plant their own preferred varieties. This was one of the purposes of the CBSPSs; the availability of more varieties to be released so that farmers would have the choice of planting their preferred varieties (

and Kosina, 2006). This lack of variety for farmers to select from however, is administrative constraint and not an inherent problem associated with the improved OPV maize itself.

- **Non-OPV planters' awareness of disadvantages associated with their own seed (n=20)**

Non-scheme members (40%; n=50) who were not planting improved OPV maize were asked to indicate what they saw as disadvantages associated with planting their own recycled maize seed. The wording of the question which was coded 1= Yes and 0= No, requires that the responses (Figure 4.12) be read as 80% said no to the fact that there were no disadvantages with their recycled maize seed. In other words, they indicated there were disadvantages associated with planting their recycled seed. This is a great point for the Department of Agriculture to capitalize on to promote improved OPV maize in the study areas because Non-OPV planters realize the disadvantages associated with their recycled maize seed.

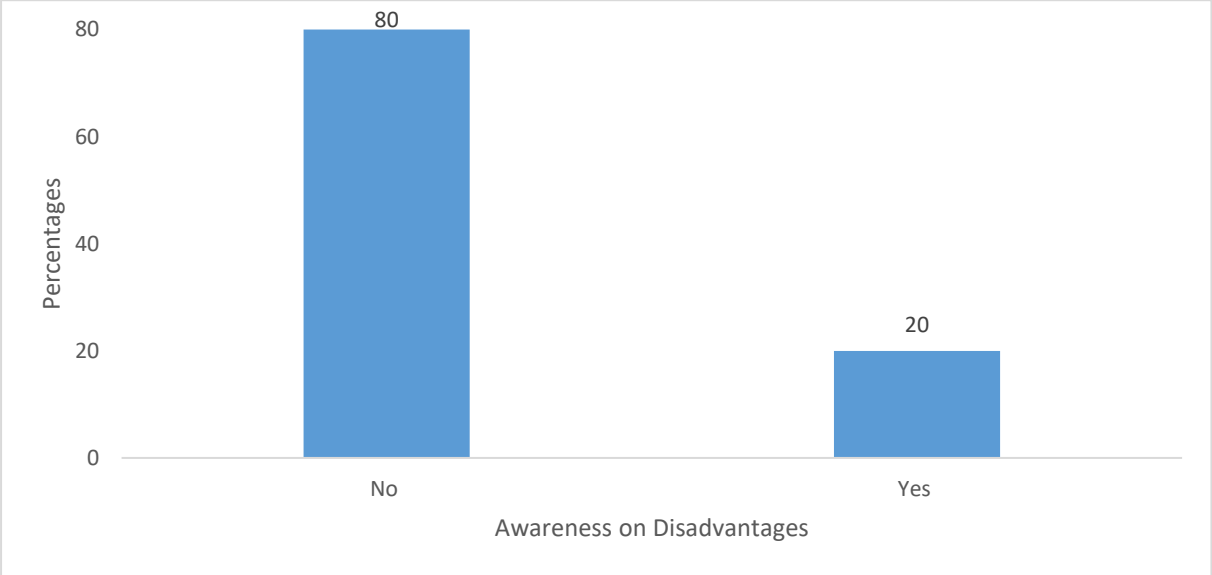


Figure 4.12: Distribution of Non-OPV planters' awareness of disadvantages with their own seeds (N= 20)

When Non-OPV maize planters were prompted further to mention specific disadvantages associated with planting their own recycled seeds, a few (10%) mentioned that the seeds get weevil infestation and that the husk leaf does not cover the kernels completely respectively (Table 4.8). Among the other disadvantages farmers mentioned (5% each) were susceptibility to drought, diseases, pests and low yield. These few numbers were a bit strange in view of the fact that most of them had indicated more disadvantages associated with their own recycled maize seed. This nevertheless, is an indication that the

farmers were experiencing challenges with the seeds from other sources compared with the improved maize OPVs seeds.

Table 4.8: Percentage distribution of Non-OPV planters' awareness of disadvantages of farmers own seeds(N=20)

	Yes	No
Disadvantages	%	%
Weevil infestation	10	90
Husk leaf does not cover kernel leaf completely	10	90
Susceptible to drought	5	95
Susceptible to diseases	5	95
Susceptible to pests	5	95
Low yield	5	95

- **Relationship between Scheme membership and respondents' views on disadvantages of improved OPV maize**

The hypothesis set in this study that respondents' views on the disadvantages of improved OPV maize are not significantly different between Scheme and Non-Scheme members who plant OPV maize (Hypothesis i) was tested by the Chi-Square test for independence. No Chi-Square statistics however, could be generated because the cross-tabulation indicates that all respondents (n= 80; 100%), scheme and non-scheme members alike, who plant improved OPV maize saw no disadvantages (Table 4.9). The Null hypothesis is thus not rejected.

Table 4.9: Distribution of scheme membership and awareness of disadvantages associated with improved OPV maize (N= 80)

Opinion	Scheme membership				Total	
	No n= 30	%	Yes n= 50	%	No	%
Low disadvantage group	30	100	50	100	80	100
High disadvantage group	0	0	0	0	0	0
Total	30	100	50	100	100	100

- **Respondents positive and negative perceptions on improved OPV maize.**

To assess the respondent's perception on improved OPV maize, respondents were asked to each mention five advantages they see with improved OPV maize, wherein the overall number of advantages mentioned was ten. Farmers with five entries were rated as positive perception and less than five as negative perceptions. The responses are summarised in Figure 4.13 in which more respondents have positive perception on improved OPV maize. This finding confirms what farmers said about the improved OPV maize varieties ZM 521 and Grace which were released in Limpopo province in 2001 (CPSI, 2007).

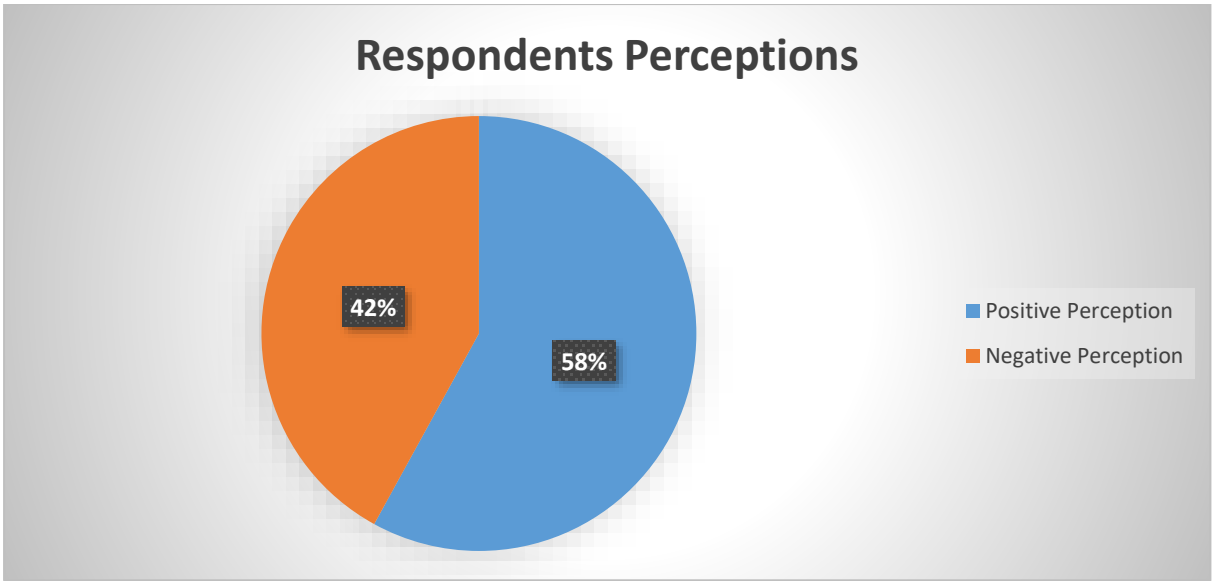


Figure 4.13: Distribution of respondent's perceptions of improved OPV maize

(N= 80)

Respondents were further asked to state six specific advantages of improved OPV maize over their own previously maize seed. More drought resistance, higher yield, higher milling weight and better taste were mentioned by an overwhelming majority of respondents as advantages over their previously recycled maize seed (Table 4.10). The two most important advantages identified by 41% and 21% of respondents were higher milling weight and higher yield respectively.

Table 4.10: Respondents' views on advantages of improved OPV maize over own recycled maize seed (N= 80)

Advantage	No. of respondents	Percentage
Higher yield	75	94
Higher milling weight	71	89
Better taste	55	69
More drought resistant	77	96
Survive better in heavy rains	6	8
Less bran but more endosperm	19	24
Early maturity	37	46
Early germination	3	4
More weed tolerant	10	13
Husk leaf covers kernel completely	18	23
Most important advantage	**No. of respondents**	**Percentage**
Higher milling weight	33	41
Higher yield	17	21
Less bran and more endosperm	1	1
Early maturity	8	10
More weed tolerant	2	3
More drought tolerant	19	24

- **Seed security and desirable traits**

Respondents' seed security was narrowly defined for this study as either having the seed already in hand or being able to access their preferred seed with some certainty (through purchase, barter, gift, or other). Respondents (Scheme members) were asked if planting improved OPV maize compared with planting their own previously recycled maize seed provided them with the seed they desire/prefer (seed security). Non-scheme members who received improved OPV maize planting seed from scheme members were also asked if the type of seed they received from scheme members (improved OPV maize) rather that their own previously recycled seed provided them with the seed they desire (seed security). Figure 4.14 shows that most respondents (66%) of respondents felt they were seed secure; slightly more than thirty per cent felt seed insecure.

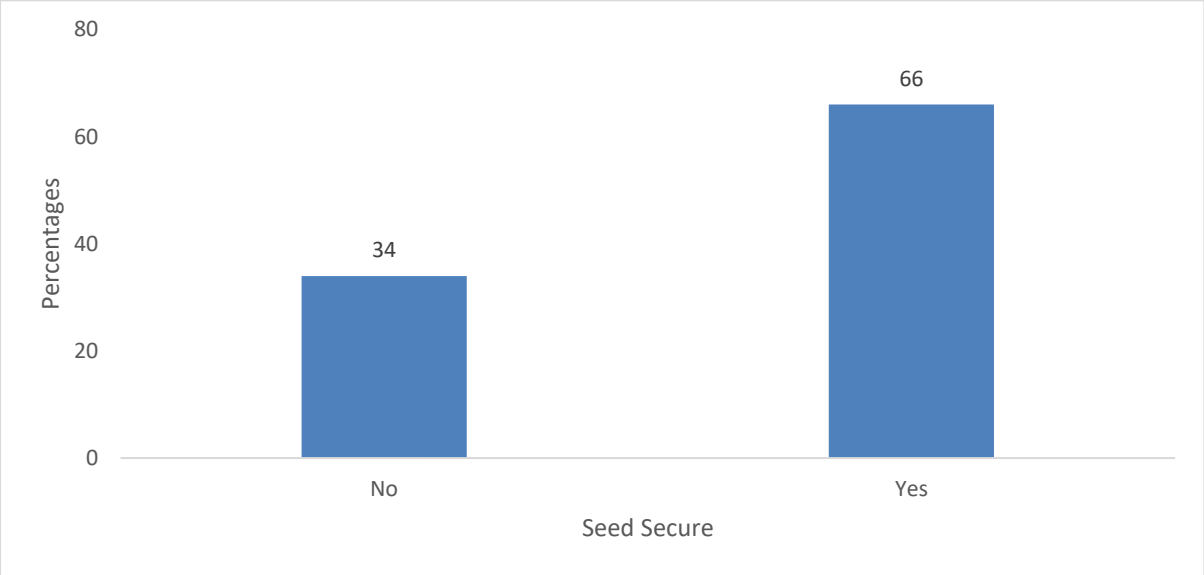


Figure 4.14 Respondents' views on their seed security (N=80)

- **Reasons for seed insecurity**

Respondents were prompted further to provide reasons why they feel they are not seed secure. The reasons between the scheme members and the non-scheme members were different. Table 4.11 shows the different reasons mentioned by both groups of respondents. Among the factors that have been found to influence the adoption of improved maize seed are geographic characteristics and availability of new varieties (Monica, 2014). However, it is clear from the results in Table 4.11 that slightly more than one-half of scheme members (54%) indicated not being provided with different varieties to choose from. The TASAI has 16 variables that measure how sub-Saharan African countries are improving seed access for smallholder farmers. Amongst the 16 indicators on the TASAI is the number of seed varieties released in the last three years (Mabaya, 2016). This complaint by respondents indicates that the ARC which is the South African government institution responsible for seed variety development and release for the CBSPSs is not doing well in this regard. Next to this major complaint, were the provision of poor quality seed in some seasons and the late delivery of seeds. On the other hand, almost all non-scheme members (97%) felt seed secure because the seed from scheme members was available for purchase during the planting season, the price was affordable and they travelled a short distance to purchase their seeds.

Table 4.11: Respondents reasons for not feeling seed secure (N= 80)

Scheme Members (N=50)			Non-Scheme Members (N=30)		
Seed Insecurity Reasons	Yes		Seed Secure Reasons	Yes	
	No.	%		No.	%
Only one variety of Improved maize OPV available each season	27	54	Improved OPV maize seed generally available for purchase during planting season	29	97
Poor quality seeds provided	11	22	Improved OPV maize seed price is affordable	29	97
Seeds are delivered late	10	20	Seed source location is not far from the farm location	29	97
Undesirable/different seed varieties are provided during some seasons	7	14			

- **Desirable traits associated with improved OPV maize**

Many factors influence decisions of smallholder farmers in adopting agricultural innovations. Some of the common traits that farmers look for in a seed variety are increased yield potential, disease resistance, pest resistance, drought tolerance and good taste (Abdi, 2013). Respondents were asked to mention some of the desirable traits of improved OPV maize seeds and the results are shown on Table 4.12. The most common desirable traits mentioned were better yield, better taste, drought tolerance, resistance to maize streak disease, resistance to stalk borer and early germination with percentages ranging from between 98 and 100%. Scheme members were told by the Department of Agriculture not to recycle or replant improved OPV maize they were supplied with and so they do not recycle their improved OPV maize seed. On the other hand, non-scheme members who obtained their planting seed (improved OPV maize) from scheme members, however, were recycling their planting seed. Yield stability was therefore, assessed for only non-scheme members (N = 30) who were planting OPV maize. Only 16 responded to the question regarding receiving the same yield or reduced yield by replanting the maize seed they received from scheme members compared with replanting their previously

owned maize seed. Their responses (Table 4.12) indicate that most of them (75%, n= 16) obtained lower yields and therefore, experienced yield instability, by recycling the improved OPV maize seeds they obtained from Scheme members. There is therefore, a need to educate these farmers not to recycle improved OPV maize planting seed but secure new every planting season for better yield.

Table 4.12: Respondents' views on desirable traits expected from current maize planting seed

Scheme Members(N=80)			Non-Scheme Members(N=16)		
Desirable trait	Yes		Desirable trait	Yes	
	No.	%		No.	%
Better yield	80	100	Yield stability	4	25
Early germination	79	99			
Better taste (roasted or boiled)	80	100			
Maize streak resistant	80	100			
Maize stalk borer	80	100			
Drought resistant	80	100			

- **Relationship between scheme membership and respondents' views on advantages of improved OPV maize**

The hypothesis set in this study that respondents' (scheme and non-scheme members who planted OPV maize) views on the advantages of improved OPV maize over respondents' previously own recycled maize are not significantly different (Hypothesis i) was tested by the Chi-Square test for independence. Similar to the discussion on disadvantages, no Chi-Square statistics could be generated because the cross-tabulation indicates that all respondents (80), scheme and non-scheme members alike, who plant improved OPV maize saw only advantages (Table 4.13). The Null hypothesis is thus not rejected and the alternative hypothesis accepted.

Table 4.13: Distribution of scheme membership and awareness of advantages associated with improved OPV maize (N= 80)

Opinion	Scheme membership				Total	
	No	%	Yes	%	No	%
Low advantage group	0	0	0	0	0	0
High advantage	30	100	50	100	80	100

group						
Total	30	100	50	100	80	100

4.5 Contributions of selected variables to variance in farmers' perceptions on the benefits of improved OPV maize.

Table 4.14 show that respondents' municipality and scheme membership had significant effect on farmer's perceptions of planting improved OPV maize seeds. This result implies that the government programmes on CBSPs have potential to change farmers' attitudes and perceptions on the advantages of improved OPV maize. It is also clear that the other explanatory variables such respondents sex, farming experience, years of schooling, farm size, income and age of participants had no significant effect on farmer perceptions of improved OPV maize.

Monela (2014) and (Hategekimana and Trant, 2002) have found different views on the relationship between farm size and the adoption behavior making it clear that farm size can either influence or not influence farmer's adoption and perceptions. On the issue of education (Nkonya, Schoroeder and Norman, 1997) and (Norris and Batie, 1987) also found different results which also makes it clear that education can either affect or not affect adoption of an innovation. Asfaw and Admassie (2014) and (Nhesamachena and Hassan, 2007) also found different results with respect to the sex of respondents. These findings can also be attributed to the roles that male and female assume in their household according to different cultures. It was therefore expected to find a lack of consistency in the results associated with behavior and adoption to socio-economic variables (Knowler and Bradshaw,2007).

Table 4.14: Logistic regression analysis of the effects of selected variables on respondents' views on the benefits of improved OPV maize (N=100)

Variables	B	S.E.	Sig.	Exp(B)
Respondent Municipality	-1.979	.751	.008***	.138
Scheme Membership	1.820	.579	.002***	6.172
Respondent Sex	.058	.545	.915	1.060
Farming Experience	.295	.382	.440	1.343
Years of Schooling	.033	.079	.674	1.034
Farm Size (ha)	-.101	1.054	.924	.904
Income	-.060	.776	.938	.941
Age of Participant (Years)	.006	.030	.831	1.006
Constant	-.866	1.829	.636	.421
Pseudo R squared	0.363			
Chi-Square	3.897			

*** Significant at 1% level

4.6. Summary

The general perception of the respondents (Scheme and Non-Scheme members) on CBSPSs is that since the introduction of these CBSPS they are more seed secure and that planting improved OPV maize helps them achieve their goals which include feeding the families and eradication hunger among others. It is observed that a lot of respondents' including even those that are not in the Schemes are aware of improved OPV maize seed and are also planting it.

All the farmers who are planting improved OPV maize have also shared that they see more advantages and no disadvantages with planting improved OPV maize seed compared to planting their own previously recycled maize seed. These advantages and the absence of any disadvantages are obvious to both scheme and non-scheme members which makes the promotion of improved OPV maize easier.

Furthermore, it is also observed that Scheme members have more benefit more from the CBSPSs than the Non-scheme members as they have first-hand access to improved OPV maize seed that they do not purchase and also receive extension support from the extension officers, albeit few extension contacts. It is still a challenge
or Non-Scheme members to get the improved OPV maize seed as they claim that the seed is not available from the Scheme members for purchase. The finding of a significant relationship between awareness knowledge and planting OPV maize bodes well for putting strategies in place to publicize OPV maize.

The promotion of improved OPV maize to enhance its adoption should be coupled with a renewed effort to release more than one variety which is widely available so farmers can multiple and sell those that they prefer.

CHAPTER 5

SUMMARY OF RESULTS, RECOMMENDATIONS AND CONCLUSION

5.1. Introduction

Seed, and quality seed for that matter and its availability is a key input for improving crop production and productivity (Monela, 2014; Atilaw, 2010); to alleviate poverty and ensure food security (Tahirou, Sanogo, Langyintuo, Bamire and Olanrewaju, 2009). Access to quality seed stimulates technology uptake and increase agricultural productivity in smallholder agriculture (Monela, 2014).

The Limpopo Department of Agriculture and Rural Development (LDARD) introduced the CBSPs with aim to make quality seed available to small holder farmers. Therefore, it became critical for the perception of farmers on CBSPs to be evaluated. The evaluation in this study focused on describing farmers' perceptions and adoption of improved OPVs maize released by the CBSPSs in Limpopo province. Purposeful research requires that its conclusions be based tested hypotheses which should answer the research questions. A summary of the main study findings together with conclusions reached from the study and recommendations are outlined next.

5.2. Summary of the findings

The problem investigated in this study relates to the little research attention to evaluate CBSPSs based on its main product, which in this study is, improved OPV maize using a conceptual framework from behaviour adoption literature, to assess farmers' awareness knowledge and other perception-related issues of improved OPV maize since its implementation. The assessment led to the generation of objectives hypotheses whose main findings are as follows:

- The significant difference in the results of respondents' awareness knowledge and planting of improved OPV maize indicates that awareness knowledge of

improved OPV maize has a positive influence on the planting of improved OPV maize. Thus, the null hypothesis was not supported.

- The results of the distribution of respondents (Scheme and Non-Scheme members) on their awareness of disadvantages of improved OPV maize showed that all respondents comprising both groups saw no disadvantages compared to their previously recycled maize seed. This finding warranted no further hypothesis test and led to the conclusion that there was no significant difference between Scheme and Non-Scheme members regarding their views on the existence of disadvantages of improved OPV maize. Thus, the null hypothesis was accepted.
- Similarly, the results of the distribution of respondents (Scheme and Non-Scheme members) on their awareness of more advantages of improved OPV maize over their previously recycled maize seed showed that all respondents comprising both groups saw more advantages. This finding warranted no further hypothesis test and led to the conclusion that there was no significant difference between Scheme and Non-Scheme members regarding their views on the existence of more advantages of improved OPV maize over their previously recycled maize. The null hypothesis was, therefore, accepted.
- The hypothesis that farmers' characteristics such as respondent's municipality, scheme membership, respondents sex, farming experience, years of schooling, farm size, income and age of participant do not significantly influence their perceptions on the benefits of improved OPV maize was tested. The results show that respondent's municipality and scheme membership have significant influence whereas other factors do not have significant influence. This study recommends that the CBSPS should be encouraged as in areas where they are farmers are likely to have positive perceptions on OPV and thereby improve the rate of adoption.

5.3. Conclusions

With respect to the study's first objective, that is, to determine respondents' awareness knowledge and planting of improved OPV maize, it can be concluded that the information about improved OPV maize had reached many farmers in the maize planting communities. The fact that more half of non-scheme farmers are planting

improved OPV maize which they source from scheme members indicates that word-of-mouth advertisement is spreading the news about the innovation. However, it appears that LDARD has not made improved OPV maize widely available among

farming communities in the province. This is because 17 years since its implementation, it is expected that by now a far greater majority of subsistence and smallholder farmers who want to plant it would have access to it and therefore, plant it. The opportunity of widespread adoption is being missed. This assertion is based on the findings in literature that the availability of an innovation and the awareness knowledge of an innovation that is perceived to have more advantages than disadvantages leads to adoption.

The conclusion regarding the second objective of this study, that is, assessing farmers' (planters and non-planters of improved maize OPVs) views on the advantages, disadvantages of improved maize OPVs between Scheme and Non-Scheme members, shows that even non-scheme members, just as scheme members recognize that planting improved OPV maize has more benefits than their own previous, recycled seed. This finding again begs the question why improved OPV maize seed has not received the publicity it deserves and made widely available to generate widespread adoption by subsistence and smallholder maize farmers in the province. Again, the LDARD has not taken advantage of findings in the literature that most subsistence and smallholder farmers' have an overall positive attitude towards improved open-pollinated maize seed (Monela, 2014).

Concluding statement one can make about the variables in research objective three appear to differ with literature regarding the influence of these variables in the logistic model on adoption of agricultural technologies, in this case, improved OPV maize. For example, the positive perceptions of all respondents who plant OPV maize, scheme and non-scheme members alike, of more advantages and lack of disadvantages of OPV maize compared with their previously recycled maize seed provide a motivation for them to plant improved OPV maize. This corroborates extant literature regarding the influence of these mediating variables in the adoption of agricultural innovations. In other words, a positive perception of the advantages of an

innovation leads to its adoption while a view of more disadvantages leads to non-adoption. It is not surprising that of the other six variables, which form part of the commonly called ‘independent variables’ in research, in the logistic model, two, namely, respondents municipality and scheme membership have a positive influence on the relationship between planting improved OPV maize and positive perception.

The findings in this study regarding the influence of the variables in the logistic model are consistent with and add to the extant literature regarding the lack of systematic impacts of the independent variables on adoption as opposed to the systematic influence of the mediating variables of advantages and disadvantages on adoption. This implies that researchers need to be aware that these independent variables appear to be situation-specific insofar as they influence on adoption of agricultural innovations and therefore, need to be identified through situation-specific analysis.

5.4. Recommendations

The researcher makes the following recommendations based on the core findings of the study. The recommendations are made to important stakeholders in the seed schemes in the Limpopo province in order to increase diffusion and widespread adoption of improved OPV maize (add) among farming communities in the province. These recommendations relate to technical and business capacity development of seed producers, availability of more varieties and supportive pro-poor agricultural producers’ policy:

- Non-scheme farmers who have shown the desire to participate in the schemes need to be supported by the extension service to form their own schemes.
- Extension contact with seed producers also needs to be increased to at least once a week during and after the planting season. Farmers need to be trained more frequently on agronomic issues, seed multiplication.
- The LDARD must emphasize turning smallholder seed production into profitable businesses by implementing more training programmes on the business side of seed multiplication so that farmers are able to generate income and achieve household food security. This will also require active effort to forge closer link between seed producers and the ARC so that the ARC can release more than one improved OPV maize variety per season for

farmers to choose their preferred varieties for multiplication and sale to others in their communities. The LDARD must ensure improved OPV maize is available to non-scheme members. New links should also be opened with financial and credit institutions coupled with market information to support producers.

- Future studies on these seed schemes could look into the production and financial issues of CBSPS to ascertain their profitability and sustainability.

REFERENCES

Abakemal, D., Hussein, S., Derera, J. and Laing, M. 2013. Farmers' Perceptions of Maize Production Systems and Breeding Priorities, and Their Implications for the Adoption of New Varieties in Selected Areas of the Highland Agro-Ecology of Ethiopia*. Journal of Agricultural Science* 5:1-14.

Afari-Sefa, V. Karanja, D.K., Rajendran, S., Chagomoka, T., Samali, S., Katunzi,A., Mtwaenzi, H., Kimenye, L and Kessy, R. 2013. Farmer-led seed enterprises as a strategy for improving smallholder income through private contracting and community seed production of traditional vegetables in Tanzania in FAO & ICRISAT. 2015. Community Seed Production, by Ojiewo CO, Kugbei S, Bishaw Z & Rubyogo JC, eds. Workshop Proceedings, 9-11 December 2013. FAO, Rome & ICRISAT, Addis Ababa. 176 pp. Retrieved 25 August, 2016 from: http://www.fao.org/3/a-i4553e.pdf.

African Centre for Biodiversity. 2016. Integration of small-scale farmers into for centre for biodiversity. Retrieved 20 January, 2017 from: http://www.acbio.org.za.

Afful, D.B., Obi, A. and Lategan, F.S. 2013. Contributions of mediating and independent variables to the adoption of co-financing public extension visits*. Journal of Agricultural Extension and Rural Development,* 5(11): 256-265.

Afful, DB., Obi, A. and Lategan, FS. 2013. The relative attractiveness of payment for the delivery of public extension visits. *Journal of Development and Agricultural Economics, Vol*. 5(12), pp. 490-498.

Afful, D.B. 2012. *Payment for the delivery of public agricultural extension services*: A needs–based analysis of medium and small–scale commercial crop farmers

in the Free State Province of South Africa. PhD Thesis, University of Fort Hare, Alice, South Africa.

Ajayi, A.O. 2006. An Assessment of Farmers‟ willingness to pay for extension services using the Contingent Valuation Method (CVM*)*: The case of Oyo State, Nigeria‟, *The Journal of Agricultural Education and Extension*, 12(2): 97-108.

Aloyce R.M., Verkuijl, K.H., and Mwangi, W. 2000. Factors affecting adoption of improved maize seeds and use of inorganic fertilizer for maize production in the intermediate and lowland zones of Tanzania. *Journal of Agricultural and Applied Economics*, 32 (1):35–47.

Annor-Frempong, C. 2013. The influence of intervening variables and subjective norms on the adoption behaviour of small scale farmers in South Africa and Lesotho. PhD Thesis, University of Pretoria, South Africa.

Arts, J.W.C., Frambach, R.T., and Bijmolt, T.H.A. 2011. Generalizations on consumer innovation adoption: A meta-analysis on drivers of intention and behaviour.

Retrieved 20 June 2017 from: http://ssrn.com/abstract=2001934.

Asfaw, A., & Admassie, A. (2004). The role of education on the adoption of chemical fertilizer under different socioeconomic environments in Ethiopia. *Agricultural Economics* 30 (3), 215–228.

Assaye, A., Melak, A., Ayalew, B., Teshale, D. and Mazengia, Y. 2015. Assessment of seed systems in North Western Ethiopia; with special emphasis on community based seed multiplication scheme. *World Scientific News*,12 (2015) 100-110.

Astatike, M., Yimam, A., Tsegaye, D., Kefale, M. and Mewa, D. 2012. Observation on Direct Seed Marketing in Amhara Region*.* Integrated Seed System Development Project (ISSD), Bahir Dar University. ISSD National Partnership Coordinator*.*

Atilaw, A. and Korbur, I. 2010. Recent development in seed systems of Ethiopia*.* Debre Zeit Research Center. Ethiopian Institute of Agricultural Research. Retrieved 21 January, 2017 from: http://www.jica.go.jp/project/english/ethopia,001/.../ Seminar proceedings 0103.pdf.

Badu-Apraku, B., Asuboah, RA., Fakorede, B. and Asafo-Adjei, B. 2014. Strategies for sustainable maize seed production in West and Central Africa. Retrieved 22 June, 2017 from: https://cgspace.cgiar.org/handle/10568/80830.

Bafana, B. 2015. Africa needs young people to get into agriculture. Retrieved 22 June, 2017 from: http://www.thenewage.co.za/africa-needs-young-people-to-get-into- agriculture/.

Baloyi, J.K. 2010. An analysis of constraints facing smallholder farmers in the Agribusiness value chain: A case study of farmers in the Limpopo Province. University of Pretoria.

Barry, J. and Proops, J. 1999. Seeking Sustainability Discourses with Q Methodology. Ecological Economics, 28; 337-345. *Journal of Development and Agricultural Economics*, Vol. 5(12), pp. 490-498.

Benin, S., Nkonya, E., Okecho, G., Randriamamonjy, J., Kato, E., Lubadde, G., Kyotalimye, M., and Byekwaso, F. 2011. Impact of Uganda's National Agricultural Advisory Service Program.

Bishaw, Z. and Niane, A.A. 2013. Are Farmer-Based Seed Enterprises Profitable and Sustainable? Experiences of VBSEs from Afghanistan in FAO & ICRISAT. 2015. Community Seed Production, by Ojiewo CO, Kugbei S, Bishaw Z & Rubyogo JC, eds.

Bishaw, Z. and Niane, A.Z. 2013. Are Farmer-Based Seed Enterprises Profitable and Sustainable? Experiences of VBSEs from Afghanistan, Workshop Proceedings. 9-11.

Budak, D.B., Budak, F. and Kaçira, O. 2010. Livestock producers needs and willingness to pay for extension services in Aduna Province of Turkey. Afr. J. Agr. Res., (11):1181-1190.

Campbell, R.R. 1996. *Suggested paradigm of the individual adoption process*. *Rural Sociology*, 31:458-466.

Centre for Public Service Innovation. 2007. Community-Based Seed Production: Limpopo farmers' strategy to resist drought. Case Study 2007/05. Retrieved 10 May, 2017 from: http://unpan1.un.org/intradoc/groups/public/documents /CPSI/UNPAN026456 pdf.

Department of Agriculture, Forestry and Fisheries. 2017. Economic Review of the South African Agriculture, 2016. Retrieved 17 June, 2017 from: http://www.daff.gov.za/Daffweb3/Portals/0/Statistics%20and%20Economic%0Analysis/Economic%20Analysis/Economic%20Review%202016.pdf.

Department of Agriculture, Forestry and Fisheries (DAFF). 2017. Trends in the Agricultural Sector. Retrieved 16 January, 2018 from: http://www.daff.gov.za/Daffweb3/Portals/0/Statistics%20and%20Economic%20Analysis/Statistical%20Information/.Trends%20in%20the%20Agricultural%20Sector%202016.pdf.

Diederen, P., Van Meijl, H., Wolters, A. and Bijak, K. 2002. Innovation adoption in agriculture*:* Innovators, early adopters and laggards. Du Plessis, J. 2003. Retrieved 28 May, 2017 from: www.arc.agric.za/arc gci/Fact%20Sheets%20Library/Maize%20Production.pdf.

Düvel, G. H. 1975. The mediating functions of perception in innovation decision making. *S. Afr. J. Of Agric. Ext*. Vol. 4: 25-36.

Duvel, G.H. 1991. Towards a model for the promotion of complex innovations through programmed extension. *S. Afr. J. Agr. Ext*., vol. P. 70-86.

Erasmus, B. J., Loedolff, P. V. S., Mda, T. and Nel, P. S. (2006). Management Training and Development. Cape Town: Oxford University Press.

Evenson, R.E. and Mwabu, G. 1998. The effects of agricultural extension on farm yields in Kenya. Retrieved 24 August 2016 from: http://ageconsearch.umn.edu/bitstream/28509/1/dp980798.pdf

Fishbein, M. and Ajzen, I. 1975. Belief, attitude, intention and behaviour: an introduction to theory and research, Addison-Wesley Publishing Company. Inc, Philippines.

Food Agricultural Natural Resources Policy Analysis Network. (n.d). Youth in Agriculture. Retrieved 29 September, 2016 from: http://www.fanrpan.org/projects/youth-in-agriculture/.

Frost, S. J. 1996. Integrating industry resources and community development. Retrieved 02 June, 2017 from: http://files.eric.ed.gov/Fulltext/ED418216.pdf.

Gautam, M. 2000. Agricultural Extension: The Kenya Experience: An Impact Evaluation. World Bank, Washington DC.

Habtemariam, A.G. 2004. The Comparative Influence of Intervening Variables in the Adoption Behaviour of Maize and Dairy Farmers in Shashemene and Debrezeith, Ethiopia. Phd thesis, University of Pretoria, Pretoria, South Africa.

Hategekimana, B. and Trant, M. 2002. Adoption and diffusion of new technology in agriculture: Genetically Modified corn and soybean. Canadian Journal of Agricultural economics. Agriculture Division, Statistics Canada, Ottawa, Ontario.

Hunt, D. and Lipton, M. 2011. Green Revolutions for sub-Saharan Africa? A briefing paper published under Chatham House's Africa Programme. Retrieved 27 June 2016 from: http://www.chathamhouse.org/publications/papers/view/109557.

Israel, 1982. The training and visit system: A warning (Projects Advisory Staff Paper). Washington, DC: World Bank.

Jona C.N.I., Terblanché, S.E. 2015. Farmers' perception on contact frequency, adequacy, relevance and quality of agriculture support services (ASS) in Oshikoto region in Namibia. *S. Afr. J. Agric. Ext.* 3(1): 107-121.

Kibirige, D. 2013. The Impact of Human Dimensions On Smallholder Farming in The Eastern Cape Province of South Africa. PhD thesis, University of Fort Hare, Alice South Africa.

Knowler, D. and Bradshaw, B. 2007. Farmers' adoption of conservation agriculture: A review and synthesis of recent research. *Food Policy*, 32, 25–48.

Koch, B. H. 1987. Problem perception as precondition of behaviour change. *S. Afr. J. Of Agric. Ext*. 16:19-25.

Lewin, K. 1951. Field Theory in Social Science. Selected Theoretical Papers. Harper & Row, New York.

Lenksjö, A & Nordzell, H. 2014. Willingness to pay for improved maize seeds among smallholder farmers: A study of the input factor market in Kenya. Retrieved 28 November 2016 from: http://stud.epsilon.slu.se.

Louis T.G. and Klein, K.J., 1982. Innovation Characteristics and Innovation Adoption Implementation: A Meta-Analysis of Findings, IEEE *Transactions on Engineering Management,* 29 (1): 8-45.

Lyimo, N.G. 2005. Improving farmers access to and management of disease resistant cultivars in southern highlands of Tanzania. Crop protection programme

Mabaya, E. 2016. *Performance of the formal seed sector in Africa*: Findings from the African Seed Access Index. Retrieved 26 July, 2017 from: http://ageconsearch.umn.edu/bitstream/249271/2/326.%20Performance%20%20the%20formal%20seed%20sector%20in%20Africa.pdf

Mafsikaneng, N.A. 2015. Evaluation of extension support within comprehensive agricultural support program in the Tshwane Metropolitan Municipality. Master's Thesis, University of Limpopo, South Arica.

Mashingaidze, K. 2006. Farmer-participatory maize (Zea maize L.) cultivar evaluation and selection in Eastern Cape Province of South Africa. Presented at the 2006 International Plant Breeding Symposium, 20 – 25 August 2006. Mexico City, Mexico.

Mastenbroek, A. 2013. Local Seed Businesses in Uganda: A Market-Oriented Approach Towards Community Seed Production. Community Seed Production, by Ojiewo CO, Kugbei S, Bishaw Z & Rubyogo JC, eds. Workshop Proceedings, 9-11 December 2013. FAO, Rome & ICRISAT, Addis Ababa. 176 pp. Retrieved 31 March, 2017 from: http://www.fao.org/3/ai4553e.pdf.

Mkhari, J.J., Matlebjane, M.R., Dlomu, K.P., Mudau, N.D. and Mashingaidze, K. 2004. Case Study of a Community-based Seed Production Scheme in two Districts of the Limpopo Province, South Africa Challenges in (eds.)′, PS Sentimela, M Monyo, M Banzinger, Successful Community-based Seed production Strategies, CIMMYT, Mexico, DF, p. 14-19.

Mkhari, J.J., Matlebjane, M.R., Dlomu, K.P., Madau, N.D., and Mashingaidze, K. 2006. Case study of a Community-based Seed Production Scheme in two districts of the Limpopo Province, South Africa. In Setimela, P. S. & Kosina, P. (eds) Strategies for Strengthening and Scaling up Community-based Seed Production. Mexico, D.F., CIMMYT.

Monela, A.G. 2014. Access to and adoption of improved seeds by smallholder farmers in Tanzania: Cases of Maize and Rice Seeds in Mbeya and Morogoro Regions. MA Dissertation, Sokoine University of Agriculture, Morogoro, Tanzania.

Monica, K.K. 2014. Seed Systems and Climate Change: Exploring Perceptions and Options for Building Resilience of Farmer Seed Systems in Uganda. Retrieved 02 November, 2016 from: https://www.africaportal.org/publications/seed systems-and-climate-change exploring-perceptions-and-options-for building-resilience-of-farmer-seed systems-in-uganda/.

Monyo, E.S., Mgonja, M.A. and Rohrbach, D.D. 2004. An Analysis of Seed Systems Development, with special reference to Smallholders Farmers in Southern Africa: Issues and Challenges in (eds.), PS Sentimela, M Monyo, M Banzinger, Successful Community-based Seed Production Strategies, CIMMYT, Mexico, DF, Vol. 19, pp. 1 10.

Monyo, E.S., Ganga R.A.O., Ojiewo, C., Simtowe, F., Rubyogo, J.C., Varshney RK. And Gowda, C.L.L. 2016. The Seed Constraint: New approaches for smallholder agriculture in eastern and southern Africa. Retrieved 21 June, 2017 from: http://oar.icrisat.org/9977/1/CP.

Mphalala, D. and Sebei, T. 2007. Community-Based Seed Production: Limpopo farmers' strategy to resist drought. Case Study 2007/05. Retrieved 27 July, 2016 from: http://unpan1.un.org/intradoc/groups/public/documents/CPSI/UNPAN026456 pdf.

Msuya, C.P. 2007. The comparative role of intervening and independent variables in the adoption behaviour of maize growers in Njombe District. Tanzania, PhD thesis, University of Pretoria, South Africa.

Msuya, C.P. 2016. The comparative role of independent and intervening variables on influencing the adoption of nitrogen fertilization among maize growers in the Njombe district. *S. Afr. J. Agric. Ext*. 44(2): 1 – 18.

Mula, MG., Saxena, KB., Gaur, P and Upadhyaya, H. 2013. *Legumes Seed System in Asia*: A Case in India in FAO & ICRISAT. 2015. Community Seed Production, by Ojiewo CO, Kugbei S, Bishaw Z & Rubyogo JC, eds. Workshop Proceedings, 9-11 December 2013. FAO, Rome & ICRISAT, Addis Ababa. 176 pp. Retrieved 25 June, 2017 from: http://www.fao.org/3/a-i4553e.pdf.

Mywish, M., Julie, H., Duncan, B., Anwar, N., Mariah, W. and Kei, K. 1999. Increasing Seed System Efficiency in Africa: Concepts, Strategies and Issues. MSU International Development Working Paper No. 77, 1999. Michigan State University.

Nagy, J. and Fawcett, S.B (eds). 2016. A framework for program evaluation: A Gateway to Tools. Work Group for Community Health and Development (WGCHD). Retrieved 02 April, 2016 from: https://www.google.com/search?q=A+Framework+for+Program+Evaluation+3A+A+Gateway+to+Tools&ie=utf-8&oe=utf-8.

Nandi, A.K, Das, B. and Sable, M. 2013. Production and marketing strategy of seeds for developing countries. Journal of crop and weed, 9(1):32-35. Retrieved 14 February 2017 from: <http://www.upa.pdx.edu/OA/newsom/da1/ho_z-test.pdf>

Nhemachena, C. and Hassan, R. 2007. Micro-level analysis of farmers' adaptation to climate change in Southern Africa. IFPRI Discussion Paper No. 00714. International Food Policy Research Institute, Washington, D.C.

Nkonya, E., Schroeder, T. and Norman, D. 1997. Factors affecting adoption of improved maize seeds and fertilizer in Northern Tanzania. Amer. Agr. Econ. 48(1997): 1–12.

Norris, E. & Batie, S. (1987). Virginia farmers' soil conservation decisions: an application of Tobit analysis. *Southern Journal of Agricultural Economics* 19 (1), 89– 97.

North Central Rural Sociology Committee. 1961. Adopters of new ideas: Characteristics and Communication behaviour. North Central Regional Publication No. 13.

Oni, S.A., Nesamvumi, A.E., Odhiambo, J.J.O and Dagada, M.C. 2013. Executive summary of a study of agricultural industry of Limpopo Province. Retrieved 17 February, 2017 from: http://policyresearch.limpopo.gov.za/bitstream/handle/123456789/636/Agric%20Study%20Summary.pdf?sequence=1.

Pallant, J. 2007. SPSS Survival Manual: A Step-by-Step Guide to Data Analysis Using SPSS Version 17 (3rd edition). McGraw-Hill, Berkshire.

Pixley, K. and Bänziger, M. 2004. Open-pollinated maize varieties: a backward step or valuable option for farmers? Retrieved 20 February, 2017 from: https://www.researchgate.net/publication/266219759.

Rogers, E.M. and Shoemaker, F.F. 1971. Communication of innovations: *A cross cultural approach (2nd edition).* Rinehart & Winston, New York.

Rogers, E.M. 1983. Diffusion of Innovations (3rd edition). The Free Press, New York.

Rogers, E.M. 2003. Diffusion of innovations (5th edition). New York: Free Press.

Ryan, B. and Gross, N. 1943. The diffusion of hybrid seed corn in Iowa communities. Rural Sociology, 8(1):15-24.

Sauro, J. 2013. Best practices for using statistics on small sample sizes. Retrieved 24 March, 2016 from: http://www.measuringu.com/blog/small-n.php.

Setimela, P.S. and Kosina, P. (eds) .2006. Strategies for strengthening and scaling up Community-based Seed Production. Mexico, D.F.: CIMMYT.

Setimela P.S, Mhike X., MacRobert J.F. and Muungani D. 2006. *Maize hybrids and open-pollinated varieties: seed production strategies.* Strategies for strengthening and scaling up community-based seed production. Mexico, CIMMYT.

Shabangu, R. G. 2015. Evaluation of Masibuyele Emasimini programme with reference to food security at New Forest irrigation scheme in Bushbuckridge municipality of Ehlanzeni district in Mpumalanga province. Master's Dissertation, University of Limpopo, Sovenga, South Africa.

Shargie, N. (2015). In the spotlight: Sorghum seed production by smallholder farmers. Retrieved 27 June, 2017 from: http://www.grainsa.co.za/in-the spotlight:sorghum-seed-production-by-smallholder-farmers.

Sihlobo, W. 2015. The youth are agriculture's future. Retrieved 17 June, 2017 from: *https://mg.co.za/article/2015-06-18-the-youth-are-agricultures-future*.

Statistical Solutions. 2018. Binary logit regression. Retrieved 20 April 2018 from: http://www.statisticssolutions.com/binary-logistic-regression/

Statistics South Africa. 2016. Community Survey 2016: Statistical release Retrieved, 10 June, 2017 from: http://www.statssa.gov.za

Stockburger, D.W. 1998. Multivariate Statistics: Concepts, Models and Applications. Retrieved 25 August, 2016 from: http://www.psyhstat.missouristate.edu/multibook/mlt00.htm.

Swanepeol, B. J., Erasmus, B. J. and Sch,enk, H. W. 2008. South African human resource management: Theory and practice. Cape Town: Juta and Co. Ltd.

Tagne, A, Feujio, T.P, Sonna, C, 2008. Essential oil and plant extracts as potential substitutes to synthetic fungicides in the control of fungi.

Tahirou, A. Sanogo, D., Langyintuo, A., Bamire, S.A. and Olanrewaju, A. 2009. Assessing the constraints affecting production and deployment of maize seed in DTMA countries of West Africa.

The African Seed Access Index. 2015. South Africa brief, March 2015. Retrieved 27 September, 2016 from: http://tasai.org/wp-content/uploads/SOUTH-AFRICA BRIEF-final.pdf.

Tolman, E.C. 1967. A psychological model, in T. Parsons & E.A. Shils (Eds.), Towards a general theory of action. Harvard University Press, Cambridge.

Tornatzky, Louis G., Katherine J. and Klein, 1982. *Innovation Characteristics and Innovation Adoption-Implementation:* A Meta-Analysis of Findings," *Transactions on Engineering Management,* 29 (1): 28-45.

Tripp, R. and Rohrbach, D.D. 2001. Policies for African Seed Enterprise. *Food Policy* 26:147-161.

Walsh S, Remington T, Kugbei S and Ojiewo, C.O. 2013. Review of Community Seed Production Practices in Africa Part 1: Implementation Strategies and Models,

in FAO & ICRISAT. 2015. Community Seed Production, by Ojiewo CO, Kugbei S, Bishaw Z & Rubyogo JC, eds. Workshop Proceedings, 9-11 December 2013. FAO, Rome & ICRISAT, Addis Ababa. 176 pp. Retrieved 31 March, 2017 from: http://www.fao.org/3/ai4553e.pdf.

Weaver, B. 2013. Assumptions/Restrictions for Chi-square Tests on Contingency Tables. Retrieved 19 June, 2017 from: http://www.iancampbell.co.uk/twobytwo/calculator.htm.

Workshop Proceedings, 9-11 December 2013. FAO, Rome & ICRISAT, Addis Ababa. 176 pp. Retrieved 31, August 2017 from: http://www.fao.org/3/a-i4553e.pdf.

APPENDICES

Appendix A: Letter requesting permission to conduct a study

Letter to the Acting Director of Research Services. Limpopo Department of Agriculture and Rural Development

Dr. SB Dikgwatlhe
67/69 Biccard Street
POLOKWANE
0700
25 August 2016

PHALA MAHLATSE (200806370)
School of Agriculture and Environmental Sciences
Department of Agricultural Extension
University of Limpopo,
Sovenga

Re: Evaluation of farmer's perceptions on community-based seed production schemes in Polokwane and Lepelle-Nkumpi, Municipalities, Limpopo Province.
Dear Dr. SB Dikgwatlhe

I am an Agricultural Extension Master's degree student at the University of Limpopo who wants to conduct research as part of my study. The study aims to achieve the following objectives:

i. Determine respondents' awareness knowledge and planting of improved OPV maize.

ii. Assess farmers' (planters and non-planters of improved maize OPVs) views on the advantages, disadvantages of improved maize OPVs between Scheme and Non-Scheme members.
iii. Analyse the psychological variables of farmers that influence their views on whether planting improved OPV maize helps to achieve one's primary goal.

The main purpose of the study is to investigate farmers' perceptions and adoption of improved OPV maize varieties released by the CBSPSs in Limpopo province. My hope is to conduct the study in the six community based seed production schemes that are based in Polokwane and Lepelle-nkumpi municipality in the province (Scheme members). The study will also include community members who are planting maize but are not part of the scheme (Non-Scheme members).

The information gathered will remain confidential and identities of participants will be protected. The farmers will be informed about the study though their respective Extension officers.

Appendix B: Letter of permission to conduct a study

Confidential

67/69 Biccard Street, POLOKWANE, 0700, Private Bag X9487, Polokwane, 0700 Tel: (015) 294 3135 Fax: (015) 294 4512 Website: http://www.lda.gov.za

Ref: 12R
Enquiries: Dr. SB Dikgwatlhe
015 294 3229
21 December, 2016
PHALA MAHLATSE (200806370)
School of Agriculture and Environmental Sciences
Department of Agricultural Extension
University of Limpopo,
Sovenga

Re: EVALUATION OF FARMERS' PERCEPTIONS OF COMMUNITY-BASED SEED PRODUCTION SCHEMES IN POLOKWANE AND LEPELLE-NKUMPI MUNICIPALITIES, LIMPOPO PROVINCE.

1. Your request for permission to conduct research has reference.

2. Kindly take note that your request to conduct Research in Limpopo Province under Capricon District has been officially recommended and approved. You will also be required to present your proposal to the LDARD-Research Forum/Committee, failure to do so will result in the retraction of the recommendation and the approval thereof. You are kindly required to visit office of the **Director: Capricon District** in conjunction with Lepelle-Nkumpi Local Agricultural Office before you begin with your work, in order to brief them on the study and your request, this in raising awareness. The department is prepared to embark on any activity to make research work possible in order to improve the livelihood of the communities in our province.

3. Kindly take note that you will be expected to hand over a copy of your final report to the department for record purposes as well as for reporting. Furthermore, you may also be invited to share your findings in the departmental research platforms.

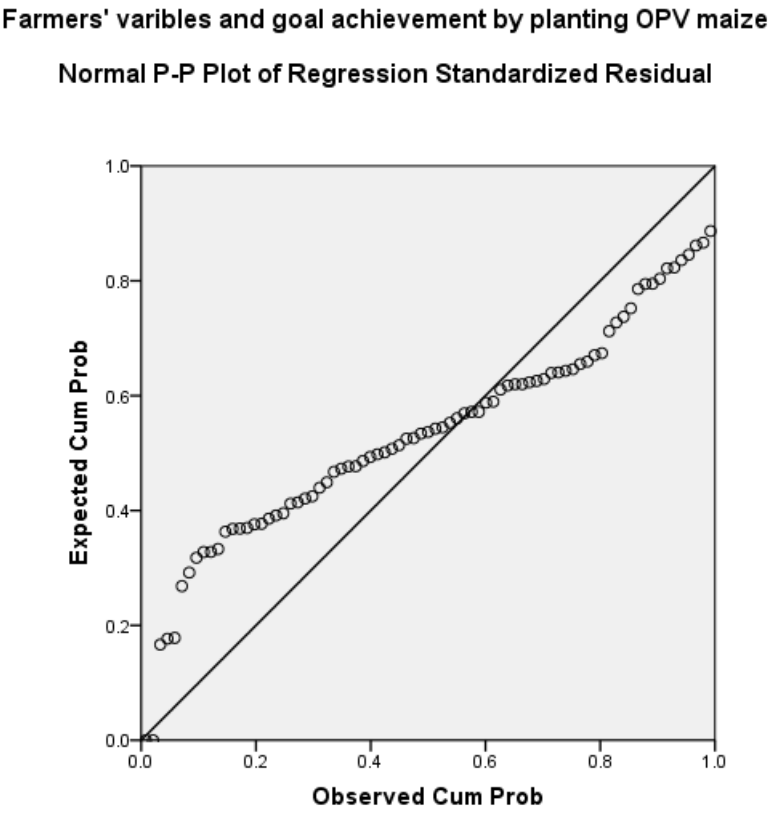
4. Hoping that you will find this in order.

Kind regards
21, December 2016

_____ _____

Dr. S.B. DIKGWATLHE Date
ACTING DIRECTOR - RESEARCH SERVICES

Appendix C: Normal Probability Plot or Regression



Appendix D: Research questionnaire for Scheme Members

SCHEME MEMBERS

KINDLY ANSWER THE FOLLOWING QUESTIONS.

1. Participant Name and surname	
2. Questionnaire no.	
3. Seed project name	
4. Date	
5. Contact details	

SECTION A: SITUATIONAL INCOMPATIBILITY

Instructions: Tick the appropriate box

1. Age (years)……..

2. Sex

Male	1
Female	0

3. On or off-farm income(Rand) per annum

Less than 5 000	1
5 000-10 000	2
More than 10 000	3

4. Years of schooling attained……..

5. Farming experience (years)

Less than 5	1
5-10	2
11-16	3

More than 16	4

6. Number of years in the seed scheme

Less than 5	
5-10	
11-16	

7. Farm size (ha)……..

8. Extension contact for management support (Tick in the space provided)

Frequency	During planting season	After planting season till next planting season
Once in a week		
Once in two weeks		
Once in four weeks		
Other specify (once during/after planting season)		

9. Have you heard about improved maize OPVs seeds before?

Yes	1, go to Q.12
No	0

10. Do you want to know more about improved maize OPVs seeds?

Yes	1
No	0

11. If No, state the reason/s why

……

……

(**END HERE FOR THOSE NOT PLANTING OPVS)**

12. Have you planted improved maize OPVs seeds before?

Yes	1
No	0, go to Q.14

13. How much of your land mentioned in Q.7 was used for planting improved maize OPVs?

2/3 and more	1
Less than 2/3	2

14. State the 1-3 most important reasons for not planting improved maize OPVs seeds up to now

a)……..

b)……

c)……

15. Do you multiply improved maize OPVs seeds for selling to other farmers?

Yes	1
No	0, Go to Q. 19

QUESTIONS BELOW ARE ONLY FOR FARMERS WHO MULTIPLY IMPROVED MAIZE OPVs SEEDS

16. Are the improved maize OPVs seeds available every year for multiplication?

Yes	1
No	0

17. How many times have you received training on the following issues since you started multiplication? (Tick in the appropriate space for your response)

Frequency	Agronomic issues about seed multiplication	Business issues including marketing of seed
No training		
Once		
Two times		
Three		

times		
Other specify		

18. Is the improved maize OPVs seed multiplication business generally profitable?

Yes	1
No	0

QUESTIONS BELOW ARE FOR ALL THE FARMERS IN THE SEED SCHEME

Seed Security

19. From your experience, do you think planting improved maize OPVs always provides you with the type of seed you desire (seed secure)?

Yes	1
No	0

20. If no : State , if any of the reasons mentioned below reflects your response:

i. Improved maize OPVs seeds are not generally available for purchase during the planting season.

Yes	1
No	0

ii. The price of improved maize OPVs seeds for planting is too high or not affordable.

Yes	1
No	0

iii. The shop to buy improved maize OPVs seeds for planting is too far from my farm location.

Yes	1
No	0

iv. There is always only one variety of improved maize OPVs seeds available each planting season (i.e. not many from which you can select your preferred variety).

Yes	1
No	0

v. State any other reasons you believe make it difficult for you to always have your desired maize OPVs (seed insecure) not mentioned above:

……

……

Desirable Traits

21. Does improved maize OPVs seeds yield better (increased yield) than own recycled maize seed under similar farming conditions?

Yes	1
No	0

22. If No, under which conditions do you think it will provide better yield?

……

……

…….

23. Does the improved maize OPVs seeds generally provide same yield compared with own recycled maize seed when recycled over 2-3 planting seasons under similar farming conditions?

Yes	1
No	0, reduced yield

24. Does improved maize OPVs seed generally germinate earlier than own recycled maize seed?

Yes	1
No	0

25. Does the improved maize OPVs generally taste better than own recycled maize when roasted or boiled as green mealies?

Yes	1
No	0, tastes the same or

	worse (**circle your response)**

26. Does the improved maize OPVs generally taste better than own recycled maize when used to prepare traditional meal such as porridge and soft porridge?

Yes	1
No	0, taste the same or worse **circle your response)**

Disease Resistance

27. Is the improved maize OPVs generally more resistant to maize streak disease?

Yes	1
No	0

Pest resistance

28. Is the improved maize OPVs generally more resistant to maize stalk borer?

Yes	1
No	0

Drought Resistance

29. Is the improved maize OPVs generally more drought resistant than own recycled seeds?

Yes	1
No	0

SECTION B: FARMERS AWARENESS OF DISADVANTAGES OF IMPROVED MAIZE OPVs OVER OWN RECYCLED MAIZE SEED

30. From your experience, do you see more disadvantages with improved maize OPVs than your own recycled maize seed?

Yes	1

No	0

31. Mention five things that you see as the disadvantages or bad about improved OPVs seed.
    a) ……..
    b) ……..
    c) ……..
    d) ……..
    e) ……..

32. Which one of these (Q. 31) is the most serious disadvantage of the improved maize OPVs seed?
    a) ……..

SECTION C: FARMERS UNAWARENESS OF ADVANTAGES OF IMPROVED MAIZE OPVs OVER OWN RECYCLED MAIZE SEED

33. **If answer to Q.30 is No**: Do you therefore see more advantages with improved maize OPVs than your own maize recycled seed?

Yes	1
No	0

34. Mention five things that you see as advantages (or good) about improved maize OPVs seed.

    a) ……
    b) ……....
    c) ……
    d) ……
    e) ……

35. Which one of these (Q. 34) is the most important advantage (or good thing) about improved maize OPVs.

    a)……..

SECTION D: PROMINENCE OF IMPROVED MAIZE OPVS

36. What is the **most important goal** you had set for yourself when you joined the seed scheme?

a)……..

37. Do you think that planting improved maize OPVs is generally better in helping you to achieve **the goal you had** than planting your own recycled maize seed? (**circle the number corresponding to your response).**

Better helping	1
Not helping	0

END- THANK YOU FOR PARTICIPATING!

Appendix E: Research questionnaire for Non-Scheme Members

NON-SCHEME MEMBERS

KINDLY ANSWER THE FOLLOWING QUESTIONS

Questionnaire

Evaluation of farmer's perceptions on community-based seed production schemes in Polokwane and Lepelle-Nkumpi, Municipalities, Limpopo Province.

1. Participant name and surname	
2. Questionnaire no.	
3. Name of Community	
4. Date	
5. Contact details	

SECTION A: SITUATIONAL INCOMPATIBILITY

Instructions: Tick the appropriate box

1. Age (years)……..

2. Sex

Male	1
Female	0

3. On or off-farm income(Rand) per annum

Less than 5 000	1
5 000-10 000	2
More than 10 000	3

4. Years of schooling attained……..

5. Farming experience (years)

Less than 5	1
5-10	2
11-16	3
More than 16	4

6. Farm size (ha)……..

7. Extension contact for management support (Tick in the space provided)

Frequency	During planting season	After planting season till next planting season
Once in a week		
Once in two weeks		
Once in four weeks		
Other specify(once during/after planting season)		

8. Have you heard about improved maize OPVs seeds before?

Yes	1, go to Q.11
No	0

9. Do you want to know more about improved maize OPVs seeds?

Yes	1
No	0

10. If No, state the reason/s why

……

……

…….

11. Are you now planting improved maize OPVs?

Yes	1
No	0

12. **If no**, State the 1-3 most important reasons for not planting improved maize OPVs seeds up to now

a)……

..

b)……

c)……

13. Where do you get the maize seed that you plant? (Circle your response)

1. Farmers in the seed scheme

2. Buying from Cooperatives

3. From other community members not in the scheme

4. Other (specify)……

14. If from other sources other than your own, for how long have been getting/buying seed from that source?

……..

15. Dou you save seed from that source for planting in subsequent planting seasons or you get new seed every planting season from that source?

1. Save seed for planting in subsequent seasons

0. Get new seed from that source every planting season.

Seed Security

16. Does the seed from the source mentioned in Q. 13 provide you with the following?

16.1 The type of seed you desire (seed secure)?

Yes	1
No	0

16.2 Seed is generally available for purchase during the planting season.

Yes	1
No	0

16.3 Seed price is affordable.

Yes	1
No	0

16.4 Distance to travel to get maize seed for planting is near to my farm location.

Yes	1
No	0

M.

Desirable Traits

16.5 Yields better (increased yield) than your own recycled maize seed under similar farming conditions?

Yes	1
No	0

16.6 **For those recycling seed from source mentioned in Q. 13:** Does it give you **same** yield compared with your own recycled maize seed when recycled over 2-3 planting seasons under similar farming conditions?

Yes	1
No	0, reduced yield **OR** increased

16.7 Germinates earlier than own recycled maize seed?

Yes	1
No	0

16.8 Generally tastes better than your own recycled maize when roasted or boiled as green mealies?

Yes	1
No	0, tastes the same or worse (**circle your response)**

16.9 Maize generally tastes better than your own recycled maize when used to prepare traditional meal such as porridge and soft porridge?

Yes	1
No	0, taste the same or worse **circle your response)**

Disease Resistance

16.10 Is generally more resistant to maize streak disease?

Yes	1
No	0

Pest resistance

16.11 Is generally more resistant to maize stalk borer?

Yes	1
No	0

Drought Resistance

16.12 Is generally more drought resistant than own recycled seeds?

Yes	1
No	0

SECTION B: FARMERS AWARENESS OF DISADVANTAGES OF MAIZE SEED (Q. 13) OVER OWN RECYCLED MAIZE SEED

17. From your experience, do you see more disadvantages with maize seed from source (Q.13) than your own recycled maize seed?

Yes	1
No	0

18. Mention five things that you see as the disadvantages or bad about maize seed you receive for planting from the source mentioned in Q. 13

a) ……

b) ……

c) ……

d) ……

e) ……

19 Which one of these (Q. 18) is the most serious disadvantage of that maize seed?

a) ……

SECTION C: FARMERS UNAWARENESS OF ADVANTAGES OF MAIZE (Q.13) OVER OWN RECYCLED MAIZE SEED

20. **If answer to Q.17 is No**: Do you therefore see more advantages with maize seed you receive or buy from source in (Q.13) for planting than your own maize recycled seed?

Yes	1
No	0

21. Mention five things that you see as advantages (or good) about maize seed from the source mentioned in Q.13.

a) ……

b) ……
c) ……
d) ……
e) ……

22. Which one of these (**Q. 21**) is the most important advantage (or good thing) about maize seed you receive or buy from the source mentioned in Q. 13

a)……

SECTION D: PROMINENCE OF MAIZE SEED (Q.13).

23. What is the **most important goal** you had set for yourself as a farmer?

a)……..

24. Do you think that planting the maize seed you mentioned in Q. 13 is generally better in helping you to achieve **the goal you had** than planting your own recycled maize seed? (**Circle the number corresponding to your response).**

Better helping	1
Not helping	0

END- THANK YOU FOR PARTICIPATING!

Appendix F: Turfloop Research Ethics Committee Clearance Certificate

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

TURFLOOP RESEARCH ETHICS COMMITTEE CLEARANCE CERTIFICATE

MEETING: 07 February 2018

PROJECT NUMBER: TREC/15/2018: PG

PROJECT:

Title: Evaluation of farmers' perceptions of community-based seed production schemes in Polokwane and Lepelle-Nkumpi Municipalities, Limpopo Province.

Researcher: M Phala
Supervisor: Prof DB Afful
Co-Supervisors: Dr P Chaminuka
School: School of Agricultural and Environmental Sciences
Degree: Masters in Agricultural Management

PROF TAB MASHEGO
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) **Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.**
ii) **The budget for the research will be considered separately from the protocol.**
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.