Factors that influence the development of South African subsistence maize farmers into commercial farming units

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It all starts here ™

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ABSTRACT

South Africa has a successful, vibrant yet complex agricultural sector. The agricultural sector is dualistic in the sense of having commercial farming units along with subsistence farmers. In South Africa, agriculture has a very important part to play in the transformation, democratisation and economic growth of the country. Millions of people are engaged in subsistence farming on millions of hectares of land in the rural part of the country mostly situated in the former homeland areas. These resource-poor farmers struggle to produce sufficient food for their own household needs and in most cases rely on non-agricultural sources of income to meet their needs.

It is essential that the subsistence and small-scale farmer sector develops and improves production in an effort to increase rural development, create jobs and stimulate the rural economy. Numerous development programs have been established over years with very little success. To be successful development programs should focus on the fundamental needs of farmers and ensure that the right beneficiaries are involved. This study was set out to determine the factors influencing the development of subsistence maize farmers as well as the ambition of these farmers to expand their operations and develop into more commercial farming units.

A literature study on the background of agriculture and maize production in South Africa as well as subsistence farming and the factors influencing the production and development of subsistence farmers was conducted. After the literature study factors was identified that influence the production and development of these farmers. These factors were used to develop a questionnaire to conduct a quantitative study. The target population was subsistence maize farmers in the KwaZulu-Natal, Mpumalanga and Eastern Cape provinces, engaged in maize farming to fulfil their household needs and is a part of the Grain SA farmer development program. The Grain SA farmer development structures were used to gather the data through convenience sampling. A total of 344 questionnaires were retained and used for data analysis. Descriptive statistical analysis was conducted to describe the sample used in the study. Exploratory factor analysis was used to identify constructs as a method of data reduction. The questionnaire was tested and found to be reliable and valid. Effect sizes were used to determine the differences between genders and age groups.

Through the results certain factors were identified that influenced the ability of the subsistence maize farmers to develop. These factors include: Poor access to resources such as land, finance and equipment, limited support from government and private agricultural companies as well as limited access to off-take markets and insufficient financial and agronomic skills. It was

also found that overall the farmers have the ambition and the will to expand their farming operations as well as the commercial intent to produce maize on a more commercial level. Certain differences between genders and age groups were also identified. Based on the conclusions, recommendations were made for the individual farmer, government and organisations. The study was evaluated according to the achievement of the primary and the secondary objectives that was set out. The limitations of the study were discussed and suggestions were made for future research. Along with the appropriate support the ambition and will of subsistence farmers will assist them to develop to a desired level of food production.

Keywords: Subsistence agriculture, Subsistence agricultural development, Subsistence maize farmers, Small farming unit development, Farmer development, commercial farming.

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CHAPTER 1: NATURE AND SCOPE OF THE STUDY

1.1 INTRODUCTION

One of the most fundamental needs for mankind is food. Effective food production and food security can only be established through a successful agriculture sector (Le Roux *et al.,* 2016:83). In South Africa particularly, agriculture needs to play a very important part in the development and democratisation of the country. Agriculture supports the very existence of the nation, through food security, economic growth, employment and providing social welfare and wellbeing for those most vulnerable members of society in the most rural areas of the country. According to Section 27.1(b) of the Constitution of the Republic of South Africa (1996) (South Africa, 1996) all citizens of South Africa have the right to have access to sufficient food. Therefore the Government of South Africa needs to do everything in their reasonable power to ensure that the citizens of South Africa are food secure. Rural agriculture in particular will play a crucial role in the growth of the South African economy and towards equitability of the nation (Groenewald & Nieuwoudt, 2003:265). According to the Honourable Minister of Agriculture, Senzeni Zokwana (Department of Agriculture, Fisheries and Forestry, 2015b) the development and empowerment of small-scale producers in South Africa will contribute to the food security of the larger community by ensuring a higher and stable income of small-scale farming communities and by increasing the availability of locally produced food. Unfortunately these objectives have to be achieved amidst known challenges faced by small-scale and subsistence producers.

Of the total 122.3 million hectare (ha) of land area in South Africa, 86.2 million ha of land is occupied by commercial agriculture and 14.5 million ha by “developing” non-commercial agriculture. Commercial agriculture occupies about six times the amount of land occupied by non-commercial agriculture. Of the total area of farmland only 14.2 million hectares are considered arable land (Fényes & Meyer, 2003:24). According to the abstract of agricultural statistics (2013:5) 2.5 million ha of the total arable land in South Africa was situated in the former homelands as part of “development” agriculture in 1991. The majority of the available arable land in South Africa is currently owned by white-commercial farmers.

According to Ortmann and Machethe (2003:47) the National Department of Agriculture have estimated that there were 240 000 small-scale emerging farmers in the agricultural sector providing livelihood for up to one million family members. These farmers have already a partial

commercial approach. They also estimate that there are an estimated three million subsistent farmers mostly situated in communal areas of the former homelands; these farmers mainly are engaged in agriculture to provide their own subsistence needs. The Bureau for Food and Agricultural Policy (BFAP, 2016:5) has recently estimated the number of black headed households engaged in crop production in the former homelands at 1.9 million in 2015. This number has increased from 1.6 million in 2010.

The inhabitants of these rural areas of subsistence agriculture are typically women, children and aged people to whom the land is more a form of social security instead of using it for agricultural production (Fényes & Meyer, 2003:26). Most of these farmers cannot even produce enough food to meet all their household needs. The crops they produce are mostly a supplement to an external form of income such as pensions and social grants. Only by occasion and exception these farmers will have a surplus produce which they can sell or trade.

According to Jacobs *et al.* (2008:8) following the first democratic elections in South-Africa in April 1994, government and parastatal research and extension services were given a mandate to transfer technology to farmers in the former homeland areas. The goal of this knowledge and skills transfer was to help develop these farmers' commercial potential and to help them to enter the national and international markets.

Except for a few exceptions, up to now, the above mentioned goals have not been reached. Policies that were put in place have focussed more on the category of emerging/new era black farmers, which can be considered already commercial. This group of farmers are in a position to access external resources and existing support. Very little attention was and is given to the small-scale and subsistence farming sector. This includes support from government, parastatals and the private sector. At the recent annual meeting of the African Farmers' Association of South Africa (AFASA), the secretary general of AFASA (Mr Aggrey Mahanjana), said that land reform without land ownership remains a very big challenge. Farmers receiving land without ownership remains venerable (Van Burick, 2016). Mr Mahanjana added that new emerging farmers should receive support from government to develop into a more commercial level. Support programs should be more focused on specific needs of these developing farmers.

Resource-poor subsistence farmers are mostly in situations that make it difficult for them to make use of available technologies and support. It is argued that the transfer of technology alone is inadequate and that more effort in terms of support is needed for these farmers to become successful. Support to these farmers is complex and an integrated approach is

required. Small-scale and subsistence resource-poor farmers should be placed on the government agriculture and poverty alleviation strategies and should receive more attention. More emphasis should be placed on the food security needs of this group rather than on their contribution to the economy (Jacobs *et al.,* 2008:20).

Agriculture for South Africa remains an important keystone of the economy, therefore it is critical that the commercial sector is maintained, but at the same time it is important to promote equality and transformation to help right past wrongs.

Although agriculture is a small contributor to the Gross Domestic Product (GDP) of South Africa, contributing R66,7 billion (1.9%) to GDP in 2015 (Department of Agriculture, Forestry and Fisheries, 2016a:3), it is very important for job creation and employment in rural areas.

According to the Quarterly Labour Force Survey for Quarter 3 of 2015 (Statistics South Africa, 2015b) agriculture has employed 897 000 people during the period July to September 2015. This figure is equal to 5.7% of the employable population of South Africa. This is a serious reduction from the 814 000 people or 10% of employable population, that was employed by the sector in 1996.

Small-scale agriculture has a dual purpose, providing a buffer against poverty for the most poor, and it is being used as a wealth creation strategy by households with higher incomes. Small-scale agriculture as a buffer against poverty is mostly overlooked by policy makers, although it is very important for resource-poor farmers. Small-scale and subsistent farming is especially important for the alleviation of poverty along black women in rural areas, as more than 50% of the African population engaged in rural agriculture are women (Statistics South Africa, 2015b:181). The women in these areas are also more likely to engage in agricultural activity as an extra source of food.

The agricultural sector in South-Africa is very complex. Fluctuating weather and soil conditions, increasing climate change, free market system with fluctuating input cost and commodity prices, globalisation is just some of the challenges agricultural producers are facing in South-Africa. The industry is also plagued by its diversity in the nature and size of producers (a very successful commercial sector to a very resource poor subsistence sector), land reform, Agricultural Black Economic Empowerment, changing policy, labour issues, import and export regulation to name a few.

Jacobs *et al.* (2008:14) have identified the numerous constraints and challenges that the agricultural sector development is facing, especially impacting small-scale/subsistence agriculture development in South-Africa:

- *Government support:* Most of the policies and programmes that were introduced by the government to help transform and develop small-scale Black agriculture have not had the desired effects as they tend to be focussed on only the emerging/new era farmers and overlook the larger portion of small-holder and subsistence farmers. Most land reform and support programmes focus their effort on emerging semi-commercial farmers. The resource-poor subsistence farmers are ignored in this process. There is a lack of programmes and support targeted at the resource-poor subsistence farming sector. The national agricultural research system has also not made a significant impact on small-scale subsistence farming or agriculture as a whole.

- *Private sector support:* The private sector also tends to focus on only the commercial viable portion of the sector.

- *Common constraints:* Negative household circumstances, motivation, land tenure security, lack of support services and challenges impacting the whole agriculture sector.

- *Institutional constraints:* The inability of small-scale and subsistence farmers to guarantee quantity and quality makes it difficult for these farmers to become part of a value-added supply chain.

- *Inadequate rural infrastructure:* The under-investment in rural infrastructure such as roads, transportation, communication networks poses a serious challenge to small-scale subsistence farming.

- *Global factors:* Although globalisation has brought some opportunities for the industry, market access barriers, domestic support and export subsidies have made it difficult for developing countries such as South Africa to fully utilise the opportunities. Small-scale farmers are particularly affected by lower local prices for produce, caused by increased global supply.

- *Changes in the commercial sector:* The financial pressure that commercial farmers experience, causing a loss in employment opportunities and retrenchment of farm workers,

puts more strain on the small-scale/subsistence farming sector to help support these unemployed individuals no-formal income households.

- *The impact of HIV/AIDS*: HIV/AIDS infections have a serious effect on small-scale/subsistence farming, with families with infected members struggling to work the land effectively.

Considering all the abovementioned challenges and constraints, it would take a deep and thorough understanding of the dynamics at work in the development of agriculture to truly determine if the challenges can be overcome.

1.2 PROBLEM STATEMENT

1.2.1 Problem statement

The agricultural sector in South Africa is faced with a big challenge of maintaining a modern vibrant commercial sector feeding both the people of its own country and neighbouring countries. Simultaneously, the agricultural sector is challenged to promote equality and transformation of the sector to right the past wrongs (Department of Agriculture, Forestry and Fisheries, 2015a).

According to Jacobs *et al.* (2008:4) not many surveys have focused on specifically black small-scale farmers in South-Africa, therefore comprehensive statistics do not exist for African, Coloured and Asian agricultural producers in South-Africa.

Productivity of subsistence agriculture is very low and improving productivity is crucial to eradicate rural poverty (Ortmann & Machethe, 2003:52, Department of Agriculture, Forestry and Fisheries, 2016b:8, Le Roux *et al.,* 2016:88). According to them smallholder agriculture requires tenure security and improved access to reliable and effective farmer support services, finance and marketing.

Although many attempts were put in place to de-racialise the agricultural sector since 1994 (Settlement/Land Acquisition Grant, Land Reform for Agricultural Development and Agricultural Black Economic Empowerment), small scale black farmers in rural areas still face a number of constraints. Although not much success has been reached with support programs, the belief continues that black emerging farmers are benefiting from it.

The categorisation of small-scale farmers in South Africa seems to be problematic and confusing (Cousins, 2010:2). Ironically small-scale, subsistent and emerging farmers are grouped and labelled as “developing” farmers, but previous studies (Jacobs *et al.,* 2008:9) suggest that the category a farmer is placed in is not seen as a function of evolution or progress. Instead it is determined by the farmer’s environment, circumstances and external factors. What this suggests is that a subsistence farmer, although there might be a will, are unable to develop into a commercial farmer, except if his environment, circumstances or external influences change. The question thus remains: Can a subsistence farmer in rural South Africa develop into a more sustainable and commercial farming entity? And what are the major factors that prohibit this development?

If a subsistence farmer is unable to develop into a bigger farming entity, the approach of the government, parastatals, and the private sector to develop agriculture in South Africa might be wrongly focussed. It seems as if the focus of most current projects are more towards the development of already commercial or semi-commercial developing farmers and that very limited and probably wrong support is provided to the biggest portion of “developing farmers” - subsistence farmers. Undoubtedly the development and support of subsistence farmers in South Africa is crucial, not only for food security, but also to sustain economic growth and create employment (Groenewald & Nieuwoudt, 2003:265, Department of Agriculture, Fisheries and Forestry, 2015b).

Because most small-scale subsistence farmers are situated on communal land in the former homelands, where they are seen as poor, mostly women and aged. It is believed that these small-scales farmer’s poverty and circumstances make it difficult for them to make use of available technology provided by state and parastatal research and extension services provide since 1994. It is also believed that the motivation and reason for these farmers to be engaged in agriculture differ greatly from those of commercial producers; it is presumed that for these farmers agriculture provides nothing more than a safety net (Jacobs *et al.* 2008:4). If it is true that most subsistence farmers are not in the position or ambition to develop into bigger more commercial farming units, the whole approach of agricultural development in South Africa might be wrong. Therefore, it is critical to determine first hand from these subsistence farmers themselves, what their ambitions are and what the most critical factors are, preventing these farmers to develop into bigger and more commercial farming units.

There is a need for a study to understand the fundamental reasoning of subsistence farmers in South-Africa. For agricultural development to be successful in South Africa it is important to

understand what the ambition and needs are of those who find themselves at the lowest level of the development cycle. It is important to understand what their needs are in terms of support and social-economic needs. It is also important to look past the common and obvious constraints as described by numerous studies (Ortmann & Machethe, 2003:47, Jacobs *et al.*, 2008:14) and get down to the fundamental constraints that small scale subsistence farmers are facing and their reasoning in terms of their development.

In the past agricultural support, development programmes and extension services were designed along racial and development potential lines. Therefore it is further important to determine what the effects are of government programmes (Land reform, pension and social grants), parastatal programmes (extension services) and private sector programmes is on the development and support of these small scale subsistence farmers.

Over time there was a loss in employment in the agricultural sector; in 1996 the industry employed 10% of the employable population, compared to only 5.7% in 2015 (Statistics South Africa, 2015). Small scale agriculture development has the potential to drive economic reform in communal areas, including employment, but substantial investment is needed in public goods (Ngqangweni & Hendriks, 2003:87, Department of Agriculture, Fisheries and Forestry, 2015b). It is therefore detrimental for the development of South Africa's economy as a whole to determine what the job creation opportunities are in the informal small-scale subsistence agricultural segment and what the needs are to stimulate employment growth in the sector.

1.2.2 Expected contribution of the study

Expected contribution of the study for individual:

A better understanding of the dynamics and needs of subsistence maize farmers will ultimately lead to the improvement of support towards these farmers' development. The development of rural subsistence maize farmers to become more sustainable and productive cannot only benefit the individual but also the entire community and ultimately the national economy and unemployment rate.

Expected contribution of the study for organisations:

Understanding the needs and ambition of subsistence maize farmers can help organisations including the government, parastatals and private companies to structure their support and offerings in such a way that will benefit the subsistence farmers the best. This will not only

improve the success rate of programmes and projects but will also create viable business opportunities for the private sector.

Expected literature/academic contribution of the study:

This study can help researchers from numerous fields to better understand the dynamics of subsistence agriculture in South Africa. This study can help to improve the understanding of the complex nature of subsistence agriculture not only in South Africa but also in the rest of Africa and even globally. The study can form a base and backbone for many future studies.

1.3 RESEARCH OBJECTIVES

1.3.1 Primary Objective

The primary objective of this study is to develop a deep understanding towards the ambition and mindset of subsistence maize farmers in South-Africa with regards to their development to more sustainable and commercial farming units and the fundamental factors that determine their development.

1.3.2 Secondary Objectives

The secondary or specific objectives include:

- Conceptualize the topic of subsistence maize agriculture production in South Africa through a literature study.
- Determine from the subsistence farmer's perspective what their ambition, motivation and will are to develop into more commercial farming units.
- Determine from the subsistence maize farmer's perspective what the fundamental challenges and constraints are to develop into more commercial farming units.
- Determine the level of support from government, industry bodies and private companies on the development of subsistence maize farmers.
- Determine if subsistence maize farming can have a positive effect on the rural economy, specifically employment.

- Determine the level of access subsistence maize farmers have to advance inputs, technology and labour.
- Determine if there is a difference between age groups and gender groups with regards to the factors influencing their development and development ambition.
- Make recommendations for future research and practises.

1.3.3 Research question

What are the major factors limiting subsistence maize farmers to develop into more commercial farming units? Do these subsistence maize farmers have the ambition and will to develop into more commercial farming units?

1.4 SCOPE OF THE STUDY

This study will be focussed on the developing portion of the agricultural sector in South Africa. A big portion of the available agricultural land in the rural parts of South Africa is occupied by developing agricultural farming units, most of this available land in situated in the former homelands area. According to the Bureau for food and Agricultural Policy (BFAP, 2016:5) there were 1.9 million households located in former homeland areas and headed by black persons in 2015, engaged in crop production.

This study will focus specifically on the portion of farmers that are engaged in maize farming to sustain their total or a portion of their household food requirements. Typically these farmers have access to very small pieces of communal land (up to 10 ha). They are responsible for their own financing and marketing. They also have limited access to advanced inputs such as seed and fertiliser; they mostly rely on local sources of seed and organic-fertilization. They get limited help from extension services and government programs in term of technology transfer and access to inputs such as seed, agrochemicals and irrigation. This support is often inappropriate due to localised challenges and other resource constraints. According to grain South Africa a subsistence grain farmers are characterised as follow: Farmers having access to limited land (<10ha), resources, technical support, financing and markets. The main aim of engaging in agriculture is to sustain or supplement their food needs. These farmers are typically situated in the former homelands and make use of communal land. The study was conducted in the former homelands areas of KwaZulu-Natal, Mpumalanga and the Eastern Cape.

The study looks at the specific economic, social, infrastructure and support factors that have an impact on the development of subsistence maize farmers. The skills set in terms of financial as well as practical skills level as a developing factor were also tested in the sample. The study does not only focus on the personal development of these farmers but also on the business development opportunities. The development of these farmers into more commercial farming units will not only have a personal positive impact, but will have a positive impact in their communities and the rural economy. The study therefore touches on business management, entrepreneurial and economic disciplines.

1.5 RESEARCH METHODOLOGY

1.5.1 Research design and approach

The research design is the plan or the approach followed to obtain information from the target population, so that the research objectives can be achieved (Welman *et al.*, 2005:52). The research design that was followed in this study was considered the most appropriate research approach to achieve the research objective. In this study objective observations were made with no random or planned intervention of any kind. Therefore the study followed a quantitative, non-experimental, cross-sectional, field survey design.

1.5.2 Literature Study

During this study a comprehensive and in-depth review of literature were conducted to fully understand and conceptualise the concept of subsistence agriculture and maize production in South Africa. The literature provided background information and helped identify existing challenges and constraints for developing agriculture in South Africa.

The review of secondary information was focussed on text books, journal publications, articles, theses and dissertations.

1.5.3 Empirical Study

1.5.3.1 Research instrument

After an in-depth literature study and consultation with the Grain South Africa development program manager a structured questionnaire was developed. The first section of the questionnaire required respondents to give demographic information through tick boxes of pre-formulated questions. Demographic information such as gender and age were collected through

these questions. Closed ended questions were also used to determine the main reason for farming and the respondents' main source of income. The second part of the questionnaire consisted of closed ended questions based on the development factors identified through the literature study and consultation with Grain SA representatives. The closed ended questions made use of a four point Likert-scale.

1.5.3.2 Study population and sample

The target population for this study include subsistence maize farmers predominantly situated in the former homeland of the KwaZulu-Natal, Mpumalanga and Eastern Cape provinces of South-Africa. Typically the population in question will be farmers that have access to a small portion of land (<10ha), are resource poor and who is engaged in maize production to fully or partially supply their household subsistence needs. The target population are farmers that participate in the Grain South Africa farmer development program.

The Grain South Africa farmer development program structures were utilised to collect the data for this study. Subsistence farmers are grouped in study groups, these study groups are mentored by Grain South Africa appointed mentors. A number of mentors are grouped into regional offices under the guidance of regional program coordinators. The sample of this study consisted of subsistence maize farmers in Grain South Africa study groups in three of the regions (Louwsburg, Dundee and Kokstad regional offices).

1.5.3.3 Gathering of data

To study the population in question the researcher utilized the current study group network of Grain South Africa's developing farmer program. In this network small-scale and subsistence maize farmers are structured into Grain SA study groups. Each study group has a Grain SA mentor, which help these farmers in terms of technical advice and best practises, support and training.

The Grain SA study groups consisting of subsistent farmers in the rural former homeland areas were used as respondents to complete the questionnaires. The Grain SA study group structure were utilised to obtain as much as possible respondents, by making use of study group meetings and the mentors as interviewers. Respondents, representative of the population in question (subsistence maize farmers) were selected according to their availability, therefore convenience sampling was used.

1.5.3.4 Statistical analysis

The completed questionnaires were firstly screened for completeness and quality. The North-West University's Statistical Consultation Services were used to capture the data from the questionnaires and to do the statistical analysis using SAS (SAS Institute, 2016). The data was captured in frequency tables, descriptive statistics was conducted to summarize, and described the results (Levine *et al.*, 2014:36). Descriptive statistics analysis that was used included means/averages, frequencies, variance and standard deviation. The descriptive analytics were used to describe the demographics of the sample and give more insight on their farming operations.

Exploratory factor analysis was conducted to identify and group questions into constructs. These constructs were validated and Kaiser's measure of sample adequacy (MSA) was calculated to determine if the factor analysis was appropriate. The reliability of the measuring instrument was measured by calculating the Cronbach Alpha coefficients.

Spearman's correlation coefficient was calculated to determine if there are linear relationships between the identified constructs.

Because non-random convenience sampling was used in the data collection process, the comparison between age groups and genders were interpreted using Cohen's effect sizes, d (Cohen, 1988). The p-values were calculated and reported as if probability sampling was conducted, but no inferential statistic was interpreted.

1.6 LAYOUT OF THE STUDY

The study is presented according to the following layout:

The mini-dissertation commences with an abstract summarizing the study. The table of content and list of tables and figures given.

Chapter 1: Nature and scope of the study

The first chapter is an introduction that provides a brief literature background, problem statement, research objectives, research questions and rationale of the study. A short description of the primary and secondary information sources and methodology was also given.

Chapter 2: Literature review

The second chapter is a literature review of all the relevant literature on the topics in question. All the relevant cohorts, terms, populations and objectives were defined. The most important factors influencing the development of subsistence maize farmers were identified from the literature.

Chapter 3: Empirical research

In the third chapter the methodology used are discussed, with emphasis on the measuring instrument and the data analysis. The target population as well as the sample used are described.

Chapter 4: Results and discussion

The results obtained from the study are presented in chapter four. The demography of the sample population is presented, along with the background information of their farming operations. Both the descriptive, factor and comparative analysis results are presented and discussed.

Chapter 5: Conclusion and recommendations

The final chapter consists of a brief introduction and summary. The conclusions are made with regards to the study objectives that were met. Recommendations are made and also suggestions for future research. The chapter ends with a concluding summary.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

It is imperative that mankind make effective use of each unit of land, to ensure food security for a growing population, it is even more critical for countries such as South Africa with limited and marginal resources available in terms of agricultural land (Le Roux *et al.,* 2016:83). To avoid future food insecurity, it is very important that countries carry out the necessary pre-emptive measures.

According to the Constitution of the Republic of South Africa (Section 27.1(b)) (South Africa, 1996) all citizens have the right to have access to sufficient food and water. This entails that the Government of South Africa have to take legislative and other measures to ensure that all South African citizens are food secure.

According to the Honourable Minister of Agriculture, Senzeni Zokwana (Department of Agriculture, Forestry and Fisheries, 2015b), the Department of Agriculture, Forestry and Fisheries (DAFF) are fully committed to the growth and development of all agricultural producers including subsistence, smallholder and commercial farmers. The Department of Agriculture, Forestry and Fisheries have prioritised its efforts to ensure food security, job creation and the contribution of agriculture to the Gross Domestic Product (GDP) of South Africa.

Agriculture in South Africa plays an important part in economic growth of the country and offers livelihood and subsistence food needs to 15 million people living in rural underdeveloped areas (Backeberg, 2009:1). The Department of Agriculture, Forestry and Fisheries urges the citizens of South Africa to produce more of their own food and make use of the productive energy of women and youth in agriculture (Department of Agriculture, Forestry and Fisheries, 2015a:16).

2.2 AGRICULTURE IN SOUTH AFRICA

2.2.1 Background of agriculture in South Africa

According to Le Roux *et al.* (2016:88) there seems to be some uncertainty about the amount of arable land available in South Africa. According to the World Bank, arable land includes land under temporary crops, temporary meadows for mowing and pasture, land under market and kitchen crops and land temporary fallow. According to the latest data found on the Trading

Economics web page (2016) there were 12.033 million hectares (ha) of arable land in South Africa measured last in 2011. This is a decrease from approximately 14.5 million ha in 2006. Considering the total land area of South Africa of 121.45 million ha, 10-12% of land in South Africa is arable. Of the arable land in South Africa only 22% are considered to be of high potential crop land (South Africa Department of Agriculture, 2007:2). According to the Trading Economics data (2016) 99.6 million ha of land are used for agriculture (82% of total land area). According to Liebenberg (2013:22), 81 million ha (67% of total land area) of land was used for agriculture during 2010. The total amount of croplands farmed in this period was 5.66 million ha; with 5.12 million ha farmed commercially and 544 000 ha farmed in the former homelands areas. Orchards and plantations occupied 1.56 million ha and grazing/pastures 75.026 million ha of farm land.

According to the BFAP baseline report of 2016 there were approximately 700 000 ha of crop production in the former homelands in 2015. This is less than 20 ha crop farming operations head by black households (BFAP, 2016:5). This is made up from 400 000 ha operations planting less than 0.5 ha, 200 000 ha operations planting 0.5-5 ha of crops and 100 000 ha operations planting 5-20 ha of crops.

The precise amount of arable land in South Africa farmed by commercial farming operations and non-commercial farming operation is unclear and there seems to be a great need for more accurate and detailed assessment of the available arable land and cropping potential in South Africa (Le Roux *et al.,* 2016:88).

According to the 2015 General Household Survey (Stats SA, 2015a:182), there are 2.710 million households involved in one or more agricultural activity. According to the same survey there are only 439 000 households considering agricultural product sales and services as their main source of income (Stats SA, 2015a:174). At the recent “Rethink Agriculture” conference held 11-13 October 2016 in Stellenbosch. Professor Johan Kirsten and Dr Frikkie Liebenberg have stated that the way farming entities in South Africa are counted, is excluding a big portion of the active farming operations. According to the current government sources there are 39 669 commercial farming units in South Africa; according to Kirsten and Liebenberg this figure can be as high as 69 669 commercial farming entities (Genis, 2016).

According to the Department of Agriculture, Forestry and Fisheries (DAFF) (2016a:3), the value of primary production in South Africa was R 233.2 billion in 2015 and its contribution to the Gross Domestic Product (GDP) was an estimated R 66,7 billion. Although the real term gross

value added by the agricultural sectors have increased by 15% over the past decade (BFAP, 2016:4), the contribution towards the South African GDP has contracted over time (1981-2006 with 1.1% per year). This means that the portion of the GDP contributed by agriculture have declined from 12.3% in 1961 to 6% in 1970 to only 1.9% in 2015 (Liebenberg & Pardey, 2010:384; Department of Agriculture, Forestry and Fisheries, 2016a:3). Because agriculture is so climate dependent and volatile it is not uncommon to experience fluctuations between periods of negative and positive growth (BFAP, 2016:4).

Although the contribution to GDP is small, agriculture remains a very important contributor to employment, especially in rural areas, and a major earner of foreign exchange (Department of Agriculture, Forestry and Fisheries, 2016a:3). During 2014 South Africa remained a net exporter of agricultural products, with exports increasing with 30% to reach a value of R 35 billion (BFAP, 2015:11).

According to DAFF agriculture delivers most jobs per every Rand invested compared to any other productive sector (Department of Agriculture, Forestry and Fisheries, 2015a:15). The Quarterly Labour Force Survey for Quarter 3 of 2015 (Statistics South Africa, 2015) indicate that agriculture has employed 897 000 people during the period July to September 2015. This figure is equal to 5.7% of the employable population of South Africa. This is a serious reduction from the 814 000 people or 10% of employable population, that was employed by the sector in 1996.

According to DAFF the National Development Plan (NDP), calls for the creation of one million additional jobs in the agricultural sector by the year 2030 (Department of Agriculture, Forestry and Fisheries, 2015a:6). According to the Minister this will be accomplished by revitalising agriculture and the agro-processing value chain. The employment contribution of each agricultural target sector is set out as follows:

Table 2.1: The contribution of each target sectors to reach the one million jobs target set out in the National Development Plan (BFAP, 2016:7)

Target Sectors	Number of Jobs contribution
Less than 0.5 ha	83 000
0.5-5 ha	165 000
Small-scale more than 5 ha	75 000
Better utilisation of redistributed land	70 000
High-value irrigation crops	200 000
Non-labour intensive field crops	10 000
Non-labour intensive livestock	40 000
Secondary jobs created in value chain	326 500

It is apparent from Table 2.1 that small-scale and subsistence farming will have to contribute a major portion towards job creation in the future. Since the launch of the National Development Plan in 2011 the employment in the agricultural sector only increased with 50 000 jobs (BFAP, 2016:5). Considering the target of 1 million jobs in 2030 the current tempo of creating additional employment in the agricultural sector is concerning.

Because agriculture is a very important link between other sector, by demanding inputs (fertilizer, fuel and more) and by supplying raw outputs for other sectors, it is a crucial sector and very important for the growth of the rest of the economy (Department of Agriculture, Forestry and Fisheries, 2016a:3)

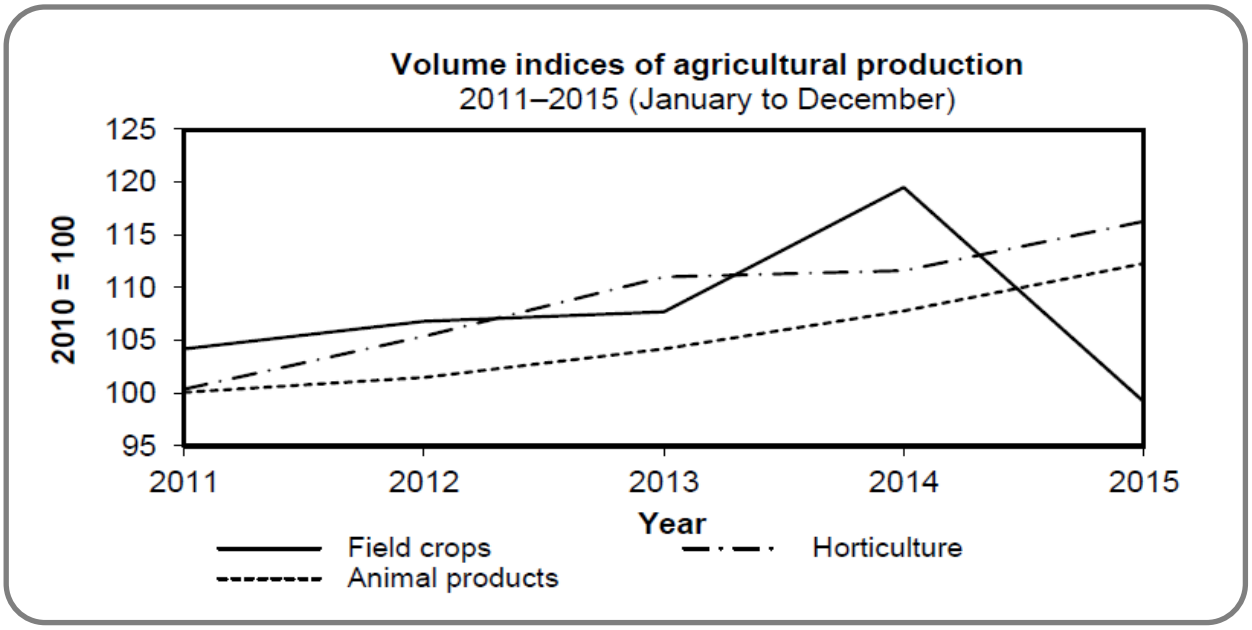

Figure 2.1: Agricultural production from 2011 to 2015.

Source: Department of Agriculture, Forestry and Fisheries, 2016a:5).

However productivity of the South African agricultural sector has been fluctuating over time, the productivity has been stagnant since the twenty-first century (Department of Agriculture, Forestry and Fisheries, 2011:6). The insignificant increase and growth in agricultural productivity (Figure 2.1) in recent years is concerning, in particularly considering the level of unemployment and food insecurity in South Africa. Contributing to the concern is the sharp decrease from 2014 to 2015 in field crop production, mainly driven by the severe drought experience during 2015.

Agriculture and agriculture production in South Africa have changed considerably the past century. The average farm size has increased, the number of farms has decreased and production increasingly focused on higher value commodities (Liebenberg & Pardey, 2010:383).

2.2.2 Maize production is South Africa

Maize is the most important grain crop in South Africa, it forms the staple food for the majority of the South African population and is a major feed grain (Department of Agriculture, Forestry and Fisheries, 2016b:8). Considering the total production of maize in South Africa during the 2014/2015 season, 47% was white maize primarily for human consumption and 53% was yellow maize that is mostly used for animal feed production (Department of Agriculture, Forestry and Fisheries, 2016b:8). Maize was the largest contributor towards the gross value of field crops

produced in South Africa for the past five seasons, the gross value of the maize crop for the 2014/2015 season amounted to R 23 236 million (Department of Agriculture, Forestry and Fisheries, 2016b:8).

Maize is usually planted during late spring to early summer with optimal planting time between November and December, depending on the area of production. Because the planting period and length of the season is highly dependent on rainfall patterns, planting can extend from October to January. The maize crop is harvested from late May up to the end of August (Department of Agriculture, Forestry and Fisheries, 2016b:8).

During the 2015/16 season an estimated 1 946 750 ha of maize were planted by commercial producers in South Africa. Considering the area planted during the 2015/16 season, 52% (1,014 million ha) of the area were planted under white maize and 48% (932 000 ha) under yellow maize.

In South Africa the maize sector are comprised of a commercial (as explained above) and a non-commercial portion. Table 2.2 provides the total, commercial and non-commercial area planted for the past 10 seasons. It is clear that the area planted commercially with maize is by far the biggest contributor of the total maize area planted in South Africa.

Table 2.2: Maize area planted in South Africa for the past 10 seasons.

Season	Total area planted (ha)	Commercial area planted (ha)	Non-Commercial area planted (ha)
2006/07	2,897,066	2,551,800	345,266
2007/08	3,296,980	2,799,000	497,980
2008/09	2,896,183	2,427,500	468,683
2009/10	3,263,340	2,742,400	520,940
2010/11	2,859,060	2,372,300	486,760
2011/12	3,141,314	2,699,200	442,114
2012/13	3,238,100	2,781,200	456,900
2013/14	3,096,200	2,688,200	408,000
2014/15	3,048,050	2,652,850	395,200
2015/16	2,212,880	1,946,750	266,130

(Source: Crop Estimate Committee (CEC) - Department of Agriculture, Forestry and Fisheries, 2016)

The non-commercial portion of the production is mostly located in the Eastern Cape, Limpopo, Mpumalanga and northern KwaZulu-Natal provinces (Department of Agriculture, Forestry and Fisheries, 2016b:9). In table 2.1 the total area planted as non-commercial maize are provided, the area planted in the 2015/16 season are estimated at 266 130 ha (191 225 ha white and 74 905 ha yellow). The non-commercial segment mainly produces white maize, used for human consumption.

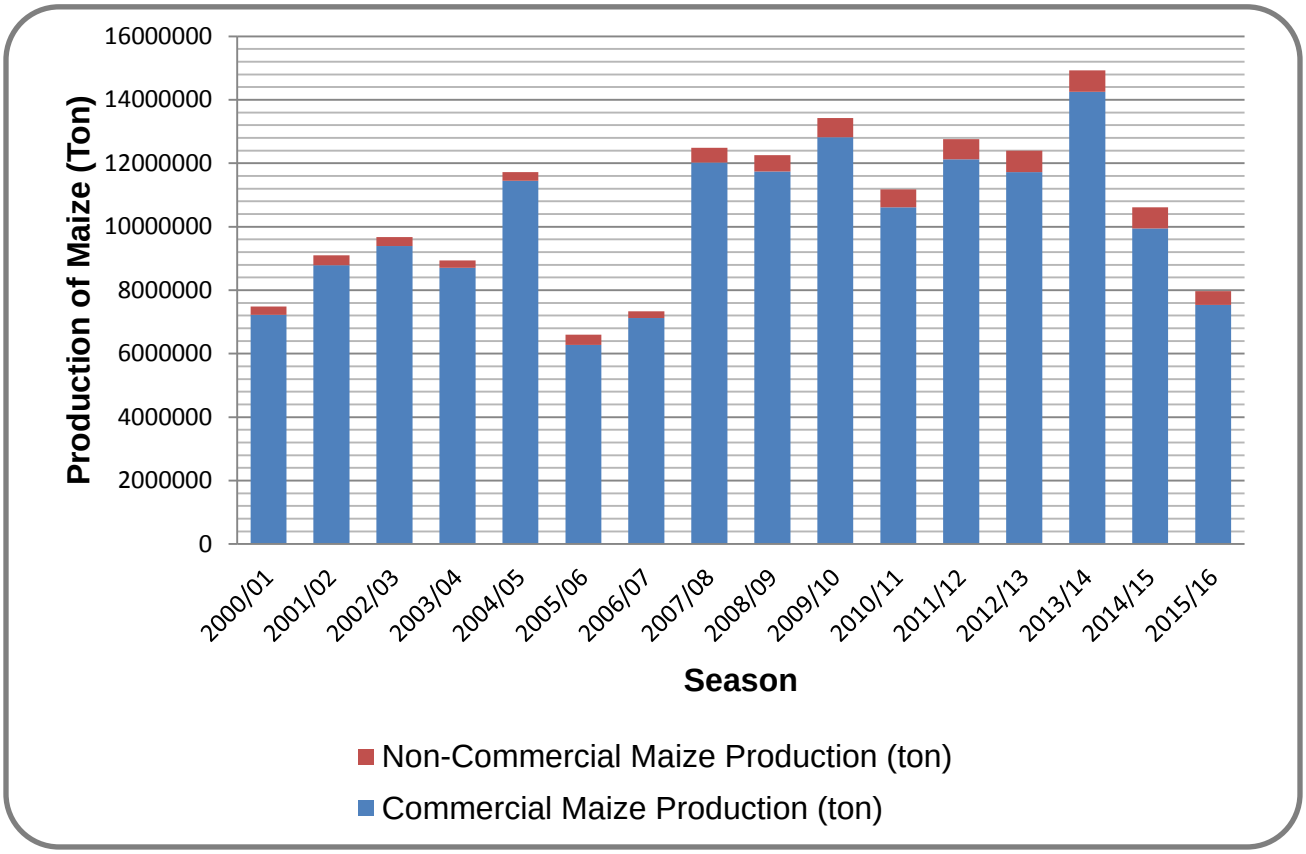

Figure 2.2: Maize production over time in South Africa

(Source: Crop Estimate Committee (CEC) - Department of Agriculture, Forestry and Fisheries, 2016).

Due to the drought experienced during the 2015/16 period maize production declined substantially (Figure 2.2). During the 2015/16 season a total of 7 972 615 ton of maize was produced. The commercial sector produced a total of 7 536 875 tons (3 253 775 tons white maize and 4 283 100 tons yellow maize). The total production of maize for the non-commercial sector during the 2015/16 season was estimated at 435 740 tons (286 175 tons white and 149 565 tons yellow). The maize produced in the non-commercial sector is mainly produced for own

use and contributed only 5.5% of the total production of maize produced in South Africa during the 2015/16 season.

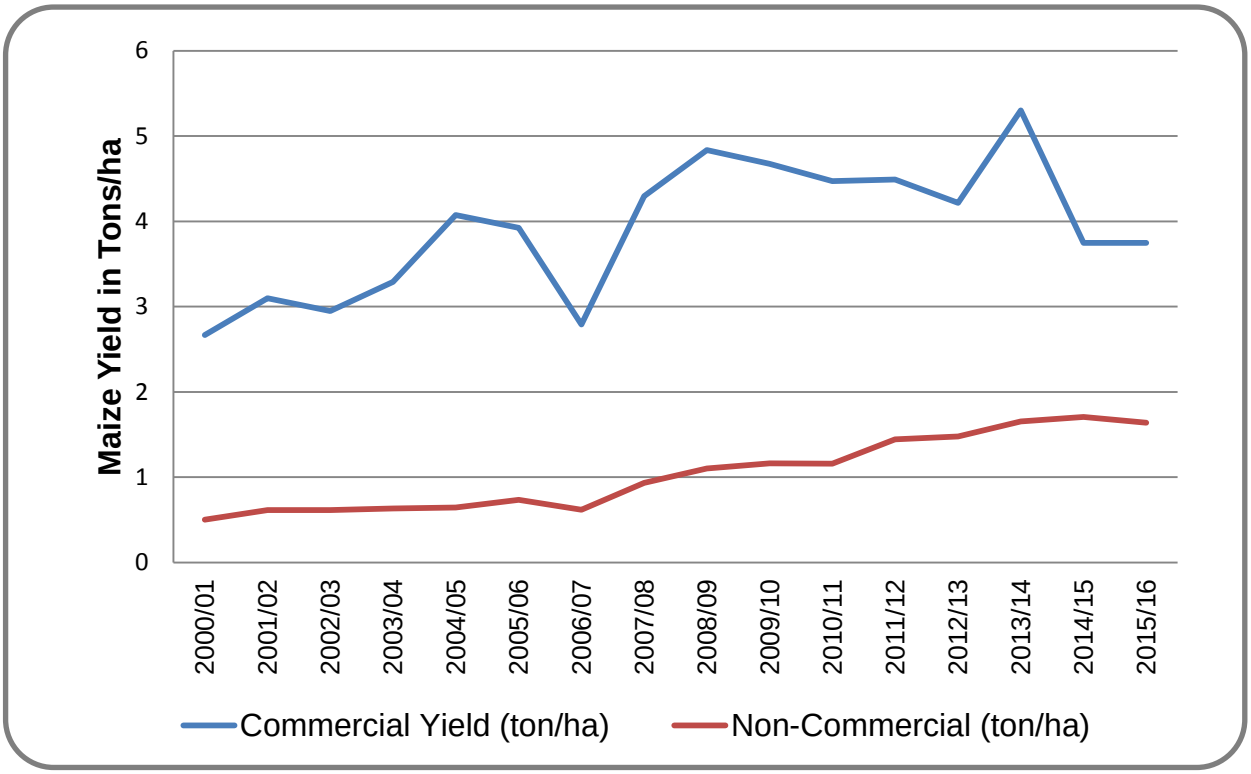

Figure 2.3: Maize yields over time of the commercial and non-commercial segments.

(Source: Crop Estimate Committee (CEC) - Department of Agriculture, Forestry and Fisheries, 2016).

Considering the total area planted and the total production of maize, the yield per area for the sectors can be calculated (Figure 2.3). It is clear from the data that the yield of the non-commercial segment (1.63 tons/ha) is much lower compared to the commercial segment (3.75 tons/ha). This is a clear indication that the level of production and effectively of maize production in the non-commercial sector is much lower compared to the commercial sector. The specific challenges faced by the non-commercial segment, impacting the production efficiency will be discussed in more detail later in this chapter.

2.2.3 Defining farming entities in South Africa

The South African agricultural industry has a unique dualistic nature, with a large vibrant commercial segment and a complex resource poor small-scale and subsistence segment (Ortmann & Machethe, 2003:47).

According to Jacobs *et al.* (2008:9) farmers can be classified along three axes:

- Firstly by size of land and farming operation: Large-scale to small-scale.
- Secondly by access to resources: Resource-rich to resource-poor.
- Thirdly by primary purpose of production: Commercial to semi-subsistence.

The position within a category and movement across categories are seen as not a function of evolution, progress or a result of modernization. Instead it is assumed that it is determined by the farmer's physical environment, social-economic and biophysical circumstances, personal choices and a host of external factors including political, agricultural and development policies.

The land area considered as part of the "developing" agriculture is mostly situated in rural areas of South-Africa. It is estimated that of the total area only 11.1-16.6% is arable land and that only 40-80% of the arable land is cultivated. Although most of the "developing" agricultural land is situated in the high potential eastern part of the country, production on this land is low (Fényes & Meyer, 2003: 26).

According to Jacobs *et al.* (2008:9) most developing black farmers are categorized in small-scale, communal and emerging farmers:

Typically a small-scale farmer has access to a very small piece of land (up to 5 ha). They are responsible for their own financing and marketing. They also have limited access to external inputs such as seed and fertiliser; they mostly rely on local sources of seed and organic-fertilization (Jacobs *et al.,* 2008:9).

Communal farmers tend to form sub-groups of small-scale farmers and farm their own small plots as part of a bigger project. They sometimes get help from extension services and government programs in term of technology transfer and access to inputs such as seed, agrochemicals and irrigation. This support is often inappropriate due to localised challenges and other resource constraints.

The majority of farmers that fall within the two abovementioned categories are elderly women that generally follow and receive support of conventional inputs and farming practices.

The third category, known as emerging farmers, typically produces off larger areas of land (20-100 ha). They usually are beneficiaries of the government's land redistribution program. They

have a larger scale of operation and make more use of external inputs. Their intention is to sell the bulk of their produce. They mostly receive more support from the public and private sector in terms of inputs, technology, financing and market access. Clear land ownership makes it easier for these farmers to get credit and better resources, enabling them to make use of better practises and technology.

According to Cousins (2010:2) the term “smallholder” is confusing and problematic. The term tends to obscure and mislead the differences there are in a large population of households involved in agriculture on a small scale. The term smallholders is in most cases used to refer to numerous levels of farming operations, including producers for whom farming contribute only portion of their livelihood, those for whom farming contribute to their total livelihood and those whom produce surplus, allowing for profit, reinvestment and capital accumulation in agriculture.

According to the Crop Estimate Committee of the Department of Agriculture, Forestry and Fisheries (CEC, 2004), a subsistence farmer is defined as a person who produces crops for own consumption. Subsistence farmers do not earn a large income from farming activities. The main reason for being engaged in crop and livestock farming is for own household consumption. Surplus production that can be sold is very limited. The subsistence farmers have limited access to markets due to technical, financial and managerial barriers. Due to the fact that these farmers do not generate a good income from farming activities, the possibility exists that these farmers might exit farming if better higher income non-agricultural opportunities arise.

According to Grain South Africa (Grain SA), farmers in South Africa farm at different levels, mostly as a result of their land tenure arrangements and availability of resources (Grain SA, 2015:10). Because of the confusing nature of defining agricultural entities, especially the non-commercial segment, Grain SA divides developing farmers into three different categories:

- Subsistence farmers: Farmers having access to limited land (<10ha), resources, technical support, financing and markets. The main aim of engaging in agriculture is to sustain or supplement their food needs. These farmers are typically situated in the former homelands and make use of communal land.

- Smallholder farmers: Farmers have access to bigger portions of land (>10ha), support, markets and financing. The main aim is to produce to meet their own food needs and to sell their surplus production. These farmers are not only situated in former homelands and make

use of communal land, but they may also have benefited from Government land distribution projects.

- Emerging/"New era" commercial farmers: Farmers having access to larger areas of land, expert technical support, financing and markets. The main aim of these farmers is to produce agricultural products to sell commercially. These farmers typically own large areas of land already or have benefited from Government land reform projects.

Because this study will focus on the subsistence maize farmers that are a part of the Grain South Africa development program, the definition as set out by Grain South Africa will be followed in this study.

2.2.4 Challenges faced by Agriculture in South Africa

According to the South African Department of Agriculture (DOA) (2007:2) the biggest limiting factor in South African agriculture is the limited supply of water. Uneven and fluctuating rainfall and limited irrigation capacity makes agriculture in South Africa challenging, adding to the complexity is the fact that 50% of South African fresh water usage is used by agricultural activity. This places a lot of pressure on the agricultural sector to make effective use of already limited water resources.

Ortmann and Machethe (2003:47) have identified the following as some of the biggest challenges and problems faced in the agricultural sector in South Africa:

- *Dualistic nature of agriculture and land redistribution:* The sector comprises a very successful commercial sector up to a very resource poor subsistence sector.

- *Uncertain property rights:* Land claims, possible land invasions and unfair land redistribution creates considerable uncertainty among commercial farmers.

- *Risk in crop production:* The biggest region in South Africa receives limited rain, making crop production very risky or impossible. The rainfall is also very erratic making crop production planning very difficult. Variation in temperature, rainfall, soil type, topography, and water availability (Fényes & Meyer, 2003: 22) makes production and production planning very complex and unpredictable.

- *High debt levels:* Farm debt in South Africa is very high as a percentage of capital assets.

- *Restrictive labour policies:* Although most labour laws have some benefits, they create high transaction and wage costs for the employer. Higher labour cost may result in farmers reducing their labour force and rather invest in machinery and technology. The steep increase in the minimum wage in 2013 saw a decline of 60 000 jobs in 2014 (BFAP, 2016:5).

- *The impact of HIV/AIDS:* Agriculture and the economy are affected negatively by HIV/AIDS by destroying social capital, weakening institutions and exacerbating the problem of poverty.

- *Low productivity in smallholder agriculture:* The small-scale agriculture sector in South-Africa is regarded as being low in productivity. This is also evident in the maize production segment (Figure 2.2).

- *Under-investment in rural economy:* Investment in rural areas in terms of physical and institutional infrastructure is considered inadequate.

- *Competitive pressure on agricultural producers and agribusiness:* Agricultural producers and agribusiness firms in South Africa face tough competition in domestic and international markets.

- *Financial position of commercial producers:* The number of commercial farms sequestrated annually has risen sharply. The number of commercial farming entities have also decreased sharply from about 91 000 in 1970 to about 40 000 in 2007. There is some uncertainty about the precise number of commercial farmers in South Africa. There can be up to 70 000 commercial farming operations currently in South Africa (Genis, 2016).

- *Low investor confidence in agriculture:* Recent land reform issues in neighbouring countries and how land reform will be managed in the future in South-Africa, labour issues, crime and possible introduction of land tax causes a reduction in investor confidence in agriculture.

The following was also identified as issues that are hampering and limiting the agricultural and food sector in South Africa (BFAP, 2016:7):

- Decreased productivity in certain industries.

- Slow growth in exports, caused by bureaucratic processes of permit requirements and sanitary trade barriers.

- Poor competitiveness in major sectors of agriculture.
- Ineffective service provision by government departments.
- Legislative constraints and policies from non-agricultural ministries.
- Policy uncertainty and slow progress on land reform.
- Limited investment in fixed improvements, land improvements and expansion of farming operations, caused by ownership and property rights uncertainty.

Growth in the agricultural sector is a prerequisite for transformation in the sector and the only way that growth can occur is through investment of both the public and private stakeholders.

2.3 SUBSISTENCE AGRICULTURE IN SOUTH AFRICA

2.3.1 Background

There are three main sources of food for a household: The market (exchange through buying/bartering), self-producing (subsistence production) and transfer from public or other households (Ruel *et al.,* 1998). Over time rural households were more likely to produce their own food, whereas urban households are more dependent on purchasing their household food needs. Low-income households in urban areas can spend as much as 60-80% of their total income on food (Ruel *et al.,* 1998). Therefore, poor urban household are more likely to experience food insecurity, because unlike rural household they do not have the ability to exploit natural resources to provide and produce food.

In 2001 the South African Department of Agriculture (DOA, 2001) published a document: “The Strategic Plan for South African Agriculture”. According to this document there were 240 000 black farmers in South Africa; these farmers were on a more commercial level and provided a livelihood for more than one million family members and employment for 500 000 people. This document also states that there are approximately three million small-scale farmers that produce food primarily to meet their own household needs, defining them as subsistence farmers. According to Aliber and Hart (2009:454) four million black South African from over 2.5 million households, mostly residing in former homelands, are engaged in agriculture as a means to supplement household food supply. The large number of subsistence producers engaged in subsistence agriculture is an indication of the importance of this sector in ensuring food security.

According to the latest Labour Force Survey (SA Statistics, 2016:63), almost 1.7 million people are practising subsistence farming during the first quarter of 2016. The biggest number of subsistence farmers were situated in KwaZulu-Natal with 757 000 followed by 423 000 in the Eastern Cape and 149 000 in Mpumalanga.

The Bureau for Food and Agricultural Policy (BFAP, 2016:6) presented in their 2016 Baseline Report data indicating that during 2015, 1.9 million black person headed households, farming less than 20 ha in former homeland areas were engaged in crop farming. The number of households increased from 1.6 million households in 2010 to the 1.9 million in 2015. This was an increase of 75 000 ha of crop farming area farmed by these households. The biggest portion of these households (up to 1.7 million) produced crops on less than 0.5 ha. A very small portion of these households produced crops on 5-20 ha. This is an indication that the majority of these households are falling in the subsistence segment of farming.

The complexity of the small-scale farming segment, specifically the segment that engages black households and individuals is high. According to Aliber and Hart (2009:435), the actual number of black farmers in the rural areas of the former homelands is unknown as well as the precise reason why they are farming. This complexity makes it very difficult to determine the type of support that is needed by emerging black farmers. The inhabitants of these rural areas of subsistence agriculture are typically women, children and aged people to whom the land is more a form of social security instead of using it for agricultural production (Fényes & Meyer, 2003: 26, Aliber & Hart, 2009:441). Most of these farmers cannot even produce enough food to meet all their household needs. Mostly the crops they produce are a supplement to an external form of income such as pensions and social grants. In most rural areas farming still remains important for rural households, but people in rural areas are considering diverse opportunities to increase and secure their household income (Baiphethi & Jacobs, 2009:461). The extent to which non-farming activities are practised as a source of income varies greatly across the different regions and countries.

During a survey conducted in the Limpopo province Aliber and Hart (2009:447) found that very little of the household engaged in subsistence farming spend any additional income on agricultural activities. The only inputs purchased when needed are seed. Only 6% of households purchase fertiliser and 2% of household purchase additional agrochemicals. Due to the extremely low levels of income, households are unable to engage in high cost input agricultural practises. Furthermore, most households are food-insecure, additional income is spent on food instead of buying expensive agricultural input products. Therefore, these reasons

subsistence farming households concentrate on low input agricultural practises and crops that are appropriate for their areas.

Only by occasion and exception surplus will be produced which can be sold or traded (Ortmann & Machethe, 2003:47). Relatively low levels of the cropping potential of arable area available to subsistence farmers are utilised. Because subsistence farmers are so dependent on efficient crop production for their food security it is essential that the entire area under production are utilised efficiently (Le Roux *et al.,* 2016:88).

Aliber and Hart (2009:439) made four important observations in their study: There is a large portion of the South African population involved in agriculture (2 710 000 households in 2015 – Stats SA, 2015a:180). The main reason for people to be engaged in agriculture is to produce an extra source of food. Over time the portion of people engaged in agriculture to produce an extra source of food have increased over time to the expense of the portion of those involved in agriculture as their main source of food. The smallest portion of the population is involved in agriculture as their main or extra source of income, but this portion has been consistent over time.

According to Aliber and Hart (2009:443) if the agricultural transition of black families from 2006 to 2007 is studied it is clear that engagement in agriculture as a main source of food is a sign of extreme poverty. Poorer households are more reliant on agriculture compared to upper income groups whose proportion of non-farming income is higher (Baiphethi & Jacobs, 2009:461). The people that transitioned from farming as a main food source to farming being a supplementary source of food as well as the people who even transitioned completely out of agriculture indicated an increase in their income. This made farming entirely unnecessary and only an additional source of food. The transition from engaging in agriculture as an extra source of food to agriculture being the main source of coincided with a significant drop in income. From their observations Aliber and Hart (2009:445) concluded that there is considerable movement in and out of agriculture by black households. It suggests that agriculture is seen as a fall back activity that is engaged into when it suits them or is able to, but is abandoned when it is unnecessary or inconvenient. Recent evidence have indicated that the number of black person headed families in the former homeland areas engaged in crop production have increased with 300 000 from 2010 to 2015 (BFAP, 2016:4). This might be an indication of the poor economic conditions prevailing in South Africa, where families under economic pressure falls back to farming as a source of household needs and income. Overall the subsistence agricultural sector can be described as large, complex and important.

The contribution of the subsistence farming sector to the economy of South Africa and towards poverty alleviation have not been well studied (Baiphethi & Jacobs, 2009:472). Although South Africa have been self-sufficient in terms of food production, considerable levels of household food insecurity still exists in mainly rural areas, especially in the former homelands.

2.3.2 Importance of small-scale and subsistence agriculture in South Africa

Subsistence farming has a positive nutritional impact on the livelihood of farmers but do not necessarily have an impact on the income of farmers. According to Aliber and Hart (2009:437) most subsistence farmers in South Africa make use of additional sources of off-farm income to sustain their livelihood. These measures are put in place to spread and mitigate risk and manage poverty. Although additional income is generated from selling surplus agricultural produce or services, a greater percentage of income is earned form social grants, family contributions, buying and selling of consumables, full time and seasonal employment in rural towns or on commercial farms.

Subsistence farming has the potential to improve food security and decrease the dependence on purchasing food not only of poor households in rural areas but also in urban areas (Baiphethi & Jacobs, 2009:459). Subsistence food production and/or smallholder food production can act as a buffer for rural households against food price inflation. Subsistence farmers in the Limpopo were able to provide a third of their household food needs through maize and African vegetable production at very little cash cost and labour (Aliber & Hart, 2009:450).

The National Development Plan estimates that agriculture could create one million additional jobs by the year 2030. One of the biggest drivers in this employment creation initiative will be the accelerated productivity of small-scale farmers, who make use of labour absorptive production practices (Department of Agriculture, Forestry and Fisheries, 2015b:15). Small-scale and subsistence agriculture need to provide 323 000 of the one million jobs in agriculture targeted by the National Development Plan (Table 2.1).

If farmers in rural areas can be assisted to make better use of the land they have available, irrespective the size of the land, it can have a positive impact on the rural economy and developments leading the poverty alleviation and employment opportunities (Grain SA, 2015:4).

2.4 DEVELOPMENT OF SUBSISTENCE MAIZE FARMERS

Agriculture remains the economic engine and the main source of livelihood for the rural poor populations in Africa. Therefore increasing on-farm yields of smallholder farmers in Africa are seen as a central to rural development efforts and strategies. On-farm yield is seen as a measure of the success of government policies, development and research (Larson *et al.,* 2013:355). Efforts to improve the productivity of smallholder farmers are central to development strategies of African governments and international development agencies.

In their study Larson *et al.* (2013:366) found empirical evidence that maize yields fall as the production scale of smallholder farmers' increase. The data suggests that the intensity of applied input differ as the production scale changed. This is an indication that efforts to increase productivity of smallholder and subsistence maize farmers in Africa should focus on increasing the productivity per area land basis instead of increasing productivity by expanding the area of production. Increasing the productivity of small scale subsistence farming units per area basis, will reduce the pressure on natural resources and will prevent the expansion of production into fragile marginal lands (Baiphethi & Jacobs, 2009:471). The literature therefore suggests that development not necessarily implies increase in farming area, but rather an increase and improvement of production efficiency.

According to the literature numerous factors influence the development and success of small scale and subsistence farming units. The following factors were identified from the literature as some of the most important factors influencing subsistence farmer development and success.

2.4.1 Government and Private sector support

The Government of South Africa already started with small scale farming support programs in the mid 1990s. Some of these programs included, homeland consolidation, trust land purchases (1970s), deregulation which increased marketing of informal farm products (1968) and land reform processes (Department of Agriculture, Forestry and Fisheries, 2011:1)

In the year 2000 the Government launched the Land Redistribution for Agricultural Development program along with the Comprehensive Agricultural Support Program. The support program provided support to black farmers that privately acquired land or obtained land through the land reform program. Since the establishment of democracy in South Africa in 1994, much has been done toward land restitution and redistribution, but at the same time farmers in the former

homeland have access to large amounts of land which is underutilised and under productive (Grain SA, 2015:4).

Evidence suggests that agricultural activity in the former homeland areas is declining. The reason being that the support farmers in the former homelands received from the pre-1994 government have been removed (Baiphethi & Jacobs, 2009:476). Recent evidence have indicated that the number black person headed families in the former homeland areas engaged in crop production have increased with 300 000 from 2010 to 2015 (BFAP, 2016:4). This might be an indication of poor economic conditions instead of increased support for this sector.

The Micro-Agricultural Financial Institutions of South Africa program extends micro-financial service to economic active poor households in rural area as well as small scale farmers and agribusinesses. The rollout and implementation of these programs have been slow and the effectiveness thereof is difficult to judge (Liebenberg & Pardey, 2010:390).

The Agricultural Policy Action Plan (APAP) was approved by Cabinet in March 2015 (Department of Agriculture, Forestry and Fisheries, 2015b:7). The APAP aims to bring more smallholder farmers into the mainstream food supply value chain. This action plan has the priority of revitalising agriculture and the agro-processing value chain. Commodities with high-growth potential and high-labour absorption capacity as identified by the National Development Plan will be focussed upon. One initiative under the APAP included the World Food Programme. During the 2014/15 financial year 346 smallholder farmers benefited, producing commodities with a value of R14.8 million. This project helps farmers to improve their productivity, reduce risks and improve their market access to sell the produce to alternative buyers. Through this project it is confirmed that smallholder farmers can produce quality products that can meet local and international standards.

The *Fetsa Tlala* programme is another programme headed by the Department of Agriculture, Forestry and Fisheries (Department of Agriculture, Forestry and Fisheries, 2015b:7). The programme plans to bring 128 00 hectares of land under production through small scale farmer development.

The *Rekgaba ka Diratswana* program in the Free State province is set out to assist 160 000 households to produce their own food trough food gardens (Department of Agriculture, Forestry and Fisheries, 2015b:7). Through these programmes the Department of Agriculture, Forestry and Fisheries plans to create an additional 31 000 jobs during the 2015/16 period.

Other support programs include the Recapitalisation (Recap) (technical and financial support to developing farmers), Casp (improvement of support services) and Mafisa (focussed on micro and small scale farmer development) program. Recently Professor Charles Machette, gave an update on an effectiveness study of these programs at the Agricultural Economics Association of South Africa (AEASA) conference. According to Professor Machette the goals of these programs were not met. There was an improvement in terms of access to support but access to the markets for these farmers were not improved. The programs were not effective in terms of employment creations and creating food security. The main reasons for these programs not meeting the set out goals were poor coordination between government departments, limited resources, no focus on market access, poor design of programs and lack of skill transfer. The beneficiaries of these programs were also not effectively selected, funds were made available too late and there was a lack of commitment from the beneficiaries. Professor Machette proposed a redesign of al agricultural support programs with better coordination and better selection of beneficiaries, mentors and strategic partners (Kruger, 2016).

Aliber and Hart (2009:454) found that it is very complex to provide support to subsistence farmers and that the support subsistence farmers receive is ineffective and does not consider the local context and needs of the farmers. The support the farmers received does not support or build on the available competencies or address the relevant constraints. The support provided only benefited a very small number of households. It was found that the support programs of the government only supported the beneficiaries and not the communities as a whole (Kruger, 2016).

Most of the policies and programmes that were introduced by the government to help transform and develop small-scale black agriculture have not had the desired effects as it tended to be focussed on only the emerging/new era farmers and overlook the larger portion of smallholder and subsistence farmers. Most land reform and support programmes focus their effort on emerging semi-commercial farmers. The resource-poor subsistence farmers are ignored in this process. There is a lack of programmes and support that is targeted at the resource-poor subsistence farming sector. The national agricultural research system has also not made a significant impact on small-scale subsistence farming or agriculture as a whole (Jacobs *et al.,* 2008:14; Kruger, 2016).

Aliber and Hart (2009:455) have concluded that policy in support of subsistence farming activities should consider the following: Firstly adequate support must be given to the large number of people involved in subsistence farming activities and it must be determined if the

current level of support is efficient and adequate. Evaluation and monitoring systems must be put in place to assess the current government support programmes. Assessments need to include the total community (beneficiaries and non-beneficiaries) to determine the broader impact on household food security as well as the constraints towards making use of technology.

Secondly because of the complexity and diversity of the subsistence farming sector, research is needed to determine the nature of the support required by the subsistence farmers. There might be commonalities between different groups in terms of support needed and constraints.

Thirdly the promotion of certain crops and livestock which is better adapted and which can improve household nutrition should be considered. Research of local preferences, socio-economic and agro-ecological factors can be complementary in terms of promoting certain crops and livestock.

Fourthly, because most subsistence farmers operate in former homeland areas with marginal conditions, support is needed to prevent further deterioration of natural resources.

Finally, as indicated by other researchers as well, with the appropriate support subsistence farmers might improve the quality and quantity of the agricultural outputs and will allow innovative farmers to move from subsistence to more commercial production systems. A situation where subsistence farmers can develop into more commercial farmers, will not only help to decrease food insecurity but will also help those engaged in agriculture to decrease their dependency on the government.

Private organisations focus their support programs more on the commercial viable portion of the agricultural sector, instead of focussing on the subsistence farming segment (Jacobs *et al.,* 2008:14).

Farmer development support programs, especially government programs should consider redesign. It is very important that the corrected, targeted beneficiaries of these programs are selected (Kruger, 2016). There are enough entrepreneurs that will make use of the opportunity, if there are more certainty in policies, ownership rights and stability in the agricultural sector (BFAP, 2016:8).

Along with the deregulation of domestic markets and the liberalisation of foreign trade in the 1990s came the unfortunate dismantling of farmer support in the form of financial services, extension services, research and development, infrastructure and market support. Instead of the

dismantling of this support indiscriminately, a redirection and rescaling should have taken place to support small scale and emerging farmers (BFAP, 2016:8).

2.4.2 Non-government support: The Grain SA farmer development program

Since its establishment in 1999, Grain South Africa has been involved in the development of farmers. The Grain SA farmer development program has received funding over the years from numerous grain trusts, government departments and private companies. Over the past years Grain SA was able to establish a network of ten regional offices in strategic locations from where the training and development programs are driven (Grain SA, 2015:4). These offices are located in Dundee, Kokstad, Louwsburg, Umtata, McClear, Nelspruit, Ladybrand, Lichtenburg and Taung.

The mission of the Grain SA program states the following: “To develop capacitated grain farmers and to contribute to household national food security through the optimal use of the land available to each farmer”. The program strives to empower grain farmers from different backgrounds, skill sets and land tenure to farm profitably and sustainably. Over the years it has become apparent that the most important factor in successful growth, development and transformation is not the availability of infrastructure, production inputs, finance and the mechanization, but rather the human element.

The programs include numerous projects that have been established to help develop farmers and transfer skills. Some of these projects include: Establishment of study groups, where program coordinators make formal contact with farmers and where formal lectures can take place on the fields of production, marketing and management. The study groups provide also contact points where field demonstrations and information days can be held as well as an opportunity for interaction between farmers of different levels. The program also coordinates demonstration trials and farmer information days. These events are aimed to demonstrate and show developing farmers the result of good production practices. Because of the complexity and diverseness of the developing agricultural sector, the program also works on establishment of partnerships throughout the grain industry. Through the partnerships the program attempts to leverage on the expertise of the different contributors, in the process of developing farmers. The program has also developed 48 different formal training courses, each developed to address specific needs of farmers at different levels.

The Grain SA development program currently supports more than 3500 subsistence grain farmers in South Africa. This study will focus on one of the specific projects of the Grain SA development program, the One Hectare Project. In 2014, this project was initiated with 855 subsistence farmers in Mpumalanga, KwaZulu-Natal and the Eastern Cape. Each farmer made a contribution of R 1500.00 for each ha of maize that they wanted to produce. Every farmer was then provided with the necessary advanced agricultural inputs and service (including herbicide tolerant maize hybrids, herbicide, insecticide, fertilizer, lime, hand planters, knap sack sprayers and soil analysis). Grain SA along with the Agricultural Research Council provided the necessary training and mentoring to the farmers in their home language.

After the first year, the success of the project led to a four-year commitment of Grain SA and the project partners, the government (through the Jobs Fund) also committed to the project. During the second year of the project 1600 farmers participated and even under the severe drought conditions were able to successfully produce sufficient grain. Over the long term, benefits of the One Hectare Program includes improved household food security, more sustainable land use, rural economic development, direct and indirect job creation and improved land use contributing to national food security.

2.4.3 Access to land, infrastructure, markets and resources

Since the change in the political regime in 1994, the South African government have initiated several programs to support black farmers and to drive agricultural and land reform (Liebenberg & Pardey, 2010:390).

Fifteen years after the transition towards a democratic society, there still remains uncertainty and controversy, as to who should be the primary beneficiaries of land reform in South Africa. According to Cousins (2010:2) it is argued that land reform in South Africa should be focussed on the “rural poor” and “smallholders” instead of the “emerging commercial farmer. In recent years focus have moved more to the “rural poor”, “small-scale farmers” and “smallholders” as beneficiaries of land reform, instead of “emerging commercial farmers” (Cousins, 2010:3).

The government and ruling party in South Africa still support and encourage land redistribution and restoration, although these programs up to date have been characterised by little success, poor performance and low levels of productivity (Cousins, 2010:3).

At the recent annual meeting of the African Farmers’ Association of South Africa (AFASA), the secretary general of AFASA, Mr Aggrey Mahanjana said that land reform without land

ownership remains a very big challenge. Farmers receiving land without ownership remains vulnerable (Van Burick, 2016). Mr Mahanjana added that new emerging farmers should receive support from government to develop into a more commercial level. Support programs should be more focused on specific needs of these developing farmers.

Land reform and the beneficiaries of land reform programs can only be successful if there is an enabling framework set in place by the government. The successful execution of land reform is necessary for stable growth in agricultural sector and improvement of rural economy (BFAP, 2016:8).

The under-investment in rural infrastructure such as roads, transportation and communication networks pose a serious challenge to small-scale subsistence farming in South Africa (Jacobs *et al.,* 2008:14). Agricultural activity in sub-Saharan Africa are characterised by small and falling farm sizes, poor-quality land and negligible irrigation infrastructure. Productivity can be improved by increasing the access to agricultural assets such as land, water and human capital (Baiphethi & Jacobs, 2009:471).

Fraser *et al.* (2003) found in their study that, although farmers in the Eastern Cape have access to crop land, they would rather concentrate on home gardens to produce food for their own household consumption. The reason for this is, although these farmers have access to crop land, they did not have access to implements and other resources and could not afford the associated risk and inputs of cultivating large areas of land.

Evidence suggests that in certain areas (especially former homelands) natural resources are underutilised in terms of agricultural production. Production can be increased by making use of improved varieties of seed, fertilisers and other inputs along with targeted subsidies (Baiphethi & Jacobs, 2009:466).

The overall economic and financial position of small-scale farmers in the rural areas, prevent them from purchasing costly inputs and making long-term investments in agriculture (Aliber & Hart, 2009:437). These poverty-stricken farmers would rather focus on more intensive and much diversified farming practises, to help spread risk and supplement their own household consumption.

A study by Mbanza and Thamaga-Chitja (2014:251) in Rwanda, where 150 members of subsistence farming cooperatives were surveyed revealed that availability to agricultural equipment and access to agricultural inputs influenced the productivity and success of the

farmers to ensure household food security. The study found that subsistence farmers forming part of a cooperative were more productive and successfully improved food security and reversing poverty. Forming part of cooperative helped subsistence farmers to increase crop productivity, income, efficient training and better access to markets and government support (Mbanza & Thamaga-Chitja, 2014:265).

It was found that one of the reasons farmer development programs failed in the past in South Africa, was the lack of focus of market availability and access (Kruger, 2016). Effective markets and distribution networks can not only improve the access of farmers to inputs but can also help developing farmers with an off-take of their producing, linking them with the consumer (Baiphethi & Jacobs, 2009:471).

2.4.4 Access to advanced agricultural inputs and technology

Most of the subsistence household food production is done under relatively harsh conditions with limited access to water, unpredictable rainfall and poor soil fertility. Because of the poor agro-ecological conditions and the poor social conditions of the farmers the natural resources tends to deteriorate under these subsistence farming practices (Aliber & Hart, 2009:450). Mismanagement, overgrazing and unmanaged harvesting of firewood is further leading to deterioration of the natural resources. During their survey, Aliber and Hart (2009:453) noted that subsistence farmers did not have the resources to use advance technologies and inputs in their farming practises. Because of the low levels of income and the low spending on agricultural inputs, farmers chose to make use of low input “traditional” farming practises that formed part of their culture. This enabled them to produce food even under harsh conditions with poor rainfall, but at low productivity.

Although subsistence farming is very important for household food security the productivity is low, this leads to abandonment of agricultural activities and increased reliance on non-agricultural sources of income (Baiphethi & Jacobs, 2009:466). The low productivity can mainly be attributed to the absence of high yielding crop varieties that are widely used in high agricultural productive areas of the world. If subsistence farmers have access to better seed and technology, it will improve the productive efficiency and reduce the risk of food shortage. Access to improved seed, fertiliser and technology for subsistence farmers is complex, with a wide range of crops, climatic and soil conditions as well as poor developed distribution channels (Baiphethi & Jacobs, 2009:471).

Small-scale and subsistence farmers rely on informal channels to access inputs, including farm saved seed, farmer-to-farmer exchange and irregular sales. Southern African smallholder farmers obtain only 10% of their seed from formal markets (Baiphethi & Jacobs, 2009:466). It is therefore important to improve and develop channels to improve the access of smallholder and subsistence farmers to advanced inputs. Encouraging subsistence farmers to make use of improved inputs can increase their productivity. Improved and advanced inputs include fertiliser, animal traction, organic inputs, water and soil conservation technology (Baiphethi & Jacobs, 2009:476).

Non-agricultural income plays an important part in being able to purchase improved inputs and technology that will help to increase productivity. Government support and programmes to help provide subsistence farmers with improved input must be sustainable, so that farmers will be able to generate enough income so that they can continue acquiring the inputs beyond the initial support of the programme (Baiphethi & Jacobs, 2009:471).

According to Larson *et al.* (2013:356) the path to improved lives for the rural poor of Africa lies with technologies that can boost the productivity of smallholder and subsistence farming households. Subsistence farmers in Rwanda indicated that their productivity increased when making use of advanced agricultural equipment and farming methods as well as improved seed and fertilizer (Mbanza & Thamaga-Chitja, 2014:265).

South-Africa is the only country on the continent of Africa where a subsistence food crop is produced by using Biotechnology (Genetically Modified (GM) Technology) for more than a decade (Gouse *et al*. 2016:1). The rapid adoption of GM technology since its introduction is an indication of the benefits the technology brings for both large and small farmers in developed and developing countries. The adoption rate of GM technology is the highest of any other new technology introduced in the agricultural industry (James, 2003:303). Since the release of biotechnology crops in 1996 more than 18 million farmers globally have benefited from the technology, 90% of these farmers were small, risk-adverse, resource-poor farmers in developing countries (James, 2015:6).

The use of GM maize in South Africa started in 1998, with the general release of insect resistant (BT - *Bacillus thuringiensis*) maize, containing a BT gene that make the maize hybrids resistant to the maize stem borer, which is a major pest that can cause major crop losses. In 2003 general release was obtained for the herbicide tolerant (HT) maize, this technology allows farmers to improve weed control in their maize fields. With the improved weed control, less-till or

no-till methods of cultivation is made possible, reducing the impact on top soil, input cost and labour. The general release of hybrids containing both the BT and HT genes were granted four years later (Gouse *et al*., 2016:9, James, 2003:305).

The use of GM technology have numerous benefits including convenient and flexible crop management, increased productivity per land area, health benefits, environmental benefits through reduced use of pesticides, improved weed and pest management, reduced input cost and improved profit (James, 2003:303, Carpenter, 2010:319, James, 2015:12). GM crops can make a vital contribution to global food, feed fibre security, especially in developing countries.

The use of GM maize hybrids by smallholder farmers in South Africa had significant benefits, especially HT maize. The HT maize is a labour and management saving technology and it has the potential to play a very important part in reducing the labour constraints of smallholder and subsistence farmers (Gouse *et al*., 2016:2).

The uptake of productivity enhancing technologies such as GM maize hybrids, are more limited for female headed farming households. The availability of labour is a limiting factor for female farmers, not only because of cultural constraints but also because there is a higher participation of males in off-farm activities (Gouse *et al*., 2016:3). Although the uptake of GM technology by female-headed farming households is slow, it appears that female farmers might benefit more from the use of this technology, especially the herbicide tolerant technology, considering the labour limitation female farmers experience. Female farmers preferred the ease of production and the labour saving benefit of herbicide tolerant maize even over gross income or yield benefits that other technologies such as BT hybrids can provide. Maize hybrids containing both GM technologies of HT and BT provided the most benefit for female farmers. In their study Grouse *et al.* (2016:11) found that not only small-scale female farmers but also male farmers were satisfied with the cultivation of hybrids containing GM technology. Globally small-scale farmers achieved greater yield benefits with GM crops compared to large farmers in developed countries (Carpenter, 2010:320).

The availability of maize cultivation data on small-scale farmers are very limited and complicated by the unclear definition and segmentation between subsistence, smallholder and emerging previously disadvantaged maize farmers. It is a very complex task and process to determine the amount of small-scale farmers that make use of the GM-technology. It is very difficult for seed companies to identify the end user of GM seed sold through distributor channels, government projects and community buying groups. Although there was an increase

in the use of GM maize seed by small-scale maize farmers since 2007, the technology adoption is still low modestly taking into account the amount of smallholders and subsistence maize farmers in South Africa (Gouse *et al*., 2016:9).

Technology that can lead to labour saving such as herbicide tolerance GM technology can allow subsistence farmers to spend more time on other food crop production and cash crop production. This in turn can provide additional income, expansion of cropping area and drive them to more commercial type of farming operations. Herbicide tolerance GM technology has huge potential for African farmers not only because of labour saving benefits but also because of yield improvement brought about by effective weed control (Gouse *et al*., 2016:11, Carpenter, 2010:320, James, 2015:12).

Unfortunately African small-scale farmers have a slow adoption of herbicide use, caused by affordability, availability and support through training and information of proper use. It is expected that the adoption of technology such as herbicide tolerant GM maize hybrids will also be limited because of the same reasons. The unavailability and poor access to the GM technology is probably one of the biggest limitations to the adoption and spread of the technology in the subsistence farming sector. One of the biggest reasons for the slow adoption of GM crops in subsistence farming practises in developing countries is the slow implementation of science-based and time-effective regulatory systems (James, 2015:13). It is therefore important that sustainable and effective input and output markets and regulatory systems need to be developed, through political will and long-term investment and support (Gouse *et al*., 2016:11).

2.4.5 Availability of Labour

Research have shown that the absence of sufficient labour during critical seasonal operation such as planting, weeding and harvesting, is a crippling impediment to increase crop yields and expand production. Gouse *et al*. (2016:9) found that in the former homelands of Kwa-Zulu-Natal land was abundant but labour was in short supply. The main reasons for the short supply of labour were the migration of people from the rural areas to the urban areas and high incidence of HIV/AIDS. The limited supply of labour is leading to under production of available agricultural land in rural parts (Gouse *et al.,* 2016:11).

In most rural small-scale farming operations males are responsible for the application of herbicides and insecticide, while the women and children are responsible for water fetching for

spraying. Female members of the households usually perform the bulk of the manual weeding and harvesting operations (Gouse *et al*., 2016:9).

Because of cultural laws it is especially difficult for women-headed households to access labour. Evidence indicate that women farmers in women-headed households in the former homeland areas in KwaZulu-Natal and the Eastern Cape unequal access to labour and land compared to male farmers (Hull, 2014:455). In male-headed households, women farmers depend of their status in the household to gain access to family labour (Hull, 2014:455).

Because of high levels of unemployment and poverty young adults remain in their parental homes, however these young adults' productive labour are often not utilized in family farming operations (Hull, 2014:451). Young, unmarried adults have limited responsibilities to provide labour and income towards the family homestead; this reduces the overall viability of small scale family faring operations.

It was found that the formation of "working groups" by female farmers made accessing labour easier, leading to an increase of productivity (Gouse *et al*., 2016:11).

2.4.6 Skills and training

Farming has become complex over time and an in-depth understanding of a large number of diverse subjects are required (Grain SA, 2015:12).

The level of education of farmers, training and skills of farmers, level of government assistance and provision of extension services influenced the productivity of farmers and their ability to ensure household food security (Mbanza & Thamaga-Chitja 2014:251). Important developments and improvements that can help increase subsistence productivity is an increased investment into research and development, extension services, financial and credit services and training and skills transfer (Baiphethi & Jacobs, 2009:477).

2.4.7 Global and commercial factors

Although globalisation has brought some opportunities for the agricultural industry and market access barriers, domestic support and export subsidies made it difficult for developing countries such as South Africa to fully utilise the opportunities. Small-scale farmers are in particular affected by lower local prices for produce, caused by increased global supply. The inability of

small-scale and subsistence farmers to guarantee quantity and quality makes it difficult for these farmers to become part of a value-added supply chain (Jacobs *et al.,* 2008:14).

Because of the fast expansion of South African Supermarket chains into smaller rural towns, the farming market sector has been radically altered in recent years. Over time rural poor households have become net consumers rather than net producers of food, relying on the expanding network of supermarkets as a source of food. Although the expansion of supermarkets into rural areas may have a positive effect on consumers, it consequently has a negative effect on the rural small scale farmer's production off-take (Baiphethi & Jacobs, 2009:464).

The financial pressure that commercial farmers experience, causing a loss in employment opportunities and retrenchment of farm workers puts more strain on the small-scale/subsistence farming sector to help support these unemployed individuals (Jacobs *et al.,* 2008:14).

2.4.8 Health and social factors

Along with poor access to agricultural assets, poor health services and education limit productivity of agriculture further (Baiphethi & Jacobs, 2009:471). People infected with HIV/AIDS have a serious effect on small-scale/subsistence farming, with families with infected members struggling to work the land effectively (Jacobs *et al.,* 2008:14).

Most of the people engaged in subsistence farming in the rural parts of South Africa are women, aged individuals and children (Fényes & Meyer, 2003: 26, Aliber & Hart, 2009:441). A study by Mbanza and Thamaga-Chitja (2014:251) revealed that the age of farmers influenced the productivity and success of the farmers to ensure household food security.

In their report the World Bank (2007) has identified the following measure that can be applied to improve productivity and sustainability of subsistence smallholder farming units:

- Improving the price incentives and public investment
- Improving the effectiveness of product markets
- Improve the access to financial services and reducing the risks
- Improving the performance of producer organisations

- Promoting innovation through science and technology

2.5 SUMMARY

After studying the relevant literature it can be deduced that agriculture in South Africa not only has to play an important role in the economic and employment growth of the country, but it also plays a very important part in household food security, correcting the past political and socio-economic wrongs and the democratization of the country. Although agriculture has a small contribution towards the total GDP and employment of the country, South Africa is in a position of overall food security and sovereignty, producing enough food for local consumption and exporting surplus produce.

The South African agricultural sector is dualistic in nature with a big commercial segment and a smaller complex non-commercial and subsistence, measured in terms of productivity and output. There is a great deal of uncertainty about the way agricultural entities are classified in South Africa, with specific reference to the non-commercial and developing portion of the industry. There is also a breach in the literature with regards to the precise number of farmers and land engaged in non-commercial and subsistence agriculture. Overall the agricultural industry faces numerous challenges.

Maize is the most important grain crop in South Africa, with South Africa being one of the world largest producers of maize and in a normal season being a net exporter of maize grain. Maize also remains one of the most important sources of food for rural communities depending on farming as a main supplementary source of household food.

Subsistence farming plays an important role in household security of rural areas and it has the potential, through the correct development, to improve the rural economy, unemployment and poverty.

Because of the complexity of the subsistence sector it is difficult to provide overall support to develop the sector as a whole. Support and development programs will have to focus on the specific needs of the diverse group of farmers.

Technology and advance production inputs will play a very important role in the development of rural resource poor farmers. The biggest limitations of adoption of advance inputs and technology include the accessibility, availability and the utilisation skills of the farmers.

Over time numerous government programmes and initiative was set in place to establish land and agricultural reform and development in South Africa. Most of these programs unfortunately focus on only the commercial viable portion of the sector, instead of focussing resources and expertise on the portion of the segment with access to land and that are relying of agriculture for their livelihood. Very little success has been documented with regards to most of these programs.

Non-government instated agricultural development programs supported by the private sector and government departments have proven to be successful with long-term benefits.

Over time many limitation and factors influencing the development of resource poor and subsistence farmers have been identified. The most obvious factors include the overall access to infrastructure, resources, assets, labour and advance inputs. Most of these limitations address the obvious limitation faced by farmers and little attention is given to the human factor. In the next portion of the study an in-depth study will be conducted on subsistence maize farmers, to understand the factors that prevent them of developing into more commercial entities, with specific focus on the human and social factors.

CHAPTER 3: EMPIRICAL STUDY

3.1 INTRODUCTION

Considering the unique dual agricultural system present in South Africa, there are certain factors that influence the development of new entrants and subsistence farmers. Through an in-depth literature study it is clear that there are certain common development factors that can be identified. This study aims to measure the importance of these identified factors as well as to determine if there is a personal drive to develop. The study will also measure if there is a difference between certain demographic backgrounds, specifically gender and age, with regards to how the development factors are perceived.

In this study the impact of certain factors on the development of subsistence maize farmers into commercial units are measured. From the literature pre-determined factors which could have an impact on the development of subsistence maize farmers were identified. The frequency of these factors occurring in the sample is measured. Therefore the factors that influence the development of subsistence maize farmers can be considered the independent variables, according the definition provided by Welman *et al.* (2005:16). The frequency of these factors and the importance of these factors to the sample (subsistence maize farmers) are considered the dependent variables.

In chapter one the research problem was defined and discussed. The research question as well as the research objectives was set out and described. In chapter two an in-depth literature study was presented on the topics relevant to the study. In this chapter the empirical approach to measure the relationship between the dependent and independent variable will be discussed.

3.2 RESEARCH PROCESS

The research process that was followed during this study is shown in Figure 3.1.

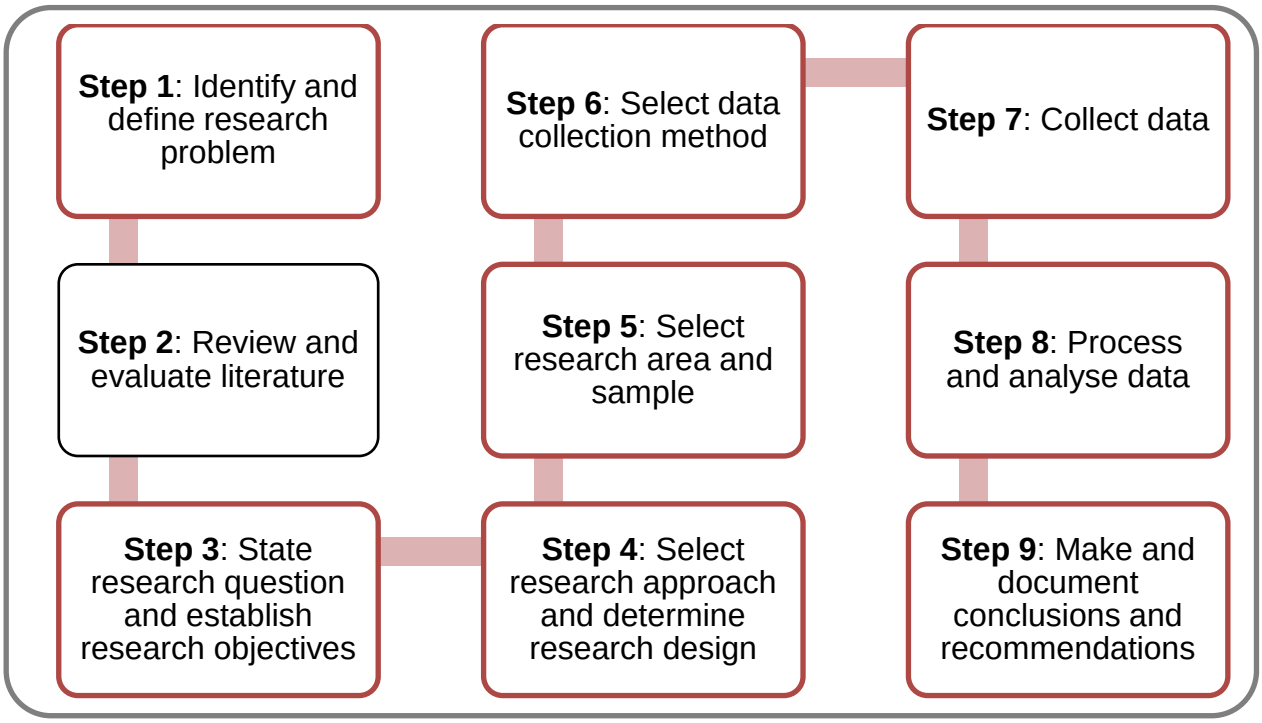

Figure 3.1: Research process followed during this study

(Adapted from Nenty, 2009:28).

The process from step 4 up to step 8 will be discussed in detail in the following sections.

3.3 RESEARCH DESIGN

According to Welman *et al.* (2005:52) research is done to gain certain insight on a hypothesis or a research question. The results obtained from the research should help to make certain conclusion with regards to the hypothesis and research question (Struwig & Stead, 2013:3-4). A crucial element to ensure that the results will address the research question is the research design of the study. The research design is basically the plan or approach that will be followed to gain the correct results and information from the target population (Leedy & Ormrod, 2005:85).

This study aims to make observations and measurements objectively, therefore the best approach will be a quantitative approach (Struwig & Stead, 2013:3-4). Quantitative research is a predetermined, instrument based method, used to collect performance, attitude and

observational data. The data gathered from quantitative research can be statistically analysed and interpreted (Creswell, 2014:17). Considering the complexity of the research question and the diversity of the research population, a quantitative research design will limit interpretation error for both the participants and the researcher. According to Creswell (2014:20) a quantitative approach is best for identifying factors that influence an outcome, as in the case with this study.

According to Nenty (2009:28) quantitative research are based on three sections: (1) Verbal discourse: presenting research problem, analyse and validate research problem, literature review and report, procedure for carrying out study and justification. (2) Numerical and quantitative discourse: Research variables, concepts and constructs are replaced with numeric values. This process is purely numerical and technical and involves hypothesis testing and gaining results. (3) Verbal translation of results: Technical and numerical results are translated into findings. The results are discussed, findings are presented, conclusions and recommendations are made.

In this study no random or planned intervention took place and there was no random assignment of research participants to groups. The effect of the independent variables on the dependent variable and the relationship between variables are only observed, giving the study a non-experimental, field survey design (Leedy & Ormrod, 2005:218-219). Because the study will measure the relationships between variables at a single point in time and cross different cohorts, it gives the study a cross-sectional design (Churchill *et al*., 2010:109). Therefore, the study followed a quantitative, non-experimental, cross-sectional, field survey design.

3.4 RESEARCH POPULATION AND AREA

According to Welman *et al.* (2005:52) the research population is the object of the study and includes the total collection of all the units of analysis about which the researcher wants to make a conclusion. The aim is to generalise the results of the study to the target population.

According to the Labour Force Survey (2016:63), there were in total almost 1.7 million people practising subsistence farming during the first quarter of 2016. There were 757 000 in KwaZulu-Natal, 423 000 in the Eastern Cape and 149 000 in Mpumalanga. These include all people engaged in subsistence agriculture; not only subsistence maize farmers.

The target population for this study was subsistence maize farmers in the KwaZulu-Natal, Eastern Cape and Mpumalanga province of South Africa. Subsistence maize farmers for the purpose of this study are defined as farmers that:

- Are engaged in maize production to fully or partially supply their household's subsistent needs;
- Have access to less than 10ha of arable land;
- Are farming in the KwaZulu-Natal, Eastern Cape or Mpumalanga province of South Africa; and
- Are members of Grain South Africa and part of the Grain South Africa farmer development program

The specific research area (indicated in figure 3.2) is situated in the former homelands of KwaZulu-Natal, South Mpumalanga and Eastern Cape in South-Africa. This includes the rural areas around the following towns: Winterton, Dundee, Bergville, Escourt, Newcastle, Nquthu, Louwsburg, Piet Retief, Sheepmoor, Vryheid, Paulpietersburg, Skhemelele and Ermelo. There are currently 3662 subsistence maize farmers in the Grain South Africa farmers' development program in these three provinces.



Figure 3.2: The map indicates the target research area of the study

3.5 RESEARCH INSTRUMENT

3.5.1 Research Questionnaire

A survey approach making use of a questionnaire was followed to collect the primary data in this study. According to Welman *et al*. (2005:152) survey questionnaires may be used to obtain the following information of the respondents; biographic details, behavioural information, opinions, beliefs, attitudes and convictions. Considering the scope of the study, a questionnaire as a research instrument can be considered the most convenient, time effective and cost effective.

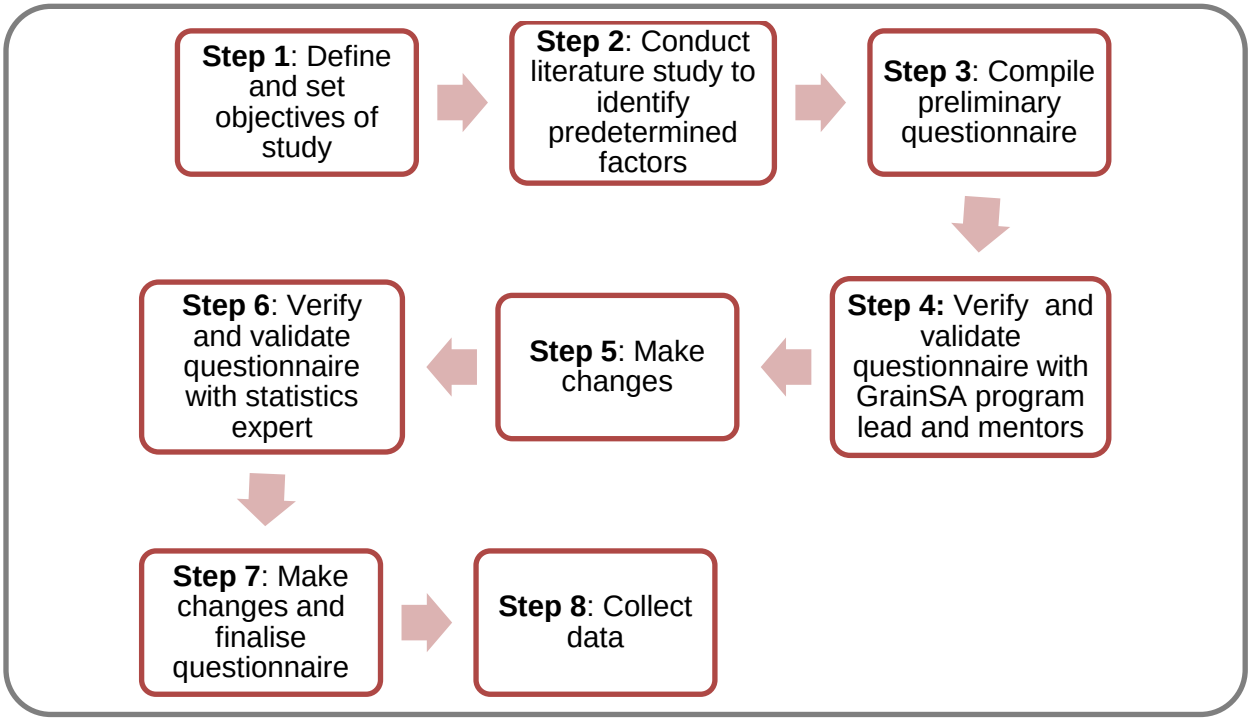

Figure 3.3: Questionnaire developing process used during the study

During this study a comprehensive and in-depth review of literature was conducted to better understand and conceptualise the concept of subsistence agriculture and maize production in South Africa. The literature provided background information and helped identify existing challenges and constraints of developing agriculture in South Africa.

The review of secondary information was focussed on text books, journal publications, articles, theses and dissertations. Keywords were used to search the electronic databases including the North-West University database, Google Scholar, Ebscohost and Science Direct. The following keywords were used during the literature search: Subsistent farming in South Africa, Developing

agriculture in South Africa, Small-scale farming in South Africa, Challenges and constraints in agriculture development. The literature study also provided valuable information to develop the constructs that will be measured by the measuring instrument.

The literature study helped to identify important factors that determine the development of subsistence farmers into more commercial farming units. The information provided by the literature study was used to formulate a preliminary questionnaire. The preliminary questionnaire was presented to the Grain South Africa farmer development program manager. Inputs were made and changes were proposed by Grain South Africa.

After the consultation and validation process with Grain South Africa and proposed changes the questionnaire was presented to the Statistical Consultation Services of the North-West University, recommendations were made and the questionnaire was finalised.

The demographic background of the population had to be considered during the development of the questionnaire. The population is characterised by aged people, with low levels of education and literacy skills. In most cases English were not the home language of the respondents. Therefore simple understandable language was used to state the questions and no complex concepts were included in the questionnaire. The questionnaire was limited to the minimum number of questions. See appendix A for the complete questionnaire as presented to the respondents.

A cover letter was compiled for the questionnaire containing the researcher's information, the aim of the study, the confidential handling of information as well as the feedback and availability of the study information.

The questionnaire comprises out of two sections. The first section consisted out of pre-formulated questions aiming to gather demographic and farming operation information. The specific demographic and farming operations information that was addressed included age, gender, reason for being engaged in farming, source of income and input purchases.

The second section of the questionnaire consisted of 38 close-ended questions addressing specific factors with regards to the agricultural development of the respondents. The closed ended questions made used of a four-point Likert-type scale, where the respondents had to indicate their level of agreement with statements addressing certain factors that can influence their development. Only a four-point scale used, to reduce complexity and limit the

misunderstanding and error. The four-point scale allowed the respondents to indicate if they fully agree (4), agree (3), disagree (2) or fully disagree (1) with the statement.

The Likert scale is currently the most popular type of scale to make use of in attitude studies (Churchill *et al*., 2010:270). The Likert scale makes it easy to compile questions and multidimensional attitudes can be measured.

The questions were formulated to ensure that all the possible factors that could influence the development of these farmers that were identified from the literature are addressed. The questions can be grouped into specific factor categories as presented in Table 3.1.

Table 3.1: Questions groups under specific factors that can possibly influence farmer development

Factor Group	Question	
Access to Resources	1	I have secure access to land
	2	I have access to money
	3	I have access to tractors, planters, sprayers and more
	25	If I had access to financial support (money) I would expand my farming operation
	24	If I had access to my own land I would expand my farming operation
Access to Advance inputs	4	I have access to hybrid maize seed
	5	I have access to biotechnology such as Roundup ready or BT seed
	6	I have access to fertilizer
	7	I have access to crop protection chemicals (herbicides, insecticides, and others)
	14	I spend extra money on buying farming inputs such as seed and fertilizer

Factor Group	Question	
Support, Information and Skills	10	I have access to mentors / agronomists that can support me
	11	I get support from the government for my farming operations
	12	I get support from Agri-Businesses such as co-ops, seed companies and others
	13	I get support from non-Governmental entities such as Grain SA, AgriSa, GFADA and others
	31	I want more support from private Agri-businesses such as co-ops, seed companies and others
	23	If I had access to more agronomic support I would expand my farming operation
	29	I have good cellular connectivity
	30	I have access to agricultural information
	31	I want more support from private Agri-businesses such as co-ops, seed companies and others
Family and Community support	17	My family members help me in my farming activities
	18	My neighbours and community members help me in my farming activities
	19	My children are involved in my farming activities
	20	My grandchildren are involved in my farming activities
	34	I want my family to be involved in my farming operations
Labour	15	I employ extra people to help in my farming activities
	16	If I could afford it, I would employ more people in my farming activities
	21	I have access to labour
Infrastructure and Markets	8	I have access to grain storage facilities
	9	I have a market where I can sell my surplus maize grain
	28	I have access to good infrastructure such as roads, transport, water and more
Age and Health	26	My age is limiting my farming activities
	27	My health is limiting my farming activities

Factor Group	Question	
Ambition to develop	22	I want to expand my farming operation
	35	I want to produce enough maize just for my own use
	36	I want to produce enough maize so that I can sell the surplus
	37	I want to be a commercial maize farmer
	38	I want farming to be my main source of income

3.6 RESEARCH SAMPLE

It is practically impossible to gather data from the entire target population when conducting research, therefore a representative sample of the population is used (Welman *et al.,* 2005:55; Steyn, 2002:10). The sampling unit is the portion of the population that is available to be used during the sampling process.

The sampling frame is a complete list of sampling units in the population (Malhotra, 2010:373). It is usually very difficult to obtain a sampling frame and in most cases such a list does not exist. In the case of this study the Grain South Africa membership list of subsistence grain farmers in the research area can be considered the sampling frame.

The Grain South Africa farmer development program structures were utilised to collect the data. Subsistence farmers are grouped in study groups; these study groups are mentored by Grain South Africa's appointed mentors. A number of mentors are grouped into regional offices under the guidance of regional program coordinators.

The sample of this study consisted of subsistence maize farmers in Grain South Africa study groups in three of the regions (Louwsburg, Dundee and Kokstad regional offices). The total number of subsistence maize farmers in the Grain South Africa study groups and involved in the development programs in these three regions during the 2016/17 season are a total of 1868 subsistence farmers planting an estimated 2965 ha of maize.

These farmers are situated in the areas indicate on the map below:

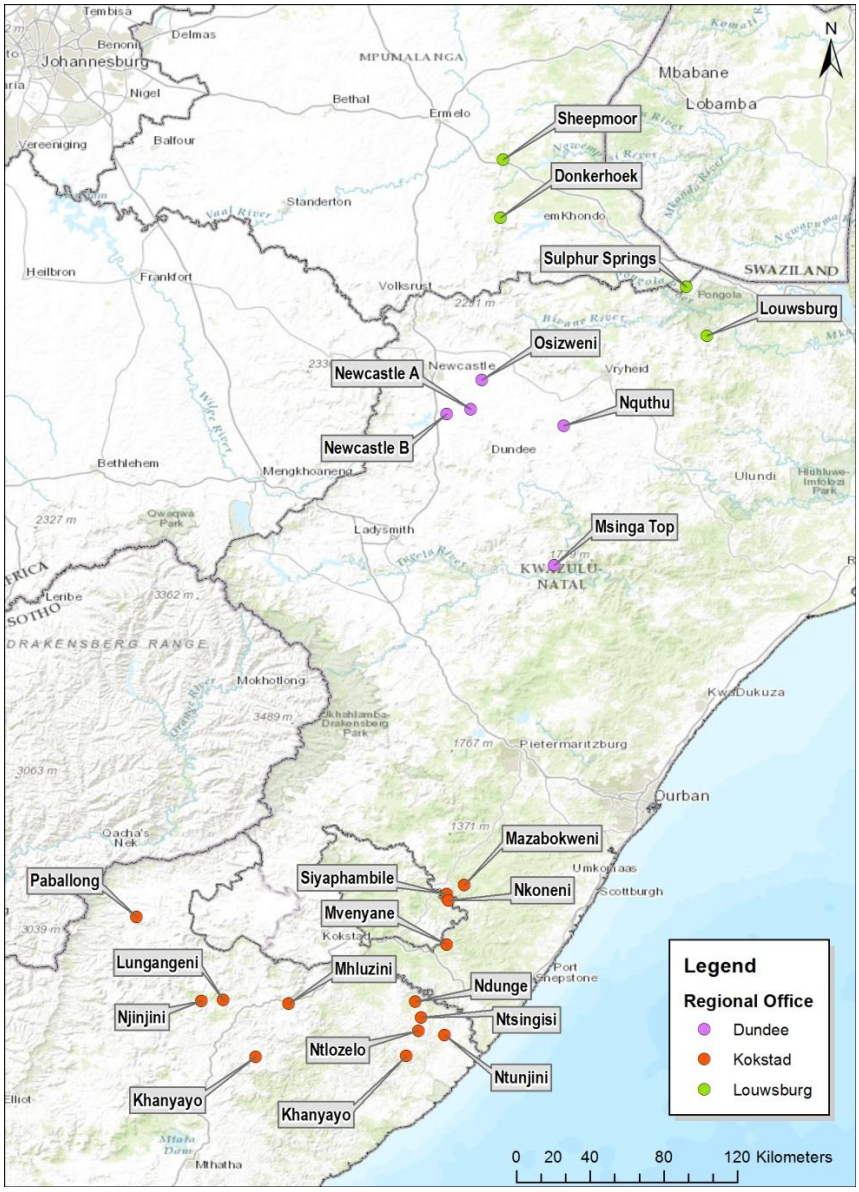

Figure 3.4: Study area where respondents are situated.

3.6.1 Sampling procedure and data collection

Non-probability sampling is a sampling procedure where samples in the population are selected non-randomly. The sampling relies on the judgement of the person conducting and administering the research and questionnaire. Respondents are not selected by chance, but through human intervention. Therefore it is not possible to determine the probability of a sampling unit to be included in the sample (Welman *et al*., 2005:67). Non-probability sampling is

less complicated and more cost effective compared to probability sampling (Malholtra, 2010:376). Considering the complexity of the population and constraints involved, non-probability sampling was considered the best option for this study. There are numerous types of non-probability sampling methods including quota sampling, judgement sampling, snowball sampling and convenience sampling (Struwig & Stead, 2013:116-118).

Because the existing study groups and mentor structure of Grain South Africa was utilised to conduct the sampling, the best option was a convenience sampling method. Convenience sampling involves selecting sample units by the interviewer based on the convenience and availability of the respondents (Welman *et al*., 2005:69). Although this sampling method is used widely, there is a limitation in terms of biased and influenced sampling (Malholtra, 2010:377). Considering the available resources, scope of study and the specific target population the sampling method can be considered sufficient for this study.

To study the population in question the study group and mentor network of Grain South Africa's farmer development program was used. In this network small-scale and subsistent maize farmers are structured in to Grain South Africa study groups. Each study group have a Grain South Africa appointed mentor, which help the farmers in term of technical and best practises, support and training.

The Grain SA regional coordinators and mentors were asked to act as interviewers and administer the hand outs and assist farmers in their study groups to complete the questionnaires. Mentors and coordinators of Grain South Africa are able to speak the major local language in the research areas and were able to assist the farmers in their home language. They were also able to explain the concepts in the questionnaire to the respondents. This reduced the possibility of misunderstanding by the respondents and the possible research error.

The sampling was conducted until the required sampling size was reached. For this study a minimum sample size of 200 respondents was set as recommended by the Statistical Consultation Services of the North-West University.

3.7 DATA ANALYSIS

To adequately address the research question and meet the research objectives, the raw data that was collected should be analysed and interpreted. Initially the all questionnaires were screened for completeness and quality. Incomplete questionnaires and low quality questionnaire

were discarded. After the screening process a total of 344 questionnaires were identified and used for data analysis. The pre-coded data on the questionnaires were captured and statistically analysed by the North-West University's Statistical Consultation Services. The SAS System for Windows (SAS Institute Inc., 2016) was used for the statistical analysis of the data.

3.7.1 Frequency and Descriptive statistical analysis

The data was entered into frequency tables and analysed through descriptive statistics. The frequency tables and descriptive statistics were used to summarize, describe and present the data (Levine *et al*., 2014:36), with regards to the demography of the sample population as well as insight on their farming activity. The following descriptive statistics were calculated:

Table 3.2: Descriptive statistical analysis used in this study

Arithmetic Mean ($\bar{x}$)	The common measure of central tendency in the data. It suggests the central value and balance point in the data set (Levine *et al.*, 2014:136).
Frequency	The number of times a response occurs in the data set.
Sample variance	The variance of the data set around the mean. The sum of squared differences around the mean, divided by the sample size minus 1 (Levine *et al.*, 2014:143).
Standard Deviation (*S*)	It is the square root of the sum of squared defences around the mean divided by the sample size minus 1. This value will be expressed in the same units as the original data set. The standard deviation and the mean value help to define if the data set is clustering. A higher the standard deviation indicates that the data is spread more around the mean (Levine *et al.*, 2014:143). 95% of values in a data set will fall within two standard deviations higher and lower than the data mean.

3.7.2 Reliability and validity

This study was set out to measure different factors influencing the development of subsistence maize farmers. The questionnaire was developed as a new measuring tool, no previous studies could be found making use of a similar measuring tool. The questionnaire was made up of 38 questions testing the respondents' attitude towards certain pre-identified factors (variables) that can limit their development into more commercial farming units. Because more than one question (variables) is set out to measure the same underlying variable (factor) they are intercorrelated. Exploratory factor analysis was used to perform a method of data reduction, grouping related questions into factors of constructs. This allows the researcher to gain a better understanding of the data and to perform the necessary analysis (Field, 2000:424). The

principle of factor analysis is based on the concept of grouping variables (questions) that are highly correlated but that correlates badly with variable (questions) outside of the group (Field, 2000:424). A construct is an abstract or imaginative concept that is created on the basis of behavioural reaction of the respondents (Struwig & Stead, 2013:4) and therefore based on the way the respondents experienced and interpreted the questions.

To conduct a factor analysis a sample size of more than 300 is needed (Tabachnick & Fidell, 2001:613). The sample size in the study was larger than 300 and therefore factor analysis could be used to analyse the data.

3.7.2.1 Validity

Validity refers to the extent to which the research results are accurately representing the true situation (Welman *et al*., 2005:142, Nenty 2009:31). The validity also refers to the ability of the study to answer the research question it was intended to answer. Validity is therefore needed to be able to accurately apply and interpret the results of a study. The validity of a study can be negatively affected by research errors such as poor sampling, misleading measurement and inaccurate research procedure (Leedy & Ormrod, 2005:28).

When using a measuring instrument it is important that the instrument measures the variable which it is supposed to measure. This requirement of a measuring instrument is referred to as the construct validity (Churchill *et al*., 2010:260). Because this study relies on the research instrument to collect the intended results, it is important to test the validity of the measuring instrument to assure that it measures what it is intended to measure (Struwig & Stead, 2013:149). Construct validity relies on sound theoretical and literature background on the constructs being measured and the relationship between the constructs. The questionnaire that was used in this study was based on a detailed literature review. Out of the literature certain relationships and associations could be made, that was used to validate the constructs retained from the exploratory factor analysis. Construct validity can be proven if empirical evidence supports the theoretical background of the research.

Kaiser's measure of sample adequacy (MSA) was computed for each factor identified from the exploratory factor analysis, to determine if the factor analysis that was done was appropriate (Tabachnick & Fidell, 2001:613). Kaiser's measure of sample adequacy gives an indication of the inter correlations among the variables. The MSA index range from 0 to 1, where 1 is an

indication that each variable is perfectly predicted by the other variables. The guidelines set out by Hair *et al*. (1998:99) were used to determine if the MSA were appropriate:

≥0.80: meritorious

0.70: middling

0.60: mediocre

0 50: miserable

< 0.50: unacceptable

According to Field (2009:647) the cut-off value for MSA of 0.50 is suggested.

The amount of variance in the data set that can be explained by each of the constructs can be determined by calculating the eigenvalue of each component associated with each construct (Field, 2009:660). SAS (2016) was used to calculate the eigenvalue associated with each of the constructs. This methodology is commonly used to determine the amount of factors needed to explain the correlation among the variable (Field, 2009:660). It is important that the correct amount of factors is retained so that a valid amount of information is retained to do the necessary data analysis to meet the research objectives.

The communalities of the variables retained in each factor were calculated using SAS (2016). The communalities are the proportion of common variance represented by each variable within the retained factors (Field, 2009:637). Variables with a high communality indicate that the variable is associated strongly with at least one of the other components within the extracted factor. Variables with a low communality indicates that the variable do not associate strongly with the components of an extracted factor.

According to the above-mentioned analysis a conclusion could be made on the validity of the measuring instrument.

3.7.2.2 Reliability

Reliability refers to the stability, credibility and repeatability of the results of the measurement or observation (Welman *et al*., 2005:145, Nenty 2009:31). Reliability is a measure of internal consistency; this refers to the extent to which individual questions of a construct correlates with

each other (Leedy & Ormrod, 2005:29). The reliability of the measuring instrument refers to the ability of the questionnaire to reflect the constructs it is supposed to measure. It is a measure of how well the items of the measuring instrument (questionnaire) combine to measure precisely what it was intended to measure (Nenty (2009:31). The Cronbach alpha coefficients are used to test the reliability and internal stability of the questionnaire, especially making use of a Likert scale (Nunnally & Bernstein, 1994; Tavakol & Dennick, 2011:53). The Cronbach's Alpha coefficient is calculated through splitting the data in every possible way and calculating the correlation coefficient of each split in the data. The final result is an average value of all the correlation coefficients calculated. The value of the Cronbach's Alpha coefficient varies between 0 and 1. According to Field (2009:675) a Cronbach's Alpha value of greater that 0.8 is the general accepted value for cognitive testing. Values as low as 0.7 can be considered acceptable for ability testing and even lower values could be considered acceptable for psychological constructs such as attitude. The more diverse the construct measured the lower the acceptable value would be for a measuring instrument to be considered reliable (Field, 2009:675). According to Tavakol and Dennik (2011:53) a shorter test would produce lower values of the Cronbach's Alpha coefficient. So if few items are used to test a construct the value of the Cronbach' Alpha would be expected to be lower. SAS (2016) would be used to calculate the Cronbach's Alpha coefficient of each of the constructs that was identified through the explanatory factor analysis.

3.7.3 Correlations among constructs

The SAS (2016) program was used to calculate the Spearman's correlation (a nonparametric equivalent of the Pearson correlation) coefficient to determine the linear relationship between different constructs. A negative correlation between two constructs is an indication that as one construct increases the other construct decreases (Welman *et al*., 2005:234). A positive correlation indicates that as the one construct increases the other will also increase. To interpret the strength of the correlation coefficients (Rho) the same guidelines will be followed as set out by Cohen (1988:77) to interpret the phi-coefficient: $\Phi = |0.1|$ is a small effect, $\Phi = |0.3|$ is a medium effect noticeable with the naked eye and $\Phi \geq |0.5|$ is a large effect with practical significance.

3.7.4 Effect Sizes

In the case of where probability sampling is used as a method to draw a sample of the target population, the p-value is calculated by researchers to determine the statistical significance of

the data (Ellis & Steyn, 2003:51). Generally a p-value smaller than 0.05 suggesting a confidence level of 95% would be considered as statistically significant (Field, 2009:51). Although the p-value is an indication of statistical significance it does not provide the practical importance of the data (Ellis & Steyn, 2003:51).

Due to the fact that non-probability convenience sampling was used during the study the p-values will be calculated and reported as if probability sampling was used. Although the p-values were calculated and reported no inferential statistics were interpreted. Cohen's effect sizes (Cohen, 1988:20), was calculated to determine if there are significant practical differences between the demographic groups, with regards to age groups and gender (Ellis & Steyn, 2003:51; Steyn, 2002:10). Effect sizes (d) give an indication of the magnitude of a difference and the practical significance of the difference. It is a standardised measure and is not influenced by the sample size. The following guidelines were used in the interpretation of the Cohen's effect sizes (d) (Cohen, 1988:40): d = |0.2| is a small effect, d = |0.5| is a medium effect, noticeable with the naked eye and d ≥ |0.8| is a large effect with practical significance and practical important.

3.8 ETHICAL CONSIDERATIONS

According to Welman *et al.* (2005:181) some of the ethical issues that should be considered include:

- The protection of study participants' personal and identity rights
- Research should be done according to the researchers' competency
- A deep and thorough literature study needs to be conducted to ensure that an already existing study is not repeated or copied
- Plagiarism must be avoided
- Results of the study must not be falsified or misrepresented.

The research conformed to all academic research etiquette and ethics as describe by literature and the Ethics Committee of the North-West University. All the literature used and studied are referenced according the Harvard guidelines as interpreted by the North-West University's guidelines. The actual results of the study were analysed and presented without distorting any information, no deliberate or intentional misrepresentation of the results took place. The

informed consent of all respondents as well as Grain South Africa was obtained before the research was conducted. The identity of the respondents is protected and won't be revealed during or after the study and all rights to privacy are protected. The data collected will be treated in confidence and won't be shared in a way that will bring harm to any of the respondents.

3.9 SUMMARY

In this chapter the empirical research methodology was described in detail. The research design and approach was described as well as the motivation why this design and approach was followed. The study follows a quantitative, non-experimental, cross-sectional, field survey design. The research process that was followed in this study was set out and presented.

The target research population and research area was described and defined. The study focus of subsistence maize farmers engaged in maize farming to partially or fully sustain their household food needs. The farmers in questions are a part of the Grain SA farmer development program in KwaZulu-Natal, Mpumalanga and the Eastern Cape provinces.

After a thorough literature study a preliminary questionnaire was developed. The questionnaire was presented to the farmer development manager of Grain SA and statistic support services for their input and recommendations. After the development the sampling procedure was followed, utilising the farmer development structures of Grain SA. A total of 344 completed questionnaires were retained for the data analysis.

The data were captured and analysed by Statistical Consultation Services of the North-West University's Potchefstroom Campus. The data was analysed making use of SAS (2016). Descriptive statistics was used to describe the profile of the respondents that took part in the study.

Exploratory factor analysis was conducted to group the variables into factors or constructs. The research questionnaire was tested for validity and reliability. The results according to the constructs were analysed and correlation between the constructs were determined. The practical differences between the demographic groups were also determined through making use of effect sizes.

Lastly the ethical considerations were discussed, with regards to performing the study accordance to ethical research standards.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter will focus on the results of the empirical study that was conducted. The data gathered and analysed as described in Chapter 3 according to the research procedure will be presented and discussed.

The research instrument (questionnaire) was administered to representatives of the target population. The completed questionnaires were screened for completeness and duplication to ensure the data quality. After the screening process a total of 344 questionnaires were considered complete and valid and retained for the data analysis. The sample size (n) used for this study was 344 farmers. All the statistical analysis was conducted by the Statistical Consultation Services of the North-West University, Potchefstroom Campus, using the SAS (2016) statistical package.

The demographic information as well as the insight in the farming operations of the respondents will be presented and discussed. The results obtained from the statistical analysis will be presented and discussed in detail in this chapter.

4.2 DEMOGRAPHIC DESCRIPTION OF RESPONDENTS

During the study certain demographic information of the sample population was gathered. This included gender and age information. For the purpose of this study no more demographic information were needed that would contribute to achieve the research objectives. All participants were of African descent and situated in the KwaZulu-Natal, Mpumalanga and Eastern Cape provinces of South Africa.

4.2.1 Gender

More female than male respondents took part in this study. Figure 4.1 indicates that 54.07% (186) of the respondents were female and 45.35% (156) of the respondents were male. There were two respondents that did not indicate their gender. The sample population can be considered a good representation of the target population as most of the subsistence farmers are female (Fényes & Meyer, 2003: 26; Aliber & Hart, 2009:441; Jacobs *et al.,* 2008:9). These gender distribution of the sample correspondence with the number of African males and females involved in agriculture according to the Household Statistics of 2015 (Statistics SA, 2015a:181).

According to the household statistics, of the African portion of the population involved in agriculture, 55% is female and 45% is male.

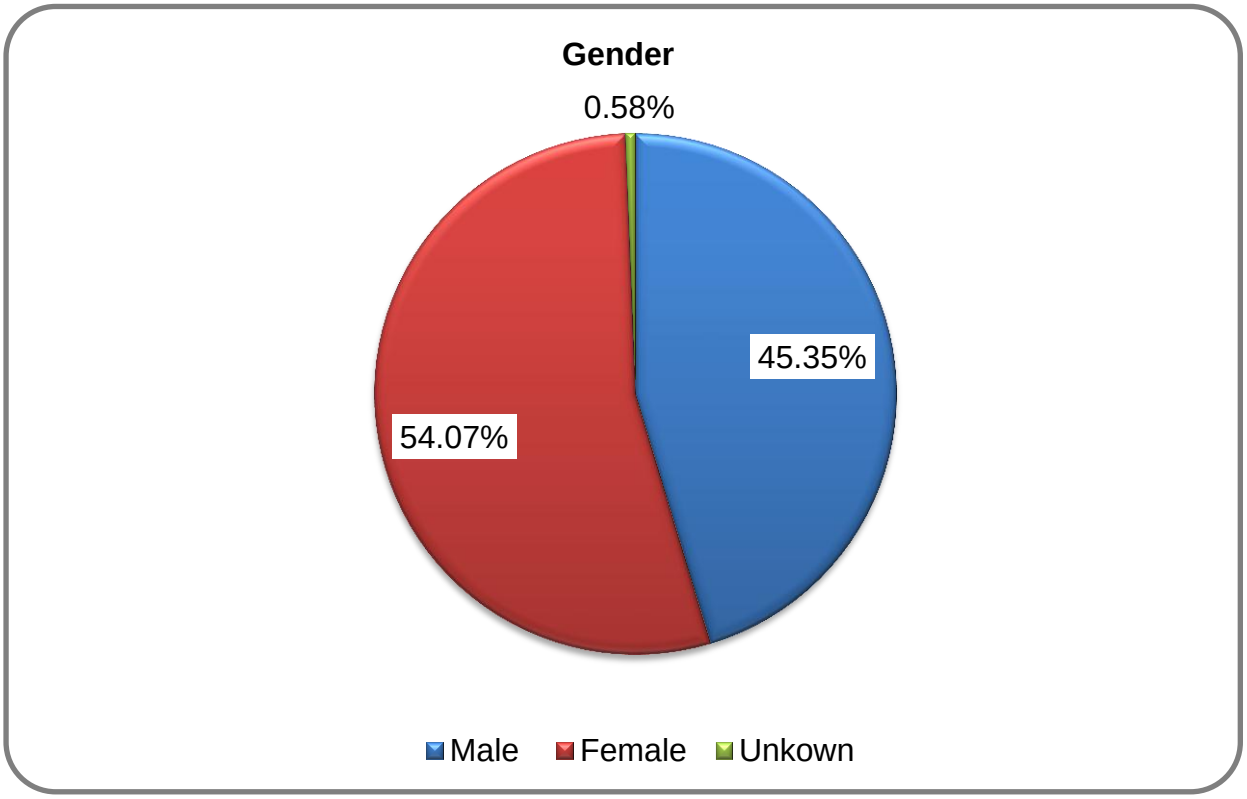

Figure 4.1: Gender of the respondents.

4.2.2 Age

Figure 4.2 indicates the age category distribution of the respondents. There was a substantial portion of the sample that did not indicate their age, 70 respondents or 20.35% of the respondents' age is unknown. The biggest portion (23.84%) of the respondents fell in the age group 45-54 with the second biggest portion (22.67%) in the age group 55-64; almost half of the respondents fell within these two age groups. The smallest portion of the respondents falls in the age groups 15-24 (1.16%) and 25-34 (6.98%). This is an indication that most of the respondents are considered middle-aged to elderly. This correspondence with the target population, that is considered to be in the elderly age groups (Fényes & Meyer, 2003: 26; Aliber & Hart, 2009:441; Jacobs *et al.,* 2008:9). The fact that the biggest portion of the sample is middle-age to elderly could possibly be considered a limiting factor for the development of these farmers. The labour and working capabilities and capacity of young adults are not fully utilised in these subsistence farming operations (Hull, 2014:451).

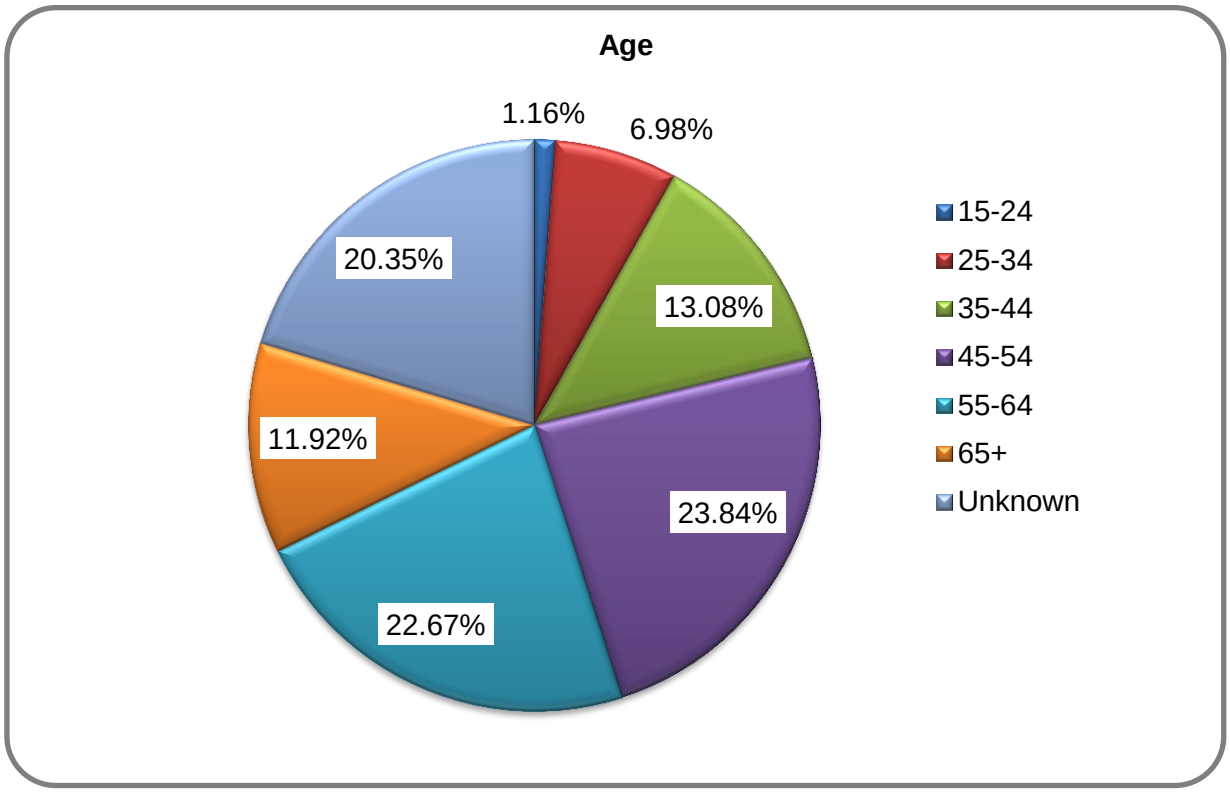

Figure 4.2: Age groups of respondents

4.3 INSIGHT TO INCOME SOURCE AND FARMING ACTIVITY

The frequency data and descriptive statistics are presented in a complete data set in appendix B. A set of questions was presented to the sample group to get better insight on their farming activities and income source; these results will be presented and discussed in the following section.

4.3.1 Reason for farming

Most of the respondents indicated that they are engaged in farming as their main source (30%) or extra source (23%) of household food (Table 4.1). The other main reasons indicated by the sample population to be engaged in farming, are as main source of income (21%) and extra source of income (16%). It can therefore be concluded that the sample population consider farming as the main source of food and income to sustain their household's needs.

Table 4.1: The main reasons for respondents to be engaged in farming activity

Main reason for farming	Main source of Food	Extra source of Food	Main Source of income	Extra source of income	Leisure/ Hobby	Unknown
Number of respondents	104	78	72	56	18	16
Percentage of respondents	30%	23%	21%	16%	5%	5%

4.3.2 Main Source of Income

The biggest number of respondents (46%) indicated that they rely on grants and pension as their main source of income. In total 60% of the respondents indicate that they consider a non-farming source as their main source of income (Table 4.2). This correspondence with the literature indicating that subsistence farmers engage in farming as a supplementary source to sustain household needs and that they rely on external non-farming sources of income such as pension and grants (Baiphethi & Jacobs, 2009:461; Fényes & Meyer, 2003: 26; Aliber & Hart, 2009:437). Having a non-agricultural source of income can be considered both a positive and negative contribution towards agricultural development. A non-farming source of income can provide additional funding to purchase advanced inputs and equipment to improve farming operation, productivity and support development on the one hand. But an external source of income outside their farming operations can discourage the farmers to pursue farming as an option of main income and only engage in farming as a supplementary source of food. This can negatively influence the development ambitions of these farmers toward more commercial farming units.

It is clear that farming are also considered an important source of income with 36% of the respondents indicating that farming forms part of their main source of income. It can therefore be concluded that the participants that took part in this study considered farming as a very important contributor to their livelihood.

Table 4.2: Main sources of income of respondents

Main source of income	Farming	Employment	Grants/ Pension	Family	Unknown
Number of respondents	123	31	158	17	15
Percentage of respondents	36%	9%	46%	5%	4%

4.3.3 Input purchase activity

To assess the productivity of the growers' operations, it is important to consider the use of inputs. Respondents were asked to indicate whether they purchase certain inputs for their farming activity. The responses (Table 4.3) indicate that most respondents purchase agronomic inputs. Seed seems to be the input that is purchased the most. This result corresponds with the study of Aliber and Hart (2009:447), that found that subsistence farmers were the most likely to purchase seed compared to other inputs. Fertiliser (97%) and agro-chemicals (90%) such as herbicides and pesticides are also purchased at high levels according to the results. According to the results, 14% of the respondents do not purchase lime (to treat soil acidity). Soil acidity management and liming can be considered an advanced farming practice. Although the input that is least purchased by the respondents, the fact that 84% of the respondents do purchase lime is a good indication that the sample group are practising sound and sustainable agricultural practises.

This response seems to differ from popular belief and the literature. According to the literature small-scale and subsistence farmers do not tend to spend money to purchase inputs, they would rather make use of low input farming practises (Baiphethi & Jacobs, 2009:466; Aliber & Hart, 2009:453). One reason why the situation among the sample population can differ from the literature could be the fact that the participants forms part of the Grain SA farmer development program. This program focuses on educating and training farmers to make use of advanced farming inputs such as quality seed, fertiliser, agro-chemicals and lime.

Table 4.3: Input purchasing activities of respondents

What inputs are purchased	YES	NO	Unknown
Seed	99%	0%	1%
Fertiliser	97%	2%	1%
Agro-chemicals	90%	8%	2%
Lime	84%	14%	2%

4.4 RELIABILITY AND VALIDITY

4.4.1 Validity

After conducting exploratory factor analysis in an effort to group variable into factors (constructs), 11 factors or constructs were retained.

Table 4.4: The 11 factors retained after conducting exploratory factor analysis.

Factor	Construct	Question Number	Questions
F1	**Access to inputs and non-government support**	7	I have access to crop protection chemicals (herbicides, insecticides and more)
		4	I have access to hybrid maize seed
		5	I have access to biotechnology such as Roundup ready or BT seed
		6	I have access to fertilizer
		13	I get support from non-Governmental entities such as Grain SA, AgriSa, GFADA and more
		10	I have access to mentors / agronomists that can support me

Factor	Construct	Question Number	Questions
F2	**Development ambition**	25	If I had access to financial support (money) I would expand my farming operation
		24	If I had access to my own land I would expand my farming operation
		16	If I could afford it, I would employ more people in my farming activities
		22	I want to expand my farming operation
		23	If I had access to more agronomic support I would expand my farming operation
		37	I want to be a commercial farmer
F3	**Family and community involvement**	17	My family members help me in my farming activities
		19	My children are involved in my farming activities
		18	My neighbours and community members help me in my farming activities
		20	My grandchildren are involved in my farming activities
F4	**Age and health**	26	My age is limiting my farming activities
		27	My health is limiting my farming activities
		35	I want to produce enough maize just for my own use
F5	**Government and private support and market access**	11	I get support from the government for my farming operations
		12	I get support from Agri-Businesses such as co-ops, seed companies and more
		9	I have a market where I can sell my surplus maize grain
		30	I have access to agricultural information
F6	**Access to resources and labour**	2	I have access to money
		3	I have access to tractors, planters, sprayers and more
		1	I have secure access to land
		15	I employ extra people to help in m farming activities

Factor	Construct	Question Number	Questions
F7	**Skills**	33	I have all the financial skills to expand my farming operations
		32	I have all the necessary agronomic skills to expand my farming operations
F8	**Access to infrastructure**	8	I have access to grain storage facilities
		28	I have access to good infrastructure such as roads, transport, water and more
		29	I have good cellular connectivity
F9		14	I spend extra money on buying farming inputs such as seed and fertiliser
		21	I have access to labour
F10	**Commercial intention**	34	I want my family to be involved in my farming operations
		36	I want to produce enough maize so that I can sell the surplus
		38	I want farming to be my main source of income
F11		31	I want more support from private Agri-businesses such as co-ops, seed companies

The Kaiser's measure of sample adequacy (MSA) was calculated to determine if the factor analysis was appropriate. An overall MSA value of 0.73 was obtained. According to Hair *et al.* (1998:99) a MSA of 0.73 would be considered middling to meritorious adequate. According to Field (2009:647) a MSA value below 0.5 would be considered unacceptable. It can therefore be concluded that performing the factor analysis was appropriate.

The eigenvalues of the correlation matrix associated with each construct was also calculated, this value represent the amount of variance that can be explained by the linear component (Field, 2009:660). The 11 factors that were retained yielded a cumulative eigenvalue of 69.22%, therefore 69.22% of variation in the data set could be explained by the 11 factors that was retained.

Communality is the estimate of variance that is present for each variable as a component of the retained factors (Field 2009:637). A variable with a high communality have a high contribution to

a retained component where a variable with a low communality do not contribute much with a retained component. According to the final communality that was calculated the question with the lowest contribution with a construct was Question 15 (0.396) in the construct *Access to resources and labour*. The question with the highest contribution to a construct is Question 4 (0.8640) in the construct *Access to inputs and non-government support***.** The range of communalities can be considered high enough and the 11 retained constructs can be considered acceptable for the analysis.

According to the factor analysis Question 35 *(I want to produce enough maize just for my own use*) was included in construct 4 (Age and health). According to content validity question 35 was excluded from the construct due to no relevance with the other two questions in the construct. Factor 9 grouped question 14 (*I spend extra money on buying farming inputs such as seed and fertilizer*) and question 21 (*I have access to labour*) together, the construct was discarded due to the poor content validity of the construct, no literature evidence could be found to link the two questions with each other. Factor 11 consisted out of only a single question, question 31(*I want more support from private Agri-businesses such as co-ops, seed companies and others*). The results of question 14, 21, 31 and 35 will therefore be interpreted as standalone question not forming part of a specific construct.

According to the factor analysis that was conducted the conclusion can be made that the validity of the measuring instrument is acceptable and that the constructs that was retained provide an acceptable level of information when analysing these constructs.

4.4.2 Reliability

The Cronbach's Alpha was calculated as a measure of reliability and internal consistency. It is an indication if items and subsets of items within the measuring instrument are correlated (Field, 2009:675). The following Cronbach's Alpha values were obtained for the constructs:

Table 4.5: Constructs in this study

Construct	Construct	Questions	n	Mean	Std. Dev.	Cronbach's Alpha
C1	Access to inputs and non-government support	Q4-Q7, Q10, Q13	344	3.00	0.59	0.87
C2	Development ambition	Q16, Q22-Q25, Q37	344	3.18	0.45	0.73
C3	Family and community involvement	Q17-Q20	344	2.59	0.61	0.71
C4	Age and health	Q26, Q27	344	2.24	0.93	0.74
C5	Government and private support and market access	Q9, Q11,Q12, Q30	344	2.31	0.59	0.68
C6	Access to resources and labour	Q1-Q3, Q15	344	2.19	0.64	0.66
C7	Skills	Q32, Q33	344	2.14	0.78	0.77
C8	Access to infrastructure	Q8,Q28, Q29	344	2.49	0.52	0.46
C9	Commercial intention	Q34,Q36, Q38	344	3.31	0.44	0.56

The Cronbach's Alpha reliability coefficient ranges between 0 and 1, with the value closer to 1 indicating a greater internal consistency of the items in the construct. According to Field (2009:675) a Cronbach's Alpha value greater than 0.8 can be considered acceptable for cognitive testing. When testing ability a Cronbach's Alpha value greater than 0.7 can be considered acceptable. Then testing psychological constructs Cronbach's Alpha values lower than 0.7 can still be considered realistically accepted due to the fact that the constructs that are measure can be considered diverse. The fewer items included in a construct it would be expected that the value of the Cronbach's Alpha would be lower (Tavakol & Dennik, 2011:53).

Most of the construct had Cronbach's Alpha values greater than 0.7, considering the level of education and literacy of the target population and respondents, the Cronbach's alpha values indicate an acceptable level of internal consistency for the questionnaire used. Only two constructs had a Cronbach's Alpha value of less than 0.7: Access to infrastructure and

Commercial intention. Both constructs had Cronbach's Alpha values equal or greater than 0.5 and because the attitudes and perspectives are measured and not ability of the respondents both these constructs will be used and analysed. When analysing the results of these two constructs the Cronbach's Alpha values will be considered when making conclusions.

Overall it can be concluded that the reliability of the newly developed measuring tool was acceptable.

4.5 ASSESSMENT OF THE CONSTRUCTS MEASURED IN THE STUDY

4.5.1 Arithmetic mean and standard deviation

The arithmetic mean ($\bar{x}$) as a measure of central tendency and the standard deviation (S) as a measure of variation and how close the data are scattered around the mean (Levine *et al.*, 2014:136) will be presented for each of the constructs. Considering the four-point Likert scale that was used in the questionnaire (Table 4.4) a mean value of below 2.5 would be considered a tendency of the respondents to disagree with the statements in the construct. A mean value greater than 2.5 would indicate a tendency that the respondents have agreed with the statements in the construct.

Table 4.6: Likert scale used in the study

TOTALLY DISAGREE	DISAGREE	AGREE	TOTALLY AGREE
1	2	3	4

4.5.1.1 Access to inputs and non-government support

The first construct relates to the access the farmers have to advanced inputs such as hybrids seed, fertiliser, biotechnology and crop protection products such as herbicides and pesticides. The construct also include items related to the support and mentorship the farmers receive from non-government industry organisations such as Grain SA, Agri SA, GFADA and others. The reason why the farmers may have responded similarly towards these items placing them in the same construct can be explained by the fact that the respondents all for part of the Grain SA farmers development program. Through this program farmers receive support from Grain SA in the form of mentorship, agronomic advice and training. The farmers in the Grain SA development program also take part in a project that allows them to gain access to advance

inputs. Therefore, the farmers associate the access to support from Grain SA with access to mentorship and access to advance inputs.

According to the results in Table 4.5 the mean value ($\bar{x}$=3.00) obtained for the construct indicate that the respondents have access to both advanced inputs and support from non-government organisations. Then standard deviation (0.59) indicates that there was not high variation in the response to the specific construct.

Table 4.7: Arithmetic mean and standard deviation results for the construct Access to inputs and non-government support

Construct #	Construct	Questions	n	Mean	Std. Dev.
C1	Access to inputs and non-government support	Q4-Q7, Q10, Q13	344	3.00	0.59

The results indicating that these subsistence farmers have access to advance inputs differ from the literature, suggesting that subsistence and small-scale farmers in South-Africa and Africa have limited access to advance inputs (Baiphethi & Jacobs, 2009:471; Gouse *et al*., 2016:11; James, 2016:12; Jacobs *et al.,* 2008:9). It could be that the respondents might have better access to inputs because of their involvement in organised agriculture and the Grain SA development program, but it is still a good indication that farmers in this segment can have access to advanced inputs. The results therefore, suggest that access to inputs cannot necessarily be seen as a limiting factor in the development of these farmers.

According to the literature resource-poor farmers such as subsistence farmers would rather spend additional money on food and other household needs instead of purchasing farming inputs (Aliber & Hart, 2009:453). The majority respondents indicated (Table 4.3) in the first section of the questionnaire that they do purchase inputs such as hybrids seed, fertiliser, crop protection chemicals and lime. The results ($\bar{x}$=2.74 and *S* = 0.84) obtained in response to the standalone Question 14 (*I spend extra money on buying farming inputs such as seed and fertilizer*) suggest that the respondents lean towards spending extra money on input. It therefore seems that under the correct conditions and mentorship, farmers such as the respondents are willing to spend money on inputs, as long as the benefits of these advance input are experienced.

The respondents overall also have indicated that they receive support from non-government industry organisations such as Grain SA, Agri SA, GFADA and others and have access to agronomic advice and mentorship. The reason for this response can be attributed to the fact that the sample group form part of the farmer development program of Grain SA. In this program they receive support and mentorship from Grain SA, helping them to improve their farming operations. It is clear that the respondents feel that they get more support from non-government industry organisation compared to government and private sector support if compared to the response to construct 5: *Government and private support and market access*.

4.5.1.2 Development ambition

The following construct are related to the ambition of the respondents to develop into more commercial farming units. The results in Table 4.6 ($\bar{x}$=3.18, S = 0.45) indicate that the majority of the respondents indicated that they would like to expand their farming operations if they had access to specific resources such as their own land, finance and agronomic support. This construct aims to give more insight towards the ambition of the respondents to expand their farming operation if they had access to certain resources. The construct also measure if the respondents are willing to employ people if they could afford it. Overall this construct is an indication of the will and ambition of the respondents to expand their farming operations. The response to this construct is a positive indication that the respondents have the ambition to develop and expand their farming operations.

Table 4.8: Arithmetic mean and standard deviation results for the construct Development ambition

Construct #	Construct	Questions	n	Mean	Std. Dev.
C2	Development ambition	Q16, Q22-Q25, Q37	344	3.18	0.45

The limiting factors that were addressed in the construct were finance, land ownership and agronomic support.

Access to land without ownership remains a very big challenge to developing farmers (Jacobs *et al.,* 2008:14; Van Burick, 2016). Most of the respondents have indicated that they would

consider expanding their farming operation if they had access to their own land. The limitation of land and ownership will be discussed more under construct 6: *Access to resources and labour*.

Considering the contribution subsistence and small-scale farming must make in employment creation in the future (DAFF, 2015b:15, BFAP, 2016:7) this results are positive and assuring that this sector have capacity to create more employment, if the productivity of these farmers can be increased and they can develop into more commercial entities.

Although most respondents have indicated that they do have access to mentors and agronomic support as suggested in the response to construct 1 (*Access to inputs and non-government support),* respondents have still indicated that if they get more access to agronomic support they would consider expanding their farming operations. This is an indication that although receiving mentorship and agronomic support, they would require more support as they develop into more commercial farming entities.

4.5.2 Family and community involvement

According to the results ($\bar{x}$=2.59, *S* = 0.61) (Table 4.7) the respondents slightly agreed that their family and community members are involved in their farming operations. If the questions grouped in the construct are considered (Appendix B), a lesser extent of the respondents have indicated that their children and grandchildren are involved in their farming activities, compared to the overall response if their family are involved in their farming activity. These results would suggest that although the respondents' family are involved in their farming activities, it not necessarily include their children and grandchildren. The finds correspond with the literature, suggesting that the labour capacity of young adults are not fully utilised in family farming operations (Hull, 2014:451). Considering the fact that most commercial farming entities in South Africa are family based operations, the absence of these family based support in the subsistence farming sector can possibly be considered a limiting factor in the development of these farmers.

The response of the respondents with regards to the involvement of the community and neighbours in their farming operations slightly indicated that in most cases the community is not involved in their farming activities. It was found that the formation of community "working groups" among community members, have improved labour access and increased productivity of subsistence farmers (Gouse *et al*., 2016:11). This could be a recommendation to these farmers to be considered in their farming operations.

Table 4.9: Arithmetic mean and standard deviation results for the construct Family and community involvement

Construct #	Construct	Questions	n	Mean	Std. Dev.
C3	Family and community involvement	Q17-Q20	344	2.59	0.61

4.5.2.1 Age and health

The construct related with age and health aims to determine if the respondents consider their age or health condition as a limiting factor in their farming operations. The results indicate that (Table 4.8: $\bar{x}$=2.24, *S* = 0.93) slightly more respondents have indicated that they do not consider their age or health as a limiting factor. What needs to be considered is the fact that there is some variation in the response of the respondents with the standard deviation being 0.93, the highest variation compared to all the other constructs. This variation can be explained by the fact that the response towards this construct would be linked to the age of the farmers. Most of the respondents can be considered elderly or middle age (Table 4.2). Overall a clear conclusion if age and health could be a limiting factor for these farmers as suggested by the literature (Mbanza & Thamaga-Chitja, 2014:251; Baiphethi & Jacobs, 2009:471; Jacobs *et al.,* 2008:14) cannot be made. A comparative analysis between the different age groups might give more insight (Table 4.17).

Table 4.10: Arithmetic mean and standard deviation results for the construct Age and health.

Construct #	Construct	Questions	n	Mean	Std. Dev.
C4	Age and health	Q26, Q27	344	2.24	0.93

4.5.2.2 Government and private support and market access

According to the response of the farmers the support received from government and private companies as well as their access to agricultural information and commodity markets are grouped into one construct. It would suggest that the respondents associate access to information and access to off-take markets for grain with support from government and private

companies such as input providers and cooperatives. The response (Table 4.9: $\bar{x}$=2.31, *S* = 0.59) indicate that most farmers believe that they are not getting enough support from the government and private companies and do not have access to agricultural information and commodity off-take markets.

Table 4.11: Arithmetic mean and standard deviation results for the construct Government and private support and market access

Construct #	Construct	Questions	n	Mean	Std. Dev.
C5	Government and private support and market access	Q9, Q11,Q12, Q30	344	2.31	0.59

Support is a very important component that is needed in the development of farmers (Aliber & Hart, 2009:455; Jacobs *et al.,* 2008:14; Kruger, 2016). Even if farmers are granted access to resources such as land, development would be limited without the correct support from government (Van Burick, 2016).

The literature indicates that the lack of the correct and focussed government support can be considered one of the most limiting factors in the development of subsistence and small-scale farmers (Jacobs *et al.,* 2008:14; Aliber & Hart; 2009:454; Kruger, 2016; Van Burick, 2016; Cousins, 2010:3; BFAP, 2016:7). The results therefore, support the literature with regards to government support being limited to subsistence farmers and can be considered a limiting factor in the development of these farmers.

The finding also correspond with the literature (Jacobs *et al.,* 2008:14), suggesting that private companies would rather focus their efforts on the already commercial viable portion of developing farming, instead of the subsistence segment. The response ($\bar{x}$=3.08 and *S* = 0.75) of the respondents towards question 31 (*I want more support from private Agri-businesses such as co-ops, seed companies and more*) strongly indicates that they would like more support from private companies such as input providers and agricultural businesses. The results therefore suggest that support from private agricultural companies can be considered a limiting factor in the development of these subsistence maize farmers.

One of the key factors identified leading to the failure of previous development programs is the limited focus on market development (Kruger, 2016). For farmers to be able to develop into

more commercial farming units, these farmers should be able to sell surplus rain. If these farmers have limited access to off-take markets, commercial farming would not be feasible. Access to markets plays an important role not only linking farmers with off-takers of their produce but also improves the farmers access to inputs that can help these farmers develop (Baiphethi & Jacobs, 2009:471). It could therefore, be recommended that government and private sector support should focus also on the development of off-take markets for these farmers so that they will be able to sell their surplus grain.

4.5.2.3 Access to resources and labour

According to the response of the sample population all questions relating to access to resources such as land, equipment and finance as well as the likelihood of employing extra people in their farming operation were group under a single construct. The results indicate (Table 4.10: $\bar{x}$=2.19, S = 0.64) that the respondents have limited access to resources and that they are not employing extra people in their farming operation. The response to the first section of the questionnaire have also indicated that most participants rely on pension and grants as their main source of income, followed by farming. The results suggest that the participants have a limited source of income and financial resources.

Table 4.12: Arithmetic mean and standard deviation results for the construct Access to resources and labour

Construct #	Construct	Questions	n	Mean	Std. Dev.
C6	Access to resources and labour	Q1-Q3, Q15	344	2.19	0.64

According to the data it is clear that the major portion of respondents feel that they do not have access to finance and equipment such as tractors, planters and sprayers. This response correspondence with the literature that describe small-scale and subsistence farmers as resource poor with limited access to finance and equipment (Aliber & Hart, 2009:437; Fraser *et al.*, 2003; Ortmann & Machethe, 2003:47).

With regards to the access to secure land it is important to note that of the subsistence farmers in South Africa are farming on communal land of the former homelands (Aliber & Hart, 2009:435; BFAP, 2016:6; Ortmann & Machethe, 2003:47). These lands are not owned by the

farmers but are a part of the traditional tribal ownership structure and are managed accordingly. Although these farmers have access to these lands allocate to them by tribal leadership, they do not own the land leading to some uncertainty with regards to secure access to the land. Access to land without ownership remains a very big challenge to developing farmers (Jacobs *et al.,* 2008:14; Van Burick, 2016). Under construct 2: *Development ambition* (question 24) respondents have indicated that they would consider expanding their farming operation if they had access to their own land. This could possibly suggest that land ownership instead of land access can be seen as a limiting factor in the development of these farmers. Land tenure remains a very complex and controversial topic in the South African agriculture sector and politics. Carrying over ownership of available land to those who are farming it, such as the target population farmers, could allow farmers access to other resources. Land can be used as surety to obtain financing from financial service providers. Additional financing can allow farmers to obtain more resources such as equipment and advance inputs that would drive the development of these farmers.

Literature has suggested that limiting access to labour have a negative effect on the productivity of subsistence farmers in KwaZulu-Natal (Gouse *et al.,* 2016:11). If the response to question 21 as a standalone question are considered ($\bar{x}$=2.76, *S* = 0.78) it would suggest that respondents feel they do have access to labour. But as the results (Table 4.10) indicate it seems as if the farmers are not employing additional people in their farming operations. A deficiency of resources and low productivity may be the main reasons why the farmers are reluctant to employ additional people. The fact that most of the respondents are women (Figure 4.1) might also contribute to the ability to employ additional people, because women in the rural homeland areas have limited access and authority to employ people (Gouse *et al.,* 2016:11).

Considering the contribution subsistence and small-scale farming must make in employment creation in the future (DAFF, 2015b:15, BFAP, 2016:7) the current situation is not considered positive. The farmers seem to be motivated to employ more people if they can afford it (Construct 2: *Development ambition*), it is therefore critical that these farmers are supported in their efforts to develop to ensure that employment targets for the sector is reached (BFAP, 2016:7). The ability of these farmers to employ additional labour would be considered positive for the overall rural economy and society.

4.5.2.4 Skills

The respondents were asked to indicate if they have the necessary financial and technical skills to develop and expand their farming operations. The results ($\bar{x}$=2.14, *S* = 0.78) suggest that the respondents feel that they do not have the necessary skills to expand their operations. This would suggest that more skill transfer would be needed by these farmers to help them develop into more commercial farming units. Therefore skills and limited support to acquire these skills can be considered a limiting factor in the development of these farmers. According to the literature training, skills transfer and research can have a positive effect on the productivity and development of subsistence farmers (Mbanza & Thamaga-Chitja, 2014:251; Baiphethi & Jacobs, 2009:477).

Table 4.13: Arithmetic mean and standard deviation results for the construct Skills

Construct #	Construct	Questions	n	Mean	Std. Dev.
C7	Skills	Q32, Q33	344	2.14	0.78

4.5.2.5 Access to infrastructure.

According to the literature (Baiphethi & Jacobs, 2009:471; Jacobs *et al.,* 2008:14) poor infrastructure and limited access to markets have a negative effect on the productivity of rural, subsistence farming. It is important to note that when considering this construct related to infrastructure that the Cronbach's alpha reliability test value was just below 0.5, therefore caution needs to be taken when making conclusions with regards to the construct's results. The results (Table 4.12) indicate a very neutral outcome with $\bar{x}$=2.49, it can therefore not be concluded if the farmers experience limitation towards access to infrastructure.

Table 4.14: Arithmetic mean and standard deviation results for the construct Access to infrastructure

Construct #	Construct	Questions	n	Mean	Std. Dev.
C8	Access to infrastructure	Q8, Q28, Q29	344	2.49	0.52

4.5.2.6 Commercial intention

Questions were presented to the respondents to determine their intentions to develop into more commercial farming units. The construct not necessarily measures the ambition or will to develop, but more if maize wants to be produced on a more commercial scale. Commercial farming intentions such as maize production becoming a main source of income, producing and selling surplus grain and wanting family members to be a part of the farming operation were addressed. The results ($\bar{x}$=3.31, *S* = 0.44) strongly indicate that the respondents have a strong intention to become more commercial maize producers.

Table 4.15: Arithmetic mean and standard deviation results for the construct Commercial intention

Construct #	Construct	Questions	n	Mean	Std. Dev.
C9	Commercial intention	Q34,Q36,Q38	344	3.31	0.44

4.5.3 Correlation between constructs

Spearman's correlation coefficient (Rho – ρ) was calculated to determine the correlation between the constructs (Appendix C). Although non-probability convenience sampling was used in the study, for completeness of the data the p-values are reported as if probability sampling was used. If the guidelines as set out by Cohen (1988:77) are used in terms of the practical significance the following practical correlation exist in the data:

A large correlation with practical significance are observed between construct 5 and construct 7 with a Rho-value of 0.46 (p-value <0.05). It therefore, imply that according to the response of the sample group the support received from government and private organisations and the skills (financial and agronomic) of the farmers to develop are positively correlated. It seems as support from government/private support and access to information decrease so does the level of skills the farmers have to develop. This is an important point to note when considering support to these farmers from a government and private sector perspective. Skills transfer and training might be one of the most important support factors these farmers need.

The results (Appendix C) indicated a medium to strong positive correlation (Rho= 0.39, p-value < 0.05) between the construct 8 and construct 6. The results therefore, suggest that access to

resources and labour are correlating with access to infrastructure. It would seem that as access to resources decline so does the access to infrastructure. It could be implied that to a medium to strong extend that farmers in the most rural parts, having lower levels of access to good infrastructure also have lower level of access to resources.

The result (Appendix C) have also indicated a medium strength correlation between construct 3 and construct 4 (Rho-value = 0.35, p-value<0.05). This result suggests that as the respondents feel that their health and age are a limiting factor for their farming activity they also experience more involvement of their family and community in their farming activity. This is a positive response in the sense that farmers experiencing difficulties due to their age or health get support from their family and community.

A medium strength correlation was also observed between construct 4 and question 35 (Rho-value = 0.32, p-value < 0.05). This is an indication that the more farmers experienced their age and health being a limiting factor, they indicated that they just want to produce enough maize for their own consumption. This could suggest that if age and health are experienced as limiting factors the farmers have a lesser ambition to produce more maize than was needed for their own consumption. This could give some direction considering development programs in the future and how these programs should be targeted in terms of demographics.

The results (Appendix C) also indicate a medium strength correlation (Rho-value = 0.32, p-value < 0.05) between construct 6 and question 14. This is an indication that as respondents experience lower levels of access to resources they were also less likely to spend extra money on advanced inputs such as hybrid seed, fertiliser and crop protection chemicals. This finding supports the literature (Aliber & Hart, 2009:453) stating that resource poor farmers would spend less money on buying advance inputs and would resort to more low cost farming practises.

The results (Appendix C) also indicate a medium strength correlation between construct 9 and question 14 (Rho-value = 0.32, p-value < 0.05). These results are medium strength indications that as farmers are more intent to farm maize more commercial they are more likely to spend additional money on advance inputs. This shows that farmers are willing to apply more resources in their farming operations along with the intentions to develop into more commercial farming units.

Other corrections that can be noted with approximately a medium effect strength correlation are between construct 3 and question 21 (Rho-value = 0.29, p-value < 0.05) and between construct

2 and construct 4 (Rho-value = - 0.27, p-value < 0.05). The correlation between construct 3 and question 21 suggest that experience and increase to access to labour as family members and community members are involved in their farming operations. This is an indication that family and community members are considered a source of labour for these farmers, as mentioned in the literature as well (Hull, 2014:451; Gouse *et al*., 2016:11). The approximate medium strength negative correlation between construct 2 and 4 is an indication that as the respondents experience their health and age to be a limiting factor, they have a lower level of ambition to develop and expand their farming operations.

4.6 COMPARISON BETWEEN GENDERS

To investigate the differences between gender groups and to determine any practical significant differences between the genders with regards to the constructs, effect sizes (Cohen's d) had to be calculated (Field, 2009:57; Ellis & Steyn, 2002:10). The guidelines as set out by Cohen (1988:40) were used in interpreting the effect sizes that was calculated. The p-values obtained from a paired T-test are reported as if probability sampling was used to indicate statistical significance for completeness sake. The results of the analysis are presented in table 4.14.

Table 4.16: Effect sizes (d) and p-values for genders

Construct	Group	n	Mean	SD	p-value*	d-value
Access to inputs and non-government support	Male	156	2.99	0.59	0.6443	0.05
	Female	186	3.02	0.60		
Development ambition	Male	156	3.23	0.45	0.0654	0.20
	Female	186	3.14	0.46		
Family and community involvement	Male	156	2.55	0.64	0.2067	0.13
	Female	186	2.63	0.60		
Age and health	Male	156	2.15	0.99	0.1222	0.16
	Female	186	2.31	0.88		
Government and private support and market access	Male	156	2.30	0.62	0.9148	0.01
	Female	186	2.31	0.57		
Resources and Labour	Male	156	2.37	0.59	<0.0001	0.53
	Female	186	2.03	0.64		

Construct	Group	n	Mean	SD	p-value*	d-value
Skills	Male	156	2.13	0.76	0.8757	0.02
	Female	186	2.15	0.80		
Access to infrastructure	Male	156	2.60	0.55	0.0008	0.35
	Female	186	2.41	0.48		
Commercial intention	Male	156	3.34	0.40	0.4164	0.08
	Female	186	3.30	0.46		
Q14	Male	156	2.82	0.81	0.0621	0.20
	Female	186	2.65	0.87		
Q21	Male	156	2.66	0.83	0.0348	0.22
	Female	186	2.84	0.74		
Q31	Male	156	3.10	0.81	0.7499	0.03
	Female	186	3.07	0.70		
Q35	Male	156	2.75	0.88	0.1575	0.15
	Female	186	2.89	0.82		

* p-value obtained from paired t-test as in the case of probability sampling. Comparison is statistically significant at the 0.05 level.

According to the Cohen's effect sizes (d) a medium effect (d= 0.53, p-value<0.05), noticeable with the naked eye can be observed between the genders with regards to the construct: *Access to resources and labour*. The results suggest that female respondents have less access ($\bar{x}$=2.03) to resources and labour, compared to male respondents ($\bar{x}$=2.37). Although the effect may only be medium it is supported by the literature (Cousins, 2010:3; Hull, 2014:455; Gouse *et al*., 2016:11) indicating that woman farmers in the rural homeland areas have less access to resources such as land and have more difficulty to employ additional people in their farming operations.

According to the data (Table 4.14) there was no more practical significant difference could be observed between the genders regards to the other constructs. This is an indication that both gender farmers experience other development factors and limitation on a similar level. It is also an indication that both genders have the equal ambition and will to develop into more commercial farming units.

4.7 COMPARISON BETWEEN AGE GROUPS

Cohen's effect sizes were also calculated to determine if there is any practical significance between the different age groups with regards to the construct. For this analysis the two youngest age groups (14-24 and 25-34) were grouped tougher to increase the amount of respondents in each age group to a significant level. The age groups presented therefore are represented as follow:

Table 4.17: Age groups used for comparison analysis

Group	1	2	3	4	5
Age	15-34	35-44	45-54	55-64	65+

The p-values are reported as if probability sampling was used to indicate statistical significance for completeness shake. The guidelines as set out by Cohen (1988:40) were used in interpreting the Cohen's effect sizes (d) that was calculated. The results for each construct and standalone question will be presented and discussed separately.

4.7.1 Access to inputs and support

According to the results (Table 4.13) there is no practical significant difference between the age groups with regards to their access to advance inputs and support from non-government industry organisations. It can therefore be interpreted that all of the age groups have equal access to inputs and support from non-government industry organisations. The fact that all the respondents are a part of the Grain SA development program could explain the results.

Table 4.18: Effect sizes of Access to inputs and support according to age groups

Construct	Group	N	Mean	Std. Dev	Comparisons significance at the 0.05 level*	d-value				
						1	2	3	4	5
Access To Inputs and support	1	28	3.13	0.45	Between age groups: 5 and 3	-	0.06	0.27	0.11	0.23
	2	45	3.15	0.42		0.06	-	0.36	0.07	0.19
	3	82	3.00	0.39		0.27	0.36	-	0.37	0.41
	4	78	3.20	0.62		0.11	0.07	0.37	-	0.12
	5	41	3.28	0.68		0.23	0.19	0.41	0.12	-

*p-value reported as in the case of probability sampling. Comparison is statistically significant at the 0.05 level.

4.7.2 Development Ambition

In terms of the development ambition of the respondents there are a medium effect difference between the age group 15-34 and 65+ (d=0.61, p-value<0.05) and as well as between the age groups 45-54 and 65+ (d=0.52, p-value<0.05). The age group 15-34 particularly indicated a strong ambition to develop. The results suggest that the younger age groups have a greater ambition to develop compared to the oldest age group. This also correlates with the correlation data between the constructs suggesting that age and health could be a limiting factor for the older group of farmers. It is therefore important that when considering development programs that the correct age groups are targeted, keeping in mind the ambition of the younger age groups.

Table 4.19: Effect sizes of Development Ambition according to age groups

Construct	Group	N	Mean	Std. Dev	Comparisons significance at the 0.05 level*	d-value				
						1	2	3	4	5
Development Ambition	1	28	3.33	0.44	Between age groups: 1 and 5, 2 and 5, 3 and 5, 4 and 5	-	0.24	0.16	0.35	0.61
	2	45	3.22	0.40		0.24	-	0.09	0.11	0.47
	3	82	3.26	0.36		0.16	0.09	-	0.20	0.52
	4	78	3.17	0.43		0.35	0.11	0.20	-	0.4
	5	41	2.88	0.73		0.61	0.47	0.52	0.4	-

*p-value reported as in the case of probability sampling. Comparison is statistically significant at the 0.05 level.

4.7.3 Family and community involvement

According to the results (Table 4.16) there are no significant practical differences between the age groups with regards to the involvement of family members and the community in the respondents farming operations.

Table 4.20: Effect sizes of Family and community involvement according to age groups

Construct	Group	N	Mean	Std. Dev	Comparisons significance at the 0.05 level*	d-value				
						1	2	3	4	5
Family and community involvement	1	28	2.52	0.76	NONE	-	0.07	0.09	0.23	0.43
	2	45	2.57	0.64		0.07	-	0.02	0.19	0.37
	3	82	2.58	0.37		0.09	0.02	-	0.18	0.35
	4	78	2.7	0.63		0.23	0.19	0.18	-	0.22
	5	41	2.87	0.82		0.43	0.37	0.35	0.22	-

*p-value reported as in the case of probability sampling. Comparison is statistically significant at the 0.05 level.

4.7.4 Age and health

According to the results (Table 4.17) a medium effect difference between the age group 15-34 and 35-44 (d=0.62) and between the age group 35-44 and 65+ (d=0.67, p-value<0.05) with regards to age and health being a limiting factor in their farming operations are observed. The results indicate a highly practical significant difference in the response towards age and health as limiting factor between the age group 15-34 and the age groups 45-54 (d=1.05, p-value<0.05), 55-64 (d=0.83, p-value<0.05) and 65+ (d=1.13, p-value<0.05). It is therefore, clear that age and health as a limiting factor for development can be seen as a function of age.

Table 4.21: Effect sizes of Age and health according to age groups

Construct	Group	N	Mean	Std. Dev	Comparisons significance at the 0.05 level*	d-value				
						1	2	3	4	5
Age and health	1	28	1.46	0.83	Between age groups: 1 and 5, 1 and 3, 1 and 4, 2 and 5	-	0.62	1.05	0.83	1.13
	2	45	1.98	0.83		0.62	-	0.43	0.30	0.67
	3	82	2.34	0.76		1.05	0.43	-	0.07	0.34
	4	78	2.27	0.97		0.83	0.30	0.07	-	0.40
	5	41	2.71	1.10		1.13	0.67	0.34	0.40	-

*p-value reported as in the case of probability sampling. Comparison is statistically significant at the 0.05 level.

4.7.5 Government and private support and market access

Overall there was no significant practical differences between age groups with regards to support from government and private companies as well as access to markets and information. The results (Table 4.18) therefore imply that all the age groups experience the same level of support from the government and private companies. It would be recommended that the government and private companies consider age groups when implementing support programs.

Table 4.22: Effect sizes of Government and private support according to age groups

Construct	Group	N	Mean	Std. Dev	Comparisons significance at the 0.05 level*	d-value				
						1	2	3	4	5
Government and private support and market access	1	28	2.43	0.59	NONE	-	0.13	0.15	0.21	0.29
	2	45	2.35	0.56		0.13	-	0.30	0.11	0.19
	3	82	2.52	0.44		0.15	0.30	-	0.33	0.42
	4	78	2.28	0.72		0.21	0.11	0.33	-	0.08
	5	41	2.22	0.70		0.29	0.19	0.42	0.08	-

*p-value reported as in the case of probability sampling. Comparison is statistically significant at the 0.05 level.

4.7.6 Resources and Labour

According to the results (Table 4.19) there are a medium effect difference between the age group 15-34 and 35-44 (d=0.64) with regards to access to resources and labour. It would seem as if the younger age group have indicated that they have more access compared to the older group. There is a strong significant practical difference between the age group 45-54 and the age groups 15-34 (d=1.26, p-value<0.05), 55-64 (d=0.80, p-value<0.05) and 65+ (d=0.97, p-value<0.05). There is also a medium effect difference between the age group 45-54 and 35-44 (d=0.59, p-value<0.05). It results suggest that the specific age group 45-54 experience a lower level of access to resources and labour. It is important when interpreting the results that other possible demographic information need to be considered. When considering the gender comparison (Table4.14) the results suggested that female farmers have less access to resources and labour compared to males. If the gender distribution of the age groups is considered, it becomes apparent that 71% of the age group 45-54 are female and 29% are male. The female respondents in this age group make up 31% of the total female respondents. The differences between the age group 45-54 and the rest of the age groups in terms of access to resources and labour can be a function of both age and gender.

Table 4.23: Effect sizes of Access to resources and labour according to age groups.

Construct	Group	N	Mean	Std. Dev	Comparisons significance at the 0.05 level*	d-value				
						1	2	3	4	5
Resources and Labour	1	28	2.50	0.54	Between age groups: 3 and 1, 3 and 2, 3 and 4, 3 and 5	-	0.64	1.26	0.33	0.30
	2	45	2.10	0.62		0.64	-	0.59	0.25	0.36
	3	82	1.73	0.61		1.26	0.59	-	0.80	0.97
	4	78	2.27	0.68		0.33	0.25	0.80	-	0.07
	5	41	2.32	0.59		0.30	0.36	0.97	0.07	-

*p-value reported as in the case of probability sampling. Comparison is statistically significant at the 0.05 level.

4.7.7 Skills

The results (Table 4.20) obtained from comparing the different age groups with regards to their financial and agronomic skills to develop and expand their farming operations have indicated no significant differences between the age groups. It can therefore be concluded that all age groups experience similar levels of financial and agronomic skills. Skills transfer and training is thus needed on all age levels and should not only be concentrated on one specific age group.

Table 4.24: Effect sizes of Skills according to age groups.

Construct	Group	N	Mean	Std. Dev	Comparisons significance at the 0.05 level*	d-value				
						1	2	3	4	5
Skills	1	28	2.16	0.79	NONE	-	0.18	0.02	0.29	0.13
	2	45	2.31	0.83		0.18	-	0.16	0.46	0.28
	3	82	2.18	0.62		0.02	0.16	-	0.31	0.14
	4	78	1.92	0.81		0.29	0.46	0.31	-	0.12
	5	41	2.04	0.98		0.13	0.28	0.14	0.12	-

*p-value reported as in the case of probability sampling. Comparison is statistically significant at the 0.05 level.

4.7.8 Access to infrastructure

The results (Table 4.21) suggest that there are no significant defences between the age groups with regards to access to infrastructure.

Table 4.25: Effect sizes of Access to infrastructure according to age groups

Construct	Group	N	Mean	Std. Dev	Comparisons significance at the 0.05 level*	d-value				
						1	2	3	4	5
Access to infrastructure	1	28	2.57	0.59	NONE	-	0.14	0.44	0.13	0.25
	2	45	2.49	0.54		0.14	-	0.33	0.00	0.12
	3	82	2.41	0.48		0.44	0.33	-	0.36	0.20
	4	78	2.49	0.51		0.13	0.00	0.36	-	0.12
	5	41	2.42	0.56		0.25	0.12	0.20	0.12	-

*p-value reported as in the case of probability sampling. Comparison is statistically significant at the 0.05 level.

4.7.9 Commercial intention

According to the results (Table 4.22) a medium effect difference can be observed between the age groups 65+ and 35-44 (d=0.5, p-value<0.05) and 55-64 (d=0.5, p-value<0.05). There is also a strong effect difference with practical significance between the age group 65+ and 45-55 (d=0.92, p-value <0.05). The results suggest that the oldest age group have a higher intention to become commercial. Although the development ambition of the age group 65+ might not be as high as the younger groups (Table 4.14) the data still suggest that this group would like to produce maize on a more commercial level. The life stage of the age group 65+ could suggest that this group of farmers are at a stage of retirement and that their options of income are limited. This could explain why they would like to see farming as a main source of income and would like to sell surplus and employ more people.

Table 4.26: Effect sizes of Commercial intention according to age groups.

Construct	Group	N	Mean	Std. Dev	Comparisons significance at the 0.05 level*	d-value				
						1	2	3	4	5
Commercial intention	1	28	3.35	0.48	Between age groups: 4 and 3, 5 and 2, 5 and 3, 5 and 4	-	0.07	0.43	0.02	0.47
	2	45	3.31	0.52		0.07	-	0.33	0.04	0.50
	3	82	3.14	0.48		0.43	0.33	-	0.49	0.92
	4	78	3.33	0.41		0.02	0.43	0.49	-	0.50
	5	41	3.57	0.48		0.47	0.50	0.92	0.50	-

*p-value reported as in the case of probability sampling. Comparison is statistically significant at the 0.05 level.

4.7.10 Standalone question comparison

The comparison results of the standalone questions according to the age groups only revealed medium to strong effect difference with regards to question 14 referring to spending additional money on purchasing inputs. It seems as if the age groups 15-34 (d=0.71, p-value <0.05) and 35-44 (d=0.63, p-value<0.05) have a tendency to spend additional money on purchasing inputs compared to the age group 45-55. The fact that the age group 45-54 have also indicated that they have a lower level of access to resources could explain why this group tend to spend lesser money of resources. The literature directly links the access to resources with the farmer's ability to purchase advance inputs (Aliber & Hart, 2009:453).

Table 4.27: Effect sizes of Question 14 according to age groups

Construct	Group	N	Mean	Std. Dev	Comparisons significance at the 0.05 level*	d-value				
						1	2	3	4	5
Q14	1	28	2.96	0.79	Between age groups: 1 and 3, 2 and 3, 5 and 3	-	0.13	0.71	0.30	0.10
	2	45	2.86	0.73		0.13	-	0.63	0.18	0.01
	3	82	2.40	0.65		0.71	0.63	-	0.37	0.40
	4	78	2.71	0.84		0.30	0.18	0.37	-	0.12
	5	41	2.85	2.12		0.10	0.01	0.40	0.12	-

*p-value reported as in the case of probability sampling. Comparison is statistically significant at the 0.05 level.

4.8 SUMMARY

The results of the study were gathered as set out by the research procedure. A total of 344 questionnaires were retained and used for the data analysis, the sample size (n) could therefore be considered 344 respondents. The results were captured and analysed using SAS (2016) by the Statistical Consultation Services of the North West University.

Descriptive analytics was done to describe the demography of the sample and to give insight into the agricultural activities.

Exploratory factor analysis was performed on the Likert scale questions relating to the factors influencing the development of the farmers, to identify grouping of variables (questions) according to the response of the respondents to for factors or constructs. This measure of data reduction delivered 11 factors or constructs. The Cronbach's Alpha coefficient was calculated for each construct and the results indicated that the questionnaire can be considered reliable. The factors analysis also indicated that the questionnaire had an acceptable level of validity.

Descriptive analytics were conducted on the construct data and was described in detail. Through this analysis certain key factors were identified that could be considered limiting factors for the development of the subsistence maize farmers. The correlation between the responses to the constructs was analysed making use of Spearman's correlation coefficient (Rho). The p-values were also reported as if probability sampling was used in the study for the sake of

complete date reporting. Some medium strength correlations were identified between certain constructs as well as the standalone questions.

Cohen's effect sizes (d) was calculated and used as a measure to determine if there are practical significant differences between the demographic groups (Gender and Age groups) with regards to the constructs. The p-value was reported as if probability sampling was used for completeness sake. Between the genders only one construct relating to access to resources and labour was found. Numerous differences with practical significance were found with regards to the age groups' response to constructs.

In the next chapter conclusions and recommendations based on the results discussed in this chapter will be made in the following and last chapter.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

South Africa has a vibrant dualistic agricultural industry, comprised of successful commercial producers as well as subsistence farmers engaged in agriculture as a main or supplementary source of food. Agriculture has a critical role to play in the transformation and democracy in South Africa. The study was conducted with the aim to address the limiting factors of agricultural development experienced by subsistence maize producers in South Africa. The primary objective of the study was to get more insight on the factors influencing the development of subsistent maize farmers in South Africa as well as to understand the ambition of these farmers to develop into more commercial farming units.

An in-depth literature study was conducted on the sector in South Africa with specific emphasis on the maize production sector and the factors that can influence the development of subsistence maize farmers. The findings of the literature study were presented in Chapter 2. In Chapter 3 the methodology used in the empirical study as well as the target population was described. The results obtained from the qualitative study using a questionnaire survey was presented in Chapter 4. The respondents that took part in the study could be considered representative of the target population according to literature.

In this final chapter conclusions will be presented based on the empirical study. Recommendations will also be made with a focus on the individual farmer, organisation and future research. The study will be evaluated according to the study objectives and the research question. The limitation of the study will be discussed and a summary of the chapter will be presented.

5.2 CONCLUSIONS

Through the literature certain factors were identified as possible limiting factors influencing the development of subsistence farmers. These pre-identified factors were used to develop a questionnaire and to test the relevance of these factors with subsistence maize farmers. The development ambition as well as the commercial intention of these farmers was also tested through the questionnaire. The following conclusion could be made based on this study:

5.2.1 Access to inputs

The literature suggests that poor access to advance agricultural inputs and the use of low input traditional farming practises have a negative effect on the production efficiency of small scale and subsistence farmers (Baiphethi & Jacobs, 2009:471). In contrast with the literature (Aliber & Hart, 2009:447; Baiphethi & Jacobs, 2009:471; Gouse *et al*., 2016:11; James, 2016:12; Jacobs *et al.,* 2008:9) the results suggest that the farmers have access to advance inputs such as hybrid seed, fertiliser, crop protection products and biotechnology. It is important to note that according to the response of the farmers, the questions with regards to input access were grouped with the question relating to access to agronomic support and support from non-government industry organisations. It therefore suggests that the farmers associate the access to advance inputs to the support they have from non-government industry such as Grain SA. The data also indicates that the farmers believe they receive support from non-government industry organisations and have access to mentorship and agronomists. All the respondents in the study as well as the target population are a part of Grain SA's farmer development program and form a part of a project where they get access to advance inputs, explaining their response towards the support level from organisation such as Grain SA and their access to inputs. This could demonstrate the advantage of being involved in organised agriculture for these farmers if compared to the literature.

The literature (Aliber & Hart, 2009:453) suggest that resource poor farmers would rather spend extra money on household needs instead of purchasing inputs. The majority of respondents have indicated that they do purchase inputs such as seed, fertiliser and crop protection chemicals. Although the indication is slight, there also seems to be an indication that the respondents will tend to spend extra money on purchasing agricultural inputs. A medium effect correlation also exists between the commercial intention of the farmers and the likelihood to spend extra money of inputs.

According to the comparison analysis there are no differences between the gender and age groups with regards to their access to inputs.

It can therefore be concluded that for the sample group access to advance inputs cannot be considered a limiting factor in their development. It can be concluded that under the correct mentorship and with the correct support subsistence farmers will make use of advance inputs to improve their production.

5.2.2 Access to resources

According to the literature small scale and subsistence farmers in South Africa would be considered resource poor with limited access to their own land, financing and equipment (Aliber & Hart, 2009:437; Fraser *et al.*, 2003, Ortmann & Machethe, 2003:47). Land tenure and land ownership is a complex issue in the former homeland areas with a limiting effect on the development and the success of the farmers cultivating the land (Cousins, 2010:3). Since the democratisation of South Africa numerous government programs were set in place to address land distribution and restitution; these projects have delivered very little success (Cousins, 2010:3; Van Burick, 2016). If the development ambitions of the farmers are considered there was an indication that these farmers would consider expanding their farming operations if they have access to their own land as well as other resources such as finances. More research on the effect of land ownership compared to land access towards the development of these farmers needs to be done.

According to the results of this study it is clear that the participating farmers are of the opinion that they have access to limited resources. According to the response of the participants, the item with regards to employment of other people in their farming operation was grouped with the access to resources items in one construct. This is an indication that employment of additional employees is closely linked to the availability of resources.

The results have indicated that there is a medium effect difference between genders with regards to the availability of resources. The results suggest that female farmers have, to a lesser extent, access to resources compared to their male counterparts. These results support the findings in the literature (Cousins, 2010:3; Hull, 2014:455; Gouse *et al*., 2016:11). The comparison between the age groups have indicated that the age group 45-54 experience a lower level of access to resources compared with the other age groups, with medium to strong effect. These findings can be linked to the proportion of female participants in this specific age group. Therefore these finding could be more a function of gender than age, although there is a tendency that the younger participants have indicated that they have more access to resources.

The results have indicated that there is a medium effect positive correlation between access to resources and access to infrastructure. This would suggest that resource poor farmers are situated in areas with lesser access to infrastructure such as roads, transport, grain storage facilities and elsewhere (Jacobs *et al.,* 2008:14). The deficiency of resources can also limit these farmers to acquire facilities such as grain storage facilities. There was also a medium

effect size correlation between access to resources and the likelihood of spending extra money of inputs.

Overall the conclusion can be made that the participants experience poor access to resources. The lack of resources can be identified as limiting factor in the development of the subsistence maize farmers and it would seem as if women farmers have to lesser an extent access to resources compared to male farmers. Limited resources can possibly explain the lack of certain key infrastructure acquirements as well as the unwillingness to use extra money to purchase additional inputs.

5.2.3 Access to infrastructure

Most subsistence maize farmers are situated in the rural areas of South Africa. In most of these rural areas there is limited access to good infrastructure such as roads, water, irrigation, housing, grain storage facilities and cellular and internet connectivity (Jacobs *et al.,* 2008:14; Baiphethi & Jacobs, 2009:471). According to the literature lack of certain key infrastructure can have a limiting effect on the production and development of subsistence and small-holder farmers (Baiphethi & Jacobs, 2009:471; Jacobs *et al.,* 2008:14) The results obtained from this study and the reliability associated with the constructs make it not possible to make a clear conclusion on the access to infrastructure as a factor influencing the production and development of the subsistence maize farmers that participated in the study. There was a medium effect indication that access to resources and access to infrastructure is correlated. The results also suggest no difference between gender and age groups with regards to access to infrastructure.

5.2.4 Skills

To become higher producing farmers and to develop into more commercial farming units a certain skill set is needed in terms of agronomic and financial skills (Grain SA, 2015:12). The right skills transfer and training can have a positive effect on the production and development of subsistence farmers (Mbanza & Thamaga-Chitja, 2014:251; Baiphethi & Jacobs, 2009:477).

The results of this study have indicated that the farmers believe that they are lacking the financial and agronomic skills to develop and expand their farming operations. There was a strong correlation between having skills and the support participants experience from the government and private agricultural companies and access to information. It would seem that as support from private companies and the government increase the skill set of the farmers

increase as well. Both male and female participants have equally indicated their lack of skills to expand their farming operations. It would seem that although the participants in the study form part of the development and training programs of Grain SA they still experience a lack of skills to develop and expand their operations. The type of training in the program can be reassessed to ensure that all necessary skills transfer and training address the needs of the farmers.

It could therefore be concluded that skills in terms of financial and agronomic skills can be seen as a limiting factor for the development and expansion of the subsistence maize farmers. This is a very important factor that should be noted when considering future development programs.

5.2.5 Support

Numerous support and development programs have been established by the government with the aim of farmer development and land reform. According to the literature very few of the programs have barred fruit and have benefited the people it was set out to support (Jacobs *et al.,* 2008:14; Aliber & Hart, 2009:454; Kruger, 2016; Van Burick, 2016; Cousins, 2010:3; BFAP, 2016:7). The private companies have also focused their development programs in the past only on the already commercial and commercial viable segment of developing farmers (Jacobs *et al.,* 2008:14). The results of the study correspondence with the literature in the sense that the participants have indicated that they limited support from government and private companies. According to the response, access to information and access to markets were grouped with the items addressing government and private company support into one construct. It would seem that participants associate access to information and off-take markets with the support of government and private companies. There is also a strong correlation between the construct of government/private support and the skill set participants have to expand their farming operations. Participants have also indicated that they would like to get more support from private companies.

In contrast there was a positive response by the participants with regards to the support they are receiving form non-government industry organisations such as Grain SA.

There was no clear difference between the gender and age groups in terms of the support received.

It can be concluded that the participants suggested that they have not sufficient support from government and private companies as well as access to information and off-take markets. They have also indicated that they would like to have more support from private agricultural

companies. It is important that off-take markets will have to be established allowing these farmers to sell their surplus grain production and becoming more commercial farming operations.

5.2.6 Age and health

Corresponding with the literature, most of the participants that took part in the study are women that can be considered middle age to elderly (Fényes & Meyer, 2003: 26; Aliber & Hart, 2009:441). According to literature age and poor health can be limiting factors in the production and the development of subsistence and small-scale farmers (Baiphethi & Jacobs, 2009:471; Mbanza & Thanaga-Chitja, 2014:251). Although the variance was high in the response the results of the study indicated that the slight majority of participants do not consider age and health as limiting factors in their farming activities. The results also indicated a medium effect correlation between the involvement of family members/community and the impact of age and health on farming activity.

The results indicated no difference between the gender groups but there is a definite indication that the experience of age and health being a limiting factor is a function of age. The youngest age groups had a practical significant difference in response compared to the older age groups with regards to age and health being a limiting factor.

In terms of development ambition of farmers, there is a medium strength correlation that farmers experiencing age and health limitation have a lower level of ambition to develop. It is interesting that the oldest age group have had a high response to indicate that they have a commercial farming intent. Although a slight medium correlation also indicates that farmers with age and health limitations tend to only want to product enough maize for their own use. It would seem as if aged farmers would like to gain more income from maize production, but they not necessarily have the ambition to expand their farming operations. This is an important point to note when considering development programs of these farmers. There was no difference between the genders with regards to age and health being a limiting factor.

The conclusion can be made that age and health as a limiting factor is a function of age according to this study. Although there is commercial intent at older age groups it seems as if the ambition to develop and expand is higher at younger farmers.

5.2.7 Family and community involvement

It would seem from the results that participants have slightly indicated that family members and community members are involved in their farming operations. There is a tendency that children and grandchildren are not that extensively involved in the farming operations. The labour capacity of young people should be better utilised by these farmers to help increase production and expand operations (Hull, 2014:451). It was also found that participants had the need for their family members to become more involved in their farming operations along with the intention to produce maize on a more commercial level. The results have also indicated with a slight medium effect that respondents experienced an increase in labour availability with the increase in family and community involvement.

It can be concluded that although higher participation would be ideal, lack of family and community involvement cannot be identified as a limiting factor in the development of subsistence maize farmers. The establishment of more family farming units should be considered with the intention to expand and produce more commercially.

5.2.8 Labour and employment

Small-scale and subsistence agriculture will have to play a very important part in the creation of jobs and reduction of unemployment in the rural areas of South Africa (DAFF, 2015:15, BFAP, 2016:7; Ngqangweni & Hendriks, 2003:87). Subsistence farming is seen as an important buffer against poverty and source of household needs if especially under bad economic conditions (Groenewald & Nieuwoudt, 2003:265). It will be crucial for the success of the rural economy and the success of the agricultural sector that subsistence and small scales farming becomes a bigger contributor in terms of reducing unemployment.

According to the literature the availability of labour to subsistence and small scale farmers in the rural areas of the former homelands are limited (Gouse *et al.,* 2016:11). The results of the study, in the contrary, indicated that most participants have access to labour. A slight medium effect correlation indicates that as family and community members are more involved in the farming operations, access to labour is also higher. There were also no differences between genders with regards to labour access.

The results of the study indicate that the majority of the participants do not employ additional people in their farming operations, linked with their access to resources. Although not many farmers have indicated that they employ additional people there is an indication that they would

definitely consider employing more people if they could afford it. It is therefore essential that these farmers are supported in development so that they can get to a point where they can employ more people.

It can be concluded that access to labour not necessarily can be identified as a limiting factor. The capacity, resources and ability to employ more people would be considered a bigger challenge.

5.2.9 Ambition and commercial intention

When considering the development of farmers, it is very important to understand the will and ambition of these farmers to develop. One of the main reasons in the past why farmer development programs had failed was due to the beneficiaries of these programs that were neither willing nor dedicated farmers (Kruger, 2016).

Through the study two aspects were tested, firstly the intention to become more commercial and secondly the ambition and will to expand if certain resources were available.

In response to the construct relating to the ambition to expand their farming operations, there was an overwhelming indication that the respondents want to expand if they have access to certain resources and support. There was no difference between the genders with regards to the response but there was a medium effect difference between the age groups. Compared to the rest of the age groups the oldest group have a lower response towards expanding their farming operations. This is also confirmed by the slightly medium effect negative correlation, indicating that where age and health are considered limiting factors the intention to expand farming operation decreases.

With regards to the construct relating to the commercial intention of the farmers, there was also an overwhelming positive response indicating that the farmers would like to produce and sell surplus maize, employ more people and have family more involved in their operations. It was the oldest age group that had the biggest response indicating that although they do not necessarily want to expand they would still like to produce maize in such a way that it can support them financially and support employees and family members.

In conclusion there is a definite ambition and will among the participants to expand their farming operations and to produce maize on a more commercial level**.**

5.3 RECOMMENDATIONS

Based on the results and conclusions, recommendations would be made towards the individual farmers, government and organisation.

5.3.1 Recommendations to individuals

The following recommendation will be made for individual subsistence maize farmers based on the results of this study:

- The benefit of being involved in organised agriculture is clear through the fact that participants have support, mentorship and access to advance inputs through Grain SA involvement. Farmers irrespective of scale will be recommended to become a part of organised agriculture and successful development programs under management of industry bodies.

- Get family members involved in farming activities. Make use of the labour capacity of legal working age children and grandchildren and at the same time transfer skills to them so that they can develop and expand farming operations.

- Getting community members involved in working groups can be an important source of labour that can be utilised.

- Farmers should embrace the support and mentorship provided by organisations and commercial farmers.

- Make an effort to get involved in study groups and skills transfer sessions. Apply necessary skills and inputs to improve the yields on a per area basis before considering additional land.

5.3.2 Recommendations to government and organisations

The following recommendations will be made for government and organisations such as private agricultural companies and non-government industry bodies:

- Government and private companies should focus their efforts on skills development and transfer. Organisations such as Grain SA should assess their training and skills transfer programs to ensure that the right skills are transferred to the farmers not only to produce

more efficiently but also on skills needed to expand their operations and become more commercial.

- Private agricultural companies could focus establishing grain off-take networks, allowing these farmers to gain access to market and to sell their surplus production.

- Support and land reform programs can only be successful if sustained support is provided that would address skills, information, resources and market access limitations.

- When considering development programs, support and objectives must be defined along age lines. Older farmers should be supported to increase their production to a sufficient level but not necessarily to expand their farming operations. Younger farmers with a higher level of ambition to develop and expand should get the corresponding support, training and resources.

- Private organisations should focus their support efforts and attention not only on already commercial viable portions of developing agriculture, but also on the lowest level of development as well.

- When considering development programs for farmers, emphasis should not necessarily be on the expansion of an area basis, but on the improvement of production efficiency on a per area basis.

5.4 EVALUATION OF THE STUDY

To evaluate the success of the study, it is important to determine if the primary and secondary research objective set out in Chapter 1 have been achieved. It is also important to determine to what extent the research question have been answered.

5.4.1 Primary objectives

The primary objective of the study was to develop a deep understanding towards the ambition and mindset of subsistence maize farmers in South-Africa with regards to their development to more sustainable and commercial farming units and the fundamental factors that determine their development.

The results of the study have indicated that there is a definite ambition and will among the target population to develop and expand their farming operations. There is also a commercial intent among these farmers to produce maize on a more commercial level.

Important factors influencing the development of these farmers have been identified from the literature and through the empirical study. Some of the most important factors influencing the development of subsistence maize farmers include: Access to resources including land, equipment and finances, support from government and private agricultural companies, access to off-take markets and financial and agronomic skills.

5.4.2 Secondary objectives

The secondary objective for this study was to:

- Conceptualize the topic of subsistence maize agriculture production in South Africa through a literature study.
- Determine from the subsistence farmer's perspective what their ambition, motivation and will are to develop into more commercial farming units.
- Determine from the subsistence maize farmer's perspective what the fundamental challenges and constraints are to develop into more commercial farming units.
- Determine the level of support from government, industry bodies and private companies on the development of subsistence maize farmers.
- Determine if subsistence maize farming can have a positive effect on rural economy, specifically employment.
- Determine the level of access subsistence maize farmers have to advance inputs, technology and labour.
- Determine if there is a difference between age groups and gender groups with regards to the factors influencing their development and development ambition.
- Make recommendations for future research and practises.

Through this study an in-depth literature study was conducted on subsistence maize production in South Africa (Chapter 2). Through the literature study important factors were identified that

could influence the development of subsistence maize farmers, these factors were tested through the empirical study. The ambition and will to expand and develop were also tested along with the factors that could influence the development of these subsistence maize farmers. The level of support these farmers get from government, private sector and non-government industry bodies was also established. It was apparent through the study that although the majority farmers do not employ additional labour there is an ambition to employ more people if they were able to afford it. The study also established that the participants have access to advance inputs, although the results cannot be applied to the general subsistence farmer in South Africa, it is still a good indication that advance inputs can be used and acquired by subsistence farmers. There was certain difference identified between gender and age groups with regards to the factors influencing development as well as development ambition and commercial intent. Lastly recommendations were made towards the individual farmers as well as government and organisations.

5.4.3 Research question

The research question stated in Chapter 1: What are the major factors limiting subsistence maize farmers to develop into more commercial farming units? Do these subsistence maize farmers have the ambition and will to develop into more commercial farming units?

According to the primary research objective achieved the research question could be answered.

5.5 LIMITATIONS OF THE STUDY

The study was conducted with the assistance of the Grain South Africa development program, although a good representation of the population in question, this study probably excludes a portion of the general subsistence farming population. The farmers that take part in the Grain South Africa development program already had taken a step in developmental direction. The study therefore excluded farmers that have not joined the development program due to lack of knowledge or other limitations.

Geographically the study only focuses on subsistence maize farmers in the KwaZulu-Natal, Mpumalanga and Eastern Cape provinces, although these provinces support the largest population of subsistence farmers; factors that influence the development of the farmers might differ from other provinces.

The cultural, educational and linguistic background of the respondents varied greatly and the factors in question could be interpreted differently, among the different ethnic groups. The Grain South Africa representative facilitated the data capturing process and acted as interpreters and interviewers. Although highly knowledgeable, the interviewers might have interpreted the questions differently.

Non-probability sampling was used, to be able to generalise the results to the larger population, probability sampling should be conducted.

5.6 SUGGESTIONS FOR FUTURE RESEARCH

It would be suggested that studies in the future included a larger portion of the target population. Probability sampling can be used to be able to generalise the results over the larger population. Certain development factors can be studied in more detail; for instance, the effect of land ownership on development ambition.

A qualitative research approach can be included where farmers are interviewed to get a better understanding of the underlying social and psychological issues influencing their development.

Farmers that have already developed into more commercial farming units can be included in a study, to do comparative studies and to determine how limiting factors were overcome.

A general framework can be established with key action and a checklist that should be met to ensure successful development and progress.

5.7 SUMMARY

The South African agricultural sector, although complex, is vibrant and the heartbeat of the country. From the smallest farmers in the rural hills of KwaZulu-Natal to the mega commercial farmers on the vast plains of the Free State have all a collective responsibility to apply their trade and passion to transform and grow South Africa.

In this chapter conclusions were made based on the results of this study. Conclusions were made with regards to specific factors influencing the development of subsistence maize farmers and on the ambition and commercial intent of these farmers. The most important factors influencing the development of these subsistence maize farmers include: Access to resources including land, equipment and finances, support from government and private agricultural companies, access to off-take markets and financial and agronomic skills. It also became

apparent that the farmers have the ambition and will to expand their farming operations as well as the commercial intent to produce maize on a more commercial level.

Recommendations were made to the individual farmer, government and organisations involved in farmer development. The study was also evaluated according to the achievement set out by the primary and secondary research objectives. Limitations of this study were discussed and recommendations were made for future research.

Although there are limitations and factors influencing their development, their ambition and passion along with the correct support and mentorship will enable all farmers, irrespective of scale, to develop to their desired level of production, even from subsistence to abundance.

"It always seems impossible until it is done" – Nelson Mandela

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APPENDIX A – QUESTIONNAIRE

Contact details of Researcher:

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Title of the study:

Factors that influence the development of South African subsistent maize farmers into commercial farming units.

Benefit and Aim of study:

Get a better understanding of the dynamics and needs of subsistent farmers. Increase understanding will ultimately lead to the improvement of support towards subsistent farmer development. The development of rural subsistent farmers to become more sustainable and productive can not only benefit the individual farmers but also the entire community and ultimately the national economy and unemployment rate. This study can help to improve the understanding of the complex nature of subsistent agriculture not only in South Africa but also in the rest of Africa and even globally.

Confidentiality:

No information regarding the respondents will be disclosed to any third parties. The confidentiality of respondents is guaranteed and their identity will not be revealed in the reporting of the results.

Feedback:

The results of the study will be made available to GrainSA and all relevant stakeholders. The results can also be shared with the respondents and communities involved in the study. The results will also be made available to other researchers. The results of the study can help researchers from numerous fields to better understand the dynamics of subsistent agriculture in South Africa. The study can form a base and backbone for many future studies.

Instructions:

Please complete the below questionnaire along with the guidance of the person administering the questionnaire. Please mark your relevant response with an “X”. Thank you for your response and participation in this study it is highly appreciated.

Demographic and background information

Gender	M	F

Age	15-24	25-34	35-44	45-54	55-64	65+

Reason for farming	1	2	4	5	6
	Main source of Food	Extra source of Food	Main Source of income	Extra source of income	Leisure/Hobby

What is your main source of income	1	2	3	4
	Farming	Employment	Grants/ Pension	Family

What of the following inputs do you purchase?		
Seed	YES	NO
Fertilizer	YES	NO
Agro-chemicals	YES	NO
Lime	YES	NO

Feedback on farming operations

		TOTALLY DISAGREE	DISAGREE	AGREE	TOTALLY AGREE
1	I have secure access to land	1	2	3	4
2	I have access to money	1	2	3	4
3	I have access to tractors, planters, sprayers etc	1	2	3	4
4	I have access to hybrid maize seed	1	2	3	4
5	I have access to biotechnology such as Roundup ready or BT seed	1	2	3	4
6	I have access to fertilizer	1	2	3	4
7	I have access to crop protection chemicals (herbicides, insecticides etc)	1	2	3	4
8	I have access to grain storage facilities	1	2	3	4
9	I have a market where I can sell my surplus maize grain	1	2	3	4
10	I have access to mentors / agronomists that can support me	1	2	3	4
11	I get support from the government for my farming operations	1	2	3	4

12	I get support from Agri-Businesses such as co-ops, seed companies etc	1	2	3	4
13	I get support from non-Governmental entities such as Grain SA, AgriSa, GFADA etc	1	2	3	4
14	I spend extra money on buying farming inputs such as seed and fertilizer	1	2	3	4
15	I employ extra people to help in my farming activities	1	2	3	4
16	If I could afford it, I would employ more people in my farming activities	1	2	3	4
17	My family members help me in my farming activities	1	2	3	4
18	My neighbours and community members help me in my farming activities	1	2	3	4
19	My children are involved in my farming activities	1	2	3	4
20	My grandchildren are involved in my farming activities	1	2	3	4
21	I have access to labour	1	2	3	4
22	I want to expand my farming operation	1	2	3	4
23	If I had access to more agronomic support I would expand my farming operation	1	2	3	4
24	If I had access to my own land I would expand my farming operation	1	2	3	4
25	If I had access to financial support (money) I would expand my farming operation	1	2	3	4
26	My age is limiting my farming activities	1	2	3	4
27	My health is limiting my farming activities	1	2	3	4
28	I have access to good infrastructure such as roads, transport, water etc	1	2	3	4
29	I have good cellular connectivity	1	2	3	4
30	I have access to agricultural information	1	2	3	4
31	I want more support from private Agri-businesses such as co-ops, seed companies etc	1	2	3	4
32	I have all the necessary agronomic skills to expand my farming operations	1	2	3	4
33	I have all the financial skills to expand my farming operations	1	2	3	4
34	I want my family to be involved in my farming operations	1	2	3	4
35	I want to produce enough maize just for my own use	1	2	3	4
36	I want to produce enough maize so that I can sell the surplus	1	2	3	4
37	I want to be a commercial maize farmer	1	2	3	4
38	I want farming to be my main source of income	1	2	3	4

APPENDIX B – FREQUENCY ANALYSIS, DESCRIPTIVE STATISTICS

Gender frequency of respondents

Male	Female	Unknown
156	186	2
45.3%	54.1%	0.6%

Age frequency of respondents

Age Groups	15-24	25-34	35-44	45-54	55-64	65+	Unknown
Number of respondents	4	24	45	82	78	41	70
Percentage of sample	1.16%	6.98%	13.08%	23.84%	22.67%	11.92%	20.35%

Main reasons for being involved in farming

Main reason for farming	Main source of Food	Extra source of Food	Main Source of income	Extra source of income	Leisure/ Hobby	Unknown
Number of respondents	104	78	72	56	18	16
Percentage	30%	23%	21%	16%	5%	5%

Main sources of income.

Main source of income	Farming	Employment	Grants/ Pension	Family	Unknown
Number of respondents	123	31	158	17	15
Percentage of respondents	36%	9%	46%	5%	4%

Input purchasing activity

What inputs do you purchase	YES	NO	Unknown
Seed	339	1	4
	99%	0%	1%
Fertilizer	335	6	3
	97%	2%	1%
Agro-chemicals	308	29	7
	90%	8%	2%
Lime	288	49	7
	84%	14%	2%

Frequency of response to Likert-scale questions.

	Question	TOTALLY DISAGREE	DISAGREE	AGREE	TOTALLY AGREE	MEAN	STANDARD DEVIATION	N
1	**I have secure access to land**	23%	7%	48%	22%	2.69	1.05	340
2	**I have access to money**	46%	25%	28%	1%	1.84	0.87	342
3	**I have access to tractors, planters, sprayers and more**	48%	29%	19%	4%	1.79	0.89	340
4	**I have access to hybrid maize seed**	4%	21%	54%	21%	2.91	0.76	343
5	**I have access to biotechnology such as Roundup ready or BT seed**	6%	20%	51%	22%	2.88	0.82	339
6	**I have access to fertilizer**	2%	6%	67%	24%	3.13	0.62	343
7	**I have access to crop protection chemicals (herbicides, insecticides and more)**	8%	18%	51%	23%	2.88	0.85	343
8	**I have access to grain storage facilities**	34%	22%	25%	19%	1.92	0.89	410
9	**I have a market where I can sell my surplus maize grain**	20%	19%	54%	7%	2.48	0.89	340
10	**I have access to mentors / agronomists that can support me**	4%	17%	53%	26%	3.02	0.76	339

	Question	TOTALLY DISAGREE	DISAGREE	AGREE	TOTALLY AGREE	MEAN	STANDARD DEVIATION	N
11	**I get support from the government for my farming operations**	39%	36%	22%	3%	1.9	0.86	330
12	**I get support from Agri-Businesses such as co-ops, seed companies and others**	32%	38%	28%	2%	1.99	0.83	341
13	**I get support from non-Governmental entities such as Grain SA, AgriSa, GFADA and others**	4%	9%	52%	35%	3.18	0.75	339
14	**I spend extra money on buying farming inputs such as seed and fertilizer**	9%	27%	48%	17%	2.74	0.84	341
15	**I employ extra people to help in my farming activities**	14%	36%	42%	7%	2.42	0.83	338
16	**If I could afford it, I would employ more people in my farming activities**	4%	11%	63%	22%	3.03	0.7	339
17	**My family members help me in my farming activities**	4%	18%	60%	18%	2.91	0.73	338
18	**My neighbors and community members help me in my farming activities**	20%	43%	27%	11%	2.29	0.9	342
19	**My children are involved in my farming activities**	8%	27%	51%	15%	2.72	0.8	342
20	**My grandchildren are involved in my farming activities**	20%	25%	43%	11%	2.46	0.94	342
21	**I have access to labor**	8%	22%	56%	14%	2.76	0.78	342
22	**I want to expand my farming operation**	1%	7%	64%	28%	3.19	0.59	344
23	**If I had access to more agronomic support I would expand my farming operation**	3%	13%	58%	26%	3.06	0.72	342
24	**If I had access to my own land I would expand my farming operation**	2%	6%	54%	38%	3.28	0.66	341
25	**If I had access to financial support (money) I would expand my farming operation**	5%	6%	46%	43%	3.26	0.8	342

	Question	TOTALLY DISAGREE	DISAGREE	AGREE	TOTALLY AGREE	MEAN	STANDARD DEVIATION	N
26	**My age is limiting my farming activities**	28%	27%	33%	12%	2.28	1	344
27	**My health is limiting my farming activities**	30%	30%	31%	10%	2.2	0.98	342
28	**I have access to good infrastructure such as roads, transport, water and more**	7%	38%	49%	6%	2.54	0.71	342
29	**I have good cellular connectivity**	2%	13%	66%	19%	3.01	0.64	342
30	**I have access to agricultural information**	7%	17%	65%	12%	2.81	0.72	340
31	**I want more support from private Agri-businesses such as co-ops, seed companies and others**	6%	8%	60%	27%	3.08	0.75	342
32	**I have all the necessary agronomic skills to expand my farming operations**	22%	47%	24%	8%	2.17	0.85	343
33	**I have all the financial skills to expand my farming operations**	24%	49%	18%	9%	2.11	0.87	342
34	**I want my family to be involved in my farming operations**	2%	6%	67%	24%	3.12	0.62	340
35	**I want to produce enough maize just for my own use**	11%	14%	57%	18%	2.82	0.85	342
36	**I want to produce enough maize so that I can sell the surplus**	0%	2%	53%	44%	3.42	0.56	342
37	**I want to be a commercial maize farmer**	3%	5%	53%	39%	3.28	0.7	342
38	**I want farming to be my main source of income**	2%	2%	49%	47%	3.41	0.62	344

APPENDIX C – CORRELATION BETWEEN CONSTUCTS AND STANDALONE QUESTIONS

Spearman's rho's and p-values (as for probability sampling) are presented for constructs.

Construct		C1	C2	C3	C4	C5	C6	C7	C8	C9	Q14	Q21	Q31	Q35
C1	Rho	1.00	0.12	0.13	-0.19	0.00	-0.07	-0.27	0.01	0.26	0.14	0.20	0.25	0.25
	p-value	-	0.03	0.02	0.00	0.95	0.22	0.00	0.86	0.00	0.01	0.00	0.00	0.00
C2	Rho		1.00	-0.01	-0.27	-0.07	0.13	-0.10	0.01	0.22	0.06	0.07	0.30	-0.17
	p-value		-	0.84	0.00	0.20	0.02	0.06	0.88	0.00	0.28	0.15	0.00	0.00
C3	Rho	0.13	-0.01	1.00	0.35	0.12	-0.04	0.11	-0.03	0.09	0.13	0.29	0.04	0.15
	p-value	0.02	0.84	-	0.00	0.02	0.49	0.04	0.54	0.08	-0.02	0.00	0.48	0.00
C4	Rho	-0.19	-0.27	0.35	1.00	0.15	-0.21	0.17	-0.08	-0.10	-0.11	0.05	-0.05	0.32
	p-value	0.00	0.00	0.00	-	0.00	0.00	0.00	0.13	0.05	0.05	0.38	0.40	0.00
C5	Rho	0.00	-0.07	0.12	0.15	1.00	0.13	0.46	0.05	-0.19	0.06	0.22	-0.17	0.10
	p-value	0.95	0.20	0.02	0.00	-	0.02	0.00	0.39	0.00	0.24	0.00	0.00	0.06
C6	Rho	-0.07	0.13	-0.04	-0.21		1.00	0.19	0.39	0.15	0.32	-0.05	0.04	-0.07
	p-value	0.22	0.02	0.49	0.00		-	0.00	0.00	0.00	0.00	0.32	0.42	0.20
C7	Rho	-0.27	-0.10	0.11	0.17	0.46	0.19	1.00	0.20	-0.10	0.10	0.15	-0.11	0.21
	p-value	0.00	0.06	0.04	0.00	0.00	0.00	-	0.00	0.05	0.06	0.01	0.04	0.00
C8	Rho	0.01	0.01	-0.03	-0.08	0.05	0.39	0.20	1.00	0.17	0.22	-0.08	0.16	-0.01
	p-value	0.86	0.88	0.54	0.13	0.39	0.00	0.00	-	0.00	0.00	0.13	0.00	0.82
C9	Rho	0.26	0.22	0.09	-0.10	-0.19	0.15	-0.10	0.17	1.00	0.30	0.09	0.25	0.11
	p-value	0.00	0.00	0.08	0.05	0.00	0.00	0.05	0.00	-	0.00	0.09	0.00	0.04
Q14	Rho	0.14	0.06	0.13	-0.11	0.06	0.32	0.10	0.22	0.30	1.00	0.26	0.18	0.07

	p-value	0.01	0.28	-0.02	0.05	0.24	0.00	0.06	0.00	0.00	-	0.00	0.00	0.17
Q21	Rho	0.20	0.07	0.29	0.05	0.22	-0.05	0.15	-0.08	0.09	0.26	1.00	0.04	0.06
	p-value	0.00	0.15	0.00	0.38	0.00	0.32	0.01	0.13	0.09	0.00	-	0.42	0.23
Q31	Rho	0.25	0.30	0.04	-0.05	-0.17	0.04	-0.11	0.16	0.25	0.18	0.04	1.00	-0.09
	p-value	0.00	0.00	0.48	0.40	0.00	0.42	0.04	0.00	0.00	0.00	0.42	-	0.09
Q35	Rho	0.25	-0.17	0.15	0.32	0.10	-0.07	0.21	-0.01	0.11	0.07	0.06	-0.09	1.00
	p-value	0.00	0.00	0.00	0.00	0.06	0.20	0.00	0.82	0.04	0.17	0.23	0.09	0.00

APPENDIX D – LETTER FROM LANGUAGE EDITOR

Dynamic Language & Translation Specialists

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Friday, 18 November 2016

To whom it may concern,

Re: Letter of confirmation of language editing

The dissertation **Factors that influence the development of South African subsistent maize farmers into commercial farming units** by **Petrus Rasmus Smit (12894990)** was language, technically and typographically edited. The citations, sources and referencing technique applied was also checked to comply with University of South Africa's guidelines. Final corrections as suggested remain the responsibility of the student.

Yours sincerely,



Antoinette Bisschoff

Officially approved language editor of the NWU since 1998
Member of SA Translators Institute (no. 100181)

APPENDIX E - LETTER –TECHNICAL EDITING

BJB

Tegniese versorging / *Technical editing*

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2520

Mr PR Smit

TECHNICAL EDITING

This letter serves to confirm that the mini-dissertation titled

Factors that influence the development of South African subsistence maize farmers into commercial farming units

was technically edited by the undermentioned

Sincerely

EP Beukes

November 2016